H01L SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR (use of semiconductor devices for measuring G01; resistors in general H01C; magnets, inductors, transformers H01F; capacitors in general H01G; electrolytic devices H01G 9/00; batteries, accumulators H01M; waveguides, resonators, or lines of the waveguide type H01P; line connectors, current collectors H01R; stimulated-emission devices H01S; electromechanical resonators H03H; loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers H04R; electric light sources in general H05B; printed circuits, hybrid circuits, casings or constructional details of electrical apparatus, manufacture of assemblies of electrical components H05K; use of semiconductor devices in circuits having a particular application, see the subclass for the application)

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, galvanomagnetic or bulk negative resistance effects and integrated circuit devices;
   - phototransistors, 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 29/66227
- H01L 21/331 covered by H01L 29/66334
- H01L 21/332 covered by H01L 29/66363
- H01L 21/333 covered by H01L 29/66075
- H01L 21/334 covered by H01L 29/66409
- H01L 21/335 covered by H01L 29/66477
- H01L 21/336 covered by H01L 29/66893
- H01L 21/337 covered by H01L 29/66848
- H01L 21/338 covered by H01L 29/66946
- H01L 21/339 covered by H01L 29/66848
- H01L 21/36-H01L 21/368 covered by H01L 21/02107
- H01L 21/50 covered by H01L 22/00
- H01L 21/60 covered by H01L 21/50, H01L 2021/60
- H01L 21/66 covered by H01L 22/00
- H01L 21/603 covered by H01L 21/02107
- H01L 21/607 covered by H01L 22/00
- H01L 21/8242 covered by H01L 27/108
- H01L 21/8244 covered by H01L 27/11
- H01L 21/8246 covered by H01L 27/112
- H01L 21/8248 covered by H01L 27/112
- H01L 21/98 covered by H01L 25/50
- H01L 21/98 covered by H01L 25/50
- H01L 29/38 covered by H01L 29/365
- H01L 29/96 covered by H01L 29/365
- H01L 51/30 covered by H01L 51/0032
- H01L 51/30 covered by H01L 51/0032
- H01L 51/40 covered by H01L 51/0032
- H01L 51/46 covered by H01L 51/0032
- H01L 51/46 covered by H01L 51/0032
- H01L 51/48 covered by H01L 51/0032
- H01L 51/54 covered by H01L 51/0032
- H01L 51/30 covered by H01L 51/0032
- H01L 51/40 covered by H01L 51/0032
- H01L 51/46 covered by H01L 51/0032
- H01L 51/48 covered by H01L 51/0032
- H01L 51/54 covered by H01L 51/0032
- H01L 51/30 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 . Manufacture or treatment of semiconductor devices or of parts thereof

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).

2. This group does not cover:
   - simple use of grinding or polishing machines B24R
   - thermal smoothening H01L 21/324

21/02005 . . . {Preparing bulk and homogeneous wafers}
21/02008 . . . . {Multistep processes}
21/0201 . . . . . {Specific process step}
21/02013 . . . . . {Grinding, lapping}
21/02016 . . . . . . {Backside treatment}
21/02019 . . . . . . {Chemical etching}
21/02021 . . . . . . . {Edge treatment, chamfering}
21/02024 . . . . . . . . {Mirror polishing}
21/02027 . . . . . {Setting crystal orientation}
21/0203 . . . . . {Making porous regions on the surface}
21/02032 . . . . {by reclaiming or re-processing}
21/02035 . . . . . {Shaping}
21/02041 . . {Cleaning}
21/02043 . . . {Cleaning before device manufacture, i.e. Begin-Of-Line process}
21/02046 . . . . . {Dry cleaning only (H01L 21/02085 takes precedence)}
21/02049 . . . . . {with gaseous HF}
21/02052 . . . . {Wet cleaning only (H01L 21/02085 takes precedence)}
WARNING
Groups H01L 21/20104 – H01L 21/20126 are incomplete pending reclassification of documents from groups H01L 21/06, H01L 21/16, and H01L 21/20. Groups H01L 21/20104 – H01L 21/20126 should be considered in order to perform a complete search.

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 in case of explicit statements of the process of formation; regardless of the precursor or layers is classified in this group.
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 21/02362)]

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]
H01L

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 21/02293 takes precedence)}

21/02274 . . . . . . . {in the presence of a plasma [PECVD]}

21/02277 . . . . . . . {the reactions being activated by other means than plasma or thermal, e.g. photo-CVD}

21/0228 . . . . . . . {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

21/02282 . . . . . . . {liquid deposition, e.g. spin-coating, sol-gel techniques, spray coating}

21/02285 . . . . . . . {Langmuir-Blodgett techniques}

21/02288 . . . . . . . {printing, e.g. ink-jet printing (per se B41J)}

21/0229 . . . . . . . {liquid atomic layer deposition}

21/02293 . . . . . . . {formation of epitaxial layers by a deposition process (epitaxial growth per se C30B)}

**NOTE**
Formation of non-epitaxial 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 21/3105 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 . . . . . . . [Microstructure]
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]
21/02532 . . . . . . . [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

21/02565 . . . . . . . . {Oxide semiconducting materials not being Group 12/16 materials, e.g. ternary compounds}
21/02568 . . . . . . . . {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 . . . . . . . . {Homoeptaxy}
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 . . . . . . . . {Pendeoepitaxy}
21/02653 . . . . . . . . {Vapour-liquid-solid growth}
21/02656 . . . . . . . . {Special treatments}
21/02658 . . . . . . . . {Pretreatments (cleaning in general H01L 21/0241)}
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 epitaxial layer, 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 by their composition, e.g. multilayer masks, materials}
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. pre-treatment, 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 or carrier concentration layer (multistep manufacturing processes for semiconductor bodies of said devices H01L 29/40; multistep manufacturing processes for electrodes of said devices H01L 29/40; multistep manufacturing processes for said devices H01L 29/6607)}
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
WARNING
Group H01L 21/20 is impacted by reclassification into groups H01L 21/12  
– H01L 21/127.

Groups H01L 21/20 and H01L 21/12  
– H01L 21/127 should be considered in  
order to perform a complete search.

21/08 . . . . Preparation of the foundation plate  
21/10 . . . . Preliminary treatment of the selenium or tellurium, its application to the foundation plate, or the subsequent treatment of the combination  
21/101 . . . . Application of the selenium or tellurium to the foundation plate  
21/103 . . . . Conversion of the selenium or tellurium to the conductive state  
21/105 . . . . Treatment of the surface of the selenium or tellurium layer after having been made conductive  
21/108 . . . . Provision of discrete insulating layers, i.e. non-genetic barrier layers

21/12 . . . . Application of an electrode to the exposed surface of the selenium or tellurium after the selenium or tellurium has been applied to the foundation plate  
21/14 . . . . Treatment of the complete device, e.g. by electroforming to form a barrier  
21/145 . . . . Ageing  
21/16 . . . . the devices having semiconductor bodies comprising cuprous oxide or cuprous iodide

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 Al-B compounds with or without impurities, e.g. doping materials ( {H01L 21/041 - H01L 21/043, H01L 21/045 - H01L 21/048 take precedence} )

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.

21/161 . . . . {Preparation of the foundation plate, preliminary treatment oxidation of the foundation plate, reduction treatment}  
21/162 . . . . {Preliminary treatment of the foundation plate}  
21/164 . . . . {Oxidation and subsequent heat treatment of the foundation plate {H01L 21/165 takes precedence}}  
21/165 . . . . {Reduction of the copper oxide, treatment of the oxide layer}  
21/167 . . . . {Application of a non-genetic conductive layer}  
21/168 . . . . {Treatment of the complete device, e.g. electroforming, ageing}  
21/18 . . . . the devices having semiconductor bodies comprising elements of Group IV of the Periodic System or Al-B compounds  

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  

21/0445 . . . . the devices having semiconductor bodies comprising crystalline silicon carbide  

21/045 . . . . [passivating silicon carbide surfaces]  
21/0455 . . . . [Making n or p doped regions or layers, e.g. using diffusion]  
21/046 . . . . [using ion implantation]  

NOTE
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.
21/2007 . . . . . . {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 AlIII BV compounds}

21/205 . . . . . . using reduction or decomposition of a gaseous compound yielding a solid condensate, i.e. chemical deposition

21/2053 . . . . . . {Expitaxial 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 21/225 - 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.
{Making the insulator}
e.g. using a liquid, i.e. chemical
treatment, e.g. electrolytic deposition
on single crystalline silicon,
e.g. using an external electrical current;
planarisation aspects
{Lithography-related aspects,
e.g. sub-lithography lengths;
Isolation-related aspects, e.g.
to solve problems arising at the
crossing with the side of the device
isolation; Planarisation aspects}

{characterised by the sectional
shape, e.g. T, inverted-T}

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

{conducting part of electrode is
defined by a sidewall spacer or a
similar technique, e.g. oxidation
under mask, plating}

{insulating part of the electrode
is defined by a sidewall spacer,
e.g. dummy spacer, or a similar
technique, e.g. oxidation under
mask, plating}

{part or whole of the electrode
is a sidewall spacer or made
by a similar technique, e.g.
transformation under mask,
plating}

{Making the insulator}

{on single crystalline silicon,
e.g. using a liquid, i.e. chemical
oxidation}

{with a treatment, e.g. annealing,
after the formation of the
definitive gate conductor}

{with a treatment, e.g. annealing,
after the formation of the
gate insulator and before the
formation of the definitive gate
conductor}

{by deposition, e.g. evaporation,
ALD, CVD, sputtering, laser
deposition (H01L 21/28202 takes
precedence)}

{in a nitrogen-containing
ambient, e.g. nitride deposition,
growth, oxy-nitridation, NH3
nitridation, N2O oxidation,
thermal nitridation, RTN, plasma
nitridation, RPN}

{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

{with substrate doping, e.g. N, Ge,
C implantation, before formation of
the insulator}

{by deposition of a layer,
e.g. metal, metal compound
or polysilicon, followed by
transformation thereof into an
insulating layer}

{with sacrificial oxide}

{passivation or protection of the
electrode, e.g. using re-oxidation}

{the insulator being formed after the
semiconductor body, the semiconductor
belonging to Group IV and not being
elemental silicon, e.g. Ge, SiGe, SiGeC}

{the insulator being formed after the
semiconductor body, the semiconductor
being a III-V compound}

Deposition of conductive or insulating
materials for electrodes [conducting
electric current]

from a gas or vapour, e.g. condensation
[of conductive layers]

{on semiconductor bodies
comprising elements of Group IV
of the Periodic System}

{the conductive layers
comprising silicides
(H01L 21/28537 takes
precedence)}

{the conductive layers
comprising semiconducting
material (H01L 21/28518,
H01L 21/28537 take
precedence)}

{Making of side-wall contacts}

{Deposition of Schottky
electrodes}

{by physical means, e.g.
sputtering, evaporation
(H01L 21/28518 - H01L 21/28537
and H01L 21/28568 take
precedence)}

{by chemical means, e.g. CVD,
LPCVD, PECVD, laser CVD
(H01L 21/28518 - H01L 21/28537
and H01L 21/28568 take
precedence)}

{Selective deposition}

{the conductive layers
comprising transition metals
(H01L 21/28518 takes
precedence)}

{on semiconductor bodies
comprising A1Bv compounds}

{Deposition of Schottky
electrodes}

{characterised by the sectional
shape, e.g. T, inverted T}

{asymmetrical sectional
shape}

from a liquid, e.g. electrolytic deposition

{using an external electrical current,
i.e. electro-deposition}
H01L

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 A_{11}B_{12}V 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 A_{11}B_{12}V compounds}

21/30617 . . . . . . . . . . . . . {Anisotropic liquid etching}

21/30621 . . . . . . . . . . . . . {Vapour phase etching}

21/30625 . . . . . . . . . . . . . {With simultaneous mechanical treatment, e.g. mechanico-chemical polishing}

21/3063 . . . . . . . . . . . . . Electrolytic etching

21/30635 . . . . . . . . . . . . . {of A_{11}B_{12}V 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 . . . . . . . . . . . . . [involving 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

21/31105 . . . . . . . . . . . . . {by chemical or physical means (H01L 21/31058 takes precedence)}

21/3111 . . . . . . . . . . . . . {Etching inorganic layers}

21/31111 . . . . . . . . . . . . . {by chemical means}

21/31116 . . . . . . . . . . . . . {by dry-etching}

21/31122 . . . . . . . . . . . . . {of layers not containing Si, e.g. PZT, Al_{2}O_{3}}

21/31127 . . . . . . . . . . . . . {Etching organic layers}

21/3113 . . . . . . . . . . . . . {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.
Inorganic layers (H01L. 21/3105, H01L 21/32 take precedence)

WARNING
Groups H01L 21/314 – H01L 21/318 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.

Deposition using atomic layer deposition techniques [ALD]

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.

Deposition from a gas or vapour (H01L 21/31695 take precedence)

Deposition of SiO₂ (H01L 21/31625, H01L 21/31629 and H01L 21/3163 take precedence)

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.

Deposition of non-insulating-, e.g. conductive- or resistive-, layers on insulating layers; After-treatment of these layers (manufacture of electrodes H01L 21/28)

using masks
produce internal imperfections to modify their internal properties, e.g. to make them semi-insulating.

NOTE

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

21/3226 . . . . . . . [of silicon on insulator]

21/3228 . . . . . . . [of $A_{m}B_{v}$ compounds, e.g. to make them semi-insulating]

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 $A_{m}B_{v}$ compounds]

21/3247 . . . . . . . [for altering the shape, e.g. smoothing the surface]

**WARNING**

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

Groups H01L 21/324 and H01L 21/3247 should be considered in order to perform a complete search.

21/326 . . . . . . . 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)

21/34 . . . . . . . the devices having semiconductor bodies not provided for in groups (H01L 21/0405, H01L 21/0445), H01L 21/06, H01L 21/16 and H01L 21/18 with or without impurities, e.g. doping materials

21/38 . . . . . . . Diffusion of impurity materials, e.g. doping materials, electrode materials, into or out of a semiconductor body, or between semiconductor regions

21/383 . . . . . . . using diffusion into or out of a solid from or into a gaseous phase

21/385 . . . . . . . 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 21/37/30)

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
H01L

21/449 . . . . . . involving the application of mechanical vibrations, e.g. ultrasonic vibrations
21/46 . . . . . . . . Treatment of semiconductor bodies using processes or apparatus not provided for in groups H01L 21/428 (manufacture of electrodes thereon H01L 21/44)
21/461 . . . . . . . to change their surface-physical characteristics or shape, e.g. etching, polishing, cutting
21/463 . . . . . . . . Mechanical treatment, e.g. grinding, ultrasonic treatment
21/465 . . . . . . . . Chemical or electrical treatment, e.g. electrolytic etching (to form insulating layers H01L 21/469)
21/467 . . . . . . . using masks
21/469 . . . . . . . . to form insulating layers thereon, e.g. for masking or by using photolithographic techniques (layers forming electrodes H01L 21/44; encapsulating layers H01L 21/56); After-treatment of these layers
21/47 . . . . . . . . Organic layers, e.g. photoresist (H01L 21/475, H01L 21/4757 take precedence)
21/471 . . . . . . . . Inorganic layers (H01L 21/475, H01L 21/4757 take precedence)
21/473 . . . . . . . . composed of oxides or glassy oxides or oxide based glass
21/475 . . . . . . . . using masks
21/4757 . . . . . . . . After-treatment
21/47573 . . . . . . . . [Etching the layer]
21/47576 . . . . . . . . [Doping the layer]
21/4763 . . . . . . . . Deposition of non-insulating, e.g. conductive -, resistive -, layers on insulating layers; After-treatment of these layers (manufacture of electrodes H01L 21/28, H01L 21/44)
21/47635 . . . . . . . . [After-treatment of these layers]
21/477 . . . . . . . . Thermal treatment for modifying the properties of semiconductor bodies, e.g. annealing, sintering (H01L 21/38 - H01L 21/449 and H01L 21/461 - H01L 21/475 take precedence)
21/479 . . . . . . . . Application of electric currents or fields, e.g. for electroforming (H01L 21/38 - H01L 21/449 and H01L 21/461 - H01L 21/475 take precedence)
21/48 . . . . . . . Manufacture or treatment of parts, e.g. containers, prior to assembly of the devices, using processes not provided for in a single one of the subgroups H01L 21/06 - H01L 21/326 (apparatus therefor H01L 21/67005; insulative sealing of leads in bases H01L 21/50); containers, encapsulations, fillings, mountings per se H01L 23/00; (marking of parts H01L 23/544)

NOTE

In this group, the expression "treatment" covers also the removal of leads from parts

21/4803 . . . . . . [Insulating or insulated parts, e.g. mountings, containers, diamond heatsinks (H01L 21/4846 takes precedence; printed circuit boards H05K 1/00)]
21/4807 . . . . . . [Ceramic parts]
21/481 . . . . . . . . Insulating layers on insulating parts, with or without metallisation
21/4814 . . . . . . . . [Conductive parts]
21/4817 . . . . . . . . [for containers, e.g. caps (H01L 21/4871 takes precedence)]
21/4821 . . . . . . . . [Flat leads, e.g. lead frames with or without insulating supports]
21/4825 . . . . . . . . [Connection or disconnection of other leads to or from flat leads, e.g. wires, bumps, other flat leads]
21/4828 . . . . . . . . [Etching (etching for cleaning without patterning H01L 21/4835)]
21/4832 . . . . . . . . [Etching a temporary substrate after encapsulation process to form leads]
21/4835 . . . . . . . . [Cleaning, e.g. removing of solder]
21/4839 . . . . . . . . [Assembly of a flat lead with an insulating support, e.g. for TAB]
21/4842 . . . . . . . . [Mechanical treatment, e.g. punching, cutting, deforming, cold welding]
21/4846 . . . . . . . . [Leads on or in insulating or insulated substrates, e.g. metallisation (H01L 21/4821 takes precedence; metallisation of ceramics in general C04B 41/51; printed circuits H05K 3/00)]
21/485 . . . . . . . . [Adaptation of interconnections, e.g. engineering charges, repair techniques]
21/4853 . . . . . . . . [Connection or disconnection of other leads to or from a metallisation, e.g. pins, wires, bumps]
21/4857 . . . . . . . . [Multilayer substrates (multilayer metallisation on monolayer substrate H01L 21/4846)]
21/486 . . . . . . . . [Via connections through the substrate with or without pins]
21/4864 . . . . . . . . [Cleaning, e.g. removing of solder]
21/4867 . . . . . . . . [Applying pastes or inks, e.g. screen printing (H01L 21/486 takes precedence)]
21/4871 . . . . . . . . [Bases, plates or heatsinks]
21/4875 . . . . . . . . [Connection or disconnection of other leads to or from bases or plates]
21/4878 . . . . . . . . [Mechanical treatment, e.g. deforming]
21/4882 . . . . . . . . [Assembly of heatsink parts]
21/4885 . . . . . . . . [Wire-like parts or pins (wire ball formation B23K 20/00; methods related to connecting semiconductor or other solid state bodies H01L 24/00)]
21/4889 . . . . . . . . [Connection or disconnection of other leads to or from wire-like parts, e.g. wires]
21/4892 . . . . . . . . [Cleaning]
21/4896 . . . . . . . . [Mechanical treatment, e.g. cutting, bending]
H01L

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)

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

21/52 . . . 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)}

2021/60 . . . {Attaching or detaching leads or other conductive members, to be used for carrying current to or from the device in operation}

2021/60007 . . . {involving a soldering or an alloying process}

2021/60015 . . . {using plate connectors, e.g. layer, film}

2021/60022 . . . {using bump connectors, e.g. for flip chip mounting}

2021/6003 . . . {Apparatus therefor}

2021/60037 . . . {Right-up bonding}

2021/60045 . . . {Pre-treatment step of the bump connectors prior to bonding}

2021/60052 . . . {Oxide removing step, e.g. flux, rosin}

2021/6006 . . . {with temporary supporting member not part of an apparatus, e.g. removable coating, film or substrate}

2021/60067 . . . {Aligning the bump connectors with the mounting substrate}

2021/60075 . . . {involving active alignment, i.e. by apparatus steering, e.g. using alignment marks, sensors}

2021/60082 . . . {involving passive alignment, e.g. using surface energy, chemical reactions, thermal equilibrium}

2021/6009 . . . {involving guiding structures, e.g. structures that are left at least partly in the bonded product, spacers}

2021/60097 . . . {Applying energy, e.g. for the soldering or alloying process}

2021/60105 . . . {using electromagnetic radiation}

2021/60112 . . . . . {Coherent radiation, i.e. laser beam}

2021/6012 . . . . . {Incoherent radiation, e.g. polychromatic heating lamp}

2021/60127 . . . . . {Induction heating, i.e. eddy currents}

2021/60135 . . . . . {using convection, e.g. reflow oven}

2021/60142 . . . . . {with a graded temperature profile}

2021/6015 . . . . . {using conduction, e.g. chuck heater, thermo-compression}

2021/60157 . . . . . {with a graded temperature profile}

2021/60165 . . . . . {using an electron beam}

2021/60172 . . . . . {static pressure}

2021/6018 . . . . . {Unidirectional static pressure}

2021/60187 . . . . . {Isostatic pressure, e.g. degassing using vacuum or pressurised liquid}

2021/60195 . . . . . {using dynamic pressure, e.g. ultrasonic or thermosonic bonding}

2021/60202 . . . . . {using a protective atmosphere, e.g. with forming or shielding gas}

2021/6021 . . . . . {using an autocatalytic reaction}

2021/60217 . . . . . {Detaching bump connectors, e.g. after testing}

2021/60225 . . . . . {Arrangement of bump connectors prior to mounting}

2021/60232 . . . . . {wherein the bump connectors are disposed only on the semiconductor chip}

2021/6024 . . . . . {wherein the bump connectors are disposed only on the mounting substrate}

2021/60247 . . . . . {wherein the bump connectors are disposed on both the semiconductor chip and the mounting substrate, e.g. bump to bump}

2021/60255 . . . . . {wherein the bump connectors are provided as prepegs, e.g. are provided in an insulating plate member}

2021/60262 . . . . . {Lateral distribution of bump connectors prior to mounting}

2021/6027 . . . . . {Mounting on semiconductor conductive members}

2021/60277 . . . . . {involving the use of conductive adhesives}

2021/60285 . . . . . {involving the use of mechanical auxiliary parts without the use of an alloying of soldering process, e.g. pressure contacts}

2021/60292 . . . . . {involving the use of an electron or laser beam}

2021/603 . . . . . . {involving the application of pressure, e.g. thermo-compression bonding}

