NOTES

1. This subclass covers:
   • electric solid state devices which are not covered by any other subclass and details thereof, and includes: semiconductor devices adapted for rectifying, amplifying, oscillating or switching; semiconductor devices sensitive to radiation; electric solid state devices using thermoelectric, superconductive, piezoelectric, electrostrictive, magnetostrictive, galvano-magnetic or bulk negative resistance effects and integrated circuit devices;
   • photoresistors, magnetic field dependent resistors, field effect resistors, capacitors with potential-jump barrier, resistors with potential-jump barrier or surface barrier, incoherent light emitting diodes and thin-film or thick-film circuits;
   • processes and apparatus adapted for the manufacture or treatment of such devices, except where such processes relate to single-step processes for which provision exists elsewhere.

2. In this subclass, the following terms or expressions are used with the meaning indicated:
   • “wafer” means a slice of semiconductor or crystalline substrate material, which can be modified by impurity diffusion (doping), ion implantation or epitaxy, and whose active surface can be processed into arrays of discrete components or integrated circuits;
   • “solid state body” means the body of material within which, or at the surface of which, the physical effects characteristic of the device occur. In thermoelectric devices, it includes all materials in the current path. Regions in or on the body of the device (other than the solid state body itself), which exert an influence on the solid state body electrically, are considered to be “electrodes” whether or not an external electrical connection is made thereto. An electrode may include several portions and the term includes metallic regions which exert an influence on the solid state body through an insulating region (e.g. capacitive coupling) and inductive coupling arrangements to the body. The dielectric region in a capacitive arrangement is regarded as part of the electrode. In arrangements including several portions, only those portions which exert an influence on the solid state body by virtue of their shape, size, or disposition or the material of which they are formed are considered to be part of the electrode. The other portions are considered to be “arrangements for conducting electric current to or from the solid state body” or “interconnections between solid state components formed in or on a common substrate”, i.e. leads;
   • “device” means an electric circuit element; where an electric circuit element is one of a plurality of elements formed in or on a common substrate it is referred to as a “component”;
   • “complete device” is a device in its fully assembled state which may or may not require further treatment, e.g. electroforming, before it is ready for use but which does not require the addition of further structural units;
   • “parts” includes all structural units which are included in a complete device;
   • “container” is an enclosure forming part of the complete device and is essentially a solid construction in which the body of the device is placed, or which is formed around the body without forming an intimate layer thereon. An enclosure which consists of one or more layers formed on the body and in intimate contact therewith is referred to as an “encapsulation”;
   • “integrated circuit” is a device where all components, e.g. diodes, resistors, are built up on a common substrate and form the device including interconnections between the components;
   • “assembly” of a device is the building up of the device from its component constructional units and includes the provision of fillings in containers.

3. In this subclass, both the process or apparatus for the manufacture or treatment of a device and the device itself are classified, whenever both of these are described sufficiently to be of interest.
4. Attention is drawn to Note (3) after the title of section C, which Note indicates to which version of the periodic table of chemical elements the IPC refers. In this subclass, the Periodic System used is the 8 group system indicated by Roman numerals in the Periodic Table thereunder.

WARNINGS
1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:

- H01L 21/301 covered by H01L 21/30
- H01L 21/328 covered by H01L 29/66075
- H01L 21/329 covered by H01L 29/66083
- H01L 21/33 covered by H01L 29/66277
- H01L 21/331 covered by H01L 29/66234
- H01L 21/332 covered by H01L 29/66075
- H01L 21/333 covered by H01L 29/66409
- H01L 21/336 covered by H01L 29/66848
- H01L 21/338 covered by H01L 29/66946
- H01L 21/36 - H01L 21/368 covered by H01L 21/58
- H01L 21/60 covered by H01L 24/80
- H01L 21/666 covered by H01L 22/00
- H01L 21/603 covered by H01L 24/80
- H01L 21/607 covered by H01L 24/80
- H01L 21/8242 covered by H01L 27/10844
- H01L 21/8244 covered by H01L 27/11
- H01L 21/8246 covered by H01L 27/112
- H01L 21/98 covered by H01L 25/50
- H01L 29/338 covered by H01L 29/004-H01L 29/365
- H01L 29/996 covered by H01L 29/68-H01L 29/945
- H01L 51/30 covered by H01L 51/0032
- H01L 51/40 covered by H01L 51/0001
- H01L 51/46 covered by H01L 51/0012
- H01L 51/48 covered by H01L 51/0001
- H01L 51/54 covered by H01L 51/0032

2. In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

21/00 Processes or apparatus adapted for the manufacture or treatment of semiconductor or solid state devices or of parts thereof ((testing or measuring during manufacture or treatment, or reliability measurements H01L 22/00); multistep manufacturing processes for passive two-terminal components without a potential-jump or surface barrier for integrated circuits H01L 28/00; ) processes or apparatus peculiar to the manufacture or treatment of devices provided for in groups H01L 31/00 - H01L 51/00 or of parts thereof, see these groups; single-step processes covered by other subclasses, see the relevant subclasses, e.g. C23C, C30B; photomechanical production of textured or patterned surfaces, materials or originals therefor, apparatus specially adapted therefor, in general G03F)

21/02 . . . (Preparing wafers)

NOTES
1. This group covers processes for manufacturing wafers prior to the fabrication of any device, i.e. between the sawing of ingots (covered by B28D) and the cleaning of substrates (covered by H01L 21/02041).

CPC - 2019.05
21/02054 . . . . [combining dry and wet cleaning steps (H01L 21/02085 takes precedence)]
21/02057 . . . . [Cleaning during device manufacture]
21/0206 . . . . . [during, before or after processing of insulating layers]
21/02063 . . . . . [the processing being the formation of vias or contact holes]
21/02065 . . . . . [the processing being a planarization of insulating layers]
21/02068 . . . . . [during, before or after processing of conductive layers, e.g. polysilicon or amorphous silicon layers]
21/02071 . . . . . [the processing being a delineation, e.g. RIE, of conductive layers]
21/02074 . . . . . [the processing being a planarization of conductive layers]
21/02076 . . . . . [Cleaning after the substrates have been singulated]
21/02079 . . . . . [Cleaning for reclaiming]
21/02082 . . . . . [product to be cleaned]
21/02085 . . . . . [Cleaning of diamond]
21/02087 . . . . . [Cleaning of wafer edges]
21/0209 . . . . . [Cleaning of wafer backside]
21/02093 . . . . . [only mechanical cleaning]
21/02096 . . . . . [only involving lasers, e.g. laser ablation]
21/02098 . . . . . [only involving supercritical fluids]
21/02101 . . . . . [combining dry and wet cleaning steps]
21/02104 . . . . . [Forming layers (deposition in general C23C; crystal growth in general C30B;)

**WARNING**

Groups H01L 21/02104 – H01L 21/02694 are incomplete pending reclassification of documents from groups H01L 21/06, H01L 21/16, and H01L 21/20.

Groups H01L 21/02104 – H01L 21/02694, H01L 21/06, H01L 21/20, and H01L 21/16 should be considered in order to perform a complete search.

21/02107 . . . . [Forming insulating materials on a substrate]

**WARNING**

Groups H01L 21/02107 – H01L 21/02326 are incomplete pending reclassification of documents from groups H01L 21/312, H01L 21/314, H01L 21/316, and H01L 21/318.

Groups H01L 21/02107 – H01L 21/02326, H01L 21/312, H01L 21/314, H01L 21/316, and H01L 21/318 should be considered in order to perform a complete search.

21/02109 . . . . [characterised by the type of layer, e.g. type of material, porous/non-porous, pre-cursors, mixtures or laminates]

21/02112 . . . . . [characterised by the material of the layer]

**NOTE**

Layers comprising sublayers, i.e. multi-layers, are additionally classified in H01L 21/022; porous layers are additionally classified in H01L 21/0203

21/02115 . . . . . [the material being carbon, e.g. alpha-C, diamond or hydrogen doped carbon]
21/02118 . . . . . [carbon based polymeric organic or inorganic material, e.g. polymides, poly cyclobutene or PVC (polymers per se C08G, photoresist per se G03F)]
21/0212 . . . . . . [the material being fluoro carbon compounds, e.g. (CFx)n, (CHxFy)n or polytetrafluoroethylene]
21/02123 . . . . . . [the material containing silicon]
21/02126 . . . . . . [the material containing Si, O, and at least one of H, N, C, F, or other non-metal elements, e.g. SiOC, SiOC:H or SiONC]
21/02129 . . . . . . [the material being boron or phosphorus doped silicon oxides, e.g. BPSG, BSG or PSG]

**NOTE**

Halogen, e.g. fluorine, containing BPSG, PSG, BSG, and the like, are additionally classified in H01L 21/02131

21/02131 . . . . . . [the material being halogen doped silicon oxides, e.g. FSG]
21/02134 . . . . . . [the material comprising hydrogen silsesquioxane, e.g. HSQ]
21/02137 . . . . . . [the material comprising alkyl silsesquioxane, e.g. MSQ]
21/0214 . . . . . . [the material being a silicon oxynitride, e.g. SiON or SiON:H]
21/02142 . . . . . . [the material containing silicon and at least one metal element, e.g. metal silicate based insulators or metal silicon oxynitrides]
21/02145 . . . . . . [the material containing aluminium, e.g. AISiOx]
21/02148 . . . . . . [the material containing hafnium, e.g. HfSiOx or HfSiON]
21/0215 . . . . . . [the material containing tantalum, e.g. TaSiOx]
21/02153 . . . . . . [the material containing titanium, e.g. TiSiOx]
21/02156 . . . . . . [the material containing at least one rare earth element, e.g. silicate of lanthanides, scandium or yttrium]
21/02159 . . . . . . [the material containing zirconium, e.g. ZrSiOx]
21/02161 . . . . . . [the material containing more than one metal element]
21/02164 . . . . . . [the material being a silicon oxide, e.g. SiO2]

**NOTE**

The formation of silicon oxide layers is classified in this group regardless of the precursor or of the process of formation; in case of explicit statements on doping, on rest-groups, or on material components see H01L 21/02126 and subgroups; deposition of silicon oxide from organic precursors without further statements on film.
H01L 21/02164 (continued)

composition is classified here and in H01L 21/02205 and subgroups

21/02167 . . . . . . . . {the material being a silicon carbide not containing oxygen, e.g. SiC, SiC:H or silicon carbonitrides (H01L 21/02126 and H01L 21/0214 take precedence)}

21/0217 . . . . . . . . {the material being a silicon nitride not containing oxygen, e.g. SixNy or SixByNz (H01L 21/02126 and H01L 21/0214 take precedence)}

21/02172 . . . . . . . . {the material containing at least one metal element, e.g. metal oxides, metal nitrides, metal oxynitrides or metal carbides (materials containing silicon H01L 21/02123; metal silicates H01L 21/02142)}

21/02175 . . . . . . . . {characterised by the metal (H01L 21/02197 takes precedence)}

21/02178 . . . . . . . . {the material containing aluminium, e.g. Al₂O₃}

21/02181 . . . . . . . . {the material containing hafnium, e.g. HfO₂}

21/02183 . . . . . . . . {the material containing tantalum, e.g. Ta₂O₅}

21/02186 . . . . . . . . {the material containing titanium, e.g. TiO₂}

21/02189 . . . . . . . . {the material containing zirconium, e.g. ZrO₂}

21/02192 . . . . . . . . {the material containing at least one rare earth metal element, e.g. oxides of lanthanides, scandium or yttrium}

21/02194 . . . . . . . . {the material containing more than one metal element}

21/02197 . . . . . . . . {the material having a perovskite structure, e.g. BaTiO₃}

21/022 . . . . . . . . {the layer being a laminate, i.e. composed of sublayers, e.g. stacks of alternating high-k metal oxides (adhesion layers or buffer layers H01L 21/02304, H01L 21/0262)}

21/02203 . . . . . . . . {the layer being porous}

21/02205 . . . . . . . . {the layer being characterised by the precursor material for deposition}

21/02208 . . . . . . . . {the precursor containing a compound comprising Si}

21/02211 . . . . . . . . {the compound being a silane, e.g. disilane, methylsilane or chlorosilane}

21/02214 . . . . . . . . {the compound comprising silicon and oxygen}

NOTE
This group does not cover mixtures of a silane and oxygen

21/02216 . . . . . . . . {the compound being a molecule comprising at least one silicon-oxygen bond and the compound having hydrogen or an organic group attached to the silicon or oxygen, e.g. a siloxane}

21/02219 . . . . . . . . {the compound comprising silicon and nitrogen}

NOTE
This group does not cover mixtures of silane and nitrogen

21/0222 . . . . . . . . . . . {the compound being a silazane}

21/0225 . . . . . . . . . . . {characterised by the process for the formation of the insulating layer}

21/0227 . . . . . . . . . . . {formation by a process other than a deposition process}

NOTE
Subject matter classified in the range of H01L 21/0223 - H01L 21/0249 is additionally classified in H01L 21/0249, H01L 21/0255 and H01L 21/0252, depending on the type of reaction

21/0223 . . . . . . . . . . . {formation by oxidation, e.g. oxidation of the substrate}

21/02233 . . . . . . . . . . . {of the semiconductor substrate or a semiconductor layer}

21/02236 . . . . . . . . . . . {group IV semiconductor}

21/02238 . . . . . . . . . . . {silicon in uncombined form, i.e. pure silicon}

21/02241 . . . . . . . . . . . {III-V semiconductor}

21/02244 . . . . . . . . . . . {of a metallic layer}

21/02247 . . . . . . . . . . . {formation by nitridation, e.g. nitridation of the substrate}

21/02249 . . . . . . . . . . . {formation by combined oxidation and nitridation performed simultaneously}

21/02252 . . . . . . . . . . . {formation by plasma treatment, e.g. plasma oxidation of the substrate (after treatment of an insulating film by plasma H01L 21/3105 and subgroups)}

21/02255 . . . . . . . . . . . {formation by thermal treatment (H01L 21/0252 takes precedence; after treatment of an insulating film H01L 21/3105 and subgroups)}

21/02258 . . . . . . . . . . . {formation by anodic treatment, e.g. anodic oxidation}

21/0226 . . . . . . . . . . . {formation by a deposition process (per se C23C)}

21/02263 . . . . . . . . . . . {deposition from the gas or vapour phase}

NOTE
This group and subgroups also cover deposition methods in which the gas or vapour is produced by physical means, e.g. ablation from targets or heating of source material

21/02266 . . . . . . . . . . . {deposition by physical ablation of a target, e.g. sputtering, reactive sputtering, physical vapour deposition or pulsed laser deposition}

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21/02269 . . . . . . . . . . . . . . . . . . . . . . (deposition by thermal evaporation
(H01L 21/02293 takes precedence))

NOTE
Subject matter relating to molecular beam epitaxy is classified in this group

21/02271 . . . . . . . . . . . . . . . . . . . . . . (deposition by decomposition or
reaction of gaseous or vapour phase
compounds, i.e. chemical vapour
deposition (H01L 21/02266 takes
precedence))

{ in the presence of a plasma
[PECVD]}

21/02274 . . . . . . . . . . . . . . . . . . . . . . { the reactions being activated
by other means than plasma or
thermal, e.g. photo-CVD}

21/02277 . . . . . . . . . . . . . . . . . . . . . . { deposition by cyclic CVD, e.g.
ALD, ALE, pulsed CVD}

NOTE
Subject matter relating to cyclic plasma CVD is additionally
classified in H01L 21/02274

21/0228 . . . . . . . . . . . . . . . . . . . . . . { liquid deposition, e.g. spin-coating, sol-
gel techniques, spray coating}

21/02282 . . . . . . . . . . . . . . . . . . . . . . { Langmuir-Blodgett techniques}

21/02285 . . . . . . . . . . . . . . . . . . . . . . { printing, e.g. ink-jet printing (per se
B41J)}

21/02288 . . . . . . . . . . . . . . . . . . . . . . { liquid atomic layer deposition
( H01L 21/02277 and subgroups take
precedence) }

21/0229 . . . . . . . . . . . . . . . . . . . . . . { formation of epitectical layers by a
deposition process (epitaxial growth per
se C30B)}

NOTE
Formation of non-epitectical layers
by MBE, ALE, etc. is not covered
by this group; for MBE see
H01L 21/02269; for ALE see
H01L 21/0228

21/02296 . . . . . . . . . . . . . . . . . . . . . . { characterised by the treatment performed
before or after the formation of the layer
( H01L 21/02227 and subgroups take
precedence) }

NOTE
This group and subgroups only cover
processes which are directly linked to
the layer formation; routine anneals,
i.e. thermal treatment without further
features like a special atmosphere,
presence of a plasma, thermally
induced chemical reactions, change
of phase (crystal structure) etc. are
not classified here; for cleaning see
H01L 21/02041 and subgroups; for etching processes see
H01L 21/311 and subgroups; for planarization processes
see H01L 21/31051 and subgroups; for processes to repair etch damage see
H01L 21/3105 and subgroups

21/02299 . . . . . . . . . . . . . . . . . . . . . . { pre-treatment }

NOTE
This group and subgroups cover
treatments to improve adhesion
or change the surface termination;
for etching see H01L 21/306 and
subgroups and H01L 21/311 and
subgroups

21/02301 . . . . . . . . . . . . . . . . . . . . . . { in-situ cleaning }

NOTE
Subject matter relating to the
cleaning processes for semiconductor
devices in general is covered by
H01L 21/02041 and subgroups

21/02304 . . . . . . . . . . . . . . . . . . . . . . { formation of intermediate layers,
e.g. buffer layers, layers to improve
adhesion, lattice match or diffusion
barriers}

21/02307 . . . . . . . . . . . . . . . . . . . . . . { treatment by exposure to a liquid}

21/0231 . . . . . . . . . . . . . . . . . . . . . . { treatment by exposure to
electromagnetic radiation, e.g. UV
light}

21/02312 . . . . . . . . . . . . . . . . . . . . . . { treatment by exposure to a gas or
vapour}

21/02315 . . . . . . . . . . . . . . . . . . . . . . { treatment by exposure to a plasma}

21/02318 . . . . . . . . . . . . . . . . . . . . . . { post-treatment }

NOTE
This group only covers processes
that are part of the layer formation;
treatments which are performed after
completion of the insulating layer
are covered by H01L 21/3105 and
subgroups

21/02321 . . . . . . . . . . . . . . . . . . . . . . { introduction of substances into an
already existing insulating layer
( H01L 21/02227 and subgroups take
precedence) }

NOTE
processes like the introduction of
phosphorus into silicon oxide by
diffusion, or doping of an already
existing insulating layer are covered
by this group and subgroups; for
the method of introduction, see
H01L 21/02337, H01L 21/02343,
H01L 21/02345 and subgroups

21/02323 . . . . . . . . . . . . . . . . . . . . . . { introduction of oxygen
21/02326 . . . . . . . . . . . . . . . . . . . . . . { into a nitride layer, e.g. changing
SiN to SiON}

21/02329 . . . . . . . . . . . . . . . . . . . . . . { introduction of nitrogen}

21/02332 . . . . . . . . . . . . . . . . . . . . . . { into an oxide layer, e.g. changing
SiO to SiON}

21/02334 . . . . . . . . . . . . . . . . . . . . . . { in-situ cleaning after layer formation,
e.g. removing process residues}

NOTE
Subject matter relating to the
cleaning processes for semiconductor
H01L

H01L 21/02334
(continued)

devices in general is covered by
H01L 21/02041 and subgroups

21/02337 . . . . . . [treatment by exposure to a gas or vapour]
21/0234 . . . . . . . [treatment by exposure to a plasma]
21/02343 . . . . . . [treatment by exposure to a liquid]
21/02345 . . . . . . . [treatment by exposure to radiation, e.g. visible light]
21/02348 . . . . . . . [treatment by exposure to UV light]
21/02351 . . . . . . . [treatment by exposure to corpuscular radiation, e.g. exposure to electrons, alpha-particles, protons or ions]
21/02354 . . . . . . . (using a coherent radiation, e.g. a laser)
21/02356 . . . . . . . [treatment to change the morphology of the insulating layer, e.g. transformation of an amorphous layer into a crystalline layer]
21/02359 . . . . . . . [treatment to change the surface groups of the insulating layer]
21/02362 . . . . . . . [formation of intermediate layers, e.g. capping layers or diffusion barriers]
21/02365 . . . . . . . [Forming inorganic semiconducting materials on a substrate (for light-sensitive devices H01L 31/00)]

WARNING

Group H01L 21/02365 is incomplete pending reclassification of documents from groups H01L 21/06, H01L 21/16, and H01L 21/20

Groups H01L 21/06, H01L 21/16, and H01L 21/20 should be considered in order to perform a complete search.

21/02367 . . . . . . [Substrates]
21/0237 . . . . . . . [Materials]
21/02373 . . . . . . . [Group 14 semiconducting materials]
21/02376 . . . . . . . [Carbon, e.g. diamond-like carbon]
21/02378 . . . . . . . [Silicon carbide]
21/02381 . . . . . . . [Silicon, silicon germanium, germanium]
21/02384 . . . . . . . [including tin]
21/02387 . . . . . . . [Group 13/15 materials]
21/02389 . . . . . . . [Nitrides]
21/02392 . . . . . . . [Phosphides]
21/02395 . . . . . . . [Arsenides]
21/02398 . . . . . . . [Antimonides]
21/024 . . . . . . . [Group 12/16 materials]
21/02403 . . . . . . . [Oxides]
21/02406 . . . . . . . [Sulfides]
21/02409 . . . . . . . [Selenides]
21/02411 . . . . . . . [Tellurides]
21/02414 . . . . . . . [Oxide semiconducting materials not being Group 12/16 materials, e.g. ternary compounds]
21/02417 . . . . . . . [Chalcogenide semiconducting materials not being oxides, e.g. ternary compounds]
21/0242 . . . . . . . [Crystalline insulating materials]
21/02422 . . . . . . . [Non-crystalline insulating materials, e.g. glass, polymers]

21/02425 . . . . . . . [Conductive materials, e.g. metallic silicides]
21/02428 . . . . . . . [Structure]
21/0243 . . . . . . . [Surface structure]
21/02433 . . . . . . . [Crystal orientation]
21/02436 . . . . . . . [Intermediate layers between substrates and deposited layers]
21/02439 . . . . . . . [Materials]
21/02441 . . . . . . . [Group 14 semiconducting materials]
21/02444 . . . . . . . [Carbon, e.g. diamond-like carbon]
21/02447 . . . . . . . [Silicon carbide]
21/0245 . . . . . . . [Silicon, silicon germanium, germanium]
21/02452 . . . . . . . [including tin]
21/02455 . . . . . . . [Group 13/15 materials]
21/02458 . . . . . . . [Nitrides]
21/02461 . . . . . . . [Phosphides]
21/02463 . . . . . . . [Arsenides]
21/02466 . . . . . . . [Antimonides]
21/02469 . . . . . . . [Group 12/16 materials]
21/02472 . . . . . . . [Oxides]
21/02474 . . . . . . . [Sulfides]
21/02477 . . . . . . . [Selenides]
21/0248 . . . . . . . [Tellurides]
21/02483 . . . . . . . [Oxide semiconducting materials not being Group 12/16 materials, e.g. ternary compounds]
21/02485 . . . . . . . [Other chalcogenide semiconducting materials not being oxides, e.g. ternary compounds]
21/02488 . . . . . . . [Insulating materials]
21/02491 . . . . . . . [Conductive materials]
21/02494 . . . . . . . [Structure]
21/02496 . . . . . . . [Layer structure]
21/02499 . . . . . . . [Monolayers]
21/02502 . . . . . . . [consisting of two layers]
21/02505 . . . . . . . [consisting of more than two layers]
21/02507 . . . . . . . [Alternating layers, e.g. superlattice]
21/0251 . . . . . . . [Graded layers]
21/02513 . . . . . . . [Microstructures]
21/02516 . . . . . . . [Crystal orientation]
21/02518 . . . . . . . [Deposited layers]
21/02521 . . . . . . . [Materials]
21/02524 . . . . . . . [Group 14 semiconducting materials]
21/02527 . . . . . . . [Carbon, e.g. diamond-like carbon]
21/02529 . . . . . . . [Silicon carbide]
21/0253 . . . . . . . [Silicon, silicon germanium, germanium]
21/02535 . . . . . . . [including tin]
21/02538 . . . . . . . [Group 13/15 materials]
21/0254 . . . . . . . [Nitrides]
21/02543 . . . . . . . [Phosphides]
21/02546 . . . . . . . [Arsenides]
21/02549 . . . . . . . [Antimonides]
21/02551 . . . . . . . [Group 12/16 materials]
21/02554 . . . . . . . [Oxides]
21/02557 . . . . . . . [Sulfides]
21/0256 . . . . . . . [Selenides]
21/02562 . . . . . . . [Tellurides]
H01L

21/02656 . . . . . . . . {Oxide semiconducting materials not being Group 12/16 materials, e.g. ternary compounds}
21/02658 . . . . . . . . {Chalcogenide semiconducting materials not being oxides, e.g. ternary compounds}
21/0257 . . . . . . . . {Doping during depositing}
21/02573 . . . . . . . . {Conductivity type}
21/02576 . . . . . . . . {N-type}
21/02579 . . . . . . . . {P-type}
21/02581 . . . . . . . . {Transition metal or rare earth elements}
21/02584 . . . . . . . . {Delta-doping}
21/02587 . . . . . . . . {Structure}
21/0259 . . . . . . . . {Microstructure}
21/02592 . . . . . . . . {amorphous}
21/02595 . . . . . . . . {polycrystalline}
21/02598 . . . . . . . . {monocrystalline}
21/02601 . . . . . . . . {Nanoparticles (fullerenes H01L 51/0046)}
21/02603 . . . . . . . . {Nanowires}
21/02606 . . . . . . . . {Nanotubes (carbon nanotubes H01L 51/0048)}
21/02609 . . . . . . . . {Crystal orientation}
21/02612 . . . . . . . . {Formation types}
21/02614 . . . . . . . . {Transformation of metal, e.g. oxidation, nitridation}
21/02617 . . . . . . . . {Deposition types}
21/0262 . . . . . . . . {Reduction or decomposition of gaseous compounds, e.g. CVD}
21/02623 . . . . . . . . {Liquid deposition}
21/02625 . . . . . . . . {using melted materials}
21/02628 . . . . . . . . {using solutions}
21/02631 . . . . . . . . {Physical deposition at reduced pressure, e.g. MBE, sputtering, evaporation}
21/02634 . . . . . . . . {Homoepitaxy}
21/02636 . . . . . . . . {Selective deposition, e.g. simultaneous growth of mono- and non-monocrystalline semiconductor materials}
21/02639 . . . . . . . . {Preparation of substrate for selective deposition}
21/02642 . . . . . . . . {Mask materials other than SiO or SiN}
21/02645 . . . . . . . . {Seed materials}
21/02647 . . . . . . . . {Lateral overgrowth}
21/0265 . . . . . . . . {Pendechoxipaty}
21/02653 . . . . . . . . {Vapour deposition}
21/02656 . . . . . . . . {Special treatments}
21/02658 . . . . . . . . {Pretreatments (cleaning in general H01L 21/02041)}
21/02661 . . . . . . . . {In-situ cleaning}
21/02664 . . . . . . . . {Aftertreatments (planarisation in general H01L 21/304)}
21/02667 . . . . . . . . {Crystallisation or recrystallisation of non-monocrystalline semiconductor materials, e.g. regrowth}
21/02669 . . . . . . . . {using crystallisation inhibiting elements}
21/02672 . . . . . . . . {using crystallisation enhancing elements}
21/02675 . . . . . . . . {using laser beams}
21/02678 . . . . . . . . {Beam shaping, e.g. using a mask}
21/0268 . . . . . . . . {Shape of mask}
21/02683 . . . . . . . . {Continuous wave laser beam}
21/02686 . . . . . . . . {Pulsed laser beam}
21/02689 . . . . . . . . {using particle beams}
21/02691 . . . . . . . . {Scanning of a beam}
21/02694 . . . . . . . . {Controlling the interface between substrate and epilayer, e.g. by ion implantation followed by annealing}
21/02697 . . . . . . . . {Forming conducting materials on a substrate}
21/027 . . . . . . . . {Making masks on semiconductor bodies for further photolithographic processing not provided for in group H01L 21/18 or H01L 21/34 ((photographic masks or originals per se G03F 1/00; registration or positioning of photographic masks or originals G03F 9/00; photographic cameras G03B; control of position G05D 3/00))}
21/0271 . . . . . . . . {comprising organic layers}
21/0272 . . . . . . . . {for lift-off processes}
21/0273 . . . . . . . . {characterised organic layers}
21/0274 . . . . . . . . {Photolithographic processes}
21/0275 . . . . . . . . {using lasers}
21/0276 . . . . . . . . {using an anti-reflective coating (anti-reflective coating for lithography in general G03F 7/09)}
21/0277 . . . . . . . . {Electrolithographic processes}
21/0278 . . . . . . . . {Röntgenlithographic or X-ray lithographic processes}
21/0279 . . . . . . . . {Ionlithographic processes}
21/033 . . . . . . . . {comprising inorganic layers}
21/0331 . . . . . . . . {for lift-off processes}
21/0332 . . . . . . . . {characterised by their composition, e.g. multilayer masks, materials}
21/0334 . . . . . . . . {characterised by their size, orientation, disposition, behaviour, shape, in horizontal or vertical plane}
21/0335 . . . . . . . . {characterised by their behaviour during the process, e.g. soluble masks, redeposited masks}
21/0337 . . . . . . . . {characterised by the process involved to create the mask, e.g. lift-off masks, sidewalls, or to modify the mask, e.g. pretreatment, post-treatment}
21/0338 . . . . . . . . {Process specially adapted to improve the resolution of the mask}
21/04 . . . . . . . . . {the devices having at least one potential-jump barrier or surface barrier, e.g. PN junction, depletion layer, carrier concentration layer ((multistep processes specially adapted for the manufacture of said devices H01L 29/66007; H01L 29/401; details of semiconductor bodies H01L 29/02))}
21/0405 . . . . . . . . {the devices having semiconductor bodies comprising semiconducting carbon, e.g. diamond, diamond-like carbon (multistep processes for the manufacture of said devices H01L 29/66015))}

NOTE
This group covers passivation
21/041 . . . . . . . . {Making n- or p-doped regions}
21/0415 . . . . . . . . {using ion implantation}
WARNING
Group H01L 21/16 is impacted by reclassification into groups H01L 21/02365 – H01L 21/02694.

Groups H01L 21/16 and H01L 21/02365 – H01L 21/02694 should be considered in order to perform a complete search.

NOTE
This group covers also processes and apparatus which, by using the appropriate technology, are clearly suitable for manufacture or treatment of devices whose bodies comprise elements of Group IV of the Periodic System or A$_3$B$_5$ compounds, even if the material used is not explicitly specified.

WARNING
Group H01L 21/20 is impacted by reclassification into groups H01L 21/02365 – H01L 21/02694.

Groups H01L 21/20 and H01L 21/02365 – H01L 21/02694 should be considered in order to perform a complete search.

21/16 . . . . . . the devices having semiconductor bodies comprising cuprous oxide or cuprous iodide

WARNING
Group H01L 21/06 is impacted by reclassification into groups H01L 21/02365 – H01L 21/02694.

Groups H01L 21/06 and H01L 21/02365 – H01L 21/02694 should be considered in order to perform a complete search.

NOTE
Processes where ion implantation of boron and subsequent annealing does not produce a p-doped region are classified elsewhere, e.g. H01L 21/0445.

21/046 . . . . . . {using ion implantation}

NOTE
Deposition of semiconductor materials on a substrate, e.g. epitaxial growth [solid phase epitaxy]
21/203 . . . . . {Characterised by the substrate
(H01L 21/203; H01L 21/205,
H01L 21/208 take precedence)}
21/207 . . . . . {Bonding of semiconductor wafers
to insulating substrates or to
semiconducting substrates using
an intermediate insulating layer
(H01L 21/2011 takes precedence;
bonding of semiconductor wafers
to semiconductor wafers for junction
formation H01L 21/187) }
21/2011 . . . . . {the substrate being of crystalline
insulating material, e.g. sapphire}
21/2015 . . . . . {the substrate being of crystalline
semiconductor material, e.g. lattice
adaptation, heteroepitaxy}
21/2018 . . . . . {Selective epitaxial growth, e.g.
simultaneous deposition of mono- and
non-mono semiconductor materials}
21/2022 . . . . . {Epitaxial regrowth of non-
monocrystalline semiconductor
materials, e.g. lateral epitaxy by seeded
solidification, solid-state crystallization,
solid-state graphoepitaxy, explosive
crystallization, grain growth in
polycrystalline materials}
21/2026 . . . . . {using a coherent energy beam, e.g.
laser or electron beam}
21/203 . . . . . using physical deposition, e.g. vacuum
deposition, sputtering
21/2033 . . . . . {Epitaxial deposition of elements of
Group IV of the Periodic System, e.g.
Si, Ge}
21/2036 . . . . . {Epitaxial deposition of AII BV
compounds}
21/205 . . . . . using reduction or decomposition of a
gaseous compound yielding a solid
condensate, i.e. chemical deposition
21/2053 . . . . . {Epitaxial deposition of elements of
Group IV of the Periodic System, e.g.
Si, Ge}
21/2056 . . . . . {Epitaxial deposition of AIII BV
compounds}
21/208 . . . . . using liquid deposition
21/2085 . . . . . {Epitaxial deposition of AIII BV
compounds}
21/22 . . . . . Diffusion of impurity materials, e.g.
doping materials, electrode materials,
into or out of a semiconductor body,
or between semiconductor regions;
[Interactions between two or more
impurities; Redistribution of impurities]
21/2205 . . . . . {from the substrate during epitaxy,
e.g. autodoping; Preventing or using
autodoping}
21/221 . . . . . {of killers}
21/2215 . . . . . {in AIII BV compounds}
21/222 . . . . . {Lithium-drift}
21/2225 . . . . . {Diffusion sources}
21/223 . . . . . using diffusion into or out of a
solid from or into a gaseous phase
(H01L 21/221 - H01L 21/222 take
precedence; diffusion through an applied
layer H01L 21/225)
21/2233 . . . . . {Diffusion into or out of AIII BV
compounds}
21/2236 . . . . . {from or into a plasma phase}
21/225 . . . . . using diffusion into or out of a solid from
or into a solid phase, e.g. a doped oxide
layer ( H01L 21/221 - H01L 21/222 take
precedence) }
21/2251 . . . . . {Diffusion into or out of group IV
semiconductors}
21/2252 . . . . . {using predeposition of impurities
into the semiconductor surface, e.g.
from a gaseous phase}
21/2253 . . . . . {by ion implantation}

NOTE
In groups
H01L 21/2254 - H01L 21/2257
one should consider the main
compositional parts of the
applied layer just before the
diffusion step
21/2254 . . . . . {from or through or into an applied
layer, e.g. photoresist, nitrides}
21/2255 . . . . . {the applied layer comprising
oxides only, e.g. P2O5, PSG,
H3BO3, doped oxides}
21/2256 . . . . . {through the applied layer}
21/2257 . . . . . {the applied layer being silicon or
silicide or SIPOS, e.g. polysilicon,
porous silicon}
21/2258 . . . . . {Diffusion into or out of AIII BV
compounds}
21/228 . . . . . using diffusion into or out of a solid from
or into a liquid phase, e.g. alloy diffusion
processes (H01L 21/221 - H01L 21/222
take precedence)
21/24 . . . . . Alloying of impurity materials, e.g. doping
materials, electrode materials, with a
semiconductor body (H01L 21/182 takes
precedence)
21/242 . . . . . {Alloying of doping materials with AIII BV
compounds}
21/244 . . . . . {Alloying of electrode materials}
21/246 . . . . . . {with AIII BV compounds}
21/248 . . . . . {Apparatus specially adapted for the
alloying}
21/26 . . . . . Bombardment with radiation
(H01L 21/3105 takes precedence)
21/2605 . . . . {using natural radiation, e.g. alpha, beta or
gamma radiation}
21/261 . . . . to produce a nuclear reaction transmuting
chemical elements
21/263 . . . . with high-energy radiation (H01L 21/261
takes precedence)
21/2633 . . . . {for etching, e.g. sputteretching}
21/2636 . . . . {for heating, e.g. electron beam heating}
WARNING

Groups H01L 21/26566, H01L 21/2658 and H01L 21/26593 are incomplete pending reclassification of documents from groups H01L 21/26506 and H01L 21/2654. Groups H01L 21/26566, H01L 21/2658, H01L 21/26593, H01L 21/26506 and H01L 21/2654 should be considered in order to perform a complete search.

NOTE

When the final conductor comprises a superconductor, subject matter is not classified according to the subgroups H01L 21/28035 - H01L 21/28097. Instead, it is classified in H01L 21/28026.

NOTE

A very thin, e.g. silicon, adhesion or seed layer is not considered as the one next to the insulator.

NOTE

To assess the coverage of groups H01L 21/28052 and H01L 21/28061, barrier layers, e.g. TaSiN, are not considered.
NOTE

Documents are also classified in groups H01L 21/28035 - H01L 21/28104 when the composition is also relevant

21/28123 . . . . . . . . . . . . . [Lintography-related aspects, e.g. sub-lintography lengths; Isolation-related aspects, e.g. to solve problems arising at the crossing with the side of the device isolation; Planarisation aspects]

21/28132 . . . . . . . . . . . . . [conducing part of electrode is defined by a sidewalk spacer or a similar technique, e.g. oxidation under mask, plating]

21/28141 . . . . . . . . . . . . . [insulating part of the electrode is defined by a sidewalk spacer, e.g. dummy spacer, or a similar technique, e.g. oxidation under mask, plating]

21/2815 . . . . . . . . . . . . . [part or whole of the electrode is a sidewalk spacer or made by a similar technique, e.g. transformation under mask, plating]

21/28158 . . . . . . . . . . . . . [Making the insulator]

21/28167 . . . . . . . . . . . . . [on single crystalline silicon, e.g. using a liquid, i.e. chemical oxidation]

21/28176 . . . . . . . . . . . . . [with a treatment, e.g. annealing, after the formation of the definitive gate conductor]

21/28185 . . . . . . . . . . . . . [with a treatment, e.g. annealing, after the formation of the gate insulator and before the formation of the definitive gate conductor]

21/28194 . . . . . . . . . . . . . [by deposition, e.g. evaporation, ALD, CVD, sputtering, laser deposition (H01L 21/28202 takes precedence)]

21/28202 . . . . . . . . . . . . . [in a nitrogen-containing ambient, e.g. nitride deposition, growth, oxynitridation, NH₃ nitridation, N₂O oxidation, thermal nitridation, RTN, plasma nitridation, RPN]

21/28211 . . . . . . . . . . . . . [in a gaseous ambient using an oxygen or a water vapour, e.g. RTO, possibly through a layer (H01L 21/28194 and H01L 21/28202 take precedence)]

NOTE

thin oxidation layers used as a barrier layer or as a buffer layer, e.g. before the formation of a high-k insulator, are classified here only if important per se.
H01L

21/28587 ............ [characterised by the sectional shape, e.g. T, inverted T]
21/28593 ............ [asymmetrical sectional shape]
21/288 ............ from a liquid, e.g. electrolytic deposition
21/2885 ............ [using an external electrical current, i.e. electro-deposition]
21/30 ............ Treatment of semiconductor bodies using processes or apparatus not provided for in groups H01L 21/20 - H01L 21/26 (manufacture of electrodes thereon H01L 21/28)
21/3003 ............ [Hydrogenation or deuterisation, e.g. using atomic hydrogen from a plasma]
21/3006 ............ [of AIBV compounds]
21/302 ............ to change their surface-physical characteristics or shape, e.g. etching, polishing, cutting
21/304 ............ Mechanical treatment, e.g. grinding, polishing, cutting (H01L 21/30625 takes precedence)
21/3043 ............ [Making grooves, e.g. cutting]
21/3046 ............ [using blasting, e.g. sand-blasting (H01L 21/2633 takes precedence)]
21/306 ............ Chemical or electrical treatment, e.g. electrolytic etching (to form insulating layers H01L 21/31)
21/30604 ............ [Chemical etching]
21/30608 ............ [Anisotropic liquid etching (H01L 21/3063 takes precedence)]
21/30612 ............ [Etching of AIBV compounds]
21/30617 ............ [Anisotropic liquid etching]
21/30621 ............ [Vapour phase etching]
21/30625 ............ [With simultaneous mechanical treatment, e.g. mechano-chemical polishing]
21/3063 ............ Electrolytic etching
21/30635 ............ [of AIBV compounds]
21/3065 ............ Plasma etching; Reactive-ion etching
21/30655 ............ [comprising alternated and repeated etching and passivation steps, e.g. Bosch process]
21/308 ............ using masks (H01L 21/3063, H01L 21/3065 take precedence)
21/3081 ............ [characterised by their composition, e.g. multilayer masks, materials]
21/3083 ............ [characterised by their size, orientation, disposition, behaviour, shape, in horizontal or vertical plane]
21/3085 ............ [characterised by their behaviour during the process, e.g. soluble masks, redeposited masks]
21/3086 ............ [characterised by the process involved to create the mask, e.g. lift-off masks, sidewalls, or to modify the mask, e.g. pre-treatment, post-treatment]
21/3088 ............ [Process specially adapted to improve the resolution of the mask]

21/31 ............ to form insulating layers thereon, e.g. for masking or by using photolithographic techniques (layers forming electrodes H01L 21/28; encapsulating layers H01L 21/56); After treatment of these layers
21/3105 ............ After-treatment
21/31051 ............ [Planarisation of the insulating layers (H01L 21/31058 takes precedence)]
21/31053 ............ [invoking a dielectric removal step]
21/31055 ............ [the removal being a chemical etching step, e.g. dry etching (etching per se H01L 21/311)]
21/31056 ............ [the removal being a selective chemical etching step, e.g. selective dry etching through a mask]
21/31058 ............ [of organic layers]
21/311 ............ Etching the insulating layers (by chemical or physical means (H01L 21/31058 takes precedence))
21/31105 ............ [Etching inorganic layers]
21/31111 ............ [by chemical means]
21/31116 ............ [by dry-etching]
21/31122 ............ [of layers not containing Si, e.g. PZT, Al2O3]
21/31127 ............ [Etching organic layers]
21/31133 ............ [by chemical means]
21/31138 ............ [by dry-etching]
21/31144 ............ [using masks]
21/3115 ............ Doping the insulating layers
21/31155 ............ [by ion implantation]
21/312 ............ Organic layers, e.g. photoresist (H01L 21/3105, H01L 21/32 take precedence; photoresists per se G03C)

**WARNING**

Groups H01L 21/312 – H01L 21/3128 are no longer used for the classification of documents as of May 1, 2011. The content of these groups is being reclassified into groups H01L 21/02107 – H01L 21/02326.

Groups H01L 21/02107 – H01L 21/02326 should be considered in order to perform a complete search.

21/3121 ............ [Layers comprising organo-silicon compounds]
21/3122 ............ [layers comprising polysiloxane compounds]
21/3124 ............ [layers comprising hydrogen silsesquioxane]
21/3125 ............ [layers comprising silazane compounds]
21/3127 ............ [Layers comprising fluoro (hydro)carbon compounds, e.g. polytetrafluoroethylene]
21/3128 ............ [by Langmuir-Blodgett techniques]
Inorganic layers (H01L 21/3105; H01L 21/32 take precedence)

**WARNING**

Groups H01L 21/314 – H01L 21/3185 are no longer used for the classification of documents as of May 1, 2011. The content of these groups is being reclassified into group H01L 21/02107 – H01L 21/02326. Groups H01L 21/02107 – H01L 21/02326 should be considered in order to perform a complete search.

21/314  
(Frozen)  
[Deposition using atomic layer deposition techniques [ALD]]

21/3141  
(Frozen)  
[of nano-laminates, e.g. alternating layers of Al2O3-HfO2]

21/3142  
(Frozen)  
[composed of alternated layers or of mixtures of nitrides and oxides or of oxinitrides, e.g. formation of oxinitride by oxidation of nitride layers]

21/3144  
(Frozen)  
{on silicon}

21/3145  
(Frozen)  
{formed by deposition from a gas or vapour}

21/3146  
(Frozen)  
[Carbon layers, e.g. diamond-like layers]

21/3147  
(Frozen)  
[Epitaxial deposition of insulating materials]

21/3148  
(Frozen)  
[Silicon Carbide layers]

2021/3149  
(Frozen)  
{Langmuir-Blodgett techniques}

21/316  
(Frozen)  
composed of oxides or glassy oxides or oxide based glass

**WARNING**

Group H01L 21/316 is no longer used for the classification of documents as of May 1, 2011. The content of this group is being reclassified into groups H01L 21/02107 – H01L 21/02326. Groups H01L 21/02107 – H01L 21/02326 should be considered in order to perform a complete search.

21/3164  
(Frozen)  
{Deposition from a gas or vapour (H01L 21/31695 take precedence)}

21/3168  
(Frozen)  
{Deposition of SiO2 (H01L 21/31625, H01L 21/31629 and H01L 21/31633 take precedence)}

21/3162  
(Frozen)  
{on a silicon body}

21/31625  
(Frozen)  
{Deposition of boron or phosphorus doped silicon oxide, e.g. BSG, PSG, BPSG}

21/31629  
(Frozen)  
{Deposition of halogen doped silicon oxide, e.g. fluorine doped silicon oxide}

21/31633  
(Frozen)  
{Deposition of carbon doped silicon oxide, e.g. SiOC}

21/31637  
(Frozen)  
{Deposition of Tantalum oxides, e.g. Ta2O5}

21/31641  
(Frozen)  
{Deposition of Zirconium oxides, e.g. ZrO2}

21/31645  
(Frozen)  
{Deposition of Hafnium oxides, e.g. HfO2}

21/3165  
(Frozen)  
{formed by oxidation (H01L 21/31691, H01L 21/31695 take precedence)}

21/31654  
(Frozen)  
{of semiconductor materials, e.g. the body itself}

21/31658  
(Frozen)  
{by thermal oxidation, e.g. of SiGe}

21/31662  
(Frozen)  
{of silicon in uncombined form}

21/31666  
(Frozen)  
{of All III BV compounds}

21/3167  
(Frozen)  
{of anodic oxidation}

21/31675  
(Frozen)  
{of silicon}

21/31679  
(Frozen)  
{of All III BV compounds}

21/31683  
(Frozen)  
{of metallic layers, e.g. Al deposited on the body, e.g. formation of multi-layer insulating structures}

21/31687  
(Frozen)  
{by anodic oxidation}

21/31691  
(Frozen)  
{with perovskite structure}

21/31695  
(Frozen)  
{Deposition of porous oxides or porous glassy oxides or oxide based porous glass}

21/318  
(Frozen)  
composed of nitrides

**WARNING**

Group H01L 21/318 is no longer used for the classification of documents as of May 1, 2011. The content of this group is being reclassified into groups H01L 21/02107 – H01L 21/02326. Groups H01L 21/02107 – H01L 21/02326 should be considered in order to perform a complete search.

21/3185  
(Frozen)  
{of silconitrides}

21/32  
(Frozen)  
using masks

21/3205  
(Frozen)  
Deposition of non-insulating-, e.g. conductive- or resistive-, layers on insulating layers; After-treatment of these layers (manufacture of electrodes H01L 21/28)
produce internal imperfections to modify their internal properties, e.g. to make them semi-insulating.

### NOTE

Getting using both extrinsic and intrinsic gettering techniques is classified in both H01L 21/3221 and H01L 21/3225.

### WARNING

Group H01L 21/3247 is incomplete pending reclassification of documents from group H01L 21/324.

Some groups (H01L 21/324) should be considered in order to perform a complete search.

Application of electric currents or fields, e.g. for electroforming (H01L 21/20 - H01L 21/288 and H01L 21/302 - H01L 21/324 take precedence)

### 21/324

Thermal treatment for modifying the properties of semiconductor bodies, e.g. annealing, sintering (H01L 21/20 - H01L 21/288 and H01L 21/302 - H01L 21/322 take precedence)

### 21/3242

{for the formation of PN junctions without addition of impurities (H01L 21/22 takes precedence)}

### 21/3245

{of A₃B₅ compounds}

### 21/3247

{for altering the shape, e.g. smoothing the surface}

Application of electric currents or fields, e.g. for electroforming (H01L 21/20 - H01L 21/288 and H01L 21/302 - H01L 21/324 take precedence)

Diffusion of impurity materials, e.g. doping materials, electrode materials, into or out of a semiconductor body, or between semiconductor regions

### 21/326

using diffusion into or out of a solid from or into a gaseous phase

### 21/328

using diffusion into or out of a solid from or into a liquid phase, e.g. using diffusion into or out of a liquid phase, e.g. alloy diffusion processes

### 21/383

using diffusion into or out of a solid from or into a solid phase, e.g. a doped oxide layer

### 21/388

using diffusion into or out of a solid from or into a liquid phase, e.g. alloy diffusion processes

### 21/40

Alloying of impurity materials, e.g. doping materials, electrode materials, with a semiconductor body

### 21/42

Bombardment with radiation

### 21/423

with high-energy radiation

### 21/425

producing ion implantation (ion beam tubes for localized treatment H01L 37/30)

### 21/426

using masks

### 21/428

using electromagnetic radiation, e.g. laser radiation

### 21/44

Manufacture of electrodes on semiconductor bodies using processes or apparatus not provided for in groups H01L 21/38 - H01L 21/428

### 21/441

Deposition of conductive or insulating materials for electrodes

### 21/443

from a gas or vapour, e.g. condensation

### 21/445

from a liquid, e.g. electrolytic deposition

### 21/447

involving the application of pressure, e.g. thermo-compression bonding
NOTE

In this group, the expression "treatment" covers also the removal of leads from parts
NOTE
Arrangements for connecting or disconnecting semiconductor or other solid state bodies, or methods related thereto, other than those arrangements or methods covered by the following subgroups, are covered by H01L 24/00

21/50 . . . Assembly of semiconductor devices using processes or apparatus not provided for in a single one of the subgroups H01L 21/06 - H01L 21/326, e.g. sealing of a cap to a base of a container

21/52 . . . Mounting semiconductor bodies in containers

21/54 . . . Providing fillings in containers, e.g. gas fillings

21/56 . . . Encapsulations, e.g. encapsulation layers, coatings

21/561 . . . {Batch processing}

21/563 . . . {Encapsulation of active face of flip-chip device, e.g. underfilling or underencapsulation of flip-chip, encapsulation preform on chip or mounting substrate}

21/565 . . . {Moulds}

21/566 . . . {Release layers for moulds, e.g. release layers, layers against residue during moulding}

21/568 . . . {Temporary substrate used as encapsulation process aid (H01L 21/4832 and H01L 21/566 take precedence)}

21/60 . . . {Attaching or detaching leads or other conductive members, to be used for carrying current to or from the device in operation}

21/60007 . . . {involving a soldering or an alloying process}

21/60015 . . . {using plate connectors, e.g. layer, film}

21/60022 . . . {using bump connectors, e.g. for flip chip mounting}

21/6003 . . . {Apparatus therefor}

21/60037 . . . {Right-up bonding}

21/60045 . . . {Pre-treatment step of the bump connectors prior to bonding}

21/60052 . . . {Oxide removing step, e.g. flux, rosin}

21/6006 . . . {with temporary supporting member not part of an apparatus, e.g. removable coating, film or substrate}

21/60067 . . . {Aligning the bump connectors with the mounting substrate}

21/60075 . . . {involving active alignment, i.e. by apparatus steering, e.g. using alignment marks, sensors}

21/60082 . . . {involving passive alignment, e.g. using surface energy, chemical reactions, thermal equilibrium}

21/6009 . . . {involving guiding structures, e.g. structures that are left at least partly in the bonded product, spacers}

21/60097 . . . {Applying energy, e.g. for the soldering or alloying process}

21/60105 . . . {using electromagnetic radiation}

21/60112 . . . . . . . {Coherent radiation, i.e. laser beam}

21/6012 . . . {Incoherent radiation, e.g. polychromatic heating lamp}

21/60127 . . . {Induction heating, i.e. eddy currents}

21/60135 . . . {using convection, e.g. eddy currents}

21/60142 . . . {with a graded temperature profile}

21/6015 . . . {using conduction, e.g. chuck heater, thermocompression}

21/60157 . . . {with a graded temperature profile}

21/60165 . . . {using an electron beam}

21/60172 . . . {using static pressure}

21/6018 . . . {Unidirectional static pressure}

21/60187 . . . {Isostatic pressure, e.g. degassing using vacuum or pressurised liquid}

21/60195 . . . {using dynamic pressure, e.g. ultrasonic or thermosonic bonding}

21/60202 . . . {using a protective atmosphere, e.g. with forming or shielding gas}

21/6021 . . . {using an autocatalytic reaction}

21/60217 . . . {Detaching bump connectors, e.g. after testing}

21/60225 . . . {Arrangement of bump connectors prior to mounting}

21/60232 . . . {wherein the bump connectors are disposed only on the semiconductor chip}

21/6024 . . . {wherein the bump connectors are disposed only on the mounting substrate}

21/60247 . . . {wherein the bump connectors are disposed on both the semiconductor chip and the mounting substrate, e.g. bump to bump}

21/60255 . . . {wherein the bump connectors are provided as prepeg, e.g. are provided in an insulating plate member}

21/60262 . . . {Lateral distribution of bump connectors prior to mounting}

21/6027 . . . {Mounting on semiconductor conductive members}

21/60277 . . . {involving the use of conductive adhesives}

21/60285 . . . {involving the use of mechanical auxiliary parts without the use of an alloying of soldering process, e.g. pressure contacts}

21/60292 . . . {involving the use of an electron or laser beam}

21/603 . . . {involving the application of pressure, e.g. thermo-compression bonding}

21/607 . . . {involving the application of mechanical vibrations, e.g. ultrasonic vibrations}

21/62 . . . the devices having no potential-jump barriers or surface barriers

21/64 . . . Manufacture or treatment of solid state devices other than semiconductor devices, or of parts thereof, not peculiar to a single device provided for in groups H01L 31/00 - H01L 51/00
Apparatus specially adapted for handling semiconductor or electric solid state devices during manufacture or treatment thereof; Apparatus specially adapted for handling wafers during manufacture or treatment of semiconductor or electric solid state devices or components: [Apparatus not specifically provided for elsewhere (processes per se H01L 21/30, H01L 21/46, H01L 23/00; simple temporary support means, e.g. using adhesives, electric or magnetic means H01L 21/68, H01L 21/302; apparatus for manufacturing arrangements for connecting or disconnecting semiconductor or solid-state bodies and for methods related thereto H01L 24/74:)]

NOTE
In this subgroup the term substrate designates a semiconductor or electric solid state device or component, or a wafer

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H01L

21/67288 . . . [Monitoring of warpage, curvature, damage, defects or the like]
21/67294 . . . [using identification means, e.g. labels on substrates or labels on containers]
21/673 . . . using specially adapted carriers (or holders; fixing the workpieces on such carriers or holders
(holders for supporting a complete device in operation H01L 21/33/24)]
21/67303 . . . [Vertical boat type carrier whereby the substrates are horizontally supported, e.g.
comprising rod-shaped elements]
21/67306 . . . [characterized by a material, a roughness, a coating or the like]
21/67309 . . . [characterized by the substrate support]
21/67313 . . . [Horizontal boat type carrier whereby the substrates are vertically supported, e.g.
comprising rod-shaped elements]
21/67316 . . . [characterized by a material, a roughness, a coating or the like]
21/6732 . . . [Vertical boat type carrier whereby the substrates are horizontally supported, e.g.
comprising sideways]
21/67323 . . . [characterized by a material, a roughness, a coating or the like]
21/67326 . . . [Horizontal boat type carrier whereby the substrates are vertically supported, e.g.
comprising sideways]
21/6733 . . . [characterized by a material, a roughness, a coating or the like]
21/67333 . . . [Trays for chips (magazine for components H05K 13/0084)]
21/67336 . . . [characterized by a material, a roughness, a coating or the like]
21/6734 . . . [specially adapted for supporting large square shaped substrates (containers and packaging
elements for glass sheets B65D 85/48; transporting of glass products during their manufacture C03B 35/00)]
21/67343 . . . [characterized by a material, a roughness, a coating or the like]
21/67346 . . . [characterized by being specially adapted for supporting a single substrate or by comprising
a stack of such individual supports]
21/6735 . . . [Closed carriers]
21/67353 . . . [specially adapted for a single substrate]
21/67356 . . . [specially adapted for containing chips, dies or Ics]
21/67359 . . . [specially adapted for containing masks, reticles or pellicles]
21/67363 . . . [specially adapted for containing substrates other than wafers (H01L 21/67356,
H01L 21/67359 take precedence)]
21/67366 . . . [characterised by materials, roughness, coatings or the like (materials relating to an
injection moulding process B29C 45/00; chemical composition of materials C08L 51/00)]
21/67369 . . . [characterised by shock absorbing elements, e.g. retainers or cushions]
21/67373 . . . [characterised by locking systems]
21/67376 . . . [characterised by sealing arrangements]
21/67379 . . . [characterised by coupling elements, kinematic members, handles or elements to
be externally gripped]
21/67383 . . . [characterised by substrate supports]
21/67386 . . . [characterised by the construction of the closed carrier]
21/67389 . . . [characterised by atmosphere control]
21/67393 . . . [characterised by the presence of atmosphere modifying elements inside or
attached to the closed carrier]
21/67396 . . . [characterised by the presence of antistatic elements]
21/677 . . . for conveying, e.g. between different workstations
21/67703 . . . [between different workstations]
21/67706 . . . [Mechanical details, e.g. roller, belt (H01L 21/67709 takes precedence)]
21/67709 . . . [using magnetic elements]
21/67712 . . . [the substrate being handled substantially vertically]
21/67715 . . . [Changing the direction of the conveying path]
21/67718 . . . [Changing orientation of the substrate, e.g. from a horizontal position to a vertical
position]
21/67721 . . . [the substrates to be conveyed not being semiconductor wafers or large planar substrates, e.g. chips, lead frames
(H01L 21/6773 takes precedence)]
21/67724 . . . [by means of a cart or a vehicle]
21/67727 . . . [using a general scheme of a conveying path within a factory]
21/6773 . . . [Conveying cassettes, containers or carriers]
21/67733 . . . [Overhead conveying]
21/67736 . . . [Loading to or unloading from a conveyor]
21/67739 . . . [into and out of processing chamber]
21/67742 . . . [Mechanical parts of transfer devices (robots in general in B25J)]
21/67745 . . . [characterized by movements or sequence of movements of transfer devices]
21/67748 . . . [horizontal transfer of a single workpiece]
21/67751 . . . [vertical transfer of a single workpiece]
21/67754 . . . [horizontal transfer of a batch of workpieces]
21/67757 . . . [vertical transfer of a batch of workpieces]
21/6776 . . . [Continuous loading and unloading into and out of a processing chamber, e.g. transporting belts within processing
chambers]
21/67763 . . . [the wafers being stored in a carrier, involving loading and unloading (H01L 21/6779 takes
precedence)]
21/67766 . . . [Mechanical parts of transfer devices (robots in general in B25J)]
21/67769 . . . [Storage means]
21/67772 . . . [involving removal of lid, door, cover]
21/67775 . . . [Docking arrangements]
21/67778 . . . [involving loading and unloading of wafers]
21/67781 . . . [Batch transfer of wafers]
21/67784 . . . [using air tracks]
21/67787 . . . [with angular orientation of the workpieces]
21/6779 . . . [the workpieces being stored in a carrier, involving loading and unloading]
21/67793 . . . [with orientating and positioning by means of a vibratory bowl or track]
21/6796 . . . [with angular orientation of workpieces (H01L 21/67787 and H01L 21/67793 take precedence)]
21/68 . . . for positioning, orientation or alignment (for conveying H01L 21/677)
21/681 . . . [using optical controlling means]
21/682 . . . [Mask-wafer alignment (in general G03F 7/70, G03F 9/70)]
21/683 . . . for supporting or gripping (for conveying H01L 21/677, for positioning, orientation or alignment H01L 21/68)
21/6831 . . . [using electrostatic chucks]
21/6833 . . . [Details of electrostatic chucks]
21/6835 . . . [using temporarily an auxiliary support]

NOTE
H01L 21/6835, details of the apparatus are to be further indexed using the indexing codes chosen from H01L 2221/68304 and subgroups

21/6836 . . . . [Wafer tapes, e.g. grinding or dicing support tapes (adhesive tapes in general C09J 7/20)]
21/6838 . . . . [with gripping and holding devices using a vacuum; Bernoulli devices]
21/687 . . . using mechanical means, e.g. chucks, clamps or pinches { (using electrostatic chucks H01L 21/6831)}
21/68707 . . . . [the wafers being placed on a robot blade, or gripped by a gripper for conveyance]
21/68714 . . . . [the wafers being placed on a susceptor, stage or support]
21/68721 . . . . . [characterised by edge clamping, e.g. clamping ring]
21/68728 . . . . . [characterised by a plurality of separate clamping members, e.g. clamping fingers]
21/68735 . . . . . [characterised by edge profile or support profile]
21/68742 . . . . . [characterised by a lifting arrangement, e.g. lift pins]
21/6875 . . . [characterised by a plurality of individual support members, e.g. support posts or protrusions]
21/68757 . . . . . [characterised by a coating or a hardness or a material]
21/68764 . . . . . [characterised by a movable susceptor, stage or support, others than those only rotating on their own vertical axis, e.g. susceptors on a rotating carrousel]
21/68771 . . . [characterised by supporting more than one semiconductor substrate]
21/68778 . . . [characterised by supporting substrates others than wafers, e.g. chips]
21/68785 . . . [characterised by the mechanical construction of the susceptor, stage or support]
21/68792 . . . [characterised by the construction of the shaft]

21/70 . . . Manufacture or treatment of devices consisting of a plurality of solid state components formed in or on a common substrate or of parts thereof; Manufacture of integrated circuit devices or of parts thereof ((multistep manufacturing processes of assemblies consisting of a plurality of individual semiconductor or other solid state devices H01L 25/00; ) manufacture of assemblies consisting of preformed electrical components H05K 3/00, H05K 13/00)
21/702 . . . [of thick-or thin-film circuits or parts thereof]
21/705 . . . . [of thick-film circuits or parts thereof]
21/707 . . . . [of thin-film circuits or parts thereof]
21/71 . . . Manufacture of specific parts of devices defined in group H01L 21/70 ((H01L 21/0405, H01L 21/0445, H01L 21/28, H01L 21/44, H01L 21/48 take precedence)
21/74 . . . Making of {localized} buried regions, e.g. buried collector layers, internal connections {substrate contacts}
21/743 . . . . [Making of internal connections, substrate contacts]
21/746 . . . . . [for AlGa-NP integrated circuits]
21/76 . . . Making of isolation regions between components
21/7602 . . . . . . [between components manufactured in an active substrate comprising SiC compounds]
21/7605 . . . . . . [between components manufactured in an active substrate comprising AlGaV compounds]
21/7607 . . . . . . [between components manufactured in an active substrate comprising AlGaV compounds]
21/761 . . . . . PN junctions
21/762 . . . . . Dielectric regions {, e.g. EPIC dielectric isolation, LOCOS; Trench refilling techniques, SOI technology, use of channel stoppers]
21/76202 . . . . [using a local oxidation of silicon, e.g. LOCOS, SWAMI, SILO (H01L 21/76235 takes precedence; together with vertical isolation, e.g. LOCOS in a SOI substrate, H01L 21/76264)]
21/76205 . . . . . . [in a region being recessed from the surface, e.g. in a recess, groove, tub or trench region]
21/76208 . . . . . [using auxiliary pillars in the recessed region, e.g. to form LOCOS over extended areas]
21/7621 . . . . . [the recessed region having a shape other than rectangular, e.g. rounded or oblique shape (H01L 21/76208 takes precedence)]
21/76213 . . . . . [introducing electrical inactive or active impurities in the local oxidation region, e.g. to alter LOCOS oxide growth characteristics or for additional isolation purpose]
21/76216 . . . . . [introducing electrical active impurities in the local oxidation region for the sole purpose of creating channel stoppers]
21/76218 . . . . . . {introducing both types of electrical active impurities in the local oxidation region for the sole purpose of creating channel stoppers, e.g. for isolation of complementary doped regions}