2021/607 . . . . . . {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

21/67005 . . . [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)]

21/67011 . . . [Apparatus for manufacture or treatment (processes H01L 21/30, H01L 21/46; for production or after-treatment of single crystals or homogeneous polycrystalline material C30B 35/00)]

21/67017 . . . . [Apparatus for fluid treatment (H01L 21/67126, H01L 21/6715 take precedence)]

21/67023 . . . . . . (for general liquid treatment, e.g. etching followed by cleaning)

21/67028 . . . . . . (for cleaning followed by drying, rinsing, stripping, blasting or the like)

21/67034 . . . . . . . {for drying}

21/6704 . . . . . . . . . . {for wet cleaning or washing}

21/67046 . . . . . . . . . . {using mainly scrubbing means, e.g. brushes}

21/67051 . . . . . . . . . . {using mainly spraying means, e.g. nozzles}

21/67057 . . . . . . . . . . {with the semiconductor substrates being dipped in baths or vessels}

21/67063 . . . . . . . . . . . {for etching}

21/67069 . . . . . . . . . . . {for drying etching}

21/67075 . . . . . . . . . . . {for wet etching}

21/6708 . . . . . . . . . . . {using mainly spraying means, e.g. nozzles}

21/67086 . . . . . . . . . . . {with the semiconductor substrates being dipped in baths or vessels}

21/67092 . . . . . . . . . . . {Apparatus for mechanical treatment (or grinding or cutting, see the relevant groups in subclasses B24B or B28D)}

21/67098 . . . . . . . . . . . [Apparatus for thermal treatment]

21/67103 . . . . . . . . . . . {mainly by conduction}

21/67109 . . . . . . . . . . . {mainly by convection}

21/67115 . . . . . . . . . . . {mainly by radiation}

21/67121 . . . . . . . . . . . {Apparatus for making assemblies not otherwise provided for, e.g. package constructions}

21/67126 . . . . . . . . . . . {Apparatus for sealing, encapsulating, glazing, decapsulating or the like (processes H01L 23/02, H01L 23/28)}

21/67132 . . . . . . . . . . . {Apparatus for placing on an insulating substrate, e.g. tape}

21/67138 . . . . . . . . . . . {Apparatus for wiring semiconductor or solid state device}

21/67144 . . . . . . . . . . . {Apparatus for mounting on conductive members, e.g. leadframes or conductors on insulating substrates}

21/6715 . . . . . . . . . . . {Apparatus for applying a liquid, a resin, an ink or the like (H01L 21/67126 takes precedence)}

21/67155 . . . . . . . . . . . {Apparatus for manufacturing or treating in a plurality of work-stations}

21/67161 . . . . . . . . . . . {characterized by the layout of the process chambers}

21/67167 . . . . . . . . . . . {surrounding a central transfer chamber}

21/67173 . . . . . . . . . . . {in-line arrangement}

21/67178 . . . . . . . . . . . {vertical arrangement}

21/67184 . . . . . . . . . . . {characterized by the presence of more than one transfer chamber}

21/6719 . . . . . . . . . . . {characterized by the construction of the processing chambers, e.g. modular processing chambers}

21/67196 . . . . . . . . . . . {characterized by the construction of the transfer chamber}

21/67201 . . . . . . . . . . . {characterized by the construction of the load-lock chamber}

21/67207 . . . . . . . . . . . {comprising a chamber adapted to a particular process}

21/67213 . . . . . . . . . . . {comprising at least one ion or electron beam chamber (coating by ion implantation C23C; ion or electron beam tubes H01J 37/00)}

21/67219 . . . . . . . . . . . {comprising at least one polishing chamber (polishing apparatuses B24B)}

21/67225 . . . . . . . . . . . {comprising at least one lithography chamber (lithographic apparatuses G03F 7/00)}

21/6723 . . . . . . . . . . . {comprising at least one plating chamber (electroless plating apparatuses C23C, electroplating apparatuses C25D)}

21/67236 . . . . . . . . . . . {the substrates being processed being not semiconductor wafers, e.g. leadframes or chips}

21/67242 . . . . . . . . . . . {Apparatus for monitoring, sorting or marking (testing or measuring during manufacture H01L 22/00, marks per se H01L 23/544; testing individual semiconductor devices G01R 31/26)}

21/67248 . . . . . . . . . . . {Temperature monitoring}

21/67253 . . . . . . . . . . . {Process monitoring, e.g. flow or thickness monitoring}

21/67259 . . . . . . . . . . . {Position monitoring, e.g. misposition detection or presence detection}

21/67265 . . . . . . . . . . . {of substrates stored in a container, a magazine, a carrier, a boat or the like}

21/67271 . . . . . . . . . . . {Sorting devices}

21/67276 . . . . . . . . . . . {Production flow monitoring, e.g. for increasing throughput (program-control systems per se G05B 19/00, e.g. total factory control G05B 19/418)}

21/67282 . . . . . . . . . . . {Marking devices}
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 23/32)}
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 carrier comprising wall type elements whereby the substrates are horizontally supported, e.g. comprising sidewalks]
21/67323 . . . . [characterized by a material, a roughness, a coating or the like]
21/67326 . . . . [Horizontal carrier comprising wall type elements whereby the substrates are vertically supported, e.g. comprising sidewalks]
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]
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 AII-BV 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 AII BV compounds]
21/7607 . . . . [between components manufactured in an active substrate comprising AIII BV compounds]
21/761 . . . . PN junctions
21/762 . . . . Dielectric regions [, e.g. EPIC dielectric isolation, LOCOS; Trench refilling techniques, SOI technology, use of channel stoppers]
21/7620 . . . . [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 21/0241

• etching H01L 21/311, H01L 21/3213

• masking H01L 21/027, H01L 21/033, H01L 21/3144, H01L 21/3219

• 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.

{post-treatment or after-treatment, e.g. cleaning or removal of oxides on underlying conductors}

{Aspects relating to the layout of the pattern or to the size of vias or trenches (layout of the interconnections per se H01L 23/528; CAD of ICs G06F 30/00)}

{using printing or stamping techniques}

{Smoothing of the dielectric (planarisation of insulating materials per se H01L 21/31051)}

{the dielectric comprising air gaps}

{Modification of the material of dielectric layers, e.g. grading, after-treatment to improve the stability of the layers, to increase their density etc.}

{transforming an insulating layer into a conductive layer}

{by exposing the layer to particle radiation, e.g. ion implantation, irradiation with UV light or electrons etc. (plasma treatment H01L 21/76826)}

{by contacting the layer with gases, liquids or plasmas}

{thermal treatment}

{characterised by the formation of thin functional dielectric layers, e.g. dielectric etch-stop, barrier, capping or liner layers}

{in via holes or trenches, e.g. non-conductive sidewall liners}

{Multiple layers}

{formation of thin insulating films on the sidewalls or on top of conductors (H01L 21/76831 takes precedence)}

{Combinations of two or more different dielectric layers having a low dielectric constant (H01L 21/76832 takes precedence)}

{Filling up the space between adjacent conductive structures; Gap-filling properties of dielectrics}

{characterised by the formation and the after-treatment of the conductors (etching for patterning the conductors H01L 21/3213)}

{Smoothing; Planarisation}

{Barrier, adhesion or liner layers}

{formed in openings in a dielectric}

{Bottomless liners}

{Layer combinations}

{the layer being positioned within the main fill metal}

{the layer being positioned on top of the main fill metal}

{the layer covering a conductive structure (H01L 21/76842 takes precedence)}

{the layer also covering the sidewalls of the conductive structure}

{characterized by particular after-treatment steps}

{After-treatment introducing at least one additional element into the layer}

{by treatment in plasmas or gaseous environments, e.g. nitriding a refractory metal liner}

{by diffusing alloying elements}

{by ion implantation}

{Post-treatment or after-treatment not introducing additional chemical elements into the layer}

{Bombardment with particles, e.g. treatment in noble gas plasmas; UV irradiation}

{Thermal treatment}

{Selective removal of parts of the layer (H01L 21/76844 takes precedence)}

{characterized by methods of formation other than PVD, CVD or deposition from a liquids (PVD H01L 21/2855; CVD H01L 21/28556; deposition from liquids H01L 21/2881)}

{Forming or treating discontinuous thin films, e.g. repair, enhancement or reinforcement of discontinuous thin films}

{Thin films associated with contacts of capacitors}

{Layers specifically deposited to enhance or enable the nucleation of further layers, i.e. seed layers}

{for electroplating}

{for electroless plating}

{for deposition from the gas phase, e.g. CVD}

{Filling of holes, grooves or trenches, e.g. vias, with conductive material}

{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)}

{by deposition over sacrificial masking layer, e.g. lift-off (lift-off per se H01L 21/0272)}

{Reflowing or applying of pressure to better fill the contact hole}

{Post-treatment or after-treatment of the conductive material}

{By forming conductive members before deposition of protective insulating material, e.g. pillars, studs}

{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 conducts, 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 bypatent 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 therefor 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

2021/775 . . . . . [comprising a plurality of TFTs on a non-semiconducting substrate, e.g. driving circuits for AMLCDs]
21/78 . . . . . with subsequent division of the substrate into plural individual devices (cutting to change the surface-physical characteristics or shape of semiconductor bodies H01L 21/304)
21/7806 . . . . . {involving the separation of the active layers from a substrate}
21/7813 . . . . . {leaving a reusable substrate, e.g. epitaxial lift off}
21/782 . . . . . to produce devices, each consisting of a single circuit element (H01L 21/82 takes precedence)
21/784 . . . . . the substrate being a semiconductor body
21/786 . . . . . the substrate being other than a semiconductor body, e.g. insulating body
21/82 . . . . . to produce devices, e.g. integrated circuits, each consisting of a plurality of components
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 devices, e.g. complementary 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}
21/823462 . . . . . . . . . . [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]

21/823468 . . . . . . . . . . [with a particular manufacturing method of the gate sidewall spacers, e.g. double spacers, particular spacer material or shape]

21/823475 . . . . . . . . . . [interconnection or wiring or contact manufacturing related aspects]

21/823481 . . . . . . . . . . [isolation region manufacturing related aspects, e.g. to avoid interaction of isolation region with adjacent structure]

21/823487 . . . . . . . . . . [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)]

21/823493 . . . . . . . . . . [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]]

21/8236 . . . . . . . . . . Combination of enhancement and depletion transistors

21/8238 . . . . . . . . . . Complementary field-effect transistors, e.g. CMOS

21/823807 . . . . . . . . . . [with a particular manufacturing method of the channel structures, e.g. channel implants, halo or pocket implants, or channel materials]

21/823814 . . . . . . . . . . [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]

21/823821 . . . . . . . . . . [with a particular manufacturing method of transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET]

21/823828 . . . . . . . . . . [with a particular manufacturing method of the gate conductors, e.g. particular materials, shapes]

21/823835 . . . . . . . . . . [silicided or salicided gate conductors]

21/823842 . . . . . . . . . . [gate conductors with different gate conductor materials or different gate conductor implants, e.g. dual gate structures]

21/82385 . . . . . . . . . . [gate conductors with different shapes, lengths or dimensions]

21/823857 . . . . . . . . . . [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]

21/823864 . . . . . . . . . . [with a particular manufacturing method of the gate sidewall spacers, e.g. double spacers, particular spacer material or shape]

21/823871 . . . . . . . . . . [interconnection or wiring or contact manufacturing related aspects]

21/823878 . . . . . . . . . . [isolation region manufacturing related aspects, e.g. to avoid interaction of isolation region with adjacent structure]

21/823885 . . . . . . . . . . [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)]

21/823892 . . . . . . . . . . [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]]

21/8239 . . . . . . . . . . Memory structures

21/8248 . . . . . . . . . . Combination of bipolar and field-effect technology

21/8249 . . . . . . . . . . Bipolar and MOS technology

21/8252 . . . . . . . . . . the substrate being a semiconductor, using III-V technology (H01L 21/8258 takes precedence)

21/8254 . . . . . . . . . . the substrate being a semiconductor, using II-VI technology (H01L 21/8258 takes precedence)

21/8256 . . . . . . . . . . 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)

21/8258 . . . . . . . . . . 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

21/84 . . . . . . . . . . the substrate being other than a semiconductor body, e.g. being an insulating body

21/845 . . . . . . . . . . [including field-effect transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET]

21/86 . . . . . . . . . . the insulating body being sapphire, e.g. silicon on sapphire structure, i.e. SOS

22/00 (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)
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 H01L 25/00 - H01L 51/00, which details are covered by those groups.

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

characterised by the shape of the container or parts, e.g. caps, walls

the container being a hollow construction having no base used as a mounting for the semiconductor body

the container being a hollow construction and having a conductive base as a mounting as well as a lead for the semiconductor body

the other leads having an insulating passage through the base

the other leads being parallel to the base

the other leads being perpendicular to the base

another lead being formed by a cover plate parallel to the base plate, e.g. sandwich type

the container being a hollow construction and having an insulating [or insulated] base as a mounting for the semiconductor body

the leads having a passage through the base

the leads being parallel to the base

characterised by the material of the container or its electrical properties

the material being an electrical insulator, e.g. glass

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

Mountings, e.g. non-detachable insulating substrates

characterised by the shape

characterised by the material or its electrical properties of printed circuit boards H05K 1/00

[Metallic substrates having insulating layers]

[Organic substrates, e.g. plastic]

[Semiconductor insulating substrates (semiconductor conductive substrates H01L 23/4926)]

[Ceramic or glass substrates ((H01L 23/142, H01L 23/145, H01L 23/147 take precedence)]

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

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

gaseous at the normal operating temperature of the device

liquid at the normal operating temperature of the device

solid or gel at the normal operating temperature of the device ((H01L 23/3135 takes precedence))
H01L.

23/26 . . . including materials for absorbing or reacting with moisture or other undesired substances (e.g., getters).

23/28 . Encapsulations, e.g. encapsulating layers, coatings, [e.g. for protection] (H01L 23/552 takes precedence; [insulating layers for contacts or interconnections (H01L 23/5329)).

23/29 . characterised by the material (¢e.g. carbon (interlayer dielectrics (H01L 23/5329)).

23/291 . . . [Oxides or nitrates or carbides, e.g. ceramics, glass]

23/293 . . . [Organic, e.g. plastic]

23/295 . . . [containing a filler (H01L 23/296 takes precedence)]

23/296 . . . [Organosilicon compounds]

23/298 . . . [Semiconductor material, e.g. amorphous silicon]

23/31 . . . characterised by the arrangement (or shape)

23/3107 . . . [the device being completely enclosed]

23/3114 . . . [the device being a chip scale package, e.g. CSP]

23/3121 . . . [a substrate forming part of the encapsulation]

23/3128 . . . [the substrate having spherical bumps for external connection]

23/3135 . . . [Double encapsulation or coating and encapsulation]

23/3142 . . . [Sealing arrangements between parts, e.g. adhesion promoters]

23/315 . . . [the encapsulation having a cavity]

23/3157 . . . [Partial encapsulation or coating (mask layer used as insulation layer (H01L 21/31)]

23/3164 . . . [the coating being a foil]

23/3171 . . . [the coating being directly applied to the semiconductor body, e.g. passivation layer (H01L 23/378 takes precedence)]

23/3178 . . . [Coating or filling in grooves made in the semiconductor body]

23/3185 . . . [the coating covering also the sidewalls of the semiconductor body]

23/3192 . . . [Multilayer coating]

23/32 . . . 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 H01K)

23/34 . Arrangements for cooling, heating, ventilating or temperature compensation [¢Temperature sensing arrangements (thermal treatment apparatus (H01L 21/00))]

23/345 . . . [Arrangements for heating (thermal treatment apparatus (H01L 21/00))]

23/36 . . . 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])

23/367 . . . Cooling facilitated by shape of device (¢H01L 23/38, H01L 23/40, H01L 23/42, H01L 23/44, H01L 23/46 take precedence)]

23/3672 . . . [Foil-like cooling fins or heat sinks (being part of lead-frames (H01L 23/49568))]

23/3675 . . . [characterised by the shape of the housing]

23/3677 . . . [Wire-like or pin-like cooling fins or heat sinks]

23/373 . . . Cooling facilitated by selection of materials for the device [¢materials for thermal expansion adaptation, e.g. carbon]

23/3731 . . . [Ceramic materials or glass (H01L 23/3732, H01L 23/3733, H01L 23/3735, H01L 23/3737, H01L 23/3738 take precedence)]

23/3732 . . . [Diamonds]

23/3733 . . . [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)]

23/3735 . . . [Laminates or multilayers, e.g. direct bond copper ceramic substrates]

23/3736 . . . [Metallic materials (H01L 23/3732, H01L 23/3733, H01L 23/3735, H01L 23/3737, H01L 23/3738 take precedence)]

23/3737 . . . [Organic materials with or without a thermoconductive filler]

23/3738 . . . [Semiconductor materials]

23/38 . . . Cooling arrangements using the Peltier effect

23/40 . . . Mountings or securing means for detachable cooling or heating arrangements [¢heating (H01L 23/345); fixed by friction, plugs or springs]

23/4006 . . . [with bolts or screws]

23/4012 . . . [for stacked arrangements of a plurality of semiconductor devices (assemblies per se (H01L 25/00)]

23/4018 . . . [characterised by the type of device to be heated or cooled]

23/4025 . . . [Base discrete devices, e.g. presspack, disc-type transistors]

23/4031 . . . [Packaged discrete devices, e.g. to-3 housings, diodes]

23/4037 . . . [characterised by thermal path or place of attachment of heatsink]

23/4043 . . . [heatsink to have chip]

23/405 . . . [heatsink to package]

23/4056 . . . [heatsink to additional heatsink]

23/4062 . . . [heatsink to or through board or cabinet]

23/4068 . . . [Heatconductors between device and heatsink, e.g. compliant heat-spreaders, heat-conducting bands]

23/4075 . . . [Mechanical elements]

23/4081 . . . [Compliant clamping elements not primarily serving heat-conduction]

23/4087 . . . [Mounting accessories, interposers, clamping or screwing parts]

23/4093 . . . [Snap-on arrangements, e.g. clips]

23/42 . . . Fillings or auxiliary members in containers [¢encapsulations] selected or arranged to facilitate heating or cooling [¢heating (H01L 23/345); characterised by selection of materials for the device (H01L 23/373)]

23/427 . . . Cooling by change of state, e.g. use of heat pipes (¢by liquefied gas (H01L 23/445)]

23/4275 . . . [by melting or evaporation of solids]

23/433 . . . [Auxiliary members {in containers} characterised by their shape, e.g. pistons]

23/4332 . . . [Bellows]

23/4334 . . . [Auxiliary members in encapsulations (H01L 23/49568 takes precedence)]

23/4336 . . . [in combination with jet impingement]
23/4338 . . . (Pistons, e.g. spring-loaded members)
23/44 . . . the complete device being wholly immersed in a fluid other than air ((H01L 23/427 takes precedence))
23/445 . . . [the fluid being a liquefied gas, e.g. in a cryogenic vessel]
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 lead-frames]
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 [BGA])
[Multilayer substrates (multilayer metallisation on monolayer substrate H01L 23/498)]

[Via connections through the substrates, e.g. pins going through the substrate, coaxial cables (H01L 23/4982, H01L 23/4983, H01L 23/4985, H01L 23/4986) take precedence]

(the chip support structure consisting of a plurality of insulating substrates)

[Geometry or layout]

(for devices being provided for in H01L 29/00)

[Flexible insulating substrates (H01L 23/49572 and H01L 23/49855 take precedence)]

(for flat-cards, e.g. credit cards (cards per se G06K 19/00))

[Lead-frames fixed on or encapsulated in insulating substrates (H01L 23/4985, H01L 23/4986) take precedence)]

(characterised by the materials (materials of the substrates H01L 23/14, of the lead-frames H01L 23/49579))

(the conductive materials containing semiconductor material)

[Carbon, e.g. fullerenes (superconducting fullerenes H01L 39/123)]

(the conductive materials containing organic materials or pastes, e.g. for thick films (for printed circuits H05K 1/092)]

(the conductive materials containing superconducting material)

[Materials of the insulating layers or coatings]

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

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

[Crossover interconnections]

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

[Capacitor integral with wiring layers]

[Shielding layers formed together with wiring layers]

[Via connections in a multilevel interconnection structure]

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

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

with adaptable interconnections

[comprising anti-fuses, i.e. connections having their state changed from non-conductive to conductive]

[the change of state resulting from the use of an external beam, e.g. laser beam or ion beam]

[comprising fuses, i.e. connections having their state changed from conductive to non-conductive]

[the change of state resulting from the use of an external beam, e.g. laser beam or ion beam]

[Geometry or layout of the interconnection structure (H01L 27/0207 takes precedence; algorithms G06F 30/00)]

[Cross-sectional geometry]

[Arrangements of power or ground buses]

characterised by the materials

[Conductive materials]

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

[the principal metal being aluminium]

[Aluminium alloys]

[Additional layers associated with aluminium layers, e.g. adhesion, barrier, cladding layers]

[the principal metal being copper]

[Copper alloys]

[Additional layers associated with copper layers, e.g. adhesion, barrier, cladding layers]

[the principal metal being a noble metal, e.g. gold]

[Noble-metal alloys]

[Additional layers associated with noble-metal layers, e.g. adhesion, barrier, cladding layers]

[the principal metal being a refractory metal]

[Refractory-metal alloys]

[Additional layers associated with refractory-metal layers, e.g. adhesion, barrier, cladding layers]

[the principal metal being a semiconductor material, e.g. polysilicon]

[the change of state resulting from the use of an external beam, e.g. laser beam or ion beam]

[the principal metal being a noble metal, e.g. gold]

[additional layers associated with refractory-metal layers, e.g. adhesion, barrier, cladding layers]

[the principal metal being a semiconductor material, e.g. polysilicon]

[the change of state resulting from the use of an external beam, e.g. laser beam or ion beam]

[the principal metal being a noble metal, e.g. gold]

[additional layers associated with refractory-metal layers, e.g. adhesion, barrier, cladding layers]

[the change of state resulting from the use of an external beam, e.g. laser beam or ion beam]

[the change of state resulting from the use of an external beam, e.g. laser beam or ion beam]

[the change of state resulting from the use of an external beam, e.g. laser beam or ion beam]
H01L

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 2223/544 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 23/49593, 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 23/66 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

24/01 [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]
{ 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 24/01, H01L 24/42, and H01L 24/85. Groups H01L 24/34 – H01L 24/41 and H01L 24/01, H01L 24/42, 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 }
24/44 . . . { Structure, shape, material or disposition of the wire connectors prior to the connecting process } 
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 } 
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 24/10 - 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 devices, 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 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)}
24/81 . . . {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}
24/98 . . . {Methods for disconnecting semiconductor or solid-state bodies}

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; panels or arrays of photo electrochemical cells H01G 9/2068))

25/03 . . . all the devices being of a type provided for in the same subgroup of groups H01L 27/00 - H01L 31/00, e.g. assemblies of rectifier diodes
25/04 . . . the devices not having separate containers
25/041 . . . . . {the devices being of a type provided for in group H01L 31/00}
25/042 . . . . . . {the devices being arranged next to each other (solar cells H01L 31/042)}
25/043 . . . . . . {Stacked arrangements of devices}
25/046 . . . . . . {the devices being of a type provided for in group H01L 51/00}
25/047 . . . . . . {the devices being of a type provided for in group H01L 51/42, e.g. photovoltaic modules based on organic solar cells}
25/048 . . . . . . {the devices being of a type provided for in group H01L 51/50, e.g. assembly of organic light emitting devices}
25/065 . . . the devices being of a type provided for in group H01L 27/00

**NOTE**
Group H01L 25/065 takes precedence over groups H01L 25/0652 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 23/5393)

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 27/1115 - 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.

27/01 . . . comprising only passive thin-film or thick-film elements formed on a common insulating substrate (passive two-terminal components without a potential-jump or surface barrier for integrated circuits, details thereof and multistep manufacturing processes therefor H01L 28/00)

**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.

27/013 . . . [Thick-film circuits]

27/016 . . . [Thin-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]]

27/0299 . . . . [of bipolar structures]

27/0233 . . . . [Integrated injection logic structures [I2L]]

27/0237 . . . . . [using vertical injector structures]

27/024 . . . . . [using field effect injector structures]
the substrate being a semiconductor body in a non-repetitive configuration
including a plurality of individual components in a non-repetitive configuration
including only semiconductor components of a single kind
the components having an active region in common
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]]

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

NOTE

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

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]
therefor } and multistep manufacturing processes
Read-only memory structures { [ROM]
Static random access memory structures
{ ROM only }
memory cells comprising a transistor
{ Peripheral circuit region }
H01L 28/20
(resistors for integrated circuits
{ the load element being a resistor
(resistors for integrated circuits
H01L 29/8605)
with floating gate
characterised by the boundary
region between the core and
deresistors for integrated circuits
{ the load element being a MOSFET
peripheral transistor
also being used as part of the
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| H01L | 27/11558 | the control gate being a doped region, e.g. single-poly memory cells |
|  | 27/1156 | the floating gate being an electrode shared by two or more components |
|  | 27/11563 | with charge-trapping gate insulators, e.g. MNOS or NROM |
|  | 27/11565 | characterised by the top-view layout |
|  | 27/11568 | characterised by the memory core region (three-dimensional arrangements H01L 27/11578) |
|  | 27/1157 | with cell select transistors, e.g. NAND |
|  | 27/11573 | characterised by the peripheral circuit region |
|  | 27/11575 | characterised by the boundary region between the core and peripheral circuit regions |
|  | 27/11578 | characterised by three-dimensional arrangements, e.g. with cells on different height levels |
|  | 27/1158 | with source and drain on different levels, e.g. with sloping channels |
|  | 27/11582 | the channels comprising vertical portions, e.g. U-shaped channels |
|  | 27/11585 | 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] |
|  | 27/11587 | characterised by the top-view layout |
|  | 27/1159 | characterised by the memory core region |
|  | 27/11592 | characterised by the peripheral circuit region |
|  | 27/11595 | characterised by the boundary region between core and peripheral circuit regions |
|  | 27/11597 | characterised by three-dimensional arrangements, e.g. cells on different height levels |
| 27/118 | Masterslice integrated circuits |
| 27/11801 | { using bipolar technology } |
| 27/11803 | { using field effect technology } |
| 2027/11805 | {A3B5 or A3B6 gate arrays} |
| 27/11807 | {CMOS gate arrays} |
| 2027/11809 | {Microarchitecture} |
| 2027/11811 | {Basic cell P to N transistor count} |
| 2027/11812 | {4-T CMOS basic cell} |
| 2027/11814 | {5-T CMOS basic cell} |
| 2027/11816 | {6-T CMOS basic cell} |
| 2027/11818 | {7-T CMOS basic cell} |
| 2027/1182 | {8-T CMOS basic cell} |
| 2027/11822 | {relative P to N transistor sizes} |
| 2027/11824 | {for current drive capability} |
| 2027/11825 | {for delay time adaptation} |
| 2027/11827 | {for capacitive loading} |
| 2027/11829 | {Isolation techniques} |
| 2027/11831 | {FET isolation} |

- 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}

| CPC - 2020.02 | 2027/11833 | {LOCOS} |
|  | 2027/11835 | {Degree of specialisation for implementing specific functions} |
|  | 2027/11837 | {Implementation of digital circuits} |
|  | 2027/11838 | {Implementation of memory functions} |
|  | 2027/1184 | {Implementation of analog circuits} |
|  | 2027/11842 | {Resistors and capacitors} |
|  | 2027/11844 | {Hybrid analog or digital} |
|  | 2027/11846 | {Embedded IO cells} |
|  | 2027/11848 | {Transmission gate} |
|  | 2027/1185 | {Porous cells, i.e. pass-through elements} |
|  | 2027/11851 | {Technology used, i.e. design rules} |
|  | 2027/11853 | {Sub-micron technology} |
|  | 2027/11855 | {Twin-tub technology} |
|  | 2027/11857 | {SOS, SOI technology} |
|  | 2027/11859 | {Connectivity characteristics, i.e. diffusion and polysilicon geometries} |
|  | 2027/11861 | {Substrate and well contacts} |
|  | 2027/11862 | {Horizontal or vertical grid line density} |
|  | 2027/11864 | {Yield or reliability} |
|  | 2027/11866 | {Gate electrode terminals or contacts} |
|  | 2027/11868 | {Macro-architecture} |
|  | 2027/1187 | {Number of core or basic cells in the macro (RAM, ROM)} |
|  | 2027/11872 | {Distribution function, e.g. Sea of Gates} |
|  | 2027/11874 | {Layout specification, i.e. inner core region} |
|  | 2027/11875 | {Wiring region, routing} |
|  | 2027/11877 | {Avoiding clock-skew or clock-delay} |
|  | 2027/11879 | {Data lines (buses)} |
|  | 2027/11881 | {Power supply lines} |
|  | 2027/11883 | {Levels of metallisation} |
|  | 2027/11885 | {Two levels of metal} |
|  | 2027/11887 | {Three levels of metal} |
|  | 2027/11888 | {More than 3 levels of metal} |
|  | 2027/1189 | {Latch-up prevention} |
|  | 2027/11892 | {Noise prevention (crosstalk)} |
|  | 2027/11894 | {Radiation hardened circuits} |

35
27/1214 . . . . [comprising a plurality of TFTs formed on a non-semiconducting substrate, e.g. driving circuits for AMLCDs]

**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]
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. InGaN]
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. half-tone mask]
27/1296 . . . . [adapted to increase the uniformity of device parameters]
27/13 . . . . . combined with thin-film or thick-film passive components
27/14 . . . . . 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)

27/142 . . . Energy conversion devices (photovoltaic modules or arrays of single photovoltaic cells comprising bypass diodes integrated or directly associated with the devices H01L 31/0443; photovoltaic modules composed of a plurality of thin film solar cells deposited on the same substrate H01L 31/046)
27/1421 . . . [comprising bypass diodes integrated or directly associated with the device, e.g. bypass diode integrated or formed in or on the same substrate as the solar cell]
27/144 . . . . Devices controlled by radiation
27/1443 . . . [with at least one potential jump or surface barrier]
27/1446 . . . [in a repetitive configuration]
27/146 . . . . Imager structures

**WARNING**

Groups H01L 27/146 – H01L 27/14893 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 27/14893 should be considered in order to perform a complete search.

27/14601 . . . . [Structural or functional details thereof]
27/14603 . . . . [Special geometry or disposition of pixel-elements, address-lines or gate-electrodes]
27/14605 . . . . [Structural or functional details relating to the position of the pixel elements, e.g. smaller pixel elements in the center of the imager compared to pixel elements at the periphery]
27/14607 . . . . [Geometry of the photosensitive area]
27/14609 . . . . [Pixel-elements with integrated switching, control, storage or amplification elements (scanning details of imagers H04N 3/15; circuitry of imagers H04N 5/369)]
27/1461 . . . . [characterised by the photosensitive area]
27/14612 . . . . [involving a transistor]
27/14614 . . . . [having a special gate structure]
27/14616 . . . . [characterised by the channel of the transistor, e.g. channel having a doping gradient]
or parts thereof (not peculiar thereto) 

{ Processes or apparatus peculiar to the Bipolar transistor imagers 

imagers; static induction transistor [SIT] 

{ Junction field effect transistor [JFET] 

{ Contact-type imagers 

{ Imagers using a photoconductor layer 

or corpuscular radiation H01L 1/00) 

including solid state devices H01L 23/38) 

including components exhibiting superconductivity 

including piezo-electric components; including electrostrictive components; including magnetoestrictive components 

including components using galvano-magnetic effects, e.g. Hall effects; using similar magnetic field effects 

{ comprising two-terminal components, e.g. diodes; MIM elements 

{ comprising multi-terminal components, e.g. transistors 

{ of the field-effect transistor type 

{ including solid state components for rectifying, amplifying or switching without a potential-jump barrier or surface barrier specially adapted for light emission 

{ (monolithically integrated components including semiconductor laser components H01S 5/026) 

{ in a repetitive configuration, e.g. LED bars 

{ two-dimensional arrays 

{ comprising a photoconductive layer deposited on the CCD structure 

including semiconductor components with at least one potential-jump barrier or surface barrier specially adapted for light emission 

including thermomagnetic components (using the Peltier effect only for cooling of semiconductor or other solid state devices H01L 23/38) 

including components using galvano-magnetic effects, e.g. Hall effects; using similar magnetic field effects 

{ comprising multi-terminal selection components, e.g. diodes, MIM elements 

{ comprising two-terminal components, e.g. transistors 

{ of the field-effect transistor type 

{ 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] 

{ comprising two-terminal selection components, e.g. diodes 

{ of the metal-insulator-metal type 

{ comprising multi-terminal selection components, e.g. transistors 

{ of the bipolar type 

{ comprising multi-terminal selection components, e.g. transistors 

{ of the bipolar type 

{ comprising multi-terminal selection components, e.g. diodes 

{ of the metal-insulator-metal type 

{ comprising two-terminal selection components, e.g. diodes 

}
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 27/288)]
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 27/288)]
27/320 . . . . [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]
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 . . . . [combined with dummy elements, i.e. non-functional features]
27/3225 . . . . [OLED integrated with another component (H01L 27/3233 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]
27/3244 . . . . [Active matrix displays]
27/3246 . . . . . [Pixel defining structures, e.g. banks]

**WARNING**

Group H01L 27/3246 is incomplete pending reclassification of documents from group H01L 27/3295. Groups H01L 27/3295 and H01L 27/3246 should be considered in order to perform a complete search.
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}

**WARNING**

Group H01L 27/3276 is incomplete pending reclassification of documents from group H01L 27/3297.

Groups H01L 27/3297 and H01L 27/3276 should be considered in order to perform a complete search.

27/3279 . . . . {comprising structures specially adapted for lowering the resistance}
27/3281 . . . . {Passive matrix displays}
27/3283 . . . . {including banks or shadow masks}

**WARNING**

Group H01L 27/3283 is incomplete pending reclassification of documents from group H01L 27/3295.

Groups H01L 27/3295 and H01L 27/3283 should be considered in order to perform a complete search.

27/3286 . . . . {Dual display, i.e. having two independent displays}
27/3288 . . . . {Wiring lines}

**WARNING**

Group H01L 27/3288 is incomplete pending reclassification of documents from group H01L 27/3297.

Groups H01L 27/3297 and H01L 27/3288 should be considered in order to perform a complete search.

27/329 . . . . {comprising structures specially adapted for lowering the resistance}
27/3293 . . . . {Tiled displays}
27/3295 . . . . {including banks or shadow masks}

**WARNING**

Group H01L 27/3295 is no longer used for the classification of documents as of January 1, 2020.

The content of this group is being reclassified into groups H01L 27/3246 and H01L 27/3283.

Groups H01L 27/3295, H01L 27/3246 and H01L 27/3283 should be considered in order to perform a complete search.

27/3297 . . . . {Wiring lines, e.g. power supply lines}

**WARNING**

Group H01L 27/3297 is no longer used for the classification of documents as of January 1, 2020.

The content of this group is being reclassified into groups H01L 27/3276 and H01L 27/3288.

Groups H01L 27/3297, H01L 27/3276 and H01L 27/3288 should be considered in order to perform a complete search.

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 rough surface, e.g. using hemispherical grains}
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}
28/91 . . {made by patterning layers, e.g. by etching conductive layers}
28/92 . . {made by patterning layers, e.g. by etching conductive layers}
H01L

Semiconductor devices adapted for rectifying, amplifying, 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 . . . . . . Semiconductor 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 29/0661 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 (SJ), 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, moth etching, depletion etching]

29/0665 . . . . . . [the shape of the body defining a nanostructure (nanotechnology per se B82B)]

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)]
H01L

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 MOS transistors}

WARNING

Groups H01L 29/0852 - H01L 29/0866 are incomplete pending reclassification of documents from group H01L 29/0847 and H01L 29/7801. Groups H01L 29/0852 - H01L 29/0866 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 29/0696)]

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, npi 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 . . . . [Graphene]
29/1608 . . . . [Silicon carbide]
29/161 . . . . including two or more of the elements provided for in group \(H01L\ 29/16\) [\(\{\\text{e.g. alloys (}H01L\ 29/1604\ \text{takes precedence)}\}\)
29/165 . . . . in different semiconductor regions \(\{\\text{e.g. heterojunctions}\}\)
29/167 . . . . further characterised by the doping material \(\{H01L\ 29/1604\ \text{takes precedence}\}\)
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\text{II}B\text{V} compounds
29/2003 . . . . [Nitride compounds]
29/2006 . . . . [Amorphous materials]
29/201 . . . . including two or more compounds \(\{\\text{e.g. alloys (}H01L\ 29/2006\ \text{takes precedence)}\}\)
29/205 . . . . in different semiconductor regions \(\{\\text{e.g. heterojunctions}\}\)
29/207 . . . . further characterised by the doping material \(\{H01L\ 29/2006\ \text{takes precedence}\}\)
29/22 . . . . including, apart from doping materials or other impurities, only A\text{II}B\text{V} compounds
29/2203 . . . . [Cd X compounds being one element of the 6th group of the Periodic System \(H01L\ 29/2206\ \text{takes precedence}\)]
29/2206 . . . . [Amorphous materials]
29/221 . . . . including two or more compounds \(\{\\text{e.g. alloys (}H01L\ 29/2206\ \text{takes precedence)}\}\)
29/225 . . . . in different semiconductor regions \(\{\\text{e.g. heterojunctions}\}\)
29/227 . . . . further characterised by the doping material \(\{H01L\ 29/2206\ \text{takes precedence}\}\)
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 . . . . \(\{\text{AlB}_3\text{ or AlB}_4\text{ compounds, e.g. CuO, Cu I (}H01L\ 29/247\ \text{takes precedence)}\}\)
29/245 . . . . \(\{\text{Pb compounds, e.g. PbO (}H01L\ 29/247\ \text{takes precedence)}\}\)
29/247 . . . . [Amorphous materials]
29/26 . . . . including, apart from doping materials or other impurities, elements provided for in two or more of the groups \(H01L\ 29/16, H01L\ 29/18, H01L\ 29/20, H01L\ 29/22, H01L\ 29/24\) \(\{\\text{e.g. alloys}\}\)
29/263 . . . . [Amorphous materials]

29/267 . . . . in different semiconductor regions \(\{\\text{e.g. heterojunctions (}H01L\ 29/263\ \text{takes precedence)}\}\)
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 \(\{\text{in the bulk material (within semiconductor regions }H01L\ 29/06)\}\)
29/365 . . . . [Planar doping, e.g. atomic-plane doping, delta-doping]
29/40 . . . . Electrodes \(\{\\text{Multistep manufacturing processes therefor}\}\)
29/401 . . . . [Multistep manufacturing processes]

**WARNING**

Group \(H01L\ 29/401\) is impacted by reclassification into groups \(H01L\ 29/011, H01L\ 29/4011, H01L\ 29/40114, H01L\ 29/40117\). Groups \(H01L\ 29/401, H01L\ 29/4011, H01L\ 29/40111, H01L\ 29/40114, H01L\ 29/40117\) should be considered in order to perform a complete search.

29/4011 . . . . [for data storage electrodes]

**WARNING**

Group \(H01L\ 29/4011\) is incomplete pending reclassification of documents from group \(H01L\ 29/401\). Group \(H01L\ 29/401\) should be considered in order to perform a complete search.

29/40111 . . . . [the electrodes comprising a layer which is used for its ferroelectric properties]

**WARNING**

Group \(H01L\ 29/40111\) is incomplete pending reclassification of documents from group \(H01L\ 29/401\). Group \(H01L\ 29/401\) and \(H01L\ 29/40111\) should be considered in order to perform a complete search.

29/40114 . . . . [the electrodes comprising a conductor-insulator-conductor-insulator-semiconductor structure]

**WARNING**

Group \(H01L\ 29/40114\) is incomplete pending reclassification of documents from group \(H01L\ 29/401\). Group \(H01L\ 29/401\) and \(H01L\ 29/40114\) should be considered in order to perform a complete search.
29/41717 . . . . [the electrodes comprising a charge-trapping insulator]

**WARNING**

Group H01L 29/41717 is incomplete pending reclassification of documents from group H01L 29/401.

Group H01L 29/40117 and H01L 29/40117 should be considered in order to perform a complete search.

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]

29/411 . . . . characterised by their shape, relative sizes or dispositions
29/413 . . . . [Nanosized electrodes, e.g. nanowire electrodes comprising one or a plurality of nanowires (transparent electrodes comprising carbon nano-tubes H01L 51/444, nanotechnology per se 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

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 29/4175 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 29/4232 and H01L 29/4234 take precedence)]
H01L.

29/4236 . . . . . . . . [within a trench, e.g. trench gate electrode, groove gate electrode]
29/42364 . . . . . . . . [characterised by the insulating material, e.g. thickness or uniformity (H01L 29/42324 and H01L 29/42341 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 . . . . . . . . [Heterojunction gate for field effect devices]
29/432 . . . . . . . . [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 AlIn-Bv compounds]
29/454 . . . . . . . . [on thin film AlIn-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 AlIn-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]
29/4916 . . . . . . . . [the conductor material next to the insulator being a silicon layer, e.g. polysilicon doped with boron, phosphorus or nitrogen (H01L 29/4908, H01L 29/4983 takes precedence)]
29/4925 . . . . . . . . . [with a multiple layer structure, e.g. several silicon layers with different crystal structure or grain arrangement (with only a vertical doping structure or vertical doping variation H01L 29/4916)]
29/4933 . . . . . . . . . [with a silicide layer contacting the silicon layer, e.g. Polycide gate (with a barrier layer between the silicide and silicon layers H01L 29/4914)]
29/4941 . . . . . . . . [with a barrier layer between the silicon and the metal or metal silicide upper layer, e.g. Silicide/TiN/Poly-silicon]
29/495 . . . . . . . . . . . . [the conductor material next to the insulator being a simple metal, e.g. W, Mo (H01L 29/4908, H01L 29/4983 take precedence)]
29/4958 . . . . . . . . . [with a multiple layer structure]
29/4966 . . . . . . . . [the conductor material next to the insulator being a composite material, e.g. organic material, TiN, MoSi, (H01L 29/4908, H01L 29/4983 take precedence)]
29/4975 . . . . . . . . [being a silicide layer, e.g. TiSi2]
29/4983 . . . . . . . . [with a lateral structure, e.g. a Polysilicon gate with a lateral doping variation or with a lateral composition variation or characterised by the sidewalls being composed of conductive, resistive or dielectric material]
29/4991 . . . . . . . . [comprising an air gap]

WARNING
Group H01L 29/4991 is incomplete 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.
29/51 . . . . . . . . . . . . Insulating materials associated therewith
29/511 . . . . . . . . . . . . [for MIS structures on thin film semiconductor (H01L 29/4909)]
29/512 . . . . . . . . . . . . [the variation being parallel to the channel plane]
29/513 . . . . . . . . . . . . [the variation being perpendicular to the channel plane]
29/515 . . . . . . . . . . . . [with cavities, e.g. containing a gas]
29/516 . . . . . . . . . . . . [with at least one ferroelectric layer]
29/517 . . . . . . . . . . . . [the insulating material comprising a metallic compound, e.g. metal oxide, metal silicate (H01L 29/518 takes precedence)]
29/518 . . . . . . . . . . . . [the insulating material containing nitrogen, e.g. nitride, oxynitride, nitrogen-doped material]
29/66 . . . . . . . . . . . . Types of semiconductor device [; Multistep manufacturing processes therefor]
29/66007 . . . . . . . . [Multistep manufacturing processes]
29/66015 . . . . . . . . [of devices having a semiconductor body comprising semiconducting carbon, e.g. diamond, diamond-like carbon, graphene]
29/66022 . . . . . . . . [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]
29/6603 . . . . . . . . . . . [Diodes]
29/66037 . . . . . . . . . . . [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]
of devices having a semiconductor body comprising crystalline silicon carbide (H01L 29/66015; comprising crystalline silicon carbide H01L 29/66053))

29/66083 . . . . . . . (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)

29/66075 . . . . . . . (of devices having semiconductor bodies comprising group 14 or group 13/15 materials (comprising semiconducting carbon H01L 29/66015; comprising crystalline silicon carbide H01L 29/66053))

29/6609 . . . . . . . (Diodes)
29/66098 . . . . . . . (Breakdown diodes)
29/66106 . . . . . . . (Zener diodes)
29/66113 . . . . . . . (Avalanche diodes)
29/66121 . . . . . . . (Multilayer diodes, e.g. PNPN diodes)
29/66128 . . . . . . . (Planar diodes)
29/66136 . . . . . . . (PN junction diodes)
29/66143 . . . . . . . (Schottky diodes)
29/66151 . . . . . . . (Tunnel diodes (group 13/15 resonant tunneling diodes H01L 29/66219))
29/66159 . . . . . . . (Transit time diodes, e.g. IMPATT, TRAPATT diodes)
29/66166 . . . . . . . (Resistors with PN junction)
29/66174 . . . . . . . (Capacitors with PN or Schottky junction, e.g. varactors (capacitors with PN junction combined with MOS control H01L 29/66189))
29/66181 . . . . . . . (Conductor-insulator-semiconductor capacitors, e.g. trench capacitors)
29/66189 . . . . . . . (with PN junction, e.g. hybrid capacitors)
29/66196 . . . . . . . (with an active layer made of a group 13/15 material)
29/66204 . . . . . . . (Diodes)
29/66212 . . . . . . . (Schottky diodes)
29/66219 . . . . . . . (with a heterojunction, e.g. resonant tunneling diodes [RTDI])
29/66227 . . . . . . . (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)
29/66234 . . . . . . . (Bipolar junction transistors [BJT])
29/66242 . . . . . . . (Heterojunction transistors [HBT] (with an active layer made of a group 13/15 material H01L 29/66318))