21/76221 . . . . . . {with a plurality of successive local oxidation steps}

21/76224 . . . . . . {using trench refilling with dielectric materials (trench filling with polycrystalline silicon H01L 21/763; together with vertical isolation, e.g. trench refilling in a SOI substrate H01L 21/76264)}

21/76227 . . . . . . {the dielectric materials being obtained by full chemical transformation of non-dielectric materials, such as polycrystalline silicon, metals}

21/76229 . . . . . . {Concurrent filling of a plurality of trenches having a different trench shape or dimension, e.g. rectangular and V-shaped trenches, wide and narrow trenches, shallow and deep trenches}

21/76232 . . . . . . {of trenches having a shape other than rectangular or V-shape, e.g. rounded corners, oblique or rounded trench walls (H01L 21/76229 takes precedence)}

21/76235 . . . . . . {trench shape altered by a local oxidation of silicon process step, e.g. trench corner rounding by LOCOS}

21/76237 . . . . . . {introducing impurities in trench side or bottom walls, e.g. for forming channel stoppers or alter isolation behavior}

21/7624 . . . . . . {using semiconductor on insulator [SOI] technology (H01L 21/76297 takes precedence; manufacture of integrated circuits on insulating substrates H01L 21/84; silicon on sapphire [SOS] technology H01L 21/86)}

21/76243 . . . . . . {using silicon implanted buried insulating layers, e.g. oxide layers, i.e. SIMOX techniques}

21/76245 . . . . . . {using full isolation by porous oxide silicon, i.e. FIPOS techniques}

21/76248 . . . . . . {using lateral overgrowth techniques, i.e. ELO techniques}

21/76251 . . . . . . {using bonding techniques}

21/76254 . . . . . . {with separation/delamination along an ion implanted layer, e.g. Smart-cut, Unibond}

21/76256 . . . . . . {using silicon etch back techniques, e.g. BESOI, ELTRAN}

21/76259 . . . . . . {with separation/delamination along a porous layer}

21/76262 . . . . . . {using selective deposition of single crystal silicon, i.e. SEG techniques}

21/76264 . . . . . . {SOI together with lateral isolation, e.g. using local oxidation of silicon, or dielectric or polycrystalline material refilled trench or air gap isolation regions, e.g. completely isolated semiconductor islands}

21/76267 . . . . . . {Vertical isolation by silicon implanted buried insulating layers, e.g. oxide layers, i.e. SIMOX techniques}

21/7627 . . . . . . {Vertical isolation by full isolation by porous oxide silicon, i.e. FIPOS techniques}

21/76272 . . . . . . {Vertical isolation by lateral overgrowth techniques, i.e. ELO techniques}

21/76275 . . . . . . {Vertical isolation by bonding techniques}

21/76278 . . . . . . {Vertical isolation by selective deposition of single crystal silicon, i.e. SEG techniques}

21/76281 . . . . . . {Lateral isolation by selective oxidation of silicon}

21/76283 . . . . . . {Lateral isolation by refilling of trenches with dielectric material}

21/76286 . . . . . . {Lateral isolation by refilling of trenches with polycrystalline material}

21/76289 . . . . . . {Lateral isolation by air gap}

21/76291 . . . . . . {Lateral isolation by field effect {((H01L 21/76264 takes precedence)}}

21/76294 . . . . . . {using selective deposition of single crystal silicon, i.e. SEG techniques}

21/76297 . . . . . . {Dielectric isolation using EPIC techniques, i.e. epitaxial passivated integrated circuit}

21/763 . . . . . . {Polycrystalline semiconductor regions (H01L 21/76264 takes precedence)}

21/764 . . . . . . {Air gaps ((H01L 21/76264 takes precedence)}

21/765 . . . . . . {by field effect ((H01L 21/76264 takes precedence)}

21/768 . . . . . . {Applying interconnections to be used for carrying current between separate components within a device {comprising conductors and dielectrics}

**NOTE**

Groups H01L 21/768 - H01L 21/76898 cover multi-step processes for manufacturing interconnections. Information peculiar to single-step processes should also be classified in the corresponding group, e.g. cleaning H01L 21/02041, etching H01L 21/311, H01L 21/3213, masking H01L 21/027, H01L 21/033, H01L 21/31144, H01L 21/32139, planarizing H01L 21/3105, H01L 21/321

21/76801 . . . . . . {characterised by the formation and the after-treatment of the dielectrics, e.g. smoothing}

21/76802 . . . . . . {by forming openings in dielectrics}

21/76804 . . . . . . {by forming tapered via holes}

21/76805 . . . . . . {the opening being a via or contact hole penetrating the underlying conductor}

21/76807 . . . . . . {for dual damascene structures}

21/76808 . . . . . . {involving intermediate temporary filling with material}

21/7681 . . . . . . {involving one or more buried masks}

21/76811 . . . . . . {involving multiple stacked pre-patterned masks}

21/76813 . . . . . . {involving a partial via etch}
NOTE  
When the interconnect is also used as the conductor part of a conductor insulator semiconductor electrode (gate level interconnections), documents are classified in the relevant electrode manufacture groups, e.g. H01L 21/28026

21/7684 . . . . . . . [Smoothing; Planarisation]
21/76841 . . . . . . . [Barrier, adhesion or liner layers]
21/76843 . . . . . . . [formed in openings in a dielectric]
21/76844 . . . . . . . [Bottomless layers]
21/76846 . . . . . . . [Layer combinations]
21/76847 . . . . . . . [the layer being positioned within the main fill metal]
21/76849 . . . . . . . [the layer being positioned on top of the main fill metal]

21/7685 . . . . . . . [the layer covering a conductive structure (H01L 21/76849 takes precedence)]
21/76852 . . . . . . . [the layer also covering the sidewalls of the conductive structure]
21/76853 . . . . . . . [characterized by particular after-treatment steps]
21/76855 . . . . . . . [After-treatment introducing at least one additional element into the layer]
21/76856 . . . . . . . [by treatment in plasmas or gaseous environments, e.g. nitriding a refractory metal liner]
21/76858 . . . . . . . [by diffusing alloying elements]
21/76859 . . . . . . . [by ion implantation]
21/76861 . . . . . . . [Post-treatment or after-treatment not introducing additional chemical elements into the layer]
21/76862 . . . . . . . [Bombardment with particles, e.g. treatment in noble gas plasmas; UV irradiation]
21/76864 . . . . . . . [Thermal treatment]
21/76865 . . . . . . . [Selective removal of parts of the layer (H01L 21/76844 takes precedence)]
21/76867 . . . . . . . [characterized by methods of formation other than PVD, CVD or deposition from a liquid (PVD H01L 21/2855; CVD H01L 21/28556; deposition from liquids H01L 21/2881)]
21/76868 . . . . . . . [Forming or treating discontinuous thin films, e.g. repair, enhancement or reinforcement of discontinuous thin films]
21/7687 . . . . . . . [Thin films associated with contacts of capacitors]
21/76871 . . . . . . . [Layers specifically deposited to enhance or enable the nucleation of further layers, i.e. seed layers]
21/76873 . . . . . . . [for electroplating]
21/76874 . . . . . . . [for electroless plating]
21/76876 . . . . . . . [for deposition from the gas phase, e.g. CVD]
21/76877 . . . . . . . [Filling of holes, grooves or trenches, e.g. vias, with conductive material]
21/76879 . . . . . . . [by selective deposition of conductive material in the vias, e.g. selective C.V.D. on semiconductor material, plating (plating on semiconductors in general H01L 21/2881)]
21/7688 . . . . . . . [by deposition over sacrificial masking layer, e.g. lift-off (lift-off per se H01L 21/0272)]
21/76882 . . . . . . . [Reflowing or applying of pressure to better fill the contact hole]
21/76883 . . . . . . . [Post-treatment or after-treatment of the conductive material]
21/76885 . . . . . . . [By forming conductive members before deposition of protective insulating material, e.g. pillars, studs]
21/76886 . . . . . . . [Modifying permanently or temporarily the pattern or the conductivity of conductive members, e.g. formation of alloys, reduction of contact resistances]
21/76888 . . . . . . . . [By rendering at least a portion of the conductor non conductive, e.g. oxidation]
21/76889 . . . . . . . . [by forming silicides of refractory metals]
21/76891 . . . . . . . . [by using superconducting materials]
21/76892 . . . . . . . . [modifying the pattern]
21/76894 . . . . . . . . [using a laser, e.g. laser cutting, laser direct writing, laser repair]
21/76895 . . . . . . . . (Local interconnects; Local pads, as exemplified by patent document EP0896365)
21/76897 . . . . . . . . [Formation of self-aligned vias or contact plugs, i.e. involving a lithographically uncritical step (self-aligned silicidation on field effect transistors H01L 29/665)]
21/76898 . . . . . . . . [formed through a semiconductor substrate]
21/77 . . . . Manufacture or treatment of devices consisting of a plurality of solid state components or integrated circuits formed in, or on, a common substrate (electrically programmable read-only memories or multistep manufacturing processes therefore H01L 27/115)

NOTE
Integration processes for the manufacture of devices of the type classified in H01L 27/14 - H01L 27/32 are not classified in this group and its sub-groups. Instead, as they are peculiar to said devices, they are classified together with the devices Multistep processes for manufacturing memory structures in general using field effect technology are covered by H01L 27/1052; Multistep processes for manufacturing dynamic random access memory structures are covered by H01L 27/10844; Multistep processes for manufacturing static random access memory structures are covered by H01L 27/111; Multistep processes for manufacturing read-only memory structures are covered by H01L 27/112; Multistep processes for manufacturing electrically programmable read-only memory structures are covered by H01L 27/115

21/8206 . . . . . . . . [the substrate being a semiconductor, using diamond technology (H01L 21/8258 takes precedence)]
21/8213 . . . . . . . . [the substrate being a semiconductor, using SiC technology (H01L 21/8258 takes precedence)]
21/822 . . . . . . . . [the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence)]
21/8221 . . . . . . . . [Three dimensional integrated circuits stacked in different levels]
21/8222 . . . . . . . . Bipolar technology
21/8224 . . . . . . . . comprising a combination of vertical and lateral transistors
21/8226 . . . . . . . . comprising merged transistor logic or integrated injection logic
21/8228 . . . . . . . . Complementary devices, e.g. complementary transistors
21/82285 . . . . . . . . (Complementary vertical transistors)
21/8229 . . . . . . . . Memory structures
21/8232 . . . . . . . . Field-effect technology
21/8234 . . . . . . . . MIS technology, i.e. integration processes of field effect transistors of the conductor-insulator-semiconductor type
21/823406 . . . . . . . . (Combination of charge coupled devices, i.e. CCD; or BBD)
21/823412 . . . . . . . . with a particular manufacturing method of the channel structures, e.g. channel implants, halo or pocket implants, or channel materials]
21/823418 . . . . . . . . with a particular manufacturing method of the source or drain structures, e.g. specific source or drain implants or silicided source or drain structures or raised source or drain structures]
21/823425 . . . . . . . . [manufacturing common source or drain regions between a plurality of conductor-insulator-semiconductor structures]
21/823431 . . . . . . . . [with a particular manufacturing method of transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET)
21/823437 . . . . . . . . [with a particular manufacturing method of the gate conductors, e.g. particular materials, shapes]
21/823443 . . . . . . . . [silicided or salicided gate conductors]
21/82345 . . . . . . . . [gate conductors with different gate conductor materials or different gate conductor implants, e.g. dual gate structures]
21/823456 . . . . . . . . [gate conductors with different shapes, lengths or dimensions]
[with a particular manufacturing method of the gate insulating layers, e.g. different gate insulating layer thicknesses, particular gate insulator materials or particular gate insulator implants]

[with a particular manufacturing method of the gate sidewall spacers, e.g. double spacers, particular spacer material or shape]

[interconnection or wiring or contact manufacturing related aspects]

[isolation region manufacturing related aspects, e.g. to avoid interaction of isolation region with adjacent structure]

[with a particular manufacturing method of vertical transistor structures, i.e. with channel vertical to the substrate surface (with a current flow parallel to the substrate surface H01L 21/823431)]

[with a particular manufacturing method of the wells or tubs, e.g. twin tubs, high energy well implants, buried implanted layers for lateral isolation [BILLII]]

Combination of enhancement and depletion transistors

Complementary field-effect transistors, e.g. CMOS

[with a particular manufacturing method of the channel structures, e.g. channel implants, halo or pocket implants, or channel materials]

[with a particular manufacturing method of the source or drain structures, e.g. specific source or drain implants or silicided source or drain structures or raised source or drain structures]

[with a particular manufacturing method of transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET]

[with a particular manufacturing method of the gate conductors, e.g. particular materials, shapes]

(silicided or salicided gate conductors)

{gate conductors with different gate conductor materials or different gate conductor implants, e.g. dual gate structures}

{gate conductors with different shapes, lengths or dimensions}

[with a particular manufacturing method of the gate insulating layers, e.g. different gate insulating layer thicknesses, particular gate insulator materials or particular gate insulator implants]

{interconnection or wiring or contact manufacturing related aspects}

[isolation region manufacturing related aspects, e.g. to avoid interaction of isolation region with adjacent structure]

[with a particular manufacturing method of vertical transistor structures, i.e. with channel vertical to the substrate surface (with a current flow parallel to the substrate surface H01L 21/823821)]

[with a particular manufacturing method of the wells or tubs, e.g. twin tubs, high energy well implants, buried implanted layers for lateral isolation [BILLII]]

Memory structures

Combination of bipolar and field-effect technology

Bipolar and MOS technology

the substrate being a semiconductor, using III-V technology (H01L 21/8258 takes precedence)

the substrate being a semiconductor, using II-VI technology (H01L 21/8258 takes precedence)

the substrate being a semiconductor, using technologies not covered by one of groups {H01L 21/8206, H01L 21/8212, H01L 21/822, H01L 21/8252 and H01L 21/8254 (H01L 21/8258 takes precedence)}

the substrate being a semiconductor, using a combination of technologies covered by {H01L 21/8206, H01L 21/8212, H01L 21/822, H01L 21/8252, H01L 21/8254 or H01L 21/8256}

the substrate being other than a semiconductor body, e.g. being an insulating body

{including field-effect transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET]

the insulating body being sapphire, e.g. silicon on sapphire structure, i.e. SOS

(Testing or measuring during manufacture or treatment; Reliability measurements, i.e. testing of parts without further processing to modify the parts as such; Structural arrangements therefor)
22/10 . (Measuring as part of the manufacturing process (burn-in G01R 31/2855))

22/12 . . . [for structural parameters, e.g. thickness, line width, refractive index, temperature, warp, bond strength, defects, optical inspection, electrical measurement of structural dimensions, metallurgic measurement of diffusions (electrical measurement of diffusions H01L 22/14)]

22/14 . . . [for electrical parameters, e.g. resistance, deep-levels, CV, diffusions by electrical means]

22/20 . . . (Sequence of activities consisting of a plurality of measurements, corrections, marking or sorting steps)

22/22 . . . (Connection or disconnection of sub-entities or redundant parts of a device in response to a measurement (testing and repair of stores after manufacture including) wafer scale G11C 29/00; fuses per se H01L 23/525]

22/24 . . . (Optical enhancement of defects or not directly visible states, e.g. selective electrolytic deposition, bubbles in liquids, light emission, colour change (voltage contrast G01R 31/311])

22/26 . . . (Acting in response to an ongoing measurement without interruption of processing, e.g. endpoint detection, in-situ thickness measurement (endpoint detection arrangements in CMP apparatus B24B 37/013, in discharge apparatus H01J 37/32))

22/30 . (Structural arrangements specially adapted for testing or measuring during manufacture or treatment, or specially adapted for reliability measurements)

22/32 . . . (Additional lead-in metallisation on a device or substrate, e.g. additional pads or pad portions, lines in the scribe line, sacrificed conductors (arrangements for conducting electric current to or from the solid state body in operation H01L 23/48))

22/34 . . . (Circuits for electrically characterising or monitoring manufacturing processes, e.g. whole test die, wafers filled with test structures, on-board-devices incorporated on each die, process control monitors or pad structures thereof, devices in scribe line (switching, multiplexing, gating devices G01R 19/25; process control with lithography, e.g. dose control, G03F 7/20; structures for alignment control by optical means G03F 7/70633))

23/00 Details of semiconductor or other solid state devices (H01L 25/00) takes precedence; structural arrangements for testing or measuring during manufacture or treatment, or for reliability measurements H01L 22/00; arrangements for connecting or disconnecting semiconductor or solid-state bodies, or methods related thereto H01L 24/00; finger print sensors G06K 9/00006))

NOTE
This group does not cover:
• details of semiconductor bodies or of electrodes of devices provided for in group H01L 29/00, which details are covered by that group;
• details peculiar to devices provided for in a single main group of groups

23/02 . . . Containers; Seals (H01L 23/12, H01L 23/34, H01L 23/48, H01L 23/52; (H01L 23/66) take precedence; (for memories G11C))

23/04 . . . characterised by the shape [of the container or parts, e.g. caps, walls]

23/041 . . . (the container being a hollow construction having no base used as a mounting for the semiconductor body)

23/043 . . . (the container being a hollow construction and having a conductive base as a mounting as well as a lead for the semiconductor body)

23/045 . . . (the other leads having an insulating passage through the base)

23/047 . . . (the other leads being parallel to the base)

23/049 . . . (the other leads being perpendicular to the base)

23/051 . . . (another lead being formed by a cover plate parallel to the base plate, e.g. sandwich type)

23/053 . . . (the container being a hollow construction and having an insulating [or insulated] base as a mounting for the semiconductor body)

23/055 . . . (the leads having a passage through the base (H01L 23/057 takes precedence))

23/057 . . . (the leads being parallel to the base)

23/06 . . . (characterised by the material of the container or its electrical properties)

23/08 . . . (the material being an electrical insulator, e.g. glass)

23/10 . . . (characterised by the material or arrangement of seals between parts, e.g. between cap and base of the container or between leads and walls of the container)

23/12 . . . Mountings, e.g. non-detachable insulating substrates characterised by the shape)

23/14 . . . (characterised by the material or its electrical properties ([printed circuit boards H05K 1/00])

23/142 . . . . . . [Metallic substrates having insulating layers]

23/145 . . . [Organic substrates, e.g. plastic]

23/147 . . . (Semiconductor insulating substrates (semiconductor conductive substrates H01L 23/4926))

23/15 . . . Ceramic or glass substrates (((H01L 23/142, H01L 23/145, H01L 23/147 take precedence))

23/16 . . . Fillings or auxiliary members in containers (or encapsulations), e.g. centering rings (H01L 23/42, H01L 23/52 take precedence)

23/18 . . . Fillings characterised by the material, its physical or chemical properties, or its arrangement within the complete device

NOTE
Group H01L 23/26 takes precedence over groups H01L 23/20 - H01L 23/24

23/20 . . . gaseous at the normal operating temperature of the device

23/22 . . . liquid at the normal operating temperature of the device

23/24 . . . solid or gel at the normal operating temperature of the device [(H01L 23/3135 takes precedence)]
including materials for absorbing or reacting with moisture or other undesired substances (e.g., getters). Encapsulations, e.g., encapsulating layers, coatings, [e.g. for protection] (H01L 23/552 takes precedence; [insulating layers for contacts or interconnections H01L 23/5329]) characterised by the material (e.g. carbon (interlayer dielectrics H01L 23/5329)) [Oxides or nitrides or carbides, e.g. ceramics, glass] Organic, e.g. plastic) [containing a filler (H01L 23/296 takes precedence)] [Organo-silicon compounds] [Semiconductor material, e.g. amorphous silicon] characterised by the arrangement (or shape) [the device being completely enclosed] [the device being a chip scale package, e.g. CSP] [a substrate forming part of the encapsulation] [the substrate having spherical bumps for external connection] [Double encapsulation or coating and encapsulation] [Sealing arrangements between parts, e.g. adhesion promoters] [the encapsulation having a cavity] [Partial encapsulation or coating (mask layer used as insulation layer H01L 21/31)] [the coating being a foil] [the coating being directly applied to the semiconductor body, e.g. passivation layer (H01L 23/3178 takes precedence)] [Coating or filling in grooves made in the semiconductor body] [the coating covering also the sidewalls of the semiconductor body] [Multilayer coating] Holders for supporting the complete device in operation, i.e. detachable fixtures (H01L 23/40 takes precedence; connectors, [e.g. sockets], in general H01R; for printed circuits H09K) Arrangements for cooling, heating, ventilating or temperature compensation (; Temperature sensing arrangements (thermal treatment apparatus H01L 21/00) [Arrangements for heating (thermal treatment apparatus H01L 21/00)] Selection of materials, or shaping, to facilitate cooling or heating; e.g. heatsinks (H01L 23/28, H01L 23/40, H01L 23/42, H01L 23/44, H01L 23/46 take precedence; heating H01L 23/345) Cooling facilitated by shape of device (H01L 23/38, H01L 23/40, H01L 23/42, H01L 23/44, H01L 23/46 take precedence) [Foil-like cooling fins or heat sinks (being part of lead-frames H01L 23/49568)] [Wire-like or pin-like cooling fins or heat sinks] Cooling facilitated by selection of materials for the device (or materials for thermal expansion adaptation, e.g. carbon) (Ceramic materials or glass (H01L 23/3732, H01L 23/3733, H01L 23/3735, H01L 23/3737, H01L 23/3738 take precedence)) [Diamonds] (having a heterogeneous or anisotropic structure, e.g. powder or fibres in a matrix, wire mesh, porous structures (H01L 23/3732, H01L 23/3737 take precedence)) [Laminates or multilayers, e.g. direct bond copper ceramic substrates] [Metallic materials (H01L 23/3732, H01L 23/3733, H01L 23/3735, H01L 23/3737, H01L 23/3738 take precedence)] (Organic materials with or without a thermoconductive filler) [Semiconductor materials] Cooling arrangements using the Peltier effect Mountings or securing means for detachable cooling or heating arrangements (heating H01L 23/345; fixed by friction, plunges or springs) [wire bolts or screws] [for stacked arrangements of a plurality of semiconductor devices (assemblies per se H01L 25/00)] [characterised by the type of device to be heated or cooled] [Base discrete devices, e.g. presspack, disc-type transistors] [Packaged discrete devices, e.g. to-3 housings, diodes] [characterised by thermal path or place of attachment of heatsink] [heat sink to have chip] [heat sink to package] [heat sink to additional heatsink] [heat sink to or through board or cabinet] [Heatconductors between device and heatsink, e.g. compliant heat-spreaders, heat-conducting bands] [Mechanical elements] [Compliant clamping elements not primarily serving heat-conduction] [Mounting accessories, interposers, clamping or screwing parts] [Snap-on arrangements, e.g. clips] Fillings or auxiliary members in containers (or encapsulations) selected or arranged to facilitate heating or cooling (heating H01L 23/345; characterised by selection of materials for the device H01L 23/373) Cooling by change of state, e.g. use of heat pipes (by liquefied gas H01L 23/445) [by melting or evaporation of solids] Auxiliary members (in containers) characterised by their shape, e.g. pistons [Bellow] [Auxiliary members in encapsulations (H01L 23/49568 takes precedence)] [in combination with jet impingement]
Arrangements for conducting electric current to or from the solid state body in operation, e.g. (H01L 23/42, H01L 23/44 take precedence)

23/46 . . . . . . involving the transfer of heat by flowing fluids (H01L 23/42, H01L 23/44 take precedence)

23/467 . . . . . . by flowing gases, e.g. air (H01L 23/473 takes precedence)

23/473 . . . . . . by flowing liquids (H01L 23/4332, H01L 23/4338 take precedence)

23/4735 . . . . . . (Jet impingement (H01L 23/4336 takes precedence)

23/48 . . . . Arrangements for conducting electric current to or from the solid state body in operation, e.g. leads, terminal arrangements (in general H01R); (Selection of materials therefor)

NOTE

Arrangements for connecting or disconnecting semiconductor or other solid state bodies, or methods related thereto, other than those arrangements or methods covered by the following subgroups, are covered by H01L 24/00

23/481 . . . . . . (Internal lead connections, e.g. via connections, feedthrough structures)

23/482 . . . . . . consisting of lead-in layers inseparably applied to the semiconductor body (electrodes H01L 29/40)

23/4821 . . . . . . [Bridge structure with air gap]

23/4822 . . . . . . [Beam leads]

23/4824 . . . . . . [Pads with extended contours, e.g. grid structure, branch structure, finger structure]

23/4825 . . . . . . [for devices consisting of semiconductor layers on insulating or semi-insulating substrates, e.g. silicon on sapphire devices, i.e. SOS]

23/4827 . . . . . . [Materials]

23/4828 . . . . . . [Conductive organic material or pastes, e.g. conductive adhesives, inks]

23/485 . . . . . . consisting of layered constructions comprising conductive layers and insulating layers, e.g. planar contacts (H01L 23/4821, H01L 23/4822, H01L 23/4824, H01L 23/4825 take precedence; materials H01L 23/532, bond pads H01L 24/02, bump connectors H01L 24/10)

23/4855 . . . . . . [Overhang structure]

23/488 . . . . . . consisting of soldered (or bonded) constructions (bump connectors H01L 24/01)

23/49 . . . . . . wire-like [arrangements or pins or rods (using optical fibres H01L 23/48; pins attached to insulating substrates H01L 23/49811)]

23/492 . . . . . . Bases or plates (or solder therefor)

23/4922 . . . . . . [having a heterogeneous or anisotropic structure]

23/4924 . . . . . . [characterised by the materials]

23/4926 . . . . . . [the materials containing semiconductor material]

23/4928 . . . . . . [the materials containing carbon]

23/495 . . . . Lead-frames (or other flat leads (H01L 23/498 takes precedence; lead frame interconnections between components H01L 23/52))

23/49503 . . . . [characterised by the die pad]

23/49506 . . . . . . [an insulative substrate being used as a diepad, e.g. ceramic, plastic (H01L 23/49531 takes precedence)]

23/4951 . . . . [Chip-on-leads or leads-on-chip techniques, i.e. inner lead fingers being used as die pad]

23/49513 . . . . [having bonding material between chip and die pad]

23/49517 . . . . [Additional leads]

23/4952 . . . . . . [the additional leads being a bump or a wire]

23/49524 . . . . . . [the additional leads being a tape carrier or flat leads]

23/49527 . . . . . . [the additional leads being a multilayer]

23/49531 . . . . . . [the additional leads being a wiring board]

23/49534 . . . . . . [Multi-layer]

23/49537 . . . . . . [Plurality of lead frames mounted in one device]

23/49541 . . . . . . [Geometry of the lead-frame]

23/49544 . . . . . . [Deformation absorbing parts in the lead frame plane, e.g. meanderline shape (H01L 23/49562 takes precedence)]

23/49548 . . . . . . [Cross section geometry (H01L 23/49562 takes precedence)]

23/49551 . . . . . . [characterised by bent parts]

23/49555 . . . . . . [the bent parts being the outer leads]

23/49558 . . . . . . [Insulating layers on lead frames, e.g. bridging members]

23/49562 . . . . . . [for devices being provided for in H01L 29/00]

23/49565 . . . . . . [Side rails of the lead frame, e.g. with perforations, sprocket holes]

23/49568 . . . . . . [specifically adapted to facilitate heat dissipation]

23/49572 . . . . . . [consisting of thin flexible metallic tape with or without a film carrier (H01L 23/49503 - H01L 23/49568 and H01L 23/49575 - H01L 23/49579 take precedence)]

23/49575 . . . . . . [Assemblies of semiconductor devices on lead frames]

23/49579 . . . . . . [characterised by the materials of the lead frames or layers thereon]

23/49582 . . . . . . [Metallic layers on lead frames]

23/49586 . . . . . . [Insulating layers on lead frames]

23/49589 . . . . . . [Capacitor integral with or on the leadframe]

23/49593 . . . . . . [Battery in combination with a leadframe]

23/49596 . . . . . . [Oscillators in combination with leadframes]

23/498 . . . . . . [Leads, (i.e. metallisations or lead-frames) on insulating substrates, e.g. chip carriers (shape of the substrate H01L 23/13)]

23/49805 . . . . . . [the leads being also applied on the sidewalls or the bottom of the substrate, e.g. leadless packages for surface mounting]

23/49811 . . . . . . [Additional leads joined to the metallisation on the insulating substrate, e.g. pins, bumps, wires, flat leads (H01L 23/49827 takes precedence)]

23/49816 . . . . . . [Spherical bumps on the substrate for external connection, e.g. ball grid arrays (BGAs)
frames (optical interconnections G02B 6/00) Arrangements for conducting electric current within semiconductor body insulating layers inseparably formed on the take precedence)

- H01L 23/498 for integrated circuit devices, e.g. power bus, number of leads (H01L 23/482 - H01L 23/498 take precedence)

23/52 Arrangements for conducting electric current within the device in operation from one component to another, i.e. interconnections, e.g. wires, lead frames (optical interconnections G02B 6/00) including external interconnections consisting of a multilayer structure of conductive and insulating layers inseparably formed on the semiconductor body

23/522 Crossover interconnections

23/5222 Capacitive arrangements or effects of, or between wiring layers (other capacitive arrangements H01L 23/642)

23/5223 Capacitor integral with wiring layers

23/5225 Shielding layers formed together with wiring layers

23/5226 Via connections in a multilevel interconnection structure

23/5227 Inductive arrangements or effects of, or between, wiring layers (other inductive arrangements H01L 23/645)

23/5228 Resistive arrangements or effects of, or between, wiring layers (other resistive arrangements H01L 23/647)

23/525 with adaptable interconnections

23/5252 comprising anti-fuses, i.e. connections having their state changed from non-conductive to conductive)

23/5254 the change of state resulting from the use of an external beam, e.g. laser beam or ion beam

23/5256 comprising fuses, i.e. connections having their state changed from conductive to non-conductive

23/5258 the change of state resulting from the use of an external beam, e.g. laser beam or ion beam

23/528 Geometry or layout of the interconnection structure (H01L 27/0207 takes precedence; algorithms G06F 17/50)

23/5283 Cross-sectional geometry

23/5286 Arrangements of power or ground buses

23/532 characterised by the materials

23/53209 based on metals, e.g. alloys, metal silicides (H01L 23/53285 takes precedence)

23/53223 Copper alloys

23/53238 Additional layers associated with copper layers, e.g. adhesion, barrier, cladding layers

23/53242 the principal metal being a noble metal, e.g. gold

23/53247 Noble-metal alloys

23/53252 Additional layers associated with noble-metal layers, e.g. adhesion, barrier, cladding layers

23/53257 the principal metal being a refractory metal

23/53261 Refractory-metal alloys

23/53266 Additional layers associated with refractory-metal layers, e.g. adhesion, barrier, cladding layers

23/53271 containing semiconductor material, e.g. polysilicon

23/53276 containing carbon, e.g. fullerenes (superconducting fullerenes H01L 39/123)

23/5328 containing conductive organic materials or pastes, e.g. conductive adhesives, inks

23/53285 containing superconducting materials

23/5329 Insulating materials

23/53295 Stacked insulating layers

23/535 including internal interconnections, e.g. cross-under constructions (internal lead connections H01L 23/481)

23/538 the interconnection structure between a plurality of semiconductor chips being formed on, or in, insulating substrates (H05K takes precedence; manufacture or treatment H01L 21/4846; mountings per se H01L 23/12; materials H01L 23/49866)

23/5381 Crossover interconnections, e.g. bridge stepovers

23/5382 Adaptable interconnections, e.g. for engineering changes
23/5383 . . . [Multilayer substrates (H01L 23/5385 takes precedence; multilayer metallisation on monolayer substrates H01L 23/538)]
23/5384 . . . [Conductive vias through the substrate with or without pins, e.g. buried coaxial conductors (H01L 23/5383, H01L 23/5385 take precedence; pins attached to insulating substrates H01L 23/4981)]
23/5385 . . . [Assembly of a plurality of insulating substrates]
23/5386 . . . [Geometry or layout of the interconnection structure]
23/5387 . . . [Flexible insulating substrates (H01L 23/5388 takes precedence)]
23/5388 . . . [for flat cards, e.g. credit cards (cards per se G06K 19/00)]
23/5389 . . . [the chips being integrally enclosed by the interconnect and support structures]
23/544 . Marks applied to semiconductor devices (or parts), e.g. registration marks, alignment structures, wafer maps (test patterns for characterising or monitoring manufacturing processes H01L 22/00)]

NOTE
When classifying in group H01L 23/544, details are to be further indexed by using the indexing codes chosen from H01L 2223/66 and subgroups

23/552 . . . Protection against radiation, e.g. light (or electromagnetic waves)
23/556 . . . against alpha rays
23/562 . . . Protection against mechanical damage (H01L 23/02, H01L 23/28 take precedence)
23/564 . . . [Details not otherwise provided for, e.g. protection against moisture (getters H01L 23/26)]
23/57 . . . Protection from inspection, reverse engineering or tampering]
23/573 . . . [using passive means]
23/576 . . . [using active circuits]
23/58 . . Structural electrical arrangements for semiconductor devices not otherwise provided for (e.g. in combination with batteries (H01L 23/4959, H01L 23/49596 take precedence)]
23/585 . . . [comprising conductive layers or plates or strips or rods or rings (H01L 23/60, H01L 23/62, H01L 23/64, H01L 23/66 take precedence)]
23/60 . . Protection against electrostatic charges or discharges, e.g. Faraday shields (in general H05F)
23/62 . . Protection against overvoltage, e.g. fuses, shunts
23/64 . . Impedance arrangements
23/642 . . . [Capacitive arrangements (H01L 23/49589, H01L 23/645, H01L 23/647, H01L 23/66 take precedence; capacitive effects between wiring layers on the semiconductor body H01L 23/5222)]
23/645 . . . [Inductive arrangements (H01L 23/647, H01L 23/660 take precedence)]
23/647 . . . [Resistive arrangements (H01L 23/66, H01L 23/62 take precedence)]
23/66 . . . High-frequency adaptations

NOTE
When classifying in group H01L 23/66, details are to be further indexed by using the indexing codes chosen from H01L 2223/66 and subgroups

24/00 [Arrangements for connecting or disconnecting semiconductor or solid-state bodies; Methods or apparatus related thereto]

NOTES
1. This group does not cover:
   • details of semiconductor bodies or of electrodes of devices provided for in group H01L 29/00, which details are covered by that group;
   • details peculiar to devices provided for in a single main group of groups H01L 31/00 - H01L 51/00, which details are covered by those groups.
   • printed circuits, which are covered by groups H05K 1/00 - H05K 1/189;
   • apparatus or manufacturing processes for printed circuits, which are covered by groups H05K 3/00 - H05K 3/4685;
   • manufacture or treatment of parts, which are covered by group H01L 21/48 and subgroups except H01L 21/4885 - H01L 21/4896;
   • assemblies of semiconductor devices, which are covered by groups H01L 21/50 - H01L 21/568;
   • applying interconnections to be used for carrying current between separate components within a device, which is covered by group H01L 21/768 and subgroups;
   • containers or seals, which are covered by groups H01L 23/02 - H01L 23/10;
   • mountings, which are covered by groups H01L 23/12 - H01L 23/15 and subgroups;
   • arrangements for cooling, heating, ventilating or temperature compensation, which are covered by groups H01L 23/34 - H01L 23/4735;
   • arrangements for conducting electric current, which are covered by groups H01L 23/48 - H01L 23/50, and by groups H01L 23/52 - H01L 23/5399;
   • structural electrical arrangements, which are covered by groups H01L 24/80 - H01L 23/66;
   • assemblies of semiconductor or other solid state devices, which are covered by groups H01L 25/00 - H01L 25/18.
2. In this group the following indexing codes are used: H01L 24/00, H01L 2224/00, H01L 2924/00, and subgroups thereof
   • [Means for bonding being attached to, or being formed on, the surface to be connected, e.g. chip-to-package, die-attach, “first-level” interconnects; Manufacturing methods related thereto]
24/02 . . . [Bonding areas (on insulating substrates, e.g. chip carriers, H01L 23/49816, H01L 23/49838, H01L 23/5389); Manufacturing methods related thereto]

**WARNING**

Groups H01L 24/02 – H01L 24/09 are incomplete pending reclassification of documents from groups H01L 24/02 and H01L 24/10.

Groups H01L 24/02 – H01L 24/09 and H01L 24/10 should be considered in order to perform a complete search.

24/03 . . . . . [Manufacturing methods]
24/04 . . . . . [Structure, shape, material or disposition of the bonding areas prior to the connecting process]  
24/05 . . . . . [of an individual bonding area]
24/06 . . . . . [of a plurality of bonding areas]
24/07 . . . . . [Structure, shape, material or disposition of the bonding areas after the connecting process]
24/08 . . . . . [of an individual bonding area]
24/09 . . . . . [of a plurality of bonding areas]
24/10 . . . . . [Bump connectors (bumps on insulating substrates, e.g. chip carriers, H01L 23/49816); Manufacturing methods related thereto]
24/11 . . . . . [Manufacturing methods (for bumps on insulating substrates H01L 21/4853)]
24/12 . . . . . [Structure, shape, material or disposition of the bump connectors prior to the connecting process]
24/13 . . . . . [of an individual bump connector]
24/14 . . . . . [of a plurality of bump connectors]
24/15 . . . . . [Structure, shape, material or disposition of the bump connectors after the connecting process]
24/16 . . . . . [of an individual bump connector]
24/17 . . . . . [of a plurality of bump connectors]
24/18 . . . . . [High density interconnect [HDI] connectors; Manufacturing methods related thereto (interconnection structure between a plurality of semiconductor chips H01L 23/5389)]

**WARNING**

Groups H01L 24/18 – H01L 24/25 are incomplete pending reclassification of documents from groups H01L 24/18 and H01L 24/82.

Groups H01L 24/18 – H01L 24/25 and H01L 24/82 should be considered in order to perform a complete search.

24/19 . . . . . [Manufacturing methods of high density interconnect preforms]
24/20 . . . . . [Structure, shape, material or disposition of high density interconnect preforms]
24/23 . . . . . [Structure, shape, material or disposition of the high density interconnect connectors after the connecting process]
24/24 . . . . . [of an individual high density interconnect connector]
24/25 . . . . . [of a plurality of high density interconnect connectors]
24/26 . . . . . [Layer connectors, e.g. plate connectors, solder or adhesive layers; Manufacturing methods related thereto]

24/27 . . . . . [Manufacturing methods]
24/28 . . . . . [Structure, shape, material or disposition of the layer connectors prior to the connecting process]
24/29 . . . . . [of an individual layer connector]
24/30 . . . . . [of a plurality of layer connectors]
24/31 . . . . . [Structure, shape, material or disposition of the layer connectors after the connecting process]
24/32 . . . . . [of an individual layer connector]
24/33 . . . . . [of a plurality of layer connectors]
24/34 . . . . . [Strap connectors, e.g. copper straps for grounding power devices; Manufacturing methods related thereto]

**WARNING**

Groups H01L 24/34 – H01L 24/41 are incomplete pending reclassification of documents from groups H01L 24/34, H01L 24/40, H01L 24/42, and H01L 24/85.

Groups H01L 24/34 – H01L 24/41 and H01L 24/01, H01L 24/42, and H01L 24/85 should be considered in order to perform a complete search.

24/35 . . . . . [Manufacturing methods]
24/36 . . . . . [Structure, shape, material or disposition of the strap connectors prior to the connecting process]
24/37 . . . . . [of an individual strap connector]
24/38 . . . . . [of a plurality of strap connectors]
24/39 . . . . . [Structure, shape, material or disposition of the strap connectors after the connecting process]
24/40 . . . . . [of an individual strap connector]
24/41 . . . . . [of a plurality of strap connectors]
24/42 . . . . . [Wire connectors; Manufacturing methods related thereto]
24/43 . . . . . [Manufacturing methods]

**WARNING**

Group H01L 24/43 is incomplete pending reclassification of documents from groups H01L 24/42 and H01L 24/85.

Groups H01L 24/43, H01L 24/42, and H01L 24/85 should be considered in order to perform a complete search.

24/44 . . . . . [Structure, shape, material or disposition of the wire connectors prior to the connecting process]

**WARNING**

Group H01L 24/44 is incomplete pending reclassification of documents from groups H01L 24/42 and H01L 24/85.

Groups H01L 24/44 and H01L 24/85 should be considered in order to perform a complete search.

24/45 . . . . . [of an individual wire connector]
24/46 . . . . . [of a plurality of wire connectors]
24/47 . . . . [Structure, shape, material or disposition of the wire connectors after the connecting process]

**WARNING**

Group H01L 24/47 is incomplete pending reclassification of documents from groups H01L 24/42 and H01L 24/85.

Groups H01L 24/47 and H01L 24/42, H01L 24/85 should be considered in order to perform a complete search.

24/48 . . . . . [of an individual wire connector]
24/49 . . . . . [of a plurality of wire connectors]
24/50 . . . . [Tape automated bonding (TAB) connectors, i.e. film carriers; Manufacturing methods related thereto (thin flexible metallic tape with or without a film carrier H01L 23/49572, flexible insulating substrates H01L 23/4985, H01L 23/5387)]

**WARNING**

Group H01L 24/50 is incomplete pending reclassification of documents from group H01L 24/86.

Groups H01L 24/50 and H01L 24/86 should be considered in order to perform a complete search.

24/63 . . . . [Connectors not provided for in any of the groups H01L 24/40, H01L 24/50 and subgroups; Manufacturing methods related thereto]
24/64 . . . . [Manufacturing methods]
24/65 . . . . [Structure, shape, material or disposition of the connectors prior to the connecting process]
24/66 . . . . . [of an individual connector]
24/67 . . . . . [of a plurality of connectors]
24/68 . . . . [Structure, shape, material or disposition of the connectors after the connecting process]
24/69 . . . . . [of an individual connector]
24/70 . . . . . [of a plurality of connectors]
24/71 . . . . [Means for bonding not being attached to, or not being formed on, the surface to be connected (holders for supporting the complete device in operation H01L 23/32)]
24/72 . . . . [Detachable connecting means consisting of mechanical auxiliary parts connecting the device, e.g. pressure contacts using springs or clips]
24/73 . . . . [Means for bonding being of different types provided for in two or more of groups H01L 24/10, H01L 24/18, H01L 24/26, H01L 24/34, H01L 24/42, H01L 24/50, H01L 24/63, H01L 24/71]
24/74 . . . . [Apparatus for manufacturing arrangements for connecting or disconnecting semiconductor or solid-state bodies]
24/741 . . . . [Apparatus for manufacturing means for bonding, e.g. connectors]
24/742 . . . . [Apparatus for manufacturing bump connectors]
24/743 . . . . [Apparatus for manufacturing layer connectors]
24/744 . . . . [Apparatus for manufacturing strap connectors]
24/745 . . . . [Apparatus for manufacturing wire connectors]
24/75 . . . . [Apparatus for connecting with bump connectors or layer connectors]
24/76 . . . . [Apparatus for connecting with build-up interconnects]
24/77 . . . . [Apparatus for connecting with strap connectors]
24/78 . . . . [Apparatus for connecting with wire connectors]
24/79 . . . . [Apparatus for Tape Automated Bonding [TAB]]
24/799 . . . . [Apparatus for disconnecting]
24/80 . . . . [Methods for connecting semiconductor or other solid state bodies using means for bonding being attached to, or being formed on, the surface to be connected]
24/81 . . . . [using a bump connector]
24/82 . . . . [by forming build-up interconnects at chip-level, e.g. for high density interconnects [HDI] (interconnection structure between a plurality of semiconductor chips H01L 23/5389)]
24/83 . . . . [using a layer connector]
24/84 . . . . [using a strap connector]

**WARNING**

Group H01L 24/84 is incomplete pending reclassification of documents from group H01L 24/85.

Group H01L 24/84 and H01L 24/85 should be considered in order to perform a complete search.

24/85 . . . . [using a wire connector (wire bonding in general B23K 20/004)]
24/86 . . . . [using tape automated bonding [TAB]]
24/89 . . . . [using at least one connector not provided for in any of the groups H01L 24/81, H01L 24/86]
24/90 . . . . [Methods for connecting semiconductor or solid state bodies using means for bonding not being attached to, or not being formed on, the body surface to be connected, e.g. pressure contacts using springs or clips]
24/91 . . . . [Methods for connecting semiconductor or solid state bodies including different methods provided for in two or more of groups H01L 24/80, H01L 24/90]
24/92 . . . . [Specific sequence of method steps]
24/93 . . . . [Batch processes]

**WARNING**

Group H01L 24/93 is incomplete pending reclassification of documents from groups H01L 24/80, H01L 24/90.

Groups H01L 24/93 and H01L 24/80 – H01L 24/90 should be considered in order to perform a complete search.

24/94 . . . . [at wafer-level, i.e. with connecting carried out on a wafer comprising a plurality of undiced individual devices]
24/95 . . . . [at chip-level, i.e. with connecting carried out on a plurality of singulated devices, i.e. on diced chips]
24/96 . . . . [the devices being encapsulated in a common layer, e.g. neo-wafer or pseudo-wafer, said common layer being separable into individual assemblies after connecting]
24/97 . . . . [the devices being connected to a common substrate, e.g. interposer, said common substrate being separable into individual assemblies after connecting]
25/00 Assemblies consisting of a plurality of individual semiconductor or other solid state devices: Multistep manufacturing processes thereof
(devices consisting of a plurality of solid state components formed in or on a common substrate
H01L 27/00: photovoltaic modules or arrays of photovoltaic cells H01L 31/042 (e.g., panels or arrays of photo electrochemical cells H01G 9/0608))

25/03 all the devices being of a type provided for in the same subgroup of groups
H01L 27/00 - H01L 51/00, e.g., assemblies of rectifier diodes

25/065 the devices being of a type provided for in group H01L 27/00

NOTE Group H01L 25/0652 takes precedence over groups H01L 25/0655 and H01L 25/0657

25/0652 the devices being arranged next and on each other, i.e., mixed assemblies

25/0655 the devices being arranged next to each other

25/0657 Stacked arrangements of devices

25/07 the devices being of a type provided for in group H01L 29/00

NOTE Group H01L 25/071 takes precedence over groups H01L 25/072 - H01L 25/074

25/071 the devices being arranged next and on each other, i.e., mixed assemblies

25/072 the devices being arranged next to each other

25/073 Apertured devices mounted on one or more rods passed through the apertures

25/074 Stacked arrangements of non-apertured devices

25/075 the devices being of a type provided for in group H01L 33/00

25/0753 the devices being arranged next to each other

25/0756 Stacked arrangements of devices

25/10 the devices having separate containers

25/105 the devices being of a type provided for in group H01L 27/00

NOTE When classifying in group H01L 25/105, details of the assemblies are to be further indexed by using the indexing codes chosen from H01L 2225/1005 and subgroups

25/11 the devices being of a type provided for in group H01L 29/00

NOTE Group H01L 25/112 takes precedence over groups H01L 25/115 and H01L 25/117

25/112 Mixed assemblies

25/115 the devices being arranged next to each other

25/117 Stacked arrangements of devices

25/13 the devices being of a type provided for in group H01L 33/00

25/16 the devices being of types provided for in two or more different main groups of
H01L 27/00 - H01L 49/00 and H01L 51/00, e.g., forming hybrid circuits (interconnections for hybrid circuits H01L 23/5389)

25/162 the devices being mounted on two or more different substrates

25/165 Containers

25/167 comprising optoelectronic devices, e.g., LED, photodiodes

25/18 the devices being of types provided for in two or more different subgroups of the same main group of groups H01L 27/00 - H01L 51/00 (comprising devices provided for in H01L 27/144 and subgroups, see H01L 27/144 and subgroups)

25/50 Multistep manufacturing processes of assemblies consisting of devices, each device being of a type provided for in group H01L 27/00 or H01L 29/00 (H01L 21/50 takes precedence)

27/00 Devices consisting of a plurality of semiconductor or other solid-state components formed in or on a common substrate (details thereof H01L 23/00, H01L 29/00 - H01L 51/00; assemblies consisting of a plurality of individual solid state devices H01L 25/00)

NOTES

1. In this group, with the exception of groups
H01L 27/115 - H01L 27/11597, the last place priority rule is applied, i.e., at each hierarchical level, in the absence of an indication to the contrary, classification is made in the last appropriate place.

2. When classifying in this group, subject matter relating to electrically programmable read-only memories is classified in group H01L 27/115, irrespective of the last place priority rule.
NOTE

In groups H01L 27/01 - H01L 27/26, in the absence of an indication to the contrary, classification is made in the last appropriate place.

27/01 . . . . . . [Thick-film circuits]
27/02 . . . . . . including semiconductor components specially adapted for rectifying, oscillating, amplifying or switching and having at least one potential-jump barrier or surface barrier; including integrated passive circuit elements with at least one potential-jump barrier or surface barrier
27/0203 . . . . . . [Particular design considerations for integrated circuits]
27/0207 . . . . . . [Geometrical layout of the components, e.g. computer aided design; custom LSI, semi-custom LSI, standard cell technique]
27/0211 . . . . . . [adapted for requirements of temperature]
27/0214 . . . . . . [for internal polarisation, e.g. I2L]
27/0218 . . . . . . [of field effect structures]
27/0222 . . . . . . [Charge pumping, substrate bias generation structures]
27/0225 . . . . . . [Charge injection in static induction transistor logic structures [SITL]]
27/0229 . . . . . . [of bipolar structures]
27/0233 . . . . . . [Integrated injection logic structures [I2L]]
27/0237 . . . . . . [using vertical injector structures]
27/024 . . . . . . [using field effect injector structures]
27/0244 . . . . . . [I2L structures integrated in combination with analog structures]
27/0248 . . . . . . [for electrical or thermal protection, e.g. electrostatic discharge [ESD] protection]
27/0251 . . . . . . [for MOS devices]
27/0255 . . . . . . [using diodes as protective elements]
27/0259 . . . . . . [using bipolar transistors as protective elements]
27/0262 . . . . . . [including a PNP transistor and a NPN transistor, wherein each of said transistors has its base coupled to the collector of the other transistor, e.g. silicon controlled rectifier [SCR] devices]
27/0266 . . . . . . [using field effect transistors as protective elements]
27/027 . . . . . . [specially adapted to provide an electrical current path other than the field effect induced current path]
27/0274 . . . . . . [involving a parasitic bipolar transistor triggered by the electrical biasing of the gate electrode of the field effect transistor, e.g. gate coupled transistors]
27/0277 . . . . . . [involving a parasitic bipolar transistor triggered by the local electrical biasing of the layer acting as base of said parasitic bipolar transistor]
27/0281 . . . . . . [field effect transistors in a “Darlington-like” configuration]
27/0285 . . . . . . [bias arrangements for gate electrode of field effect transistors, e.g. RC networks, voltage partitioning circuits (H01L 27/0281 takes precedence)]
27/0288 . . . . . . [using passive elements as protective elements, e.g. resistors, capacitors, inductors, spark-gaps]
27/0292 . . . . . . [using a specific configuration of the conducting means connecting the protective devices, e.g. ESD buses]
27/0296 . . . . . . [involving a specific disposition of the protective devices]
27/04 . . . . . . the substrate being a semiconductor body
27/06 . . . . . . including a plurality of individual components in a non-repetitive configuration
27/0605 . . . . . . [integrated circuits made of compound material, e.g. A_{III}B_{V}]
27/0611 . . . . . . [integrated circuits having a two-dimensional layout of components without a common active region]
27/0617 . . . . . . [comprising components of the field-effect type (H01L 27/0251 takes precedence)]
27/0623 . . . . . . [in combination with bipolar transistors]
27/0629 . . . . . . [in combination with diodes, or resistors, or capacitors]
27/0635 . . . . . . [in combination with bipolar transistors and diodes, or resistors, or capacitors]
27/0641 . . . . . . [without components of the field effect type]
27/0647 . . . . . . [Bipolar transistors in combination with diodes, or capacitors, or resistors, e.g. vertical bipolar transistor and bipolar lateral transistor and resistor]
27/0652 . . . . . . [Vertical bipolar transistor in combination with diodes, or capacitors, or resistors]
27/0658 . . . . . . [Vertical bipolar transistor in combination with resistors or capacitors]
27/0664 . . . . . . [Vertical bipolar transistor in combination with diodes]
27/067 . . . . . . [Lateral bipolar transistor in combination with diodes, or capacitors, or resistors]
27/0676 . . . . . . [comprising combinations of diodes, or capacitors or resistors]
27/0682 . . . . . . [comprising combinations of capacitors and resistors]
27/0688 . . . . . . [Integrated circuits having a three-dimensional layout]
27/0694 . . . . . . [comprising components formed on opposite sides of a semiconductor substrate]
27/07 . . . . . . the components having an active region in common
27/0705 . . . . . . . (comprising components of the field effect type)
27/0711 . . . . . . . (in combination with bipolar transistors and diodes, or capacitors, or resistors)
27/0716 . . . . . . . (in combination with vertical bipolar transistors and diodes, or capacitors, or resistors)
27/0722 . . . . . . . (in combination with lateral bipolar transistors and diodes, or capacitors, or resistors)
27/0727 . . . . . . . (in combination with diodes, or capacitors or resistors)
27/0733 . . . . . . . (in combination with capacitors only)
27/0738 . . . . . . . (in combination with resistors only)
27/0744 . . . . . . . (without components of the field effect type)
27/075 . . . . . . . (Bipolar transistors in combination with diodes, or capacitors, or resistors, e.g. lateral bipolar transistor, and vertical bipolar transistor and resistor)
27/0755 . . . . . . . (Vertical bipolar transistor in combination with diodes, or capacitors, or resistors)
27/0761 . . . . . . . (Vertical bipolar transistor in combination with diodes only)
27/0766 . . . . . . . (with Schottky diodes only)
27/0772 . . . . . . . (Vertical bipolar transistor in combination with resistors only)
27/0777 . . . . . . . (Vertical bipolar transistor in combination with capacitors only)
27/0783 . . . . . . . (Lateral bipolar transistors in combination with diodes, or capacitors, or resistors)
27/0788 . . . . . . . (comprising combinations of diodes or capacitors or resistors)
27/0794 . . . . . . . (Combinations of capacitors and resistors)
27/08 . . . . . . . including only semiconductor components of a single kind
27/0802 . . . . . . . (Resistors only)
27/0805 . . . . . . . (Capacitors only)
27/0808 . . . . . . . (Varactor diodes)
27/0811 . . . . . . . (MIS diodes)
27/0814 . . . . . . . (Diodes only)
27/0817 . . . . . . . (Thyristors only)
27/082 . . . . . . . including bipolar components only
27/0821 . . . . . . . (Combination of lateral and vertical transistors only)
27/0823 . . . . . . . (including vertical bipolar transistors only)
27/0825 . . . . . . . (Combination of vertical direct transistors of the same conductivity type having different characteristics, e.g. Darlington transistors)
27/0826 . . . . . . . (Combination of vertical complementary transistors)
27/0828 . . . . . . . (Combination of direct and inverse vertical transistors)
27/085 . . . . . . . including field-effect components only
27/088 . . . . . . . the components being field-effect transistors with insulated gate
27/0883 . . . . . . . (Combination of depletion and enhancement field effect transistors)
27/0886 . . . . . . . (including transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET)
27/092 . . . . . . . complementary MIS field-effect transistors
27/0921 . . . . . . . (Means for preventing a bipolar, e.g. thyristor, action between the different transistor regions, e.g. Latchup prevention)
27/0922 . . . . . . . (Combination of complementary transistors having a different structure, e.g. stacked CMOS, high-voltage and low-voltage CMOS)
27/0924 . . . . . . . (including transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET)
27/0925 . . . . . . . (comprising an N-well only in the substrate)
27/0927 . . . . . . . (comprising a P-well only in the substrate)
27/0928 . . . . . . . (comprising both N- and P- wells in the substrate, e.g. twin-tub)
27/095 . . . . . . . the components being Schottky barrier field-effect transistors
27/098 . . . . . . . the components being PN junction gate field-effect transistors
27/10 . . . . . . . including a plurality of individual components in a repetitive configuration
27/101 . . . . . . . (including resistors or capacitors only)
27/102 . . . . . . . including bipolar components
27/1021 . . . . . . . (including diodes only)
27/1022 . . . . . . . (including bipolar transistors)
27/1023 . . . . . . . (Bipolar dynamic random access memory structures)
27/1024 . . . . . . . (Arrays of single bipolar transistors only, e.g. read only memory structures)
27/1025 . . . . . . . (Static bipolar memory cell structures)
27/1026 . . . . . . . (Bipolar electrically programmable memory structures (using fuses H01L 23/525))
27/1027 . . . . . . . (Thyristors)
27/1028 . . . . . . . (Double base diodes)
27/105 . . . . . . . including field-effect components

NOTE

In this group and its subgroups classification is made in any appropriate place

27/1052 . . . . . . . (Memory structures and multistep manufacturing processes therefor not provided for in groups H01L 27/1055 - H01L 27/112)
27/1055 . . . . . . . (comprising charge coupled devices of the so-called bucket brigade type)
27/1057 . . . . . . . (comprising charge coupled devices [CCD] or charge injection devices [CID])

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NOTE

In this group and its subgroups classification is made in any appropriate place

27/108 . . . . . . Dynamic random access memory structures

27/10802 . . . . . . {comprising floating-body transistors, e.g. floating-body cells}
27/10805 . . . . . . {with one-transistor one-capacitor memory cells}
27/10808 . . . . . . {the storage electrode stacked over transistor}
27/10811 . . . . . . {with bit line higher than capacitor}
27/10814 . . . . . . {with capacitor higher than bit line level}
27/10817 . . . . . . {the storage electrode having multiple wings}
27/1082 . . . . . . {the capacitor extending under transfer transistor area}
27/10823 . . . . . . {the transistor having a trench structure in the substrate}
27/10826 . . . . . . {the transistor being of the FinFET type}
27/10829 . . . . . . {the capacitor being in a substrate trench}
27/10832 . . . . . . {the capacitor extending under or around transfer transistor area}
27/10835 . . . . . . {having storage electrode extension stacked over transistor}
27/10838 . . . . . . {the capacitor and the transistor being in one trench}
27/10841 . . . . . . {the transistor being vertical}
27/10844 . . . . . . {Multistep manufacturing methods}
27/10847 . . . . . . {for structures comprising one transistor one-capacitor memory cells}
27/1085 . . . . . . {with at least one step of making the capacitor or connections thereto}
27/10852 . . . . . . {the capacitor extending over the access transistor}
27/10855 . . . . . . {with at least one step of making a connection between transistor and capacitor, e.g. plug}
27/10858 . . . . . . {the capacitor extending under the access transistor area}
27/10861 . . . . . . {the capacitor being in a substrate trench}
27/10864 . . . . . . {in combination with a vertical transistor}
27/10867 . . . . . . {with at least one step of making a connection between transistor and capacitor, e.g. buried strap}
27/1087 . . . . . . {with at least one step of making the trench}
27/10873 . . . . . . {with at least one step of making the transistor}
27/10876 . . . . . . {the transistor having a trench structure in the substrate (vertical transistor in combination with a capacitor formed in a substrate trench H01L 27/10864)}
27/10879 . . . . . . {the transistor being of the FinFET type}
27/10882 . . . . . . {with at least one step of making a data line}
27/10885 . . . . . . {with at least one step of making a bit line}
27/10888 . . . . . . {with at least one step of making a bit line contact}
27/10891 . . . . . . {with at least one step of making a word line}
27/10894 . . . . . . {with simultaneous manufacture of periphery and memory cells}
27/10897 . . . . . . {Peripheral structures}
27/11 . . . . . . Static random access memory structures
27/1104 . . . . . . {the load element being a MOSFET transistor}
27/1108 . . . . . . {the load element being a thin film transistor}
27/1112 . . . . . . {the load element being a resistor (resistors for integrated circuits H01L 28/20, H01L 29/8605)}
27/1116 . . . . . . {Peripheral circuit region}
27/112 . . . . . . Read-only memory structures [ROM] and multistep manufacturing processes therefor
27/11206 . . . . . . {Programmable ROM [PROM], e.g. memory cells comprising a transistor and a fuse or an antifuse}
27/11213 . . . . . . {ROM only}
27/1122 . . . . . . {with source and drain on the same level, e.g. lateral transistors}
27/11226 . . . . . . {Source or drain contact programmed}
27/11233 . . . . . . {Gate programmed, e.g. different gate material or no gate}
27/1124 . . . . . . {Gate contact programmed}
27/11246 . . . . . . {Gate dielectric programmed, e.g. different thickness}
27/11253 . . . . . . {Doping programmed, e.g. mask ROM}
27/1126 . . . . . . {Entire channel doping programmed}
27/11266 . . . . . . {Source or drain doping programmed}
27/11273 . . . . . . {with source and drain on different levels, e.g. vertical channel}
27/1128 . . . . . . {with transistors on different levels, e.g. 3D ROM}
27/11286 . . . . . . {Peripheral circuit regions}
27/11293 . . . . . . {of memory structures of the ROM-only type}
27/115 . . . . . . Electrically programmable read-only memories; Multistep manufacturing processes therefor
27/11502 . . . . . . {with ferroelectric memory capacitors}
27/11504 . . . . . . {characterised by the top-view layout}
27/11507 . . . . . . {characterised by the memory core region}
with charge-trapping gate insulators,
characterised by the top-view layout
characterised by the memory core region (three-dimensional arrangements H01L 27/11551)
with cell select transistors, e.g. NAND
of memory regions comprising cell select transistors, e.g. NAND
Simultaneous manufacturing of periphery and memory cells
including only one type of peripheral transistor
with a control gate layer also being used as part of the peripheral transistor
with an inter-gate dielectric layer also being used as part of the peripheral transistor
with a floating-gate layer also being used as part of the peripheral transistor
with a tunnel dielectric layer also being used as part of the peripheral transistor
including different types of peripheral transistor
characterised by the boundary region between the core and peripheral circuit regions
characterised by three-dimensional arrangements, e.g. with cells on different height levels
with source and drain on different levels, e.g. with sloping channels
the channels comprising vertical portions, e.g. U-shaped channels
characterised by the control gate being a doped region, e.g. single-poly memory cells
the floating gate being an electrode shared by two or more components
with charge-trapping gate insulators, e.g. MNOS or NROM
characterised by the top-view layout
characterised by the memory core region (three-dimensional arrangements H01L 27/11578)
with cell select transistors, e.g. NAND
characterised by the peripheral circuit region
characterised by the boundary region between the core and peripheral circuit regions
characterised by three-dimensional arrangements, e.g. with cells on different height levels
with source and drain on different levels, e.g. with sloping channels
the channels comprising vertical portions, e.g. U-shaped channels
with the gate electrodes comprising a layer used for its ferroelectric memory properties, e.g. metal-ferroelectric-semiconductor [MFS] or metal-ferroelectric-metal-insulator-semiconductor [MFMIS]
characterised by the top-view layout
characterised by the memory core region
characterised by the peripheral circuit region
characterised by the boundary region between core and peripheral circuit regions
characterised by three-dimensional arrangements, e.g. cells on different height levels
Masterslice integrated circuits
{ using bipolar technology }
{ using field effect technology }
[A3B5 or A3B6 gate arrays]
{ CMOS gate arrays }
{ Microarchitecture }
{ Basic cell P to N transistor count }
{ 4-T CMOS basic cell }
{ 5-T CMOS basic cell }
{ 6-T CMOS basic cell }
{ 7-T CMOS basic cell }
{ 8-T CMOS basic cell }
{ relative P to N transistor sizes }
{ for current drive capability }
{ for delay time adaptation }
{ for capacitive loading }
{ Isolation techniques }
{ FET isolation }
{ LOCOS }
{ Degree of specialisation for implementing specific functions }
{ Implementation of digital circuits }
{ Implementation of memory functions }
{ Implementation of analog circuits }
{ Resistors and capacitors }
{ Hybrid analog or digital }
{ Embedded IO cells }
{ Transmission gate }
27/1222 . . . . . [with a particular composition, shape or crystalline structure of the active layer]
27/1225 . . . . . [with semiconductor materials not belonging to the group IV of the periodic table, e.g. InGaZnO]
27/1229 . . . . . [with different crystal properties within a device or between different devices]
27/1233 . . . . . [with different thicknesses of the active layer in different devices]
27/1237 . . . . . [with a different composition, shape, layout or thickness of the gate insulator in different devices]
27/124 . . . . . [with a particular composition, shape or layout of the wiring layers specially adapted to the circuit arrangement, e.g. scanning lines in LCD pixel circuits (wiring structures per se H01L 23/52)]
27/1244 . . . . [for preventing breakage, peeling or short circuiting]
27/1248 . . . . . [with a particular composition or shape of the interlayer dielectric specially adapted to the circuit arrangement]
27/1251 . . . . . [comprising TFTs having a different architecture, e.g. top- and bottom gate TFTs]
27/1255 . . . . . [integrated with passive devices, e.g. auxiliary capacitors]
27/1259 . . . . . [Multistep manufacturing methods]
27/1262 . . . . . [with a particular formation, treatment or coating of the substrate]
27/1266 . . . . . [the substrate on which the devices are formed not being the final device substrate, e.g. using a temporary substrate]
27/127 . . . . . [with a particular formation, treatment or patterning of the active layer specially adapted to the circuit arrangement]
27/1274 . . . . . [using crystallisation of amorphous semiconductor or recrystallisation of crystalline semiconductor]
27/1277 . . . . . [using a crystallisation promoting species, e.g. local introduction of Ni catalyst]
27/1281 . . . . . [by using structural features to control crystal growth, e.g. placement of grain filters]
27/1285 . . . . . [using control of the annealing or irradiation parameters, e.g. using different scanning direction or intensity for different transistors]
27/1288 . . . . . [employing particular masking sequences or specially adapted masks, e.g. half-tone mask]
27/1292 . . . . . [using liquid deposition, e.g. printing]
27/1296 . . . . . [adapted to increase the uniformity of device parameters]
27/13 . . . . . . combined with thin-film or thick-film passive components

**WARNING**

Group H01L 27/1218 – H01L 27/1296 are incomplete pending reclassification of documents from group H01L 27/1214.
Groups H01L 27/1218 – H01L 27/1296 and H01L 27/1214 should be considered in order to perform a complete search.