29/6625 . . . . . . . (Lateral transistors (H01L 29/66242 and H01L 29/66265 take precedence))
29/66257 . . . . . . . (Schottky transistors)
29/66265 . . . . . . . (Thin film bipolar transistors (H01L 29/66242 takes precedence))
29/66272 . . . . . . . (Silicon vertical transistors (H01L 29/66242, H01L 29/66257 and H01L 29/66265 take precedence))
29/6628 . . . . . . . (Inverse transistors)
29/66287 . . . . . . . (with a single crystalline emitter, collector or base including extrinsic, link or graft base formed on the silicon substrate, e.g. by epitaxy, recrystallisation, after insulating device isolation (H01L 29/6628 takes precedence))
29/66295 . . . . . . . (with main current going through the whole silicon substrate, e.g. power bipolar transistor)
29/66303 . . . . . . . (with multi-emitter, e.g. interdigitated, multi-cellular or distributed emitter)
29/6631 . . . . . . . (with an active layer made of a group 13/15 material)
29/66318 . . . . . . . (Heterojunction transistors)
29/66325 . . . . . . . (controlled by field-effect, e.g. insulated gate bipolar transistors [IGBT])
29/66333 . . . . . . . (Vertical insulated gate bipolar transistors)
29/6634 . . . . . . . (with a recess formed by etching in the source/emitter contact region (H01L 29/66348 takes precedence; etching of semiconductor bodies H01L 21/302))
29/66348 . . . . . . . (with a recessed gate)
29/66356 . . . . . . . (Gated diodes, e.g. field controlled diodes [FCD], static induction thyristors [SITh], field controlled thyristors [FCTh])
29/66363 . . . . . . . (Thyristors)
29/66371 . . . . . . . (structurally associated with another device, e.g. built-in diode (making integrated circuits H01L 21/821))
29/66378 . . . . . . . (the other device being a controlling field-effect device)
29/66386 . . . . . . . (Bidirectional thyristors)
29/66393 . . . . . . . (Lateral or planar thyristors)
29/66401 . . . . . . . (with an active layer made of a group 13/15 material)
29/66409 . . . . . . . (Unipolar field-effect transistors)
29/66416 . . . . . . . (Static induction transistors [SIT] (with an active layer made of a group 13/15 material H01L 29/66454))
29/66424 . . . . . . . (Permeable base transistors [PBT])
29/66431 . . . . . . . (with a heterojunction interface channel or gate, e.g. HFET, HIGFET, SISFET, HJFET, HEMT (with an active layer made of a group 13/15 material H01L 29/66462))
29/66439 . . . . . . . (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. HIFET, HIGFET, SISFET, HJFET, 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}

{using inside spacers, permanent or not}

{using multiple spacer layers, e.g. multiple sidewall spacers}

{Lateral single gate silicon transistors}

{where the source and drain or source and drain extensions are self-aligned to the sides of the gate (H01L 29/66606 takes precedence)}

{with initial gate mask or masking layer complementary to the prospective gate location, e.g. with dummy source and drain contacts}

{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}

{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}

{final source and drain contacts formation strictly before final or dummy gate formation, e.g. contact first technology (H01L 29/66621 takes precedence)}

{with a gate recessing step, e.g. using local oxidation (making recessed gate LDMOS transistors H01L 29/66704)}

{using etching to form a recess at the gate location (etching of semiconductor bodies H01L 21/302)}

{recessing the gate by forming single crystalline semiconductor material at the source or drain location}

{with source or drain recessed by etching or first recessed by etching and then refilled}

{source or drain regions formed by a Schottky barrier or a conductor-insulator-semiconductor structure}

{with a single crystalline channel formed on the silicon substrate after insulating device isolation}

{with asymmetry in the channel direction, e.g. lateral high-voltage MISFETs with drain offset region, extended drain MISFETs}

{Vertical transistors (H01L 29/66712, H01L 29/66742 take precedence)}

{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 29/6659)}

{Lateral DMOS transistors, i.e. LDMOS transistors}

{with a step of forming an insulating sidewall spacer (forming insulating material on a substrate H01L 21/02107)}

{with a step of recessing the source electrode}

{with a step of recessing the gate electrode, e.g. to form a trench gate electrode}

{Vertical DMOS transistors, i.e. VDMOS transistors}
With a PN junction gate, i.e. JFET

With a Schottky gate, i.e. MESFET

13/15 material (H01L 29/66446 takes precedence)

{ with a ferroelectric gate insulator }
e.g. MNOS transistors

{ with a charge trapping gate insulator,
takes precedence ) }

Lateral single gate single channel transistors with inverted structure, i.e. the channel layer is formed after the gate

Monocrystalline silicon transistors on insulating substrates, e.g. quartz substrates (H01L 29/66666 takes precedence; thin film FinFETs H01L 29/66795)

{ on sapphire substrates, e.g. SOS transistors }

{ with a gate at the side of the channel }

{ with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET }

{ with a step of doping the vertical sidewall, e.g. using tilted or multi-angled implants }

{ using dummy structures having essentially the same shape as the semiconductor body, e.g. to provide stability }

{ the channel being thinned after patterning, e.g. sacrificial oxidation on fin }

{ with a floating gate (H01L 29/6684 takes precedence) }

{ with a charge trapping gate insulator, e.g. MNOS transistors }

{ with a ferroelectric gate insulator }

{ with a Schottky gate, i.e. MESFET }

{ with an active layer made of a group 13/15 material (H01L 29/66446 takes precedence) }

Lateral single gate transistors

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

Processes wherein the final gate is made before the formation, e.g. activation anneal, of the source and drain regions in the active layer

Lateral transistors with two or more independent gates

{ with a PN junction gate, i.e. JFET }

{ Vertical transistors, e.g. tecnetrons }

{ with a PN heterojunction gate }

{ with an active layer made of a group 13/15 material (H01L 29/66446 takes precedence) }

{ 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] }

{ with an active layer made of a group 13/15 material }

{ Charge transfer devices }

{ with an insulated gate }

{ with a Schottky gate }

{ [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) ] }

{ Quantum effect devices, e.g. using quantum reflection, diffraction or interference effects, i.e. Bragg- or Aharonov-Bohm effects }

{ Devices using spin polarized carriers }

{ controllable only by the variation of applied heat (controllable by IR radiation H01L 31/00; measuring quantity of heat G01K 17/00) }

{ 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 }

{ Hi-Lo semiconductor devices, e.g. memory devices }

Bipolar devices

{ Double base diodes }

Transistor-type devices, i.e. able to continuously respond to applied control signals

Bipolar junction transistors

{ structurally associated with other devices (assemblies of devices H01L 25/00; integrated circuits H01L 27/00; IGBT H01L 29/7393) }

{ the device being a resistive element, e.g. ballasting resistor (transistors integrated with resistors H01L 27/0075) }

{ Point contact transistors }

{ Schottky transistors }

{ Tunnel transistors }

{ Avalanche transistors }

{ Transistors with hook collector }

{ Bipolar thin film transistors }

Vertical transistors

{ 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] (unijunction 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; JGT; 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 has a component substantially not parallel to the main surface

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]

29/76825 . . . . . . . . . . . . . [Structures for regeneration, refreshing, leakage compensation or the like]

29/76833 . . . . . . . . . . . . . [Buried channel CCD]

29/76841 . . . . . . . . . . . . . [Two-Phase CCD]

29/7685 . . . . . . . . . . . . . [Three-Phase CCD]

29/76858 . . . . . . . . . . . . . [Four-Phase CCD]

29/76866 . . . . . . . . . . . . . [Surface Channel CCD]

29/76875 . . . . . . . . . . . . . [Two-Phase CCD]

29/76883 . . . . . . . . . . . . . [Three-Phase CCD]

29/76891 . . . . . . . . . . . . . [Four-Phase CCD]

29/772 . . . . . . . . . . . . . Field effect transistors

29/7722 . . . . . . . . . . . . . [using static field induced regions, e.g. SIT, PBT]

29/7725 . . . . . . . . . . . . . [with delta-doped channel (H01L 29/778 takes precedence)]

29/7727 . . . . . . . . . . . . . [Velocity modulation transistors, i.e. VMT]

29/775 . . . . . . . . . . . . . with one dimensional charge carrier gas channel, e.g. quantum wire FET
29/778 . . . . . . with two-dimensional charge carrier
gas channel, e.g. HEMT [; with two-
dimensional charge-carrier layer formed at
a heterojunction interface (H01L 29/803
takes precedence)]

29/7781 . . . . . . [with inverted single heterostructure,
i.e. with active layer formed on top of
wide bandgap layer, e.g. IHEMT]

29/7782 . . . . . . [with confinement of carriers by at least
two heterojunctions, e.g. DHHEMT,
quantum well HEMT, DHMODFET]

29/7783 . . . . . . [using III-V semiconductor material]

29/7784 . . . . . . [with delta or planar doped
donor layer (H01L 29/7785 takes precedence)]

29/7785 . . . . . . [with more than one donor layer]

29/7786 . . . . . . [with direct single heterostructure, i.e.
with wide bandgap layer formed on
top of active layer, e.g. direct single
heterostructure MIS-like HEMT]

29/7787 . . . . . . [with wide bandgap charge-carrier
supplying layer, e.g. direct single
heterostructure MODFET]

29/7788 . . . . . . [Vertical transistors]

29/7789 . . . . . . [the two-dimensional charge carrier
gas being at least partially not parallel
to a main surface of the semiconductor
body]

29/78 . . . . . . with field effect produced by an insulated
gate ((H01L 29/7725, H01L 29/775,
H01L 29/778 take precedence))

29/7801 . . . . . . [DMOS transistors, i.e. MISFETs with
a channel accommodating body or base
region adjoining a drain drift region
(lateral high-voltage MISFETs with
channel well and drain offset region
H01L 29/7835)]

29/7802 . . . . . . [Vertical DMOS transistors]

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

[with asymmetrical source and drain regions, e.g. lateral high-voltage MISFETs with drain offset region, extended drain MISFETs]

[with lightly doped drain or source extension, e.g. LDD MOSFET’s; DDD MOSFET’s (for thin film transistors H01L 29/78618)]

[with a significant overlap between the lightly doped extension and the gate electrode (H01L 29/7834, H01L 29/7835 take precedence)]

[without inversion channel, e.g. buried channel lateral MISFETs, normally-on lateral MISFETs, depletion-mode lateral MISFETs]

[with Schottky drain or source contact]

[the gate comprising a layer which is used for its ferroelectric properties]

[with floating body, e.g. programmable transistors]

[means for exerting mechanical stress on the crystal lattice of the channel region, e.g. using a flexible substrate (variation of the composition of the channel H01L 29/1054)]

[the means being an applied insulating layer]

[the means being a conductive material, e.g. silicided S/D or Gate]

[the means being located in the lateral device isolation region, e.g. STI]

[using a memorization technique, e.g. re-crystallization under strain, bonding on a substrate having a thermal expansion coefficient different from the one of the region]
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29/78627  {with a significant overlap between the lightly doped drain and the gate electrode, e.g. GOLDD}

2029/7863 {with an LDD consisting of more than one lightly doped zone or having a non-homogeneous dopant distribution, e.g. graded LDD}

29/78633  {with a light shield}

29/78636  {with supplementary region or layer for improving the flatness of the device}

29/78639  {with a drain or source connected to a bulk conducting substrate}

29/78642  {Vertical transistors}

29/78645  {with multiple gate}

NOTE

In groups H01L 29/78651 - H01L 29/78696, the materials specified for the transistors are the material of the channel region.

29/78648  {arranged on opposing sides of the channel}

29/78651  {Silicon transistors (H01L 29/78606 - H01L 29/78645 take precedence)}

29/78654  {Monocrystalline silicon transistors}

29/78657  {SOS transistors}

29/78666  {Non-monocrystalline silicon transistors}

29/78663  {Amorphous silicon transistors}

29/78666  {with normal-type structure, e.g. with top gate}

29/78669  {with inverted-type structure, e.g. with bottom gate}

29/78672  {Polycrystalline or microcrystalline silicon transistor}

29/78675  {with normal-type structure, e.g. with top gate}

29/78678  {with inverted-type structure, e.g. with bottom gate}

29/78681  {having a semiconductor body comprising A_{III}B_{V} or A_{IV}B_{V} or A_{III}V_{V}
semiconductor materials, or Se or Te}

29/78684  {having a semiconductor body comprising semiconductor materials of Group IV not being silicon, or alloys including an element of the group IV, e.g. Ge, SiN alloys, SiC alloys (H01L 29/7869 takes precedence)}

29/78687  {with a multilayer structure or superlattice structure}

29/7869  {having a semiconductor body comprising an oxide semiconductor material, e.g. zinc oxide, copper aluminium oxide, cadmium stannate}

29/78693  {the semiconductor oxide being amorphous}

29/78696  {characterised by the structure of the channel, e.g. multichannel, transverse or longitudinal shape, length or width, doping structure, or the overlap or alignment between the channel and the gate, the source or the drain, or the contacting structure of the channel (H01L 29/78612 takes precedence; transistors having a drain offset region or a lightly doped drain [LDD] H01L 29/78621)}

29/788  {with floating gate (H01L 29/78391 takes precedence)}

29/7881  {Programmable transistors with only two possible levels of programmation (H01L 29/7888 takes precedence)}

29/7882  {charging by injection of carriers through a conductive insulator, e.g. Poole-Frankel conduction}

29/7883  {charging by tunnelling of carriers, e.g. Fowler-Nordheim tunnelling}

29/7884  {charging by hot carrier injection}

29/7885  {Hot carrier injection from the channel}

29/7886  {Hot carrier produced by avalanche breakdown of a PN junction, e.g. FAMOS}

29/7887  {Programmable transistors with more than two possible different levels of programmation}

29/7888  {Transistors programmable by two single electrons}

29/7889  {Vertical transistors, i.e. transistors having source and drain not in the same horizontal plane}

29/792  {with charge trapping gate insulator, e.g. MNOS-memory transistors}

29/7923  {Programmable transistors with more than two possible different levels of programmation}

29/7926  {Vertical transistors, i.e. transistors having source and drain not in the same horizontal plane}

29/80  {with field effect produced by a PN or other rectifying junction gate, i.e. potential-jump barrier}

29/802  {with heterojunction gate, e.g. transistors with semiconductor layer acting as gate insulating layer, MIS-like transistors (H01L 29/806 takes precedence; with one dimensional electron gas H01L 29/775; with dimensional electron gas H01L 29/778)}

29/803  {Programmable transistors, e.g. with charge-trapping quantum well}

29/806  {with Schottky drain or source contact}

29/808  {with a PN junction gate, e.g. PN homojunction gate (H01L 29/7725, H01L 29/775, H01L 29/778, H01L 29/806; take precedence)}

29/8083  {Vertical transistors (SIT H01L 29/7722)

29/8086  {Thin film JFET's}
with a Schottky gate (H01L 29/7755, H01L 29/7757, H01L 29/7759, H01L 29/806 take precedence; with Schottky contact on top of heterojunction gate H01L 29/802)

[Vertical transistors (SIT, PBT H01L 29/7723)]

[with multiple gate]

[Thin film MESFET’s]

[with recessed gate]

controllable by variation of the magnetic field applied to the device

controllable by variation of applied mechanical force, e.g. of pressure

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

Variable capacitance diodes, e.g. varactors

Metal-insulator-semiconductors, e.g. MOS

[Trench capacitors]

Semiconductor devices sensitive to infra-red radiation, light, electromagnetic radiation of shorter wavelength or corpuscular 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)

[Arrangements for conducting electric current to or from the device in operations]

[for device characterised by at least one potential jump barrier or surface barrier]

[for solar cells or solar cell modules]

[comprising specially adapted module bus-bar structures]

[comprising output lead wires elements]

[Circuit arrangements of general character for the devices]

[for devices characterised by at least one potential jump barrier or surface barrier]

[for solar cells (electrical connection means, e.g. junction boxes, specially adapted for structural association with photovoltaic modules H02S 40/34)]

[Position sensitive and lateral effect photodetectors; Quadrant photodiodes]

[for devices working in avalanche mode]

[Containers; Encapsulations, e.g. encapsulation of photodiodes; for photovoltaic devices H01L 31/048; for organic photosensitive devices H01L 51/44]

[Coatings (H01L 31/041 takes precedence)]

[for devices characterised by at least one potential jump barrier or surface barrier]

[for filtering or shielding light, e.g. multicolour filters for photodetectors]

[for shielding light, e.g. light blocking layers, cold shields for infra-red detectors]

[using interference filters, e.g. multilayer dielectric filters (interference filters G02B 5/28)]

[for solar cells]

[the coatings being antireflective or having enhancing optical properties for the solar cells]

Electrodes

[for devices characterised by at least one potential jump barrier or surface barrier]

[comprising ring electrodes]

[for solar cells]
characterised by their semiconductor bodies

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)

31/0232 . . . comprising luminescent members, e.g. fluorescent sheets upon the device

31/0235 . . . (the optical elements not being integrated nor being directly associated with the device)

31/0237 . . . (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 31/0252)

31/0248 . . . characterised by their semiconductor bodies

31/0256 . . . characterised by the material

31/0264 . . . Inorganic materials

31/0272 . . . Selenium or tellurium

31/0275 . . . (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 A\textsubscript{III}B\textsubscript{V} 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 A\textsubscript{III}B\textsubscript{V} compounds

31/03042 . . . (characterised by the doping material)

31/03044 . . . (comprising a nitride compounds, e.g. GaN)

31/03046 . . . (including ternary or quaternary compounds, e.g. GaAlAs, InGaAs, InGaAsP)

31/03048 . . . (comprising a nitride compounds, e.g. InGaN)

31/0312 . . . including, apart from doping materials or other impurities, only A\textsubscript{III}B\textsubscript{V} compounds, e.g. SiC

31/03125 . . . [characterised by the doping material]

31/032 . . . including, apart from doping materials or other impurities, only compounds not provided for in groups H01L 31/0272 - H01L 31/0312

31/0321 . . . [characterised by the doping material (H01L 31/0323, H01L 31/0325 take precedence)]

31/0322 . . . [comprising only A\textsubscript{II}B\textsubscript{VI}C\textsubscript{VI} chalcopyrite compounds, e.g. Cu In Se\textsubscript{2}, Cu Ga Se\textsubscript{2}, Cu In Ga Se\textsubscript{2}]

31/0323 . . . [characterised by the doping material]

31/0324 . . . [comprising only A\textsubscript{III}B\textsubscript{V} or A\textsubscript{II}B\textsubscript{VI}C\textsubscript{VI} chalcopyrite compounds, e.g. Pb Sn Te]

31/0325 . . . [characterised by the doping material]

31/0326 . . . [comprising A\textsubscript{II}B\textsubscript{VI}C\textsubscript{VI} kesterite compounds, e.g. CuZnSnSe\textsubscript{4}, CuZnSnS\textsubscript{4}]

31/0327 . . . [characterised by the doping material]

31/0328 . . . including, apart from doping materials or other impurities, semiconductor materials provided for in two or more of groups H01L 31/0272 - H01L 31/0312

31/0336 . . . in different semiconductor regions, e.g. Cu\textsubscript{X}Cd\textsubscript{X} hetero-junctions, X being an element of Group VI of the Periodic System

31/03365 . . . [comprising only Cu\textsubscript{X}/CdX heterojunctions, X being an element of Group VI of the Periodic System]

31/0344 . . . [Organic materials]

31/0352 . . . characterised by their shape or by the shapes, relative sizes or disposition of the semiconductor regions

31/035209 . . . [comprising a quantum structures]

31/035218 . . . [the quantum structure being quantum dots]

31/035227 . . . [the quantum structure being quantum wires, or nanorods (carbon nanotubes H01L 51/0048)]

31/035236 . . . [Superlattices; Multiple quantum well structures]

31/035245 . . . [characterised by amorphous semiconductor layers]

31/035254 . . . [including, apart from doping materials or other impurities, only elements of Group IV of the Periodic System, e.g. Si-SiGe superlattices]

31/035263 . . . [Doping superlattices, e.g. nipi superlattices]

31/035272 . . . [characterised by at least one potential jump barrier or surface barrier]

31/035281 . . . [Shape of the body]

31/03529 . . . [Shape of the potential jump barrier or surface barrier]

31/036 . . . characterised by their crystalline structure or particular orientation of the crystalline planes

31/0368 . . . including polycrystalline semiconductors (H01L 31/0392 takes precedence)

31/03682 . . . [including only elements of Group IV of the Periodic System]

31/03685 . . . [including microcrystalline silicon, uc-Si]

31/03687 . . . [including microcrystalline A\textsubscript{III}B\textsubscript{V} alloys, e.g. uc-SiGe, uc-SiC]
including amorphous semiconductors

including only elements of Group IV of the Periodic System

{including A\textsubscript{2}B\textsubscript{3}V\textsubscript{5} compounds or alloys, e.g. SiGe, SiC}

{presenting light-induced characteristic variations, e.g. Staebler-Wronski effect}

including other non-monocrystalline materials, e.g. semiconductor particles embedded in an insulating material

{comprising semiconductor nanoparticles embedded in a semiconductor matrix (in insulating matrix \textit{H01L 31/0384})}

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 \textit{H01L 31/0236})

{comprising semiconductor nanoparticles embedded in a semiconductor matrix (in insulating matrix \textit{H01L 31/0384})}

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 \textit{H01L 31/0236})

adapted as photovoltaic [PV] conversion devices (testing thereof during manufacture \textit{H01L 22/00}; testing thereof after manufacture \textit{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 \textit{H02S 20/00})

Mechanically stacked PV cells

including bypass diodes (bypass diodes in the junction box \textit{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

PV modules composed of a plurality of thin film solar cells deposited on the same substrate

characterised by special patterning methods to connect the PV cells in a module, e.g. laser cutting of the conductive or active layers

comprising particular structures for the electrical interconnection of adjacent PV cells in the module (\textit{H01L 31/0463} takes precedence)

comprising specific means for obtaining partial light transmission through the module, e.g. partially transparent thin film solar modules for windows

PV cell arrays including PV cells having multiple vertical junctions or multiple V-groove junctions formed in a semiconductor substrate

PV cell arrays made by cells in a planar, e.g. repetitive, configuration on a single semiconductor substrate; PV cell microarrays (PV modules composed of a plurality of thin film solar cells deposited on the same substrate \textit{H01L 31/0465})

Encapsulation of modules

characterised by the composition of the encapsulation material

{Double glass encapsulation, e.g. photovoltaic cells arranged between front and rear glass sheets}

Protective back sheets

Electrical interconnection means between PV cells inside the PV module, e.g. series connection of PV cells (electrodes \textit{H01L 31/0224}; electrical interconnection of thin film solar cells formed on a common substrate \textit{H01L 31/0465}; particular structures for electrical interconnecting of adjacent thin film solar cells in the module \textit{H01L 31/0465}; electrical interconnection means specially adapted for electrically connecting two or more PV modules \textit{H02S 40/36})

{Specially adapted for series or parallel connection of solar cells in a module}

{the interconnection means having a particular shape}

{made of a particular material or composition of materials}

{specially adapted for interconnection of back-contact solar cells}

Cooling means directly associated or integrated with the PV cell, e.g. integrated Peltier elements for active cooling or heat sinks directly associated with the PV cells (cooling means in combination with the PV module \textit{H02S 40/42})

{using a gaseous or a liquid coolant, e.g. air flow ventilation, water circulation}

including means to utilise heat energy directly associated with the PV cell, e.g. integrated Seebeck elements

Energy storage means directly associated or integrated with the PV cell, e.g. a capacitor integrated with a PV cell (energy storage means associated with the PV module \textit{H02S 40/38})

Optical elements directly associated or integrated with the PV cell, e.g. light-reflecting means or light-concentrating means

{comprising light concentrating means of the refractive type, e.g. lenses}

{comprising light concentrating means of the reflecting type, e.g. parabolic mirrors, concentrators using total internal reflection}

{comprising spectrum splitting means, e.g. dichroic mirrors}
the light-reflecting means being of the back surface reflector [BSR] type

characterised by at least one potential-jump barrier or surface barrier

the potential barriers being of the point-contact type (H01L 31/07 takes precedence)

the potential barriers being only of the metal-insulator-semiconductor type

the potential barriers being only of the graded gap type

the potential barriers being only of the PN homojunction type, e.g. bulk silicon PN homojunction solar cells or thin film polycrystalline silicon PN homojunction solar cells

[back-junction, i.e. researse emitter, solar cells, e.g. interdigitated base-emitter regions back-junction cells]

[double emitter cells, e.g. bifacial solar cells]

Multiple junction or tandem solar cells

[inverted grown metamorphic [IMM] multiple junction solar cells, e.g. III-V compounds inverted metamorphic multi-junction cells]

the devices including, apart from doping material or other impurities, only AIIIIV 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 AIIIIV compound semiconductors, e.g. CdS/CdTe solar cells

comprising only AIIIIV compound semiconductors, e.g. GaAs/AlGaAs or InP/GaInAs solar cells

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

comprising a AIIIIV 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

including a AIIIIVCIV VI compound, e.g. CdS/CulnSe2 [CIS] heterojunction solar cells

the potential barriers being only of the PIN type

Multiple junction or tandem solar cells

the devices comprising monocrystalline or polycrystalline materials

including different types of potential barriers provided for in two or more of groups H01L 31/062 - H01L 31/075

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

[the devices being sensitive to very short wavelength, e.g. X-ray, Gamma-rays]

Devices sensitive to infra-red, visible or ultraviolet radiation (H01L 31/101 takes precedence)

[comprising amorphous semiconductors]

characterised by at least one potential-jump barrier or surface barrier, e.g. phototransistors

Devices sensitive to infra-red, visible or ultra-violet radiation

[devices sensitive to two or more wavelengths, e.g. multi-spectrum radiation detection devices]

[comprising transparent or semitransparent devices]

characterised by only one potential barrier or surface barrier

[the potential barrier being of the point contact type]

the potential barrier being of the PN homojunction type

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

[the devices comprising active layers formed only by AIIIBVI compounds]

[the devices comprising active layers formed only by AIIIBVI compounds]

the potential barrier being of the PIN type

[the devices comprising amorphous materials of Group IV of the Periodic System]

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

[in which the active layers, e.g. absorption or multiplication layers, form an heterostructure, e.g. SAM structure]

the potential barrier being of the Schottky type

[the devices being of the Metal-Semiconductor-Metal [MSM] Schottky barrier type]

the potential barrier being of the PN heterojunction type

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

[the device being a bipolar phototransistor]

characterised by at least three potential barriers, e.g. photothyristor

[the device being a photothyristor]

[of the static induction type]

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

[Devices with Schottky gate]

[the device being a CCD device]

[the device being a photo MESFET]

[Devices with PN homojunction gate]

[the device being a CCD device]

[the device being a field-effect phototransistor]

[Devices with PN heterojunction gate]

[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 thereeto (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. photoresistors}
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}
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 21/00)
31/1804 . . . . {comprising only elements of Group IV of the Periodic System}
31/1808 . . . . {including only Ge}
31/1812 . . . . {including only AIII \textsubscript{IV}B \textsubscript{V} 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, poly Si ingots, thin films of polycrystalline Si}
31/1824 . . . . {Special manufacturing methods for microcrystalline Si, uc-Si}
31/1828 . . . . {the active layers comprising only AIII \textsubscript{IV}B \textsubscript{V} compounds, e.g. CdS, ZnS, CdTe}
31/1832 . . . . {comprising ternary compounds, e.g. Hg Cd Te}
31/1836 . . . . {comprising a growth substrate not being an AIII \textsubscript{IV}B \textsubscript{V} compound}
31/184 . . . . {the active layers comprising only AIII \textsubscript{IV}B \textsubscript{V} compounds, e.g. GaAs, InP}
31/1844 . . . . {comprising ternary or quaternary compounds, e.g. Ga Al As, In Ga As P}
31/1848 . . . . {comprising nitride compounds, e.g. InGaN, InGaAIN}
31/1852 . . . . {comprising a growth substrate not being an AIII \textsubscript{IV}B \textsubscript{V} 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 AIII \textsubscript{IV}B \textsubscript{V} 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}
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

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

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

33/30 . . . containing only elements of group III and group V of the periodic system

33/32 . . . . . . containing nitrogen

33/325 . . . . . . {characterised by the doping materials}

33/330 . . . . . . {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 package

33/483 . . [Containers]
33/486 . . [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]

50/00 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; [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)

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

35/14 . . using inorganic compositions
35/16 . . comprising tellurium or selenium or sulfur
35/18 . . comprising arsenic or antimony or bismuth (H01L 35/16 takes precedence), {e.g. A\textsubscript{III}B\textsubscript{V} compounds]
35/20 . . comprising metals only (H01L 35/16, H01L 35/18 take precedence)
35/22 . . comprising compounds containing boron, carbon, oxygen or nitrogen {or germanium or silicon, e.g. superconductors}
35/225 . . . . {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 (including details about, e.g., housing, insulation, geometry, module)
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 Thermoelectric 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; [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 19/19] 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]
39/13 . . . . 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 films (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_{3}Sn]
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 casting]
39/2432  . . . . . [by evaporation independent of heat source, e.g. MBE]
39/2435  . . . . . [by sputtering]
39/2438  . . . . . [by chemical vapour deposition (CVD)]
39/2441  . . . . . [by metalloorganochemical vapour deposition (MOCVD)]
39/2445  . . . . . [by thermal spraying, e.g. plasma deposition]
39/2448  . . . . . [Pulsed laser deposition, e.g. laser sputtering; laser ablation]
39/2451  . . . . [Precursor deposition followed by after-treatment, e.g. oxidation]
39/2454  . . . . . [characterised by the substrate]
39/2458  . . . . . [Monocrystalline substrates, e.g. epitaxial growth]
39/2461  . . . . . [Intermediate layers, e.g. for growth control]
39/2464  . . . . . [After-treatment, e.g. patterning]
39/2467  . . . . . [Etching]
39/247  . . . . . [Passivation]
39/2474  . . . . . [Manufacture or deposition of contacts or electrodes]
39/2477  . . . . . [Processes including the use of precursors]
39/248  . . . . . [Processes peculiar to the manufacture or treatment of films or composite wires]
39/2483  . . . . . [Introducing flux pinning centres]
39/2487  . . . . . [of devices comprising metal borides, e.g. MgB_{2}]
39/249  . . . . . [Treatment of superconductive layers by irradiation, e.g. ion-beam, electron-beam, laser beam, X-rays (irradiation devices G21K, H01J)]
39/2493  . . . . . [for Josephson devices]
39/2496  . . . . . [comprising high Tc ceramic materials]

41/00 Piezo-electric devices in general; Electrostrictive devices in general; Magnetostriuctive 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]
Piezo-electric or electrostrictive devices 
transformers } with electrical input and electrical output {, e.g. actuators, vibrators (in frequency selective 
with electrical input and mechanical output {, e.g. having combined actuator and sensor parts ) 
{ based on piezo-electric or electrostrictive films or coatings ) 
{ characterised by the underlying base, e.g. substrates ) 
{ Intermediate layers, e.g. barrier, adhesion or growth control buffer layers ) 
{ based on piezo-electric or electrostrictive fibres ) 
{ with electrical and mechanical input and output, e.g. having combined actuator and sensor parts ) 
{ having a stacked or multilayer structure 
{ with non-rectangular cross-section in stacking direction, e.g. polygonal, trapezoidal } 
{ with non-rectangular cross-section orthogonal to the stacking direction, e.g. polygonal, circular } 
{ Annular cross-section ) 
{ of cylindrical shape with stacking in radial direction, e.g. coaxial or spiral type rolls ) 
{ adapted for alleviating internal stress, e.g. cracking control layers ("Sollbruchstellen") ) 
{ formed as coaxial cables ) 
{ with electrical input and mechanical output {, e.g. actuators, vibrators (in frequency selective 
networks H03H 9/00 ) ) 
{ using longitudinal or thickness displacement combined with bending, shear or torsion displacement ) 
{ with polygonal or rectangular shape ) 
{ with cylindrical or annular shape ) 
{ using bending displacement, e.g. unimorph, bimorph or multimorph cantilever or membrane benders ) 
{ Beam type ) 
{ Cantilevers, i.e. having one fixed end ) 
{ connected at their free ends, e.g. parallelogram type ) 
{ with multiple segments mechanically connected in series, e.g. zig-zag type ) 
{ adapted for in-plane bending displacement ) 
{ adapted for multi-directional bending displacement ) 
{ Membrane type ) 
{ with non-planar shape ) 
{ using longitudinal or thickness displacement only, e.g. d33 or d31 type devices ) 
{ using shear or torsion displacement, e.g. d15 type devices ) 
{ with mechanical input and electrical output {, e.g. transformers ) 

NOTE 
Integral individual layer electrode and connection electrode are classified in both H01L 41/293 and H01L 41/297 

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Integral individual layer electrode and connection electrode are classified in both H01L 41/293 and H01L 41/297 

Applying piezo-electric or electrostrictive parts or bodies onto an electrical element or another base
41/311 ... Mounting of piezo-electric or electrostrictive parts together with semiconductor elements, or other circuit elements, on a common substrate
41/312 ... by laminating or bonding of piezo-electric or electrostrictive bodies
41/313 ... by metal fusing or with adhesives
41/314 ... by depositing piezo-electric or electrostrictive layers, e.g. aerosol or screen printing
41/316 ... by vapour phase deposition
41/317 ... by liquid phase deposition
41/318 ... by sol-gel deposition
41/319 ... using intermediate layers, e.g. for growth control
41/33 ... Shaping or machining of piezo-electric 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 piezo-electric 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 magnetostrictive 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 or of a surface barrier, or surface barrier controllable by variation of a magnetic field)

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)
43/14 ... for Hall-effect devices

45/00 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 or of a surface barrier controllable by variation of a magnetic field)

45/005 ... [Charge density wave transport devices]
45/02 ... Solid state travelling-wave devices
45/04 ... [Bistable or multistable switching devices, e.g. for resistance switching non-volatile memory]
45/06 ... [based on solid-state phase change, e.g. between amorphous and crystalline phases, Ovshinsky effect]
45/065 ... [between different crystalline phases, e.g. cubic and hexagonal]
45/08 ... [based on migration or redistribution of ionic species, e.g. anions, vacancies]
45/085 ... [the species being metal cations, e.g. programmable metallization cells]
45/10 ... [based on bulk electronic defects, e.g. trapping of electrons]
45/12 ... [Details]
45/1206 ... [Three or more terminal devices, e.g. transistor like devices]
45/1213 ... [Radiation or particle beam assisted switching devices, e.g. optically controlled devices]
45/122 ... [Device geometry]
45/1226 ... [adapted for essentially horizontal current flow, e.g. bridge type devices]
45/1233 ... [adapted for essentially vertical current flow, e.g. sandwich or pillar type devices]
45/124 ... [on sidewalls of dielectric structures, e.g. mesa or cup type devices]
45/1246 ... [Further means within the switching material region to limit current flow, e.g. constrictions]
45/1253 ... [Electrodes]
45/126 ... [adapted for resistive heating]
45/1266 ... [adapted for supplying ionic species]
45/1273 ... [adapted for electric field or current focusing, e.g. tip shaped]
45/128 ... [Thermal details]
45/1286 ... [Heating or cooling means other than resistive heating electrodes, e.g. heater in parallel]
45/1293 ... [Thermal insulation means]
45/14 ... [Selection of switching materials]
45/141 ... [Compounds of sulfur, selenium or tellurium, e.g. chalcogenides]
45/142 ... [Sulfides, e.g. CuS]
45/143 ... [Selenides, e.g. GeSe]
45/144 ... [Tellurides, e.g. GeSbTe]
45/145 ... [Oxides or nitrides]
45/146 ... [Binary metal oxides, e.g. TaOx]
H01L

45/147 . . . . [Complex metal oxides, e.g. perovskites, spinels]
45/148 . . . . [Other compounds of groups 13-15, e.g. elemental or compound semiconductors]
45/149 . . . . [Carbon or carbides]
45/16 . . . . [Manufacturing]
45/1608 . . . . [Formation of the switching material, e.g. layer deposition]
45/1616 . . . . [by chemical vapor deposition, e.g. MOCVD, ALD]
45/1625 . . . . [by physical vapor deposition, e.g. sputtering]
45/1633 . . . . [by conversion of electrode material, e.g. oxidation]
45/1641 . . . . [Modification of the switching material, e.g. post-treatment, doping]
45/165 . . . . [by implantation]
45/1658 . . . . [by diffusion, e.g. photo-dissolution]
45/1666 . . . . [Patterning of the switching material]
45/1675 . . . . [by etching of pre-deposited switching material layers, e.g. lithography]
45/1683 . . . . [by filling of openings, e.g. damascene method]
45/1691 . . . . [Patterning process specially adapted for achieving sub-lithographic dimensions, e.g. using spacers]

47/00 Bulk negative resistance effect devices, e.g. Gunn-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)
47/005 . . . . [Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof (not peculiar thereto H01L 21/00)]
47/02 . . . . Gunn-effect devices (or transferred electron devices)
47/023 . . . . [controlled by electromagnetic radiation]
47/026 . . . . [Gunn diodes (H01L 47/02 takes precedence)]

49/00 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
49/003 . . . . [Devices using Mott metal-insulator transition, e.g. field effect transistors]
49/006 . . . . [Quantum devices, e.g. Quantum Interference Devices, Metal Single Electron Transistor (using semiconductors in the active part H01L 29/00)]
49/02 . . . . Thin-film or thick-film devices

51/00 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 acrylic chains, e.g. poly acrylic (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 selene, e.g. polythiophene (per se C08G 61/126)]

51/0037 . . . [Poly-phenylene dioxythiophene [PEDOT] and derivatives]

51/0038 . . . [Poly-phenylenevinylene and derivatives (per se C08G 61/10)]

51/0039 . . . [Polyolefins 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 or derivatives)]

51/0042 . . . [poly N-vinylcarbazol and derivatives]

51/0043 . . . [Copolymers]

51/0044 . . . [Ladder-type polymers]

51/0045 . . . [Carbon containing materials, e.g. carbon nanotubes, fulerenes (per se C01B 32/15)]

51/0046 . . . [Fulerenes, 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, tetraaihafulvalene (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]
Details of devices oscillated or switched, e.g. two-terminal devices carrying the current to be rectified, amplified, potential applied, to one or more of the electrodes of the electric current supplied or the electric potential applied, to an electrode which does not carry the electric current supplied or the electric potential applied, to an electrode which does not carry the electric current supplied or the electric potential applied.

Passivation, containers, encapsulations

Molecular electronic devices (molecular bi-stable switching devices)

Organic/inorganic hetero-junction

Organic/organic junction, e.g. Schottky diodes

Field-effect devices, e.g. TFTs

Organic semiconductor layers forming pn-hetero-junctions

Metal-organic semiconductor-metal devices

Comprising organic semiconductor-inorganic semiconductor hetero-junctions

Majority carrier devices using sensitisation of widebandgap semiconductors, e.g. TiO₂ (photoelectrochemical devices with a liquid or solid electrolyte)

Field-effect devices, e.g. TFTs

Light sensitive field effect devices

Devices having a m-i-s structure

Devices having a p-i-n structure

Details of devices

Electrodes

Organic electroluminescent displays

Light emitting devices [PLED] (organic semiconductor light emitting diodes [OLED] or polymer light emitting devices [PLED])

Specially adapted for light emission, e.g. organic light emitting diodes (OLED) or polymer light emitting devices (PLED)

Organic semiconductor hetero-junctions

Metal-organic semiconductor-metal devices

Light sensitive field effect devices

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Devices having a m-i-s structure

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Light emitting devices [PLED] (organic semiconductor light emitting diodes [OLED] or polymer light emitting devices [PLED])

Specially adapted for light emission, e.g. organic light emitting diodes (OLED) or polymer light emitting devices (PLED)

Organic semiconductor hetero-junctions

Metal-organic semiconductor-metal devices

Light sensitive field effect devices

Devices having a m-i-s structure

Details of devices

Electrodes

Organic electroluminescent displays

Light emitting devices [PLED] (organic semiconductor light emitting diodes [OLED] or polymer light emitting devices [PLED])

Specially adapted for light emission, e.g. organic light emitting diodes (OLED) or polymer light emitting devices (PLED)

Organic semiconductor hetero-junctions

Metal-organic semiconductor-metal devices

Light sensitive field effect devices

Devices having a m-i-s structure
51/5024 . . . [having a host comprising an emissive dopant and further additive materials, e.g. for improving the dispersability, for improving the stabilisation, for assisting energy transfer]
51/5028 . . . [for assisting energy transfer, e.g. sensitization]
51/5032 . . . [Light emitting electrochemical cells [LEC], i.e. with mobile ions in the active layer]
51/5036 . . . [Multi-colour light emission, e.g. colour tuning, polymer blend, stack of electroluminescent layers]
51/504 . . . [Stack of electroluminescent layers]
51/5044 . . . [with spacer layers between the emissive layers]
51/5048 . . . [Carrier transporting layer]
51/5052 . . . [Doped transporting layer]

**WARNING**

Groups H01L 51/5052 is no longer used for the classification of documents as of January 1, 2020.

The content of this group is being reclassified into groups H01L 51/506 and H01L 51/5076.

Groups H01L 51/5052, H01L 51/506 and H01L 51/5076 should be considered in order to perform a complete search.

51/5056 . . . [Hole transporting layer]
51/506 . . . [comprising a dopant]

**WARNING**

Group H01L 51/506 is incomplete pending reclassification of documents from group H01L 51/5052.

Groups H01L 51/5052 and H01L 51/506 should be considered in order to perform a complete search.

51/5064 . . . [having a multilayered structure]
51/5068 . . . [arranged between the light emitting layer and the cathode]
51/5072 . . . [Electron transporting layer]
51/5076 . . . [comprising a dopant]

**WARNING**

Group H01L 51/5076 is incomplete pending reclassification of documents from group H01L 51/5052.

Groups H01L 51/5052 and H01L 51/5076 should be considered in order to perform a complete search.

51/508 . . . [having a multilayered structure]
51/5084 . . . [arranged between the light emitting layer and the anode]
51/5088 . . . [Carrier injection layer]
51/5092 . . . [Electron injection layer]
51/5096 . . . [Carrier blocking layer]
51/52 . . . [Details of devices]
51/5203 . . . [Electrodes]
51/5206 . . . [Anodes, i.e. with high work-function material]
51/5209 . . . [characterised by the shape]

**WARNING**

Groups H01L 51/5052, H01L 51/506 and H01L 51/5076 should be considered in order to perform a complete search.