27/1218 . . . . . [with a particular composition or structure of the substrate]
including semiconductor components sensitive to infra-red radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation and specially adapted either for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation (radiation-sensitive components structurally associated with one or more electric light sources only H01L 31/14; couplings of light guides with optoelectronic elements G02B 6/42)

Energy conversion devices (photovoltaic modules or arrays of single photovoltaic cells comprising bypass diodes integrated or directly associated with the devices H01L 31/044; photovoltaic modules composed of a plurality of thin film solar cells deposited on the same substrate H01L 31/046)

[comprising bypass diode integrated or directly associated with the device, e.g. bypass diode integrated or formed in or on the same substrate as the solar cell]

Devices controlled by radiation

(with at least one potential jump or surface barrier)

[in a repetitive configuration]

Imager structures

WARNING

Groups H01L 27/146 – H01L 27/1493 are incomplete pending reclassification of documents from groups H04N 5/3696 and H04N 9/045.

Groups H04N 5/3696, H04N 9/045, and H01L 27/146 – H01L 27/1493 should be considered in order to perform a complete search.

[Structural or functional details thereof]

[Solar cells deposited on the same substrate with the devices H01L 31/044; bypass diodes integrated or directly associated or arrays of single photovoltaic cells comprising]

[Photodiode arrays; MOS imagers]

[Colour imagers]

[Multicolour imagers having a stacked pixel-element structure, e.g. npn, npnppn or MQW elements]

[Infra-red imagers]

[of the hybrid type]

[Multispectral infra-red imagers, having a stacked pixel-element structure, e.g. npn, npnppn or MQW structures]

[Blooming suppression]

[Overflow drain structures]

[X-ray, gamma-ray or corpuscular radiation imagers (measuring X-, gamma- or corpuscular radiation G01T 1/00)]

[Direct radiation imagers structures]

[of the hybrid type]

[Indirect radiation imagers, e.g. using luminescent members]

[Imagers using a photoconductor layer]

[Colour imagers]

[Infra-red imagers]

[of the hybrid type]

[Blooming suppression]

[Overflow drain structures]

[X-ray, gamma-ray or corpuscular radiation imagers (measuring X-, gamma- or corpuscular radiation G01T 1/00)]

[Contact-type imagers]

[Junction field effect transistor [JFET] imagers; static induction transistor [SIT] imagers]

[Bipolar transistor imagers]

[Processes or apparatus peculiar to the manufacture or treatment of these devices or parts thereof (not peculiar thereto H01L 21/00)]

[Process for coatings or optical elements]

[Wafer level processing]

[MOS based technologies]

[Assemblies, i.e. hybrid integration]

[Thin film technologies, e.g. amorphous, poly, micro- or nanocrystalline silicon]

[The active layers comprising only A

B

V

compounds, e.g. GaAs, InP]

[The active layers comprising only A

B

V

compounds, e.g. CdS, ZnS, CdTe]

[Post-treatment for the devices, e.g. annealing, impurity-gettering, shor-circuit elimination, recrystallisation]

Charge coupled imagers (individual charge coupled devices H01L 29/765)
27/14806 . . . . . . (Structural or functional details thereof)
27/14812 . . . . . . (Special geometry or disposition of
pixel-elements, address lines or gate-
 electrodes)
27/14818 . . . . . . (Optical shielding)
27/14825 . . . . . . (Linear CCD imagers)
27/14831 . . . . . . (Area CCD imagers)
27/14837 . . . . . . (Frame-interline transfer)
27/14843 . . . . . . (Interline transfer)
27/1485 . . . . . . (Frame transfer)
27/14856 . . . . . . (Time-delay and integration)
27/14862 . . . . . . (CID imagers)
27/14868 . . . . . . (CCD or CID colour imagers)
27/14875 . . . . . . (Infra-red CCD or CID imagers)
27/14881 . . . . . . (of the hybrid type)
27/14887 . . . . . . (Bloom suppression)
27/14893 . . . . . . (comprising a photoconductive layer
deposited on the CCD structure)
27/15 . . . including semiconductor components with
at least one potential-jump barrier or surface
barrier specially adapted for light emission
{(monolithically integrated components including
semiconductor laser components H01S 5/026)}
27/153 . . . (in a repetitive configuration, e.g. LED bars)
27/156 . . . . . . (two-dimensional arrays)
27/16 . . . including thermoelectric components with or
without a junction of dissimilar materials; including
thermoelectric components (using the Peltier
effect only for cooling of semiconductor or other
solid state devices H01L 23/38)
27/18 . . . including components exhibiting superconductivity
27/20 . . . including piezo-electric components; including
electrostrictive components; including
magnetostrictive components
27/22 . . . including components using galvano-magnetic
effects, e.g. Hall effects; using similar magnetic
field effects
27/222 . . . (Magnetic non-volatile memory structures, e.g.
MRAM)
27/224 . . . . . . (comprising two-terminal components, e.g.
diodes, MIM elements)
27/226 . . . . . . (comprising multi-terminal components, e.g.
transistors)
27/228 . . . . . . (of the field-effect transistor type)
27/24 . . . including solid state components for rectifying,
amplifying or switching without a potential-jump
barrier or surface barrier, e.g. resistance switching
non-volatile memory structures)
27/2409 . . . . . . (comprising two-terminal selection components,
e.g. diodes)
27/2418 . . . . . . (of the metal-insulator-metal type)
27/2427 . . . . . . (of the Ovonic threshold switching type)
27/2436 . . . . . . (comprising multi-terminal selection components,
e.g. transistors)
27/2445 . . . . . . (of the bipolar type)
27/2454 . . . . . . (of the vertical channel field-effect transistor
type)
27/2463 . . . . . . (Arrangements comprising multiple bistable
or multistable switching components of the
same type on a plane parallel to the substrate,
e.g. cross-point arrays, details of the horizontal
layout)
27/2472 . . . . . . (the switching components having a common
active material layer)
27/2481 . . . . . . (arranged in a direction perpendicular to the
substrate, e.g. 3D cell arrays, details of the
vertical layout)
27/249 . . . . . . (the switching components being connected
to a common vertical conductor)
27/26 . . . including bulk negative resistance effect
components
27/265 . . . . . . (Gunn effect devices)
27/28 . . . including components using organic materials as
the active part, or using a combination of organic
materials with other materials as the active part
27/281 . . . . . . (Integrated circuits having a three-dimensional
layout)
27/283 . . . (comprising components of the field-effect type)
27/285 . . . (Integrated circuits with a common active layer,
e.g. cross point devices)
27/286 . . . . . . (with an active region comprising an inorganic
semiconductor)
27/288 . . . . . . (Combination of organic light sensitive
components with organic light emitting
components, e.g. optocoupler)
27/30 . . . with components specially adapted for sensing
infra-red radiation, light, electromagnetic
radiation of shorter wavelength, or corpuscular
radiation; with components specially adapted
for either the conversion of the energy of
such radiation into electrical energy or for the
control of electrical energy by such radiation
{(combination of organic light sensitive
components with organic light emitting
components, e.g. optocoupler H01L 27/2881)}
27/301 . . . . . . (Energy conversion devices)
27/302 . . . . . . (comprising multiple junctions, e.g. tandem
cells)
27/304 . . . . . . (in form of a fiber or a tube, e.g.
photovoltaic fibers)
27/305 . . . . . . (Devices controlled by radiation)
27/307 . . . . . . (Imager structures)

**WARNING**

Group H01L 27/307 is incomplete pending reclassification of documents
from groups H04N 5/3696 and
H04N 9/045.

Groups H04N 5/3696,
H04N 9/045, and
H01L 27/307 should be considered in
order to perform a complete search.

27/308 . . . . . . (Devices specially adapted for detecting
X-ray radiation (measuring X-radiation
G01T 1/00))
27/32 . . . with components specially adapted for light
emission, e.g. flat-panel displays using organic
light-emitting diodes [OLED] {(combination
of organic light sensitive components with organic
light emitting components, e.g. optocoupler
H01L 27/2881)}
27/3202 . . . . . . [OLEDs electrically connected in parallel]
27/3204 . . . . . . [OLEDs electrically connected in series]
27/3206 . . . . . . [Multi-colour light emission]
27/3209 . . . . . . [using stacked OLED]
27/3211 . . . . [using RGB sub-pixels]

**WARNING**

Groups H01L 27/3213 – H01L 27/3218 are incomplete pending reclassification of documents from group H01L 27/3211. Groups H01L 27/3213 – H01L 27/3218 and H01L 27/3211 should be considered in order to perform a complete search.

27/3213 . . . . . [using more than three sub-pixels, e.g. RGBW]

27/3216 . . . . . (the areas of RGB sub-pixels being different)

27/3218 . . . . . [characterised by the geometrical arrangement of the RGB sub-pixels]

27/322 . . . . . [using colour filters or colour changing media [CCM]]

27/3223 . . . [OLED integrated with dummy elements, i.e. non-functional features]

27/3225 . . . . . [OLED integrated with another component (H01L 27/3223 takes precedence)]

27/3227 . . . . . [the other component being a light sensitive element, e.g. inorganic solar cell, inorganic photodiode (H01L 27/288 takes precedence)]

27/323 . . . . . [the other component being a touch screen]

27/3232 . . . . . [the other component being a light modulating element, e.g. electrochromic element, photochromic element, liquid crystal element]

27/3234 . . . . . [the other component being an imager structure (H01L 27/146 takes precedence)]

27/3237 . . . . . [Displays not provided for in group H01L 27/3241 and subgroups, e.g. segment-type displays]

27/3239 . . . . . [Light emitting logos]

27/3241 . . . . . [Matrix-type displays]

**WARNING**

From 1.2.2012 onwards, groups H01L 27/3295 and H01L 27/3297 are no longer used for classification of new documents. The backfile is being reclassified to H01L 27/3244 and H01L 27/3281 and subgroups thereof.

27/3244 . . . . . [Active matrix displays]

27/3246 . . . . . [Banks, i.e. pixel defining layers]

27/3248 . . . . . [Connection of the pixel electrode to the TFT]

27/3251 . . . . . [Double substrate, i.e. with OLED and TFT on different substrates]

27/3253 . . . . . [Electrical connection of the two substrates]

27/3255 . . . . . [Chiplets]

27/3258 . . . . . [Insulating layers formed between TFT elements and OLED elements]

27/326 . . . . . . [Special geometry or disposition of pixel-elements]

27/3262 . . . . . [of TFT]

27/3265 . . . . . [of capacitor]

27/3267 . . . . . [Dual display, i.e. having two independent displays]

27/3269 . . . . . [Including photosensors to control luminance]

27/3272 . . . . . [Shielding, e.g. of TFT]

27/3274 . . . . . [including organic thin film transistors [OTFT]]

27/3276 . . . . . [Wiring lines]

27/3279 . . . . . [comprising structures specially adapted for lowering the resistance]

27/3281 . . . . . [Passive matrix displays]

27/3283 . . . . . [Including banks or shadow masks]

27/3286 . . . . . [Dual display, i.e. having two independent displays]

27/3288 . . . . . [Wiring lines]

27/329 . . . . . [comprising structures specially adapted for lowering the resistance]

27/3293 . . . . . [Tiled displays]

27/3295 . . . . . [Including banks or shadow masks]

27/3297 . . . . . [Wiring lines, e.g. power supply lines]

28/00 [Passive two-terminal components without a potential-jump or surface barrier for integrated circuits; Details thereof; Multistep manufacturing processes therefor (testing or measuring during manufacture H01L 22/00; integration methods H01L 21/70; integrated circuits H01L 27/00; two-terminal components with a potential-jump or surface barrier H01L 29/00; resistors in general H01C; inductors in general H01F; capacitors in general H01G)]

28/10 . . . . . [Inductors]

28/20 . . . . . . [Resistors]

28/22 . . . . . [with an active material comprising carbon, e.g. diamond or diamond-like carbon [DLC]]

28/24 . . . . . [with an active material comprising a refractory, transition or noble metal, metal compound or metal alloy, e.g. silicides, oxides, nitrides]

28/26 . . . . . [with an active material comprising an organic conducting material, e.g. conducting polymers]

28/40 . . . . . [Capacitors]

28/55 . . . . . [with a dielectric comprising a perovskite structure material]

28/56 . . . . . [the dielectric comprising two or more layers, e.g. comprising buffer layers, seed layers, gradient layers]

28/57 . . . . . [comprising a barrier layer to prevent diffusion of hydrogen or oxygen]

28/60 . . . . . [Electrodes]

28/65 . . . . . [comprising a noble metal or a noble metal oxide, e.g. platinum (Pt), ruthenium (Ru), ruthenium dioxide (RuO2), iridium (Ir), iridium dioxide (IrO2)]

28/75 . . . . . [comprising two or more layers, e.g. comprising a barrier layer and a metal layer]

28/82 . . . . . [with an enlarged surface, e.g. formed by texturisation]

28/84 . . . . . [being a rough surface, e.g. using hemispherical grains]

28/86 . . . . . [having horizontal extensions]

28/87 . . . . . [made by depositing layers, e.g. by depositing alternating conductive and insulating layers]

28/88 . . . . . [made by patterning layers, e.g. by etching conductive layers]

28/90 . . . . . [having vertical extensions]
29/00 Semiconducto devices adapted for rectifying, ammifling, oscillating or switching, or capacitors or resistors with at least one potential-jump barrier or surface barrier, e.g. PN junction depletion layer or carrier concentration layer; Details of semiconductor bodies or of electrodes thereof; [Multistep manufacturing processes therefor] (H01L 31/00 - H01L 47/00; H01L 51/05 take precedence; processes or apparatus adapted for the manufacture or treatment thereof or of parts thereof H01L 21/00; details other than of semiconductor bodies or of electrodes thereof H01L 23/00; devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; {passive two-terminal components without a potential-jump or surface barrier for integrated circuits, details thereof and multistep manufacturing processes therefor H01L 28/00; } resistors in general H01C; capacitors in general H01G. (e.g. ceramic barrier-layer capacitors H01G 4/1272))

NOTE
In this main group, classification is made both in groups H01L 29/02 - H01L 29/51 and in groups H01L 29/66 - H01L 29/94 if both of these sets of groups are relevant.

29/02 . Semiconducto bodies [; Multistep manufacturing processes therefor]
29/04 . characterised by their crystalline structure, e.g. polycrystalline, cubic or particular orientation of crystalline planes (characterised by physical imperfections H01L 29/30)
29/045 . . . [by their particular orientation of crystalline planes]
29/06 . characterised by their shape; characterised by the shapes, relative sizes, or dispositions of the semiconductor regions ;[characterised by the concentration or distribution of impurities within semiconductor regions]
29/0603 . [characterised by particular constructional design considerations, e.g. for preventing surface leakage, for controlling electric field concentration or for internal isolations regions isolation regions between components H01L 21/76; design considerations for integrated circuits H01L 27/00; geometrical design considerations for devices H01L 29/0657)]
29/0607 . . . . . . [for preventing surface leakage or controlling electric field concentration]
29/0611 . . . . . . [for increasing or controlling the breakdown voltage of reverse biased devices (H01L 29/0611 takes precedence)]
29/0615 . . . . . . [by the doping profile or the shape or the arrangement of the PN junction, or with supplementary regions, e.g. junction termination extension [JTE] (LDD or drain offset regions H01L 29/7833)]

29/0619 . . . . . . [with a supplementary region doped oppositely to or in rectifying contact with the semiconductor containing or contacting region, e.g. guard rings with PN or Schottky junction]
29/0623 . . . . . . [Buried supplementary region, e.g. buried guard ring (multi-RESURF H01L 29/0634)]
29/0626 . . . . . . [with a localised breakdown region, e.g. built-in avalanching region (in self-protected thyristors H01L 29/7424)]
29/063 . . . . . . [Reduced surface field [RESURF] pn-junction structures]
29/0634 . . . . . . [Multiple reduced surface field (multi-RESURF) structures, e.g. double RESURF charge compensation, cool, superjunction (SI), 3D-RESURF, composite buffer (CB) structures]
29/0638 . . . . . . [for preventing surface leakage due to surface inversion layer, e.g. with channel stopper (channel stoppers in combination with isolation region for integrated circuits H01L 21/762)]
29/0642 . . . . . . [Isolation within the component, i.e. internal isolation]
29/0646 . . . . . . [PN junctions]
29/0649 . . . . . . [Dielectric regions, e.g. SiO2 regions, air gaps]
29/0653 . . . . . . [adjoining the input or output region of a field-effect device, e.g. the source or drain region]
29/0657 . . . . . . [characterised by the shape of the body]
29/0661 . . . . . . [specially adapted for altering the breakdown voltage by removing semiconductor material at, or in the neighbourhood of, a reverse biased junction, e.g. by bevelling, moat etching, depletion etching]
29/0665 . . . . . . [the shape of the body defining a nanostructure (nanotechnology per se R82B)]
29/0669 . . . . . . [Nanowires or nanotubes (carbon nanotubes as material of solid-state device active part H01L 51/0048)]
29/0673 . . . . . . [oriented parallel to a substrate]
29/0676 . . . . . . [oriented perpendicular or at an angle to a substrate]
29/068 . . . . . . [comprising a junction]
29/0684 . . . . . . [characterised by the shape, relative sizes or dispositions of the semiconductor regions or junctions between the regions]
29/0688 . . . . . . [characterised by the particular shape of a junction between semiconductor regions]
29/0692 . . . . . . [Surface layout]
29/0696 . . . . . . [of cellular field-effect devices, e.g. multicellular DMOS transistors or IGBTs]
29/08 . . . . . . [with semiconductor regions connected to an electrode carrying current to be rectified, amplified or switched and such electrode being part of a semiconductor device which comprises three or more electrodes]
29/0804 . . . . . . [Emitter regions of bipolar transistors]
29/0808 . . . . . . [of lateral transistors]
29/0813 . . . . . . . (Non-interconnected multi-emitter structures)
29/0817 . . . . . . . (of heterojunction bipolar transistors (H01L 29/7375 takes precedence))
29/0821 . . . . . . . (Collector regions of bipolar transistors)
29/0826 . . . . . . . (Pedestal collectors)
29/083 . . . . . . . (Anode or cathode regions of thyristors or gated bipolar-mode devices)
29/0834 . . . . . . . (Anode regions of thyristors or gated bipolar-mode devices, e.g. supplementary regions surrounding anode regions)
29/0839 . . . . . . . (Cathode regions of thyristors)
29/0843 . . . . . . . (Source or drain regions of field-effect devices)
29/0847 . . . . . . . (of field-effect transistors with insulated gate (H01L 29/0653 takes precedence; with a passive supplementary region between source or drain and substrate related to punch-through, capacity or isolation phenomena H01L 29/1079; with LDD or DDD structure H01L 29/7833; for thin film transistors H01L 29/78618))
29/0852 . . . . . . . (of DMOS transistors)

**WARNING**

Groups H01L 29/0852 – H01L 29/0886 are incomplete pending reclassification of documents from group H01L 29/0847 and H01L 29/7801.

Groups H01L 29/0852 – H01L 29/0886 and H01L 29/0847, H01L 29/7801 should be considered in order to perform a complete search.

29/0856 . . . . . . . [Source regions]
29/086 . . . . . . . [Impurity concentration or distribution]
29/0865 . . . . . . . [Disposition]
29/0869 . . . . . . . [Shape (cell layout H01L 29/0696)]
29/0873 . . . . . . . [Drain regions]
29/0878 . . . . . . . [Impurity concentration or distribution]
29/0882 . . . . . . . [Disposition]
29/0886 . . . . . . . [Shape]
29/0891 . . . . . . . {of field-effect transistors with Schottky gate}
29/0895 . . . . . . . [Tunnel injectors]
29/10 . . . . . . . with semiconductor regions connected to an electrode not carrying current to be rectified, amplified or switched and such electrode being part of a semiconductor device which comprises three or more electrodes
29/1004 . . . . . . . [Base region of bipolar transistors]
29/1008 . . . . . . . [of lateral transistors]
29/1012 . . . . . . . [Base regions of thyristors (H01L 29/083 takes precedence)]
29/1016 . . . . . . . [Anode base regions of thyristors]
29/102 . . . . . . . [Cathode base regions of thyristors]
29/1025 . . . . . . . [Channel region of field-effect devices]
29/1029 . . . . . . . [of field-effect transistors]

29/1033 . . . . . . . {with insulated gate, e.g. characterised by the length, the width, the geometric contour or the doping structure (with channel and gate aligned in the lengthwise direction H01L 29/42376; with buried channel H01L 29/7838)}
29/1037 . . . . . . . {and (non-planar channel (resulting from the gate electrode disposition, e.g. within a trench), H01L 29/42356)}
29/1041 . . . . . . . {with a non-uniform doping structure in the channel region surface}
29/1045 . . . . . . . {the doping structure being parallel to the channel length, e.g. DMOS like}
29/105 . . . . . . . {with vertical doping variation (H01L 29/7827 takes precedence)}
29/1054 . . . . . . . {with a variation of the composition, e.g. channel with strained layer for increasing the mobility}
29/1058 . . . . . . . {with PN junction gate}
29/1062 . . . . . . . {of charge coupled devices}
29/1066 . . . . . . . {Gate region of field-effect devices with PN junction gate}
29/107 . . . . . . . {Substrate region of field-effect devices}
29/1075 . . . . . . . {of field-effect transistors}
29/1079 . . . . . . . {with insulated gate}
29/1083 . . . . . . . {with an inactive supplementary region, e.g. for preventing punch-through, improving capacity effect or leakage current}
29/1087 . . . . . . . {characterised by the contact structure of the substrate region, e.g. for controlling or preventing bipolar effect}
29/1091 . . . . . . . {of charge coupled devices}
29/1095 . . . . . . . {Body region, i.e. base region, of DMOS transistors or IGBTs (cell layout H01L 29/0690)}
29/12 . . . . . . . characterised by the materials of which they are formed
29/122 . . . . . . . {Single quantum well structures (single heterojunctions, couples of materials H01L 29/165, H01L 29/205, H01L 29/225, H01L 29/267)}
29/125 . . . . . . . {Quantum wire structures}
29/127 . . . . . . . {Quantum box structures}
29/15 . . . . . . . Structures with periodic or quasi periodic potential variation, e.g. multiple quantum wells, superlattices (such structures applied for the control of light G02F 1/017, applied in semiconductor lasers H01S 5/34)

**NOTE**

Group H01L 29/15 takes precedence over groups H01L 29/16 - H01L 29/26.

29/151 . . . . . . . {Compositional structures (H01L 29/157 and H01L 29/158 take precedence)}
29/152 . . . . . . . {with quantum effects only in vertical direction, i.e. layered structures with quantum effects solely resulting from vertical potential variation}
29/154 . . . . . . comprising at least one long range structurally disordered material, e.g. one-dimensional vertical amorphous superlattices

29/155 . . . . . . (Comprising only semiconductor materials (H01L 29/154 takes precedence))

29/157 . . . . . . [Doping structures, e.g. doping superlattices, nipi superlattices (delta doping in general H01L 29/365)]

29/158 . . . . . . [Structures without potential periodicity in a direction perpendicular to a major surface of the substrate, i.e. vertical direction, e.g. lateral superlattices, lateral surface superlattices [LSS]]

29/16 . . . . . . including, apart from doping materials or other impurities, only elements of Group IV of the Periodic System

29/1602 . . . . . . [Diamond]

29/1604 . . . . . . [Amorphous materials]

29/1606 . . . . . . [Graphite]

29/1608 . . . . . . [Silicon carbide]

29/161 . . . . . . [including two or more of the elements provided for in group H01L 29/16 (e.g. alloys (H01L 29/1604 takes precedence)]

29/165 . . . . . . in different semiconductor regions (e.g. heterojunctions)

29/167 . . . . . . further characterised by the doping material (H01L 29/1604 takes precedence)

29/18 . . . . . . Selenium or tellurium only, apart from doping materials or other impurities

29/185 . . . . . . [Amorphous materials]

29/20 . . . . . . including, apart from doping materials or other impurities, only A_B_C compounds

29/2003 . . . . . . [Nitride compounds]

29/2006 . . . . . . [Amorphous materials]

29/201 . . . . . . including two or more compounds (e.g. alloys (H01L 29/2006 takes precedence)

29/205 . . . . in different semiconductor regions (e.g. heterojunctions)

29/207 . . . . . . further characterised by the doping material (H01L 29/2006 takes precedence)

29/22 . . . . . . including, apart from doping materials or other impurities, only A_B_C compounds

29/2203 . . . . . . (Cd X compounds being one element of the 6th group of the Periodic System (H01L 29/2206 takes precedence)

29/2206 . . . . . . [Amorphous materials]

29/221 . . . . . . including two or more compounds (e.g. alloys (H01L 29/2206 takes precedence)

29/225 . . . . in different semiconductor regions (e.g. heterojunctions)

29/227 . . . . . . further characterised by the doping material (H01L 29/2206 takes precedence)

29/24 . . . . . . including, apart from doping materials or other impurities, only semiconductor materials not provided for in groups H01L 29/16, H01L 29/18, H01L 29/20, H01L 29/22 (including organic materials H01L 51/00)

29/242 . . . . . . (A_B_C or A_B_C compounds, e.g. Cu2O, CuI (H01L 29/247 takes precedence)

29/245 . . . . . . (Pb compounds, e.g. PbO (H01L 29/247 takes precedence)

29/247 . . . . . . [Amorphous materials]

29/26 . . . . . . including, apart from doping materials or other impurities, elements provided for in two or more of the groups H01L 29/16, H01L 29/18, H01L 29/20, H01L 29/22, H01L 29/24 (e.g. alloys)

29/263 . . . . . . [Amorphous materials]

29/267 . . . . . . in different semiconductor regions (e.g. heterojunctions (H01L 29/263 takes precedence)

29/30 . . . . . . characterised by physical imperfections; having polished or roughened surface

29/32 . . . . . . the imperfections being within the semiconductor body

29/34 . . . . . . the imperfections being on the surface

29/36 . . . . . . characterised by the concentration or distribution of impurities (in the bulk material (within semiconductor regions H01L 29/06)

29/365 . . . . . . [Planar doping, e.g. atomic-plane doping, delta-doping]

29/40 . . . . . . Electrodes (Multistep manufacturing processes therefor)

29/401 . . . . . . [Multistep manufacturing processes]

29/402 . . . . . . [Field plates]

29/404 . . . . . . [Multiple field plate structures]

29/405 . . . . . . [Resistive arrangements, e.g. resistive or semi-insulating field plates]

29/407 . . . . . . [Recessed field plates, e.g. trench field plates, buried field plates]

29/408 . . . . . . with an insulating layer with a particular dielectric or electrostatic property, e.g. with static charges or for controlling trapped charges or moving ions, or with a plate acting on the insulator potential or the insulator charges, e.g. for controlling charges effect or potential distribution in the insulating layer, or with a semi-insulating layer contacting directly the semiconductor surface

29/41 . . . . . . characterised by their shape, relative sizes or dispositions

29/413 . . . . . . [Nanized electrodes, e.g. nanowire electrodes comprising one or a plurality of nanowires (transparent electrodes comprising carbon nano-tubes H01L 51/444, nanotechnology per se vs B82B; nanosized carbon materials, e.g. carbon nanotubes, per se C01B 32/15)]

29/417 . . . . . . carrying the current to be rectified, amplified or switched

29/41708 . . . . . . [Emitter or collector electrodes for bipolar transistors]

29/41716 . . . . . . [Cathode or anode electrodes for thyristors]

29/41725 . . . . . . [Source or drain electrodes for field effect devices (with monocrystalline semiconductor on source/drain region H01L 29/0843)]]

29/41733 . . . . . . [for thin film transistors with insulated gate]

29/41741 . . . . . . [for vertical or pseudo-vertical devices]

NOTE
A pseudo-vertical device is a device with the drain and source electrodes on the same main surface and where the main current is vertical at least in a part of its path
H01L

29/4175 . . . . . (for lateral devices where the connection to the source or drain region is done through at least one part of the semiconductor substrate thickness, e.g. with connecting sink or with via-hole)

NOTE

The sink or via-hole leading to the source or drain region is considered to form part of the source or drain electrode

29/41758 . . . . . (for lateral devices with structured layout for source or drain region, i.e. the source or drain region having cellular, interdigitated or ring structure or being curved or angular (H01L 29/41733 - H01L 29/4175 take precedence))

NOTE

Interdigitated structure means that at least one of the source or drain region has two or more fingers

29/41766 . . . . . (with at least part of the source or drain electrode having contact below the semiconductor surface, e.g. the source or drain electrode formed at least partially in a groove or with inclusions of conductor inside the semiconductor (H01L 29/41733 - H01L 29/41758 take precedence))

29/41775 . . . . . (characterised by the proximity or the relative position of the source or drain electrode and the gate electrode, e.g. the source or drain electrode separated from the gate electrode by side-walls or spreading around or above the gate electrode)

29/41783 . . . . . [Raised source or drain electrodes self aligned with the gate]

29/41791 . . . . . (for transistors with a horizontal current flow in a vertical sidewall, e.g. FinFET, MuGFET)

29/423 . . . not carrying the current to be rectified, amplified or switched

29/42304 . . . . . [Base electrodes for bipolar transistors]

29/42308 . . . . . [Gate electrodes for thyristors]

29/42312 . . . . . [Gate electrodes for field effect devices]

29/42316 . . . . . (for field-effect transistors)

29/4232 . . . . . . . . . [with insulated gate]

29/42324 . . . . . . . . . [Gate electrodes for transistors with a floating gate]

29/42328 . . . . . . . . . [with at least one additional gate other than the floating gate and the control gate, e.g. program gate, erase gate or select gate]

29/42332 . . . . . . . . . [with the floating gate formed by two or more non connected parts, e.g. multi-particles floating gate]

29/42336 . . . . . . . . . [with one gate at least partly formed in a trench]

29/4234 . . . . . . . . . [Gate electrodes for transistors with charge trapping gate insulator]

29/42344 . . . . . . . . . (with at least one additional gate, e.g. program gate, erase gate or select gate)

29/42348 . . . . . . . . . (with trapping site formed by at least two separated sites, e.g. multi-particles trapping site)

29/42352 . . . . . . . . . (with the gate at least partly formed in a trench)

29/42356 . . . . . . . . . (Disposition, e.g. buried gate electrode (H01L 29/42324 and H01L 29/4234 take precedence))

29/4236 . . . . . . . . . (within a trench, e.g. trench gate electrode, groove gate electrode)

29/42364 . . . . . . . . . (characterised by the insulating layer, e.g. thickness or uniformity (H01L 29/42324 and H01L 29/4234 take precedence))

29/42368 . . . . . . . . . (the thickness being non-uniform)

29/42372 . . . . . . . . . (characterised by the conducting layer, e.g. the length, the sectional shape or the lay-out (H01L 29/42324 takes precedence))

29/42376 . . . . . . . . . (characterised by the length or the sectional shape)

29/4238 . . . . . . . . . (characterised by the surface lay-out)

29/42384 . . . . . . . . . (for thin film field effect transistors, e.g. characterised by the thickness or the shape of the insulator or the dimensions, the shape or the lay-out of the conductor)

2029/42388 . . . . . . . . . (characterised by the shape of the insulating material)

29/42392 . . . . . . . . . (fully surrounding the channel, e.g. gate-all-around)

29/42396 . . . . . . . . . (for charge coupled devices)

29/43 . . . . . . . . . (characterised by the materials of which they are formed)

29/432 . . . . . . . . . (Heterojunction gate for field effect devices)

29/435 . . . . . . . . . (Resistive materials for field effect devices, e.g. resistive gate for MOSFET or MESFET)

29/437 . . . . . . . . . (Superconductor materials)

29/45 . . . . . . . . . (Ohmic electrodes)

29/452 . . . . . . . . . (on AIII-BV compounds)

29/454 . . . . . . . . . (on thin film AIII-BV compounds)

29/456 . . . . . . . . . (on silicon)

29/458 . . . . . . . . . (for thin film silicon, e.g. source or drain electrode)

29/47 . . . . . . . . . (Schottky barrier electrodes (H01L 29/435 takes precedence))

29/475 . . . . . . . . . (on AIII-BV compounds)

29/49 . . . . . . . . . (Metal-insulator-semiconductor electrodes, e.g. gates of MOSFET (H01L 29/435 takes precedence))

NOTE

This group covers also devices using any other conductor material in place of metal

29/4908 . . . . . . . . . (for thin film semiconductor, e.g. gate of TFT)
Types of semiconductor device: Multistep manufacturing processes therefor

Types of semiconductor device: Multistep manufacturing processes

Manufacturing processes therefor

Types of semiconductor device: Multistep manufacturing processes

Semiconductor H01L 29/4908 (for MIS structures on thin film)

Insulating materials associated therewith

Conductive, resistive or dielectric material

By the sidewalls being composed of lateral composition variation or characterised gate with a lateral doping variation or with a lateral structure, e.g. Polysilicon

Mo (H01L 29/4908)

Insulator being a simple metal, e.g. W, take precedence

The conductor material next to the insulator, e.g. W, Mo (H01L 29/4908)

Groups H01L 29/4983

pending reclassification of documents from group H01L 29/4983.

Groups H01L 29/4991 and H01L 29/4983 should be considered in order to perform a complete search.

Insulating materials associated therewith (for MIS structures on thin film semiconductor H01L 29/4908)

With a compositional variation, e.g. multilayer structures (H01L 29/516 takes precedence)

The variation being parallel to the channel plane

The variation being perpendicular to the channel plane

With cavities, e.g. containing a gas

With at least one ferroelectric layer

The insulating material comprising a metallic compound, e.g. metal oxide, metal silicate (H01L 29/518 takes precedence)

The insulating material containing nitrogen, e.g. nitride, oxynitride, nitrogen-doped material

Types of semiconductor device: Multistep manufacturing processes thereafter

Types of semiconductor device: Multistep manufacturing processes

{Diodes}

{Field-effect transistors}

{Diodes}

{Breakdown diodes}

{Zener diodes}

{Avalanche diodes}

{Multilayer diodes, e.g. PNPN diodes}

{Planar diodes}

{PN junction diodes}

{Schottky diodes}

{Tunnel diodes (group 13/15 resonant tunneling diodes H01L 29/66219)}

{Tunnel diodes (group 13/15 resonant tunneling diodes H01L 29/66219)}

[Transit time diodes, e.g. IMPATT, TRAPATT diodes]

{Resistors with PN junction}

{Capacitors with PN or Schottky junction, e.g. varactors (capacitors with PN junction combined with MOS control H01L 29/66189)}

{Conductor-insulator-semiconductor capacitors, e.g. trench capacitors}

{with PN junction, e.g. hybrid capacitors}

{with an active layer made of a group 13/15 material}
devices \{ amplified or switched, e.g. three-terminal potential applied, to an electrode which the electric current supplied or the electric field controlled thyristors [FCTh], static induction thyristors [SITh], \{ gated diodes, e.g. field controlled diodes [FCD], static induction thyristors [SITh], field controlled thyristors [FCTh] \} \}, field-effect device \{ the other device being a controlling field-effect device \}, \{ bidirectional thyristors \} \}, \{ lateral or planar thyristors \} \}, \{ bidirectional thyristors \} \}, \{ with multi-emitter, e.g. interdigitated, multi-cellular or distributed emitter \} \}, \{ with an active layer made of a group 13/15 material \} \}, \{ controlled by field-effect, e.g. insulated gate bipolar transistors [IGBT] \} \}, \{ vertical insulated gate bipolar transistors \} \}, \{ with a recess formed by etching in the source/emitter contact region (H01L 29/66348 takes precedence; etching of semiconductor bodies H01L 21/302) \} \}, \{ with a recessed gate \} \}, \{ gated diodes, e.g. field controlled diodes [FCD], static induction thyristors [SITh], field controlled thyristors [FCTh] \} \}, \{ thyristors \} \}, \{ structurally associated with another device, e.g. built-in diode (making integrated circuits H01L 21/82) \} \}, \{ \{ the other device being a controlling field-effect device \} \}, \{ bidirectional thyristors \} \}, \{ lateral or planar thyristors \} \}, \{ with an active layer made of a group 13/15 material \} \}, \{ unipolar field-effect transistors \} \}, \{ \{ static induction transistors [SIT] with an active layer made of a group 13/15 material H01L 29/66454 \} \}, \{ permeable base transistors [PBT] \} \}, \{ with a heterojunction interface channel or gate, e.g. HFET, HIGFET, SISFET, HFJET, HEMT (with an active layer made of a group 13/15 material H01L 29/66462) \} \}, \{ with a one- or zero-dimensional channel, e.g. quantum wire FET, in-plane gate transistor [IPG], single electron transistor [SET], striped channel transistor, Coulomb blockade transistor (with an active layer made of a group 13/15 material H01L 29/66469) \} \}, \{ \{ with an active layer made of a group 13/15 material, e.g. group 13/15 velocity modulation transistor [VMT], group 13/15 negative resistance FET [NERFET] \} \}, \{ static induction transistors [SIT], e.g. permeable base transistors [PBT] \} \}, \{ with a heterojunction interface channel or gate, e.g. HFET, HIGFET, SISFET, HFJET, HEMT \} \}, \{ \{ with one- or zero-dimensional channel, e.g. quantum wire field-effect transistors, in-plane gate transistors [IPG], single electron transistors [SET], Coulomb blockade transistors, striped channel transistors \} \}, \{ with an insulated gate, i.e. MISFET \} \}, \{ with multiple gate, at least one gate being an insulated gate (H01L 29/66742 takes precedence) \} \}, \{ with a pocket or a lightly doped drain selectively formed at the side of the gate \} \}, \{ \{ using self aligned silicidation, i.e. salicide (formation of conductive layers comprising silicides H01L 21/28518) \} \}, \{ \{ providing different silicide thicknesses on the gate and on source or drain \} \}, \{ \{ using self aligned selective metal deposition simultaneously on the gate and on source or drain \} \}, \{ \{ with an active layer made of a group 13/15 material (H01L 29/66446 takes precedence) \} \}, \{ \{ using the removal of at least part of spacer, e.g. disposable spacer \} \}, \{ \{ using a self aligned punch through stopper or threshold implant under the gate region (H01L 29/66606 takes precedence) \} \}, \{ \{ using a dummy, i.e. replacement gate in a process wherein at least a part of the final gate is self aligned to the dummy gate \} \}
H01L 29/66553 . . . . . . . [using inside spacers, permanent or not]
H01L 29/6656 . . . . . . . [using multiple spacer layers, e.g. multiple sidewall spacers]
H01L 29/66568 . . . . . . . [Lateral single gate silicon transistors]
H01L 29/66575 . . . . . . . [where the source and drain or source and drain extensions are self-aligned to the sides of the gate (H01L 29/66606 takes precedence)]
H01L 29/66583 . . . . . . . [with initial gate mask or masking layer complementary to the prospective gate location, e.g. with dummy source and drain contacts]
H01L 29/6659 . . . . . . . [with both lightly doped source and drain extensions and source and drain self-aligned to the sides of the gate, e.g. lightly doped drain [LDD] MOSFET, double diffused drain [DDD] MOSFET]
H01L 29/66598 . . . . . . . [forming drain [D] and lightly doped drain [LDD] simultaneously, e.g. using implantation through the wings a T-shaped layer, or through a specially shaped layer]
H01L 29/66606 . . . . . . . [with final source and drain contacts formation strictly before final or dummy gate formation, e.g. contact first technology (H01L 29/66621 takes precedence)]
H01L 29/66613 . . . . . . . [with a gate recessing step, e.g. using local oxidation (making recessed gate LDMOS transistors H01L 29/66704)]
H01L 29/66621 . . . . . . . [using etching to form a recess at the gate location (etching of semiconductor bodies H01L 21/3203)]
H01L 29/66628 . . . . . . . [recessing the gate by forming single crystalline semiconductor material at the source or drain location]
H01L 29/66636 . . . . . . . [with source or drain recessed by etching or first recessed by etching and then refilled]
H01L 29/66643 . . . . . . . [with source or drain regions formed by Schottky barrier or a conductor-insulator-semiconductor structure]
H01L 29/66651 . . . . . . . [with a single crystalline channel formed on the silicon substrate after insulating device isolation]
H01L 29/66659 . . . . . . . [with asymmetry in the channel direction, e.g. lateral high-voltage MISFETs with drain offset region, extended drain MISFETs]
H01L 29/6666 . . . . . . . [Vertical transistors (H01L 29/66712, H01L 29/66742 take precedence)]
H01L 29/6674 . . . . . . . [DMOS transistors, i.e. MISFETs with a channel accommodating body or base region adjoining a drain drift region (making lateral high-voltage MISFETs with channel well and drain offset region H01L 29/66659)]
H01L 29/6681 . . . . . . . [Lateral DMOS transistors, i.e. LDMOS transistors]
H01L 29/6689 . . . . . . . [with a step of forming an insulating sidewall spacer (forming insulating material on a substrate H01L 21/02107)]
H01L 29/6696 . . . . . . . [with a step of recessing the source electrode]
H01L 29/66704 . . . . . . . [with a step of recessing the gate electrode, e.g. to form a trench gate electrode]
H01L 29/66712 . . . . . . . [Vertical DMOS transistors, i.e. VDMOS transistors]
H01L 29/66719 . . . . . . . [With a step of forming an insulating sidewall spacer]
H01L 29/66727 . . . . . . . [with a step of recessing the source electrode]
H01L 29/66734 . . . . . . . [with a step of recessing the gate electrode, e.g. to form a trench gate electrode]
H01L 29/66742 . . . . . . . [Thin film unipolar transistors]
H01L 29/6675 . . . . . . . [Amorphous silicon or polysilicon transistors]
H01L 29/66757 . . . . . . . [Lateral single gate single channel transistors with non-inverted structure, i.e. the channel layer is formed before the gate]
H01L 29/66765 . . . . . . . [Lateral single gate single channel transistors with inverted structure, i.e. the channel layer is formed after the gate]
H01L 29/66772 . . . . . . . [Monocrystalline silicon transistors on insulating substrates, e.g. quartz substrates (H01L 29/6666 takes precedence; thin film FinFETs H01L 29/66795)]
H01L 29/6678 . . . . . . . [on sapphire substrates, e.g. SOS transistors]
H01L 29/66787 . . . . . . . [with a gate at the side of the channel]
H01L 29/66795 . . . . . . . [with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET]
H01L 29/66803 . . . . . . . [with a step of doping the vertical sidewall, e.g. using tilted or multi-angled implants]
H01L 29/6681 . . . . . . . [using dummy structures having essentially the same shape as the semiconductor body, e.g. to provide stability]
H01L 29/66818 . . . . . . . [the channel being thinned after patterning, e.g. sacrificial oxidation on fin]
H01L 29/66825 . . . . . . . [with a floating gate (H01L 29/6684 takes precedence)]
H01L 29/66833 . . . . . . . [with a charge trapping gate insulator, e.g. MNOS transistors]
H01L

29/6684 . . . . . . . [with a ferroelectric gate insulator]
29/66848 . . . . . . . [with a Schottky gate, i.e. MESFET]
29/66856 . . . . . . . [with an active layer made of a group 13/15 material (H01L 29/66446 takes precedence)]
29/66863 . . . . . . . [Lateral single gate transistors]
29/66871 . . . . . . . [Processes wherein the final gate is made after the formation of the source and drain regions in the active layer, e.g. dummy-gate processes]
29/66878 . . . . . . . [Processes wherein the final gate is made before the formation, e.g. activation anneal, of the source and drain regions in the active layer]
29/66886 . . . . . . . [Lateral transistors with two or more independent gates]
29/66893 . . . . . . . [with a PN junction gate, i.e. JFET]
29/66901 . . . . . . . [with a PN homojunction gate]
29/66909 . . . . . . . [Vertical transistors, e.g. tecnetrons]
29/66916 . . . . . . . [with a PN heterojunction gate]
29/66924 . . . . . . . [with an active layer made of a group 13/15 material (H01L 29/66446 takes precedence)]
29/66931 . . . . . . . [BJT-like unipolar transistors, e.g. hot electron transistors [HET], metal base transistors [MBT], resonant tunneling transistor [RTT], bulk barrier transistor [BBT], planar doped barrier transistor [PDBT], charge injection transistor [CHINT]]
29/66939 . . . . . . . [with an active layer made of a group 13/15 material]
29/66946 . . . . . . . [Charge transfer devices]
29/66954 . . . . . . . [with an insulated gate]
29/66962 . . . . . . . [with a Schottky gate]
29/66969 . . . . . . . [of devices having semiconductor bodies not comprising group 14 or group 13/15 materials (comprising selenium or tellurium in uncombined form other than as impurities in semiconductor bodies of other materials, comprising cuprous oxide or cuprous iodide H01L 21/02365)]
29/66977 . . . . . . . [Quantum effect devices, e.g. using quantum reflection, diffraction or interference effects, i.e. Bragg- or Aharonov-Bohm effects]
29/66984 . . . . . . . [Devices using spin polarized carriers]
29/66992 . . . . . . . [controllable only by the variation of applied heat (controllable by IR radiation H01L 31/00; measuring quantity of heat G01K 17/000)]
29/68 . . . . . . . . . . controllable by only the electric current supplied, or only the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched
29/685 . . . . . . . . . . [Hi-Lo semiconductor devices, e.g. memory devices]
29/70 . . . . . . . . . . Bipolar devices
29/705 . . . . . . . . . . [Double base diodes]
29/72 . . . . . . . . . . Transistor-type devices, i.e. able to continuously respond to applied control signals
29/73 . . . . . . . . . . Bipolar junction transistors

29/7302 . . . . . . . [structurally associated with other devices (assemblies of devices H01L 2500; integrated circuits H01L 2700; IGBT H01L 29/7393)]
29/7304 . . . . . . . [the device being a resistive element, e.g. ballasting resistor (transistors integrated with resistors H01L 27075)]
29/7306 . . . . . . . [Point contact transistors]
29/7308 . . . . . . . [Schottky transistors]
29/7311 . . . . . . . [Tunnel transistors]
29/7313 . . . . . . . [Avalanche transistors]
29/7315 . . . . . . . [Transistors with hook collector]
29/7317 . . . . . . . [Bipolar thin film transistors]
29/732 . . . . . . . . . . Vertical transistors
29/7322 . . . . . . . [having emitter-base and base-collector junctions leaving at the same surface of the body, e.g. planar transistor]
29/7325 . . . . . . . [having an emitter-base junction leaving at a main surface and a base-collector junction leaving at a peripheral surface of the body, e.g. mesa planar transistor]
29/7327 . . . . . . . [Inverse vertical transistors]
29/735 . . . . . . . . . . Lateral transistors
29/737 . . . . . . . . . . Hetero-junction transistors
29/7371 . . . . . . . [Vertical transistors]
29/7373 . . . . . . . [having a two-dimensional base, e.g. modulation-doped base, inversion layer base, delta-doped base]
29/7375 . . . . . . . [having an emitter comprising one or more non-monocrystalline elements of group IV, e.g. amorphous silicon, alloys comprising group IV elements]
29/7376 . . . . . . . [Resonant tunnelling transistors]
29/7378 . . . . . . . [comprising lattice mismatched active layers, e.g. SiGe strained layer transistors]
29/739 . . . . . . . . . . controlled by field-effect, e.g. bipolar static induction transistors [BSIT] (unjunction transistors H01L 29/705)]
29/7391 . . . . . . . [Gated diode structures]
29/7392 . . . . . . . [with PN junction gate, e.g. field controlled thyristors (FCTh), static induction thyristors (SITh)]
29/7393 . . . . . . . [Insulated gate bipolar mode transistors, i.e. IGBT; IGT; COMFET]
29/7394 . . . . . . . [on an insulating layer or substrate, e.g. thin film device or device isolated from the bulk substrate (H01L 29/7398 takes precedence)]
29/7395 . . . . . . . [Vertical transistors, e.g. vertical IGBT]

**NOTE**

The transistor is called vertical if the emitter and the collector are not on the same main surface or, if they are on the same main surface, at least a part of the main current
Unipolar devices, e.g. field effect transistors

29/7396 . . . . . . . . . . . . . (with a non planar surface, e.g. with a non planar gate or with a trench or recess or pillar in the surface of the emitter, base or collector region for improving current density or short circuiting the emitter and base regions (H01L 29/7398 takes precedence))

29/7397 . . . . . . . . . . . . . (and a gate structure lying on a slanted or vertical surface or formed in a groove, e.g. trench gate IGBT)

29/7398 . . . . . . . . . . . . . (with both emitter and collector contacts in the same substrate side)

29/74 . . . . . . Thyristor-type devices, e.g. having four-zone regenerative action ((two-terminal thyristors H01L 29/87))

29/7404 . . . . . . . . . . . . . (structurally associated with at least one other device (assemblies H01L 25/00: integrated circuits H01L 27/00))

29/7408 . . . . . . . . . . . . . (the device being a capacitor or a resistor)

29/7412 . . . . . . . . . . . . . (the device being a diode)

29/7416 . . . . . . . . . . . . . (the device being an antiparallel diode, e.g. RCT (shorted anode structures enabling reverse conduction H01L 29/0834))

29/742 . . . . . . . . . . . . . (the device being a field effect transistor (for turn-on or turn-off by field effect H01L 29/745, H01L 29/749))

29/7424 . . . . . . . . . . . . . (having a built-in localised breakdown/breakover region, e.g. self-protected against destructive spontaneous, e.g. voltage breakover, firing)

29/7428 . . . . . . . . . . . . . (having an amplifying gate structure, e.g. cascade (Darlington) configuration)

29/7432 . . . . . . . . . . . . . (Asymmetrical thyristors (with a particular shorted anode structure H01L 29/0834))

29/7436 . . . . . . . . . . . . . (Lateral thyristors)

29/744 . . . . . . . . . . . . . Gate-turn-off devices

29/745 . . . . . . . . . . . . . with turn-off by field effect

29/7455 . . . . . . . . . . . . . (produced by an insulated gate structure)

29/747 . . . . . . . . . . . . . Bidirectional devices, e.g. triacs

29/749 . . . . . . . . . . . . . with turn-on by field effect

29/76 . . . . . . Unipolar devices, e.g. field effect transistors

29/7606 . . . . . . Transistor-like structures, e.g. hot electron transistor [Het]: metal base transistor [MBT]

29/7613 . . . . . . Single electron transistors; Coulomb blockade devices (H01L 29/7888 takes precedence)

29/762 . . . . . . Charge transfer devices

29/765 . . . . . . Charge-coupled devices (peripheral circuits for CCD storage devices G11C 19/285)

29/768 . . . . . . with field effect produced by an insulated gate

29/76808 . . . . . . (Input structures)

29/76816 . . . . . . (Output structures)
29/7803 . . . . . . . [structurally associated with at least one other device (assemblies H01L 25/00; integrated circuits H01L 27/00)]

**WARNING**
Groups H01L 29/7803 – H01L 29/7808 are incomplete pending reclassification of documents from group H01L 29/7802.
Groups H01L 29/7803 – H01L 29/7808 and H01L 29/7802 should be considered in order to perform a complete search.

29/7804 . . . . . . . [the other device being a pn-junction diode]
29/7805 . . . . . . . [in antiparallel, e.g. freewheel diode]
29/7806 . . . . . . . [the other device being a Schottky barrier diode]
29/7808 . . . . . . . [the other device being a breakdown diode, e.g. Zener diode]
29/7809 . . . . . . . [having both source and drain contacts on the same surface, i.e. Up-Drain VDMOS transistors]
29/781 . . . . . . . [Inverted VDMOS transistors, i.e. Source-Down VDMOS transistors]
29/7811 . . . . . . . [with an edge termination structure (guard regions per se H01L 29/0619; field plates per se H01L 29/402)]

**WARNING**
Group H01L 29/7811 is incomplete pending reclassification of documents from group H01L 29/7802.
Groups H01L 29/7811 and H01L 29/7802 should be considered in order to perform a complete search.

29/7812 . . . . . . . [with a substrate comprising an insulating layer, e.g. SOI-VDMOS transistors]
29/7813 . . . . . . . [with trench gate electrode, e.g. UMOS transistors (trench gate electrodes per se H01L 29/4236)]
29/7815 . . . . . . . [with voltage or current sensing structure, e.g. emulator section, overcurrent sensing cell]

**WARNING**
Group H01L 29/7815 is incomplete pending reclassification of documents from group H01L 29/7802.
Groups H01L 29/7815 and H01L 29/7802 should be considered in order to perform a complete search.

29/7816 . . . . . . . [Lateral DMOS transistors, i.e. LDMOS transistors]
29/7817 . . . . . . . [structurally associated with at least one other device (assemblies H01L 25/00; integrated circuits H01L 27/00)]
29/7818 . . . . . . . [the other device being a pn-junction diode]
29/7819 . . . . . . . [in antiparallel, e.g. freewheel diode]
29/782 . . . . . . . [the other device being a Schottky barrier diode]
29/7821 . . . . . . . [the other device being a breakdown diode, e.g. Zener diode]
29/7823 . . . . . . . [with an edge termination structure (guard regions per se H01L 29/0619; field plates per se H01L 29/402)]
29/7824 . . . . . . . [with a substrate comprising an insulating layer, e.g. SOI-LDMOS transistors]
29/7825 . . . . . . . [with trench gate electrode (trench gate electrodes per se H01L 29/4236)]
29/7826 . . . . . . . [with voltage or current sensing structure, e.g. emulator section, overcurrent sensing cell]
29/7827 . . . . . . . [Vertical transistors (H01L 29/7802, H01L 29/78642 take precedence)]
29/7828 . . . . . . . [without inversion channel, e.g. vertical ACCUFETs, normally-on vertical MOSFETs]
29/783 . . . . . . . [comprising a gate to body connection, i.e. bulk dynamic threshold voltage MOSFET (for thin film transistors H01L 29/78612, H01L 29/78696)]
29/7831 . . . . . . . [with multiple gate structure (FinFETs or MuGFETs H01L 29/7855, thin film transistors H01L 29/78645)]
29/7832 . . . . . . . [the structure comprising a MOS gate and at least one non-MOS gate, e.g. JFET or MESFET gate]
29/7833 . . . . . . . [with lightly doped drain or source extension, e.g. LDD MOSFET’s; DDD MOSFET’s (for thin film transistors H01L 29/78618)]
29/7834 . . . . . . . [with a non-planar structure, e.g. the gate or the source or the drain being non-planar]

**NOTE**
Field oxide sunken in the substrate and not filling a groove is not an element characterising a non-planar structure

29/7835 . . . . . . . [with asymmetrical source and drain regions, e.g. lateral high-voltage MISFETs with drain offset region, extended drain MISFETs]
29/7836 . . . . . . . [with a significant overlap between the lightly doped extension and the gate electrode (H01L 29/7834, H01L 29/7835 take precedence)]
The document contains technical details related to semiconductor devices, specifically focusing on thin film transistors. It describes various configurations, such as:

- Transistors with Schottky drain or source contact.
- Transistors having only a thin film (transistors having only one layer).
- Transistors with floating body, e.g., FinFET.
- Transistors with a body tied to the substrate.
- Transistors with a drain or source connected to a bulk conducting substrate.

The document also mentions techniques for preventing leakage current, controlling or increasing the safety of the device, and preventing bipolar effects. It includes notes on non-monocrystalline silicon, polycrystalline or amorphous silicon transistors, and various doping structures and material properties.
MNOS-memory transistors with charge trapping gate insulator, e.g. with floating gate, i.e. MIS-like transistors (H01L 29/806 takes precedence; with one dimensional electron gas H01L 29/773, with dimensional electron gas H01L 29/778)

Programmable transistors, e.g. with charge-trapping quantum well

Programmable transistors with two possible levels of programmation takes precedence;

Programmable transistors with only two possible levels of programmation, e.g. PN homojunction gate (H01L 29/7725, H01L 29/7775, H01L 29/778, H01L 29/806 take precedence)

Vertical transistors (SIT, PBT H01L 29/7722)

[with multiple gate]

[Thin film MESFET’s]

[with recessed gate]

controllable by variation of the magnetic field applied to the device

controllable only by variation of the electric current supplied, or only the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated or switched

Resistors with PN junctions

Diodes

Planar PN junction diodes

Mesa PN junction diodes

Hi-lo semiconductor devices, e.g. memory devices

Charge trapping diodes

Diodes with bulk potential barrier, e.g. Camel diodes, Planar Doped Barrier diodes, Graded bandgap diodes

Point contact diodes

Transit-time diodes, e.g. IMPATT, TRAPATT diodes

Zener diodes

PIN diodes

Thyristor diodes, e.g. Shockley diodes, break-over diodes

Schottky diodes

(of the trench MOS barrier type [TMBS])

Tunnel-effect diodes

(Resonant tunneling diodes, i.e. RTD, RTBD)

Esaki diodes

Capacitors with potential-jump barrier or surface barrier
Semiconductor devices sensitive to infra-red radiation, light, electromagnetic radiation of shorter wavelength or corpusscular radiation and adapted either for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof; Details thereof (H01L 51/42 takes precedence; devices consisting of a plurality of solid state components formed in, or on, a common substrate, other than combinations of radiation-sensitive components with one or more electric light sources, H01L 27/00; measurement of X-radiation, gamma radiation, corpuscular radiation or cosmic radiation with semiconductor detectors G01T 1/24, with resistance detectors G01T 1/26; measurement of neutron radiation with semiconductor detectors G01T 3/08; couplings of light guides with optoelectronic elements G02B 6/42; obtaining energy from radioactive sources G21H).