51/5212 . . . . . . [combined with auxiliary electrode, e.g. ITO layer combined with metal lines]
51/5215 . . . . . . [composed of transparent multilayers]
51/5218 . . . . . . [Reflective anodes, e.g. ITO combined with thick metallic layer]
51/5221 . . . . . . [Cathodes, i.e. with low work-function material]
51/5225 . . . . . . [characterised by the shape]
51/5228 . . . . . . [combined with auxiliary electrodes]
51/5231 . . . . . . [composed of opaque multilayers]
51/5234 . . . . . . [Transparent, e.g. including thin metal film]
51/5237 . . . . . . [Passivation; Containers; Encapsulation, e.g. against humidity]
51/524 . . . . . . [Sealing arrangements having a self-supporting structure, e.g. containers]
51/5243 . . . . . . [the sealing arrangements being made of metallic material]
51/5246 . . . . . . [characterised by the peripheral sealing arrangements, e.g. adhesives, sealants]
51/525 . . . . . . [Vertical spacers, e.g. arranged between the sealing arrangement and the OLED]
51/5253 . . . . . . [Protective coatings]
51/5256 . . . . . . [having repetitive multilayer structures]
51/5259 . . . . . . [including getter material or desiccant]
51/5262 . . . . . . [Arrangements for extracting light from the device]
51/5265 . . . . . . [comprising a resonant cavity structure, e.g. Bragg reflector pair]
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
H01L

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
2223/54486 . . . . Located on package parts, e.g. encapsulation, leads, package substrate
2223/54493 . . . . Peripheral marks on wafers, e.g. orientation flats, notches, lot number
2223/58 . . . . Structural electrical arrangements for semiconductor devices not otherwise provided for
2223/64 . . . . Impedance arrangements
2223/66 . . . . High-frequency adaptations
2223/6605 . . . . High-frequency electrical connections
2223/6611 . . . . Wire connections
2223/6616 . . . . Vertical connections, e.g. vias
2223/6622 . . . . Coaxial feed-throughs in active or passive substrates
2223/6627 . . . . Waveguides, e.g. microstrip line, strip line, coplanar line
2223/6632 . . . . Transition between different waveguide types
2223/6637 . . . . 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)
Indexing scheme for arrangements for connecting or disconnecting semiconductor or solid-state bodies and methods related thereto as covered by H01L 24/00

2224/001 . 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

2224/02233 . 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

2224/0231 . 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

2224/03005 . for aligning the bonding area, e.g. marks, spacers

2224/03009 . for protecting parts during manufacture

2224/03011 . Involving a permanent auxiliary member, i.e. a member which is left at least partly in the finished device, e.g. coating, dummy feature

2224/03013 . for holding or confining the bonding area, e.g. solder flow barrier

2224/03015 . for aligning the bonding area, e.g. marks, spacers

2224/03019 . for protecting parts during the process

2224/031 . Manufacture and pre-treatment of the bonding area preform

2224/0311 . Shaping

2224/0312 . Applying permanent coating

2224/033 . by local deposition of the material of the bonding area

2224/0331 . in liquid form

2224/03312 . Continuous flow, e.g. using a micro syringe, a pump, a nozzle or extrusion

2224/03318 . by dispensing droplets

2224/0332 . Screen printing, i.e. using a stencil

2224/0333 . in solid form

2224/03332 . using a powder

2224/03334 . using a preform

2224/0334 . by blanket deposition of the material of the bonding area

2224/0341 . in liquid form

2224/03416 . Spin coating

2224/03418 . Spray coating
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2224/0342 . . . . . . . Curtains coating
2224/03422 . . . . . . . by dipping, e.g. in a solder bath (hot-dipping C23C 2/00)
2224/03424 . . . . . . . Immersion coating, e.g. in a solder bath (immersion processes C23C 2/00)
2224/03426 . . . . . . . Chemical solution deposition [CSD], i.e. using a liquid precursor
2224/03428 . . . . . . . Wave coating
2224/0343 . . . . . . . in solid form
2224/03436 . . . . . . . Lamination of a preform, e.g. foil, sheet or layer
2224/03438 . . . . . . . the preform being at least partly pre-patterned
2224/0344 . . . . . . . by transfer printing
2224/03442 . . . . . . . using a powder
2224/03444 . . . . . . . in gaseous form
2224/0345 . . . . . . . Physical vapour deposition [PVD], e.g. evaporation, or sputtering
2224/03452 . . . . . . . Chemical vapour deposition [CVD], e.g. laser CVD
2224/0346 . . . . . . . Plating
2224/03462 . . . . . . . Electroplating
2224/03464 . . . . . . . Electroless plating
2224/03466 . . . . . . . Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface
2224/0347 . . . . . . . using a lift-off mask
2224/03472 . . . . . . . Profile of the lift-off mask
2224/03474 . . . . . . . Multilayer masks
2224/0348 . . . . . . . Permanent masks, i.e. masks left in the finished device, e.g. passivation layers
2224/035 . . . . . . . by chemical or physical modification of a pre-existing or pre-deposited material
2224/03502 . . . . . . . Pre-existing or pre-deposited material
2224/03505 . . . . . . . Sintering
2224/0351 . . . . . . . Anodisation
2224/03515 . . . . . . . Curing and solidification, e.g. of a photosensitive material
2224/0352 . . . . . . . Self-assembly, e.g. self-agglomeration of the material in a fluid
2224/03522 . . . . . . . Auxiliary means therefor, e.g. for self-assembly activation
2224/03524 . . . . . . . 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
2224/0355 . . . . . . . Selective modification
2224/03552 . . . . . . . using a laser or a focused ion beam [FIB]
2224/03554 . . . . . . . Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin
2224/036 . . . . . . . by patterning a pre-deposited material (treatment of parts prior to assembly of the devices H01L 21/48)
2224/03602 . . . . . . . Mechanical treatment, e.g. polishing, grinding
2224/0361 . . . . . . . Physical or chemical etching
2224/03612 . . . . . . . by physical means only
2224/03614 . . . . . . . by chemical means only
2224/03616 . . . . . . . Chemical mechanical polishing [CMP]

2224/03618 . . . . . . . with selective exposure, development and removal of a photosensitive material, e.g. of a photosensitive conductive resin
2224/0362 . . . . . . . Photolithography
2224/03622 . . . . . . . using masks
2224/0363 . . . . . . . using a laser or a focused ion beam [FIB]
2224/03632 . . . . . . . Ablation by means of a laser or focused ion beam [FIB]
2224/037 . . . . . . . involving monitoring, e.g. feedback loop
2224/038 . . . . . . . Post-treatment of the bonding area
2224/0381 . . . . . . . Cleaning, e.g. oxide removal step, desmearing
2224/0382 . . . . . . . Applying permanent coating, e.g. in-situ coating
2224/03821 . . . . . . . Spray coating
2224/03822 . . . . . . . by dipping, e.g. in a solder bath
2224/03823 . . . . . . . Immersion coating, e.g. in a solder bath
2224/03824 . . . . . . . Chemical solution deposition [CSD], i.e. using a liquid precursor
2224/03825 . . . . . . . Plating, e.g. electroplating, electroless plating
2224/03826 . . . . . . . Physical vapour deposition [PVD], e.g. evaporation, or sputtering
2224/03827 . . . . . . . Chemical vapour deposition [CVD], e.g. laser CVD
2224/03828 . . . . . . . Applying flux
2224/03829 . . . . . . . Applying a precursor material
2224/0383 . . . . . . . Reworking, e.g. shaping (reflowing H01L 2224/03849)
2224/03831 . . . . . . . involving a chemical process, e.g. etching the bonding area
2224/0384 . . . . . . . involving a mechanical process, e.g. planarising the bonding area
2224/03845 . . . . . . . Chemical mechanical polishing [CMP]
2224/03848 . . . . . . . Thermal treatments, e.g. annealing, controlled cooling
2224/03849 . . . . . . . Reflowing
2224/039 . . . . . . . Methods of manufacturing bonding areas involving a specific sequence of method steps
2224/03901 . . . . . . . with repetition of the same manufacturing step
2224/03902 . . . . . . . Multiple masking steps
2224/03903 . . . . . . . using different masks
2224/03906 . . . . . . . with modification of the same mask
2224/0391 . . . . . . . Forming a passivation layer after forming the bonding area
2224/03912 . . . . . . . the bump being used as a mask for patterning the bonding area
2224/03914 . . . . . . . the bonding area, e.g. under bump metallisation [UBM], being used as a mask for patterning other parts
2224/03916 . . . . . . . a passivation layer being used as a mask for patterning the bonding area
2224/0392 . . . . . . . specifically adapted to include a probing step
2224/03921 . . . . . . . by repairing the bonding area damaged by the probing step
2224/04 . . . . . . . Structure, shape, material or disposition of the bonding areas prior to the connecting process
2224/0401 . . . . . . . Bonding areas specifically adapted for bump connectors, e.g. under bump metallisation [UBM]
Bonding areas specifically adapted for layer connectors
Bonding areas specifically adapted for strap connectors
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
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
Disposition
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
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
2224/05149 . . . . . . . . Manganese [Mn] as principal constituent
2224/05155 . . . . . . . . Nickel [Ni] as principal constituent
2224/05157 . . . . . . . . Cobalt [Co] as principal constituent
2224/0516 . . . . . . . . . Iron [Fe] as principal constituent
2224/05163 . . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/05164 . . . . . . . . Palladium [Pd] as principal constituent
2224/05166 . . . . . . . . Titanium [Ti] as principal constituent
2224/05169 . . . . . . . . Platinum [Pt] as principal constituent
2224/0517 . . . . . . . . . . . . . . Zirconium [Zr] as principal constituent
2224/05171 . . . . . . . . Chromium [Cr] as principal constituent
2224/05172 . . . . . . . . Vanadium [V] as principal constituent
2224/05173 . . . . . . . . Rhodium [Rh] as principal constituent
2224/05176 . . . . . . . . Ruthenium [Ru] as principal constituent
2224/05178 . . . . . . . . Iridium [Ir] as principal constituent
2224/05179 . . . . . . . . Niobium [Nb] as principal constituent
2224/0518 . . . . . . . . Molybdenum [Mo] as principal constituent
2224/05181 . . . . . . . . Tantalum [Ta] as principal constituent
2224/05183 . . . . . . . . Rhenium [Re] as principal constituent
2224/05184 . . . . . . . . Tungsten [W] as principal constituent
2224/05186 . . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/05187 . . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05188)
2224/05188 . . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/0519 . . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/05191 . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/05193 . . . . . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/051 - H01L 2224/05191, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/05194 . . . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/051 - H01L 2224/05191

2224/05195 . . . . . . . . . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/051 - H01L 2224/05191
2224/05198 . . . . . . . . . . . . . . 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
2224/05199 . . . . . . . . Material of the matrix
2224/052 . . . . . . . . . . . . . . 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
2224/05201 . . . . . . . . . . . . . . the principal constituent melting at a temperature of less than 400°C
2224/05205 . . . . . . . . . . . . . . Gallium [Ga] as principal constituent
2224/05209 . . . . . . . . . . . . . . Indium [In] as principal constituent
2224/05211 . . . . . . . . . . . . . . Tin [Sn] as principal constituent
2224/05213 . . . . . . . . . . . . . . Bismuth [Bi] as principal constituent
2224/05214 . . . . . . . . . . . . . . Thallium [Tl] as principal constituent
2224/05216 . . . . . . . . . . . . . . Lead [Pb] as principal constituent
2224/05217 . . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/05218 . . . . . . . . . . . . . . Zinc [Zn] as principal constituent
2224/0522 . . . . . . . . . . . . . . Antimony [Sb] as principal constituent
2224/05223 . . . . . . . . . . . . . . Magnesium [Mg] as principal constituent
2224/05224 . . . . . . . . . . . . . . Aluminium [Al] as principal constituent
2224/05238 . . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/05239 . . . . . . . . . . . . . . Silver [Ag] as principal constituent
2224/0524 . . . . . . . . . . . . . . Gold [Au] as principal constituent
2224/05247 . . . . . . . . . . . . . . Copper [Cu] as principal constituent
2224/05249 . . . . . . . . . . . . . . Manganese [Mn] as principal constituent
2224/05255 . . . . . . . . . . . . . . Nickel [Ni] as principal constituent
2224/05257 . . . . . . . . . . . . . . Cobalt [Co] as principal constituent
2224/0526 . . . . . . . . . . . . . . Iron [Fe] as principal constituent
Fillers

Base material

H01L 2224/052

not provided for in groups of the material being a gas
- H01L 2224/05291

H01L 2224/052

not provided for in groups of the material being a liquid with a principal constituent
- H01L 2224/05291

nanotubes, diamond fullerene, graphite, carbon - e.g. allotropes of carbon, H01L 2224/05281

polymer, epoxy e.g. polyester, phenolic based the material being a polymer, H01L 2224/05301

e.g. silicones, e.g. silicones, H01L 2224/05305

non metalloid inorganic material with a principal constituent of isoprene, neoprene an elastomer, e.g. silicones, H01L 2224/05314

carbonates, e.g. amorphous oxides, nitriles or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy H01L 2224/05316

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C H01L 2224/05317

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05318

the principal constituent melting at a temperature of less than 400°C H01L 2224/05319

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C H01L 2224/05320

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 2224/05321

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05322

the principal constituent melting at a temperature of 950°C and less than 1550°C H01L 2224/05323

the principal constituent melting at a temperature of 400°C and less than 950°C H01L 2224/05324

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C H01L 2224/05325

with a principal constituent of the material being a solid not provided for in groups H01L 2224/052 - H01L 2224/05291

e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond H01L 2224/05292

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05293

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05294

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05295

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05296

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05297

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05298

the principal constituent melting at a temperature of greater than 1550°C H01L 2224/05299
Coating material being a hybrid material, e.g. a matrix with a filler, i.e. materials in the form of a combination of two or more of the material being a gas - H01L 2224/05391 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 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
- 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
- Rhenium [Re] as principal constituent
- Tantalum [Ta] as principal constituent
- Molybdenum [Mo] as principal constituent
- Nickel [Ni] as principal constituent
- Copper [Cu] as principal constituent
- Gold [Au] as principal constituent
- Silver [Ag] as principal constituent
- Coating material
<table>
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<th>Chromium [Cr] as principal constituent</th>
<th>2224/05548</th>
<th>Bonding area integrally formed with a redistribution layer on the semiconductor or solid-state body</th>
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</thead>
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<td></td>
<td>2224/05472</td>
<td>Vanadium [V] as principal constituent</td>
<td>2224/0555</td>
<td>Shape</td>
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<tr>
<td></td>
<td>2224/05473</td>
<td>Rhodium [Rh] as principal constituent</td>
<td>2224/05551</td>
<td>comprising apertures or cavities in top view</td>
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<td></td>
<td>2224/05476</td>
<td>Ruthenium [Ru] as principal constituent</td>
<td>2224/05552</td>
<td>being rectangular</td>
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<td></td>
<td>2224/05478</td>
<td>Iridium [Ir] as principal constituent</td>
<td>2224/05553</td>
<td>being square</td>
</tr>
<tr>
<td></td>
<td>2224/05479</td>
<td>Niobium [Nb] as principal constituent</td>
<td>2224/05554</td>
<td>being circular or elliptic</td>
</tr>
<tr>
<td></td>
<td>2224/0548</td>
<td>Molybdenum [Mo] as principal constituent</td>
<td>2224/05555</td>
<td>in side view</td>
</tr>
<tr>
<td></td>
<td>2224/05481</td>
<td>Tantalum [Ta] as principal constituent</td>
<td>2224/05556</td>
<td>comprising protrusions or indentations</td>
</tr>
<tr>
<td></td>
<td>2224/05483</td>
<td>Rhenium [Re] as principal constituent</td>
<td>2224/05557</td>
<td>conformal protrusions or indentations</td>
</tr>
<tr>
<td></td>
<td>2224/05484</td>
<td>Tungsten [W] as principal constituent</td>
<td>2224/05558</td>
<td>non conformal layer on a patterned surface</td>
</tr>
<tr>
<td></td>
<td>2224/05486</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
<td>2224/05559</td>
<td>Disposition</td>
</tr>
<tr>
<td></td>
<td>2224/05487</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics)</td>
<td>2224/0556</td>
<td>On the entire surface of the internal layer</td>
</tr>
<tr>
<td></td>
<td>2224/05488</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
<td>2224/05561</td>
<td>On the entire exposed surface of the internal layer</td>
</tr>
<tr>
<td></td>
<td>2224/0549</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
<td>2224/05562</td>
<td>Only on parts of the surface of the internal layer</td>
</tr>
<tr>
<td></td>
<td>2224/05491</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
<td>2224/05563</td>
<td>Only on the bonding interface of the bonding area</td>
</tr>
<tr>
<td></td>
<td>2224/05493</td>
<td>with a principal constituent of the material being a solid not provided for in groups H01L 2224/054 - H01L 2224/05491</td>
<td>2224/05564</td>
<td>Only outside the bonding interface of the bonding area</td>
</tr>
<tr>
<td></td>
<td>2224/05494</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/054 - H01L 2224/05491</td>
<td>2224/05565</td>
<td>Both on and outside the bonding interface of the bonding area</td>
</tr>
<tr>
<td></td>
<td>2224/05495</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/054 - H01L 2224/05491</td>
<td>2224/05566</td>
<td>the external layer being at least partially embedded in the surface</td>
</tr>
<tr>
<td></td>
<td>2224/05498</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>2224/05567</td>
<td>the whole external layer protruding from the surface</td>
</tr>
<tr>
<td></td>
<td>2224/05499</td>
<td>Shape or distribution of the fillers</td>
<td>2224/05568</td>
<td>the external layer being disposed on a redistribution layer on the semiconductor or solid-state body</td>
</tr>
<tr>
<td></td>
<td>2224/0554</td>
<td>External layer</td>
<td>2224/05569</td>
<td>the external layer being disposed on a via connection of the semiconductor or solid-state body</td>
</tr>
<tr>
<td></td>
<td>2224/05541</td>
<td>Structure</td>
<td>2224/05571</td>
<td>the external layer being disposed in a recess of the surface</td>
</tr>
<tr>
<td></td>
<td>2224/05546</td>
<td>Dual damascene structure</td>
<td>2224/05572</td>
<td>the external layer extending out of an opening</td>
</tr>
<tr>
<td></td>
<td>2224/05547</td>
<td>comprising a core and a coating</td>
<td>2224/05573</td>
<td>Single external layer</td>
</tr>
<tr>
<td></td>
<td>2224/0555</td>
<td>Bonding area</td>
<td>2224/05574</td>
<td>Plural external layers</td>
</tr>
<tr>
<td></td>
<td>2224/0558</td>
<td>Provided for in groups H01L 2224/054 - H01L 2224/05491</td>
<td>2224/05575</td>
<td>being mutually engaged together, e.g. through inserts</td>
</tr>
<tr>
<td></td>
<td>2224/05582</td>
<td>Two-layer coating</td>
<td>2224/05576</td>
<td>being disposed next to each other, e.g. side-to-side arrangements</td>
</tr>
<tr>
<td></td>
<td>2224/05583</td>
<td>Three-layer coating</td>
<td>2224/05577</td>
<td>being stacked</td>
</tr>
<tr>
<td></td>
<td>2224/05584</td>
<td>Four-layer coating</td>
<td>2224/05578</td>
<td>being arranged in a side-to-side arrangement</td>
</tr>
<tr>
<td></td>
<td>2224/05599</td>
<td>Material</td>
<td>2224/05579</td>
<td>Material</td>
</tr>
<tr>
<td></td>
<td>2224/05601</td>
<td>Gallium [Ga] as principal constituent</td>
<td>2224/0558</td>
<td>Material</td>
</tr>
<tr>
<td></td>
<td>2224/05605</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>
<td>2224/0559</td>
<td>Material</td>
</tr>
<tr>
<td></td>
<td>2224/05606</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
<td>2224/0559</td>
<td>Material</td>
</tr>
</tbody>
</table>

External layer comprising a core and a coating

Dual damascene structure
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
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 2224/05687)
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 2224/05688 - 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 2224/05686 - H01L 2224/05691
with a principal constituent of the material being a gas not provided for in groups
H01L 2224/05686 - 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
Tin [Sn] as principal constituent
Indium [In] as principal constituent
Gallium [Ga] 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 950°C and less than 1550°C
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
The principal constituent being a liquid not provided for in groups
with a principal constituent of the material being a gas not provided for in groups
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 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
- 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

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-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/058 - H01L 2224/05891

with a principal constituent of the material being a gas not provided for in groups H01L 2224/058 - 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 greater 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

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/0588)

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...
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 2224/05987)
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 2224/05991 - H01L 2224/05991, e.g. allotropes of carbon, fullerenes, graphite, carbon-nanotubes, diamond

nanotubes, diamond fullerene, graphite, carbon—e.g. allotropes of carbon, not provided for in groups of the material being a solid—H01L 2224/05991 with a principal constituent
polymer, epoxy e.g. polyester, phenolic based the material being a polymer, with a principal constituent
metallic, non metalloid silicones, isoprene, neoprene being an elastomer, e.g.
The principal constituent oxides, nitrides or fluorides Glasses, e.g. amorphous H01L 2224/05988 with a principal constituent of the material being a gas, not provided for in groups H01L 2224/0599 - 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
of a plurality of bonding areas
Bonding areas having different sizes, e.g. different heights or widths
Shape of a plurality of bonding areas
Bonding areas having different shapes
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
Random array, i.e. array 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
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
Combinations of arrays with different layouts
Corner adaptations, i.e. disposition of the bonding areas 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
with specially adapted redistribution layers [RDL]
On contiguous sides of the body
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
Structure
Shape
in top view
being non uniform along the bonding area
being rectangular
being square
being circular or elliptic
in side view
being non uniform along the bonding area
comprising protrusions or indentations
of bonding interfaces, e.g. interlocking features
Disposition
the bonding area being disposed in a recess of the surface of the body
the bonding area being at least partially embedded in the surface of the body
the whole bonding area protruding from the surface of the body
the bonding area connecting directly to another bonding area, i.e. connectorless bonding, e.g. bumpless bonding
the connected bonding areas being not aligned with respect to each other
the bonding area connecting directly to at least two bonding areas
the bonding area 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 stacked
the bonding area connecting to a via connection in the body
the bonding area connecting to a bonding area disposed in a recess of the surface of the body
the bonding area connecting to a bonding area protruding from the surface of the body
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
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 bonding area connecting to a pin of the item

the bonding area connecting to a potential ring of the item

the bonding area connecting to a via metallisation of the item

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area connecting to a bonding area protruding from the surface of the item

the item being metallic

the bonding area connecting to a potential ring of the item

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area connecting to a bonding area protruding from the surface of the item

the item being a discrete passive component

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area 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 bonding area connecting to a pin of the item

the bonding area connecting to a potential ring of the item

the bonding area connecting to a via metallisation of the item

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area connecting to a bonding area protruding from the surface of the item

the item being a discrete passive component

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area connecting to a bonding area protruding from the surface of the item

the item being metallic

the bonding area connecting to a potential ring of the item

the bonding area connecting to a via metallisation of the item

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area connecting to a bonding area protruding from the surface of the item

the item being a discrete passive component

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area connecting to a bonding area protruding from the surface of the item

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area connecting to a bonding area protruding from the surface of the item

the bonding area connecting to a bonding area disposed in a recess of the surface of the item

the bonding area connecting to a bonding area protruding from the surface of the item
thereto

Bump connectors; Manufacturing methods related thereto

Auxiliary members for bump connectors, e.g. spacers

being formed on the semiconductor or solid-state body to be connected

Reinforcing structures

Bump collar

Alignment aids

Flow barriers

being formed on an item to be connected not being a semiconductor or solid-state body

Reinforcing structures

Bump collar

Alignment aids

Flow barriers

Manufacturing methods

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

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
Methods of manufacturing bump connectors involving a specific sequence of method steps

Post-treatment of the bump connector involving monitoring, e.g. feedback loop devices

Thermal treatments, e.g. annealing, involving a specific sequence of method steps

Coating

Cleaning, e.g. oxide removal step, using a laser or a focused ion beam [FIB]

Mechanical treatment, e.g. polishing, grinding

Photolithography

Ablation by means of a laser or focused ion beam [FIB]

Chemical mechanical polishing [CMP]

Bump connectors formed on an encapsulation of the semiconductor or solid-state body, e.g. bumps on chip-scale packages

Core members of the bump connector

Structure

Bump connector larger than the underlying bonding area, e.g. than the under bump metallisation [UBM]

Bump connector smaller than the underlying bonding area, e.g. than 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, i.e. on the surface 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

by patterning a pre-deposited material (treatment of parts prior to assembly of the devices H01L 21/48)

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

Chemical vapour deposition [CVD], e.g. laser CVD
Material...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

...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 2224/13188)

...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 2224/131 - H01L 2224/13191, 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 2224/131 - H01L 2224/13191
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

- with a principal constituent of the material being a non metallic, non metalloid organic material

- 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 2224/132 - H01L 2224/13291, 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 2224/132 - H01L 2224/13291

- with a principal constituent of the material being a gas not provided for in groups H01L 2224/132 - H01L 2224/13291

- Fillers

- Base material
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
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 2224/13388)
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
nanotubes, diamond fullerene, graphite, carbon-e.g. allotropes of carbon,
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/133 - H01L 2224/13391, 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 2224/133 - H01L 2224/13391
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 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, nitrates or oxides (glass ceramics
Glasses, e.g. amorphous oxides, nitrates 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 2224/134 - H01L 2224/13491, 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 2224/134 - H01L 2224/13491 with a principal constituent of the material being a gas not provided for in groups H01L 2224/134 - H01L 2224/13491 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...
Material

Plural coating layers

Single coating layer

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

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 2224/13688)

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 2224/136 - H01L 2224/13691, 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 2224/136 - H01L 2224/1391

with a principal constituent of the material being a gas not provided for in groups H01L 2224/136 - H01L 2224/1391

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 2224/13788)

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 2224/137 - H01L 2224/1391, 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 2224/137 - H01L 2224/1391

with a principal constituent of the material being a gas not provided for in groups H01L 2224/137 - H01L 2224/1391

Fillers
Base material with a principal constituent of the material being a metal or a metallolid, 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 2224/1388).