31/02 . . . Details
31/02002 . . . [Arrangements for conducting electric current to or from the device in operations]
31/02005 . . . [for device characterised by at least one potential jump barrier or surface barrier]
31/02008 . . . [for solar cells or solar cell modules]
31/0201 . . . [comprising specially adapted module bus-bar structures]
31/02013 . . . [comprising output lead wires elements]
31/02016 . . . [Circuit arrangements of general character for the devices]
31/02019 . . . [for devices characterised by at least one potential jump barrier or surface barrier]
31/02021 . . . [for solar cells (electrical connection means, e.g. junction boxes, specially adapted for structural association with photovoltaic modules H02S 40/43)]
31/02024 . . . [Position sensitive and lateral effect photodetectors; Quadrant photodiodes]
31/02027 . . . [for devices working in avalanche mode]
31/0203 . . . Containers; Encapsulations {, e.g. encapsulation of photodiodes} {for photovoltaic devices H01L 31/048; for organic photosensitive devices H01L 53/44}
31/0216 . . . Coatings (H01L 31/041 takes precedence)
31/02161 . . . [for devices characterised by at least one potential jump barrier or surface barrier]
31/02162 . . . [for filtering or shielding light, e.g. multicolour filters for photodetectors]
31/02164 . . . [for shielding light, e.g. light blocking layers, cold shields for infra-red detectors]
31/02165 . . . [using interference filters, e.g. multilayer dielectric filters (interference filters G02B 5/20)]
31/02167 . . . [for solar cells]
31/02168 . . . [the coatings being antireflective or having enhancing optical properties for the solar cells]
31/0224 . . . Electrodes
31/022408 . . . [for devices characterised by at least one potential jump barrier or surface barrier]
31/022416 . . . [comprising ring electrodes]
31/022425 . . . [for solar cells]
31/022433 . . . [Particular geometry of the grid contacts]
31/022441 . . . [Electrode arrangements specially adapted for back-contact solar cells]
31/02245 . . . . . . [for metallisation wrap-through [MWT] type solar cells]
31/022458 . . . . . . [for emitter wrap-through [EWT] type solar cells, e.g. interdigitated emitter-base back-contacts]
31/022466 . . . [made of transparent conductive layers, e.g. TCO, ITO layers]
31/022475 . . . . . . [composed of indium tin oxide [ITO]]
31/022483 . . . . . . [composed of zinc oxide [ZnO]]
31/022491 . . . . . . [composed of a thin transparent metal layer, e.g. gold]
31/0232 . . . Optical elements or arrangements associated with the device (H01L 31/0236 takes precedence; for photovoltaic cells H01L 31/054; for photovoltaic modules H02S 40/20)
31/02322 . . . . . . [comprising luminous members, e.g. fluorescent sheets upon the device]
31/02325 . . . . . . [the optical elements not being integrated nor being directly associated with the device]
31/02327 . . . . . . [the optical elements being integrated or being directly associated to the device, e.g. back reflectors (optical coatings H01L 31/0216)]
31/0236 . . . Special surface textures
31/02363 . . . . . . [of the semiconductor body itself, e.g. textured active layers]
31/02366 . . . . . . [of the substrate or of a layer on the substrate, e.g. textured ITO/glass substrate or superstrate, textured polymer layer on glass substrate]
31/024 . . . Arrangements for cooling, heating, ventilating or temperature compensation (for photovoltaic devices H01L 31/052)
31/0248 . . . characterised by their semiconductor bodies
31/0256 . . . characterised by the material
31/0264 . . . Inorganic materials
31/0272 . . . Selenium or tellurium
31/02725 . . . . . . [characterised by the doping material]
31/028 . . . including, apart from doping material or other impurities, only elements of Group IV of the Periodic System
31/0284 . . . . . . [comprising porous silicon as part of the active layer(s) (porous silicon as antireflective layer for photodiodes H01L 31/0216; for solar cells H01L 31/02168)]
31/0288 . . . characterised by the doping material
31/0296 . . . including, apart from doping material or other impurities, only Al₂B₆ compounds, e.g. CdS, ZnS, HgCdTe
31/02963 . . . [characterised by the doping material]
31/02966 . . . [including ternary compounds, e.g. HgCdTe]
31/0304 . . . including, apart from doping materials or other impurities, only Al₂B₆ compounds
31/03042 . . . [characterised by the doping material]
31/03044 . . . [comprising a nitride compounds, e.g. GaN]
particular orientation of the crystalline planes characterised by their crystalline structure or regions relative sizes or disposition of the semiconductor characterised by their shape or by the shapes, barrier or surface barrier characterised by at least one potential jump structures Superlattices; Multiple quantum structures comprising a quantum structures Organic materials Shape of the body Doping superlattices, e.g. nipi superlattices comprising a flexible substrate comprising only A$_{BII}$(Cu,Cd)I$_4$, Cu$_2$X/CdX hetero-junctions, X being an element of Group VI of the Periodic System comprising only Cu$_2$X / CdX heterojunctions, X being an element of Group VI of the Periodic System comprising a nitride compounds, e.g. InGaN including thin films deposited on metallic or insulating substrates; characterised by specific substrate materials or substrate features or by the presence of intermediate layers, e.g. barrier layers, on the substrate (textured substrates H01L 31/02366) including only elements of Group IV of the Periodic System including A$_{BII}$(Cu,Cd)I$_4$ compounds materials, e.g. CIS, CIGS including A$_{BII}$(Cu,Cd)I$_4$ compounds materials, e.g. CIS, CIGS including only elements of Group IV of the Periodic System including amorphous semiconductors (H01L 31/0392 takes precedence) including only elements of Group IV of the Periodic System including A$_{BII}$B$_{IV}$ compounds or alloys, e.g. SiGe, SiC including light-induced characteristic variations, e.g. Staebler-Wronski effect including other non-monocrystalline materials, e.g. semiconductor particles embedded in an insulating material (H01L 31/0392 takes precedence) including semiconductor nanoparticles embedded in a semiconductor matrix (insulating matrix H01L 31/03841) including thin film solar cells, e.g. single thin junction box H02S 40/34 including bypass diodes (bypass diodes in the bypass diodes integrated or formed in or on the same substrate as the photovoltaic cells directly associated with the devices, e.g. barrier layers, on the substrate (textured substrates H01L 31/02366) comprising a flexible substrate comprising only A$_{BII}$(Cu,Cd)I$_4$ compound materials, e.g. CIS, CIGS comprising only Cu$_2$X / CdX heterojunctions, X being an element of Group VI of the Periodic System comprising a nitride compounds, e.g. InGaN including thin films deposited on metallic or insulating substrates; characterised by specific substrate materials or substrate features or by the presence of intermediate layers, e.g. barrier layers, on the substrate (textured substrates H01L 31/02366) including only elements of Group IV of the Periodic System including A$_{BII}$B$_{IV}$ compounds materials, e.g. CIS, CIGS including A$_{BII}$B$_{IV}$ compounds materials, e.g. CdTe, CdS including only elements of Group IV of the Periodic System including only elements of Group IV of the Periodic System including A$_{BII}$B$_{IV}$ compounds materials, e.g. CIS, CIGS including A$_{BII}$B$_{IV}$ compounds materials, e.g. CIS, CIGS deposited on metal or polymer foils adapted as photovoltaic [PV] conversion devices (testing thereof during manufacture H01L 22/00); testing thereof after manufacture H02S 50/10) Provisions for preventing damage caused by corpuscular radiation, e.g. for space applications PV modules or arrays of single PV cells (supporting structures for PV modules H02S 20/00) Mechanically stacked PV cells including bypass diodes (bypass diodes in the junction box H02S 40/34) comprising bypass diodes integrated or directly associated with the devices, e.g. bypass diodes integrated or formed in or on the same substrate as the photovoltaic cells including thin film solar cells, e.g. single thin film a-Si, CIS or CdTe solar cells comprising a plurality of thin film solar cells deposited on the same substrate comprising particular structures for the electrical interconnection of adjacent PV cells in the module (H01L 31/0463 takes precedence) comprising specific structures for the electrical interconnection of adjacent PV cells in the module (H01L 31/0465 takes precedence) comprising bypass diodes integrated or directly associated with the devices, e.g. bypass diodes integrated or formed in or on the same substrate as the photovoltaic cells including thin film solar cells, e.g. single thin film a-Si, CIS or CdTe solar cells comprising a plurality of thin film solar cells deposited on the same substrate comprising particular structures for the electrical interconnection of adjacent PV cells in the module (H01L 31/0463 takes precedence) comprising specific structures for the electrical interconnection of adjacent PV cells in the module (H01L 31/0465 takes precedence) comprising specific structures for the electrical interconnection of adjacent PV cells in the module (H01L 31/0465 takes precedence) comprising specific structures for the electrical interconnection of adjacent PV cells in the module (H01L 31/0465 takes precedence)
light-concentrating means with the PV cell, e.g. light-reflecting means or optical elements directly associated or integrated with the PV module H02S 40/38

... energy storage means directly associated or integrated with the PV module H02S 40/42

... cooling means in combination with adjacent thin film solar cells in the module H01L 31/0465; electrical interconnection means specially adapted for electrically connecting two or more PV modules H02S 40/36)

... back-contact solar cells }

... the devices including, apart from doping material or other impurities, only A$_{B_1}$V$_2$ compounds, e.g. GaAs or InP solar cells

... the potential barriers being only of the Schottky type

... the potential barriers being only of the PN heterojunction type

... multiple junction or tandem solar cells

... comprising only A$_{B_1}$V$_2$ compound semiconductors, e.g. CdS/CdTe solar cells

... comprising only A$_{B_1}$V$_2$ compound semiconductors, e.g. GaAs/AlGaAs or InP/ GaInAs solar cells

... comprising a junction with an element of Group IV of the Periodic System, e.g. ITO/Si, GaAs/Si or CdTe/Si solar cells

... comprising a A$_{B_1}$V$_2$ heterojunction, e.g. Si/Ge, SiGe/Si or Si/SiC solar cells

... comprising a heterojunction of crystalline and amorphous materials, e.g. heterojunction with intrinsic thin layer or HIT® solar cells; solar cells

... comprising a A$_{B_1}$B$_2$C$_3$ compound, e.g. CdS/CulnSe$_2$ [CIS] heterojunction solar cells

... the potential barriers being only of the PIN type

... in which radiation controls flow of current through the device, e.g. photoresistors

... in which radiation controls flow of current through the device, e.g. photoresistors
barrier or surface barrier, e.g. phototransistors

characterised by at least one potential-jump

ultraviolet radiation (H01L 31/101

Devices sensitive to very short wavelength, e.g. X-rays, gamma-rays or corpuscular radiation

Devices with Metal-Semiconductor-Metal (MSM) Schottky barrier type

the potential barrier being of the Schottky type

the devices comprising active layers formed only by AtraBv compounds, e.g. HgCdTe IR photodiodes

the devices comprising active layers formed only by AtraBv compounds

the devices comprising active layers formed only by AtraBv compounds

the potential barrier being of the PIN type

the potential barrier being of the Schottky type

the devices comprising amorphous semiconductors

31/1013 . . . . (devices sensitive to two or more wavelengths, e.g. multi-spectrum radiation detection devices)

31/1016 . . . . (comprising transparent or semitransparent devices)

31/1025 . . . . characterised by only one potential barrier or surface barrier

31/103 . . . . the potential barrier being of the Point contact type

31/1032 . . . . the devices comprising active layers formed only by AtraBv compounds, e.g. HgCdTe IR photodiodes

31/1035 . . . . the devices comprising active layers formed only by AtraBv compounds

31/1037 . . . . the devices comprising active layers formed only by AtraBv compounds

31/105 . . . . the potential barrier being of the PIN type

31/1055 . . . . the devices comprising amorphous materials of Group IV of the Periodic System

31/107 . . . . the potential barrier working in avalanche mode, e.g. avalanche photodiode

31/108 . . . . the potential barrier being of the Schottky type

31/109 . . . . the potential barrier being of the PN heterojunction type

31/11 . . . . characterised by two potential barriers or surface barriers, e.g. bipolar phototransistor

31/1105 . . . . (the device being a bipolar phototransistor)

31/111 . . . . characterised by at least three potential barriers, e.g. phototransistor

31/1113 . . . . (the device being a phototransistor)

31/1116 . . . . (of the static induction type)

31/112 . . . . characterised by field-effect operation, e.g. junction field-effect phototransistor

31/1121 . . . . (Devices with Schottky gate)

31/1122 . . . . (the device being a CCD device)

31/1123 . . . . (the device being a photo MESFET)

31/1124 . . . . (Devices with PN heterojunction gate)

31/1125 . . . . (the device being a CCD device)

31/1126 . . . . (the device being a field-effect phototransistor)

31/1127 . . . . (Devices with PN heterojunction gate)

31/1128 . . . . (the device being a CCD device)

31/1129 . . . . (the device being a field-effect phototransistor)

31/113 . . . . being of the conductor-insulator-semiconductor type, e.g. metal-insulator-semiconductor field-effect transistor

31/1133 . . . . (the device being a conductor-insulator-semiconductor diode or a CCD device)

31/1136 . . . . (the device being a metal-insulator-semiconductor field-effect transistor)

31/115 . . . . Devices sensitive to very short wavelength, e.g. X-rays, gamma-rays or corpuscular radiation

31/117 . . . . of the bulk effect radiation detector type, e.g. Ge-Li compensated PIN gamma-ray detectors

31/1175 . . . . (Li compensated PIN gamma-ray detectors)

31/118 . . . . of the surface barrier or shallow PN junction detector type, e.g. surface barrier alpha-particle detectors

31/1185 . . . . (of the shallow PN junction detector type)

31/119 . . . . characterised by field-effect operation, e.g. MIS type detectors

31/12 . structurally associated with, e.g. formed in or on a common substrate with, one or more electric light sources, e.g. electroluminescent light sources, and electrically or optically coupled thereto (semiconductor devices with at least one potential barrier or surface barrier adapted for light emission H01L 33/00; amplifiers using electroluminescent element and photocell H03F 17/00; electroluminescent light sources per se H05B 33/00)

31/125 . . . . (Composite devices with photosensitive elements and electroluminescent elements within one single body)

31/14 . the light source or sources being controlled by the semiconductor device sensitive to radiation, e.g. image converters, image amplifiers or image storage devices

31/141 . . . . (the semiconductor device sensitive to radiation being without a potential-jump barrier or surface barrier)

31/143 . . . . (the light source being a semiconductor device with at least one potential-jump barrier or surface barrier, e.g. light emitting diode)

31/145 . . . . (the semiconductor device sensitive to radiation being characterised by at least one potential-jump barrier or surface barrier)

31/147 . . . . the light sources and the devices sensitive to radiation all being semiconductor devices characterised by at least one potential or surface barrier

31/153 . . . . formed in, or on, a common substrate

31/16 . the semiconductor device sensitive to radiation being controlled by the light source or sources

31/161 . . . . (Semiconductor device sensitive to radiation without a potential-jump or surface barrier, e.g. photodiodes)

31/162 . . . . (the light source being a semiconductor device with at least one potential-jump barrier or surface barrier, e.g. a light emitting diode)

31/164 . . . . (Optical potentiometers)
H01L

31/165 . . .  [the semiconductor sensitive to radiation being characterised by at least one potential-jump or surface barrier]
31/167 . . .  the light sources and the devices sensitive to radiation all being semiconductor devices characterised by at least one potential or surface barrier
31/173 . . .  formed in, or on, a common substrate
31/18 . Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof (not peculiar thereto H01L 21/000)
31/1804 . . .  [comprising only elements of Group IV of the Periodic System]
31/1808 . . .  [including only Ge]
31/1812 . . .  [including only AIVBVI alloys, e.g. SiGe]
31/1816 . . .  [Special manufacturing methods for microcrystalline layers, e.g. uc-SiGe, uc-SiC]
31/182 . . .  [Special manufacturing methods for polycrystalline Si, e.g. Si ribbon, pol Si ingots, thin films of polycrystalline Si]
31/1824 . . .  [Special manufacturing methods for microcrystalline Si, uc-SiC]
31/1828 . . .  [the active layers comprising only AIVBVI compounds, e.g. CdS, ZnS, CdTe]
31/1832 . . .  [comprising ternary compounds, e.g. HgCdTe]
31/1836 . . .  [comprising a growth substrate not being an AIVBVI compound]
31/184 . . .  [the active layers comprising only AIVB compounds, e.g. GaAs, InP]
31/1844 . . .  [comprising ternary or quaternary compounds, e.g. GaAlAs, InGaAsP]
31/1848 . . .  [comprising nitride compounds, e.g. InGaN, InGaAlN]
31/1852 . . .  [comprising a growth substrate not being an AIVB compound]
31/1856 . . .  [comprising nitride compounds, e.g. GaN]
31/186 . . .  [Particular post-treatment for the devices, e.g. annealing, impurity gettering, short-circuit elimination, recrystallisation]
31/1864 . . .  [Annealing]
31/1868 . . .  [Passivation]
31/1872 . . .  [Recrystallisation]
31/1876 . . .  [Particular processes or apparatus for batch treatment of the devices]
31/188 . . .  [Apparatus specially adapted for automatic interconnection of solar cells in a module]
31/1884 . . .  [Manufacture of transparent electrodes, e.g. TCO, ITO]
31/1888 . . .  [methods for etching transparent electrodes]
31/1892 . . .  [methods involving the use of temporary, removable substrates]
31/1896 . . .  [for thin-film semiconductors]
31/20 . . .  such devices or parts thereof comprising amorphous semiconductor materials
31/202 . . .  [including only elements of Group IV of the Periodic System]
31/204 . . .  [including AIVBVI alloys, e.g. SiGe, SiC]
31/206 . . .  [Particular processes or apparatus for continuous treatment of the devices, e.g. roll-to-roll processes, multi-chamber deposition]
31/208 . . .  [Particular post-treatment of the devices, e.g. annealing, short-circuit elimination]
33/00 Semiconductor devices with at least one potential-jump barrier or surface barrier specially adapted for light emission; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof (H01L 51/50 takes precedence; devices consisting of a plurality of semiconductor components formed in or on a common substrate and including semiconductor components with at least one potential-jump barrier or surface barrier, specially adapted for light emission H01L 27/15; semiconductor lasers H01S 5/00)

NOTES

1. This group covers light emitting diodes [LEDs] or superluminescent diodes [SLDs], including LEDs or SLDs emitting infra-red [IR] light or ultra-violet [UV] light.
2. In this group, the first place priority rule is applied, i.e. at each hierarchical level, in the absence of an indication to the contrary, classification is made in the first appropriate place.

33/0004 . . .  [Devices characterised by their operation]
33/0008 . . .  [having p-n or hi-lo junctions]
33/0012 . . .  [p-n devices]
33/0016 . . .  [having at least two p-n junctions]
33/002 . . .  [having heterojunctions or graded gap]
33/0025 . . .  [comprising only AIVBVI compounds]
33/0029 . . .  [comprising only AIVB compounds]
33/0033 . . .  [having Schottky barriers]
33/0057 . . .  [having a MIS barrier layer]
33/0041 . . .  [characterised by field-effect operation]
33/0045 . . .  [the devices being superluminescent diodes]
33/005 . . .  [Processes]
33/0054 . . .  [for devices with an active region comprising only group IV elements]
33/0058 . . .  [comprising amorphous semiconductors]
33/0062 . . .  [for devices with an active region comprising only III-V compounds]
33/0066 . . .  [with a substrate not being a III-V compound]
33/007 . . .  [comprising nitride compounds]
33/0075 . . .  [comprising nitride compounds]
33/0079 . . .  [wafer bonding or at least partial removal of the growth substrate]
33/0083 . . .  [for devices with an active region comprising only II-VI compounds]
33/0087 . . .  [with a substrate not being a II-VI compound]
33/0091 . . .  [for devices with an active region comprising only IV-VI compounds]
33/0095 . . .  [Post-treatments of the devices, e.g. annealing, recrystallisation, short-circuit elimination]
33/002 . . .  characterised by the semiconductor bodies
33/025 . . .  [Physical imperfections, e.g. particular concentration or distribution of impurities]
33/04 . . .  with a quantum effect structure or superlattice, e.g. tunnel junction
33/06 . . .  within the light emitting region, e.g. quantum confinement structure or tunnel barrier
H01L

33/08 . . . with a plurality of light emitting regions, e.g. laterally discontinuous light emitting layer or photoluminescent region integrated within the semiconductor body (H01L 27/15 takes precedence)

33/10 . . . with a light reflecting structure, e.g. semiconductor Bragg reflector

33/105 . . . [with a resonant cavity structure]

33/12 . . . with a stress relaxation structure, e.g. buffer layer

33/14 . . . with a carrier transport control structure, e.g. highly-doped semiconductor layer or current-blocking structure

33/145 . . . [with a current-blocking structure]

33/16 . . . with a particular crystal structure or orientation, e.g. polycrystalline, amorphous or porous

33/18 . . . within the light emitting region

NOTE
When classifying in this group, classification is also made in group H01L 33/26 or one of its subgroups in order to identify the chemical composition of the light emitting region

33/20 . . . with a particular shape, e.g. curved or truncated substrate

33/22 . . . Roughened surfaces, e.g. at the interface between epitaxial layers

33/24 . . . of the light emitting region, e.g. non-planar junction

33/26 . . . Materials of the light emitting region

33/28 . . . containing only elements of group II and group VI of the periodic system

33/285 . . . [characterised by the doping materials]

33/30 . . . containing only elements of group III and group V of the periodic system

33/305 . . . [characterised by the doping materials]

33/32 . . . containing nitrogen

33/325 . . . [characterised by the doping materials]

33/34 . . . containing only elements of group IV of the periodic system

33/343 . . . [characterised by the doping materials]

33/346 . . . [containing porous silicon]

33/36 . . . characterised by the electrodes

33/38 . . . with a particular shape

33/382 . . . [the electrode extending partially in or entirely through the semiconductor body]

33/385 . . . [the electrode extending at least partially onto a side surface of the semiconductor body]

33/387 . . . [with a plurality of electrode regions in direct contact with the semiconductor body and being electrically interconnected by another electrode layer]

33/40 . . . Materials therefor

33/405 . . . [Reflective materials]

33/42 . . . Transparent materials

33/44 . . . characterised by the coatings, e.g. passivation layer or anti-reflective coating

33/46 . . . Reflective coating, e.g. dielectric Bragg reflector

33/465 . . . [with a resonant cavity structure]

33/48 . . . characterised by the semiconductor body packages

NOTE
This group covers elements in intimate contact with the semiconductor body or integrated with the semiconductor body

33/483 . . . [Containers]

33/485 . . . [adapted for surface mounting]

33/50 . . . Wavelength conversion elements

33/501 . . . [characterised by the materials, e.g. binder]

33/502 . . . [Wavelength conversion materials]

33/504 . . . . . . [Elements with two or more wavelength conversion materials]

33/505 . . . [characterised by the shape, e.g. plate or foil]

33/507 . . . [the elements being in intimate contact with parts other than the semiconductor body or integrated with parts other than the semiconductor body]

33/508 . . . [having a non-uniform spatial arrangement or non-uniform concentration, e.g. patterned wavelength conversion layer, wavelength conversion layer with a concentration gradient of the wavelength conversion material]

33/52 . . . Encapsulations

33/54 . . . having a particular shape

33/56 . . . Materials, e.g. epoxy or silicone resin

33/58 . . . Optical field-shaping elements

33/60 . . . Reflective elements

33/62 . . . Arrangements for conducting electric current to or from the semiconductor body, e.g. lead-frames, wire-bonds or solder balls

33/64 . . . Heat extraction or cooling elements

33/641 . . . [characterized by the materials]

33/642 . . . [characterized by the shape]

33/644 . . . [in intimate contact or integrated with parts of the device other than the semiconductor body]

33/645 . . . [the elements being electrically controlled, e.g. Peltier elements]

33/647 . . . [the elements conducting electric current to or from the semiconductor body]

33/648 . . . [the elements comprising fluids, e.g. heat-pipes]

35/00 Thermoelectric devices comprising a junction of dissimilar materials, i.e. exhibiting Seebeck or Peltier effect with or without other thermoelectric effects or thermomagnetic effects; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof; Details thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; refrigerating machines using electric or magnetic effects F25B 21/00; thermometers using thermoelectric or thermomagnetic elements G01K 7/00; obtaining energy from radioactive sources G21H)

35/02 . . . Details

35/04 . . . Structural details of the junction; Connections of leads

35/06 . . . detachable, e.g. using a spring

35/08 . . . non-detachable, e.g. cemented, sintered, soldered [, e.g. thin films]

35/10 . . . Connections of leads

35/12 . . . Selection of the material for the legs of the junction
H01L.

35/14 . . . using inorganic compositions
35/16 . . . comprising tellurium or selenium or sulfur
35/18 . . . comprising arsenic or antimony or bismuth

35/20 . . . comprising metals only (H01L 35/16, H01L 35/18 take precedence).

35/22 . . . comprising compounds containing boron, carbon, oxygen or nitrogen

35/25 . . . (Superconducting materials)
35/24 . . . using organic compositions
35/26 . . . using compositions changing continuously or discontinuously inside the material
35/28 . operating with Peltier or Seebeck effect only
35/30 . characterised by the heat-exchanging means at the junction
35/32 . characterised by the structure or configuration of the cell or thermo-couple forming the device
35/325 . . . [Cascades of thermo-couples]
35/34 . Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof (not peculiar thereto H01L 21/00)
37/00 Thermolectric devices without a junction of dissimilar materials; Thermomagnetic devices, e.g. using Nernst-Ettinghausen effect; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; [radiation pyrometers using pyroelectric detectors G01J 5/34] thermometers using thermo-electric or thermomagnetic elements G01K 7/00; selection of materials for magnetography, e.g. for Curie-point writing G03G 5/00)
37/02 . using thermal change of dielectric constant, e.g. working above and below Curie point (e.g. pyroelectric devices)
37/04 . using thermal change of magnetic permeability, e.g. working above and below the Curie point (e.g. pyromagnetic devices)
37/05 . . . [Selection of materials]
39/00 Devices using superconductivity; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; [light detection G01J, G02F 2/00; application to memories G11C 11/44; G11C 15/00, G11C 19/32] superconducting conductors cables or transmission lines H01B 12/00; [microwaves H01P 7/00, H01P 11/00] : superconductive coils or windings H01F; amplifiers using superconductivity H03F 19/00; [impulse generators and logic circuits H03K 3/38, H03K 17/02, H03K 19/195; lasers H01S 3/00, H01S 5/00])

NOTE
In this group, in the absence of an indication to the contrary, an invention is classified in the last appropriate place

39/005 . . . [Alleged superconductivity]
39/02 . Details
39/025 . . . [for Josephson devices]
39/04 . . . Containers; Mountings
39/045 . . . [for Josephson devices]
39/06 . characterised by the current path
39/08 . characterised by the shape of the element
39/10 . characterised by the means for switching (between superconductive and normal states)
39/12 . characterised by the material
39/121 . . . [Organic materials]
39/123 . . . [Fullerene superconductors, e.g. soccerball-shaped allotrope of carbon, e.g. C_{60}, C_{70} (fullerenes in general C07C 13/00)]
39/125 . . . [Ceramic materials]
39/126 . . . [comprising copper oxide]
39/128 . . . [Multi-layered structures, e.g. super lattices]
39/14 . Permanent superconductor devices
39/141 . . . [comprising metal borides, e.g. MgB_2]
39/143 . . . [comprising high Tc ceramic materials]
39/145 . . . [Three or more electrode devices (H01L 39/228 takes precedence)]
39/146 . . . [Field effect devices]
39/148 . . . [Abrikosov vortex devices]
39/16 . Devices switchable between superconductive and normal states (e.g. switches, current limiters (circuits for current limitation using superconductor elements H02H 9/023])
39/18 . . . Cryotrons
39/20 . . . Power cryotrons
39/22 . . . Devices comprising a junction of dissimilar materials, e.g. Josephson-effect devices
39/221 . . . [Single electron tunnelling devices]
39/223 . . . [Josephson-effect devices]
39/225 . . . [comprising high Tc ceramic materials]
39/226 . . . [comprising metal borides, e.g. MgB_2]
39/228 . . . [three or more electrode devices, e.g. transistor-like structures]
39/24 . . . Processes or apparatus peculiar to the manufacture or treatment of devices provided for in H01L 39/00 or of parts thereof
39/2403 . . . [Processes peculiar to the manufacture or treatment of composite superconductor filaments (comprising copper oxide H01L 39/2419)]
39/2406 . . . [of devices comprising Nb or an alloy of Nb with one or more of the elements of group 4, e.g. Ti, Zr, Hf]
39/2409 . . . [of devices comprising an intermetallic compound of type A-15, e.g. Nb_3Sn]
39/2412 . . . [of devices comprising molybdenum chalcogenides]
39/2416 . . . [of devices comprising nitrides or carbonitrides]
39/2419 . . . [the superconducting material comprising copper oxide]
39/2422 . . . [Processes for depositing or forming superconductor layers]
39/2425 . . . . [from a solution]
39/2429 . . . . [from a suspension or slurry, e.g. screen printing; doctor blade coating]
39/2432 . . . . [by evaporation independent of heat source, e.g. MBE]
39/2435 . . . . [by sputtering]
Piezo-electric or electrostrictive devices in general; Electrostrictive devices in general; Magnetostrictive devices in general; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof (devices consisting of a plurality of solid-state components formed in or on a common substrate H01L 27/00)

WARNING

Groups H01L 41/23-H01L 41/47 are incomplete pending reclassification of documents from group H01L 41/22.

Groups H01L 41/23-H01L 41/47 and H01L 41/22 should be considered in order to perform a complete search.

41/02 . Details

41/04 . of piezo-electric or electrostrictive devices

41/042 . [Drive or control circuitry or methods for piezo-electric or electrostrictive devices not otherwise provided for]

41/044 . . . [for piezoelectric transformers (conversion of DC or AC power H02M; for operating discharge lamps H05B 41/282)]

41/047 . Electrodes [or electrical connection arrangements]

41/0471 . . . [Individual layer electrodes of multilayer piezo-electric or electrostrictive devices, e.g. internal electrodes]

41/0472 . . . [Connection electrodes of multilayer piezo-electric or electrostrictive devices, e.g. external electrodes]

41/0474 . . . [embedded within piezo-electric or electrostrictive material, e.g. via connections]
41/113 . . . with mechanical input and electrical output { e.g. generators, sensors }
41/1132 . . . [Sensors]
41/1134 . . . [Beam type]
41/1136 . . . . [Cantilevers]
41/1138 . . . [Membrane type]
41/12 . . . Magnetoelectric devices
41/125 . . . { with mechanical input and electrical output, e.g. generators, sensors }
41/16 . . . Selection of materials
41/18 . . . for piezoelectric or electrostrictive devices { e.g. bulk piezoelectric crystals }
41/183 . . . [Composite materials, e.g. having 1-3 or 2-2 type connectivity]
41/187 . . . Ceramic compositions {, e.g. synthetic inorganic polycrystalline composites incl. epitaxial, quasi-crystalline materials}
41/1871 . . . . [Alkaline earth metal based oxides, e.g. barium titanates]
41/1873 . . . . [Alkaline metal based oxides, e.g. lithium, sodium or potassium niobates]
41/1875 . . . . [Lead based oxides]
41/1876 . . . . [Lead zirconate titanate based]
41/1878 . . . . [Bismuth based oxides]
41/193 . . . Macromolecular compositions { e.g. piezoelectric polymers}
41/20 . . . for magnetoelectric devices
41/22 . . . Processes or apparatus specially adapted for the assembly, manufacture or treatment of piezoelectric or electrostrictive devices or of parts thereof
41/23 . . . Forming enclosures or casings
41/25 . . . Assembling devices that include piezoelectric or electrostrictive parts
41/253 . . . Treating devices or parts thereof to modify a piezoelectric or electrostrictive property, e.g. polarisation characteristics, vibration characteristics or mode tuning
41/257 . . . . by polarising
41/27 . . . Manufacturing multilayered piezoelectric or electrostrictive devices or parts thereof, e.g. by stacking piezoelectric bodies and electrodes
41/273 . . . . by integrally sintering piezoelectric or electrostrictive bodies and electrodes
41/277 . . . . by stacking bulk piezoelectric or electrostrictive bodies and electrodes
41/29 . . . Forming electrodes, leads or terminal arrangements
41/293 . . . Connection electrodes of multilayered piezoelectric or electrostrictive parts

**NOTE**

Integral individual layer electrode and connection electrode are classified in both H01L 41/293 and H01L 41/297

41/297 . . . Individual layer electrodes of multilayered piezoelectric or electrostrictive parts

**NOTE**

Integral individual layer electrode and connection electrode are classified in both H01L 41/293 and H01L 41/297

41/31 . . . Applying piezoelectric or electrostrictive parts or bodies onto an electrical element or another base

41/311 . . . Mounting of piezoelectric or electrostrictive parts together with semiconductor elements, or other circuit elements, on a common substrate
41/312 . . . by laminating or bonding of piezoelectric or electrostrictive bodies
41/313 . . . . by metal fusing or with adhesives
41/314 . . . . by depositing piezoelectric or electrostrictive layers, e.g. aerosol or screen printing
41/316 . . . . by vapour phase deposition
41/317 . . . . by liquid phase deposition
41/318 . . . . by solution deposition
41/319 . . . . by using intermediate layers, e.g. for growth control
41/33 . . . Shaping or machining of piezoelectric or electrostrictive bodies
41/331 . . . by coating or depositing using masks, e.g. lift-off
41/332 . . . by etching, e.g. lithography
41/333 . . . by moulding or extrusion
41/335 . . . . by machining
41/337 . . . . . by polishing or grinding
41/338 . . . . . by cutting or dicing
41/339 . . . . . by punching
41/35 . . . . Forming piezoelectric or electrostrictive materials
41/37 . . . Composite materials
41/39 . . . Inorganic materials
41/41 . . . . by melting
41/43 . . . . by sintering
41/45 . . . . Organic materials
41/47 . . . Processes or apparatus specially adapted for the assembly, manufacture or treatment of magnetoelectric devices or of parts thereof

43/00 Devices using galvano-magnetic or similar magnetic effects; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; devices with potential-jump barrier, or surface barrier controllable by variation of a magnetic field H01L 29/02)

43/02 . . . Details
43/04 . . . . of Hall-effect devices
43/06 . . . Hall-effect devices
43/065 . . . . [Semiconductor Hall-effect devices]
43/08 . . . Magnetic-field-controlled resistors
43/10 . . . Selection of materials
43/12 . . . Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof (not peculiar thereto H01L 21/00)
43/14 . . . . for Hall-effect devices
H01L

Solid state devices adapted for rectifying, amplifying, oscillating or switching without a potential-jump barrier or surface barrier, e.g. dielectric triodes; Ovshinsky-effect devices; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00); devices using superconductivity H01L 39/00; piezo-electric devices H01L 41/00; bulk negative resistance effect devices H01L 47/00; [memories G11C 11/34; G11C 13/002; amplifying circuits H03F 1/00]; pulse generation H03K 3/02; electronic switching circuits H03K 17/00; logic circuits H03K 19/00)

Solid state travelling-wave devices

Solid state devices not provided for in any other subclass; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00)

Solid state devices not provided for in groups H01L 27/00 - H01L 47/00 and H01L 51/00 and not provided for in any other subclass; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof

Solid state devices using organic materials as the active part, or using a combination of organic materials with other materials as the active part; Processes or apparatus specially adapted for the manufacture or treatment of such devices, or of parts thereof (devices consisting of a plurality of components formed in or on a common substrate H01L 27/28; thermoelectric devices using organic material H01L 35/00; H01L 37/00; piezoelectric, electrostrictive or magnetostrictive elements using organic material H01L 41/00)
51/0001 . . . [Processes specially adapted for the manufacture or treatment of devices or of parts thereof (multistep processes H01L 51/0098, H01L 51/05, H01L 51/42, H01L 51/50)]
51/0002 . . . [Deposition of organic semiconductor materials on a substrate]
51/0003 . . . . [using liquid deposition, e.g. spin coating]
51/0004 . . . . [using printing techniques, e.g. ink-jet printing, screen printing]
51/0005 . . . . [ink-jet printing]
51/0006 . . . [Electrolytic deposition using an external electrical current, e.g. in-situ electropolymerisation]
51/0007 . . . . [characterised by the solvent]
51/0008 . . . . [using physical deposition, e.g. sublimation, sputtering]
51/0009 . . . . [using laser ablation]
51/001 . . . . [Vacuum deposition]
51/0011 . . . . [selective deposition, e.g. using a mask]
51/0012 . . . . [special provisions for the orientation or alignment of the layer to be deposited]
51/0013 . . . . [using non liquid printing techniques, e.g. thermal transfer printing from a donor sheet]
51/0014 . . . . [for changing the shape of the device layer, e.g. patterning]
51/0015 . . . . [by selective transformation of an existing layer]
51/0016 . . . . [lift off techniques]
51/0017 . . . . [etching of an existing layer]
51/0018 . . . . [using photolithographic techniques]
51/0019 . . . . [using printing techniques, e.g. applying the etch liquid using an ink jet printer]
51/002 . . . . [Making n- or p-doped regions]
51/0021 . . . . [Formation of conductors]
51/0022 . . . . [using printing techniques, e.g. ink jet printing]
51/0023 . . . . [Patterning of conductive layers]
51/0024 . . . . [for forming devices by joining two substrates together, e.g. lamination technique]
51/0025 . . . . [Purification process of the organic semiconductor material]
51/0026 . . . . [Thermal treatment of the active layer, e.g. annealing]
51/0027 . . . . [using coherent electromagnetic radiation, e.g. laser annealing]
51/0028 . . . . [Thermal treatment in the presence of solvent vapors, e.g. solvent annealing]
51/0029 . . . . [Special provisions for controlling the atmosphere during processing (H01L 51/0026 takes precedence)]
51/003 . . . . [using a temporary substrate]
51/0031 . . . . [Testing, e.g. accelerated lifetime tests of photoelectric devices]
51/0032 . . . . [Selection of organic semiconducting materials, e.g. organic light sensitive or organic light emitting materials]

**NOTE**

This group only covers the selection of organic materials for their electrical or other properties insofar as they are specific for their use in devices covered by the group H01L 51/00.

For the materials per se, see the relevant subclasses.

Attention is drawn to the following places:

- organic materials in general C07C, C07D, C07F, C08L;
- organic materials as electrical conductors H01B 1/12;
- organic materials as electrical insulators H01B 3/18;

51/0034 . . . [Organic polymers or oligomers (organic macromolecular compounds or compositions per se C08)]
51/0035 . . . [comprising aromatic, heteroaromatic, or arylcyclic chains, e.g. polyaniline (per se C08G 73/026), polyphenylene (per se C08G 61/10), polyphenylene vinylene (per se C08G 61/02)]
51/0036 . . . . [Heteroaromatic compounds comprising sulfur or selenium, e.g. polythiophene (per se C08G 61/126)]
51/0037 . . . . [Polyethylene dioxythiophene [PEDOT] and derivatives]
51/0038 . . . . [Poly-phenylenvinylene and derivatives (per se C08G 61/10)]
51/0039 . . . . [Polypehtlofluorene and derivatives]
51/004 . . . . [comprising aliphatic or olefinic chains, e.g. poly N-vinylcarbazol, PVC, PTFE]
51/0041 . . . . [Poly acetylene (per se C08G 61/04, C08F 38/02, C08F 138/02, C08F 238/02) derivativer]
51/0042 . . . . [poly N-vinylcarbazol and derivatives]
51/0043 . . . . [Copolymers]
51/0044 . . . . [Ladder-type polymers]
51/0045 . . . . [Carbon containing materials, e.g. carbon nanotubes, fullerene (per se C01B 32/15)]
51/0046 . . . . [Fullerenes, e.g. C_{60}, C_{70}]
51/0047 . . . . [comprising substituents, e.g. PCBM]
51/0048 . . . . [Carbon nanotubes]
51/0049 . . . . [comprising substituents]
51/005 . . . . [Macromolecular systems with low molecular weight, e.g. cyanine dyes, coumarine dyes, tetrathiafulvalene (H01L 51/0045, H01L 51/0077, H01L 51/0093, H01L 51/0094 take precedence)]
51/0051 . . . . [Charge transfer complexes]
51/0052 . . . . [Polycyclic condensed aromatic hydrocarbons, e.g. anthracene]
51/0053 . . . . [Aromatic anhydride or imide compounds, e.g. perylene tetra-carboxylic dianhydride, perylene tetracarboxylic diimide]
51/0054 . . . . [containing four rings, e.g. pyrene]
51/0055 . . . . [containing five rings, e.g. pentacene]
51/0056 . . . . [containing six or more rings]
51/0057 . . . . [containing at least one aromatic ring having 7 or more carbon atoms, e.g. azulene]
51/0058 . . . . [containing more than one polycyclic condensed aromatic rings, e.g. bis-anthracene]
51/0059 . . . [Amine compounds having at least two aryl rest on at least one amine-nitrogen atom, e.g. triphenylamine (per se C07C 211/00)]
51/006 . . . . [comprising polycyclic condensed aromatic hydrocarbons as substituents on the nitrogen atom]
51/0061 . . . [comprising heteroaromatic hydrocarbons as substituents on the nitrogen atom]
51/0062 . . . [aromatic compounds comprising a heteroatom, e.g.: N,P,S]
2051/0063 . . . [Oxadiazole Compounds]
51/0064 . . . [Cyanine Dyes]
51/0065 . . . [comprising only oxygen as heteroatom]
51/0067 . . . [comprising only nitrogen as heteroatom (H01L 51/0064 takes precedence)]
51/0068 . . . [comprising only sulfur as heteroatom (H01L 51/0064 takes precedence)]
51/0069 . . . [comprising two or more different heteroatoms per ring, e.g. S and N]
51/007 . . . . [oxadiazole compounds]
51/0071 . . . [Polycyclic condensed heteroaromatic hydrocarbons]
51/0072 . . . . [comprising only nitrogen in the heteroaromatic polycnondensed ringsystem, e.g. phenanthroline, carbazole]
51/0073 . . . . [comprising only oxygen in the heteroaromatic polycnondensed ringsystem, e.g. cumarine dyes]
51/0074 . . . . [comprising only sulfur in the heteroaromatic polycnondensed ringsystem, e.g. benzo[10]
51/0075 . . . . [Langmuir Blodgett films (per se B05D 1/02)]
51/0076 . . . [Liquid crystalline materials (per se C09K 19/00)]
51/0077 . . . [Coordination compounds, e.g. porphyrin]
51/0078 . . . [Phthalocyanine (per se C09B 47/04)]
51/0079 . . . [Metal complexes comprising a IIB-metal (B, Al, Ga, In or TI), e.g. Tris (8-hydroxyquinoline) gallium (Ga3)]
51/008 . . . . [comprising boron]
51/0081 . . . [comprising aluminium, e.g. Alq3]
51/0082 . . . [comprising gallium]
51/0083 . . . [Metal complexes comprising an iron-series metal, e.g. Fe, Co, Ni]
51/0084 . . . [Transition metal complexes, e.g. Ru(II)polypyridine complexes]
51/0085 . . . [comprising Iridium]
51/0086 . . . [comprising Ruthenium]
51/0087 . . . [comprising platinum]
51/0088 . . . [comprising osmium]
51/0089 . . . [Metal complexes comprising Lanthanides or Actinides, e.g. Eu]
51/009 . . . [Polynuclear complexes, i.e. complexes having two or more metal centers]
51/0091 . . . [Metal complexes comprising a IB-metal (Cu, Ag, Au)]
51/0092 . . . [Metal complexes comprising a IIB-metal (Zn, Cd, Hg)]
51/0093 . . . [Biomolecules or bio-macromolecules, e.g. proteins, ATP, chlorophyll, beta-carotene, lipids, enzymes]
51/0094 . . . [Silicon-containing organic semiconductors]
51/0095 . . . [Starburst compounds]
51/0096 . . . [Substrates]
51/0097 . . . [flexible substrates]
51/0098 . . . [Molecular electronic devices (molecular computers G06F 15/80; molecular memories G11C 11/00, G11C 13/02)]
51/05 . . . specially adapted for rectifying, amplifying, oscillating or switching, or capacitors or resistors with at least one potential- jump barrier or surface barrier [multistep processes for their manufacture]
51/0504 . . . [the devices being controllable only by the electric current supplied or the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched, e.g. three-terminal devices]
51/0508 . . . [Field-effect devices, e.g. TFTs]
51/0512 . . . [insulated gate field effect transistors]
51/0516 . . . [characterised by the gate dielectric]
51/052 . . . [the gate dielectric comprising only organic materials]
51/0525 . . . [the gate dielectric comprising only inorganic materials]
51/0529 . . . [the gate dielectric having a multilayered structure]
51/0533 . . . [Combinations of organic and inorganic layers]
51/0537 . . . [the gate dielectric comprising composite materials, e.g. TiO2 particles in a polymer matrix]
51/0541 . . . [Lateral single gate single channel transistors with non inverted structure, i.e. the organic semiconductor layer is formed before the gate electrode]
51/0545 . . . [Lateral single gate single channel transistors with inverted structure, i.e. the organic semiconductor layer is formed after the gate electrode]
51/055 . . . [characterised by the gate conductor]
51/0554 . . . [the transistor having two or more gate electrodes]
51/0558 . . . [characterised by the channel of the transistor]
51/0562 . . . [the channel comprising two or more active layers, e.g. forming pn - hetero junction]
51/0566 . . . [the channel comprising a composite layer, e.g. a mixture of donor and acceptor moieties, forming pn - bulk hetero junction]
51/057 . . . [having a vertical structure, e.g. vertical carbon nanotube field effect transistors [CNT-FETs]]
51/0575 . . . [the devices being controllable only by variation of the electric current supplied or the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated or switched, e.g. two-terminal devices]
51/0579 . . . [Schottky diodes]
51/0583 . . . [comprising an organic/organic junction, e.g. hetero-junction]
51/0587 . . . [comprising an organic/inorganic hetero-junction, e.g. hetero-junction]
51/0591 . . . [Bi-stable switching devices]
51/0595 . . . [molecular electronic devices (molecular computers G06F 15/80; molecular memories G11C 11/00, G11C 13/02)]
51/10 . . . [Details of devices]
51/102 . . . [Electrodes]
51/105 . . . [Ohmic contacts, e.g. source and drain electrodes]
51/107 . . . [Passivation, containers, encapsulations]
specially adapted for sensing infra-red radiation, light, electro-magnetic radiation of shorter wavelength or corpuscular radiation and adapted for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation [using organic materials as the active part, or using a combination of organic materials with other material as the active part; Multistep processes for their manufacture]

[Comprising organic semiconductor-metal devices]

[Majority carrier devices using sensitisation of widebandgap semiconductors, e.g. TiO₂ (photoelectrochemical devices with a liquid or solid electrolyte H01G 9/20)]

[the wideband gap semiconductor comprising titanium oxide, e.g. TiO₂]

[the wideband gap semiconductor comprising zinc oxide, e.g. ZnO]

[comprising organic semiconductor-organic semiconductor hetero-junctions (H01L 51/4253 takes precedence)]

[comprising multi-junctions, e.g. double hetero-junctions]

[comprising bulk hetero-junctions, e.g. interpenetrating networks]

[comprising inorganic nanostructures, e.g. CdSe nanoparticles]

[the inorganic nanostructures being nanotubes or nanowires, e.g. CdTe nanotubes in P3HT]

[comprising blocking layers, e.g. exciton blocking layers]

[light sensitive field effect devices]

[Devices having a m-i-s structure]

[Devices having a p-i-n structure]

[Details of devices]

[Electrodes]

[transparent electrodes, e.g. ITO, TCO]

[comprising carbon nanotubes]

[comprising arrangements for extracting the current from the cell, e.g. metal finger grid systems to reduce the serial resistance of transparent electrodes]

[Light trapping means]

[Passivation, containers, encapsulations]

specially adapted for light emission, e.g. organic light emitting diodes [OLED] or polymer light emitting devices [PLED]; (organic semiconductor lasers H01S 5/36; circuit arrangements for OLED or PLED H05B 33/0896; control arrangements for organic electroluminescent displays G09G 3/3208)]

[characterised by the interrelation between parameters of constituting active layers, e.g. HOMO-LUMO relation]

[Intermediate layers comprising a mixture of materials of the adjoining active layers]

[Electroluminescent [EL] layer]

[Triplet emission]

[comprising active inorganic nanostructures, e.g. luminescent quantum dots]

[comprising a dopant]

[having a multilayered structure]

[arranged between the light emitting layer and the anode]

[Carrier injection layer]

[Electron injection layer]

[Carrier blocking layer]

[Details of devices]

[Electrodes]

[Anodes, i.e. with high work-function material]

[characterised by the shape]

[combined with auxiliary electrode, e.g. ITO layer combined with metal lines]

[composed of transparent multilayers]

[Reflective anodes, e.g. ITO combined with thick metallic layer]

[Cathodes, i.e. with low work-function material]

[characterised by the shape]

[combined with auxiliary electrodes]

[composed of opaque multilayers]

[Transparent, e.g. including thin metal film]

[Passivation; Containers; Encapsulation, e.g. against humidity]

[Sealing arrangements having a self-supporting structure, e.g. containers]

[the sealing arrangements being made of metallic material]

[characterised by the peripheral sealing arrangements, e.g. adhesives, sealants]

[Vertical spacers, e.g. arranged between the sealing arrangement and the OLED]

[Protective coatings]

[having repetitive multilayer structures]

[including getter material or desiccant]

[Arrangements for extracting light from the device]

[comprising a resonant cavity structure, e.g. Bragg reflector pair]
H01L

51/5268 . . . .  [Scattering means]
51/5271 . . . .  [Reflective means]
51/5275 . . . .  [Refractive means, e.g. lens]
51/5278 . . . .  [comprising a repetitive electroluminescent unit between one set of electrodes]
51/5281 . . . .  [Arrangements for contrast improvement, e.g. preventing reflection of ambient light]
51/5284 . . . .  [comprising a light absorbing layer, e.g. black layer]
51/5287 . . . .  [OLED having a fiber structure]
51/529 . . . .  [Arrangements for heating or cooling]
51/5293 . . . .  [Arrangements for polarized light emission (H01L 51/5281 takes precedence)]
51/5296 . . . .  [Light emitting organic transistors]
51/56 . . . . Processes or apparatus specially adapted for the manufacture or treatment of such devices or of parts thereof

2221/00 Processes or apparatus adapted for the manufacture or treatment of semiconductor or solid state devices or of parts thereof covered by H01L 21/00

2221/10 Applying interconnections to be used for carrying current between separate components within a device
2221/1005 . . . . Formation and after-treatment of dielectrics
2221/101 . . . . Forming openings in dielectrics
2221/1015 . . . . for dual damascene structures
2221/1021 . . . . Pre-forming the dual damascene structure in a resist layer
2221/1026 . . . . the via being formed by burying a sacrificial pillar in the dielectric and removing the pillar
2221/1031 . . . . Dual damascene by forming vias in the via-level dielectric prior to deposition of the trench-level dielectric
2221/1036 . . . . Dual damascene with different via-level and trench-level dielectrics
2221/1042 . . . . the dielectric comprising air gaps
2221/1047 . . . . the air gaps being formed by pores in the dielectric
2221/1052 . . . . Formation of thin functional dielectric layers
2221/1057 . . . . in via holes or trenches
2221/1063 . . . . Sacrificial or temporary thin dielectric films in openings in a dielectric
2221/1068 . . . . Formation and after-treatment of conductors
2221/1073 . . . . Barrier, adhesion or liner layers
2221/1078 . . . . Multiple stacked thin films not being formed in openings in dielectrics
2221/1084 . . . . Layers specifically deposited to enhance or enable the nucleation of further layers, i.e. seed layers
2221/1089 . . . . Stacks of seed layers
2221/1094 . . . . Conducting structures comprising nanotubes or nanowires

2221/67 Apparatus for handling semiconductor or electric solid state devices during manufacture or treatment thereof; Apparatus for handling wafers during manufacture or treatment of semiconductor or electric solid state devices or components; Apparatus not specifically provided for elsewhere
2221/683 . . . . for supporting or gripping
2221/68304 . . . . using temporarily an auxiliary support
2221/68309 . . . . Auxiliary support including alignment aids
2221/68313 . . . . Auxiliary support including a cavity for storing a finished device, e.g. IC package, or a partly finished device, e.g. die, during manufacturing or mounting
2221/68318 . . . . Auxiliary support including means facilitating the separation of a device or wafer from the auxiliary support
2221/68322 . . . . Auxiliary support including means facilitating the selective separation of some of a plurality of devices from the auxiliary support
2221/68327 . . . . used during dicing or grinding
2221/68331 . . . . of passive members, e.g. die mounting substrate
2221/68336 . . . . involving stretching of the auxiliary support post dicing
2221/6834 . . . . used to protect an active side of a device or wafer
2221/68345 . . . . used as a support during the manufacture of self supporting substrates
2221/6835 . . . . used as a support during build up manufacturing of active devices
2221/68354 . . . . used to support diced chips prior to mounting
2221/68359 . . . . used as a support during manufacture of interconnect decals or build up layers
2221/68363 . . . . used in a transfer process involving transfer directly from an origin substrate to a target substrate without use of an intermediate handle substrate
2221/68368 . . . . used in a transfer process involving at least two transfer steps, i.e. including an intermediate handle substrate
2221/68372 . . . . used to support a device or wafer when forming electrical connections thereto (when forming bonding pads H01L 24/03; when forming bump connectors H01L 24/11; when forming layer connectors H01L 24/27)
2221/68377 . . . . with parts of the auxiliary support remaining in the finished device
2221/68381 . . . . Details of chemical or physical process used for separating the auxiliary support from a device or wafer
2221/68386 . . . . Separation by peeling
2221/6839 . . . . using peeling wedge or knife or bar
2221/68395 . . . . using peeling wheel

2223/00 Details relating to semiconductor or other solid state devices covered by the group H01L 23/00

2223/544 . . . . Marks applied to semiconductor devices or parts
2223/54406 . . . . comprising alphanumeric information
2223/54413 . . . . comprising digital information, e.g. bar codes, data matrix
2223/5442 . . . . comprising non digital, non alphanumeric information, e.g. symbols
2223/54426 . . . . for alignment
2223/54433 . . . . containing identification or tracking information
2223/5444 . . . . for electrical read out
2223/54446 . . . . Wireless electrical read out
2223/54453 . . . . for use prior to dicing
2223/5446 . . . . Located in scribe lines
2223/54466 . . . . Located in a dummy or reference die
2223/54473 . . . . for use after dicing
2223/5448 . . . . Located on chip prior to dicing and remaining on chip after dicing
2223/6638 . . . . . . . Differential pair signal lines
2223/6644 . . . . . . . Packaging aspects of high-frequency amplifiers (amplifiers per se H03F)
2223/665 . . . . . . . Bias feed arrangements
2223/6655 . . . . . . . Matching arrangements, e.g. arrangement of inductive and capacitive components
2223/6661 . . . . . . . for passive devices (passive components per se H01L 28/00)
2223/6666 . . . . . . . for decoupling, e.g. bypass capacitors
2223/6672 . . . . . . . for integrated passive components, e.g. semiconductor device with passive components only (integrated circuits with passive components only per se H01L 27/01)
2223/6677 . . . . . . . for antenna, e.g. antenna included within housing of semiconductor device (antennas per se H01Q)
2223/6683 . . . . . . . for monolithic microwave integrated circuit (MMIC)
2223/6688 . . . . . . . Mixed frequency adaptations, i.e. for operation at different frequencies
2223/6694 . . . . . . . Optical signal interface included within high-frequency semiconductor device housing

2224/00 Indexing scheme for arrangements for connecting or disconnecting semiconductor or solid-state bodies and methods related thereto as covered by H01L 24/00

2224/01 . . . . . . . Means for bonding being attached to, or being formed on, the surface to be connected, e.g. chip-to-package, die-attach, "first-level" interconnects; Manufacturing methods related thereto
2224/02 . . . . . . . Bonding areas; Manufacturing methods related thereto
2224/0212 . . . . . . . Auxiliary members for bonding areas, e.g. spacers
2224/02122 . . . . . . . being formed on the semiconductor or solid-state body
2224/02123 . . . . . . . inside the bonding area
2224/02125 . . . . . . . Reinforcing structures
2224/02126 . . . . . . . Collar structures
2224/0213 . . . . . . . Alignment aids
2224/02135 . . . . . . . Flow barrier
2224/0214 . . . . . . . Structure of the auxiliary member
2224/02141 . . . . . . . Multilayer auxiliary member
2224/02145 . . . . . . . Shape of the auxiliary member
2224/0215 . . . . . . . Material of the auxiliary member

2224/02163 . . . . . . . on the bonding area
2224/02165 . . . . . . . Reinforcing structures
2224/02166 . . . . . . . Collar structures
2224/0217 . . . . . . . Alignment aids
2224/02175 . . . . . . . Flow barrier
2224/0218 . . . . . . . Structure of the auxiliary member
2224/02181 . . . . . . . Multilayer auxiliary member
2224/02185 . . . . . . . Shape of the auxiliary member
2224/0219 . . . . . . . Material of the auxiliary member
2224/022 . . . . . . . Protective coating, i.e. protective bond-through coating
2224/02205 . . . . . . . Structure of the protective coating
2224/02206 . . . . . . . Multilayer protective coating
2224/0221 . . . . . . . Shape of the protective coating
2224/02215 . . . . . . . Material of the protective coating
2224/0223 . . . . . . . not in direct contact with the bonding area
2224/02235 . . . . . . . Reinforcing structures
2224/0224 . . . . . . . Alignment aids
2224/02245 . . . . . . . Flow barrier
2224/0225 . . . . . . . Structure of the auxiliary member
2224/02251 . . . . . . . Multilayer auxiliary member
2224/02255 . . . . . . . Shape of the auxiliary member
2224/0226 . . . . . . . Material of the auxiliary member
2224/0223 . . . . . . . Redistribution layers [RDL] for bonding areas
2224/02231 . . . . . . . Manufacturing methods of the redistribution layers
2224/02311 . . . . . . . Additive methods
2224/02313 . . . . . . . Subtractive methods
2224/02315 . . . . . . . Self-assembly processes
2224/02317 . . . . . . . by local deposition
2224/02319 . . . . . . . by using a preform
2224/02321 . . . . . . . Reworking
2224/0233 . . . . . . . Structure of the redistribution layers
2224/02331 . . . . . . . Multilayer structure
2224/02333 . . . . . . . being a bump
2224/02335 . . . . . . . Free-standing redistribution layers
2224/0235 . . . . . . . Shape of the redistribution layers
2224/02351 . . . . . . . comprising interlocking features
2224/0236 . . . . . . . Shape of the insulating layers therebetween
2224/0237 . . . . . . . Disposition of the redistribution layers
2224/02371 . . . . . . . connecting the bonding area on a surface of the semiconductor or solid-state body with another surface of the semiconductor or solid-state body
2224/02372 . . . . . . . connecting to a via connection in the semiconductor or solid-state body
2224/02373 . . . . . . . Layout of the redistribution layers
2224/02375 . . . . . . . Top view
2224/02377 . . . . . . . Fan-in arrangement
2224/02379 . . . . . . . Fan-out arrangement
2224/02381 . . . . . . . Side view
2224/0239 . . . . . . . Material of the redistribution layers
2224/024 . . . . . . . Material of the insulating layers therebetween
2224/03 . . . . . . . Manufacturing methods
2224/03001 . . . . . . . Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate
2224/03002 . . . . . . . for supporting the semiconductor or solid-state body
2224/03003 . . . . . . . for holding or transferring a preform

CPC - 2019.05
Involving a permanent auxiliary member, i.e., a member which is left at least partly in the finished device, e.g., coating, dummy feature

for protecting parts during manufacture

for aligning the bonding area, e.g., marks, spacers

for holding or confining the bonding area, e.g., solder flow barrier

for aligning the bonding area, e.g., marks, spacers

for protecting parts during the process

Manufacture and pre-treatment of the bonding area preform

Shaping

Applying permanent coating

by local deposition of the material of the bonding area

in liquid form

by dispensing droplets

Screen printing, i.e. using a stencil

in solid form

using a powder

using a preform

by blanket deposition of the material of the bonding area

in liquid form

Spin coating

Spray coating

Curtain coating

by dipping, e.g. in a solder bath (hot-dipping C23C 2/00)

Immersion coating, e.g. in a solder bath (immersion processes C23C 2/00)

Chemical solution deposition [CSD], i.e. using a liquid precursor

Wave coating

in solid form

Lamination of a preform, e.g. foil, sheet or layer

the preform being at least partly pre-patterned

by transfer printing

using a powder

in gaseous form

Physical vapour deposition [PVD], e.g., evaporation, or sputtering

Chemical vapour deposition [CVD], e.g. laser CVD

Plating

Electroplating

Electroless plating

Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface

using a lift-off mask

Profile of the lift-off mask

Multilayer masks

Permanent masks, i.e. masks left in the finished device, e.g. passivation layers

by chemical or physical modification of a pre-existing or pre-deposited material

Pre-existing or pre-deposited material

Sintering

Anodisation

Curing and solidification, e.g. of a photosensitive material

Self-assembly, e.g. self-agglomeration of the material in a fluid

Auxiliary means therefor, e.g. for self-assembly activation

with special adaptation of the surface of the body to be connected or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process

Selective modification

using a laser or a focussed ion beam [FIB]

Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin

by patterning a pre-deposited material (treatment of parts prior to assembly of the devices H01L 21/48)

Mechanical treatment, e.g. polishing, grinding

Physical or chemical etching

by physical means only

by chemical means only

Chemical mechanical polishing [CMP]

with selective exposure, development and removal of a photosensitive material, e.g. of a photosensitive conductive resin

Photolithography

using masks

using a laser or a focused ion beam [FIB]

Ablation by means of a laser or focused ion beam [FIB]

involving monitoring, e.g. feedback loop

Post-treatment of the bonding area

Cleaning, e.g. oxide removal step, desmearing

Applying permanent coating, e.g. in-situ coating

Spray coating

by dipping, e.g. in a solder bath

Immersion coating, e.g. in a solder bath

Chemical solution deposition [CSD], i.e. using a liquid precursor

Plating, e.g. electroplating, electroless plating

Physical vapour deposition [PVD], e.g. evaporation, or sputtering

Chemical vapour deposition [CVD], e.g. laser CVD

Applying a precursor material

Reworking, e.g. shaping (reflowing H01L, 2224/03849)

involving a chemical process, e.g. etching the bonding area
bonding areas prior to the connecting process
Structure, shape, material or disposition of the bonding areas on chip-scale packages
Bonding areas specifically adapted for tape connectors, e.g. wirebond pads
Bonding areas specifically adapted for wire connectors, e.g. wirebond pads
Bonding areas specifically adapted for tape automated bonding [TAB] connectors
Bonding areas specifically adapted for connectors of different types
Bonding areas formed on an encapsulation of the semiconductor or solid-state body, e.g. bonding areas on chip-scale packages
Shape of the additional element
of an individual bonding area
Internal layers
Dual damascene structure
comprising a core and a coating
Bonding area integrally formed with a redistribution layer on the semiconductor or solid-state body, e.g.
Bonding area integrally formed with a via connection of the semiconductor or solid-state body
Shape
comprising apertures or cavities
in top view
being rectangular
being square
being circular or elliptic
in side view
comprising protrusions or indentations
being a conformal layer on a patterned surface
being a non conformal layer on a patterned surface
the internal layer being at least partially embedded in the surface
the whole internal layer protruding from the surface
the internal layer being disposed on a redistribution layer on the semiconductor or solid-state body
the internal layer being disposed on a via connection of the semiconductor or solid-state body
the internal layer being disposed in a recess of the surface
the internal layer extending out of an opening
Single internal layer
Plural internal layers
being mutually engaged together, e.g. through inserts
being disposed next to each other, e.g. side-to-side arrangements
being stacked
Two-layer arrangements
Three-layer arrangements
Four-layer arrangements
with additional elements, e.g. vias arrays, interposed between the stacked layers
Structure of the additional element
being a via with at least a lining layer
Shape of the additional element
Disposition of the additional element
of a single via
at the center of the internal layers
at the periphery of the internal layers
of a plurality of vias
at the center of the internal layers
at the periphery of the internal layers
Uniform arrangement, i.e. array
Random arrangement
Material of the additional element
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
the principal constituent melting at a temperature of less than 400°C
Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [Tl] as principal constituent
Lead [Pb] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
 Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05188
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/05191, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a gas not provided for in groups H01L 2224/05191
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
Material of the matrix
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
the principal constituent melting at a temperature of less than 400°C
Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [Tl] as principal constituent
Lead [Pb] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05287)

Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/05288 - H01L 2224/05289, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/05290 - H01L 2224/05291

with a principal constituent of the material being a gas not provided for in groups H01L 2224/05292 - H01L 2224/05293

Fillers

Base material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Iridium [Ir] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Nickel [Ni] as principal constituent

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Gold [Au] as principal constituent

Silver [Ag] as principal constituent

Platinum [Pt] as principal constituent

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/0531 - H01L 2224/05391, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/0531 - H01L 2224/05391

with a principal constituent of the material being a gas not provided for in groups H01L 2224/0531 - H01L 2224/05391

Coating material with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05388)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

with a principal constituent of the material being a hybrid material, e.g. segmented structures, foams

materials in the form of segmented structures, foams or nanotubes, diamond fullerene, graphite, carbon-nanotubes, diamond
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a solid
not provided for in groups H01L 2224/054 - H01L 2224/05491,
e.g. allotropes of carbon, fullerene, graphite, carbon-
nanotubes, diamond
with a principal constituent of the material being a liquid
not provided for in groups H01L 2224/054 - H01L 2224/05491
with a principal constituent of the material being a gas
not provided for in groups H01L 2224/054 - H01L 2224/05491
with a principal constituent of the material being a combination of two or more
materials in the form of a matrix with a filler, i.e.,
being a hybrid material, e.g.,
segmented structures, foams
Shape or distribution of the fillers
External layer
Structure
Dual damascene structure
comprising a core and a coating
Bonding area integrally formed
with a redistribution layer on the semiconductor or solid-state body
comprising apertures or cavities
in top view
being rectangular
being square
being circular or elliptic
in side view
comprising protrusions or indentations
conformal layer on a patterned surface
non conformal layer on a patterned surface
Disposition
On the entire surface of the internal layer
On the entire exposed surface of the internal layer
only on parts of the surface of the internal layer
only on the bonding interface of the bonding area
outside the bonding interface of the bonding area
the external layer being at least
partially embedded in the surface
the whole external layer protruding from the surface
the external layer being disposed
on a redistribution layer on the semiconductor or solid-state body
Material

Plural external layers

Single external layer

Solid external layers

being mutually engaged together, e.g. through inserts

being disposed next to each other, e.g. side-to-side arrangements

being stacked

Material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Paladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05688)

Glasses, e.g. amorphous oxides, nitrides or fluorides

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/056 - H01L 2224/05691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/056 - H01L 2224/05691

with a principal constituent of the material being a gas not provided for in groups H01L 2224/056 - H01L 2224/05691
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams.

Material of the matrix with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof.

the principal constituent melting at a temperature of less than 400°C.

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C.

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C.

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C.

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material.

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05788)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/057 - H01L 2224/05791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/057 - H01L 2224/05791

with a principal constituent of the material being a gas not provided for in groups H01L 2224/057 - H01L 2224/05791

Fillers

Base material
with a principal constituent melting at a temperature less than 400°C

Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [Tl] as principal constituent
Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05888)
Glasses, e.g. amorphous oxides, nitrides or fluorides ( polymer, epoxy e.g. polyester, phenolic based polymer, epoxy)

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/058 - H01L 2224/05891, e.g. allotropes of carbon, fullerene, graphite, carbon nanoparticles, diamond with a principal constituent of the material being a liquid not provided for in groups H01L 2224/0588 - H01L 2224/05891 with a principal constituent of the material being a gas not provided for in groups H01L 2224/0588 - H01L 2224/05891 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams Coating material
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non-metallic, non-metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05988),

Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

- The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/059 - H01L 2224/05991, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/059 - H01L 2224/05991

with a principal constituent of the material being a gas not provided for in groups H01L 2224/059 - H01L 2224/05991

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Shape or distribution of the fillers

of a plurality of bonding areas

Structure

Bonding areas having different sizes, e.g. different heights or widths

Shape
Bonding areas having different shapes of the bonding areas being at different heights

Layout

Square or rectangular array

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

with specially adapted redistribution layers [RDL]

being disposed in a single wiring level, i.e. planar layout

being disposed in different wiring levels, i.e. resurf layout

Circular array, i.e. array with radial symmetry

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

with specially adapted redistribution layers [RDL]

being disposed in a single wiring level, i.e. planar layout

being disposed in different wiring levels, i.e. resurf layout

Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

with specially adapted redistribution layers [RDL]

being disposed in a single wiring level, i.e. planar layout

being disposed in different wiring levels, i.e. resurf layout

Material

Bonding areas having different materials

Function

Bonding areas having different functions

including bonding areas providing primarily mechanical bonding

including bonding areas providing primarily thermal dissipation

Structure, shape, material or disposition of the bonding areas after the connecting process

of an individual bonding area

in top view

being non uniform along the bonding area

being rectangular

being square

being circular or elliptic

in side view
2224/08058 . . . . . . . . . . being non uniform along the bonding area
2224/08059 . . . . . . . . . . comprising protrusions or indentations of bonding interfaces, e.g. interlocking features
2224/0807 . . . . . . . . . . Disposition
2224/08111 . . . . . . . . . . the bonding area being disposed in a recess of the surface of the body
2224/08112 . . . . . . . . . . the bonding area being at least partially embedded in the surface of the body
2224/08113 . . . . . . . . . . the whole bonding area protruding from the surface of the body
2224/0812 . . . . . . . . . . the bonding area connecting directly to another bonding area, i.e. connectorless bonding, e.g. bumpless bonding
2224/08121 . . . . . . . . . . the connected bonding areas being not aligned with respect to each other
2224/08123 . . . . . . . . . . the bonding area connecting directly to at least two bonding areas
2224/08135 . . . . . . . . . . the bonding area connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
2224/08137 . . . . . . . . . . the bodies being arranged next to each other, e.g. on a common substrate
2224/08145 . . . . . . . . . . the bodies being stacked
2224/08146 . . . . . . . . . . the bonding area connecting to a via connection in the body
2224/08147 . . . . . . . . . . the bonding area connecting to a bonding area disposed in a recess of the surface of the body
2224/08148 . . . . . . . . . . the bonding area connecting to a bonding area protruding from the surface of the body
2224/08151 . . . . . . . . . . the bonding area connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
2224/08153 . . . . . . . . . . the body and the item being arranged next to each other, e.g. on a common substrate
2224/08155 . . . . . . . . . . the item being non-metallic, e.g. being an insulating substrate with or without metallisation
2224/0816 . . . . . . . . . . the bonding area connecting to a pin of the item
2224/08163 . . . . . . . . . . the bonding area connecting to a potential ring of the item
2224/08165 . . . . . . . . . . the bonding area connecting to a via metallisation of the item
2224/08167 . . . . . . . . . . the bonding area connecting to a bonding area disposed in a recess of the surface of the item
2224/08168 . . . . . . . . . . the bonding area connecting to a bonding area protruding from the surface of the item
2224/08175 . . . . . . . . . . the item being metallic
2224/08183 . . . . . . . . . . the bonding area connecting to a potential ring of the item
2224/08187 . . . . . . . . . . the bonding area connecting to a bonding area disposed in a recess of the surface of the item
2224/08188 . . . . . . . . . . the bonding area connecting to a bonding area protruding from the surface of the item
2224/08195 . . . . . . . . . . the item being a discrete passive component
2224/08197 . . . . . . . . . . the bonding area connecting to a bonding area disposed in a recess of the surface of the item
2224/08198 . . . . . . . . . . the bonding area connecting to a bonding area protruding from the surface of the item
2224/08221 . . . . . . . . . . the body and the item being stacked
2224/08225 . . . . . . . . . . the item being non-metallic, e.g. insulating substrate with or without metallisation
2224/0823 . . . . . . . . . . the bonding area connecting to a pin of the item
2224/08233 . . . . . . . . . . the bonding area connecting to a potential ring of the item
2224/08235 . . . . . . . . . . the bonding area connecting to a via metallisation of the item
2224/08237 . . . . . . . . . . the bonding area connecting to a bonding area disposed in a recess of the surface of the item
2224/08238 . . . . . . . . . . the bonding area connecting to a bonding area protruding from the surface of the item
2224/08245 . . . . . . . . . . the item being metallic
2224/08253 . . . . . . . . . . the bonding area connecting to a potential ring of the item
2224/08257 . . . . . . . . . . the bonding area connecting to a bonding area disposed in a recess of the surface of the item
2224/08258 . . . . . . . . . . the bonding area connecting to a bonding area protruding from the surface of the item
2224/08265 . . . . . . . . . . the item being a discrete passive component
2224/08267 . . . . . . . . . . the bonding area connecting to a bonding area disposed in a recess of the surface of the item
2224/08268 . . . . . . . . . . the bonding area connecting to a bonding area protruding from the surface of the item
2224/085 . . . . . . . . . . Material
2224/08501 . . . . . . . . . . at the bonding interface
2224/08502 . . . . . . . . . . comprising an eutectic alloy
2224/08503 . . . . . . . . . . comprising an intermetallic compound
2224/08505 . . . . . . . . . . outside the bonding interface
2224/08506 . . . . . . . . . . comprising an eutectic alloy
2224/09 . . . . . . . . . . of a plurality of bonding areas
2224/0901 . . . . . . . . . . Structure
2224/0903 . . . . . . . . . . Bonding areas having different sizes, e.g. different diameters, heights or widths
Bump connectors; Manufacturing methods related thereto

Auxiliary members for bump connectors, e.g. spacers

Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate

for supporting the semiconductor or solid-state body

for holding or transferring the bump preform

for aligning the bump connector, e.g. marks, spacers

for protecting parts during manufacture

Involving a permanent auxiliary member, i.e. a member which is left at least partly in the finished device, e.g. coating, dummy feature

for holding or confining the bump connector, e.g. solder flow barrier

for aligning the bump connector, e.g. marks, spacers

for protecting parts during the process

Manufacture and pre-treatment of the bump connector preform

Shaping

Applying permanent coating

by local deposition of the material of the bump connector

in liquid form

Continuous flow, e.g. using a microsyringe, a pump, a nozzle or extrusion

by dispensing droplets

Screen printing, i.e. using a stencil

in solid form

using a powder

Shaping

Applying permanent coating

by local deposition of the material of the bump connector

in liquid form

Continuous flow, e.g. using a microsyringe, a pump, a nozzle or extrusion

by dispensing droplets

Screen printing, i.e. using a stencil

in solid form

using a powder
by patterning a pre-deposited material (treatment of parts prior to assembly of the devices H01L 21/48)

Mechanical treatment, e.g. polishing, grinding

Physical or chemical etching

by physical means only

by chemical means only

Chemical mechanical polishing [CMP]

with selective exposure, development and removal of a photosensitive bump material, e.g. of a photosensitive conductive resin

using masks

Photolithography

using a laser or a focused ion beam [FIB]

Ablation by means of a laser or focused ion beam [FIB]

involving monitoring, e.g. feedback loop

Post-treatment of the bump connector

Cleaning, e.g. oxide removal step, desmearing

Applying permanent coating, e.g. in-situ coating

Spray coating

by dipping, e.g. in a solder bath

Immersion coating, e.g. in a solder bath

Chemical solution deposition [CSD], i.e. using a liquid precursor

Plating, e.g. electroplating, electroless plating

Physical vapour deposition [PVD], e.g. evaporation, or sputtering

Chemical vapour deposition [CVD], e.g. laser CVD

by transfer printing

using a powder

in gaseous form

Physical vapour deposition [PVD], e.g. evaporation, or sputtering

Chemical vapour deposition [CVD], e.g. laser CVD

Plating

Electroplating

Electroless plating

Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface

using a lift-off mask

Profile of the lift-off mask

Multilayer masks

Permanent masks, i.e. masks left in the finished device, e.g. passivation layers

by chemical or physical modification of a pre-existing or pre-deposited material

Pre-existing or pre-deposited material

Sintering

Anodisation

Curing and solidification, e.g. of a photosensitive bump material

Self-assembly, e.g. self-agglomeration of the bump material in a fluid

Auxiliary means therefor, e.g. for self-assembly activation

with special adaptation of the surface or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process

involving the material of the bonding area, e.g. bonding pad or under bump metallisation [UBM]

Selective modification

using a laser or a focussed ion beam [FIB]

Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin

using preformed bumps

Stud bumping, i.e. using a wire-bonding apparatus

by blanket deposition of the material of the bump connector

in liquid form

Spin coating

Spray coating

Curtain coating

by dipping, e.g. in a solder bath (hot-dipping C23C 2/00)

Immersion coating, e.g. in a solder bath (immersion processes C23C 2/00)

Chemical solution deposition [CSD], i.e. using a liquid precursor

Wave coating

in solid form

Lamination of a preform, e.g. foil, sheet or layer

the preform being at least partly pre-patterned

by transfer printing

using a powder

in gaseous form

Physical vapour deposition [PVD], e.g. evaporation, or sputtering

Chemical vapour deposition [CVD], e.g. laser CVD

Plating

Electroplating

Electroless plating

Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface

using a lift-off mask

Profile of the lift-off mask

Multilayer masks

Permanent masks, i.e. masks left in the finished device, e.g. passivation layers

by chemical or physical modification of a pre-existing or pre-deposited material

Pre-existing or pre-deposited material

Sintering

Anodisation

Curing and solidification, e.g. of a photosensitive bump material

Self-assembly, e.g. self-agglomeration of the bump material in a fluid

Auxiliary means therefor, e.g. for self-assembly activation

with special adaptation of the surface or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process

involving the material of the bonding area, e.g. bonding pad or under bump metallisation [UBM]

Selective modification

using a laser or a focused ion beam [FIB]
Core members of the bump connector
Structure

Bump connector larger than the underlying bonding area, e.g. the under bump metallisation [UBM]
Bump connector smaller than the underlying bonding area, e.g. the under bump metallisation [UBM]
Bump connector integrally formed with a redistribution layer on the semiconductor or solid-state body
Bump connector integrally formed with a via connection of the semiconductor or solid-state body

Shape

comprising apertures or cavities, e.g. hollow bump
in top view
being rectangular or square
being circular or elliptic
comprising protrusions or indentations
in side view
being non uniform along the bump connector
comprising protrusions or indentations
at the bonding interface of the bump connector

Disposition
the bump connector being disposed in a recess of the surface
the bump connector being at least partially embedded in the surface
the whole bump connector protruding from the surface
the bump connector being disposed on a redistribution layer on the semiconductor or solid-state body
the bump connector being disposed on a via connection of the semiconductor or solid-state body
relative to the bonding area, e.g. bond pad, of the semiconductor or solid-state body
the bump connector being offset with respect to the bonding area, e.g. bond pad
the bump connector being disposed on at least two separate bonding areas, e.g. bond pads

Plural core members
being mutually engaged together, e.g. through inserts
being disposed next to each other, e.g. side-to-side arrangements
being stacked
Two-layer arrangements
Three-layer arrangements
Four-layer arrangements
Material
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
the principal constituent melting at a temperature of less than 400°C
Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [Tl] as principal constituent
Lead [Pb] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
CPC - 2019.05

Material of the matrix

- with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

- with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
Fillers

Base material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

2224/13301  with the principal constituent melting at a temperature of less than 400°C

2224/13305  Gallium [Ga] as principal constituent

2224/13309  Indium [In] as principal constituent

2224/13311  Tin [Sn] as principal constituent

2224/13313  Bismuth [Bi] as principal constituent

2224/13314  Thallium [Tl] as principal constituent

2224/13316  Iridium [Ir] as principal constituent

2224/13317  Niobium [Nb] as principal constituent

2224/13318  Molybdenum [Mo] as principal constituent

2224/13319  Tantalum [Ta] as principal constituent

2224/1332  Rhenium [Re] as principal constituent

2224/13321  Tungsten [W] as principal constituent

2224/13324  with a principal constituent of the material being a non metallic, non metalloid inorganic material

2224/13327  Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics

2224/13328  H01L 2224/13288)

2224/13329  Glasses, e.g. amorphous oxides, nitrides or fluorides

2224/1333  with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

2224/13331  The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

2224/13333  with a principal constituent of the material being a solid not provided for in groups

H01L 2224/132 - H01L 2224/13291, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

2224/13335  with a principal constituent of the material being a liquid not provided for in groups

H01L 2224/132 - H01L 2224/13291

2224/13337  with a principal constituent of the material being a gas not provided for in groups

H01L 2224/132 - H01L 2224/13291

2224/13338  Fillers

2224/13339  Base material

2224/1334  with a principal constituent of the material being a being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

2224/13341  the principal constituent melting at a temperature of less than 400°C

2224/13345  Gallium [Ga] as principal constituent

2224/13349  Indium [In] as principal constituent

2224/13353  Tin [Sn] as principal constituent

2224/13357  Bismuth [Bi] as principal constituent

2224/13359  Thallium [Tl] as principal constituent

2224/1336  Niobium [Nb] as principal constituent

2224/13364  Molybdenum [Mo] as principal constituent

2224/13366  Tantalum [Ta] as principal constituent

2224/13369  Rhenium [Re] as principal constituent

2224/13371  Tungsten [W] as principal constituent

2224/13372  Lead [Pb] as principal constituent

2224/13374  Zinc [Zn] as principal constituent

2224/13378  Antimony [Sb] as principal constituent

2224/1338  Aluminium [Al] as principal constituent

2224/13384  the principal constituent melting at a temperature of greater than or equal to

2224/13385  400°C and less than 950°C

2224/13388  the principal constituent melting at a temperature of greater than or equal to

2224/13391  950°C and less than 1550°C

2224/13394  the principal constituent melting at a temperature of greater than or equal to

2224/13397  1550°C

2224/13399  Fillers

2224/134  Base material

2224/1343  with a principal constituent of the material being a non metallic, non metalloid inorganic material

2224/1346  Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics

2224/1347  H01L 2224/13288)

2224/1348  Glasses, e.g. amorphous oxides, nitrides or fluorides

2224/1349  with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

2224/1351  The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

2224/1353  with a principal constituent of the material being a solid not provided for in groups

H01L 2224/132 - H01L 2224/13291, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

2224/1355  with a principal constituent of the material being a liquid not provided for in groups

H01L 2224/132 - H01L 2224/13291

2224/1357  with a principal constituent of the material being a gas not provided for in groups

H01L 2224/132 - H01L 2224/13291

2224/1359  Fillers

2224/136  Base material

2224/1363  with a principal constituent of the material being a being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

2224/1365  the principal constituent melting at a temperature of less than 400°C

2224/1369  Gallium [Ga] as principal constituent

2224/1371  Indium [In] as principal constituent

2224/1374  Tin [Sn] as principal constituent

2224/1376  Bismuth [Bi] as principal constituent

2224/1378  Thallium [Tl] as principal constituent

2224/1379  Lead [Pb] as principal constituent

2224/1381  Molybdenum [Mo] as principal constituent

2224/1383  Tantalum [Ta] as principal constituent

2224/1384  Tungsten [W] as principal constituent
Coating material containing tellurium [Te] and polonium [Po], and alloys thereof, with a principal constituent of the material being a solid not provided for in groups H01L 2224/1339 - H01L 2224/13391.

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics [H01L 2224/13418])

Glasses, e.g. amorphous oxides, nitrides or fluorides

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene.

The principal constituent being a hybrid material, e.g. a matrix with a filler, i.e. materials in the form of combination of two or more materials in the form of segmented structures, foams.

The principal constituent melting at a temperature of greater than or equal to 1550°C.

The principal constituent being a gas melting at a temperature of greater than or equal to 400°C and less than 950°C.

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics [H01L 2224/13388]).

Glasses, e.g. amorphous oxides, nitrides or fluorides

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene.

The principal constituent being a hybrid material, e.g. a matrix with a filler, i.e. materials in the form of combination of two or more materials in the form of segmented structures, foams.

The principal constituent melting at a temperature of greater than or equal to 1550°C.

The principal constituent being a gas melting at a temperature of greater than or equal to 400°C and less than 950°C.
| 2224/13486 | Coating with a principal constituent of the material being a non metallic, non metalloid inorganic material |
| 2224/13487 | Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13488) |
| 2224/13488 | Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy |
| 2224/1349 | The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/134 - H01L 2224/13491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond |
| 2224/13491 | with a principal constituent of the material being a liquid not provided for in groups H01L 2224/134 - H01L 2224/13491 |
| 2224/13495 | with a principal constituent of the material being a gas not provided for in groups H01L 2224/134 - H01L 2224/13491 |
| 2224/13498 | with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams |
| 2224/13499 | Shape or distribution of the fillers |
| 2224/1354 | Coating |
| 2224/13541 | Structure |
| 2224/1355 | Shape |
| 2224/13551 | being non uniform |
| 2224/13552 | comprising protrusions or indentations at the bonding interface of the bump connector, i.e. on the surface of the bump connector |
| 2224/1356 | Disposition |
| 2224/13561 | On the entire surface of the core, i.e. integral coating |
| 2224/13562 | On the entire exposed surface of the core |
| 2224/13563 | Only on parts of the surface of the core, i.e. partial coating |
| 2224/13564 | Only on the bonding interface of the bump connector |
| 2224/13565 | Only outside the bonding interface of the bump connector |
| 2224/13566 | Both on and outside the bonding interface of the bump connector |
| 2224/1357 | Single coating layer |
| 2224/13575 | Plural coating layers |
| 2224/13576 | being mutually engaged together, e.g. through inserts |
| 2224/13578 | being disposed next to each other, e.g. side-to-side arrangements |
| 2224/1358 | being stacked |
| 2224/13582 | Two-layer coating |
| 2224/13583 | Three-layer coating |
| 2224/13584 | Four-layer coating |
| 2224/13599 | Material |
| 2224/136 | with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof |
| 2224/13601 | the principal constituent melting at a temperature of less than 400°C |
| 2224/13605 | Gallium [Ga] as principal constituent |
| 2224/13609 | Indium [In] as principal constituent |
| 2224/13611 | Tin [Sn] as principal constituent |
| 2224/13613 | Bismuth [Bi] as principal constituent |
| 2224/13614 | Thallium [Tl] as principal constituent |
| 2224/13616 | Lead [Pb] as principal constituent |
| 2224/13617 | the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C |
| 2224/13618 | Zinc [Zn] as principal constituent |
| 2224/1362 | Antimony [Sb] as principal constituent |
| 2224/13623 | Magnesium [Mg] as principal constituent |
| 2224/13624 | Aluminium [Al] as principal constituent |
| 2224/13638 | the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C |
| 2224/13639 | Silver [Ag] as principal constituent |
| 2224/13644 | Gold [Au] as principal constituent |
| 2224/13647 | Copper [Cu] as principal constituent |
| 2224/13649 | Manganese [Mn] as principal constituent |
| 2224/1365 | Nickel [Ni] as principal constituent |
| 2224/13657 | Cobalt [Co] as principal constituent |
| 2224/1366 | Iron [Fe] as principal constituent |
| 2224/13663 | the principal constituent melting at a temperature of greater than 1550°C |
| 2224/13664 | Palladium [Pd] as principal constituent |
| 2224/13666 | Titanium [Ti] as principal constituent |
| 2224/13669 | Platinum [Pt] as principal constituent |
H01L 2224/1367 . . . . . . . . . . . . . . Zirconium [Zr] as principal constituent
2224/13671 . . . . . . . . . . . . . . Chromium [Cr] as principal constituent
2224/13672 . . . . . . . . . . . . . . Vanadium [V] as principal constituent
2224/13673 . . . . . . . . . . . . . . Rhodium [Rh] as principal constituent
2224/13676 . . . . . . . . . . . . . . Ruthenium [Ru] as principal constituent
2224/13678 . . . . . . . . . . . . . . Iridium [Ir] as principal constituent
2224/13679 . . . . . . . . . . . . . . Niobium [Nb] as principal constituent
2224/1368 . . . . . . . . . . . . . . Molybdenum [Mo] as principal constituent
2224/13681 . . . . . . . . . . . . . . Tantalum [Ta] as principal constituent
2224/13683 . . . . . . . . . . . . . . Rhenium [Re] as principal constituent
2224/13684 . . . . . . . . . . . . . . Tungsten [W] as principal constituent
2224/13686 . . . . . . . . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/13687 . . . . . . . . . . . . . . Ceramics, e.g. crystalline carbides, nitriles or oxides (glass ceramics H01L 2224/13688)
2224/13688 . . . . . . . . . . . . . . Glasses, e.g. amorphous oxides, nitriles or fluorides
2224/1369 . . . . . . . . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/13691 . . . . . . . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/13693 . . . . . . . . . . . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/136 - H01L 2224/13691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/13694 . . . . . . . . . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/136 - H01L 2224/13691
2224/13695 . . . . . . . . . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/136 - H01L 2224/13691
2224/13698 . . . . . . . . . . . . . . with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/13699 . . . . . . . . . . . . . . Material of the matrix
2224/137 . . . . . . . . . . . . . . with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/13701 . . . . . . . . . . . . . . the principal constituent melting at a temperature of less than 1550°C
2224/13705 . . . . . . . . . . . . . . Gallium [Ga] as principal constituent
2224/13709 . . . . . . . . . . . . . . Indium [In] as principal constituent
2224/13711 . . . . . . . . . . . . . . Tin [Sn] as principal constituent
2224/13713 . . . . . . . . . . . . . . Bismuth [Bi] as principal constituent
2224/13714 . . . . . . . . . . . . . . Thallium [Tl] as principal constituent
2224/13716 . . . . . . . . . . . . . . Lead [Pb] as principal constituent
2224/13717 . . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/13718 . . . . . . . . . . . . . . Zinc [Zn] as principal constituent
2224/1372 . . . . . . . . . . . . . . Antimony [Sb] as principal constituent
2224/13723 . . . . . . . . . . . . . . Magnesium [Mg] as principal constituent
2224/13724 . . . . . . . . . . . . . . Aluminium [Al] as principal constituent
2224/13738 . . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/13739 . . . . . . . . . . . . . . Silver [Ag] as principal constituent
2224/13744 . . . . . . . . . . . . . . Gold [Au] as principal constituent
2224/13747 . . . . . . . . . . . . . . Copper [Cu] as principal constituent
2224/13749 . . . . . . . . . . . . . . Manganese [Mn] as principal constituent
2224/13755 . . . . . . . . . . . . . . Nickel [Ni] as principal constituent
2224/13757 . . . . . . . . . . . . . . Cobalt [Co] as principal constituent
2224/1376 . . . . . . . . . . . . . . Iron [Fe] as principal constituent
2224/13763 . . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/13764 . . . . . . . . . . . . . . Palladium [Pd] as principal constituent
2224/13766 . . . . . . . . . . . . . . Titanium [Ti] as principal constituent
2224/13769 . . . . . . . . . . . . . . Platinum [Pt] as principal constituent
2224/1377 . . . . . . . . . . . . . . Zirconium [Zr] as principal constituent
2224/13771 . . . . . . . . . . . . . . Chromium [Cr] as principal constituent
2224/13772 . . . . . . . . . . . . . . Vanadium [V] as principal constituent
2224/13773 . . . . . . . . . . . . . . Rhodium [Rh] as principal constituent
2224/13776 . . . . . . . . . . . . . . Ruthenium [Ru] as principal constituent
Fillers

Base material

H01L 2224/13778
... Iridium [Ir] as principal constituent
H01L 2224/13779
... Niobium [Nb] as principal constituent
H01L 2224/1378
... Molybdenum [Mo] as principal constituent
H01L 2224/13781
... Tantalum [Ta] as principal constituent
H01L 2224/13783
... Rhenium [Re] as principal constituent
H01L 2224/13784
... Tungsten [W] as principal constituent
H01L 2224/13786
... with a principal constituent of the material being a non metallic, non metalloid inorganic material
H01L 2224/13787
... Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13788)
H01L 2224/13788
... Glasses, e.g. amorphous oxides, nitrides or fluorides
H01L 2224/1379
... with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
H01L 2224/13791
... The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
H01L 2224/13793
... with a principal constituent of the material being a solid not provided for in groups H01L 2224/1377 - H01L 2224/13791, e.g. allotropes of carbon, fullerene, graphite, carbon- nanotubes, diamond
H01L 2224/13794
... with a principal constituent of the material being a liquid not provided for in groups H01L 2224/1377 - H01L 2224/13791
H01L 2224/13795
... with a principal constituent of the material being a gas not provided for in groups H01L 2224/1377 - H01L 2224/13791
H01L 2224/13798
... Fillers
H01L 2224/13799
... Base material
H01L 2224/138
... with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
H01L 2224/13801
... the principal constituent melting at a temperature of less than 400°C
H01L 2224/13805
... Gallium [Ga] as principal constituent
H01L 2224/13809
... Indium [In] as principal constituent
H01L 2224/13811
... Tin [Sn] as principal constituent
H01L 2224/13813
... Bismuth [Bi] as principal constituent
H01L 2224/13814
... Thallium [Tl] as principal constituent
H01L 2224/13816
... Lead [Pb] as principal constituent
H01L 2224/13817
... the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
H01L 2224/13818
... Zinc [Zn] as principal constituent
H01L 2224/1382
... Antimony [Sb] as principal constituent
H01L 2224/13823
... Magnesium [Mg] as principal constituent
H01L 2224/13824
... Aluminium [Al] as principal constituent
H01L 2224/13838
... the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
H01L 2224/13839
... Silver [Ag] as principal constituent
H01L 2224/13844
... Gold [Au] as principal constituent
H01L 2224/13847
... Copper [Cu] as principal constituent
H01L 2224/13849
... Manganese [Mn] as principal constituent
H01L 2224/13855
... Nickel [Ni] as principal constituent
H01L 2224/13857
... Cobalt [Co] as principal constituent
H01L 2224/1386
... Iron [Fe] as principal constituent
H01L 2224/13863
... the principal constituent melting at a temperature of greater than 1550°C
H01L 2224/13864
... Palladium [Pd] as principal constituent
H01L 2224/13866
... Titanium [Ti] as principal constituent
H01L 2224/13869
... Platinum [Pt] as principal constituent
H01L 2224/1387
... Zirconium [Zr] as principal constituent
H01L 2224/13871
... Chromium [Cr] as principal constituent
H01L 2224/13872
... Vanadium [V] as principal constituent
H01L 2224/13873
... Rhodium [Rh] as principal constituent
H01L 2224/13876
... Ruthenium [Ru] as principal constituent
H01L 2224/13878
... Iridium [Ir] as principal constituent
H01L 2224/13879
... Niobium [Nb] as principal constituent
H01L 2224/1388
... Molybdenum [Mo] as principal constituent
H01L 2224/13881
... Tantalum [Ta] as principal constituent
H01L 2224/13883
... Rhenium [Re] as principal constituent
H01L 2224/13884
... Tungsten [W] as principal constituent
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the material being a solid not provided for in groups H01L 2224/138 - H01L 2224/13891
e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/138 - H01L 2224/13891

with a principal constituent of the material being a gas not provided for in groups H01L 2224/138 - H01L 2224/13891

with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13888)
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the material being a solid not provided for in groups H01L 2224/138 - H01L 2224/13891
e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/138 - H01L 2224/13891

with a principal constituent of the material being a gas not provided for in groups H01L 2224/138 - H01L 2224/13891

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

with a principal constituent melting at a temperature of less than 400°C
Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [Tl] as principal constituent
Lead [Pb] as principal constituent

with a principal constituent melting at a temperature of greater than 1550°C
Tungsten [W] as principal constituent
Rhenium [Re] as principal constituent
Tantalum [Ta] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent

with a principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Iridium [Ir] as principal constituent
Rhodium [Rh] as principal constituent

with a principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
Platinum [Pt] as principal constituent

Coating material
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Copper [Cu] as principal constituent
with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13988)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicons, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/139 - H01L 2224/13991, e.g. allotropes of carbon, fullerenes, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/139 - H01L 2224/13991

with a principal constituent of the material being a gas not provided for in groups H01L 2224/139 - H01L 2224/13991

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Shape or distribution of the fillers

of a plurality of bump connectors

Bump connectors having different sizes, e.g. different diameters, heights or widths

Shape

Bump connectors having different shapes

Disposition relative to the bonding areas, e.g. bond pads, of the semiconductor or solid-state body

the bump connectors being bonded to at least one common bonding area

Layout

Square or rectangular array

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

Circular array, i.e. array with radial symmetry

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

Random layout, i.e. layout with no symmetry

with a staggered arrangement

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

Combinations of arrays with different layouts

Corner adaptations, i.e. disposition of the bump connectors at the corners of the semiconductor or solid-state body

being disposed on at least two different sides of the body, e.g. dual array

On opposite sides of the body

On contiguous sides of the body

Material

Bump connectors having different materials

Function

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Bump connectors having different functions
including bump connectors providing primarily mechanical bonding
including bump connectors providing primarily thermal dissipation
Structure, shape, material or disposition of the bump connectors after the connecting process
of an individual bump connector
Structure relative to the bonding area, e.g. bond pad
the bump connector being larger than the bonding area, e.g. bond pad
the bump connector being smaller than the bonding area, e.g. bond pad
Shape in top view
being rectangular or square
being circular or elliptic
comprising protrusions or indentations
in side view
being non uniform along the bump connector
comprising protrusions or indentations
of bonding interfaces, e.g. interlocking features
Disposition relative to the bonding area, e.g. bond pad
the bump connector connecting bonding areas being not aligned with respect to each other
the bump connector connecting one bonding area to at least two respective bonding areas
the bump connector not being orthogonal to the surface
the bump connector being disposed in a recess of the surface
the bump connector being at least partially embedded in the surface
the whole bump connector protruding from the surface
the bump connector connecting within a semiconductor or solid-state body, i.e. connecting two bonding areas on the same semiconductor or solid-state body
the bump connector connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
the bodies being arranged next to each other, e.g. on a common substrate
the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
the bodies being stacked
the bump connector connecting to a via connection in the semiconductor or solid-state body
the bump connector connecting to a bonding area disposed in a recess of the surface
the bump connector connecting to a bonding area protruding from the surface
the bump connector connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
the body and the item being arranged next to each other, e.g. on a common substrate
the item being non-metallic, e.g. being an insulating substrate with or without metallisation
the bump connector connecting to a bond pad of the item
the bump connector connecting to a pin of the item
the bump connector connecting to a potential ring of the item
the bump connector connecting to a via metallisation of the item
the bump connector connecting to a bonding area disposed in a recess of the surface of the item
the bump connector connecting to a bonding area protruding from the surface of the item
the item being metallic
the bump connector connecting to a potential ring of the item
the bump connector connecting to a bonding area disposed in a recess of the surface of the item
the bump connector connecting to a bonding area protruding from the surface of the item
the item being a discrete passive component
the bump connector connecting to a bonding area disposed in a recess of the surface of the item
the bump connector connecting to a bonding area protruding from the surface of the item
the body and the item being stacked
the item being non-metallic, e.g. insulating substrate with or without metallisation
the bump connector connecting to a bond pad of the item
the bump connector connecting to a pin of the item
the bump connector connecting to a potential ring of the item
the bump connector connecting to a via metallisation of the item
the bump connector connecting to a bonding area disposed in a recess of the surface of the item
H01L

2224/16238 ............ the bump connector connecting to a bonding area protruding from the surface of the item
2224/1624 ............ the bump connector connecting between the body and an opposite side of the item with respect to the body
2224/16245 ............ the item being metallic
2224/16253 ............ the bump connector connecting to a potential ring of the item
2224/16257 ............ the bump connector connecting to a bonding area disposed in a recess of the surface of the item
2224/16258 ............ the bump connector connecting to a bonding area protruding from the surface of the item
2224/1626 ............ the bump connector connecting between the body and an opposite side of the item with respect to the body
2224/16265 ............ the item being a discrete passive component
2224/16267 ............ the bump connector connecting to a bonding area disposed in a recess of the surface of the item
2224/16268 ............ the bump connector connecting to a bonding area protruding from the surface of the item

2224/165 ............ Material
2224/16501 ............ at the bonding interface
2224/16502 ............ comprising an eutectic alloy
2224/16503 ............ comprising an intermetallic compound
2224/16505 ............ outside the bonding interface, e.g. in the bulk of the bump connector
2224/16506 ............ comprising an eutectic alloy
2224/16507 ............ comprising an intermetallic compound
2224/17 ............ of a plurality of bump connectors
2224/1701 ............ Structure
2224/1703 ............ Bump connectors having different sizes, e.g. different diameters, heights or widths
2224/1705 ............ Shape
2224/17051 ............ Bump connectors having different shapes
2224/17055 ............ of their bonding interfaces
2224/171 ............ Disposition
2224/17104 ............ relative to the bonding areas, e.g. bond pads
2224/17106 ............ the bump connectors being bonded to at least one common bonding area
2224/17107 ............ the bump connectors connecting two common bonding areas
2224/1712 ............ Layout (layout of bump connectors prior to the connecting process H01L 2224/1412)
2224/1713 ............ Square or rectangular array
2224/17132 ............ being non uniform, i.e. having a non uniform pitch across the array
2224/17133 ............ with a staggered arrangement, e.g. depopulated array
2224/17134 ............ covering only portions of the surface to be connected

2224/17135 ............ Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/17136 ............ Covering only the central area of the surface to be connected, i.e. central arrangements
2224/1714 ............ Circular array, i.e. array with radial symmetry
2224/17142 ............ being non uniform, i.e. having a non uniform pitch across the array
2224/17143 ............ with a staggered arrangement
2224/17144 ............ covering only portions of the surface to be connected
2224/17145 ............ Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/17146 ............ Covering only the central area of the surface to be connected, i.e. central arrangements
2224/1715 ............ Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry
2224/17151 ............ being uniform, i.e. having a uniform pitch across the array
2224/17152 ............ being non uniform, i.e. having a non uniform pitch across the array
2224/17153 ............ with a staggered arrangement, e.g. depopulated array
2224/17154 ............ covering only portions of the surface to be connected
2224/17155 ............ Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/17156 ............ Covering only the central area of the surface to be connected, i.e. central arrangements
2224/1716 ............ Random layout, i.e. layout with no symmetry
2224/17163 ............ with a staggered arrangement
2224/17164 ............ covering only portions of the surface to be connected
2224/17165 ............ Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/17166 ............ Covering only the central area of the surface to be connected, i.e. central arrangements
2224/1717 ............ Combinations of arrays with different layouts
2224/17179 ............ Corner adaptations, i.e. disposition of the bump connectors at the corners of the semiconductor or solid-state body
2224/1718 ............ being disposed on at least two different sides of the body, e.g. dual array
2224/17181 ............ On opposite sides of the body
2224/17183 ............ On contiguous sides of the body
2224/175 ............ Material
2224/17505 ............ Bump connectors having different materials
2224/1751 ............ Function
2224/17515 ............ Bump connectors having different functions
2224/17517 ............ including bump connectors providing primarily mechanical support
Manufacturing methods related thereto
High density interconnect [HDI] connectors;
manufacturing methods of high density interconnect preforms
Structure, shape, material or disposition of high density interconnect preforms
Structure, shape, material or disposition of high density interconnect preforms of an individual HDI interconnect

of an individual high density interconnect connector
Structure
Deposited, e.g. MCM-D type
Laminated, e.g. MCM-L type
Shape
Conformal with the semiconductor or solid-state device
Disposition
Connecting bonding areas at the same height
Connecting bonding areas at different heights
Connecting within a semiconductor or solid-state body
Connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
the bodies being arranged next to each other, e.g. on a common substrate
the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
the bodies being stacked
the HDI interconnect connecting to the same level of the lower semiconductor or solid-state body, at which the upper semiconductor or solid-state body is mounted
the HDI interconnect not connecting to the same level of the lower semiconductor or solid-state body at which the upper semiconductor or solid-state body is mounted, e.g. the upper semiconductor or solid-state body being mounted in a cavity or on a protrusion of the lower semiconductor or solid-state body

Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
the body and the item being arranged next to each other, e.g. on a common substrate
the item being non-metallic, e.g. insulating substrate with or without metallisation
the item being metallic
the item being a discrete passive component
the body and the item being stacked
to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
the item being metallic
the HDI interconnect connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
the item being a discrete passive component
Connecting portions
Material
Auxiliary members for HDI interconnects, e.g. spacers, alignment aids
Reinforcing structures, e.g. ramp-like support
of a plurality of high density interconnect connectors
Connecting at different heights

Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
the body and the item being arranged next to each other, e.g. on a common substrate
the item being non-metallic, e.g. insulating substrate with or without metallisation
the item being metallic
the item being a discrete passive component
the body and the item being stacked
to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
the item being metallic
the HDI interconnect connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
the item being a discrete passive component
Connecting portions
Material
Auxiliary members for HDI interconnects, e.g. spacers, alignment aids
Reinforcing structures, e.g. ramp-like support
of a plurality of high density interconnect connectors
Connecting at different heights

Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
the body and the item being arranged next to each other, e.g. on a common substrate
the item being non-metallic, e.g. insulating substrate with or without metallisation
the item being metallic
the item being a discrete passive component
the body and the item being stacked
to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
the item being metallic
the HDI interconnect connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
the item being a discrete passive component
Connecting portions
Material
Auxiliary members for HDI interconnects, e.g. spacers, alignment aids
Reinforcing structures, e.g. ramp-like support
of a plurality of high density interconnect connectors
Connecting at different heights
2224/2511 . . . . . . . the connectors being bonded to at least one common bonding area
2224/25111 . . . . . . . the connectors connecting two common bonding areas
2224/25112 . . . . . . . the connectors connecting a common bonding area on the semiconductor or solid-state body to different bonding areas outside the body
2224/25113 . . . . . . . the connectors connecting different bonding areas on the semiconductor or solid-state body to a common bonding area outside the body
2224/2512 . . . . . . . Layout
2224/25171 . . . . . . . Fan-out arrangements
2224/25174 . . . . . . . Stacked arrangements
2224/25175 . . . . . . . Parallel arrangements
2224/25177 . . . . . . . Combinations of a plurality of arrangements
2224/2518 . . . . . . . being disposed on at least two different sides of the body, e.g. dual array
2224/254 . . . . . . . Connecting portions
2224/2541 . . . . . . . the connecting portions being stacked
2224/2543 . . . . . . . the connecting portions being staggered
2224/255 . . . . . . . Material
2224/26 . . . . . . . Layer connectors, e.g. plate connectors, solder or adhesive layers; Manufacturing methods related thereto
2224/2612 . . . . . . . Auxiliary members for layer connectors, e.g. spacers
2224/26122 . . . . . . . being formed on the semiconductor or solid-state body to be connected
2224/26125 . . . . . . . Reinforcing structures
2224/26135 . . . . . . . Alignment aids
2224/26145 . . . . . . . Flow barriers
2224/26152 . . . . . . . being formed on an item to be connected not being a semiconductor or solid-state body
2224/26155 . . . . . . . Reinforcing structures
2224/26165 . . . . . . . Alignment aids
2224/26175 . . . . . . . Flow barriers
2224/27 . . . . . . . Manufacturing methods
2224/27001 . . . . . . . Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate
2224/27002 . . . . . . . for supporting the semiconductor or solid-state body
2224/27003 . . . . . . . for holding or transferring the layer preform
2224/27005 . . . . . . . for aligning the layer connector, e.g. marks, spacers
2224/27009 . . . . . . . for protecting parts during manufacture
2224/27011 . . . . . . . Involving a permanent auxiliary member, i.e. a member which is left at least partly in the finished device, e.g. coating, dummy feature
2224/27013 . . . . . . . for holding or confining the layer connector, e.g. solder flow barrier
2224/27015 . . . . . . . for aligning the layer connector, e.g. marks, spacers
2224/27019 . . . . . . . for protecting parts during the process
2224/271 . . . . . . . Manufacture and pre-treatment of the layer connector preform
2224/2711 . . . . . . . Shaping
2224/2712 . . . . . . . Applying permanent coating
2224/273 . . . . . . . by local deposition of the material of the layer connector
2224/2731 . . . . . . . in liquid form
2224/27312 . . . . . . . Continuous flow, e.g. using a microsyringe, a pump, a nozzle or extrusion
2224/27318 . . . . . . . by dispensing droplets
2224/2732 . . . . . . . Screen printing, i.e. using a stencil
2224/2733 . . . . . . . in solid form
2224/27332 . . . . . . . using a powder
2224/27334 . . . . . . . using preformed layer
2224/274 . . . . . . . by blanket deposition of the material of the layer connector
2224/2741 . . . . . . . in liquid form
2224/27416 . . . . . . . Spin coating
2224/27418 . . . . . . . Spray coating
2224/2742 . . . . . . . Curtain coating
2224/27422 . . . . . . . by dipping, e.g. in a solder bath (hot-dipping C23C 2/00)
2224/27424 . . . . . . . Immersion coating, e.g. in a solder bath (immersion processes C23C 2/00)
2224/27426 . . . . . . . Chemical solution deposition [CSD], i.e. using a liquid precursor
2224/27428 . . . . . . . Wave coating
2224/2743 . . . . . . . in solid form
2224/27436 . . . . . . . Lamination of a preform, e.g. foil, sheet or layer
2224/27438 . . . . . . . the preform being at least partly pre-patterned
2224/2744 . . . . . . . by transfer printing
2224/27442 . . . . . . . using a powder
2224/27444 . . . . . . . in gaseous form
2224/2745 . . . . . . . Physical vapour deposition [PVD], e.g. evaporation, or sputtering
2224/27452 . . . . . . . Chemical vapour deposition [CVD], e.g. laser CVD
2224/2746 . . . . . . . Plating
2224/27462 . . . . . . . Electroplating
2224/27464 . . . . . . . Electroless plating
2224/27466 . . . . . . . Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface
2224/2747 . . . . . . . using a lift-off mask
2224/27472 . . . . . . . Profile of the lift-off mask
2224/27474 . . . . . . . Multilayer masks
2224/2748 . . . . . . . Permanent masks, i.e. masks left in the finished device, e.g. passivation layers
2224/275 . . . . . . . by chemical or physical modification of a pre-existing or pre-deposited material
2224/27502 . . . . . . . Pre-existing or pre-deposited material
2224/27505 . . . . . . . Sintering
2224/2751 . . . . . . . Anodisation
2224/27515 . . . . . . . Curing and solidification, e.g. of a photosensitive layer material
2224/2752 . . . . . . . Self-assembly, e.g. self-agglomeration of the layer material in a fluid
2224/27522 . . . . . . . Auxiliary means therefor, e.g. for self-assembly activation
2224/27524 . . . . . . . with special adaptation of the surface or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process
Steps involving a specific sequence of method

Methods of manufacturing layer connectors

Involving monitoring, e.g. feedback loop

Post-treatment of the layer connector

Cleaning, e.g. oxide removal step, desmearing

Applying permanent coating, e.g. in-situ coating

Spray coating

by dipping, e.g. in a solder bath

Immersion coating, e.g. in a solder bath

Chemical solution deposition [CSD], i.e. using a liquid precursor

Plating, e.g. electroplating, electroless plating

Physical vapour deposition [PVD], e.g. evaporation, or sputtering

Chemical vapour deposition [CVD], e.g. laser CVD

Reworking, e.g. shaping (reflowing [H01L 2224/27849])

involving a chemical process, e.g. etching the layer connector

involving a mechanical process, e.g. planarising the layer connector

Chemical mechanical polishing [CMP]

Thermal treatments, e.g. annealing, controlled cooling

Reflowing

Methods of manufacturing layer connectors involving a specific sequence of method steps

with repetition of the same manufacturing step

Multiple masking steps

using different masks

with modification of the same mask

Forming a passivation layer after forming the layer connector

the layer being used as a mask for patterning other parts

a passivation layer being used as a mask for patterning other parts

Structure, shape, material or disposition of the layer connectors prior to the connecting process

Layer connectors formed on an encapsulation of the semiconductor or solid-state body, e.g. layer connectors on chip-scale packages

of an individual layer connector

Core members of the layer connector

Structure

Layer connector larger than the underlying bonding area

Layer connector smaller than the underlying bonding area

Layer connector integrally formed with a redistribution layer on the semiconductor or solid-state body

Layer connector integrally formed with a via connection of the semiconductor or solid-state body

Shape

comprising apertures or cavities

in top view

being rectangular or square

being circular or elliptic

comprising protrusions or indentations

in side view

being non uniform along the layer connector

comprising protrusions or indentations

at the bonding interface of the layer connector, i.e. on the surface of the layer connector

the layer connector being disposed in a recess of the surface (embedded layer connector [H01L 2224/29022])

the layer connector being at least partially embedded in the surface

the whole layer connector protruding from the surface

the layer connector being disposed on a redistribution layer on the semiconductor or solid-state body

relative to the bonding area, e.g. bond pad, of the semiconductor or solid-state body

the layer connector being offset with respect to the bonding area, e.g. bond pad

the layer connector being disposed on at least two separate bonding areas, e.g. bond pads

the layer connector covering only portions of the surface to be connected
Material

Plural core members of polonium [Po], and alloys thereof antimony [Sb], tellurium [Te] and silicon [Si], germanium [Ge], arsenic [As], metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof being mutually engaged together, e.g. through inserts being disposed next to each other, e.g. side-to-side arrangements being stacked Two-layer arrangements

Three-layer arrangements Four-layer arrangements

Material being a hybrid of two or more materials in the form of a composite or with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po]

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics)

Glass, e.g. amorphous oxides, nitrides or fluorides

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a non metallic, non metalloid inorganic material

The principal constituent being a polymer, e.g. polyester, phenolic based polymer, epoxy

Material of the matrix
<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>2224/292</td>
<td>with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof</td>
</tr>
<tr>
<td>2224/2901</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
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<tr>
<td>2224/2905</td>
<td>Gallium [Ga] as principal constituent</td>
</tr>
<tr>
<td>2224/2909</td>
<td>Indium [In] as principal constituent</td>
</tr>
<tr>
<td>2224/2911</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/2913</td>
<td>Bismuth [Bi] as principal constituent</td>
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<tr>
<td>2224/2914</td>
<td>Thallium [Tl] as principal constituent</td>
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<tr>
<td>2224/2916</td>
<td>Lead [Pb] as principal constituent</td>
</tr>
<tr>
<td>2224/2917</td>
<td>the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C</td>
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<tr>
<td>2224/2918</td>
<td>Zinc [Zn] as principal constituent</td>
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<tr>
<td>2224/2922</td>
<td>Antimony [Sb] as principal constituent</td>
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<tr>
<td>2224/2923</td>
<td>Magnesium [Mg] as principal constituent</td>
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<tr>
<td>2224/2924</td>
<td>Aluminium [Al] as principal constituent</td>
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<td>the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C</td>
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<td>Silver [Ag] as principal constituent</td>
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<td>Gold [Au] as principal constituent</td>
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<td>Copper [Cu] as principal constituent</td>
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<td>Manganese [Mn] as principal constituent</td>
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<td>Nickel [Ni] as principal constituent</td>
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<td>2224/2934</td>
<td>Cobalt [Co] as principal constituent</td>
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<td>2224/2935</td>
<td>Iron [Fe] as principal constituent</td>
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<td>2224/2936</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
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<td>2224/2937</td>
<td>Palladium [Pd] as principal constituent</td>
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<td>Titanium [Ti] as principal constituent</td>
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<td>Platinum [Pt] as principal constituent</td>
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<td>Zirconium [Zr] as principal constituent</td>
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<td>2224/2941</td>
<td>Chromium [Cr] as principal constituent</td>
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<td>2224/2942</td>
<td>Vanadium [V] as principal constituent</td>
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<td>2224/2943</td>
<td>Rhodium [Rh] as principal constituent</td>
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<td>Ruthenium [Ru] as principal constituent</td>
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<td>Iridium [Ir] as principal constituent</td>
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<td>Tantalum [Ta] as principal constituent</td>
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<tr>
<td>2224/2949</td>
<td>Rhenium [Re] as principal constituent</td>
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<tr>
<td>2224/2950</td>
<td>Tungsten [W] as principal constituent</td>
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<tr>
<td>2224/2951</td>
<td>Lead [Pb] as principal constituent</td>
</tr>
<tr>
<td>2224/2952</td>
<td>Thallium [Tl] as principal constituent</td>
</tr>
<tr>
<td>2224/2953</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/2954</td>
<td>Indium [In] as principal constituent</td>
</tr>
<tr>
<td>2224/2955</td>
<td>Gallium [Ga] as principal constituent</td>
</tr>
</tbody>
</table>

H01L
H01L

2224/29309  Indium [In] as principal constituent
2224/29311  Tin [Sn] as principal constituent
2224/29313  Bismuth [Bi] as principal constituent
2224/29314  Thallium [Tl] as principal constituent
2224/29316  Lead [Pb] as principal constituent
2224/29317  the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/29318  Zinc [Zn] as principal constituent
2224/2932  Antimony [Sb] as principal constituent
2224/29323  Magnesium [Mg] as principal constituent
2224/29324  Aluminium [Al] as principal constituent
2224/29338  the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/29339  Silver [Ag] as principal constituent
2224/29344  Gold [Au] as principal constituent
2224/29347  Copper [Cu] as principal constituent
2224/29349  Manganese [Mn] as principal constituent
2224/29355  Nickel [Ni] as principal constituent
2224/29357  Cobalt [Co] as principal constituent
2224/2936  Iron [Fe] as principal constituent
2224/29363  the principal constituent melting at a temperature of greater than 1550°C
2224/29364  Palladium [Pd] as principal constituent
2224/29366  Titanium [Ti] as principal constituent
2224/29369  Platinum [Pt] as principal constituent
2224/2937  Zirconium [Zr] as principal constituent
2224/29371  Chromium [Cr] as principal constituent
2224/29372  Vanadium [V] as principal constituent
2224/29373  Rhodium [Rh] as principal constituent
2224/29376  Ruthenium [Ru] as principal constituent
2224/29378  Iridium [Ir] as principal constituent
2224/29379  Niobium [Nb] as principal constituent
2224/2938  Molybdenum [Mo] as principal constituent
2224/29381  Tantalum [Ta] as principal constituent
2224/29383  Rhenium [Re] as principal constituent
2224/29384  Tungsten [W] as principal constituent
2224/29386  with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29387  Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29388)
2224/29388  Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/29389  with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/2939  The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29391  with a principal constituent of the material being a solid not provided for in groups H01L 2224/29391 - H01L 2224/29391, e.g. allotropes of carbon, fullerene, graphite, carbon nanotubes, diamond
2224/29392  with a principal constituent of the material being a liquid not provided for in groups H01L 2224/29391 - H01L 2224/29391
2224/29395  with a principal constituent of the material being a gas not provided for in groups H01L 2224/29391 - H01L 2224/29391
2224/29398  with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/29399  Coating material
2224/294  with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/2940  the principal constituent melting at a temperature of less than 400°C
2224/29401  Gallium [Ga] as principal constituent
2224/29405  Indium [In] as principal constituent
2224/29409  Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29488)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/294 - H01L 2224/29491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/294 - H01L 2224/29491

with a principal constituent of the material being a gas not provided for in groups H01L 2224/294 - H01L 2224/29491

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Shape or distribution of the fillers

Coating

Structure

Shape

being non uniform

comprising protrusions or indentations

at the bonding interface of the layer connector, i.e. on the surface of the layer connector

Disposition

On the entire surface of the core, i.e. integral coating

On the entire exposed surface of the core

Only on parts of the surface of the core, i.e. partial coating

Only on the bonding interface of the layer connector

Only outside the bonding interface of the layer connector

H01L 2224/294
Material of the matrix

- Single coating layer
- Plural coating layers
- being mutually engaged together, e.g. through inserts
- being disposed next to each other, e.g. side-to-side arrangements
- being stacked
- Two-layer coating
- Three-layer coating
- Four-layer coating

2224/29699

Material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

- Gallium [Ga] as principal constituent
- Indium [In] as principal constituent
- Tin [Sn] as principal constituent
- Bismuth [Bi] as principal constituent
- Thallium [Tl] as principal constituent
- Lead [Pb] as principal constituent
- Zinc [Zn] as principal constituent
- Antimony [Sb] as principal constituent
- Magnesium [Mg] as principal constituent
- Aluminium [Al] as principal constituent
- the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
- the principal constituent melting at a temperature of greater than 950°C and less than 1550°C
- Silver [Ag] as principal constituent
- Gold [Au] as principal constituent
- Copper [Cu] as principal constituent
- Manganese [Mn] as principal constituent
- Nickel [Ni] as principal constituent
- Cobalt [Co] as principal constituent
- Iron [Fe] as principal constituent
- Palladium [Pd] as principal constituent

- Titanium [Ti] as principal constituent
- Platinum [Pt] as principal constituent
- Zirconium [Zr] as principal constituent
- Chromium [Cr] as principal constituent
- Vanadium [V] as principal constituent
- Rhodium [Rh] as principal constituent
- Ruthenium [Ru] as principal constituent
- Iridium [Ir] as principal constituent
- Niobium [Nb] as principal constituent
- Molybdenum [Mo] as principal constituent
- Tantalum [Ta] as principal constituent
- Rhenium [Re] as principal constituent
- Tungsten [W] as principal constituent
- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/2968)
- Glasses, e.g. amorphous oxides, nitrides or fluorides
- The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- with a principal constituent of the material being a solid not provided for in groups H01L 2224/296 - H01L 2224/29691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- with a principal constituent of the material being a liquid not provided for in groups H01L 2224/296 - H01L 2224/29691
- with a principal constituent of the material being a gas not provided for in groups H01L 2224/296 - H01L 2224/29691
- with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Material of the matrix

- H01L 2224/29699
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof.