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 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 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

Tantalum [Ta] 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. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/139 - H01L 2224/1391, 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 2224/139 - H01L 2224/1391 with a principal constituent of the material being a gas not provided for in groups H01L 2224/139 - H01L 2224/1391 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 Structure Bump connectors having different sizes, e.g. different diameters, heights or widths
Body pads, of the semiconductor or solid-state body relative to the bonding areas, e.g. bond pads, 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 Bump connectors having different materials 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 of bonding interfaces, e.g. interlocking features Disposition 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 bodies being stacked
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 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 item being a discrete passive component
the item being metallic
the item being a discrete passive component
the item being metallic

Bump connectors having different widths
e.g. different diameters, heights or bulk of the bump connector
outside the bonding interface, e.g. in the bulk of the bump connector
at the bonding interface
e.g. different diameters, heights or widths

Shape
Structure
Material

comprising an intermetallic compound
comprising an eutectic alloy
comprising an intermetallic compound
outside the bonding interface, e.g. in the bulk of the bump connector
comprising an eutectic alloy
comprising an intermetallic compound
of a plurality of bump connectors

of a plurality of bump connectors
Bump connectors having different sizes, e.g. different diameters, heights or widths
Bump connectors having different shapes
Manufacturing methods related thereto

High density interconnect [HDI] connectors; Manufacturing methods related thereto

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

Bump connectors having different functions

Including bump connectors providing primarily mechanical support

Including bump connectors providing primarily thermal dissipation

High density interconnect [HDI] connectors; Manufacturing methods related thereto

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

Manufacturing methods of high density interconnects

Structure, shape, material or disposition of high density interconnects

Structure, shape, material or disposition of high density interconnect connectors after the connecting process

Structure, shape, material or disposition of the high density interconnect connectors after the connecting process

Structure, shape, material or disposition of the high density interconnect connectors after the connecting process

Structure of an individual high density interconnect

Structure of an individual high density interconnect connector

Structure of an individual high density interconnect connector

Deposit, e.g. MCM-D type

Laminated, e.g. MCM-L type

Shape

Shape

Material

Material

Material

HDI interconnects having different materials

Structure, shape, material or disposition of the high density interconnect connectors after the connecting process

Structure, shape, material or disposition of the high density interconnect connectors after the connecting process

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Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. mirror arrangements

Connecting at different heights

Connecting at least two different bonding areas outside the body

Connecting to be bonded at least one common bonding area

Connecting to the same level of the item

Connecting to the same level of the lower semiconductor or solid-state body

Connecting to the same level of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Connecting to the semiconductor or solid-state body mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item

Manufacturing methods related thereto
H01L

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
2224/2732 . . . by chemical or physical modification of a pre-existing or pre-deposited material
2224/2733 . . . in solid form
2224/2734 . . . using a laser or a focused ion beam [FIB]
2224/2735 . . . Selective modification
2224/2736 . . . by dipping, e.g. in a solder bath (hot-dipping C23C 2/00)
2224/2737 . . . by chemical means only
2224/2738 . . . by physical means only
2224/2739 . . . by local or mechanical means
2224/274 . . . by blanket deposition of the material of the layer connector
2224/2741 . . . in liquid form
2224/2742 . . . in solid form
2224/2743 . . . in solid form
2224/2744 . . . the preform being at least partly pre-patterned
2224/2745 . . . by transfer printing
2224/2746 . . . using a powder
2224/2747 . . . using a lift-off mask
2224/2748 . . . Permanent masks, i.e. masks left in the finished device, e.g. passivation layers
2224/2749 . . . by chemical or physical modification of a pre-existing or pre-deposited material
2224/2750 . . . 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
2224/27526 . . . involving the material of the bonding area, e.g. bonding pad
2224/2755 . . . Selective modification
2224/27552 . . . using a laser or a focused ion beam [FIB]
2224/27554 . . . Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin
2224/2756 . . . by patterning a pre-deposited material (treatment of parts prior to assembly of the devices H01L 21/48)
2224/27602 . . . Mechanical treatment, e.g. polishing, grinding
2224/276 . . . Physical or chemical etching
2224/2761 . . . by physical means only
2224/27612 . . . by chemical means only
2224/27614 . . . by chemical means only
2224/27616 . . . Chemical mechanical polishing [CMP]
2224/27618 . . . with selective exposure, development and removal of a photosensitive layer material, e.g. of a photosensitive conductive resin
2224/2762 . . . using masks
2224/27622 . . . Photolithography
2224/2763 . . . using a laser or a focused ion beam [FIB]
2224/27632 . . . Ablation by means of a laser or focused ion beam [FIB]
2224/2777 . . . involving monitoring, e.g. feedback loop
2224/2781 . . . Cleaning, e.g. oxide removal step, desmearing
2224/2782 . . . Applying permanent coating, e.g. in-situ coating
2224/27821 . . . Spray coating
2224/27822 . . . by dipping, e.g. in a solder bath
2224/27823 . . . Immersion coating, e.g. in a solder bath
2224/27824 . . . Chemical solution deposition [CSD], i.e. using a liquid precursor
2224/27825 . . . Plating, e.g. electroplating, electroless plating
2224/27826 . . . Physical vapour deposition [PVD], e.g. evaporation, or sputtering

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layer connectors prior to the connecting process
Structure, shape, material or disposition of the layer connectors on chip-scale packages of the semiconductor or solid-state body, e.g. Layer connectors formed on an encapsulation with repetition of the same manufacturing step
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
Disposition
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
the layer 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 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
covering only the peripheral area of the surface to be connected
covering only the central area of the surface to be connected
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
Zinc [Zn] as principal constituent
Lead [Pb] as principal constituent
Thallium [Tl] as principal constituent
Bismuth [Bi] as principal constituent
Tin [Sn] as principal constituent
Indium [In] as principal constituent
Galium [Ga] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
Material of the matrix

- H01L 2224/2939
- H01L 2224/2944
- H01L 2224/2947

with a principal constituent of the material being a solid not provided for in groups H01L 2224/291 - H01L 2224/2919, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

- H01L 2224/29194
- H01L 2224/29195
- H01L 2224/29198

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/291 - H01L 2224/2919

- H01L 2224/29201

with a principal constituent of the material being a gas not provided for in groups H01L 2224/291 - H01L 2224/2919

- H01L 2224/29205
- H01L 2224/29209
- H01L 2224/29211
- H01L 2224/29213
- H01L 2224/29214
- H01L 2224/29216
- H01L 2224/29217
- H01L 2224/29218
- H01L 2224/2922
- H01L 2224/29223
- H01L 2224/29224
- H01L 2224/29238

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

- H01L 2224/29201

Material of the matrix

- H01L 2224/2939
- H01L 2224/2944
- H01L 2224/2947

with a principal constituent of the material being a solid not provided for in groups H01L 2224/291 - H01L 2224/2919, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

- H01L 2224/29194
- H01L 2224/29195
- H01L 2224/29198

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/291 - H01L 2224/2919

- H01L 2224/29201

with a principal constituent of the material being a gas not provided for in groups H01L 2224/291 - H01L 2224/2919

- H01L 2224/29205
- H01L 2224/29209
- H01L 2224/29211
- H01L 2224/29213
- H01L 2224/29214
- H01L 2224/29216
- H01L 2224/29217
- H01L 2224/29218
- H01L 2224/2922
- H01L 2224/29223
- H01L 2224/29224
- H01L 2224/29238

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

- H01L 2224/29201
Manganese [Mn] as principal constituent with a principal constituent of the material being a liquid not provided for in groups H01L 2224/292 - H01L 2224/29291
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 2224/2928)
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 2224/292 - H01L 2224/29291, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
Tellurium [Te] and polonium arsenic [As], antimony [Sb], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
the principal constituent melting at a temperature greater than or equal to 950°C and less than 1550°C
950°C and less than 1550°C
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 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
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

The principal constituent melting at a temperature of greater than 950°C and less than 1550°C

Silver [Ag] as principal constituent

with a principal constituent melting at a temperature greater than or equal to 400°C and less than 950°C

Palladium [Pd] as principal constituent

with a principal constituent of the material being a solid not provided for in groups H01L 2224/293 - H01L 2224/29391 e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

Titanium [Ti] as principal constituent

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/293 - H01L 2224/29391

Platinum [Pt] as principal constituent

with a principal constituent of the material being a gas not provided for in groups H01L 2224/293 - H01L 2224/29391

Zirconium [Zr] 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 2224/29388)

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 2224/293 - H01L 2224/29391 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 2224/293 - H01L 2224/29391

with a principal constituent of the material being a gas not provided for in groups H01L 2224/293 - H01L 2224/29391

with a principal constituent melting at a temperature greater than 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 greater than or equal to 950°C and less than 1550°C

with a principal constituent melting at a temperature of greater than 1550°C
segmented 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 gas with a principal constituent - H01L 2224/29491
H01L 2224/294 not provided for in groups of the material being a liquid with a principal constituent - H01L 2224/29491
nanotubes, diamond fullerene, graphite, carbon-e.g. allotropes of carbon, H01L 2224/29481
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy H01L 2224/29488
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29488)
Glasses, e.g. amorphous oxides, nitrides or fluorides H01L 2224/29487
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene H01L 2224/29491
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 H01L 2224/29493
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/294 - H01L 2224/29491 H01L 2224/29494
with a principal constituent of the material being a gas not provided for in groups H01L 2224/294 - H01L 2224/29491 H01L 2224/29495
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 H01L 2224/29498
Coating H01L 2224/2954
Structure H01L 2224/29541
Shape H01L 2224/2955
being non uniform H01L 2224/29551
comprising protrusions or indentations H01L 2224/29552
at the bonding interface of the layer connector, i.e. on the surface of the layer connector H01L 2224/29553
Disposition H01L 2224/2956
On the entire surface of the core, i.e. integral coating H01L 2224/29561
On the entire exposed surface of the core H01L 2224/29562
Only on parts of the surface of the core, i.e. partial coating H01L 2224/29563
Only on the bonding interface of the layer connector H01L 2224/29564
Only outside the bonding interface of the layer connector H01L 2224/29565
Both on and outside the bonding interface of the layer connector H01L 2224/29566
Single coating layer H01L 2224/2957
Plural coating layers H01L 2224/29575
being mutually engaged together, e.g. through inserts H01L 2224/29576
being disposed next to each other, e.g. side-to-side arrangements H01L 2224/29578
being stacked H01L 2224/2958
Two-layer coating H01L 2224/29582
Three-layer coating H01L 2224/29583
Four-layer coating H01L 2224/29584
Material H01L 2224/29599
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 H01L 2224/29601
Gallium [Ga] as principal constituent H01L 2224/29605
Indium [In] as principal constituent H01L 2224/29609
Tin [Sn] as principal constituent H01L 2224/29611
Bismuth [Bi] as principal constituent H01L 2224/29613
Thallium [TI] as principal constituent H01L 2224/29614
Lead [Pb] as principal constituent H01L 2224/29616
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C H01L 2224/29617
Zinc [Zn] as principal constituent H01L 2224/29618
Antimony [Sb] as principal constituent H01L 2224/2962
Magnesium [Mg] as principal constituent H01L 2224/29623
Aluminium [Al] as principal constituent H01L 2224/29624

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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 2224/29688])

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 2224/296 - H01L 2224/29691], e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
nanotubes, diamond fullerene, graphite, carbon—e.g. allotropes of carbon, with a 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

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

the principal constituent melting at a temperature greater than or equal to 950°C and less than 1550°C

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 or equal to 1550°C and less than 2000°C

the principal constituent melting at a temperature of greater than or equal to 2000°C

with a principal constituent of the material being a gas not provided for in groups H01L 2224/297 - H01L 2224/29791

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/297 - H01L 2224/29791

Fillers

Base material
H01L

2224/29864 ............... Palladium [Pd] as principal constituent
2224/29866 ............... Titanium [Ti] as principal constituent
2224/29869 ............... Platinum [Pt] as principal constituent
2224/2987 ............... Zirconium [Zr] as principal constituent
2224/29871 ............... Chromium [Cr] as principal constituent
2224/29872 ............... Vanadium [V] as principal constituent
2224/29873 ............... Rhodium [Rh] as principal constituent
2224/29876 ............... Ruthenium [Ru] as principal constituent
2224/29878 ............... Iridium [Ir] as principal constituent
2224/29879 ............... Niobium [Nb] as principal constituent
2224/2988 ............... Molybdenum [Mo] as principal constituent
2224/29881 ............... Tantalum [Ta] as principal constituent
2224/29883 ............... Rhenium [Re] as principal constituent
2224/29884 ............... Tungsten [W] as principal constituent
2224/29886 ............... with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29887 ............... Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29888)
2224/29888 ............... 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
2224/29889 ............... The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29891 ............... 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
2224/29894 ............... with a principal constituent of the material being a liquid not provided for in groups H01L 2224/298 - H01L 2224/29891
2224/29895 ............... with a principal constituent of the material being a gas not provided for in groups H01L 2224/298 - H01L 2224/29891

2224/29898 ............... 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
2224/29899 ............... Coating material
2224/299 ............... 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
2224/29901 ............... the principal constituent melting at a temperature of less than 400°C
2224/29905 ............... Gallium [Ga] as principal constituent
2224/29909 ............... Indium [In] as principal constituent
2224/29911 ............... 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
2224/29963 ............... Iron [Fe] as principal constituent
2224/29964 ............... 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 2224/2998), 
 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 2224/2999 - H01L 2224/29991, 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 2224/2999 - H01L 2224/29991, 
with a principal constituent of the material being a gas not provided for in groups H01L 2224/2999 - H01L 2224/29991, 
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 layer connectors, 
Layer connectors having different sizes, e.g. different heights or widths, 
Shape, 
Layer connectors having different shapes, 
Disposition, 
relative to the bonding areas, e.g. bond pads, of the semiconductor or solid-state body, 
the layer connectors being bonded to at least one common bonding area, 
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, 
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, 
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, 
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.
Structure, shape, material or disposition of the layer connector

- of an individual layer connector
- relative to the bonding area, e.g. bond pad
- the layer connector being larger than the bonding area, e.g. bond pad
- the layer connector being smaller than the bonding area, e.g. bond pad
- in top view
- being non uniform along the layer connector
- 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
- of bonding interfaces, e.g. interlocking features
- relative to the bonding area, e.g. bond pad
- the layer connector connecting bonding areas being not aligned with respect to each other
- the layer connector connecting one bonding area to at least two respective bonding areas
- the layer connector being disposed in a recess of the surface

- the layer connector being at least partially embedded in the surface
- the whole layer connector protruding from the surface
- 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
- the layer 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 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
- 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 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 item being 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 body and the item being stacked
the item being non-metallic, e.g. 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 between the body and an opposite side of the item with respect to the body
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 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
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
Discretion
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 H01L 2224/3012)
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
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 1100°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 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 greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magneesium [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
Material of the matrix
Epoxy
Polyester, phenolic based polymer
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics)
Glasses, e.g. amorphous oxides, nitrides or fluoride alloys thereof

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 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 greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magneesium [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
Material of the matrix
Epoxy
Polyester, phenolic based polymer
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics)
Glasses, e.g. amorphous oxides, nitrides or fluoride alloys thereof