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of less than 400°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L.2224/29791, e.g. allotropes of carbon, fullerene, graphite, carbon nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L.2224/29791

with a principal constituent of the material being a gas not provided for in groups H01L.2224/29791

Fillers

Base material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent
Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbidies, nitrides or oxides

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/298 - H01L 2224/29891, e.g. allotropes of carbon, fullerene, graphite, carbon nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/298 - H01L 2224/29891

with a principal constituent of the material being a gas not provided for in groups H01L 2224/298 - H01L 2224/29891

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Coating material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent
2224/29913 ................. Bismuth [Bi] as principal constituent
2224/29914 ................. Thallium [Tl] as principal constituent
2224/29916 ................. Lead [Pb] as principal constituent
2224/29917 ................. the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/29918 ................. Zinc [Zn] as principal constituent
2224/2992 ................. Antimony [Sb] as principal constituent
2224/29923 ................. Magnesium [Mg] as principal constituent
2224/29924 ................. Aluminium [Al] as principal constituent
2224/29938 ................. the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/29939 ................. Silver [Ag] as principal constituent
2224/29944 ................. Gold [Au] as principal constituent
2224/29947 ................. Copper [Cu] as principal constituent
2224/29949 ................. Manganese [Mn] as principal constituent
2224/29955 ................. Nickel [Ni] as principal constituent
2224/29957 ................. Cobalt [Co] as principal constituent
2224/2996 ................. Iron [Fe] as principal constituent
2224/29963 ................. the principal constituent melting at a temperature of greater than 1550°C
2224/29964 ................. Palladium [Pd] as principal constituent
2224/29966 ................. Titanium [Ti] as principal constituent
2224/29969 ................. Platinum [Pt] as principal constituent
2224/2997 ................. Zirconium [Zr] as principal constituent
2224/29971 ................. Chromium [Cr] as principal constituent
2224/29972 ................. Vanadium [V] as principal constituent
2224/29973 ................. Rhodium [Rh] as principal constituent
2224/29976 ................. Ruthenium [Ru] as principal constituent
2224/29978 ................. Iridium [Ir] as principal constituent
2224/29979 ................. Niobium [Nb] as principal constituent
2224/2998 ................. Molybdenum [Mo] as principal constituent
2224/29981 ................. Tantalum [Ta] as principal constituent
2224/29983 ................. Rhenium [Re] as principal constituent
2224/29984 ................. Tungsten [W] as principal constituent
2224/29986 ................. with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29987 ................. Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29988)
2224/29988 ................. Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/2999 ................. with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29991 ................. The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29993 ................. with a principal constituent of the material being a solid not provided for in groups H01L 2224/299- H01L 2224/29999, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29994 ................. with a principal constituent of the material being a liquid not provided for in groups H01L 2224/299- H01L 2224/29999
2224/29995 ................. with a principal constituent of the material being a gas not provided for in groups H01L 2224/299- H01L 2224/29999
2224/29998 ................. with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/29999 ................. Shape or distribution of the fillers
2224/30 ................. of a plurality of layer connectors
2224/3001 ................. Structure
2224/3003 ................. Layer connectors having different sizes, e.g. different heights or widths
2224/3005 ................. Shape
2224/30051 ................. Layer connectors having different shapes
2224/301 ................. Disposition
2224/30104 ................. relative to the bonding areas, e.g. bond pads, of the semiconductor or solid-state body
2224/3011 ................. the layer connectors being bonded to at least one common bonding area
2224/3012 ................. Layout
2224/3013 ................. Square or rectangular array
2224/30131 ................. being uniform, i.e. having a uniform pitch across the array
2224/30132 ................. being non uniform, i.e. having a non uniform pitch across the array
2224/30133 ................. with a staggered arrangement, e.g. depopulated array
2224/30134 . . . . . . . . covering only portions of the surface to be connected
2224/30135 . . . . . . . . Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/30136 . . . . . . . . Covering only the central area of the surface to be connected, i.e. central arrangements
2224/3014 . . . . . . . . Circular array, i.e. array with radial symmetry
2224/30141 . . . . . . . . being uniform, i.e. having a uniform pitch across the array
2224/30142 . . . . . . . . being non uniform, i.e. having a non uniform pitch across the array
2224/30143 . . . . . . . . covering only portions of the surface to be connected
2224/30145 . . . . . . . . Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/30146 . . . . . . . . Covering only the central area of the surface to be connected, i.e. central arrangements
2224/3015 . . . . . . . . Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry
2224/30151 . . . . . . . . being uniform, i.e. having a uniform pitch across the array
2224/30152 . . . . . . . . being non uniform, i.e. having a non uniform pitch across the array
2224/30153 . . . . . . . . with a staggered arrangement, e.g. depopulated array
2224/30154 . . . . . . . . covering only portions of the surface to be connected
2224/30155 . . . . . . . . Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/30156 . . . . . . . . Covering only the central area of the surface to be connected, i.e. central arrangements
2224/3016 . . . . . . . . Random layout, i.e. layout with no symmetry
2224/30163 . . . . . . . . with a staggered arrangement
2224/30164 . . . . . . . . covering only portions of the surface to be connected
2224/30165 . . . . . . . . Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/30166 . . . . . . . . Covering only the central area of the surface to be connected, i.e. central arrangements
2224/30177 . . . . . . . . Combinations of arrays with different layouts
2224/30179 . . . . . . . . Corner adaptations, i.e. disposition of the layer connectors at the corners of the semiconductor or solid-state body
2224/3018 . . . . . . . . being disposed on at least two different sides of the body, e.g. dual array
2224/30181 . . . . . . . . On opposite sides of the body
2224/30183 . . . . . . . . On contiguous sides of the body
2224/305 . . . . . . . . Material
2224/30505 . . . . . . . . Layer connectors having different materials
2224/3051 . . . . . . . . Function

2224/30515 . . . . . . . . Layer connectors having different functions
2224/30517 . . . . . . . . including layer connectors providing primarily mechanical bonding
2224/30519 . . . . . . . . including layer connectors providing primarily thermal dissipation
2224/31 . . . . . . . . Structure, shape, material or disposition of the layer connectors after the connecting process
2224/32 . . . . . . . . of an individual layer connector
2224/3201 . . . . . . . . Structure
2224/32012 . . . . . . . . relative to the bonding area, e.g. bond pad
2224/32013 . . . . . . . . the layer connector being larger than the bonding area, e.g. bond pad
2224/32014 . . . . . . . . the layer connector being smaller than the bonding area, e.g. bond pad
2224/3205 . . . . . . . . Shape
2224/32052 . . . . . . . . in top view
2224/32053 . . . . . . . . being non uniform along the layer connector
2224/32054 . . . . . . . . being rectangular or square
2224/32055 . . . . . . . . being circular or elliptic
2224/32056 . . . . . . . . comprising protrusions or indentations
2224/32057 . . . . . . . . in side view
2224/32058 . . . . . . . . being non uniform along the layer connector
2224/32059 . . . . . . . . comprising protrusions or indentations
2224/3207 . . . . . . . . of bonding interfaces, e.g. interlocking features
2224/321 . . . . . . . . Disposition
2224/32104 . . . . . . . . relative to the bonding area, e.g. bond pad
2224/32105 . . . . . . . . the layer connector connecting bonding areas being not aligned with respect to each other
2224/32106 . . . . . . . . the layer connector connecting one bonding area to at least two respective bonding areas
2224/32111 . . . . . . . . the layer connector being disposed in a recess of the surface
2224/32112 . . . . . . . . the layer connector being at least partially embedded in the surface
2224/32113 . . . . . . . . the whole layer connector protruding from the surface
2224/3213 . . . . . . . . the layer connector connecting within a semiconductor or solid-state body, i.e. connecting two bonding areas on the same semiconductor or solid-state body
2224/32135 . . . . . . . . the layer connector connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
2224/32137 . . . . . . . . the bodies being arranged next to each other, e.g. on a common substrate
2224/32141 . . . . . . . . the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
2224/32145 . . . . . . . . the layer being stacked
2224/32146 . . . . . . . . the layer connector connecting to a via connection in the semiconductor or solid-state body
the layer connector connecting to a bonding area disposed in a recess of the surface of the item
the layer connector connecting to a bonding area protruding from the surface
the layer connector connecting to a bonding area protruding from the surface
the layer connector connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
the body and the item being arranged next to each other, e.g. on a common substrate
the item being non-metallic, e.g. being an insulating substrate with or without metallisation
the layer connector connecting to a bond pad of the item
the layer connector connecting to a pin of the item
the layer connector connecting to a potential ring of the item
the layer connector connecting to a via metallisation of the item
the layer connector connecting to a bonding area disposed in a recess of the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the item being metallic
the layer connector connecting to a potential ring of the item
the layer connector connecting to a bonding area disposed in a recess of the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting between the body and an opposite side of the item with respect to the body
the item being metallic
the layer connector connecting to a potential ring of the item
the layer connector connecting to a bonding area disposed in a recess of the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting between the body and an opposite side of the item with respect to the body
the item being metallic
the layer connector connecting to a discrete passive component
the layer connector connecting to a bonding area disposed in a recess of the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
the layer connector connecting to a bonding area protruding from the surface of the item
Material
at the bonding interface
comprising an eutectic alloy
comprising an intermetallic compound
outside the bonding interface, e.g. in the bulk of the layer connector
comprising an eutectic alloy
comprising an intermetallic compound
of a plurality of layer connectors
Structure
Layer connectors having different sizes, e.g. different heights or widths
Shape
Layer connectors having different shapes
of their bonding interfaces
Disposition
relative to the bonding areas, e.g. bond pads
the layer connectors being bonded to at least one common bonding area
the layer connectors connecting two common bonding areas
Layout (layout of layer connectors prior to the connecting process)
Square or rectangular array
being non uniform, i.e. having a non uniform pitch across the array
with a staggered arrangement, e.g. depopulated array
covering only portions of the surface to be connected
Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Circular array, i.e. array with radial symmetry

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

Random layout, i.e. layout with no symmetry

with a staggered arrangement

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Combinations of arrays with different layouts

Corner adaptations, i.e. disposition of the layer connectors at the corners of the semiconductor or solid-state body

being disposed on at least two different sides of the body, e.g. dual array

On opposite sides of the body

On contiguous sides of the body

Material

Layer connectors having different materials

Function

Layer connectors having different functions

including layer connectors providing primarily mechanical support

including layer connectors providing primarily thermal dissipation

Strap connectors, e.g. copper straps for grounding power devices; Manufacturing methods related thereto

Manufacturing methods

Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate

Pre-treatment of the preform connector

Applying permanent coating, e.g. in-situ coating

Plating, e.g. electroplating, electroless plating

Mechanical processes

Pulling

Modification of a pre-existing material

Sintering

Anodisation

Involving monitoring, e.g. feedback loop

Post-treatment of the connector

Cleaning, e.g. oxide removal step, desmearing

Applying permanent coating, e.g. in-situ coating

Spray coating

Dip coating

Immersion coating, e.g. solder bath

Chemical solution deposition [CSD], i.e. using a liquid precursor

Plating, e.g. electroplating, electroless plating

Physical vapour deposition [PVD], e.g. evaporation, sputtering

Chemical vapour deposition [CVD], e.g. laser CVD

Reworking

with a chemical process, e.g. with etching of the connector

with a mechanical process, e.g. with flattening of the connector

Thermal treatments, e.g. annealing, controlled cooling

Methods of manufacturing strap connectors involving a specific sequence of method steps

with repetition of the same manufacturing step

Structure, shape, material or disposition of the strap connectors prior to the connecting process

of an individual strap connector

Core members of the connector

Structure

Shape

comprising apertures or cavities

Cross-sectional shape

being non uniform along the connector

Disposition

Plural core members

being mutually engaged together, e.g. through inserts

Side-to-side arrangements

Stacked arrangements

Two-layer arrangements

Three-layer arrangements

Four-layer arrangements

Material
with a principal constituent of the material being a metal or a
metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As],
antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

- Gallium [Ga] as principal constituent
- Indium [In] as principal constituent
- Tin [Sn] as principal constituent
- Bismuth [Bi] as principal constituent
- Thallium [Tl] as principal constituent
- Lead [Pb] as principal constituent
- Zinc [Zn] as principal constituent
- Antimony [Sb] as principal constituent
- Magnesium [Mg] as principal constituent
- Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or
equal to 400°C and less than 950°C

- Nickel [Ni] as principal constituent
- Cobalt [Co] as principal constituent
- Iron [Fe] as principal constituent
- Palladium [Pd] as principal constituent
- Titanium [Ti] as principal constituent
- Platinum [Pt] as principal constituent
- Zirconium [Zr] as principal constituent
- Chromium [Cr] as principal constituent
- Vanadium [V] as principal constituent
- Rhodium [Rh] as principal constituent
- Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non
metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides
(glass ceramics H01L 2224/37188)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g.
polyester, phenolic based polymer, epoxy

The principal constituent being an
elastomer, e.g. silicones, isoprene,
neoprene

with a principal constituent of the material being a solid
not provided for in groups

H01L 2224/371 - H01L 2224/37191,
e.g. allotropes of carbon, fullerene,
graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid
not provided for in groups

H01L 2224/371 - H01L 2224/37191

with a principal constituent of the material being a gas
not provided for in groups

H01L 2224/371 - H01L 2224/37191

with a principal constituent of the material being a combination of two
or more materials in the form of a
matrix with a filler, i.e. being a hybrid
material, e.g. segmented structures,
foams

Material of the matrix

with a principal constituent of the material being a metal or a
metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic
[As], antimony [Sb], tellurium [Te] and polonium [Po], and
alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent

H01L 2224/371 - H01L 2224/37191

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<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2224/37213</td>
<td>Bismuth [Bi] as principal constituent</td>
</tr>
<tr>
<td>2224/37214</td>
<td>Thallium [Tl] as principal constituent</td>
</tr>
<tr>
<td>2224/37216</td>
<td>Lead [Pb] as principal constituent</td>
</tr>
<tr>
<td>2224/37217</td>
<td>Zinc [Zn] as principal constituent</td>
</tr>
<tr>
<td>2224/37218</td>
<td>Antimony [Sb] as principal constituent</td>
</tr>
<tr>
<td>2224/37219</td>
<td>Magnesium [Mg] as principal constituent</td>
</tr>
<tr>
<td>2224/37224</td>
<td>Aluminiunm [Al] as principal constituent</td>
</tr>
<tr>
<td>2224/37238</td>
<td>the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C</td>
</tr>
<tr>
<td>2224/37239</td>
<td>Silver [Ag] as principal constituent</td>
</tr>
<tr>
<td>2224/37244</td>
<td>Gold [Au] as principal constituent</td>
</tr>
<tr>
<td>2224/37247</td>
<td>Copper [Cu] as principal constituent</td>
</tr>
<tr>
<td>2224/37249</td>
<td>Manganese [Mn] as principal constituent</td>
</tr>
<tr>
<td>2224/37255</td>
<td>Nickel [Ni] as principal constituent</td>
</tr>
<tr>
<td>2224/37257</td>
<td>Cobalt [Co] as principal constituent</td>
</tr>
<tr>
<td>2224/3726</td>
<td>Iron [Fe] as principal constituent</td>
</tr>
<tr>
<td>2224/37263</td>
<td>the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C</td>
</tr>
<tr>
<td>2224/37264</td>
<td>Palladium [Pd] as principal constituent</td>
</tr>
<tr>
<td>2224/37266</td>
<td>Titanium [Ti] as principal constituent</td>
</tr>
<tr>
<td>2224/37269</td>
<td>Platinum [Pt] as principal constituent</td>
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<tr>
<td>2224/3727</td>
<td>Zirconium [Zr] as principal constituent</td>
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<tr>
<td>2224/37271</td>
<td>Chromium [Cr] as principal constituent</td>
</tr>
<tr>
<td>2224/37272</td>
<td>Vanadium [V] as principal constituent</td>
</tr>
<tr>
<td>2224/37273</td>
<td>Rhodium [Rh] as principal constituent</td>
</tr>
<tr>
<td>2224/37276</td>
<td>Ruthenium [Ru] as principal constituent</td>
</tr>
<tr>
<td>2224/37278</td>
<td>Iridium [Ir] as principal constituent</td>
</tr>
<tr>
<td>2224/37279</td>
<td>Niobium [Nb] as principal constituent</td>
</tr>
<tr>
<td>2224/3728</td>
<td>Molybdenum [Mo] as principal constituent</td>
</tr>
<tr>
<td>2224/37281</td>
<td>Tantalum [Ta] as principal constituent</td>
</tr>
<tr>
<td>2224/37283</td>
<td>Rhenium [Re] as principal constituent</td>
</tr>
<tr>
<td>2224/37284</td>
<td>Tungsten [W] as principal constituent</td>
</tr>
<tr>
<td>2224/37286</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>2224/37287</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37288)</td>
</tr>
<tr>
<td>2224/37288</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
</tr>
<tr>
<td>2224/37289</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>2224/37291</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>2224/37293</td>
<td>with a principal constituent of the material being a solid not provided for in groups H01L 2224/372 - H01L 2224/37291, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond</td>
</tr>
<tr>
<td>2224/37294</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/372 - H01L 2224/37291</td>
</tr>
<tr>
<td>2224/37295</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/372 - H01L 2224/37291</td>
</tr>
<tr>
<td>2224/37298</td>
<td>Fillers</td>
</tr>
<tr>
<td>2224/37299</td>
<td>Base material</td>
</tr>
<tr>
<td>2224/373</td>
<td>with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof</td>
</tr>
<tr>
<td>2224/37301</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>2224/37305</td>
<td>Gallium [Ga] as principal constituent</td>
</tr>
<tr>
<td>2224/37309</td>
<td>Indium [In] as principal constituent</td>
</tr>
<tr>
<td>2224/37311</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/37313</td>
<td>Bismuth [Bi] as principal constituent</td>
</tr>
<tr>
<td>2224/37314</td>
<td>Thallium [Tl] as principal constituent</td>
</tr>
<tr>
<td>2224/37316</td>
<td>Lead [Pb] as principal constituent</td>
</tr>
<tr>
<td>2224/37317</td>
<td>the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C</td>
</tr>
<tr>
<td>2224/37318</td>
<td>Zinc [Zn] as principal constituent</td>
</tr>
</tbody>
</table>
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics
\[H01L 2224/37388\])
Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups
\[H01L 2224/373 - H01L 2224/37391\], e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a liquid not provided for in groups
\[H01L 2224/373 - H01L 2224/37391\]
with a principal constituent of the material being a gas not provided for in groups
\[H01L 2224/373 - H01L 2224/37391\]
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
Coating material
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
the principal constituent melting at a temperature of less than 400°C
Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [Tl] as principal constituent
Lead [Pb] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
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.. Aluminium [Al] as principal constituent
2224/37438 ............... the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/37439 ............... Silver [Ag] as principal constituent
2224/37444 ............... Gold [Au] as principal constituent
2224/37447 ............... Copper [Cu] as principal constituent
2224/37449 ............... Manganese [Mn] as principal constituent
2224/37455 ............... Nickel [Ni] as principal constituent
2224/37457 ............... Cobalt [Co] as principal constituent
2224/3746 ............... Iron [Fe] as principal constituent
2224/37463 ............... the principal constituent melting at a temperature of greater than 1550°C
2224/37464 ............... Palladium [Pd] as principal constituent
2224/37466 ............... Titanium [Ti] as principal constituent
2224/37469 ............... Platinum [Pt] as principal constituent
2224/3747 ............... Zirconium [Zr] as principal constituent
2224/37471 ............... Chromium [Cr] as principal constituent
2224/37472 ............... Vanadium [V] as principal constituent
2224/37473 ............... Rhodium [Rh] as principal constituent
2224/37476 ............... Ruthenium [Ru] as principal constituent
2224/37478 ............... Iridium [Ir] as principal constituent
2224/37479 ............... Niobium [Nb] as principal constituent
2224/3748 ............... Molybdenum [Mo] as principal constituent
2224/37481 ............... Tantalum [Ta] as principal constituent
2224/37483 ............... Rhenium [Re] as principal constituent
2224/37484 ............... Tungsten [W] as principal constituent
2224/37486 ............... with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/37487 ............... Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics
H01L 2224/37488)
2224/37488 ............... Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/3749 ............... with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/37491 ............... The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/37493 ............... with a principal constituent of the material being a solid not provided for in groups H01L 2224/374 - H01L 2224/37491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/37494 ............... with a principal constituent of the material being a liquid not provided for in groups H01L 2224/374 - H01L 2224/37491
2224/37495 ............... with a principal constituent of the material being a gas not provided for in groups H01L 2224/374 - H01L 2224/37491
2224/37498 ............... with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/37499 ............... Shape or distribution of the fillers
2224/3754 ............... Coating
2224/37541 ............... Structure
2224/3755 ............... Shape
2224/3756 ............... Disposition, e.g. coating on a part of the core
2224/37565 ............... Single coating layer
2224/3757 ............... Plural coating layers
2224/37572 ............... Two-layer stack coating
2224/37573 ............... Three-layer stack coating
2224/37574 ............... Four-layer stack coating
2224/37576 ............... being mutually engaged together, e.g. through inserts
2224/37578 ............... being disposed next to each other, e.g. side-to-side arrangements
2224/37599 ............... Material
2224/376 ............... with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/37601 ............... the principal constituent melting at a temperature of less than 400°C
2224/37605 ............... Gallium [Ga] as principal constituent
2224/37609 ............... Indium [In] as principal constituent
2224/37611 ............... Tin [Sn] as principal constituent
2224/37613 ............... Bismuth [Bi] as principal constituent
2224/37614 ............... Thallium [Tl] as principal constituent
2224/37616 ............... Lead [Pb] as principal constituent
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37688)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/376 - H01L 2224/37691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/376 - H01L 2224/37691

with a principal constituent of the material being a gas not provided for in groups H01L 2224/376 - H01L 2224/37691

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Material of the matrix

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Iron [Fe] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37688)
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Titanium [Ti] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37787)

Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/377 - H01L 2224/37791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/377 - H01L 2224/37791

with a principal constituent of the material being a gas not provided for in groups H01L 2224/377 - H01L 2224/37791

Fillers

Base material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a solid not provided for in groups H01L 2224/378 - H01L 2224/37891, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/378 - H01L 2224/37891
with a principal constituent of the material being a gas not provided for in groups H01L 2224/378 - H01L 2224/37891
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
the principal constituent melting at a temperature of less than 400°C
Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [Tl] as principal constituent
Lead [Pb] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
 Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
Iridium [Ir] as principal constituent
Ruthenium [Ru] as principal constituent
Rhodium [Rh] as principal constituent
Vanadium [V] as principal constituent
Platinum [Pt] as principal constituent
Titanium [Ti] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a gas not provided for in groups H01L 2224/379 - H01L 2224/37991
Shape or distribution of the fillers
of a plurality of strap connectors
Structure, shape, material or disposition of the strap connectors after the connecting process
of an individual strap connector
of bonding interfaces, e.g. interlocking features
Connecting bonding areas at the same heights, e.g. horizontal bond
Connecting bonding areas at different heights
the connector being orthogonal to a side surface of the semiconductor or solid-state body, e.g. parallel layout
the connector not being orthogonal to a side surface of the semiconductor or solid-state body, e.g. fanned-out connectors, radial layout
the strap connector extending above another semiconductor or solid-state body
Connecting within a semiconductor or solid-state body, i.e. fly strap, bridge strap
with an intermediate bond, e.g. continuous strap daisy chain
Connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
the bodies being arranged next to each other, e.g. on a common substrate
with an intermediate bond, e.g. continuous strap daisy chain
the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
the bodies being stacked
with an intermediate bond, e.g. continuous strap daisy chain
Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
the body and the item being arranged next to each other, e.g. on a common substrate
the item being non-metallic, e.g. insulating substrate with or without metallisation

Connecting the strap to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

Connecting the strap to a pin of the item

Connecting the strap to a potential ring of the item

the item being metallic

Connecting the strap to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

the item being a discrete passive component

Connecting at different heights

Connectors having different shapes

Connectors having different sizes

being formed on the semiconductor or solid-state body

being formed on an item to be connected outside the semiconductor or solid-state body

not being interposed between the connector and the bonding area

Material of the auxiliary connecting means

Auxiliary members for strap connectors, e.g. flow-barriers, spacers

being formed on the semiconductor or solid-state body to be connected

Reinforcing structures

Alignment aids

being formed on an item to be connected not being a semiconductor or solid-state body

Reinforcing structures

Alignment aids

of a plurality of strap connectors

Connectors having different sizes

Connectors having different shapes

Different loop heights

Disposition

Connecting at different heights

on the semiconductor or solid-state body being

outside the semiconductor or solid-state body
H01L

2224/4111 . . . . . . the connectors being bonded to at least one common bonding area, e.g. daisy chain

2224/41111 . . . . . . the connectors connecting two common bonding areas

2224/41112 . . . . . . the connectors connecting a common bonding area on the semiconductor or solid-state body to different bonding areas outside the body, e.g. diverging straps

2224/41113 . . . . . . the connectors connecting different bonding areas on the semiconductor or solid-state body to a common bonding area outside the body, e.g. converging straps

2224/4112 . . . . . . Layout

2224/4117 . . . . . . Crossed straps

2224/41171 . . . . . . Fan-out arrangements

2224/41173 . . . . . . Radial fan-out arrangements

2224/41174 . . . . . . Stacked arrangements

2224/41175 . . . . . . Parallel arrangements

2224/41176 . . . . . . Strap connectors having the same loop shape and height

2224/41177 . . . . . . Combinations of different arrangements

2224/41179 . . . . . . Corner adaptations, i.e. disposition of the strap connectors at the corners of the semiconductor or solid-state body

2224/4118 . . . . . . being disposed on at least two different sides of the body, e.g. dual array

2224/414 . . . . . . Connecting portions

2224/4141 . . . . . . the connecting portions being stacked

2224/41421 . . . . . . on the semiconductor or solid-state body

2224/41422 . . . . . . outside the semiconductor or solid-state body

2224/4143 . . . . . . the connecting portions being staggered

2224/415 . . . . . . Material

2224/41505 . . . . . . Connectors having different materials

2224/42 . . . . . . Wire connectors; Manufacturing methods related thereto

2224/43 . . . . . . Manufacturing methods

2224/43001 . . . . . . Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate

2224/431 . . . . . . Pre-treatment of the preform connector

2224/4312 . . . . . . Applying permanent coating, e.g. in-situ coating

2224/43125 . . . . . . Plating, e.g. electroplating, electroless plating

2224/432 . . . . . . Mechanical processes

2224/4321 . . . . . . Pulling

2224/435 . . . . . . Modification of a pre-existing material

2224/4351 . . . . . . Sintering

2224/4352 . . . . . . Anodisation

2224/437 . . . . . . Involving monitoring, e.g. feedback loop

2224/438 . . . . . . Post-treatment of the connector

2224/4381 . . . . . . Cleaning, e.g. oxide removal step, desmearing

2224/4382 . . . . . . Applying permanent coating, e.g. in-situ coating

2224/43821 . . . . . . Spray coating

2224/43822 . . . . . . Dip coating

2224/43823 . . . . . . Immersion coating, e.g. solder bath

2224/43824 . . . . . . Chemical solution deposition [CSD], i.e. using a liquid precursor

2224/43825 . . . . . . Plating, e.g. electroplating, electroless plating

2224/43826 . . . . . . Physical vapour deposition [PVD], e.g. evaporation, sputtering

2224/43827 . . . . . . Chemical vapour deposition [CVD], e.g. laser CVD

2224/4383 . . . . . . Reworking

2224/43831 . . . . . . with a chemical process, e.g. with etching of the connector

2224/43847 . . . . . . with a mechanical process, e.g. with flattening of the connector

2224/43848 . . . . . . Thermal treatments, e.g. annealing, controlled cooling

2224/43985 . . . . . . Methods of manufacturing wire connectors involving a specific sequence of method steps

2224/43986 . . . . . . with repetition of the same manufacturing step

2224/44 . . . . . . Structure, shape, material or disposition of the wire connectors prior to the connecting process

2224/45 . . . . . . of an individual wire connector

2224/45001 . . . . . Core members of the connector

2224/45005 . . . . . Structure

2224/4501 . . . . . . Shape

2224/45012 . . . . . . Cross-sectional shape

2224/45013 . . . . . being non uniform along the connector

2224/45014 . . . . . . Ribbon connectors, e.g. rectangular cross-section

2224/45015 . . . . . being circular

2224/45016 . . . . . being elliptic

2224/4502 . . . . . . Disposition

2224/45025 . . . . . . Plural core members

2224/45026 . . . . . . being mutually engaged together, e.g. through inserts

2224/45028 . . . . . . Side-to-side arrangements

2224/4503 . . . . . . Stacked arrangements

2224/45032 . . . . . . Two-layer arrangements

2224/45033 . . . . . . Three-layer arrangements

2224/45034 . . . . . . Four-layer arrangements

2224/45099 . . . . . Material

2224/451 . . . . . . with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof

2224/45010 . . . . . the principal constituent melting at a temperature of less than 400°C

2224/45015 . . . . . Gallium (Ga) as principal constituent

2224/4505 . . . . . . Indium (In) as principal constituent

2224/45111 . . . . . Tin (Sn) as principal constituent

2224/45113 . . . . . Bismuth (Bi) as principal constituent

2224/45114 . . . . . Thallium (Tl) as principal constituent

2224/45116 . . . . . Lead (Pb) as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

- Zinc (Zn) as principal constituent
- Antimony (Sb) as principal constituent
- Magnesium (Mg) as principal constituent
- Aluminium (Al) as principal constituent
- Silver (Ag) as principal constituent
- Gold (Au) as principal constituent
- Copper (Cu) as principal constituent
- Manganese (Mn) as principal constituent
- Nickel (Ni) as principal constituent
- Cobalt (Co) as principal constituent
- Iron (Fe) as principal constituent
- Palladium (Pd) as principal constituent
- Titanium (Ti) as principal constituent
- Platinum (Pt) as principal constituent
- Zirconium (Zr) as principal constituent
- Chromium (Cr) as principal constituent
- Vanadium (V) as principal constituent
- Rhodium (Rh) as principal constituent
- Ruthenium (Ru) as principal constituent
- Iridium (Ir) as principal constituent
- Niobium (Nb) as principal constituent
- Molybdenum (Mo) as principal constituent
- Tantalum (Ta) as principal constituent
- Rhenium (Re) as principal constituent
- Tungsten (W) as principal constituent
- with a principal constituent of the material being a non metallic, non metalloid inorganic material
- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45188)

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

- The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

- with a principal constituent of the material being a solid not provided for in groups H01L 2224/451 - H01L 2224/45191, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

- with a principal constituent of the material being a liquid not provided for in groups H01L 2224/451 - H01L 2224/45191

- Material of the matrix

- with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof

- Glasses, e.g. amorphous oxides, nitrides or fluorides

- with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
<table>
<thead>
<tr>
<th>Code</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>2224/45238</td>
<td>the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C</td>
</tr>
<tr>
<td>2224/45239</td>
<td>Silver (Ag) as principal constituent</td>
</tr>
<tr>
<td>2224/45244</td>
<td>Gold (Au) as principal constituent</td>
</tr>
<tr>
<td>2224/45247</td>
<td>Copper (Cu) as principal constituent</td>
</tr>
<tr>
<td>2224/45249</td>
<td>Manganese (Mn) as principal constituent</td>
</tr>
<tr>
<td>2224/45255</td>
<td>Nickel (Ni) as principal constituent</td>
</tr>
<tr>
<td>2224/45257</td>
<td>Cobalt (Co) as principal constituent</td>
</tr>
<tr>
<td>2224/4526</td>
<td>Iron (Fe) as principal constituent</td>
</tr>
<tr>
<td>2224/45263</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
</tr>
<tr>
<td>2224/45264</td>
<td>Palladium (Pd) as principal constituent</td>
</tr>
<tr>
<td>2224/45266</td>
<td>Titanium (Ti) as principal constituent</td>
</tr>
<tr>
<td>2224/45269</td>
<td>Platinum (Pt) as principal constituent</td>
</tr>
<tr>
<td>2224/4527</td>
<td>Zirconium (Zr) as principal constituent</td>
</tr>
<tr>
<td>2224/45271</td>
<td>Chromium (Cr) as principal constituent</td>
</tr>
<tr>
<td>2224/45272</td>
<td>Vanadium (V) as principal constituent</td>
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<tr>
<td>2224/45273</td>
<td>Rhodium (Rh) as principal constituent</td>
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<tr>
<td>2224/45276</td>
<td>Ruthenium (Ru) as principal constituent</td>
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<tr>
<td>2224/45278</td>
<td>Iridium (Ir) as principal constituent</td>
</tr>
<tr>
<td>2224/45279</td>
<td>Niobium (Nb) as principal constituent</td>
</tr>
<tr>
<td>2224/4528</td>
<td>Molybdenum (Mo) as principal constituent</td>
</tr>
<tr>
<td>2224/45281</td>
<td>Tantalum (Ta) as principal constituent</td>
</tr>
<tr>
<td>2224/45283</td>
<td>Rhenium (Re) as principal constituent</td>
</tr>
<tr>
<td>2224/45284</td>
<td>Tungsten (W) as principal constituent</td>
</tr>
<tr>
<td>2224/45286</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>2224/45287</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45288)</td>
</tr>
<tr>
<td>2224/45288</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>2224/45291</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>2224/45293</td>
<td>with a principal constituent of the material being a solid not provided for in groups H01L 2224/452 - H01L 2224/45291, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond</td>
</tr>
<tr>
<td>2224/45294</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/452 - H01L 2224/45291</td>
</tr>
<tr>
<td>2224/45295</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/452 - H01L 2224/45291</td>
</tr>
<tr>
<td>2224/45298</td>
<td>Fillers</td>
</tr>
<tr>
<td>2224/45299</td>
<td>Base material</td>
</tr>
<tr>
<td>2224/453</td>
<td>with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof</td>
</tr>
<tr>
<td>2224/45301</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>2224/45305</td>
<td>Gallium (Ga) as principal constituent</td>
</tr>
<tr>
<td>2224/45309</td>
<td>Indium (In) as principal constituent</td>
</tr>
<tr>
<td>2224/45311</td>
<td>Tin (Sn) as principal constituent</td>
</tr>
<tr>
<td>2224/45313</td>
<td>Bismuth (Bi) as principal constituent</td>
</tr>
<tr>
<td>2224/45314</td>
<td>Thallium (Tl) as principal constituent</td>
</tr>
<tr>
<td>2224/45316</td>
<td>Lead (Pb) as principal constituent</td>
</tr>
<tr>
<td>2224/45317</td>
<td>the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C</td>
</tr>
<tr>
<td>2224/45318</td>
<td>Zinc (Zn) as principal constituent</td>
</tr>
<tr>
<td>2224/4532</td>
<td>Antimony (Sb) as principal constituent</td>
</tr>
<tr>
<td>2224/45323</td>
<td>Magnesium (Mg) as principal constituent</td>
</tr>
<tr>
<td>2224/45324</td>
<td>Aluminium (Al) as principal constituent</td>
</tr>
<tr>
<td>2224/45338</td>
<td>the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C</td>
</tr>
<tr>
<td>2224/45339</td>
<td>Silver (Ag) as principal constituent</td>
</tr>
<tr>
<td>2224/45344</td>
<td>Gold (Au) as principal constituent</td>
</tr>
<tr>
<td>2224/45347</td>
<td>Copper (Cu) as principal constituent</td>
</tr>
</tbody>
</table>
Manganese (Mn) as principal constituent
Nickel (Ni) as principal constituent
Cobalt (Co) as principal constituent
Iron (Fe) as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
Palladium (Pd) as principal constituent
Titanium (Ti) as principal constituent
Platinum (Pt) as principal constituent
Zirconium (Zr) as principal constituent
Chromium (Cr) as principal constituent
Vanadium (V) as principal constituent
Rhodium (Rh) as principal constituent
Ruthenium (Ru) as principal constituent
Iridium (Ir) as principal constituent
Niobium (Nb) as principal constituent
Molybdenum (Mo) as principal constituent
Tantalum (Ta) as principal constituent
Rhenium (Re) as principal constituent
Tungsten (W) as principal constituent
the principal constituent melting at a temperature of less than 400°C
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics) [H01L 2224/453]
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics) [H01L 2224/45388]
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the material being a solid not provided for in groups [H01L 2224/453 - H01L 2224/45391]
e.g. allotropes of carbon, fullerenes, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a liquid not provided for in groups [H01L 2224/453 - H01L 2224/45391]
with a principal constituent of the material being a gas not provided for in groups [H01L 2224/453 - H01L 2224/45391]
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. segmented structures, foams
Coating material
with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
H01L

2224/45457 .......................... Cobalt (Co) as principal constituent
2224/4546 ............................ Iron (Fe) as principal constituent
2224/45463 ........................... the principal constituent melting at a temperature of greater than 1550°C
2224/45464 ............................ Palladium (Pd) as principal constituent
2224/45466 ............................ Titanium (Ti) as principal constituent
2224/45469 ............................ Platinum (Pt) as principal constituent
2224/4547 .............................. Zirconium (Zr) as principal constituent
2224/45471 ............................ Chromium (Cr) as principal constituent
2224/45472 ............................ Vanadium (V) as principal constituent
2224/45473 ............................ Rhodium (Rh) as principal constituent
2224/45476 ............................ Ruthenium (Ru) as principal constituent
2224/45478 ............................ Iridium (Ir) as principal constituent
2224/45479 ............................ Niobium (Nb) as principal constituent
2224/4548 ............................... Molybdenum (Mo) as principal constituent
2224/45481 ............................ Tantalum (Ta) as principal constituent
2224/45483 ............................ Rhenium (Re) as principal constituent
2224/45484 ............................ Tungsten (W) as principal constituent
2224/45486 ............................ with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/45487 ............................ Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45488)
2224/45488 ............................ Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/4549 ............................... The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/45493 ............................ with a principal constituent of the material being a solid not provided for in groups H01L 2224/454 - H01L 2224/45491 e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/45494 ............................ with a principal constituent of the material being a liquid not provided for in groups H01L 2224/454 - H01L 2224/45491

2224/45495 ............................ with a principal constituent of the material being a gas not provided for in groups H01L 2224/454 - H01L 2224/45491

2224/45498 ............................ with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

2224/45499 ............................ Shape or distribution of the fillers
2224/4554 .............................. Coating
2224/45541 ............................ Structure
2224/4555 .............................. Shape
2224/4556 .............................. Disposition, e.g. coating on a part of the core
2224/45565 ............................ Single coating layer
2224/4557 .............................. Plural coating layers
2224/45572 ............................ Two-layer stack coating
2224/45573 ............................ Three-layer stack coating
2224/45574 ............................ Four-layer stack coating
2224/45576 ............................ being mutually engaged together, e.g. through inserts
2224/45578 ............................ being disposed next to each other, e.g. side-to-side arrangements
2224/45599 ............................ Material
2224/456 ............................... with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/45601 ............................ the principal constituent melting at a temperature of less than 400°C
2224/45605 ............................ Gallium (Ga) as principal constituent
2224/45609 ............................ Indium (In) as principal constituent
2224/45611 ............................ Tin (Sn) as principal constituent
2224/45613 ............................ Bismuth (Bi) as principal constituent
2224/45614 ............................ Thallium (Tl) as principal constituent
2224/45616 ............................ Lead (Pb) as principal constituent
2224/45617 ............................ the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45618 ............................ Zinc (Zn) as principal constituent
2224/4562 .............................. Antimony (Sb) as principal constituent
2224/45623 ............................ Magnesium (Mg) as principal constituent
2224/45624 ............................ Aluminium (Al) as principal constituent
2224/45638 ............................ the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/45639 ............................ Silver (Ag) as principal constituent
2224/45644 ............................ Gold (Au) as principal constituent
CPC - 2019.05

H01L

- Copper (Cu) as principal constituent
- Manganese (Mn) as principal constituent
- Nickel (Ni) as principal constituent
- Cobalt (Co) as principal constituent
- Iron (Fe) as principal constituent
- Palladium (Pd) as principal constituent
- Titanium (Ti) as principal constituent
- Platinum (Pt) as principal constituent
- Zirconium (Zr) as principal constituent
- Chromium (Cr) as principal constituent
- Vanadium (V) as principal constituent
- Rhodium (Rh) as principal constituent
- Ruthenium (Ru) as principal constituent
- Iridium (Ir) as principal constituent
- Niobium (Nb) as principal constituent
- Molybdenum (Mo) as principal constituent
- Tantalum (Ta) as principal constituent
- Rhenium (Re) as principal constituent
- Tungsten (W) as principal constituent
- with a principal constituent of the material being a non metallic, non metalloid inorganic material
- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45688)
- Glasses, e.g. amorphous oxides, nitrides or fluorides
- with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- with a principal constituent of the material being a solid not provided for in groups H01L 2224/456 - H01L 2224/45691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond with a principal constituent of the material being a liquid not provided for in groups H01L 2224/456 - H01L 2224/45691
- with a principal constituent of the material being a gas not provided for in groups H01L 2224/456 - H01L 2224/45691
- with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- Material of the matrix
- with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
- Gallium (Ga) as principal constituent
- Indium (In) as principal constituent
- Tin (Sn) as principal constituent
- Bismuth (Bi) as principal constituent
- Thallium (Tl) as principal constituent
- Lead (Pb) as principal constituent
- the principal constituent melting at a temperature of less than 400°C
- Zinc (Zn) as principal constituent
- Antimony (Sb) as principal constituent
- Magnesium (Mg) as principal constituent
- Aluminium (Al) as principal constituent
- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- Silver (Ag) as principal constituent
- Gold (Au) as principal constituent
- Copper (Cu) as principal constituent
- Manganese (Mn) as principal constituent
- Nickel (Ni) as principal constituent
- Cobalt (Co) as principal constituent

2224/45694
**Fillers**

- H01L 2224/457
- of the material being a gas
- H01L 2224/45791
- with a principal constituent
- H01L 2224/457
- not provided for in groups
- of the material being a liquid
- H01L 2224/45791
- nanotubes, diamond
- fullerene, graphite, carbon–
- e.g. allotropes of carbon,
- H01L 2224/457
- not provided for in groups
- of the material being a solid
- H01L 2224/45791
- polymer, epoxy
- e.g. polyester, phenolic based
- the material being a polymer,
- with a principal constituent of
- non metalloid inorganic material
- Glasses, e.g. amorphous
- oxides, nitrides or fluorides
- with a principal constituent of
- the material being a polymer,
- e.g. polyester, phenolic based
- polymer, epoxy
- The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- with a principal constituent of the material being a solid not provided for in groups
- H01L 2224/457 - H01L 2224/45791, e.g. allotropes of carbon, fullerene, graphite, carbon–nanotubes, diamond
- with a principal constituent of the material being a liquid not provided for in groups
- H01L 2224/457 - H01L 2224/45791
- with a principal constituent of the material being a gas not provided for in groups
- H01L 2224/457 - H01L 2224/45791
- Base material
- with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
- Tungsten (W) as principal constituent
- Rhenium (Re) as principal constituent
- Tantalum (Ta) as principal constituent
- Molybdenum (Mo) as constituent
- Niobium (Nb) as principal constituent
- Iridium (Ir) as principal constituent
- Ruthenium (Ru) as principal constituent
- Iridium (Ir) as principal constituent
- Antimony (Sb) as principal constituent
- Magnesium (Mg) as principal constituent
- Aluminium (Al) as principal constituent
- Zinc (Zn) as principal constituent
- Silver (Ag) as principal constituent
- Gold (Au) as principal constituent
- Copper (Cu) as principal constituent
- Manganese (Mn) as principal constituent
- Nickel (Ni) as principal constituent
- Cobalt (Co) as principal constituent
- Iron (Fe) as principal constituent
- Palladium (Pd) as principal constituent
- Titanium (Ti) as principal constituent
- Platinum (Pt) as principal constituent
- Zirconium (Zr) as principal constituent
Coating material segment structures, foams being a hybrid material, e.g. a matrix with a filler, i.e. materials in the form of combination of two or more of the material being a liquid with a principal constituent not provided for in groups - H01L 2224/45891.

- Tungsten (W) as principal constituent
- Tantalum (Ta) as principal constituent
- Molybdenum (Mo) as principal constituent
- Niobium (Nb) as principal constituent
- Rhodium (Rh) as principal constituent
- Ruthenium (Ru) as principal constituent
- Iridium (Ir) as principal constituent
- Cobalt (Co) as principal constituent
- Nickel (Ni) as principal constituent
- Copper (Cu) as principal constituent
- Silver (Ag) as principal constituent
- Aluminium (Al) as principal constituent
- Magnesium (Mg) as principal constituent
- Titanium (Ti) as principal constituent
- Tungsten (W) as principal constituent
- Molybdenum (Mo) as principal constituent
- Nickel (Ni) as principal constituent
- Silicon (Si) and germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof

- Gallium (Ga) as principal constituent
- Indium (In) as principal constituent
- Tin (Sn) as principal constituent
- Bismuth (Bi) as principal constituent
- Thallium (Tl) as principal constituent
- Lead (Pb) as principal constituent
- Copper (Cu) as principal constituent
- Nickel (Ni) as principal constituent
- Molybdenum (Mo) as principal constituent
- Titanium (Ti) as principal constituent

- Silicones, isoprene, neoprene
- Inorganic material metallic, non metalloid of the material being a solid, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- Inorganic material containing oxides, nitrides or fluorides
- Inorganic material containing oxides (glass ceramics H01L 2224/45888)
- Inorganic material containing carbon-carbon bonds

- Chromium (Cr) as principal constituent
- Rhodium (Rh) as principal constituent
- Ruthenium (Ru) as principal constituent
- Iridium (Ir) as principal constituent
- Niobium (Nb) as principal constituent
- Molybdenum (Mo) as principal constituent
- Tantalum (Ta) as principal constituent
- Rhénium (Re) as principal constituent
- Tungsten (W) as principal constituent

- Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

- The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/458 - H01L 2224/45891.

- with a principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- with a principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
- with a principal constituent melting at a temperature of less than 400°C
- with a principal constituent melting at a temperature of greater than 1550°C

- Magnesium (Mg) as principal constituent
- Lead (Pb) as principal constituent
- Magnesium (Mg) as principal constituent
- Nickel (Ni) as principal constituent
- Copper (Cu) as principal constituent
- Nickel (Ni) as principal constituent
- Cobalt (Co) as principal constituent
- Iron (Fe) as principal constituent
- Cobalt (Co) as principal constituent
- Iron (Fe) as principal constituent
- Palladium (Pd) as principal constituent
- Titanium (Ti) as principal constituent
- Platinum (Pt) as principal constituent
- Zirconium (Zr) as principal constituent
- Silver (Ag) as principal constituent
- Gold (Au) as principal constituent
- Copper (Cu) as principal constituent
- Manganese (Mn) as principal constituent
- Nickel (Ni) as principal constituent
Connecting between different semiconductor or solid-state bodies, the wire connector being orthogonal to a side surface of the semiconductor or solid-state body, e.g. parallel layout.

Connecting bonding areas at the same height, e.g. horizontal bond.

Connecting bonding areas at different heights.

Connecting to a bonding area of the semiconductor or solid-state body located at the far end of the body with respect to the bonding area outside the semiconductor or solid-state body.

The connector being arranged next to each other, e.g. on a common substrate.

Connecting within a semiconductor or solid-state body, i.e. fly wire, bridge wire.

Connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip.

The bodies being arranged in a recess of the surface.

The bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements.

The bodies being stacked.

The wire connector connecting to a bonding area disposed in a recess of the surface.

The wire connector connecting to a bonding area protruding from the surface.

The wire connector connecting to a bonding area disposed in a recess of the surface.

The wire connector connecting to a bonding area protruding from the surface.
Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive

the body and the item being arranged next to each other, e.g. on a common substrate

the item being non-metallic, e.g. insulating substrate with or without metallisation

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to a bond pad of the item

connecting the wire to a potential ring of the item

connect the wire to a via metallisation of the item

the item being metallic

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

the item being a discrete passive component

the body and the item being stacked

the item being non-metallic, e.g. insulating substrate with or without metallisation

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to a potential ring of the item

the item being a discrete passive component

the body and the item being stacked

the item being non-metallic, e.g. insulating substrate with or without metallisation

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to the body and an opposite side of the item with respect to the body

the item being metallic

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to a potential ring of the item

the item being a discrete passive component

the body and the item being arranged next to each other, e.g. on a common substrate

the item being non-metallic, e.g. insulating substrate with or without metallisation

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to a potential ring of the item

connecting the wire to a via metallisation of the item

Connecting between the body and an opposite side of the item with respect to the body

the item being metallic

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to a potential ring of the item

the item being a discrete passive component

the body and the item being arranged next to each other, e.g. on a common substrate

the item being non-metallic, e.g. insulating substrate with or without metallisation

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to the body and an opposite side of the item with respect to the body

the item being metallic

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

connecting the wire to a potential ring of the item

the item being a discrete passive component

the body and the item being arranged next to each other, e.g. on a common substrate

the item being non-metallic, e.g. insulating substrate with or without metallisation

connecting the wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item
Material at the bonding interface being Gold (Au) connecting portion of the wire principal constituent of the area, e.g. grain size distribution morphology of the connecting compound comprising an intermetallic comprising an eutectic alloy means material of the auxiliary connecting connector and the bonding area not being interposed between the wire connector and the bonding area being an additional member attached to the bonding area through an adhesive or solder, e.g. buffer pad not being interposed between the bonding area being a metal or a non metalloid inorganic material attached to the bonding area being an additional member inside a semiconductor or outside a semiconductor or a solid-state body on the semiconductor or a solid-state body outside the semiconductor or a solid-state body.

H01L 950 °C or equal to 400°C and less than 1550°C at a temperature of greater than 400°C or equal to 950°C and less than the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Material of the auxiliary connecting means at the bonding interface comprising an eutectic alloy comprising an intermetallic compound Morphology of the connecting portion, e.g. grain size distribution Heat affected zone [HAZ] Bonding interface between the connecting portion and the bonding area principal constituent of the connecting portion of the wire connector being Gold (Au) with a principal constituent of the bonding area being a metal or a metallloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof, the principal constituent melting at a temperature of less than 400°C

Gallium (Ga) as principal constituent Indium (In) as principal constituent Tin (Sn) as principal constituent Bismuth (Bi) as principal constituent Thallium (Tl) as principal constituent Lead (Pb) as principal constituent the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950 °C

Zinc (Zn) as principal constituent Antimony (Sb) as principal constituent Magnesium (Mg) as principal constituent Aluminium (Al) as principal constituent the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C Silver (Ag) as principal constituent Gold (Au) as principal constituent Copper (Cu) as principal constituent Manganese (Mn) as principal constituent Nickel (Ni) as principal constituent Cobalt (Co) as principal constituent Iron (Fe) as principal constituent Palladium (Pd) as principal constituent Titanium (Ti) as principal constituent Platinum (Pt) as principal constituent Zirconium (Zr) as principal constituent Chromium (Cr) as principal constituent Vanadium (V) as principal constituent Rhodium (Rh) as principal constituent Iridium (Ir) as principal constituent Niobium (Nb) as principal constituent Molybdenum (Mo) as principal constituent Tantalum (Ta) as principal constituent Rhenium (Re) as principal constituent Tungsten (W) as principal constituent with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L, 2224/48688) Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/4874 - H01L 2224/4869, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/4874 - H01L 2224/4869

with a principal constituent of the bonding area being a combination of two or more material regions, i.e. being a hybrid material, e.g. segmented structures, island patterns

Principal constituent of the connecting portion of the wire connector being Aluminium (Al)

with a principal constituent of the bonding area being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof, the principal constituent melting at a temperature of less than 400°C

Gallium (Ga) as principal constituent

Indium (In) as principal constituent

Tin (Sn) as principal constituent

Bismuth (Bi) as principal constituent

Thallium (Tl) as principal constituent

Lead (Pb) as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950 °C

Zinc (Zn) as principal constituent

Antimony (Sb) as principal constituent

Magnesium (Mg) as principal constituent

Aluminium (Al) as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver (Ag) as principal constituent

Gold (Au) as principal constituent

Copper (Cu) as principal constituent

Manganese (Mn) as principal constituent

Nickel (Ni) as principal constituent

Cobalt (Co) as principal constituent

Iron (Fe) as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium (Pd) as principal constituent

Titanium (Ti) as principal constituent

Platinum (Pt) as principal constituent

Zirconium (Zr) as principal constituent

Chromium (Cr) as principal constituent

Vanadium (V) as principal constituent

Rhodium (Rh) as principal constituent

Iridium (Ir) as principal constituent

Niobium (Nb) as principal constituent

Molybdenum (Mo) as principal constituent

Tantalum (Ta) as principal constituent

Rhenium (Re) as principal constituent

Tungsten (W) as principal constituent

with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/48785)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/487 - H01L 2224/4879, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/487 - H01L 2224/4879

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2224/48798 ............... with a principal constituent of the bonding area being a combination of two or more material regions, i.e. being a hybrid material, e.g. segmented structures, island patterns

2224/48799 ............... Principal constituent of the connecting portion of the wire connector being Copper (Cu)

2224/488 ............... with a principal constituent of the bonding area being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof

2224/48801 ............... the principal constituent melting at a temperature of less than 400°C

2224/48805 ............... Gallium (Ga) as principal constituent

2224/48809 ............... Indium (In) as principal constituent

2224/48811 ............... Tin (Sn) as principal constituent

2224/48813 ............... Bismuth (Bi) as principal constituent

2224/48814 ............... Thallium (Tl) as principal constituent

2224/48816 ............... Lead (Pb) as principal constituent

2224/48817 ............... the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950 °C

2224/48818 ............... Zinc (Zn) as principal constituent

2224/4882 ............... Antimony (Sb) as principal constituent

2224/48823 ............... Magnesium (Mg) as principal constituent

2224/48824 ............... Aluminium (Al) as principal constituent

2224/48838 ............... the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

2224/48839 ............... Silver (Ag) as principal constituent

2224/4884 ............... Gold (Au) as principal constituent

2224/48847 ............... Copper (Cu) as principal constituent

2224/48849 ............... Manganese (Mn) as principal constituent

2224/48855 ............... Nickel (Ni) as principal constituent

2224/48857 ............... Cobalt (Co) as principal constituent

2224/4886 ............... Iron (Fe) as principal constituent

2224/48863 ............... the principal constituent melting at a temperature of greater than 1550°C

2224/48864 ............... Palladium (Pd) as principal constituent

2224/48866 ............... Titanium (Ti) as principal constituent

2224/48869 ............... Platinum (Pt) as principal constituent

2224/4887 ............... Zirconium (Zr) as principal constituent

2224/48871 ............... Chromium (Cr) as principal constituent

2224/48872 ............... Vanadium (V) as principal constituent

2224/48873 ............... Rhodium (Rh) as principal constituent

2224/48878 ............... Iridium (Ir) as principal constituent

2224/48879 ............... Niobium (Nb) as principal constituent

2224/4888 ............... Molybdenum (Mo) as principal constituent

2224/48881 ............... Tantalum (Ta) as principal constituent

2224/48883 ............... Rhenium (Re) as principal constituent

2224/48884 ............... Tungsten (W) as principal constituent

2224/48886 ............... with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material

2224/48887 ............... Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/48888)

2224/48888 ............... Glasses, e.g. amorphous oxides, nitrides or fluorides

2224/48889 ............... with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy

2224/48891 ............... The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

2224/48893 ............... with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/488 - H01L 2224/4889, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

2224/48894 ............... with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/488 - H01L 2224/4889

2224/48898 ............... with a principal constituent of the bonding area being a combination of two or more material regions, i.e. being a hybrid material, e.g. segmented structures, island patterns

2224/48899 ............... Auxiliary members for wire connectors, e.g. flow-barriers, reinforcing structures, spacers, alignment aids

2224/48991 ............... being formed on the semiconductor or solid-state body to be connected

2224/48992 ............... Reinforcing structures

2224/48993 ............... Alignment aids
2224/48996 . . . . . . . . . . . . being formed on an item to be connected
not being a semiconductor or solid-state
body

2224/48997 . . . . . . . . . . . . Reinforcing structures

2224/48998 . . . . . . . . . . . . Alignment aids

2224/49 . . . . . . . . . . . . . . . of a plurality of wire connectors

2224/4901 . . . . . . . . . . . . Structure

2224/4903 . . . . . . . . . . . . Connectors having different sizes, e.g.
different diameters

2224/4905 . . . . . . . . . . . . Shape

2224/49051 . . . . . . . . . . . . Connectors having different shapes

2224/49052 . . . . . . . . . . . . Different loop heights

2224/4909 . . . . . . . . . . . . Loop shape arrangement

2224/49095 . . . . . . . . . . . . parallel in plane

2224/49096 . . . . . . . . . . . . horizontal

2224/49097 . . . . . . . . . . . . vertical

2224/491 . . . . . . . . . . . . Disposition

2224/49105 . . . . . . . . . . . . Connecting at different heights

2224/49107 . . . . . . . . . . . . on the semiconductor or solid-state
body

2224/49109 . . . . . . . . . . . . outside the semiconductor or solid-
state body

2224/4911 . . . . . . . . . . . . the connectors being bonded to at least
one common bonding area, e.g. daisy
chain

2224/49111 . . . . . . . . . . . . the connectors connecting two
common bonding areas, e.g. Litz or
braid wires

2224/49112 . . . . . . . . . . . . the connectors connecting a common
bonding area on the semiconductor or
different body to different bonding
areas outside the body, e.g. diverging
wires

2224/49113 . . . . . . . . . . . . the connectors connecting different
bonding areas on the semiconductor or
solid-state body to a common
bonding area outside the body, e.g.
converging wires

2224/4912 . . . . . . . . . . . . Layout

2224/4917 . . . . . . . . . . . . Crossed wires

2224/49171 . . . . . . . . . . . . Fan-out arrangements

2224/49173 . . . . . . . . . . . . Radial fan-out arrangements

2224/49174 . . . . . . . . . . . . Stacked arrangements

2224/49175 . . . . . . . . . . . . Parallel arrangements

2224/49176 . . . . . . . . . . . . Wire connectors having the same
loop shape and height

2224/49177 . . . . . . . . . . . . Combinations of different
arrangements

2224/49179 . . . . . . . . . . . . Corner adaptations, i.e. disposition
of the wire connectors at the
corners of the semiconductor or
solid-state body

2224/4918 . . . . . . . . . . . . being disposed on at least two different
sides of the body, e.g. dual array

2224/494 . . . . . . . . . . . . Connecting portions

2224/4941 . . . . . . . . . . . . the connecting portions being stacked

2224/4942 . . . . . . . . . . . . Ball bonds

2224/49421 . . . . . . . . . . . . on the semiconductor or solid-state
body

2224/49422 . . . . . . . . . . . . outside the semiconductor or solid-
state body

2224/49425 . . . . . . . . . . . . Wedge bonds

2224/49426 . . . . . . . . . . . . on the semiconductor or solid-state
body

2224/49427 . . . . . . . . . . . . outside the semiconductor or solid-
state body

2224/49429 . . . . . . . . . . . . Wedge and ball bonds

2224/4943 . . . . . . . . . . . . the connecting portions being staggered

2224/49431 . . . . . . . . . . . . on the semiconductor or solid-state
body

2224/49433 . . . . . . . . . . . . outside the semiconductor or solid-
state body

2224/4945 . . . . . . . . . . . . Wire connectors having connecting
portions of different types on the
semiconductor or solid-state body, e.g.
regular and reverse stitches

2224/495 . . . . . . . . . . . . Material

2224/49505 . . . . . . . . . . . . Connectors having different materials

2224/50 . . . . . . . . . . . . Tape automated bonding [TAB] connectors, i.e.
film carriers; Manufacturing methods related
thereto

2224/63 . . . . . . . . . . . . Connectors not provided for in any of the groups
H01L 2224/10 - H01L 2224/50 and subgroups;
Manufacturing methods related thereto

2224/64 . . . . . . . . . . . . Manufacturing methods

2224/65 . . . . . . . . . . . . Structure, shape, material or disposition of the
connectors prior to the connecting process

2224/66 . . . . . . . . . . . . of an individual connector

2224/67 . . . . . . . . . . . . of a plurality of connectors

2224/68 . . . . . . . . . . . . Structure, shape, material or disposition of the
connectors after the connecting process

2224/69 . . . . . . . . . . . . of an individual connector

2224/70 . . . . . . . . . . . . of a plurality of connectors

2224/71 . . . . . . . . . . . . Means for bonding not being attached to, or not
being formed on, the surface to be connected

2224/72 . . . . . . . . . . . . Detachable connecting means consisting of
mechanical auxiliary parts connecting the device,
e.g. pressure contacts using springs or clips

2224/73 . . . . . . . . . . . . Means for bonding being of different types provided
for in two or more of groups H01L 2224/10,
H01L 2224/18, H01L 2224/26, H01L 2224/34,
H01L 2224/42, H01L 2224/50, H01L 2224/63,
H01L 2224/71

2224/731 . . . . . . . . . . . . Location prior to the connecting process

2224/73101 . . . . . . . . . . . . on the same surface

2224/73103 . . . . . . . . . . . . Bump and layer connectors

2224/73104 . . . . . . . . . . . . the bump connector being embedded into
the layer connector

2224/73151 . . . . . . . . . . . . on different surfaces

2224/73153 . . . . . . . . . . . . Bump and layer connectors

2224/732 . . . . . . . . . . . . Location after the connecting process

2224/73201 . . . . . . . . . . . . on the same surface

2224/73203 . . . . . . . . . . . . Bump and layer connectors

2224/73204 . . . . . . . . . . . . the bump connector being embedded into
the layer connector

2224/73205 . . . . . . . . . . . . Bump and strap connectors

2224/73207 . . . . . . . . . . . . Bump and wire connectors

2224/73209 . . . . . . . . . . . . Bump and HDI connectors

2224/73211 . . . . . . . . . . . . Bump and TAB connectors

2224/73213 . . . . . . . . . . . . Layer and strap connectors

2224/73215 . . . . . . . . . . . . Layer and wire connectors

2224/73217 . . . . . . . . . . . . Layer and HDI connectors

2224/73219 . . . . . . . . . . . . Layer and TAB connectors

2224/73221 . . . . . . . . . . . . Strap and wire connectors

2224/73223 . . . . . . . . . . . . Strap and HDI connectors
Means for applying flux or plasma blasting, using gas-flow, by etching, by ice blasting, for ultrasonic cleaning, for dry processes.

Apparatus for manufacturing layer connectors
Apparatus for manufacturing bump connectors
Means for applying a preform, e.g. laminator squeegee, screen stencil
Means for screen printing, e.g. roller, screen stencil
Means for direct writing
Syringe
integrated into the bonding head
Jetting means, e.g. ink jet
including a laser
Means for screen printing, e.g. roller, squeegee, screen stencil
Means for applying a preform, e.g. laminator
including a vacuum-bag
Means for blanket deposition
for spin coating, i.e. spin coater
for curtain coating
for immersion coating, i.e. bath
for spray coating, i.e. nozzle
Means for physical vapour deposition [PVD], e.g. evaporation, sputtering
Means for sputtering, e.g. target
Means for evaporation
Means for chemical vapour deposition [CVD], e.g. for laser CVD
Means for plating, e.g. for electroplating, electroless plating
Protection means against electrical discharge
Means for applying energy, e.g. heating means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus, e.g. in the bonding head
adapted for localised heating
Polychromatic heating lamp
Laser
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus, e.g. in the bonding head
by induction heating, i.e. coils
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus, e.g. in the bonding head
Flame torch, e.g. hydrogen torch
Discharge electrode
Shape of the discharge electrode
Material of the discharge electrode
Circuitry of the discharge electrode
Oven
Resistance welding electrodes, i.e. for ohmic heating
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus, e.g. in the bonding head
by infrared heating, e.g. infrared heating lamp
by means of pressure
Bonding head
Shape
of the pressing surface
being curved
comprising protrusions
of other parts
Material
Removable bonding head
Auxiliary members on the pressing surface
Elastomer inlay
with retaining mechanisms
Removable auxiliary member
Shape of the auxiliary member
Material of the auxiliary member
by ultrasonic vibrations
Eccentric cams
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus, e.g. in the bonding head
Piezoelectric transducers
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus, e.g. in the bonding head
2224/7535 . . . . . . Stable and mobile yokes
2224/75351 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75352 . . . . . . in the upper part of the bonding apparatus, e.g. in the bonding head
2224/75353 . . Ultrasonic horns
2224/75354 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75355 . . . . . . Design, e.g. of the waveguide
2224/755 . . . . . . Cooling means
2224/75501 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75502 . . . . . . in the upper part of the bonding apparatus, e.g. in the bonding head
2224/755 . . . . . . Mechanical means, e.g. for planarising, pressing, stamping
2224/756 . . . . . . Means for supplying the connector to be connected in the bonding apparatus
2224/75601 . . . . . . Storing means
2224/75611 . . . . . . Feeding means
2224/75621 . . . . . . Holding means
2224/7565 . . . . . . Means for transporting the components to be connected
2224/75651 . . . . . . Belt conveyor
2224/75652 . . . . . . Chain conveyor
2224/75653 . . . . . . Vibrating conveyor
2224/75654 . . . . . . Pneumatic conveyor
2224/75655 . . . . . . in a fluid
2224/757 . . . . . . Means for aligning
2224/75701 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75702 . . . . . . in the upper part of the bonding apparatus, e.g. in the bonding head
2224/75703 . . . . . . Mechanical holding means
2224/75704 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75705 . . . . . . in the upper part of the bonding apparatus, e.g. in the bonding head
2224/75723 . . . . . . Electrostatic holding means
2224/75724 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75725 . . . . . . in the upper part of the bonding apparatus, e.g. in the bonding head
2224/75733 . . . . . . Magnetic holding means
2224/75734 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75735 . . . . . . in the upper part of the bonding apparatus, e.g. in the bonding head
2224/75743 . . . . . . Suction holding means
2224/75744 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75745 . . . . . . in the upper part of the bonding apparatus, e.g. in the bonding head
2224/75753 . . . . . . Means for optical alignment, e.g. sensors
2224/75754 . . . . . . Guiding structures
2224/75755 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/75756 . . . . . . in the upper part of the bonding apparatus, e.g. in the bonding head
2224/758 . . . . . . Means for moving parts
2224/75801 . . . . . . Lower part of the bonding apparatus, e.g. XY table
2224/75802 . . . . . . Rotational mechanism
2224/75803 . . . . . . Pivoting mechanism
2224/75804 . . . . . . Translational mechanism
2224/75821 . . . . . . Upper part of the bonding apparatus, i.e. bonding head
2224/75822 . . . . . . Rotational mechanism
2224/75823 . . . . . . Pivoting mechanism
2224/75824 . . . . . . Translational mechanism
2224/75841 . . . . . . of the bonding head
2224/75842 . . . . . . Rotational mechanism
2224/75843 . . . . . . Pivoting mechanism
2224/759 . . . . . . Means for monitoring the connection process
2224/75901 . . . . . . using a computer, e.g. fully- or semi-automatic bonding
2224/7592 . . . . . . Load or pressure adjusting means, e.g. sensors
2224/75925 . . . . . . Vibration adjusting means, e.g. sensors
2224/7595 . . . . . . Means for forming additional members
2224/7598 . . . . . . specially adapted for batch processes
2224/75981 . . . . . . Apparatus chuck
2224/75982 . . . . . . Shape
2224/75983 . . . . . . of the mounting surface
2224/75984 . . . . . . of other portions
2224/75985 . . . . . . Material
2224/75986 . . . . . . Auxiliary members on the pressing surface
2224/75987 . . . . . . Shape of the auxiliary member
2224/75988 . . . . . . Material of the auxiliary member
2224/76 . . . . Apparatus for connecting with build-up interconnects
2224/76001 . . . . . . Calibration means
2224/7601 . . . . . . Means for cleaning, e.g. brushes, for hydro blasting, for ultrasonic cleaning, for dry ice blasting, using gas-flow, by etching, by applying flux or plasma
2224/761 . . . . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
2224/76101 . . . . . . Chamber
2224/76102 . . . . . . Vacuum chamber
2224/7611 . . . . . . High pressure chamber
2224/7615 . . . . . . Means for depositing
2224/76151 . . . . . . Means for direct writing
2224/76152 . . . . . . Syringe
2224/76155 . . . . . . Jetting means, e.g. ink jet
2224/76158 . . . . . . including a laser
2224/76161 . . . . . . Means for screen printing, e.g. roller, squeegee, screen stencil
2224/7617 . . . . . . Means for applying a preform, e.g. laminator
2224/76171 . . . . . . including a vacuum-bag
2224/7618 . . . . . . Means for blanket deposition
2224/76181 . . . . . . for spin coating, i.e. spin coater
2224/76182 . . . . . . for curtain coating
2224/76183 . . . . . . for immersion coating, i.e. bath
2224/76184 . . . . . . for spray coating, i.e. nozzle
2224/76185 . . . . . . Means for physical vapour deposition [PVD]
2224/76186 . . . . . . Means for sputtering, e.g. target
2224/76187 . . . . . . Means for evaporation
2224/76188 . . . . . . Means for chemical vapour deposition [CVD], e.g. for laser CVD
2224/76189 . . . . . . Means for plating, e.g. for electroplating, electroseless plating
2224/762 . . . . . . Protection means against electroplating, electroseless plating
2224/7625 . . . . . . Means for applying energy, e.g. heating means
Means for monitoring the connection process
Means for moving parts
Means for aligning
Means for transporting the components to be connected

Cooling means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Mechanical means, e.g. for planarising, pressing, stamping
for drilling
for abrasive blasting, e.g. sand blasting, wet blasting, hydro-blasting, dry ice blasting

Means for supplying the material of the interconnect
Storing means
Feeding means
Holding means
Means for transporting the components to be connected
Belt conveyor
Chain conveyor
Vibrating conveyor
Pneumatic conveyor
in a fluid
Means for aligning
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Mechanical holding means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Electrostatic holding means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Magnetic holding means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Suction holding means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Means for optical alignment, e.g. sensors
Guiding structures
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Means for moving parts
Lower part of the bonding apparatus, e.g. XY table
Rotational mechanism
Pivoting mechanism
Translational mechanism
Upper part of the bonding apparatus, i.e. bonding head
Rotational mechanism
Pivoting mechanism
Translational mechanism
of the bonding head
Rotational mechanism
Pivoting mechanism
Translational mechanism
Means for monitoring the connection process
Design, e.g. of the wave guide
Apparatus for connecting with strap connectors

Means for controlling the bonding environment, e.g. valves, vacuum pumps

Chamber

Vacuum chamber

High pressure chamber

Means for applying permanent coating, e.g. in-situ coating

Means for direct writing

Syringe

Jetting means, e.g. ink jet

including a laser

Means for screen printing, e.g. roller, squeegee, screen stencil

Means for applying a preform, e.g. laminator

including a vacuum-bag

Means for blanket deposition

for spin coating, i.e. spin coater

for curtain coating

for immersion coating, i.e. bath

for spray coating, i.e. nozzle

Means for physical vapour deposition [PVD], e.g. evaporation, sputtering

Means for sputtering, e.g. target

Means for evaporation

Means for chemical vapour deposition [CVD], e.g. for laser CVD

Means for plating, e.g. for electroplating, electroless plating

Protection means against electrical discharge

Means for applying energy, e.g. heating means

in the lower part of the bonding apparatus, e.g. in the apparatus chuck

in the upper part of the bonding apparatus, e.g. in the wedge

adapted for localised heating

Polychromatic heating lamp

Laser

in the lower part of the bonding apparatus, e.g. in the apparatus chuck

in the upper part of the bonding apparatus, e.g. in the wedge

by induction heating, i.e. coils

in the lower part of the bonding apparatus, e.g. in the apparatus chuck

in the upper part of the bonding apparatus, e.g. in the wedge

Flame torch, e.g. hydrogen torch

Discharge electrode

Shape of the discharge electrode

Material of the discharge electrode

Circuitry of the discharge electrode

Oven

Resistance welding electrodes, i.e. for ohmic heating

in the lower part of the bonding apparatus, e.g. in the apparatus chuck

in the upper part of the bonding apparatus, e.g. in the wedge

by infrared heating, e.g. infrared heating lamp

by means of pressure

Wedge

Shape of the apparatus for connecting with strap connectors

of the pressing surface, e.g. tip or head

comprising protrusions

of other portions

inside the capillary

outside the capillary

Removable wedge

Material

Auxiliary members on the pressing surface

Removable auxiliary member

Shape of the auxiliary member

Material of the auxiliary member

by ultrasonic vibrations

Eccentric cams

in the lower part of the bonding apparatus, e.g. in the apparatus chuck

in the upper part of the bonding apparatus, e.g. in the wedge

Piezoelectric transducers

in the lower part of the bonding apparatus, e.g. in the apparatus chuck

in the upper part of the bonding apparatus, e.g. in the wedge

Stable and mobile yokes

Design, e.g. of the wave guide

Cooling means

in the lower part of the bonding apparatus, e.g. in the apparatus chuck

in the upper part of the bonding apparatus, e.g. in the wedge

Mechanical means, e.g. for severing, pressing, stamping
Means for monitoring the connection process using a computer, e.g. fully- or semi-automatic bonding

Means for moving parts

Means for applying energy, e.g. heating means

Means for transporting the components to be connected

Means for controlling the bonding environment, e.g. valves, vacuum pumps
Means for transporting the components to be connected in the bonding apparatus.

Means for supplying the connector to be stamped.

Mechanical means, e.g. for severing, pressing, by ultrasonic vibrations.

Cooling means.

Ultrasonic horns.

Design, e.g. of the wave guide.

Cooling means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the apparatus chuck.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

Means for forming additional members.

Means for monitoring the connection process.

Means for moving parts.

Lower part of the bonding apparatus, e.g. XY table.

Rotational mechanism.

Translational mechanism.

Upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge.

Rotational mechanism.

Translational mechanism.

Means for forming additional members.

Means for aligning.

Weaving conveyor.

Pneumatic conveyor.

in a fluid.

Means for aligning.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Mechanical holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Electrostatic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Magnetic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Suction holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

Means for optical alignment, e.g. sensors.

Guiding structures.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the capillary or wedge.

Means for aligning.

Means for moving parts.

Lower part of the bonding apparatus, e.g. XY table.

Rotational mechanism.

Translational mechanism.

Means for forming additional members.

Means for aligning.

Weaving conveyor.

Pneumatic conveyor.

in a fluid.

Means for aligning.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Mechanical holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Electrostatic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Magnetic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Suction holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

Means for optical alignment, e.g. sensors.

Guiding structures.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the capillary or wedge.

Means for aligning.

Means for moving parts.

Lower part of the bonding apparatus, e.g. XY table.

Rotational mechanism.

Translational mechanism.

Means for forming additional members.

Means for aligning.

Weaving conveyor.

Pneumatic conveyor.

in a fluid.

Means for aligning.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Mechanical holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Electrostatic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Magnetic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Suction holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

Means for optical alignment, e.g. sensors.

Guiding structures.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the capillary or wedge.

Means for aligning.

Means for moving parts.

Lower part of the bonding apparatus, e.g. XY table.

Rotational mechanism.

Translational mechanism.

Means for forming additional members.

Means for aligning.

Weaving conveyor.

Pneumatic conveyor.

in a fluid.

Means for aligning.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Mechanical holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Electrostatic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Magnetic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Suction holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

Means for optical alignment, e.g. sensors.

Guiding structures.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the capillary or wedge.

Means for aligning.

Means for moving parts.

Lower part of the bonding apparatus, e.g. XY table.

Rotational mechanism.

Translational mechanism.

Means for forming additional members.

Means for aligning.

Weaving conveyor.

Pneumatic conveyor.

in a fluid.

Means for aligning.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Mechanical holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Electrostatic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Magnetic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Suction holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

Means for optical alignment, e.g. sensors.

Guiding structures.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the capillary or wedge.

Means for aligning.

Means for moving parts.

Lower part of the bonding apparatus, e.g. XY table.

Rotational mechanism.

Translational mechanism.

Means for forming additional members.

Means for aligning.

Weaving conveyor.

Pneumatic conveyor.

in a fluid.

Means for aligning.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Mechanical holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Electrostatic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Magnetic holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

Suction holding means.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

in the upper part of the bonding apparatus, e.g. in the capillary or wedge.

in the lower part of the bonding apparatus, e.g. in the apparatus chuck.

Means for optical alignment, e.g. sensors.

Guiding structures.
2224/78988 . . . . . Material of the auxiliary member
2224/79  . . . . . . . Apparatus for Tape Automated Bonding [TAB]
2224/79001 . . . . . Calibration means
2224/7901 . . . . . . . Means for cleaning, e.g. brushes, for hydro blasting, for ultrasonic cleaning, for dry ice blasting, using gas-flow, by etching, by applying flux or plasma
2224/791 . . . . . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
2224/79101 . . . . . Chamber
2224/79102 . . . . . Vacuum chamber
2224/7911 . . . . . . . High pressure chamber
2224/7915 . . . . . . . Means for applying permanent coating
2224/79151 . . . . . . . Means for direct writing
2224/79152 . . . . . . . Syringe
2224/79153 . . . . . . . integrated into the pressing head
2224/79155 . . . . . . . Jetting means, e.g. ink jet
2224/79158 . . . . . . . including a laser
2224/79161 . . . . . . . Means for screen printing, e.g. roller, squeegee, screen stencil
2224/7917 . . . . . . . Means for applying a preform, e.g. laminator
2224/79171 . . . . . . . including a vacuum-bag
2224/7918 . . . . . . . Means for blanket deposition
2224/79181 . . . . . . . Means for spin coating, i.e. spin coater
2224/79182 . . . . . . . Means for curtain coating
2224/79183 . . . . . . . Means for immersion coating, i.e. bath
2224/79184 . . . . . . . Means for spray coating, i.e. nozzle
2224/79185 . . . . . . . Means for physical vapour deposition [PVD], e.g. evaporation, sputtering
2224/79186 . . . . . . . Means for sputtering, e.g. target
2224/79187 . . . . . . . Means for evaporation
2224/79188 . . . . . . . Means for chemical vapour deposition [CVD], e.g. for laser CVD
2224/79189 . . . . . . . Means for plating, e.g. for electroplating, electroleess plating
2224/792 . . . . . . . Protection means against electrical discharge
2224/7925 . . . . . . . Means for applying energy, e.g. heating means
2224/79251 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79252 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79253 . . . . . . . adapted for localised heating
2224/7926 . . . . . . . Polychromatic heating lamp
2224/79261 . . . . . . . Laser
2224/79262 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79263 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79264 . . . . . . . by induction heating, i.e. coils
2224/79265 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79266 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79267 . . . . . . . Flame torch, e.g. hydrogen torch
2224/79268 . . . . . . . Discharge electrode
2224/79269 . . . . . . . Shape of the discharge electrode
2224/7927 . . . . . . . Material of the discharge electrode
2224/79271 . . . . . . . Circuitry of the discharge electrode
2224/79272 . . . . . . . Oven
2224/7928 . . . . . . . Resistance welding electrodes, i.e. for ohmic heating
2224/79281 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79282 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79283 . . . . . . . by infrared heating, e.g. infrared heating lamp
2224/793 . . . . . . . by means of pressure
2224/79301 . . . . . . . Pressing head
2224/79302 . . . . . . . Shape
2224/79303 . . . . . . . of the pressing surface
2224/79304 . . . . . . . being curved
2224/79305 . . . . . . . comprising protrusions
2224/7931 . . . . . . . of other parts
2224/79312 . . . . . . . Material
2224/79313 . . . . . . . Removable pressing head
2224/79314 . . . . . . . Auxiliary members on the pressing surface
2224/79315 . . . . . . . Elastomer inlay
2224/79316 . . . . . . . with retaining mechanisms
2224/79317 . . . . . . . Removable auxiliary member
2224/79318 . . . . . . . Shape of the auxiliary member
2224/7932 . . . . . . . Material of the auxiliary member
2224/7934 . . . . . . . by ultrasonic vibrations
2224/79344 . . . . . . . Eccentric cams
2224/79345 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79346 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79347 . . . . . . . Piezoelectric transducers
2224/79348 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79349 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/7935 . . . . . . . Stable and mobile yokes
2224/79351 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79352 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79353 . . . . . . . Ultrasonic horns
2224/79354 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79355 . . . . . . . Design, e.g. of the wave guide
2224/795 . . . . . . . Cooling means
2224/79501 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79502 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/7955 . . . . . . . Mechanical means, e.g. for pressing, stamping
2224/796 . . . . . . . Means for supplying the connector to be connected in the bonding apparatus
2224/79601 . . . . . . . Storing means
2224/79611 . . . . . . . Feeding means
2224/79621 . . . . . . . Holding means
2224/7965 . . . . . . . Means for transporting the components to be connected
2224/79651 . . . . . . . Belt conveyor
2224/79652 . . . . . . . Chain conveyor
2224/79653 . . . . . . . Vibrating conveyor
2224/79654 . . . . . . . Pneumatic conveyor
2224/79655 . . . . . . . in a fluid
2224/797 . . . . . . . Means for aligning
2224/79701 . . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79702 . . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79703 . . . . . Mechanical holding means
2224/79704 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79705 . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79723 . . . . . . Electrostatic holding means
2224/79724 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79725 . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79733 . . . . . . Magnetic holding means
2224/79734 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79735 . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79743 . . . . . . Suction holding means
2224/79744 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79745 . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/79753 . . . . . . Means for optical alignment, e.g. sensors
2224/79754 . . . . . . Guiding structures
2224/79755 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/79756 . . . . . . in the upper part of the bonding apparatus, e.g. in the pressing head
2224/798 . . . . . . Means for moving parts
2224/79801 . . . . . Lower part of the bonding apparatus, e.g. XY table
2224/79802 . . . . . . Rotational mechanism
2224/79803 . . . . . . Pivoting mechanism
2224/79804 . . . . . . Translational mechanism
2224/79821 . . . . . . Upper part of the bonding apparatus, i.e. pressing head
2224/79822 . . . . . . Rotational mechanism
2224/79823 . . . . . . Pivoting mechanism
2224/79824 . . . . . . Translational mechanism
2224/79841 . . . . . . of the pressing head
2224/79842 . . . . . . Rotational mechanism
2224/79843 . . . . . . Pivoting mechanism
2224/799 . . . . . . Means for monitoring the connection process
2224/79901 . . . . . . using a computer, e.g. fully- or semi-automatic bonding
2224/7992 . . . . . . Load or pressure adjusting means, e.g. sensors
2224/79925 . . . . . . Vibration adjusting means, e.g. sensors
2224/7995 . . . . . . Means for forming additional members
2224/7998 . . . . . . specially adapted for batch processes
2224/79981 . . . . . . Apparatus chuck
2224/79982 . . . . . . Shape
2224/79983 . . . . . . of the mounting surface
2224/79984 . . . . . . of other portions
2224/79985 . . . . . . Material
2224/79986 . . . . . . Auxiliary members on the pressing surface
2224/79987 . . . . . . Shape of the auxiliary member
2224/79988 . . . . . . Material of the auxiliary member
2224/7999 . . . . . . for disconnecting
2224/80 . . . . . . Methods for connecting semiconductor or other solid state bodies using means for bonding being attached to, or being formed on, the surface to be connected
2224/80001 . . . . . . by connecting a bonding area directly to another bonding area, i.e. connectorless bonding
2224/80003 . . . . . . involving a temporary auxiliary member not forming part of the bonding apparatus
2224/80004 . . . . . . being a removable or sacrificial coating
2224/80006 . . . . . . being a temporary or sacrificial substrate
2224/80007 . . . . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for protecting the bonding area during or after the bonding process
2224/80009 . . . . . . Pre-treatment of the bonding area
2224/8001 . . . . . . Cleaning the bonding area, e.g. oxide removal step, desmearing
2224/80011 . . . . . . Chemical cleaning, e.g. etching, flux
2224/80012 . . . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/80013 . . . . . . Plasma cleaning
2224/80014 . . . . . . Thermal cleaning, e.g. decomposition, sublimation
2224/80019 . . . . . . Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8001 - H01L 2224/80014
2224/8002 . . . . . . Applying permanent coating to the bonding area in the bonding apparatus, e.g. in-situ coating
2224/80024 . . . . . . Applying flux to the bonding area in the bonding apparatus
2224/8003 . . . . . . Reshaping the bonding area in the bonding apparatus, e.g. flattening the bonding area
2224/80031 . . . . . . by chemical means, e.g. etching, anodisation
2224/80035 . . . . . . by heating means
2224/80037 . . . . . . using a polychromatic heating lamp
2224/80039 . . . . . . using a laser
2224/80041 . . . . . . Induction heating, i.e. eddy currents
2224/80047 . . . . . . by mechanical means, e.g. severing, pressing, stamping
2224/80048 . . . . . . Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
2224/80051 . . . . . . Forming additional members
2224/80052 . . . . . . Detaching bonding areas, e.g. after testing (unsoldering in general B23K 1/018)
2224/80053 . . . . . . Bonding environment
2224/80054 . . . . . . Composition of the atmosphere
2224/80055 . . . . . . being oxidating
2224/80065 . . . . . . being reducing
2224/80075 . . . . . . being inert
2224/80085 . . . . . . being a liquid, e.g. for fluidic self-assembly
2224/8009 . . . . . . Vacuum
2224/80091 . . . . . . Under pressure
2224/80092 . . . . . . Atmospheric pressure
2224/80093 . . . . . . Transient conditions, e.g. gas-flow
2224/80095 . . . . . . Temperature settings
2224/80096 . . . . . . Transient conditions
2224/80097 . . . . . . Heating
2224/80098 . . . . . . Cooling
2224/80099 . . . . . . Ambient temperature
2224/8011 . . . . . . involving protection against electrical discharge, e.g. removing electrostatic charge
2224/8012 . . . . . . Aligning
Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors by detecting inherent features of, or outside, the semiconductor or solid-state body

Shape or position of the body Bonding areas on the body Bonding areas outside the body Shape or position of the other item using marks formed on the semiconductor or solid-state body using marks formed outside the semiconductor or solid-state body, i.e. “off-chip” involving guiding structures, e.g. spacers or supporting members the guiding structures being at least partially left in the finished device Guiding structures on the body Guiding structures outside the body Guiding structures both on and outside the body involving movement of a part of the bonding apparatus being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table Rotational movements Translational movements being the upper part of the bonding apparatus, i.e. bonding head Rotational movements Translational movements Arrangement of the bonding areas prior to mounting Lateral distribution of the bonding areas Applying energy for connecting Compression bonding Thermocompression bonding, e.g. diffusion bonding, pressure joining, thermocompression welding or solid-state welding with a graded temperature profile Ultrasonic bonding Direction of oscillation Thermosonic bonding applying unidirectional static pressure applying isostatic pressure, e.g. degassing using vacuum or a pressurised liquid using a reflow oven with a graded temperature profile with energy being in the form of electromagnetic radiation Induction heating, i.e. eddy currents using a laser Polychromatic or infrared lamp heating using an autocatalytic reaction, e.g. exothermic brazing using means for applying energy being within the device, e.g. integrated heater using electro-static corona discharge using an electron beam (electron beam welding in general B23K 15/00) using electric resistance welding, i.e. ohmic heating Bonding interfaces of the bonding area Shape, e.g. interlocking features having an external coating, e.g. protective bond-through coating being flush with the surface Material Bonding interfaces of the semiconductor or solid state body Shape, e.g. interlocking features having an external coating, e.g. protective bond-through coating Material (material of the bonding area prior to the connecting process H01L 2224/05099 and H01L 2224/05599) Bonding interfaces outside the semiconductor or solid-state body Shape, e.g. interlocking features having an external coating, e.g. protective bond-through coating Material with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof the principal constituent melting at a temperature of less than 400°C Gallium [Ga] as principal constituent Indium [In] as principal constituent Tin [Sn] as principal constituent Bismuth [Bi] as principal constituent Thallium [Tl] as principal constituent Lead [Pb] as principal constituent the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C Zinc [Zn] as principal constituent Antimony [Sb] as principal constituent Magnesium [Mg] as principal constituent Aluminium [Al] as principal constituent the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C Silver [Ag] as principal constituent Gold [Au] as principal constituent Copper [Cu] as principal constituent Manganese [Mn] as principal constituent Nickel [Ni] as principal constituent Cobalt [Co] as principal constituent Iron [Fe] as principal constituent the principal constituent melting at a temperature of greater than 1550°C Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80488)
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the material being a solid not provided for in groups H01L 2224/804 - H01L 2224/80491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/804 - H01L 2224/80491
with a principal constituent of the material being a gas not provided for in groups H01L 2224/804 - H01L 2224/80491
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
Material of the matrix
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
the principal constituent melting at a temperature of less than 400°C
Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [TI] as principal constituent
Lead [Pb] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80588)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/805 - H01L 2224/80591, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/805 - H01L 2224/80591

with a principal constituent of the material being a gas not provided for in groups H01L 2224/805 - H01L 2224/80591

Fillers

Base material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [TI] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80688)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
Coating material

with a principal constituent of the material being a solid not provided for in groups H01L 2224/806 - H01L 2224/80691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/806 - H01L 2224/80691

with a principal constituent of the material being a gas not provided for in groups H01L 2224/806 - H01L 2224/80691

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Coating material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics) H01L 2224/80788

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/807 - H01L 2224/80791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/807 - H01L 2224/80791
with a principal constituent of the material being a gas not provided for in groups

H01L 2224/80895 - H01L 2224/80791

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Shape or distribution of the fillers

Bonding techniques

Soldering or alloying

involving forming a eutectic alloy at the bonding interface

involving forming an intermetallic compound at the bonding interface

Reflow soldering

Diffusion bonding

Solid-liquid interdiffusion

Solid-solid interdiffusion

Sintering

using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester

Hardening the adhesive by curing, i.e. thermosetting

Pre-cured adhesive, i.e. B-stage adhesive

Localised curing of parts of the bonding area

Heat curing

Microwave curing

Infrared [IR] curing

Visible light curing

Ultraviolet [UV] curing

Moisture curing, i.e. curing by exposure to humidity, e.g. for silicones and polyurethanes

Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives

Combinations of two or more hardening methods provided for in at least two different groups from H01L 2224/80895 - H01L 2224/80888, e.g. for hybrid thermostatic-thermosetting adhesives

using an inorganic non metallic glass type adhesive, e.g. a solder glass

Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond

Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces

between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding

between electrically insulating surfaces, e.g. oxide or nitride layers

Mechanical interlocking, e.g. anchoring, hook and loop-type fastening or the like
Aligning involving protection against electrical
the bump connector being supplied to the parts
Bonding environment
Detaching bump connectors, e.g., after testing
Composition of the atmosphere
Forming additional members
Applying a precursor material to the bonding area
Reshaping the bump connector in the bonding apparatus, e.g., flattening the bump connector
by chemical means, e.g., etching, anodisation
by heating means
using a polychromatic heating lamp
using a laser
Induction heating, i.e., eddy currents
by mechanical means, e.g., severing, pressing, stamping
Thermal treatments, e.g., annealing, controlled pre-heating or pre-cooling
Forming additional members
Detaching bump connectors, e.g., after testing (unsoldering in general B23K 1/018)
Bonding environment
Composition of the atmosphere
being oxidating
being reducing
being inert
being a liquid, e.g., for fluidic self-assembly
Vacuum
Under pressure
Atmospheric pressure
Transient conditions, e.g., gas-flow
Temperature settings
Transient conditions
Heating
Cooling
Ambient temperature
the bump connector being supplied to the parts to be connected in the bonding apparatus
as prepeg comprising a bump connector, e.g., provided in an insulating plate member
involving protection against electrical discharge, e.g., removing electrostatic charge
Active alignment, i.e., by apparatus steering, e.g., optical alignment using marks or sensors
by detecting inherent features of, or outside, the semiconductor or solid-state body
Shape or position of the body
Bonding areas on the body
Bonding areas outside the body
Shape or position of the other item
using marks formed on the semiconductor or solid-state body
using marks formed outside the semiconductor or solid-state body, i.e., "off-chip"
involving guiding structures, e.g., spacers or supporting members
the guiding structures being at least partially left in the finished device
Guiding structures on the body
Guiding structures outside the body
Guiding structures both on and outside the body
Passive alignment, i.e., self alignment, e.g., using surface energy, chemical reactions, thermal equilibrium
involving movement of a part of the bonding apparatus
being the lower part of the bonding apparatus, i.e., holding means for the body to be connected, e.g., XY table
Rotational movements
Translational movements
being the upper part of the bonding apparatus, i.e., bonding head
Rotational movements
Translational movements
Arrangement of the bump connectors prior to mounting
wherein the bump connectors are disposed only on the semiconductor or solid-state body
wherein the bump connectors are disposed only on another item or body to be connected to the semiconductor or solid-state body
wherein the bump connectors are disposed on both the semiconductor or solid-state body and another item or body to be connected to the semiconductor or solid-state body
Lateral distribution of the bump connectors
Applying energy for connecting
Compression bonding
Thermocompression bonding, e.g., diffusion bonding, pressure joining, thermocompression welding or solid-state welding
with a graded temperature profile
Ultrasonic bonding
Direction of oscillation
Thermosonic bonding
applying unidirectional static pressure
applying isostatic pressure, e.g., degassing using vacuum or a pressurised liquid
using a reflow oven
with a graded temperature profile
with energy being in the form of electromagnetic radiation

Induction heating, i.e. eddy currents

using a laser

Polychromatic or infrared lamp heating

using an autocatalytic reaction, e.g. exothermic brazing

using means for applying energy being within the device, e.g. integrated heater

using electro-static corona discharge

using an electron beam (electron beam welding in general B23K 15/00)

using electric resistance welding, i.e. ohmic heating

Bonding interfaces of the bump connector

Shape, e.g. interlocking features

having an external coating, e.g. protective bond-through coating

Material

Bonding interfaces of the semiconductor or solid state body

Shape, e.g. interlocking features

having an external coating, e.g. protective bond-through coating

Material (material of the bump connector prior to the connecting process H01L 2224/13099 and H01L 2224/13599, and subgroups)

Bonding interfaces outside the semiconductor or solid-state body

Shape, e.g. interlocking features

having an external coating, e.g. protective bond-through coating

Material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/81488)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/81493

H01L 2224/8149 - H01L 2224/81491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/81493

H01L 2224/8149 - H01L 2224/81491

with a principal constituent of the material being a gas not provided for in groups H01L 2224/81493

H01L 2224/8149 - H01L 2224/81491

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Material of the matrix

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
of the material being a gas with a principal constituent of metalloid inorganic material, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond with a principal constituent of the material being a liquid not provided for in groups H01L 2224/81591 - H01L 2224/81591, e.g. al lotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond with a principal constituent of the material being a gas not provided for in groups H01L 2224/81591 - H01L 2224/81591

- Fillers
- Base material
- with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- the principal constituent melting at a temperature of less than 400°C
- Gallium [Ga] as principal constituent
- Indium [In] as principal constituent
- Tin [Sn] as principal constituent
- Bismuth [Bi] as principal constituent
- Thallium [TI] as principal constituent
- Lead [Pb] as principal constituent
- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- Silver [Ag] as principal constituent
- Gold [Au] as principal constituent
- Copper [Cu] as principal constituent
- Manganese [Mn] as principal constituent
- Nickel [Ni] as principal constituent
- Cobalt [Co] as principal constituent
- Iron [Fe] as principal constituent
- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- Palladium [Pd] as principal constituent
- Titanium [Ti] as principal constituent
- Platinum [Pt] as principal constituent
- Zirconium [Zr] as principal constituent
- Chromium [Cr] as principal constituent
- Vanadium [V] as principal constituent
- Rhodium [Rh] as principal constituent
- Ruthenium [Ru] as principal constituent
- Iridium [Ir] as principal constituent
- Niobium [Nb] as principal constituent
- Molybdenum [Mo] as principal constituent
- Tantalum [Ta] as principal constituent
- Rhenium [Re] as principal constituent
- Tungsten [W] as principal constituent
- with a principal constituent of the material being a non metallic, non metalloid inorganic material
- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/8158)
- Glasses, e.g. amorphous oxides, nitrides or fluorides
- with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- with a principal constituent of the material being a solid not provided for in groups H01L 2224/815 - H01L 2224/81591, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond with a principal constituent of the material being a liquid not provided for in groups H01L 2224/815 - H01L 2224/81591
- with a principal constituent of the material being a gas not provided for in groups H01L 2224/815 - H01L 2224/81591
- Fillers
- Base material
- with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- the principal constituent melting at a temperature of less than 400°C
- Gallium [Ga] as principal constituent
- Indium [In] as principal constituent
- Tin [Sn] as principal constituent
- Bismuth [Bi] as principal constituent
- Thallium [TI] as principal constituent
- Lead [Pb] as principal constituent
- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 950°C
- Zinc [Zn] as principal constituent

H01L
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/81688)
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the material being a solid not provided for in groups H01L 2224/816 - H01L 2224/81691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/816 - H01L 2224/81691
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
Coating material
with a principal constituent of the material being a gas not provided for in groups H01L 2224/816 - H01L 2224/81691
with a principal constituent of the material being a solid not provided for in groups H01L 2224/816 - H01L 2224/81691
the principal constituent melting at a temperature of less than 400°C
Gallium [Ga] as principal constituent
Indium [In] as principal constituent
Tin [Sn] as principal constituent
Bismuth [Bi] as principal constituent
Thallium [Tl] as principal constituent
Lead [Pb] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitriles or oxides (glass ceramics H01L 2224/81787)

Ceramics, e.g. amorphous oxides, nitriles or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/817 - H01L 2224/81791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/817 - H01L 2224/81791

with a principal constituent of the material being a gas not provided for in groups H01L 2224/817 - H01L 2224/81791

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces

Between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding

Between electrically insulating surfaces, e.g. oxide or nitride layers

Mechanical interlocking, e.g. anchoring, hook and loop-type fastening or the like

Press-fitting, i.e. pushing the parts together and fastening by friction, e.g. by compression of one part against the other

Using resilient parts in the bump connector or in the bonding area

With the bump connector not providing any mechanical bonding

Pressing the bump connector against the bonding areas by means of another connector (detachable pressure contact H01L 2224/72)

By means of another bump connector

By means of a layer connector

By means of an encapsulation layer or foil

Combinations of bonding methods provided for in at least two different groups from H01L 2224/81904

Specific sequence of method steps

Intermediate bonding, i.e. intermediate bonding step for temporarily bonding the semiconductor or solid-state body, followed by at least a further bonding step

Involving monitoring, e.g. feedback loop

Post-treatment of the bump connector or bonding area

Cleaning, e.g. oxide removal step, desmearing

Chemical cleaning, e.g. etching, flux

Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow cleaning

Plasma cleaning

Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge

Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/81914

Applying permanent coating, e.g. protective coating

Reshaping

By chemical means, e.g. etching

By heating means, e.g. reflowing

Using a polychromatic heating lamp

Using a laser

Induction heating, i.e. eddy currents

Using a flame torch, e.g. hydrogen torch

Using a corona discharge, e.g. electronic flame off [EFO]

By mechanical means, e.g. "pull-and-cut", pressing, stamping

Thermal treatments, e.g. annealing, controlled cooling

Forming additional members, e.g. for reinforcing

Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence

By forming build-up interconnects at chip-level, e.g. for high density interconnects [HDI]

Involving a temporary auxiliary member not forming part of the bonding apparatus

Being a removable or sacrificial coating

Being a temporary or sacrificial substrate

Involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting a build-up interconnect during or after the bonding process

Pre-treatment of the connector or the bonding area

Cleaning, e.g. oxide removal step, desmearing

Reshaping, e.g. forming vias

By chemical means, e.g. etching, anodisation

By heating means

Using a laser

Using a corona discharge, e.g. electronic flame off [EFO]

By mechanical means, e.g. severing, pressing, stamping

Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

Forming additional members

Bonding environment

Composition of the atmosphere

Being a liquid, e.g. for fluidic self-assembly

Vacuum

Under pressure

Temperature settings

Transient conditions

Heating

Cooling

Ambient temperature

Forming a build-up interconnect

By additive methods, e.g. direct writing

Using jetting, e.g. ink jet

Using laser direct writing

Using screen printing

By using a preform

By subtractive methods

By self-assembly processes

Involving protection against electrical discharge, e.g. removing electrostatic charge

Aligning

Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors

By detecting inherent features of, or outside, the semiconductor or solid-state body

Using marks formed on the semiconductor or solid-state body

Using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"

Involving guiding structures, e.g. spacers or supporting members
2224/8218 . . . . . Translational movements

2224/82186 . . . . . connecting first outside the semiconductor or solid-state body, i.e. off-chip

2224/82191 . . . . . connecting first both on and outside the semiconductor or solid-state body

2224/822 . . . . . Applying energy for connecting

2224/82201 . . . . . Compression bonding

2224/82203 . . . . . Thermocompression bonding

2224/82205 . . . . . Ultrasonic bonding

2224/82207 . . . . . Thermosonic bonding

2224/8221 . . . . . with energy being in the form of electromagnetic radiation

2224/82212 . . . . . Induction heating, i.e. eddy currents

2224/82214 . . . . . using a laser

2224/8223 . . . . . Polychromatic or infrared lamp heating

2224/82232 . . . . . using an autocatalytic reaction, e.g. exothermic brazing

2224/82234 . . . . . using means for applying energy being within the device, e.g. integrated heater

2224/82236 . . . . . using electro-static corona discharge

2224/82237 . . . . . using electron beam, (electron beam in general B23K 15/00)

2224/82238 . . . . . using electric resistance welding, i.e. ohmic heating

2224/82239 . . . . . Material

2224/823 . . . . . Bonding interfaces of the semiconductor or solid state body

2224/82355 . . . . . having an external coating, e.g. protective bond-through coating

2224/82359 . . . . . Material

2224/8236 . . . . . Bonding interfaces of the semiconductor or solid state body

2224/82365 . . . . . Shape, e.g. interlocking features

2224/82375 . . . . . having an external coating, e.g. protective bond-through coating

2224/82379 . . . . . Material

2224/8238 . . . . . Bonding interfaces outside the semiconductor or solid-state body

2224/82385 . . . . . Shape, e.g. interlocking features

2224/82395 . . . . . having an external coating, e.g. protective bond-through coating

2224/82399 . . . . . Material

2224/828 . . . . . Bonding techniques

2224/82801 . . . . . Soldering or alloying

2224/82805 . . . . . involving forming a eutectic alloy at the bonding interface

2224/8281 . . . . . involving forming an intermetallic compound at the bonding interface

2224/82815 . . . . . Reflow soldering

2224/8282 . . . . . Diffusion bonding

2224/82825 . . . . . Solid-liquid interdiffusion

2224/82828 . . . . . Solid-solid interdiffusion

2224/82824 . . . . . Sintering

2224/8285 . . . . . using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester

2224/82855 . . . . . Hardening the adhesive by curing, i.e. thermosetting

2224/82856 . . . . . Pre-cured adhesive, i.e. B-stage adhesive

2224/82859 . . . . . Localised curing of parts of the connector

2224/82862 . . . . . Heat curing

2224/82865 . . . . . Microwave curing

2224/82868 . . . . . Infrared [IR] curing

2224/82871 . . . . . Visible light curing

2224/82874 . . . . . Ultraviolet [UV] curing

2224/82877 . . . . . Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes

2224/8288 . . . . . Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives

2224/82885 . . . . . Combinations of two or more hardening methods provided for in at least two different groups from H01L 2224/8288, e.g. for hybrid thermoplastic-thermosetting adhesives

2224/8289 . . . . . using an inorganic non metallic glass type adhesive, e.g. solder glass

2224/82893 . . . . . Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond

2224/82895 . . . . . Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces

2224/82896 . . . . . between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding

2224/82897 . . . . . between electrically insulating surfaces, e.g. oxide or nitride layers

2224/82899 . . . . . Combinations of bonding methods provided for in at least two different groups from H01L 2224/8288, e.g. chemical bonding and laser bonding, e.g. laser welding

2224/829 . . . . . involving monitoring, e.g. feedback loop

2224/82909 . . . . . Post-treatment of the connector or the bonding area

2224/8291 . . . . . Cleaning, e.g. oxide removal step, desmearing

2224/8293 . . . . . Reshaping

2224/82931 . . . . . by chemical means, e.g. etching, anodisation

2224/82935 . . . . . by heating means

2224/82939 . . . . . using a laser

2224/82945 . . . . . using a corona discharge, e.g. electronic flame off [EFO]

2224/82947 . . . . . by mechanical means, e.g. severing, pressing, stamping
using a layer connector

Lateral distribution of the layer connectors

Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence

Pre-treatment of the layer connector or the bonding area

Cleaning the layer connector, e.g. oxide removal step, desmearing

Chemical cleaning, e.g. etching, flux

Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow

Plasma cleaning

Thermal cleaning, e.g. decomposition, sublimation

Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8319 - H01L 2224/83014

Applying permanent coating to the layer connector in the bonding apparatus, e.g. in-situ coating

Cleaning the bonding area, e.g. oxide removal step, desmearing

Applying flux to the bonding area

Applying a precursor material to the bonding area

Reshaping the layer connector in the bonding apparatus, e.g. flattening the layer connector by chemical means, e.g. etching, anodisation

by heating means

using a polychromatic heating lamp

using a laser

Induction heating, i.e. eddy currents

by mechanical means, e.g. severing, pressing, stamping

Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

Forming additional members, e.g. dam structures

Detaching layer connectors, e.g. after testing (unsoldering in general B23K 1/018)

Bonding environment

Composition of the atmosphere

being oxidating

being reducing

being inert

being a liquid, e.g. for fluidic self-assembly

Vacuum

Under pressure

Atmospheric pressure

Transient conditions, e.g. gas-flow

Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

Forming additional members

Detaching layer connectors, e.g. after testing (unsoldering in general B23K 1/018)

Bonding environment

Composition of the atmosphere

being oxidating

being reducing

being inert

being a liquid, e.g. for fluidic self-assembly

Vacuum

Under pressure

Atmospheric pressure

Transient conditions, e.g. gas-flow

Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

Forming additional members

Detaching layer connectors, e.g. after testing (unsoldering in general B23K 1/018)

Bonding environment

Composition of the atmosphere

being oxidating

being reducing

being inert

being a liquid, e.g. for fluidic self-assembly

Vacuum

Under pressure

Atmospheric pressure

Transient conditions, e.g. gas-flow

Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

Forming additional members

Detaching layer connectors, e.g. after testing (unsoldering in general B23K 1/018)

Bonding environment

Composition of the atmosphere

being oxidating

being reducing

being inert

being a liquid, e.g. for fluidic self-assembly

Vacuum

Under pressure

Atmospheric pressure

Transient conditions, e.g. gas-flow
Applying energy for connecting

Compression bonding

Thermocompression bonding, e.g. diffusion bonding, pressure joining, thermocompression welding or solid-state welding

with a graded temperature profile

Ultrasonic bonding

Direction of oscillation

Thermosonic bonding

applying unidirectional static pressure

applying isostatic pressure, e.g. degassing using vacuum or a pressurised liquid

using a refow oven

with a graded temperature profile

with energy being in the form of electromagnetic radiation

Induction heating, i.e. eddy currents

using a laser

Polychromatic or infrared lamp heating

using an autocatalytic reaction, e.g. exothermic brazing

using means for applying energy being within the device, e.g. integrated heater

using electro-static corona discharge

using an electron beam (electron beam welding in general B23K 15/00)

using electric resistance welding, i.e. ohmic heating

Bonding interfaces of the layer connector

Shape, e.g. interlocking features

having an external coating, e.g. protective bond-through coating

Material

Bonding interfaces of the semiconductor or solid state body

Shape, e.g. interlocking features

having an external coating, e.g. protective bond-through coating

Material (material of the layer connector prior to the connecting process H01L 2224/2909 and H01L 2224/29599, and subgroups)

Bonding interfaces outside the semiconductor or solid-state body

Shape, e.g. interlocking features

having an external coating, e.g. protective bond-through coating

Material (material of the layer connector prior to the connecting process H01L 2224/2909 and H01L 2224/29599, and subgroups)

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/38488)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/834 - H01L 2224/83491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/834 - H01L 2224/83491
with a principal constituent of the material being a gas not provided for in groups H01L 2224/83491 - H01L 2224/83491,

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams.

Material of the matrix

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Magnesium [Mg] as principal constituent

Aluminium [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Silver [Ag] as principal constituent

Gold [Au] as principal constituent

Copper [Cu] as principal constituent

Manganese [Mn] as principal constituent

Nickel [Ni] as principal constituent

Cobalt [Co] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83588)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/835 - H01L 2224/83591, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/835 - H01L 2224/83591

with a principal constituent of the material being a gas not provided for in groups H01L 2224/835 - H01L 2224/83591

Fillers

Base material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent
<table>
<thead>
<tr>
<th>CPC</th>
<th>Description</th>
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<tbody>
<tr>
<td>2224/83609</td>
<td>Indium [In] as principal constituent</td>
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<tr>
<td>2224/83611</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/83613</td>
<td>Bismuth [Bi] as principal constituent</td>
</tr>
<tr>
<td>2224/83614</td>
<td>Thallium [Tl] as principal constituent</td>
</tr>
<tr>
<td>2224/83616</td>
<td>Lead [Pb] as principal constituent</td>
</tr>
<tr>
<td>2224/83617</td>
<td>the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C</td>
</tr>
<tr>
<td>2224/83618</td>
<td>Zinc [Zn] as principal constituent</td>
</tr>
<tr>
<td>2224/8362</td>
<td>Antimony [Sb] as principal constituent</td>
</tr>
<tr>
<td>2224/83623</td>
<td>Magnesium [Mg] as principal constituent</td>
</tr>
<tr>
<td>2224/83624</td>
<td>Aluminium [Al] as principal constituent</td>
</tr>
<tr>
<td>2224/83638</td>
<td>the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C</td>
</tr>
<tr>
<td>2224/83639</td>
<td>Silver [Ag] as principal constituent</td>
</tr>
<tr>
<td>2224/83644</td>
<td>Gold [Au] as principal constituent</td>
</tr>
<tr>
<td>2224/83647</td>
<td>Copper [Cu] as principal constituent</td>
</tr>
<tr>
<td>2224/83649</td>
<td>Manganese [Mn] as principal constituent</td>
</tr>
<tr>
<td>2224/83655</td>
<td>Nickel [Ni] as principal constituent</td>
</tr>
<tr>
<td>2224/83657</td>
<td>Cobalt [Co] as principal constituent</td>
</tr>
<tr>
<td>2224/8366</td>
<td>Iron [Fe] as principal constituent</td>
</tr>
<tr>
<td>2224/83663</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
</tr>
<tr>
<td>2224/83664</td>
<td>Palladium [Pd] as principal constituent</td>
</tr>
<tr>
<td>2224/83666</td>
<td>Titanium [Ti] as principal constituent</td>
</tr>
<tr>
<td>2224/83669</td>
<td>Platinum [Pt] as principal constituent</td>
</tr>
<tr>
<td>2224/8367</td>
<td>Zirconium [Zr] as principal constituent</td>
</tr>
<tr>
<td>2224/83671</td>
<td>Chromium [Cr] as principal constituent</td>
</tr>
<tr>
<td>2224/83672</td>
<td>Vanadium [V] as principal constituent</td>
</tr>
<tr>
<td>2224/83673</td>
<td>Rhodium [Rh] as principal constituent</td>
</tr>
<tr>
<td>2224/83676</td>
<td>Ruthenium [Ru] as principal constituent</td>
</tr>
<tr>
<td>2224/83678</td>
<td>Iridium [Ir] as principal constituent</td>
</tr>
<tr>
<td>2224/83679</td>
<td>Niobium [Nb] as principal constituent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2224/8368</td>
<td>Molybdenum [Mo] as principal constituent</td>
</tr>
<tr>
<td>2224/83681</td>
<td>Tantalum [Ta] as principal constituent</td>
</tr>
<tr>
<td>2224/83683</td>
<td>Rhenium [Re] as principal constituent</td>
</tr>
<tr>
<td>2224/83684</td>
<td>Tungsten [W] as principal constituent</td>
</tr>
<tr>
<td>2224/83686</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>2224/83687</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83688)</td>
</tr>
<tr>
<td>2224/83688</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
</tr>
<tr>
<td>2224/8369</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>2224/83691</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>2224/83693</td>
<td>with a principal constituent of the material being a solid not provided for in groups H01L 2224/83691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond</td>
</tr>
<tr>
<td>2224/83694</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/83691</td>
</tr>
<tr>
<td>2224/83695</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/83691</td>
</tr>
<tr>
<td>2224/83698</td>
<td>with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams</td>
</tr>
<tr>
<td>2224/83699</td>
<td>Coating material</td>
</tr>
<tr>
<td>2224/837</td>
<td>with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof</td>
</tr>
<tr>
<td>2224/83701</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>2224/83705</td>
<td>Gallium [Ga] as principal constituent</td>
</tr>
<tr>
<td>2224/83709</td>
<td>Indium [In] as principal constituent</td>
</tr>
<tr>
<td>2224/83711</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/83713</td>
<td>Bismuth [Bi] as principal constituent</td>
</tr>
<tr>
<td>2224/83714</td>
<td>Thallium [Tl] as principal constituent</td>
</tr>
</tbody>
</table>
H01L

2224/83716 . . . . . . . . . . . . . Lead [Pb] as principal constituent
2224/83717 . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/83718 . . . . . . . . . . . . . Zinc [Zn] as principal constituent
2224/8372 . . . . . . . . . . . . . Antimony [Sb] as principal constituent
2224/83723 . . . . . . . . . . . . . Magnesium [Mg] as principal constituent
2224/83724 . . . . . . . . . . . . . Aluminium [Al] as principal constituent
2224/83738 . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/83739 . . . . . . . . . . . . . Silver [Ag] as principal constituent
2224/83744 . . . . . . . . . . . . . Gold [Au] as principal constituent
2224/83747 . . . . . . . . . . . . . Copper [Cu] as principal constituent
2224/83749 . . . . . . . . . . . . . Manganese [Mn] as principal constituent
2224/83755 . . . . . . . . . . . . . Nickel [Ni] as principal constituent
2224/83757 . . . . . . . . . . . . . Cobalt [Co] as principal constituent
2224/8376 . . . . . . . . . . . . . Iron [Fe] as principal constituent
2224/83763 . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/83764 . . . . . . . . . . . . . Palladium [Pd] as principal constituent
2224/83766 . . . . . . . . . . . . . Titanium [Ti] as principal constituent
2224/83769 . . . . . . . . . . . . . Platinum [Pt] as principal constituent
2224/8377 . . . . . . . . . . . . . Zirconium [Zr] as principal constituent
2224/83771 . . . . . . . . . . . . . Chromium [Cr] as principal constituent
2224/83772 . . . . . . . . . . . . . Vanadium [V] as principal constituent
2224/83773 . . . . . . . . . . . . . Rhodium [Rh] as principal constituent
2224/83776 . . . . . . . . . . . . . Ruthenium [Ru] as principal constituent
2224/83778 . . . . . . . . . . . . . Iridium [Ir] as principal constituent
2224/83779 . . . . . . . . . . . . . Niobium [Nb] as principal constituent
2224/8378 . . . . . . . . . . . . . Molybdenum [Mo] as principal constituent
2224/83781 . . . . . . . . . . . . . Tantalum [Ta] as principal constituent
2224/83783 . . . . . . . . . . . . . Rhenium [Re] as principal constituent
2224/83784 . . . . . . . . . . . . . Tungsten [W] as principal constituent
2224/83786 . . . . . . . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/83787 . . . . . . . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83787)
2224/83788 . . . . . . . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8379 . . . . . . . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/83791 . . . . . . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/83793 . . . . . . . . . . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/837 - H01L 2224/83791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/83794 . . . . . . . . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/837 - H01L 2224/83791
2224/83795 . . . . . . . . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/837 - H01L 2224/83791
2224/83798 . . . . . . . . . . . . . with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/83799 . . . . . . . . . . . . . Shape or distribution of the fillers
2224/838 . . . . . . . . . . . . . Bonding techniques
2224/8380 . . . . . . . . . . . . . Soldering or alloying
2224/83805 . . . . . . . . . . . . . involving forming a eutectic alloy at the bonding interface
2224/8381 . . . . . . . . . . . . . involving forming an intermetallic compound at the bonding interface
2224/83815 . . . . . . . . . . . . . Reflow soldering
2224/8382 . . . . . . . . . . . . . Diffusion bonding
2224/83825 . . . . . . . . . . . . . Solid-liquid interdiffusion
2224/8383 . . . . . . . . . . . . . Solid-solid interdiffusion
2224/8384 . . . . . . . . . . . . . Sintering
2224/8385 . . . . . . . . . . . . . using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
2224/83851 . . . . . . . . . . . . . being an anisotropic conductive adhesive
2224/83855 . . . . . . . . . . . . . Hardening the adhesive by curing, i.e. thermosetting
2224/83856 . . . . . . . . . . . . . Pre-cured adhesive, i.e. B-stage adhesive
2224/83859 . . . . . . . . . . . . . Localised curing of parts of the layer connector
2224/8386 . . . . . . . . . . . . . Heat curing
2224/83865 . . . . . . . . . . . . . Microwave curing
2224/83868 . . . . . . . . . . . . . Infrared [IR] curing
2224/83871 . . . . . . . . . . . . . Visible light curing
2224/83874 . . . . . . . . . . . . . Ultraviolet [UV] curing
2224/83877 . . . . Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
2224/8388 . . . . Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
2224/83885 . . . . Combinations of two or more hardening methods provided for in at least two different groups from H01L 2224/83855 - H01L 2224/8388, e.g. for hybrid thermoplastic-thermosetting adhesives
2224/83886 . . . . Involving a self-assembly process, e.g. self-agglomeration of a material dispersed in a fluid
2224/83887 . . . . Auxiliary means therefor, e.g. for self-assembly activation
2224/83888 . . . . with special adaptation of the surface of the body to be connected, e.g. surface shape specially adapted for the self-assembly process
2224/83889 . . . . involving the material of the bonding area, e.g. bonding pad
2224/8389 . . . . using an inorganic non metallic glass type adhesive, e.g. solder glass
2224/83893 . . . . Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
2224/83894 . . . . Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
2224/83895 . . . . between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
2224/83896 . . . . between electrically insulating surfaces, e.g. oxide or nitride layers
2224/83897 . . . . Mechanical interlocking, e.g. anchoring, hook and loop-type fastening or the like
2224/83898 . . . . Press-fitting, i.e. pushing the parts together and fastening by friction, e.g. by compression of one part against the other
2224/83899 . . . . using resilient parts in the layer connector or in the bonding area
2224/839 . . . . with the layer connector not providing any mechanical bonding
2224/83901 . . . . Pressing the layer connector against the bonding areas by means of another connector
2224/83902 . . . . by means of another layer connector
2224/83903 . . . . by means of a bump connector
2224/83904 . . . . by means of an encapsulation layer or foil
2224/83905 . . . . Combinations of bonding methods provided for in at least two different groups from H01L 2224/838 - H01L 2224/83904
2224/83906 . . . . Specific sequence of method steps
2224/83907 . . . . Intermediate bonding, i.e. intermediate bonding step for temporarily bonding the semiconductor or solid-state body, followed by at least a further bonding step
2224/83908 . . . . involving monitoring, e.g. feedback loop
2224/83909 . . . . Post-treatment of the layer connector or bonding area
2224/8391 . . . . Cleaning, e.g. oxide removal step, desmearing
2224/83911 . . . . Chemical cleaning, e.g. etching, flux
2224/83912 . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/83913 . . . . Plasma cleaning
2224/83914 . . . . Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
2224/83919 . . . . Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8391 - H01L 2224/83914
2224/8392 . . . . Applying permanent coating, e.g. protective coating
2224/8393 . . . . Reshaping
2224/83931 . . . . by chemical means, e.g. etching
2224/83935 . . . . by heating means, e.g. reflowing
2224/83937 . . . . using a polychromatic heating lamp
2224/83939 . . . . using a laser
2224/83941 . . . . Induction heating, i.e. eddy currents
2224/83943 . . . . using a flame torch, e.g. hydrogen torch
2224/83945 . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/83947 . . . . by mechanical means, e.g. "pull-and-cut", pressing, stamping
2224/83948 . . . . Thermal treatments, e.g. annealing, controlled cooling
2224/83951 . . . . Forming additional members, e.g. for reinforcing, fillet sealant
2224/8396 . . . . Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
2224/84 . . . . using a strap connector
2224/84001 . . . . involving a temporary auxiliary member not forming part of the bonding apparatus
2224/84002 . . . . being a removable or sacrificial coating
2224/84005 . . . . being a temporary substrate
2224/84007 . . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the strap connector during or after the bonding process
2224/84009 . . . . Pre-treatment of the connector and/or the bonding area
2224/8401 . . . . Cleaning, e.g. oxide removal step, desmearing
2224/84011 . . . . Chemical cleaning, e.g. etching, flux
2224/84012 . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/84013 . . . . Plasma cleaning
2224/84014 . . . . Thermal cleaning, e.g. decomposition, sublimation
2224/84019 . . . . Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8401 - H01L 2224/84014
2224/8402 . . . . Applying permanent coating, e.g. in-situ coating
2224/8403 . . . . Reshaping
2224/84031 . . . . by chemical means, e.g. etching, anodisation
2224/84035 . . . . by heating means, e.g. "free-air-ball"
2224/84037 . . . . using a polychromatic heating lamp
2224/84039 . . . . using a laser
2224/84041 . . . . Induction heating, i.e. eddy currents
2224/84043 . . . . . . using a flame torch, e.g. hydrogen torch
2224/84045 . . . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/84047 . . . . . . by mechanical means, e.g. severing, pressing, stamping
2224/84048 . . . . . . Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
2224/84051 . . . . . . Forming additional members
2224/84053 . . . . . . Bonding environment
2224/84054 . . . . . . Composition of the atmosphere
2224/84055 . . . . . . being oxidating
2224/84065 . . . . . . being reducing
2224/84075 . . . . . . being inert
2224/84085 . . . . . . being a liquid (e.g. for fluidic self-assembly)
2224/8409 . . . . . . Vacuum
2224/84091 . . . . . . Under pressure
2224/84092 . . . . . . Atmospheric pressure
2224/84093 . . . . . . Transient conditions, e.g. gas-flow
2224/84095 . . . . . . Temperature settings
2224/84096 . . . . . . Transient conditions
2224/84097 . . . . . . Heating
2224/84098 . . . . . . Cooling
2224/84099 . . . . . . Ambient temperature
2224/841 . . . . . . the connector being supplied to the parts to be connected in the bonding apparatus
2224/8411 . . . . . . involving protection against electrical discharge, e.g. removing electrostatic charge
2224/8412 . . . . . . Aligning
2224/84121 . . . . . . Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
2224/84122 . . . . . . by detecting inherent features of, or outside, the semiconductor or solid-state body
2224/84123 . . . . . . Shape or position of the body
2224/84125 . . . . . . Bonding areas on the body
2224/84127 . . . . . . Bonding areas outside the body
2224/84129 . . . . . . Shape or position of the other item
2224/8413 . . . . . . using marks formed on the semiconductor or solid-state body
2224/84132 . . . . . . using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
2224/84136 . . . . . . involving guiding structures, e.g. spacers or supporting members
2224/84138 . . . . . . the guiding structures being at least partially left in the finished device
2224/84143 . . . . . . Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
2224/84148 . . . . . . involving movement of a part of the bonding apparatus
2224/84149 . . . . . . being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
2224/8415 . . . . . . Rotational movements
2224/8416 . . . . . . Translational movements
2224/84169 . . . . . . being the upper part of the bonding apparatus, i.e. bonding head,
2224/8417 . . . . . . Rotational movements
2224/8418 . . . . . . Translational movements
2224/84181 . . . . . . connecting first on the semiconductor or solid-state body, i.e. on-chip, regular stitch
2224/84186 . . . . . . connecting first outside the semiconductor or solid-state body, i.e. off-chip, reverse stitch
2224/84191 . . . . . . connecting first both on and outside the semiconductor or solid-state body, i.e. regular and reverse stitches
2224/84196 . . . . . . involving intermediate connecting steps before cutting the strap connector
2224/842 . . . . . . Applying energy for connecting
2224/84201 . . . . . . Compression bonding
2224/84203 . . . . . . Thermocompression bonding
2224/84205 . . . . . . Ultrasonic bonding
2224/84206 . . . . . . Direction of oscillation
2224/84207 . . . . . . Thermosonic bonding
2224/84209 . . . . . . with energy being in the form of electromagnetic radiation
2224/84212 . . . . . . Induction heating, i.e. eddy currents
2224/84214 . . . . . . using a laser
2224/8423 . . . . . . Polychromatic or infrared lamp heating
2224/84232 . . . . . . using an autocatalytic reaction, e.g. exothermic brazing
2224/84234 . . . . . . using means for applying energy being within the device, e.g. integrated heater
2224/84236 . . . . . . using electro-static corona discharge
2224/84237 . . . . . . using an electron beam (electron beam welding in general B23K 15/00)
2224/84238 . . . . . . using electric resistance welding, i.e. ohmic heating
2224/84239 . . . . . . Bonding interfaces of the connector
2224/8434 . . . . . . Bonding interfaces of the semiconductor or solid state body
2224/84345 . . . . . . Shape, e.g. interlocking features
2224/84355 . . . . . . having an external coating, e.g. protective bond-through coating
2224/84359 . . . . . . Material
2224/8436 . . . . . . Bonding interfaces outside the semiconductor or solid-state body
2224/84365 . . . . . . Shape, e.g. interlocking features
2224/84375 . . . . . . having an external coating, e.g. protective bond-through coating
2224/84379 . . . . . . Material
2224/8438 . . . . . . Bonding interfaces outside the semiconductor or solid-state body
2224/84385 . . . . . . Shape, e.g. interlocking features
2224/84395 . . . . . . having an external coating, e.g. protective bond-through coating
2224/84399 . . . . . . Material
2224/844 . . . . . . with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/84401 . . . . . . the principal constituent melting at a temperature of less than 400°C
2224/84405 . . . . . . Gallium [Ga] as principal constituent
2224/84409 . . . . . . Indium [In] as principal constituent
2224/84411 . . . . . . Tin [Sn] as principal constituent
2224/84413 . . . . . . Bismuth [Bi] as principal constituent
2224/84414 . . . . . . Thallium [Tl] as principal constituent
2224/84416 . . . . . . Lead (Pb) as principal constituent
2224/84417 . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/84418 . . . . . . Zinc [Zn] as principal constituent
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e., being a hybrid material, e.g., segmented structures, foams

Material of the matrix

with a principal constituent of the material being a metal or a metalloid, e.g., boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent

the principal constituent melting at a temperature of greater than 400°C

Indium [In] as principal constituent

Tin [Sn] as principal constituent

Bismuth [Bi] as principal constituent

Thallium [Tl] as principal constituent

Lead [Pb] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc [Zn] as principal constituent

Antimony [Sb] as principal constituent

Manganese [Mg] as principal constituent

Antimony [Al] as principal constituent

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

Palladium [Pd] as principal constituent

Titanium [Ti] as principal constituent

Platinum [Pt] as principal constituent

Zirconium [Zr] as principal constituent

Chromium [Cr] as principal constituent

Vanadium [V] as principal constituent

Rhodium [Rh] as principal constituent

Ruthenium [Ru] as principal constituent

Iridium [Ir] as principal constituent

Niobium [Nb] as principal constituent

Molybdenum [Mo] as principal constituent

Tantalum [Ta] as principal constituent

Rhenium [Re] as principal constituent

Tungsten [W] as principal constituent

with a principal constituent of the material being a non-metallic, non-metalloid inorganic material

Ceramics, e.g., crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84488)

Glassceramics, e.g., amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g., polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g., silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/8441 - H01L 2224/84491, e.g., allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/8441 - H01L 2224/84491

with a principal constituent of the material being a gas not provided for in groups H01L 2224/8441 - H01L 2224/84491

... with a principal constituent of the material being a gas not provided for in groups H01L 2224/8441 - H01L 2224/84491...
| 2224/84572 | Vanadium [V] as principal constituent |
| 2224/84573 | Rhodium [Rh] as principal constituent |
| 2224/84576 | Ruthenium [Ru] as principal constituent |
| 2224/84578 | Iridium [Ir] as principal constituent |
| 2224/84579 | Niobium [Nb] as principal constituent |
| 2224/8458 | Molybdenum [Mo] as principal constituent |
| 2224/84581 | Tantalum [Ta] as principal constituent |
| 2224/84583 | Rhenium [Re] as principal constituent |
| 2224/84584 | Tungsten [W] as principal constituent |
| 2224/84586 | with a principal constituent of the material being a non metallic, non metalloid inorganica material |
| 2224/84587 | Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84586) |
| 2224/84588 | Glasses, e.g. amorphous oxides, nitrides or fluorides |
| 2224/8459 | with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy |
| 2224/84591 | The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene |
| 2224/84593 | with a principal constituent of the material being a solid not provided for in groups H01L 2224/84587 - H01L 2224/84591, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond |
| 2224/84594 | with a principal constituent of the material being a liquid not provided for in groups H01L 2224/84575 - H01L 2224/84591 |
| 2224/84595 | with a principal constituent of the material being a gas not provided for in groups H01L 2224/84575 - H01L 2224/84591 |
| 2224/84598 | Fillers |
| 2224/84599 | Base material |
| 2224/846 | with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof |
| 2224/84601 | the principal constituent melting at a temperature of less than 400°C |
| 2224/84605 | Gallium [Ga] as principal constituent |
| 2224/84609 | Indium [In] as principal constituent |
| 2224/84611 | Tin [Sn] as principal constituent |
with a principal constituent of the material being a non metallic, non metalloid inorganic material

- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84688)
- Glasses, e.g. amorphous oxides, nitrides or fluorides

- with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

- with a principal constituent of the material being a liquid not provided for in groups H01L 2224/846 - H01L 2224/84691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

- with a principal constituent of the material being a gas not provided for in groups H01L 2224/846 - H01L 2224/84691

- with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

- Coating material
- with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- the principal constituent melting at a temperature of less than 400°C
- Gallium [Ga] as principal constituent
- Indium [In] as principal constituent
- Tin [Sn] as principal constituent
- Bismuth [Bi] as principal constituent
- Thallium [Tl] as principal constituent
- Lead [Pb] as principal constituent
- Zinc [Zn] as principal constituent
- Antimony [Sb] as principal constituent
- Magnesium [Mg] as principal constituent
- Aluminium [Al] as principal constituent
- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- silver [Ag] as principal constituent
- gold [Au] as principal constituent
- Copper [Cu] as principal constituent
- Manganese [Mn] as principal constituent
- Nickel [Ni] as principal constituent
- Cobalt [Co] as principal constituent
- Iron [Fe] as principal constituent
- the principal constituent melting at a temperature of greater than 1550°C
- Palladium [Pd] as principal constituent
- Titanium [Ti] as principal constituent
- Platinum [Pt] as principal constituent
- Zirconium [Zr] as principal constituent
- Chromium [Cr] as principal constituent
- Vanadium [V] as principal constituent
- Rhodium [Rh] as principal constituent
- Ruthenium [Ru] as principal constituent
- Iridium [Ir] as principal constituent
- Niobium [Nb] as principal constituent
- Molybdenum [Mo] as principal constituent
- Tantalum [Ta] as principal constituent
- Rhenium [Re] as principal constituent
- Tungsten [W] as principal constituent
- with a principal constituent of the material being a non metallic, non metalloid inorganic material
Bonding techniques based on silicone, epoxy, polyimide, using a polymer adhesive, e.g. an adhesive

Sintering
Soldering or alloying

Thermoplastics or hot-melt adhesives

Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives

Combinations of two or more hardening methods provided for in at least two different groups from H01L. H01L 2224/8485 - H01L 2224/8488, e.g. for hybrid thermoplastic-thermosetting adhesives

using an inorganic non metallic glass type adhesive, e.g. solder glass

Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond

Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces

between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding

between electrically insulating surfaces, e.g. oxide or nitride layers

Combinations of bonding methods provided for in at least two different groups from H01L 2224/848 - H01L 2224/8498

involving monitoring, e.g. feedback loop

Post-treatment of the connector or bonding area

Cleaning, e.g. oxide removal step, desmearing

Chemical cleaning, e.g. etching, flux

Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow

Plasma cleaning

Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge

Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8491 - H01L 2224/84914

Applying permanent coating, e.g. protective coating

Reshaping, e.g. for severing the strap, modifying the loop shape

by chemical means, e.g. etching

by heating means, e.g. reflowing

using a polychromatic heating lamp

using a laser

Induction heating, i.e. eddy currents

using a flame torch, e.g. hydrogen torch

using a corona discharge, e.g. electronic flame off [EFO]

by mechanical means, e.g. pressing, stamping

Thermal treatments, e.g. annealing, controlled cooling

Forming additional members, e.g. for reinforcing

Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence

using a wire connector

involving a temporary auxiliary member not forming part of the bonding apparatus, e.g. removable or sacrificial coating, film or substrate
2224/85002 . . . . . . being a removable or sacrificial coating
2224/85005 . . . . . . being a temporary or sacrificial substrate
2224/85007 . . . . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the wire connector during or after the bonding process
2224/85009 . . . . . . Pre-treatment of the connector or the bonding area
2224/8501 . . . . . . Cleaning, e.g. oxide removal step, desmearing
2224/85011 . . . . . . Chemical cleaning, e.g. etching, flux
2224/85012 . . . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/85013 . . . . . . Plasma cleaning
2224/85014 . . . . . . Thermal cleaning, e.g. decomposition, sublimation
2224/85016 . . . . . . using a laser
2224/85017 . . . . . . Electron beam cleaning
2224/85019 . . . . . . Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8501 - H01L 2224/85014
2224/8502 . . . . . . Applying permanent coating, e.g. in-situ coating
2224/8503 . . . . . . Reshaping, e.g. forming the ball or the wedge of the wire connector
2224/85031 . . . . . . by chemical means, e.g. etching, anodisation
2224/85035 . . . . . . by heating means, e.g. "free-air-ball"
2224/85037 . . . . . . using a polychromatic heating lamp
2224/85039 . . . . . . using a laser
2224/85041 . . . . . . Induction heating, i.e. eddy currents
2224/85043 . . . . . . using a flame torch, e.g. hydrogen torch
2224/85045 . . . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/85047 . . . . . . by mechanical means, e.g. severing, pressing, stamping
2224/85048 . . . . . . Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
2224/85051 . . . . . . Forming additional members, e.g. for "wedge-on-ball", "ball-on-wedge", "ball-on-ball" connections
2224/85053 . . . . . . Bonding environment
2224/85054 . . . . . . Composition of the atmosphere
2224/85055 . . . . . . being oxidating
2224/85065 . . . . . . being reducing
2224/85075 . . . . . . being inert
2224/85085 . . . . . . being a liquid, e.g. for fluidic self-assembly
2224/8509 . . . . . . Vacuum
2224/85091 . . . . . . Under pressure
2224/85092 . . . . . . Atmospheric pressure
2224/85093 . . . . . . Transient conditions, e.g. gas-flow
2224/85095 . . . . . . Temperature settings
2224/85096 . . . . . . Transient conditions
2224/85097 . . . . . . Heating
2224/85098 . . . . . . Cooling
2224/85099 . . . . . . Ambient temperature
2224/851 . . . . . . the connector being supplied to the parts to be connected in the bonding apparatus
2224/8511 . . . . . . involving protection against electrical discharge, e.g. removing electrostatic charge
2224/8512 . . . . . . Aligning
2224/85121 . . . . . . Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
2224/85122 . . . . . . by detecting inherent features of, or outside, the semiconductor or solid-state body
2224/85123 . . . . . . Shape or position of the body
2224/85125 . . . . . . Bonding areas on the body
2224/85127 . . . . . . Bonding areas outside the body
2224/85129 . . . . . . Shape or position of the other item
2224/8513 . . . . . . using marks formed on the semiconductor or solid-state body
2224/85132 . . . . . . using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
2224/85136 . . . . . . involving guiding structures, e.g. spacers or supporting members
2224/85138 . . . . . . the guiding structures being at least partially left in the finished device
2224/85143 . . . . . . Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
2224/85148 . . . . . . involving movement of a part of the bonding apparatus
2224/85149 . . . . . . being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
2224/8515 . . . . . . Rotational movements
2224/8516 . . . . . . Translational movements
2224/85169 . . . . . . being the upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge
2224/8517 . . . . . . Rotational movements
2224/8518 . . . . . . Translational movements
2224/85181 . . . . . . connecting first on the semiconductor or solid-state body, i.e. on-chip, regular stitch
2224/85186 . . . . . . connecting first outside the semiconductor or solid-state body, i.e. off-chip, reverse stitch
2224/85191 . . . . . . connecting first both on and outside the semiconductor or solid-state body, i.e. regular and reverse stitches
2224/85196 . . . . . . involving intermediate connecting steps before cutting the wire connector
2224/852 . . . . . . Applying energy for connecting
2224/85201 . . . . . . Compression bonding
2224/85203 . . . . . . Thermocompression bonding
2224/85205 . . . . . . Ultrasonic bonding
2224/85206 . . . . . . Direction of oscillation
2224/85207 . . . . . . Thermosonic bonding
2224/8521 . . . . . . with energy being in the form of electromagnetic radiation
2224/85212 . . . . . . Induction heating, i.e. eddy currents
2224/85214 . . . . . . using a laser
2224/85223 . . . . . . Polychromatic or infrared lamp heating
2224/85232 . . . . . . using an autocatalytic reaction, e.g. exothermic brazing
2224/85234 . . . . . . using means for applying energy being within the device, e.g. integrated heater
2224/85236 . . . . . . using electro-static corona discharge
2224/85237 . . . . . . using electron beam (using electron beam in general B23K 15/00)
2224/85238 . . . . . . . . . . . . . using electric resistance welding, i.e. ohmic heating
2224/8534 . . . . . . . . . . . . . Bonding interfaces of the connector
2224/85345 . . . . . . . . . . . . . Shape, e.g. interlocking features
2224/85355 . . . . . . . . . . . . . having an external coating, e.g. protective bond-through coating
2224/85359 . . . . . . . . . . . . . Material
2224/8536 . . . . . . . . . . . . . Bonding interfaces of the semiconductor or solid state body
2224/85365 . . . . . . . . . . . . . Shape, e.g. interlocking features
2224/85375 . . . . . . . . . . . . . having an external coating, e.g. protective bond-through coating
2224/85379 . . . . . . . . . . . . . Material
2224/8538 . . . . . . . . . . . . . Bonding interfaces outside the semiconductor or solid-state body
2224/85385 . . . . . . . . . . . . . Shape, e.g. interlocking features
2224/85395 . . . . . . . . . . . . . having an external coating, e.g. protective bond-through coating
2224/85399 . . . . . . . . . . . . . Material
2224/854 . . . . . . . . . . . . . with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/85401 . . . . . . . . . . . . . the principal constituent melting at a temperature of less than 400°C
2224/85405 . . . . . . . . . . . . . Gallium (Ga) as principal constituent
2224/85409 . . . . . . . . . . . . . Indium (In) as principal constituent
2224/85411 . . . . . . . . . . . . . Tin (Sn) as principal constituent
2224/85413 . . . . . . . . . . . . . Bismuth (Bi) as principal constituent
2224/85414 . . . . . . . . . . . . . Thallium (Tl) as principal constituent
2224/85416 . . . . . . . . . . . . . Lead (Pb) as principal constituent
2224/85417 . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/85418 . . . . . . . . . . . . . Zinc (Zn) as principal constituent
2224/8542 . . . . . . . . . . . . . Antimony (Sb) as principal constituent
2224/85423 . . . . . . . . . . . . . Magnesium (Mg) as principal constituent
2224/85424 . . . . . . . . . . . . . Aluminium (Al) as principal constituent
2224/85438 . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/85439 . . . . . . . . . . . . . Silver (Ag) as principal constituent
2224/8544 . . . . . . . . . . . . . Gold (Au) as principal constituent
2224/85447 . . . . . . . . . . . . . Copper (Cu) as principal constituent
2224/85449 . . . . . . . . . . . . . Manganese (Mn) as principal constituent
2224/85455 . . . . . . . . . . . . . Nickel (Ni) as principal constituent
2224/85457 . . . . . . . . . . . . . Cobalt (Co) as principal constituent
2224/8546 . . . . . . . . . . . . . Iron (Fe) as principal constituent
2224/85463 . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/85464 . . . . . . . . . . . . . Palladium (Pd) as principal constituent
2224/85466 . . . . . . . . . . . . . Titanium (Ti) as principal constituent
2224/85469 . . . . . . . . . . . . . Platinum (Pt) as principal constituent
2224/8547 . . . . . . . . . . . . . Zirconium (Zr) as principal constituent
2224/85471 . . . . . . . . . . . . . Chromium (Cr) as principal constituent
2224/85472 . . . . . . . . . . . . . Vanadium (V) as principal constituent
2224/85473 . . . . . . . . . . . . . Rhodium (Rh) as principal constituent
2224/85476 . . . . . . . . . . . . . Ruthenium (Ru) as principal constituent
2224/85478 . . . . . . . . . . . . . Iridium (Ir) as principal constituent
2224/85479 . . . . . . . . . . . . . Niobium (Nb) as principal constituent
2224/8548 . . . . . . . . . . . . . Molybdenum (Mo) as principal constituent
2224/85481 . . . . . . . . . . . . . Tantalum (Ta) as principal constituent
2224/85483 . . . . . . . . . . . . . Rhenium (Re) as principal constituent
2224/85484 . . . . . . . . . . . . . Tungsten (W) as principal constituent
2224/85486 . . . . . . . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/85487 . . . . . . . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85488)
2224/85488 . . . . . . . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8549 . . . . . . . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/85491 . . . . . . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/85493 . . . . . . . . . . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/854 - H01L 2224/85491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/85494 . . . . . . . . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/854 - H01L 2224/85491
2224/85495 . . . . . . . . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/854 - H01L 2224/85491
2224/85498 . . . . . . . . . . . . . with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/85499 . . . . . . . . . . . . . Material of the matrix
2224/855 . . . . . . . . . . . . . with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/85501 . . . . . . . . . . . . . the principal constituent melting at a temperature of less than 400°C
2224/85505 . . . . . . . . . . . . . Gallium (Ga) as principal constituent
2224/85509 . . . . . . . . . . . . . Indium (In) as principal constituent
2224/85511 . . . . . . . . . . . . . Tin (Sn) as principal constituent
2224/85513 . . . . . . . . . . . . . Bismuth (Bi) as principal constituent
2224/85514 . . . . . . . . . . . . . Thallium (Tl) as principal constituent
2224/85516 . . . . . . . . . . . . . Lead (Pb) as principal constituent
2224/85517 . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/85518 . . . . . . . . . . . . . Zinc (Zn) as principal constituent
Antimony (Sb) as principal constituent
Magnesium (Mg) as principal constituent
Aluminium (Al) as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver (Ag) as principal constituent
Gold (Au) as principal constituent
Copper (Cu) as principal constituent
Manganese (Mn) as principal constituent
Nickel (Ni) as principal constituent
Cobalt (Co) as principal constituent
Iron (Fe) as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
 Palladium (Pd) as principal constituent
Titanium (Ti) as principal constituent
Platinum (Pt) as principal constituent
Zirconium (Zr) as principal constituent
Chromium (Cr) as principal constituent
Vanadium (V) as principal constituent
Rhodium (Rh) as principal constituent
Ruthenium (Ru) as principal constituent
Iridium (Ir) as principal constituent
Niobium (Nb) as principal constituent
Molybdenum (Mo) as principal constituent
Tantalum (Ta) as principal constituent
Rhenium (Re) as principal constituent
Tungsten (W) as principal constituent
with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85588)
Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the material being a solid not provided for in groups H01L 2224/855 - H01L 2224/85591, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/855 - H01L 2224/85591
with a principal constituent of the material being a gas not provided for in groups H01L 2224/855 - H01L 2224/85591
Fillers
Base material
with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
the principal constituent melting at a temperature of less than 400°C
Gallium (Ga) as principal constituent
Indium (In) as principal constituent
Tin (Sn) as principal constituent
Bismuth (Bi) as principal constituent
Thallium (Tl) as principal constituent
Lead (Pb) as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc (Zn) as principal constituent
Antimony (Sb) as principal constituent
Magnesium (Mg) as principal constituent
Aluminium (Al) as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver (Ag) as principal constituent
Gold (Au) as principal constituent

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2224/85647 .................. Copper (Cu) as principal constituent
2224/85649 .................. Manganese (Mn) as principal constituent
2224/85655 .................. Nickel (Ni) as principal constituent
2224/85657 .................. Cobalt (Co) as principal constituent
2224/8566 .................. Iron (Fe) as principal constituent
2224/85663 .................. the principal constituent melting at a temperature of greater than 1550°C
2224/85664 .................. Palladium (Pd) as principal constituent
2224/85666 .................. Titanium (Ti) as principal constituent
2224/85669 .................. Platinum (Pt) as principal constituent
2224/8567 .................. Zirconium (Zr) as principal constituent
2224/85671 .................. Chromium (Cr) as principal constituent
2224/85672 .................. Vanadium (V) as principal constituent
2224/85673 .................. Rhodium (Rh) as principal constituent
2224/85676 .................. Ruthenium (Ru) as principal constituent
2224/85678 .................. Iridium (Ir) as principal constituent
2224/85679 .................. Niobium (Nb) as principal constituent
2224/8568 .................. Molybdenum (Mo) as principal constituent
2224/85681 .................. Tantalum (Ta) as principal constituent
2224/85683 .................. Rhenium (Re) as principal constituent
2224/85684 .................. Tungsten (W) as principal constituent
2224/85686 .................. with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/85687 .................. Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85688)
2224/85688 .................. Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8569 .................. with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/85691 .................. The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/85693 .................. with a principal constituent of the material being a solid not provided for in groups H01L 2224/856 - H01L 2224/85691, e.g. allotropes of carbon, fullerenes, graphite, carbon-nanotubes, diamond
2224/85694 .................. with a principal constituent of the material being a liquid not provided for in groups H01L 2224/856 - H01L 2224/85691
2224/85695 .................. with a principal constituent of the material being a gas not provided for in groups H01L 2224/856 - H01L 2224/85691
2224/85698 .................. with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/85699 .................. Coating material
2224/857 .................. with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/85701 .................. the principal constituent melting at a temperature of less than 400°C
2224/85705 .................. Gallium (Ga) as principal constituent
2224/85709 .................. Indium (In) as principal constituent
2224/85711 .................. Tin (Sn) as principal constituent
2224/85713 .................. Bismuth (Bi) as principal constituent
2224/85714 .................. Thallium (Tl) as principal constituent
2224/85716 .................. Lead (Pb) as principal constituent
2224/85717 .................. the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/85718 .................. Zinc (Zn) as principal constituent
2224/8572 .................. Antimony (Sb) as principal constituent
2224/85723 .................. Magnesium (Mg) as principal constituent
2224/85724 .................. Aluminium (Al) as principal constituent
2224/85738 .................. the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/85739 .................. Silver (Ag) as principal constituent
2224/85744 .................. Gold (Au) as principal constituent
2224/85747 .................. Copper (Cu) as principal constituent
2224/85749 .................. Manganese (Mn) as principal constituent
2224/85755 .................. Nickel (Ni) as principal constituent
2224/85757 .................. Cobalt (Co) as principal constituent
H01L

2224/8576 . . . . . . . . . . . Iron (Fe) as principal constituent
2224/85763 . . . . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/85764 . . . . . . . . . . . Palladium (Pd) as principal constituent
2224/85766 . . . . . . . . . . . Titanium (Ti) as principal constituent
2224/85769 . . . . . . . . . . . Platinum (Pt) as principal constituent
2224/8577 . . . . . . . . . . . Zirconium (Zr) as principal constituent
2224/85771 . . . . . . . . . . . Chromium (Cr) as principal constituent
2224/85772 . . . . . . . . . . . Vanadium (V) as principal constituent
2224/85773 . . . . . . . . . . . Rhodium (Rh) as principal constituent
2224/85776 . . . . . . . . . . . Ruthenium (Ru) as principal constituent
2224/85778 . . . . . . . . . . . Iridium (Ir) as principal constituent
2224/85779 . . . . . . . . . . . Niobium (Nb) as principal constituent
2224/8578 . . . . . . . . . . . Molybdenum (Mo) as principal constituent
2224/85781 . . . . . . . . . . . Tantalum (Ta) as principal constituent
2224/85783 . . . . . . . . . . . Rhenium (Re) as principal constituent
2224/85784 . . . . . . . . . . . Tungsten (W) as principal constituent
2224/85786 . . . . . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/85787 . . . . . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85788)
2224/85788 . . . . . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8579 . . . . . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/85791 . . . . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/85793 . . . . . . . . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/857 - H01L 2224/85791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/85794 . . . . . . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/857 - H01L 2224/85791
2224/85795 . . . . . . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/857 - H01L 2224/85791
2224/85798 . . . . . . . . . . . with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/85799 . . . . . . . . . . . Shape or distribution of the fillers
2224/858 . . . . . . . . . . . Bonding techniques
2224/85801 . . . . . . . . . . . Soldering or alloying
2224/85805 . . . . . . . . . . . involving forming a eutectic alloy at the bonding interface
2224/8581 . . . . . . . . . . . involving forming an intermetallic compound at the bonding interface
2224/85815 . . . . . . . . . . . Reflow soldering
2224/8582 . . . . . . . . . . . Diffusion bonding
2224/85825 . . . . . . . . . . . Solid-liquid interdiffusion
2224/8583 . . . . . . . . . . . Solid-solid interdiffusion, e.g. "direct bonding"
2224/8584 . . . . . . . . . . . Sintering
2224/8585 . . . . . . . . . . . using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
2224/85855 . . . . . . . . . . . Hardening the adhesive by curing, i.e. thermosetting
2224/85856 . . . . . . . . . . . Pre-cured adhesive, i.e. B-stage adhesive
2224/85859 . . . . . . . . . . . Localised curing of parts of the connector
2224/8586 . . . . . . . . . . . Heat curing
2224/85865 . . . . . . . . . . . Microwave curing
2224/85868 . . . . . . . . . . . Infrared [IR] curing
2224/85871 . . . . . . . . . . . Visible light curing
2224/85874 . . . . . . . . . . . Ultraviolet [UV] curing
2224/85877 . . . . . . . . . . . Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
2224/8588 . . . . . . . . . . . Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
2224/85885 . . . . . . . . . . . Combinations of two or more hardening methods provided for in at least two different groups from H01L 2224/8585 - H01L 2224/8588, e.g. for hybrid thermoplastic-thermosetting adhesives
2224/8589 . . . . . . . . . . . using an inorganic non metallic glass type adhesive, e.g. solder glass
2224/85893 . . . . . . . . . . . Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
2224/85895 . . . . . . . . . . . Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
2224/85897 . . . . . . . . . . . . between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
2224/85898 . . . . . . . . . . . . between electrically insulating surfaces, e.g. oxide or nitride layers
2224/85899 . . . . . . . . . . . Combinations of bonding methods provided for in at least two different groups from H01L 2224/858 - H01L 2224/85898
2224/859 . . . . . . . . . . . involving monitoring, e.g. feedback loop
using tape automated bonding [TAB]

2224/8601 . . . . . . Cleaning, e.g. oxide removal step, desmearing
2224/8603 . . . . . . Reshaping
2224/86031 . . . . . . by chemical means, e.g. etching, anodisation
2224/86035 . . . . . . by heating
2224/86039 . . . . . . using a laser
2224/86045 . . . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/86047 . . . . . . by mechanical means, e.g. severing, pressing, stamping
2224/86048 . . . . . . Thermal treatment, e.g. annealing, controlled pre-heating or pre-cooling
2224/86051 . . . . . . Forming additional members
Bonding techniques

Material having an external coating, e.g. protective bond-through coating

Bonding interfaces of the connector or solid state body

Material

Bonding interfaces outside the semiconductor or solid-state body

Shape, e.g. interlocking features

having an external coating, e.g. protective bond-through coating

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Soldering or alloying

involving forming a eutectic alloy at the bonding interface

involving forming an intermetallic compound at the bonding interface

using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester

Hardening the adhesive by curing, i.e. thermosetting

Pre-cured adhesive, i.e. B-stage adhesive

Localised curing of parts of the connector

Heat curing

Microwave curing

Infrared [IR] curing

Visible light curing

Ultraviolet [UV] curing

Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes

Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives

Combinations of two or more hardening methods provided for in at least two different groups selected from H01L 2224/8685 - H01L 2224/8688, e.g. hybrid thermoplastic-thermosetting adhesives

using an inorganic non metallic glass type adhesive, e.g. solder glass

Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond

Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces

between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding

between electrically insulating surfaces, e.g. oxide or nitride layers

Combinations of bonding methods provided for in at least two different groups from H01L 2224/868 - H01L 2224/86897

involving monitoring, e.g. feedback loop

Post-treatment of the connector or the bonding area

Cleaning, e.g. oxide removal step, desmearing

Reshaping

by chemical means, e.g. etching, anodisation

by heating means

using a laser

using a corona discharge, e.g. electronic flame off [EFO]

by mechanical means, e.g. severing, pressing, stamping

Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

Forming additional members

Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence

using at least one connector not provided for in any of the groups H01L 2224/81 - H01L 2224/86

Methods for connecting semiconductor or solid state bodies using means for bonding not being attached to, or not being formed on, the body surface to be connected, e.g. pressure contacts using springs or clips

Methods for connecting semiconductor or solid state bodies including different methods provided for in two or more of groups H01L 2224/80 - H01L 2224/90

Specific sequence of method steps

Forming connectors during the connecting process, e.g. in-situ formation of bumps

Forming additional connectors after the connecting process

Intermediate bonding steps, i.e. partial connection of the semiconductor or solid-state body during the connecting process

Connecting a surface with connectors of different types

Parallel connecting processes

Sequential connecting processes

the first connecting process involving a bump connector

the second connecting process involving a build-up interconnect

the second connecting process involving a layer connector
Batch processes

2224/92127 . . . . . . the second connecting process involving a wire connector
2224/92128 . . . . . . the first connecting process involving a bump connector
2224/92132 . . . . . . the first connecting process involving a build-up interconnect
2224/92133 . . . . . . the second connecting process involving a bump connector
2224/92135 . . . . . . the second connecting process involving a layer connector
2224/92136 . . . . . . the second connecting process involving a strap connector
2224/92137 . . . . . . the second connecting process involving a wire connector
2224/92138 . . . . . . the second connecting process involving a TAB connector
2224/92142 . . . . . . the first connecting process involving a layer connector
2224/92143 . . . . . . the second connecting process involving a bump connector
2224/92144 . . . . . . the second connecting process involving a build-up interconnect
2224/92147 . . . . . . the second connecting process involving a wire connector
2224/92148 . . . . . . the second connecting process involving a TAB connector
2224/92152 . . . . . . the first connecting process involving a strap connector
2224/92153 . . . . . . the second connecting process involving a strap connector
2224/92155 . . . . . . the second connecting process involving a layer connector
2224/92157 . . . . . . the second connecting process involving a wire connector
2224/92158 . . . . . . the second connecting process involving a TAB connector
2224/92162 . . . . . . the first connecting process involving a wire connector
2224/92163 . . . . . . the second connecting process involving a bump connector
2224/92164 . . . . . . the second connecting process involving a build-up interconnect
2224/92165 . . . . . . the second connecting process involving a layer connector
2224/92166 . . . . . . the second connecting process involving a strap connector
2224/92168 . . . . . . the second connecting process involving a TAB connector
2224/92172 . . . . . . the first connecting process involving a TAB connector
2224/92173 . . . . . . the second connecting process involving a bump connector
2224/92174 . . . . . . the second connecting process involving a build-up interconnect
2224/92175 . . . . . . the second connecting process involving a layer connector
2224/92176 . . . . . . the second connecting process involving a strap connector
2224/92177 . . . . . . the second connecting process involving a wire connector
2224/922 . . . Connecting different surfaces of the semiconductor or solid-state body with connectors of different types
2224/9221 . . . Parallel connecting processes
2224/9222 . . . Sequential connecting processes

2224/92222 . . . the first connecting process involving a bump connector
2224/92224 . . . the second connecting process involving a build-up interconnect
2224/92225 . . . the second connecting process involving a layer connector
2224/92226 . . . the second connecting process involving a strap connector
2224/92227 . . . the second connecting process involving a wire connector
2224/92228 . . . the second connecting process involving a TAB connector
2224/92242 . . . the first connecting process involving a layer connector
2224/92244 . . . the second connecting process involving a build-up interconnect
2224/92246 . . . the second connecting process involving a strap connector
2224/92247 . . . the second connecting process involving a wire connector
2224/92248 . . . the second connecting process involving a TAB connector
2224/92252 . . . the first connecting process involving a strap connector
2224/92253 . . . the second connecting process involving a bump connector
2224/92255 . . . the second connecting process involving a layer connector
Details relating to assemblies covered by the group H01L 2500 but not provided for in its subgroups

- All the devices being of a type provided for in the same subgroup of groups H01L 2700 - H01L 5100
- the devices not having separate containers
- the devices being of a type provided for in group H01L 2700
- Stacked arrangements of devices
- Wire or wire-like electrical connections between devices
- Wire or wire-like electrical connections from device to substrate
- Bump or bump-like direct electrical connections between devices, e.g. flip-chip connection, solder bumps
- Bump or bump-like direct electrical connections from device to substrate
- Bump or bump-like direct electrical connections from substrate to substrate
- Electrical connections formed on device or on substrate, e.g. a deposited or grown layer
- Special adaptation of electrical connections, e.g. rewiring, engineering changes, pressure contacts, layout
- Non-galvanic coupling, e.g. capacitive coupling
- Optical coupling
- Electromagnetic shielding
- Conductive via connections through the device, e.g. vertical interconnects, through silicon via [TSV] (manufacturing via connections \textit{per se} H01L 21/76898)
- Design considerations for via connections, e.g. geometry or layout
- Conductive via connections through the substrate, container, or encapsulation
- Conductive connections on the side of the device
- Geometry of the stack, e.g. form of the devices, geometry to facilitate stacking
H01L

227/00 Indexing scheme for devices consisting of a plurality of semiconductor or other solid state components formed in or on a common substrate covered by group H01L 27/00

227/32 . . . Devices including an organic light emitting device [OLED], e.g. OLED display
227/323 . . . Multistep processes for AMOLED
227/326 . . . Use of temporary substrate, e.g. for manufacturing of OLED displays having an inorganic driving circuit

229/00 Indexing scheme for semiconductor devices adapted for rectifying, amplifying, oscillating or switching, or capacitors or resistors with at least one potential-jump barrier or surface barrier, for details of semiconductor bodies or of electrodes thereof, or for multistep manufacturing processes therefor

225/00 Indexing scheme relating to organic semiconductor devices covered by group H01L 51/00

225/10 . . . Processes specially adapted for the manufacture or treatment of organic semiconductor devices
225/105 . . . Patterning of a layer by embossing, e.g. to form trenches in an insulating layer
225/30 . . . Materials
225/301 . . . Inorganic materials
225/303 . . . Oxides, e.g. metal oxides
225/305 . . . Transparent conductive oxides [TCO]
225/306 . . . . . . composed of tin oxides, e.g. F doped SnO2
225/308 . . . . . . composed of indium oxides, e.g. ITO
225/50 . . . Organic light emitting devices
225/53 . . . Structure
225/5307 . . . . . . specially adapted for controlling the direction of light emission
225/5315 . . . . . . Top emission
225/5323 . . . . . . Two-side emission, i.e. TOLED
225/533 . . . . . . End-face emission
225/5338 . . . . . . Flexible OLED
225/5346 . . . . . . Graded composition
225/5353 . . . . . . Inverted OLED
225/5361 . . . . . . OLED lamp
225/5369 . . . . . . Nanoparticles used in whatever layer except emissive layer, e.g. in packaging
225/5376 . . . . . . Combination of fluorescent and phosphorescent emission
225/5384 . . . . . . Multiple hosts in the emissive layer
225/5392 . . . . . . Short-circuit prevention
225/55 . . . . . . characterised by parameters
225/552 . . . . . . HOMO-LUMO-EF
225/554 . . . . . . Oxidation-reduction potential
225/556 . . . . . . Temperature
225/558 . . . . . . Thickness
225/56 . . . . . . Processes specially adapted for the manufacture or treatment of OLED
225/562 . . . . . . Aging
225/564 . . . . . . Application of alternating current
225/566 . . . . . . Division of substrate, c.g. for manufacturing of OLED displays
225/568 . . . . . . Repairing

2924/00 Indexing scheme for arrangements or methods for connecting or disconnecting semiconductor or solid-state bodies as covered by H01L 24/00

2924/0001 . . . Technical content checked by a classifier

NOTE

Codes H01L 2924/0001 - H01L 2924/0002 are used to describe the status of reclassification; they do not relate to technical features as such

2924/00011 . . . Not relevant to the scope of the group, the symbol of which is combined with the symbol of this group
2924/00012 . . . Relevant to the scope of the group, the symbol of which is combined with the symbol of this group
2924/00013 . . . Fully indexed content
2924/00014 . . . the subject-matter covered by the group, the symbol of which is combined with the symbol of this group, being disclosed without further technical details
2924/00015 . . . the subject-matter covered by the group, the symbol of which is combined with the symbol of this group, being disclosed as prior art
2924/00016 . . . Not covered by any one of groups H01L 24/00, H01L 24/00 and H01L 2224/00

2924/01 . . . Chemical elements
2924/01001 . . . Hydrogen [H]
2924/01002 . . . Helium [He]
2924/01003 . . . Lithium [Li]
2924/01004 . . . Beryllium [Be]
2924/01005 . . . Boron [B]
2924/01006 . . . Carbon [C]
2924/01007 . . . Nitrogen [N]
2924/01008 . . . Oxygen [O]
2924/01009 . . . Fluorine [F]
2924/0101 . . . Neon [Ne]
2924/01011 . . . Sodium [Na]
2924/01012 . . . Magnesium [Mg]
2924/01013 . . . Aluminum [Al]
2924/01014 . . . Silicon [Si]
2924/01015 . . . Phosphorus [P]
2924/01016 . . . Sulfur [S]
2924/01017 . . . Chlorine [Cl]
2924/01018 . . . Argon [Ar]
2924/01019 . . . Potassium [K]
2924/0102 . . . Calcium [Ca]
2924/01021 . . . Scandium [Sc]
2924/01022 . . . Titanium [Ti]
2924/01023 . . . Vanadium [V]
2924/01024 . . . Chromium [Cr]
2924/01025 . . . Manganese [Mn]
2924/01026 . . . Iron [Fe]
2924/01027 . . . Cobalt [Co]
2924/01028 . . . Nickel [Ni]
2924/01029 . . . Copper [Cu]
2924/0103 . . . Zinc [Zn]
2924/01031 . . . Gallium [Ga]
2924/01032 . . . Germanium [Ge]
2924/01033 . . . Arsenic [As]
2924/01034 . . . Selenium [Se]
2924/01035 . . . Bromine [Br]
2924/01036 . . . Krypton [Kr]
2924/01037 . . . Rubidium [Rb]
2924/01038 . . . Strontium [Sr]
2924/01039 . . . Yttrium [Y]
2924/0104 . . . Zirconium [Zr]
Groups of the periodic table

Rare earth metals

- Lanthanides, i.e. Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu

- Actinides, i.e. Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr

- Noble metals

- Metalloids or Semi-metals

- Chalcogens

- Halogens

- Noble gases

- Semiconductor purity grades

- 1N purity grades, i.e. 99%

- 2N purity grades, i.e. 99.9%

- 3N purity grades, i.e. 99.99%

- 4N purity grades, i.e. 99.999%

- 5N purity grades, i.e. 99.9999%

- 6N purity grades, i.e. 99.99999%

- 7N purity grades, i.e. 99.999999%

- 8N purity grades, i.e. 99.9999999%

- Alloys

- Binary Alloys

- Isomorphous Alloys

- Eutectic Alloys, i.e. obtained by a liquid transforming into two solid phases

- Hypoeutectic alloys i.e. with compositions lying to the left of the eutectic point

- Hypereutectic alloys i.e. with compositions lying to the right of the eutectic point

- Peritectic Alloys, i.e. obtained by a liquid and a solid transforming into a new and different solid phase

- Monotectics, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase

- Intermediate phases, i.e. intermetallics compounds

- 1N purity grades, i.e. 99%

- 2N purity grades, i.e. 99.9%

- 3N purity grades, i.e. 99.99%

- 4N purity grades, i.e. 99.999%

- 5N purity grades, i.e. 99.9999%

- 6N purity grades, i.e. 99.99999%

- 7N purity grades, i.e. 99.999999%

- 8N purity grades, i.e. 99.9999999%

- Noble metals

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- Chalcogens

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- Monotectics, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase

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- 7N purity grades, i.e. 99.999999%

- 8N purity grades, i.e. 99.9999999%

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- Hypoeutectic alloys i.e. with compositions lying to the left of the eutectic point

- Hypereutectic alloys i.e. with compositions lying to the right of the eutectic point

- Peritectic Alloys, i.e. obtained by a liquid and a solid transforming into a new and different solid phase

- Monotectics, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase

- Intermediate phases, i.e. intermetallics compounds

- 1N purity grades, i.e. 99%

- 2N purity grades, i.e. 99.9%

- 3N purity grades, i.e. 99.99%

- 4N purity grades, i.e. 99.999%

- 5N purity grades, i.e. 99.9999%

- 6N purity grades, i.e. 99.99999%

- 7N purity grades, i.e. 99.999999%

- 8N purity grades, i.e. 99.9999999%

- Alloys

- Binary Alloys

- Isomorphous Alloys

- Eutectic Alloys, i.e. obtained by a liquid transforming into two solid phases

- Hypoeutectic alloys i.e. with compositions lying to the left of the eutectic point

- Hypereutectic alloys i.e. with compositions lying to the right of the eutectic point

- Peritectic Alloys, i.e. obtained by a liquid and a solid transforming into a new and different solid phase

- Monotectics, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase

- Intermediate phases, i.e. intermetallics compounds

- 1N purity grades, i.e. 99%

- 2N purity grades, i.e. 99.9%

- 3N purity grades, i.e. 99.99%

- 4N purity grades, i.e. 99.999%

- 5N purity grades, i.e. 99.9999%

- 6N purity grades, i.e. 99.99999%

- 7N purity grades, i.e. 99.999999%

- 8N purity grades, i.e. 99.9999999%

- Alloys

- Binary Alloys

- Isomorphous Alloys

- Eutectic Alloys, i.e. obtained by a liquid transforming into two solid phases

- Hypoeutectic alloys i.e. with compositions lying to the left of the eutectic point

- Hypereutectic alloys i.e. with compositions lying to the right of the eutectic point

- Peritectic Alloys, i.e. obtained by a liquid and a solid transforming into a new and different solid phase

- Monotectics, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase

- Intermediate phases, i.e. intermetallics compounds

- 1N purity grades, i.e. 99%

- 2N purity grades, i.e. 99.9%

- 3N purity grades, i.e. 99.99%

- 4N purity grades, i.e. 99.999%

- 5N purity grades, i.e. 99.9999%

- 6N purity grades, i.e. 99.99999%

- 7N purity grades, i.e. 99.999999%

- 8N purity grades, i.e. 99.9999999%

- Alloys

- Binary Alloys

- Isomorphous Alloys

- Eutectic Alloys, i.e. obtained by a liquid transforming into two solid phases

- Hypoeutectic alloys i.e. with compositions lying to the left of the eutectic point

- Hypereutectic alloys i.e. with compositions lying to the right of the eutectic point

- Peritectic Alloys, i.e. obtained by a liquid and a solid transforming into a new and different solid phase

- Monotectics, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase

- Intermediate phases, i.e. intermetallics compounds

- 1N purity grades, i.e. 99%

- 2N purity grades, i.e. 99.9%

- 3N purity grades, i.e. 99.99%

- 4N purity grades, i.e. 99.999%

- 5N purity grades, i.e. 99.9999%

- 6N purity grades, i.e. 99.99999%

- 7N purity grades, i.e. 99.999999%

- 8N purity grades, i.e. 99.9999999%
Nitrides composed of metals from groups of the periodic table

Silicides composed of metals from groups of the periodic table

Carbides composed of metals from groups of the periodic table

Actinides

Lanthanides

SiC

having a polycrystalline microstructure

having a monocrystalline microstructure

having an amorphous microstructure, i.e. glass

14th Group

13th Group

12th Group

11th Group

10th Group

9th Group

8th Group

7th Group

6th Group

5th Group

4th Group

3rd Group

2nd Group

1st Group

SiN₄

FeOx

ZrO₂

TiO₂

TiN

ZrN

Si₃N₄

Oxides composed of metals from groups of the periodic table

14th Group

13th Group

12th Group

11th Group

10th Group

9th Group

8th Group

7th Group

6th Group

5th Group

4th Group

3rd Group

2nd Group

1st Group

Nitrides composed of metals from groups of the periodic table

Silicides composed of metals from groups of the periodic table

Carbides composed of metals from groups of the periodic table

Actinides

Lanthanides

SiC

having a polycrystalline microstructure

having a monocrystalline microstructure

having an amorphous microstructure, i.e. glass

14th Group

13th Group

12th Group

11th Group

10th Group

9th Group

8th Group

7th Group

6th Group

5th Group

4th Group

3rd Group

2nd Group

1st Group
Periodic table

Halides composed of metals from groups of the periodic table

- Actinides
- Lanthanides
- 1st Group
- 2nd Group
- 3rd Group
- 4th Group
- 5th Group
- 6th Group
- 7th Group
- 8th Group
- 9th Group
- 10th Group
- 11th Group
- 12th Group
- 13th Group
- 14th Group
- Being a combination of two or more materials provided in the groups H01L 2924/0551 - H01L 2924/0566
- having an amorphous microstructure, i.e. glass
- having a polycrystalline microstructure
- having a monocrystalline microstructure
- Halogens other than oxygen i.e. sulfides, seleniums and tellurides composed of metals from groups of the periodic table
- H01L 2924/0561
- H01L 2924/0562
- H01L 2924/0563
- H01L 2924/0564
- H01L 2924/0565
- H01L 2924/0566
- H01L 2924/0567
- Polymers (polymers per se C08; polymer adhesives C09J)
- Polymers (polymers per se C08; polymer adhesives C09J)
- Halogenated polymer
- Nonhalogenated polymer
- Epoxy resin
- Polyester
- Polyether
- Polylurethane
- Polymide
- Polyamine or polyimide
- Polyamine
- Polyamide
- Polyimide
- Sulfur containing polymer
- Polysiloxane
- Adhesive characteristics other than chemical
- being an ohmic electrical conductor
- being an ohmic electrical conductor
- being pressure sensitive
- Extrinsic, i.e. with electrical conductive fillers
- Intrinsic, e.g. polyaniline [PANI]
- being pressure sensitive
- with a principal constituent of the material being a combination of two or more materials provided in the groups H01L 2924/0551 - H01L 2924/0566
- Glass epoxy laminates
- FR-4
- FR-5
- G10
- G11
- Cermets, i.e. composite material composed of ceramic and metallic materials
- Glass-ceramics, e.g. devitrified glass
- Low temperature co-fired ceramic [LTCC]
- Details of semiconductor or other solid state devices to be connected
- Structure
- Shape
- being other than a cuboid
- at the periphery
- at the active surface
- at the passive surface
- being a cuboid
- with a rectangular active surface
- with a square active surface
being a sphere

Material of the semiconductor or solid state bodies

Semiconducting materials

Elemental semiconductors, i.e. Group IV

Germanium [Ge]

Silicon [Si]

Diamond [C]

Compound semiconductors

IV

Silicon-germanium [SiGe]

Silicon Carbide [SiC]

III-V

Aluminium arsenide [AlAs]

Aluminium antimonide [AlSb]

Aluminium nitride [AlN]

Aluminium phosphate [AlP]

Boron nitride [BN], e.g. cubic, hexagonal, nanotube

Boron phosphide [BP]

Boron arsenide [BAs, B12As2]

Gallium antimonide [GaSb]

Gallium arsenide [GaAs]

Gallium nitride [GaN]

Gallium phosphide [GaP]

Indium antimonide [InSb]

Indium arsenide [InAs]

Indium nitride [InN]

Indium phosphide [InP]

Aluminium gallium arsenide [AlGaAs]

Gallium arsenide antimonide [GaAsSb]

Aluminium arsenide nitride [AlAsN]

Gallium arsenide antimonide nitride [GaAsSbN]

Gallium indium arsenide antimonide [GaInAsSb]

Gallium indium arsenide antimonide phosphide [GaInAsSbP]

Cadmium selenide [CdSe]

Cadmium telluride [CdTe]

Zinc selenide [ZnSe]

Zinc sulfide [ZnS]

Cadmium zinc telluride, i.e. CZT [CdZnTe]

Mercury cadmium telluride [HgZnTe]

Mercury zinc selenide [HgZnSe]

Cuprochloride [CuCl]

Copper sulfide [CuS]

IV-VI

Lead selenide [PbSe]

Lead telluride [PbTe]

Tin sulfide [SnS, SnS2]

Tin telluride [SnTe]

Lead telluride [PbSnTe]

Thallium tin telluride [Tl2SnTe3]

Thallium germanium telluride [Tl2GeTe3]

Bismuth telluride [Bi2Te3]

II-V

Cadmium phosphide [CdP2]

Cadmium arsenide [CdAs2]

Cadmium antimonide [CdSb]

Zinc phosphide [ZnP2]

Zinc arsenide [ZnAs]

Zinc telluride [ZnTe]

Oxide

Titanium dioxide, anatase, rutile, brookite [TiO2]

Copper(I)oxide [Cu2O]

Copper(II)oxide [CuO]

Uranium dioxide [UO2]

Uranium trioxide [UO3]

Bismuth trioxide [Bi2O3]

Tin dioxide [SnO2]

Barium titanate [BaTiO3]

Strontium titanate [SrTiO3]

Lanthanum copper oxide [La2CuO4]

Layered

Lead(II)iodide [PbI2]

Molybdenum disulfide [MoS2]

Gallium selenide [GaSe]

Tin sulfide [SnS]

Bismuth sulfide [Bi2S3]

Magnetic diluted [DMS]

Gallium manganese arsenide [GaMnAs]

H01L
Device type

Passive devices, e.g. 2 terminal devices

Rectifying Diode

PIN diode

Schottky diode

Gunn diode

Varactor

Zener diode

PN diode

Cat’s whisker diode

Point contact

Optical Diode

LED

LASER

Photo diode

OLED

Capacitor

Inductor

Resistor

Discrete devices, e.g. 3 terminal devices

Thyristor

Anode Gate Thyristor [AGT]

Bidirectional Control Thyristor [BCT]

Breakover Diode [BOD]

DIAC - Bidirectional trigger device

Dynistor - Unidirectional switching device

Shockley diode - Unidirectional trigger and switching device

SIDAC - Bidirectional switching device

Trisl, SIDACtor - Bidirectional protection devices

GTO - Gate Turn-Off thyristor

DB-GTO - Distributed Buffer Gate Turn-Off thyristor

MA-GTO - Modified Anode Gate Turn-Off thyristor

IGCT - Integrated Gate Commutated Thyristor

LASCR - Light Activated SCR, or LTT - Light triggered thyristor

Light Activated Semiconducting Switch [LASS]

MCT - MOSFET Controlled Thyristor - It contains two additional FET structures for on/off control

BRT - Base Resistance Controlled Thyristor

RCT - Reverse Conducting Thyristor

PUT or PÜT - Programmable Unijunction Transistor - A thyristor with gate on n-type layer near to the anode used as a functional replacement for unijunction transistor

SCS - Silicon Controlled Switch or Thyristor Tetrode - A thyristor with both cathode and anode gates

SITh - Static Induction Thyristor, or FCTh - Field Controlled Thyristor - containing a gate structure that can shut down anode current flow

TRIAC - Triode for Alternating Current - A bidirectional switching device containing two thyristor structures with common gate contact

Silicon Controlled Rectifier [SCR]

Asymmetrical SCR [ASCR]

Transistor

Bipolar Junction Transistor [BJT]

Heterojunction bipolar transistor [HBT]

Schottky transistor

Avalanche transistor

Darlington transistor

Insulated gate bipolar transistor [IGBT]

Photo transistor

Field-effect transistor [FET]

Carbon nanotube field-effect transistor [CNFET]

Junction field-effect transistor [JFET]

Metal-Semiconductor Field-Effect Transistor [MESFET]

High Electron Mobility Transistor [HEMT, HFET [heterostructure FET], MODFET]

Inverted-T field effect transistor [ITFET]

FinFET, source/drain region shapes fins on the silicon surface

Fast-reverse epitaxial diode field-effect transistor [FREDFET]

Thin film transistor [TFT]

Organic Field-Effect Transistor [OFET]

Ballistic transistor

Sensor FET

ion-sensitive field-effect transistor [ISFET]

Electrolyte-oxide-semiconductor field effect transistor [EOSFET], e.g. Neurochip
H01L

2924/13075 . . . . . . . . . . . . Deoxyribonucleic acid field-effect transistor [DNAFET]
2924/13076 . . . . . . . . . . . . DEPFET
2924/13078 . . . . . . . . . . . . Unijunction transistors
2924/13079 . . . . . . . . . . . . Single-electron transistors [SET]
2924/1308 . . . . . . . . . . . . Nanofluidic transistor
2924/13081 . . . . . . . . . . . . Multigate devices
2924/13082 . . . . . . . . . . . . Tetrode transistor
2924/13083 . . . . . . . . . . . . Pentode transistor
2924/13084 . . . . . . . . . . . . Trigate transistor
2924/13085 . . . . . . . . . . . . Dual gate FETs
2924/13086 . . . . . . . . . . . . Junctionless Nanowire Transistor [JNT]
2924/13087 . . . . . . . . . . . . Vertical- slit Field-Effect Transistor [VeSFET]
2924/13088 . . . . . . . . . . . . Graphene Nanoribbon Field-Effect Transistor [GNRFET]
2924/13089 . . . . . . . . . . . . Nanoparticle Organic Memory Field-Effect Transistor [NOMFET]
2924/1309 . . . . . . . . . . . . Modulation- Doped Field Effect Transistor [MODFET]
2924/13091 . . . . . . . . . . . . Metal- Oxide- Semiconductor Field- Effect Transistor [MOSFET]
2924/13092 . . . . . . . . . . . . Dual Gate Metal- Oxide- Semiconductor Field- Effect Transistor [DG MOSFET]

2924/14 . . . . . . . . . . . . Integrated circuits
2924/141 . . . . . . . . . . . . Analog devices
2924/142 . . . . . . . . . . . . HF devices
2924/1421 . . . . . . . . . . . . RF devices
2924/14211 . . . . . . . . . . . . Voltage- controlled oscillator [VCO]
2924/14215 . . . . . . . . . . . . Low- noise amplifier [LNA]
2924/1422 . . . . . . . . . . . . Mixer
2924/14221 . . . . . . . . . . . . Electronic mixer
2924/14222 . . . . . . . . . . . . Frequency mixer
2924/1423 . . . . . . . . . . . . Monolithic Microwave Integrated Circuit [MMIC]
2924/1424 . . . . . . . . . . . . Operational amplifier
2924/1425 . . . . . . . . . . . . Converter
2924/14251 . . . . . . . . . . . . Frequency converter
2924/14252 . . . . . . . . . . . . Voltage converter
2924/14253 . . . . . . . . . . . . Digital- to- analog converter [DAC]
2924/1426 . . . . . . . . . . . . Driver
2924/1427 . . . . . . . . . . . . Voltage regulator [VR]
2924/143 . . . . . . . . . . . . Digital devices
2924/1431 . . . . . . . . . . . . Logic devices
2924/1432 . . . . . . . . . . . . Central processing unit [CPU]
2924/1433 . . . . . . . . . . . . Application- specific integrated circuit [ASIC]
2924/14335 . . . . . . . . . . . . Digital signal processor [DSP]
2924/1434 . . . . . . . . . . . . Memory
2924/1435 . . . . . . . . . . . . Random access memory [RAM]
2924/1436 . . . . . . . . . . . . Dynamic random- access memory [DRAM]
2924/14361 . . . . . . . . . . . . Synchronous dynamic random access memory [SDRAM]
2924/14362 . . . . . . . . . . . . RAS Only Refresh [ROR]
2924/14363 . . . . . . . . . . . . CAS before RAS refresh [CBR]
2924/14364 . . . . . . . . . . . . Multibank DRAM [MDRAM]
2924/14365 . . . . . . . . . . . . Video DRAM [VRAM]
2924/14366 . . . . . . . . . . . . Window DRAM [WRAM]
2924/14367 . . . . . . . . . . . . Fast page mode DRAM [FPM DRAM]
2924/14368 . . . . . . . . . . . . Extended data out DRAM [EDO DRAM]
2924/14369 . . . . . . . . . . . . Burst EDO DRAM [BEDO DRAM]
2924/1437 . . . . . . . . . . . . Static random- access memory [SRAM]
2924/1438 . . . . . . . . . . . . Flash memory
2924/1441 . . . . . . . . . . . . Ferroelectric RAM [FeRAM or FRAM]
2924/1442 . . . . . . . . . . . . Synchronous graphics RAM [SGRAM]
2924/1443 . . . . . . . . . . . . Non- volatile random- access memory [NVRAM]
2924/1444 . . . . . . . . . . . . PB RAM
2924/145 . . . . . . . . . . . . Read- only memory [ROM]
2924/1451 . . . . . . . . . . . . EPROM
2924/14511 . . . . . . . . . . . . EEPROM
2924/1453 . . . . . . . . . . . . PROM
2924/146 . . . . . . . . . . . . Mixed devices
2924/1461 . . . . . . . . . . . . MEMS
2924/1465 . . . . . . . . . . . . Details of package parts other than the semiconductor or other solid state devices to be connected
2924/151 . . . . . . . . . . . . Die mounting substrate
2924/1511 . . . . . . . . . . . . Structure
2924/1515 . . . . . . . . . . . . Shape
2924/15151 . . . . . . . . . . . . the die mounting substrate comprising an aperture, e.g. for underfilling, outgassing, window type wire connections
2924/15152 . . . . . . . . . . . . the die mounting substrate comprising a recess for hosting the device
2924/15153 . . . . . . . . . . . . the shape of the recess being other than a cuboid
2924/15154 . . . . . . . . . . . . Side view
2924/15156 . . . . . . . . . . . . Top view
2924/15157 . . . . . . . . . . . . die mounting substrate being other than a cuboid
2924/15158 . . . . . . . . . . . . Side view
2924/15162 . . . . . . . . . . . . Top view
2924/15165 . . . . . . . . . . . . Monolayer substrate
2924/1517 . . . . . . . . . . . . Multilayer substrate
2924/15172 . . . . . . . . . . . . Fan-out arrangement of the internal vias
2924/15173 . . . . . . . . . . . . in a single layer of the multilayer substrate
2924/15174 . . . . . . . . . . . . in different layers of the multilayer substrate
2924/15175 . . . . . . . . . . . . Fan-in arrangement of the internal vias
2924/1518 . . . . . . . . . . . . in a single layer of the multilayer substrate
2924/15181 . . . . . . . . . . . . in different layers of the multilayer substrate
2924/15182 . . . . . . . . . . . . Resurf arrangement of the internal vias
2924/15183 . . . . . . . . . . . . Disposition
2924/15184 . . . . . . . . . . . . Connection portion
2924/15185 . . . . . . . . . . . . the connection portion being formed only on the surface of the substrate opposite to the die mounting surface
2924/15311 . . . . . . . . . . . . being a ball array, e.g. BGA
2924/15312 . . . . . . . . . . . . being a pin array, e.g. PGA
2924/15313 . . . . . . . . . . . . being a land array, e.g. LGA
2924/1532 . . . . . . . . . . . . the connection portion being formed on the die mounting surface of the substrate
2924/15321 . . . . . . . . . . . . being a ball array, e.g. BGA
2924/15322 . . . . . . . . . . . . being a pin array, e.g. PGA
2924/15323 . . . . . . . . . . . . being a land array, e.g. LGA
Material

Device, e.g. U-shaped cap
Cap comprising a cavity for hosting the control, encapsulation
Cap comprising an aperture, e.g. for pressure

Material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of greater than or equal to 950 C and less than 1550 C
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

with a principal constituent of the material being a non metallic, non metalloid inorganic material
Cavity coating shape
Cavity coating
Cavity coating shape
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

Flat cap [not enclosing an internal cavity]
Flat cap [not enclosing an internal cavity]
Flat cap [not enclosing an internal cavity]

Disposition
Cap forming a cavity, e.g. being a curved metal foil

Connecting to a semiconductor or solid-state bodies, i.e. cap-to-chip
Connecting to an item not being a semiconductor or solid-state body, e.g. cap-to-substrate

Cap-in-cap assemblies
stacked type assemblies, e.g. stacked multi-cavities

Structure
Structure
Structure

Disposition
Disposition
Disposition

Material
Material
Material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics)
Ceramics, e.g. crystalline carbides, nitrides or oxides

Glasses, e.g. amorphous oxides, nitrides or fluorides
Glasses, e.g. amorphous oxides, nitrides or fluoride
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2924/157 - H01L 2924/15791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
Cavity coating shape
Cavity coating
Cavity coating
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides
Glasses, e.g. amorphous oxides, nitrides or fluorides
<table>
<thead>
<tr>
<th>Frame</th>
<th>Material</th>
<th>Connection portion, e.g. seal</th>
<th>Disposition</th>
<th>Structure</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>2924/166</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
<td>with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/167</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a hybrid material, e.g. being a polymer, e.g. polyester, phenolic based polymer, epoxy, being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16701</td>
<td>. . . .</td>
<td>the principal constituent melting at a temperature of less than 400 C</td>
<td>with a principal constituent of the material being a solid not provided for in groups [H01L 2924/157 - H01L 2924/15791], e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1671</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16724</td>
<td>. . . . . .</td>
<td>Aluminium [Al] as principal constituent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16726</td>
<td>. . . . . .</td>
<td>Iron [Fe] as principal constituent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16747</td>
<td>. . . . . .</td>
<td>Copper [Cu] as principal constituent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1676</td>
<td>. . . . . .</td>
<td>the principal constituent melting at a temperature of greater than 1550 C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16763</td>
<td>. . . . . .</td>
<td>the principal constituent melting at a temperature of greater than or equal to 950 C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16786</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16787</td>
<td>. . . . . .</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16788</td>
<td>. . . . . .</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1679</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a hybrid material, e.g. segmented structures, foams</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16791</td>
<td>. . . . . .</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16793</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1681</td>
<td>. . . . . .</td>
<td>Encapsulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1682</td>
<td>. . . . . .</td>
<td>Disposition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/16830</td>
<td>. . . . . .</td>
<td>being an anchoring portion, i.e. mechanical interlocking between the encapsulation resin and another package part</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1686</td>
<td>. . . . . .</td>
<td>Material</td>
<td></td>
<td></td>
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<tr>
<td>2924/169</td>
<td>. . . . . .</td>
<td>Details of hybrid assemblies other than the semiconductor or other solid state devices to be connected</td>
<td></td>
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<tr>
<td>2924/1701</td>
<td>. . . .</td>
<td>the principal constituent melting at a temperature of less than 400 C</td>
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<tr>
<td>2924/1717</td>
<td>. . . . . .</td>
<td>the principal constituent melting at a temperature of greater than or equal to 1550 C</td>
<td></td>
<td></td>
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<tr>
<td>2924/1724</td>
<td>. . . . . .</td>
<td>Aluminium [Al] as principal constituent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1738</td>
<td>. . . . . .</td>
<td>the principal constituent melting at a temperature of greater than or equal to 950 C and less than 1550 C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1739</td>
<td>. . . . . .</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/177</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
<td></td>
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<tr>
<td>2924/17747</td>
<td>. . . . . .</td>
<td>Copper [Cu] as principal constituent</td>
<td></td>
<td></td>
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<tr>
<td>2924/17766</td>
<td>. . . . . .</td>
<td>Iron [Fe] as principal constituent</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2924/17763</td>
<td>. . . . . .</td>
<td>the principal constituent melting at a temperature of greater than 950 C</td>
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<tr>
<td>2924/17786</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
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<td></td>
</tr>
<tr>
<td>2924/17787</td>
<td>. . . . . .</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/17788</td>
<td>. . . . . .</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1779</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
<td></td>
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<tr>
<td>2924/17791</td>
<td>. . . . . .</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
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<tr>
<td>2924/17793</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
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<tr>
<td>2924/17798</td>
<td>. . . . . .</td>
<td>with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams</td>
<td></td>
<td></td>
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<tr>
<td>2924/181</td>
<td>. . . . . .</td>
<td>Encapsulation</td>
<td></td>
<td></td>
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<tr>
<td>2924/1815</td>
<td>. . . . . .</td>
<td>Shape</td>
<td></td>
<td></td>
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<tr>
<td>2924/1816</td>
<td>. . . . . .</td>
<td>Exposing the passive side of the semiconductor or solid-state body</td>
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<tr>
<td>2924/18161</td>
<td>. . . . . .</td>
<td>of a flip chip</td>
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<tr>
<td>2924/18162</td>
<td>. . . . . .</td>
<td>of a chip with build-up interconnect</td>
<td></td>
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<tr>
<td>2924/18165</td>
<td>. . . . . .</td>
<td>of a wire bonded chip</td>
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<tr>
<td>2924/18301</td>
<td>. . . . . .</td>
<td>being an anchoring portion, i.e. mechanical interlocking between the encapsulation resin and another package part</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2924/186</td>
<td>. . . . . .</td>
<td>Material</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2924/19</td>
<td>. . . . . .</td>
<td>Details of hybrid assemblies other than the semiconductor or other solid state devices to be connected</td>
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<tr>
<td>2924/1901</td>
<td>. . . . . .</td>
<td>Structure</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2924/19011</td>
<td>. . . . . .</td>
<td>including integrated passive components</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2924/19015</td>
<td>. . . . . .</td>
<td>including thin film passive components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2924/1902</td>
<td>. . . . . .</td>
<td>including thick film passive components</td>
<td></td>
<td></td>
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<tr>
<td>2924/1903</td>
<td>. . . . . .</td>
<td>including wave guides</td>
<td></td>
<td></td>
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<tr>
<td>2924/19031</td>
<td>. . . . . .</td>
<td>being a strip line type</td>
<td></td>
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</table>
2924/19032 . . . being a microstrip line type
2924/19033 . . . being a coplanar line type
2924/19038 . . . being a hybrid line type
2924/19039 . . . impedance transition between different types of wave guides
2924/1904 . . . Component type
2924/19041 . . . being a capacitor
2924/19042 . . . being an inductor
2924/19043 . . . being a resistor
2924/1905 . . . Shape
2924/19051 . . . Impedance matching structure [e.g. balun]
2924/191 . . . Disposition
2924/19101 . . . of discrete passive components
2924/19102 . . . in a stacked assembly with the semiconductor or solid state device
2924/19103 . . . interposed between the semiconductor or solid-state device and the die mounting substrate, i.e. chip-on-passive
2924/19104 . . . on the semiconductor or solid-state device, i.e. passive-on-chip
2924/19105 . . . in a side-by-side arrangement on a common die mounting substrate
2924/19106 . . . in a mirrored arrangement on two different sides of a common die mounting substrate
2924/19107 . . . off-chip wires
2924/20 . . . Parameters
2924/201 . . . Temperature ranges
2924/20101 . . . Temperature range T<0 C, T<273.15 K
2924/20102 . . . Temperature range 0 C=<T<60 C, 273.15 K =T< 333.15K
2924/20103 . . . Temperature range 60 C=<T<100 C, 333.15 K =T< 373.15K
2924/20104 . . . Temperature range 100 C=<T<150 C, 373.15 K =T< 423.15K
2924/20105 . . . Temperature range 150 C=<T<200 C, 423.15 K =T< 473.15K
2924/20106 . . . Temperature range 200 C=<T<250 C, 473.15 K =T< 523.15K
2924/20107 . . . Temperature range 250 C=<T<300 C, 523.15K =T< 573.15K
2924/20108 . . . Temperature range 300 C=<T<350 C, 573.15K =T< 623.15K
2924/20109 . . . Temperature range 350 C=<T<400 C, 623.15K =T< 673.15K
2924/2011 . . . Temperature range 400 C=<T<450 C, 673.15K =T< 723.15K
2924/20111 . . . Temperature range 450 C=<T<500 C, 723.15K =T< 773.15K
2924/202 . . . Electromagnetic wavelength ranges [W]
2924/20201 . . . Gamma radiation, i.e. wavelength less than 0.01 nm
2924/20202 . . . X-ray radiation, i.e. wavelength 0.01 to 10 nm
2924/2021 . . . Ultraviolet radiation
2924/20211 . . . UV-C 100=<W<280 nm
2924/20212 . . . UV-B 280=<W<315 nm
2924/20213 . . . UV-A 315=<W<400 nm
2924/2024 . . . Visible spectrum wavelength 390=<W<700 nm, i.e. 400-790 THz
2924/2026 . . . Infrared radiation 700=<W<3000 nm
2924/20261 . . . IR-A 700=<W<1400 nm, i.e. 215 THz-430 THz
2924/20262 . . . IR-B 1400=<W<3000 nm, i.e. 100THz-215 THz
2924/2027 . . . Microwave radiation 1 mm - 1 meter, i.e. 300 GHz - 300 MHz
2924/20271 . . . Microwave radiation 1 mm - km 300 GHz - 3 Hz
2924/203 . . . Ultrasonic frequency ranges, i.e. KHz
2924/20301 . . . Ultrasonic frequency [f] f<25 KHz
2924/20302 . . . Ultrasonic frequency [f] 25 KHz=<f< 50 KHz
2924/20303 . . . Ultrasonic frequency [f] 50 KHz=<f< 75 KHz
2924/20304 . . . Ultrasonic frequency [f] 75 KHz=<f< 100 KHz
2924/20305 . . . Ultrasonic frequency [f] 100 KHz=<f< 125 KHz
2924/20306 . . . Ultrasonic frequency [f] 125 KHz=<f< 150 KHz
2924/20307 . . . Ultrasonic frequency [f] 150 KHz=<f< 175 KHz
2924/20308 . . . Ultrasonic frequency [f] 175 KHz=<f< 200 KHz
2924/20309 . . . Ultrasonic frequency [f] f>=200 KHz
2924/206 . . . Length ranges
2924/2064 . . . larger or equal to 1 micron less than 100 microns
2924/20641 . . . larger or equal to 100 microns less than 200 microns
2924/20642 . . . larger or equal to 200 microns less than 300 microns
2924/20643 . . . larger or equal to 300 microns less than 400 microns
2924/20644 . . . larger or equal to 400 microns less than 500 microns
2924/20645 . . . larger or equal to 500 microns less than 600 microns
2924/20646 . . . larger or equal to 600 microns less than 700 microns
2924/20647 . . . larger or equal to 700 microns less than 800 microns
2924/20648 . . . larger or equal to 800 microns less than 900 microns
2924/20649 . . . larger or equal to 900 microns less than 1000 microns
2924/2065 . . . larger or equal to 1000 microns less than 1500 microns
2924/20651 . . . larger or equal to 1500 microns less than 2000 microns
2924/20652 . . . larger or equal to 2000 microns less than 2500 microns
2924/20653 . . . larger or equal to 2500 microns less than 3000 microns
2924/20654 . . . larger or equal to 3000 microns less than 4000 microns
2924/20655 . . . larger or equal to 4000 microns less than 5000 microns
2924/20656 . . . larger or equal to 5000 microns less than 6000 microns
2924/20657 . . . larger or equal to 6000 microns less than 7000 microns
2924/20658 . . . larger or equal to 7000 microns less than 8000 microns
2924/207 . . . Diameter ranges
2924/2075 . . . larger or equal to 1 micron less than 10 microns
2924/20751 . . . larger or equal to 10 microns less than 20 microns
2924/20752 . . . larger or equal to 20 microns less than 30 microns
Details relating to devices covered by the group H01L 33/00 but not provided for in its subgroups

Processes

relating to electrodes

relating to coatings

relating to semiconductor body packages

relating to wavelength conversion elements

relating to encapsulations

relating to optical field-shaping elements

relating to arrangements for conducting electric current to or from the semiconductor body

relating to heat extraction or cooling elements

Periodic patterns for optical field-shaping in or on the semiconductor body or semiconductor body package, e.g. photonic bandgap structures

Scattering means in or on the semiconductor body or semiconductor body package (H01L 33/22 takes precedence)