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 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 greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magneesium [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
<table>
<thead>
<tr>
<th>CPC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
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<tr>
<td>2224/37273</td>
<td>Rhodium [Rh] as principal constituent</td>
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<tr>
<td>2224/37276</td>
<td>Ruthenium [Ru] as principal constituent</td>
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<td>2224/37278</td>
<td>Iridium [Ir] as principal constituent</td>
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<td>2224/37279</td>
<td>Niobium [Nb] as principal constituent</td>
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<td>2224/37281</td>
<td>Molybdenum [Mo] as principal constituent</td>
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<tr>
<td>2224/37283</td>
<td>Rhenium [Re] as principal constituent</td>
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<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>
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<tr>
<td>2224/3729</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>
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<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>
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<tr>
<td>2224/37301</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
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<tr>
<td>2224/37305</td>
<td>Gallium [Ga] as principal constituent</td>
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<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>
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<tr>
<td>2224/37313</td>
<td>Bismuth [Bi] as principal constituent</td>
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<tr>
<td>2224/37314</td>
<td>Thallium [Tl] as principal constituent</td>
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<tr>
<td>2224/37316</td>
<td>Lead [Pb] as principal constituent</td>
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<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>
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<tr>
<td>2224/37318</td>
<td>Zinc [Zn] as principal constituent</td>
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<tr>
<td>2224/3732</td>
<td>Antimony [Sb] as principal constituent</td>
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<tr>
<td>2224/37323</td>
<td>Magnesium [Mg] as principal constituent</td>
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<tr>
<td>2224/37324</td>
<td>Aluminium [Al] as principal constituent</td>
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<td>2224/37338</td>
<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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<tr>
<td>2224/37339</td>
<td>Silver [Ag] as principal constituent</td>
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<td>2224/37344</td>
<td>Gold [Au] as principal constituent</td>
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<tr>
<td>2224/37347</td>
<td>Copper [Cu] as principal constituent</td>
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<td>Nickel [Ni] as principal constituent</td>
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<td>2224/37357</td>
<td>Cobalt [Co] as principal constituent</td>
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<td>2224/37358</td>
<td>Iron [Fe] as principal constituent</td>
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<td>2224/37363</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
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<tr>
<td>2224/37364</td>
<td>Palladium [Pd] as principal constituent</td>
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<td>2224/37366</td>
<td>Titanium [Ti] as principal constituent</td>
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<tr>
<td>2224/37369</td>
<td>Platinum [Pt] as principal constituent</td>
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<tr>
<td>2224/3737</td>
<td>Zirconium [Zr] as principal constituent</td>
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<td>2224/37372</td>
<td>Vanadium [V] as principal constituent</td>
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<tr>
<td>2224/37373</td>
<td>Rhodium [Rh] as principal constituent</td>
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<td>2224/37376</td>
<td>Ruthenium [Ru] as principal constituent</td>
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<tr>
<td>2224/37378</td>
<td>Iridium [Ir] as principal constituent</td>
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<tr>
<td>2224/37379</td>
<td>Niobium [Nb] as principal constituent</td>
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<tr>
<td>Classification</td>
<td>Description</td>
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<tr>
<td>H01L 2224/3738</td>
<td>Molybdenum [Mo] as principal constituent</td>
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<td>H01L 2224/37381</td>
<td>Tantalum [Ta] as principal constituent</td>
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<td>H01L 2224/37383</td>
<td>Rhenium [Re] as principal constituent</td>
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<tr>
<td>H01L 2224/37384</td>
<td>Tungsten [W] as principal constituent</td>
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<tr>
<td>H01L 2224/37386</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>H01L 2224/37387</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37388)</td>
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<tr>
<td>H01L 2224/37388</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
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<tr>
<td>H01L 2224/37391</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
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<tr>
<td>H01L 2224/37393</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
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<tr>
<td>H01L 2224/37394</td>
<td>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</td>
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<td>H01L 2224/37395</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/373 - H01L 2224/37391</td>
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<tr>
<td>H01L 2224/37398</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/373 - H01L 2224/37391</td>
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<td>H01L 2224/37399</td>
<td>Coating material</td>
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<td>H01L 2224/374</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>
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<tr>
<td>H01L 2224/37401</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
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<td>H01L 2224/37405</td>
<td>Gallium [Ga] as principal constituent</td>
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<td>H01L 2224/37409</td>
<td>Indium [In] as principal constituent</td>
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<tr>
<td>H01L 2224/37411</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/37413</td>
<td>Bismuth [Bi] as principal constituent</td>
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<td>H01L 2224/37414</td>
<td>Thallium [Tl] as principal constituent</td>
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<td>H01L 2224/37416</td>
<td>Lead [Pb] as principal constituent</td>
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<tr>
<td>H01L 2224/37417</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>H01L 2224/37418</td>
<td>Zinc [Zn] as principal constituent</td>
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<td>H01L 2224/3742</td>
<td>Antimony [Sb] as principal constituent</td>
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<td>H01L 2224/37423</td>
<td>Magnesium [Mg] as principal constituent</td>
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<td>H01L 2224/37424</td>
<td>Aluminium [Al] as principal constituent</td>
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<tr>
<td>H01L 2224/37438</td>
<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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<tr>
<td>H01L 2224/37439</td>
<td>Silver [Ag] as principal constituent</td>
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<td>H01L 2224/37444</td>
<td>Gold [Au] as principal constituent</td>
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<td>H01L 2224/37447</td>
<td>Copper [Cu] as principal constituent</td>
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<td>H01L 2224/37449</td>
<td>Manganese [Mn] as principal constituent</td>
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<td>Cobalt [Co] as principal constituent</td>
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<td>H01L 2224/3746</td>
<td>Iron [Fe] as principal constituent</td>
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<td>H01L 2224/37463</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
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<td>H01L 2224/37464</td>
<td>Palladium [Pd] as principal constituent</td>
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<td>H01L 2224/37466</td>
<td>Titanium [Ti] as principal constituent</td>
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<td>H01L 2224/37469</td>
<td>Platinum [Pt] as principal constituent</td>
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<td>H01L 2224/3747</td>
<td>Zirconium [Zr] as principal constituent</td>
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<td>Chromium [Cr] as principal constituent</td>
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<td>H01L 2224/37472</td>
<td>Vanadium [V] as principal constituent</td>
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<td>Rhodium [Rh] as principal constituent</td>
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<td>H01L 2224/37476</td>
<td>Ruthenium [Ru] as principal constituent</td>
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<tr>
<td>H01L 2224/37478</td>
<td>Iridium [Ir] as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/37479</td>
<td>Niobium [Nb] as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/3748</td>
<td>Molybdenum [Mo] as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/37481</td>
<td>Tantalum [Ta] as principal constituent</td>
</tr>
<tr>
<td>H01L</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2224/37483</td>
<td>Rhenium [Re] as principal constituent</td>
</tr>
<tr>
<td>2224/37484</td>
<td>Tungsten [W] as principal constituent</td>
</tr>
<tr>
<td>2224/37486</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>2224/37487</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37488)</td>
</tr>
<tr>
<td>2224/37488</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
</tr>
<tr>
<td>2224/3749</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>2224/37491</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>2224/37493</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>2224/37494</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/374 - H01L 2224/37491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond</td>
</tr>
<tr>
<td>2224/37495</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/374 - H01L 2224/37491</td>
</tr>
<tr>
<td>2224/37498</td>
<td>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</td>
</tr>
<tr>
<td>2224/37499</td>
<td>Shape or distribution of the fillers</td>
</tr>
<tr>
<td>2224/3754</td>
<td>Coating</td>
</tr>
<tr>
<td>2224/37541</td>
<td>Structure</td>
</tr>
<tr>
<td>2224/3755</td>
<td>Shape</td>
</tr>
<tr>
<td>2224/3756</td>
<td>Disposition, e.g. coating on a part of the core</td>
</tr>
<tr>
<td>2224/37565</td>
<td>Single coating layer</td>
</tr>
<tr>
<td>2224/3757</td>
<td>Plural coating layers</td>
</tr>
<tr>
<td>2224/37572</td>
<td>Two-layer stack coating</td>
</tr>
<tr>
<td>2224/37573</td>
<td>Three-layer stack coating</td>
</tr>
<tr>
<td>2224/37574</td>
<td>Four-layer stack coating</td>
</tr>
<tr>
<td>2224/37576</td>
<td>being mutually engaged together, e.g. through inserts</td>
</tr>
<tr>
<td>2224/37578</td>
<td>being disposed next to each other, e.g. side-to-side arrangements</td>
</tr>
<tr>
<td>2224/37599</td>
<td>Material</td>
</tr>
<tr>
<td>2224/376</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>2224/37601</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>2224/37605</td>
<td>Gallium [Ga] as principal constituent</td>
</tr>
<tr>
<td>2224/37609</td>
<td>Indium [In] as principal constituent</td>
</tr>
<tr>
<td>2224/37611</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/37613</td>
<td>Bismuth [Bi] as principal constituent</td>
</tr>
<tr>
<td>2224/37614</td>
<td>Thallium [TI] as principal constituent</td>
</tr>
<tr>
<td>2224/37616</td>
<td>Lead [Pb] as principal constituent</td>
</tr>
<tr>
<td>2224/37617</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>2224/37618</td>
<td>Zinc [Zn] as principal constituent</td>
</tr>
<tr>
<td>2224/3762</td>
<td>Antimony [Sb] as principal constituent</td>
</tr>
<tr>
<td>2224/37623</td>
<td>Magnesium [Mg] as principal constituent</td>
</tr>
<tr>
<td>2224/37624</td>
<td>Aluminium [Al] as principal constituent</td>
</tr>
<tr>
<td>2224/37638</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>2224/37639</td>
<td>Silver [Ag] as principal constituent</td>
</tr>
<tr>
<td>2224/37644</td>
<td>Gold [Au] as principal constituent</td>
</tr>
<tr>
<td>2224/37647</td>
<td>Copper [Cu] as principal constituent</td>
</tr>
<tr>
<td>2224/37649</td>
<td>Manganese [Mn] as principal constituent</td>
</tr>
<tr>
<td>2224/37655</td>
<td>Nickel [Ni] as principal constituent</td>
</tr>
<tr>
<td>2224/37657</td>
<td>Cobalt [Co] as principal constituent</td>
</tr>
<tr>
<td>2224/3766</td>
<td>Iron [Fe] as principal constituent</td>
</tr>
<tr>
<td>2224/37663</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
</tr>
<tr>
<td>2224/37664</td>
<td>Palladium [Pd] as principal constituent</td>
</tr>
<tr>
<td>2224/37666</td>
<td>Titanium [Ti] as principal constituent</td>
</tr>
<tr>
<td>2224/37669</td>
<td>Platinum [Pt] as principal constituent</td>
</tr>
<tr>
<td>2224/3767</td>
<td>Zirconium [Zr] as principal constituent</td>
</tr>
<tr>
<td>2224/37671</td>
<td>Chromium [Cr] as principal constituent</td>
</tr>
<tr>
<td>2224/37672</td>
<td>Vanadium [V] as principal constituent</td>
</tr>
<tr>
<td>2224/37673</td>
<td>Rhodium [Rh] as principal constituent</td>
</tr>
<tr>
<td>2224/37676</td>
<td>Ruthenium [Ru] as principal constituent</td>
</tr>
<tr>
<td>2224/37678</td>
<td>Iridium [Ir] as principal constituent</td>
</tr>
<tr>
<td>2224/37679</td>
<td>Niobium [Nb] as principal constituent</td>
</tr>
<tr>
<td>2224/3768</td>
<td>Molybdenum [Mo] as principal constituent</td>
</tr>
<tr>
<td>Patent No.</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>2224/37681</td>
<td>Tantalum [Ta] as principal constituent</td>
</tr>
<tr>
<td>2224/37683</td>
<td>Rhenium [Re] as principal constituent</td>
</tr>
<tr>
<td>2224/37684</td>
<td>Tungsten [W] as principal constituent</td>
</tr>
<tr>
<td>2224/37686</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>2224/37687</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37688)</td>
</tr>
<tr>
<td>2224/37688</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
</tr>
<tr>
<td>2224/3769</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>2224/37691</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>2224/37693</td>
<td>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</td>
</tr>
<tr>
<td>2224/37694</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/376 - H01L 2224/37691</td>
</tr>
<tr>
<td>2224/37695</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/376 - H01L 2224/37691</td>
</tr>
<tr>
<td>2224/37698</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>2224/37699</td>
<td>Material of the matrix</td>
</tr>
<tr>
<td>2224/377</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>2224/37701</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>2224/37705</td>
<td>Gallium [Ga] as principal constituent</td>
</tr>
<tr>
<td>2224/37709</td>
<td>Indium [In] as principal constituent</td>
</tr>
<tr>
<td>2224/37711</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/37713</td>
<td>Bismuth [Bi] as principal constituent</td>
</tr>
<tr>
<td>2224/37714</td>
<td>Thallium [Tl] as principal constituent</td>
</tr>
<tr>
<td>2224/37716</td>
<td>Lead [Pb] as principal constituent</td>
</tr>
<tr>
<td>2224/37717</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>2224/37718</td>
<td>Zinc [Zn] as principal constituent</td>
</tr>
<tr>
<td>2224/3772</td>
<td>Antimony [Sb] as principal constituent</td>
</tr>
<tr>
<td>2224/37723</td>
<td>Magnesium [Mg] as principal constituent</td>
</tr>
<tr>
<td>2224/37724</td>
<td>Aluminium [Al] as principal constituent</td>
</tr>
<tr>
<td>2224/37738</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>2224/37739</td>
<td>Silver [Ag] as principal constituent</td>
</tr>
<tr>
<td>2224/37744</td>
<td>Gold [Au] as principal constituent</td>
</tr>
<tr>
<td>2224/37747</td>
<td>Copper [Cu] as principal constituent</td>
</tr>
<tr>
<td>2224/37749</td>
<td>Manganese [Mn] as principal constituent</td>
</tr>
<tr>
<td>2224/37755</td>
<td>Nickel [Ni] as principal constituent</td>
</tr>
<tr>
<td>2224/37757</td>
<td>Cobalt [Co] as principal constituent</td>
</tr>
<tr>
<td>2224/3776</td>
<td>Iron [Fe] as principal constituent</td>
</tr>
<tr>
<td>2224/37763</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
</tr>
<tr>
<td>2224/37764</td>
<td>Palladium [Pd] as principal constituent</td>
</tr>
<tr>
<td>2224/37766</td>
<td>Titanium [Ti] as principal constituent</td>
</tr>
<tr>
<td>2224/37769</td>
<td>Platinum [Pt] as principal constituent</td>
</tr>
<tr>
<td>2224/3777</td>
<td>Zirconium [Zr] as principal constituent</td>
</tr>
<tr>
<td>2224/37771</td>
<td>Chromium [Cr] as principal constituent</td>
</tr>
<tr>
<td>2224/37772</td>
<td>Vanadium [V] as principal constituent</td>
</tr>
<tr>
<td>2224/37773</td>
<td>Rhodium [Rh] as principal constituent</td>
</tr>
<tr>
<td>2224/37776</td>
<td>Ruthenium [Ru] as principal constituent</td>
</tr>
<tr>
<td>2224/37778</td>
<td>Iridium [Ir] as principal constituent</td>
</tr>
<tr>
<td>2224/37779</td>
<td>Niobium [Nb] as principal constituent</td>
</tr>
<tr>
<td>2224/3778</td>
<td>Molybdenum [Mo] as principal constituent</td>
</tr>
<tr>
<td>2224/37781</td>
<td>Tantalum [Ta] as principal constituent</td>
</tr>
<tr>
<td>2224/37783</td>
<td>Rhenium [Re] as principal constituent</td>
</tr>
<tr>
<td>2224/37784</td>
<td>Tungsten [W] as principal constituent</td>
</tr>
<tr>
<td>2224/37786</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
</tbody>
</table>
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2224/37787 — Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37788)

2224/37788 — Glasses, e.g. amorphous oxides, nitrides or fluorides

2224/3779 — with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

2224/37791 — The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

2224/37793 — 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

2224/37794 — with a principal constituent of the material being a liquid not provided for in groups H01L 2224/377 - H01L 2224/37791

2224/37795 — with a principal constituent of the material being a gas not provided for in groups H01L 2224/377 - H01L 2224/37791

2224/37798 — Fillers

2224/3799 — Base material

2224/378 — 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

2224/37801 — the principal constituent melting at a temperature of less than 400°C

2224/37805 — Gallium [Ga] as principal constituent

2224/37809 — Indium [In] as principal constituent

2224/37811 — Tin [Sn] as principal constituent

2224/37813 — Bismuth [Bi] as principal constituent

2224/37814 — Thallium [Tl] as principal constituent

2224/37816 — Lead [Pb] as principal constituent

2224/37817 — the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

2224/37818 — Zinc [Zn] as principal constituent

2224/3782 — Antimony [Sb] as principal constituent

2224/37823 — Magnesium [Mg] as principal constituent

2224/37824 — Aluminium [Al] as principal constituent

2224/37838 — the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

2224/37839 — Silver [Ag] as principal constituent

2224/37844 — Gold [Au] as principal constituent

2224/37847 — Copper [Cu] as principal constituent

2224/37849 — Manganese [Mn] as principal constituent

2224/37855 — Nickel [Ni] as principal constituent

2224/37857 — Cobalt [Co] as principal constituent

2224/3786 — Iron [Fe] as principal constituent

2224/37863 — the principal constituent melting at a temperature of greater than 1550°C

2224/37864 — Palladium [Pd] as principal constituent

2224/37866 — Titanium [Ti] as principal constituent

2224/37869 — Platinum [Pt] as principal constituent

2224/3787 — Zirconium [Zr] as principal constituent

2224/37871 — Chromium [Cr] as principal constituent

2224/37872 — Vanadium [V] as principal constituent

2224/37873 — Rhodium [Rh] as principal constituent

2224/37876 — Ruthenium [Ru] as principal constituent

2224/37878 — Iridium [Ir] as principal constituent

2224/37879 — Niobium [Nb] as principal constituent

2224/3788 — Molybdenum [Mo] as principal constituent

2224/37881 — Tantalum [Ta] as principal constituent

2224/37883 — Rhenium [Re] as principal constituent

2224/37884 — Tungsten [W] as principal constituent

2224/37886 — with a principal constituent of the material being a non metallic, non metalloid inorganic material

2224/37887 — Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37888)

2224/37888 — Glasses, e.g. amorphous oxides, nitrides or fluorides

2224/3789 — with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

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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

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

the principal constituent melting at a temperature of greater than or equal to 1550°C

the principal constituent melting at a temperature of less than 400°C

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 or equal to 950°C and less than 1550°C

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 hybrid material, e.g. segmented structures, foams

with a principal constituent of the material being a metal with a principal constituent of greater than or equal to 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

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 2224/37988)

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 2224/379 - H01L 2224/37991 e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

2224/37994 . . . . . . . . . . . . . . . . . . . . . . a principal constituent of the material being a liquid not provided for in groups H01L 2224/379 - H01L 2224/37991

2224/37995 . . . . . . . . . . . . . . . . . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/379 - H01L 2224/37991

2224/37998 . . . . . . . . . . . . . . . . . . . . . . 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 strap connectors Structure, shape, material or disposition of the strap connectors after the connecting process of an individual strap connector Structure, shape, material or disposition of the strap connectors after the connecting process of bonding interfaces, e.g. interlocking features Loop shape Arched Kinked Disposition Connecting bonding areas at the same height, 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 potential ring of the item Connecting the strap to a via metallisation 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 Connecting the strap 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 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 potential ring of the item Connecting the strap to a via metallisation of the item connecting the strap to a die pad 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 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 potential ring of the item
Connecting the strap to a die pad of the item
Connecting between the body and an opposite side of the item with respect to the body
the item being a discrete passive component
Connecting portions with multiple bonds on the same bonding area
connected to auxiliary connecting means on the bonding areas
being a pre-ball (i.e. a ball formed by capillary bonding)
on the semiconductor or solid-state body
outside the semiconductor or solid-state body
being a plurality of pre-balls disposed side-to-side
on the semiconductor or solid-state body
outside the semiconductor or solid-state body
being an additional member attached to the bonding area through an adhesive or solder, e.g. buffer pad
not being interposed between the connector and the bonding area
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
Bonding interface between the connecting portion and the bonding area
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
Structure
Connectors having different sizes
Shape
Connectors having different shapes

Different loop heights
Disposition
Connecting at different heights
on the semiconductor or solid-state body
outside the semiconductor or solid-state body
the connectors being bonded to at least one common bonding area, e.g. daisy chain
the connectors connecting two common bonding areas
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
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
Layout
Crossed straps
Fan-out arrangements
Radial fan-out arrangements
Stacked arrangements
Parallel arrangements
Strap connectors having the same loop shape and height
Combinations of different arrangements
Corner adaptations, i.e. disposition of the strap 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
Connecting portions
the connecting portions being stacked
on the semiconductor or solid-state body
outside the semiconductor or solid-state body
the connecting portions being staggered
Material
Connectors having different materials
Wire connectors; 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, electrolyless plating
Mechanical processes
Pulling
Modification of a pre-existing material
Sintering
Anodisation

H01L

Shape
Structure
Connectors having different sizes
Shape
Connectors having different shapes

Manufacturing methods related thereto
Material
Connectors having different materials
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 wire connectors involving a specific sequence of method steps

with repetition of the same manufacturing step

Structure, shape, material or disposition of the wire connectors prior to the connecting process

of an individual wire connector

Core members of the connector

Structure

Shape

Cross-sectional shape

being non uniform along the connector

Ribbon connectors, e.g. rectangular cross-section

being circular

being elliptic

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

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 or equal to 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
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

- with a principal constituent of the material being a non metallic, non metalloid inorganic material

- 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 2224/4519

- with a principal constituent of the material being a liquid not provided for in groups H01L 2224/451 - H01L 2224/4519

- Glasses, e.g. amorphous oxides, nitrides or fluorides

- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45188)

- with a principal constituent of the material being a non metallic, non metalloid inorganic material

- 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

- 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

- Palladium (Pd) as principal constituent

- Platinum (Pt) as principal constituent

- Titanium (Ti) as principal constituent

- Palladium (Pd) 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 2224/45288)
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

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
Coating material (Po), and alloys thereof tellurium (Te) and polonium arsenic (As), antimony (Sb), silicon (Si), germanium (Ge), or a metalloid, e.g. boron (B), of the material being a metal with a principal constituent segmented 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 gas not provided for in groups of the material being a liquid not provided for in groups nanotubes, diamond e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond.

Gold (Au) as principal constituent
Silver (Ag) as principal constituent
Aluminium (Al) as principal constituent
Antimony (Sb) as principal constituent
Zinc (Zn) as principal constituent
Lead (Pb) as principal constituent
Platinum (Pt) as principal constituent
Plutonium (Pu) as principal constituent
Tungsten (W) as principal constituent
Rhenium (Re) as principal constituent
Rhenium (Re) 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
Tantalum (Ta) as principal constituent
Tungsten (W) as principal constituent
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 non metallic, non metalloid inorganic material.
H01L

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

2224/45647 . . . . . . . . . . . . Copper (Cu) as principal constituent

2224/45649 . . . . . . . . . . . . Manganese (Mn) as principal constituent

2224/45655 . . . . . . . . . . . . Nickel (Ni) as principal constituent

2224/45657 . . . . . . . . . . . . Cobalt (Co) as principal constituent

2224/4566 . . . . . . . . . . . . Iron (Fe) as principal constituent

2224/45663 . . . . . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C

2224/45664 . . . . . . . . . . . . Palladium (Pd) as principal constituent

2224/45666 . . . . . . . . . . . . Titanium (Ti) as principal constituent

2224/45669 . . . . . . . . . . . . Platinum (Pt) as principal constituent

2224/4567 . . . . . . . . . . . . Zirconium (Zr) as principal constituent

2224/45671 . . . . . . . . . . . . Chromium (Cr) as principal constituent

2224/45672 . . . . . . . . . . . . Vanadium (V) as principal constituent

2224/45673 . . . . . . . . . . . . Rhodium (Rh) as principal constituent

2224/45676 . . . . . . . . . . . . Ruthenium (Ru) as principal constituent

2224/45678 . . . . . . . . . . . . Iridium (Ir) as principal constituent

2224/45679 . . . . . . . . . . . . Niobium (Nb) as principal constituent

2224/4568 . . . . . . . . . . . . Molybdenum (Mo) as principal constituent

2224/45681 . . . . . . . . . . . . Tantalum (Ta) as principal constituent

2224/45683 . . . . . . . . . . . . Rhenium (Re) as principal constituent

2224/45684 . . . . . . . . . . . . Tungsten (W) as principal constituent

2224/45686 . . . . . . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material

2224/45687 . . . . . . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45688)

2224/45688 . . . . . . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides

2224/4569 . . . . . . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

2224/45691 . . . . . . . . . . . . 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

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

Rhenium (Re) 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 2224/45788)

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 2224/457 - H01L 2224/45791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
Fillers

Base material

H01L 2224/457 not provided for in groups of the material being a gas

- H01L 2224/45791 with a principal constituent of the material being a liquid 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

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 group H01L 2224/458 - H01L 2224/45891, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

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 2224/458 - H01L 2224/45891

with a principal constituent of the material being a gas not provided for in groups H01L 2224/458 - H01L 2224/45891
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 with a principal constituent of the material being a hybrid material, e.g. segmented structures, foams being a matrix with a filler, i.e. materials in the form of combination of two or more of the material being a gas not provided for in groups - H01L 2224/45991

H01L 2224/45991 nanotubes, diamond fullerene, graphite, carbon-
e.g. allotropes of carbon, carbon-

H01L 2224/45988 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-

H01L 2224/45987 with a principal constituent of the material being a non metallic, non metalloid inorganic material-

H01L 2224/45986 with a principal constituent of the material being a solid not provided for in groups H01L 2224/459 - H01L 2224/45991, e.g. allotropes of carbon, fullerene, graphite, carbon-
nanotubes, diamond-

H01L 2224/45991 with a principal constituent of the material being a liquid not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45995 with a principal constituent of the material being a gas not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45998 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

H01L 2224/45993 with a principal constituent of the material being a solid not provided for in groups H01L 2224/459 - H01L 2224/45991, e.g. allotropes of carbon, fullerene, graphite, carbon-
nanotubes, diamond-

H01L 2224/45991 with a principal constituent of the material being a liquid not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45995 with a principal constituent of the material being a gas not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45998 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

H01L 2224/45993 with a principal constituent of the material being a solid not provided for in groups H01L 2224/459 - H01L 2224/45991, e.g. allotropes of carbon, fullerene, graphite, carbon-
nanotubes, diamond-

H01L 2224/45991 with a principal constituent of the material being a liquid not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45995 with a principal constituent of the material being a gas not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45998 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

H01L 2224/45993 with a principal constituent of the material being a solid not provided for in groups H01L 2224/459 - H01L 2224/45991, e.g. allotropes of carbon, fullerene, graphite, carbon-
nanotubes, diamond-

H01L 2224/45991 with a principal constituent of the material being a liquid not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45995 with a principal constituent of the material being a gas not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45998 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

H01L 2224/45993 with a principal constituent of the material being a solid not provided for in groups H01L 2224/459 - H01L 2224/45991, e.g. allotropes of carbon, fullerene, graphite, carbon-
nanotubes, diamond-

H01L 2224/45991 with a principal constituent of the material being a liquid not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45995 with a principal constituent of the material being a gas not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45998 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

H01L 2224/45993 with a principal constituent of the material being a solid not provided for in groups H01L 2224/459 - H01L 2224/45991, e.g. allotropes of carbon, fullerene, graphite, carbon-
nanotubes, diamond-

H01L 2224/45991 with a principal constituent of the material being a liquid not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45995 with a principal constituent of the material being a gas not provided for in groups H01L 2224/459 - H01L 2224/45991

H01L 2224/45998 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 wire connectors

Structure, shape, material or disposition of the wire connectors after the connecting process

of an individual wire connector

Structure

Length

Shape

of bonding interfaces, e.g. interlocking features

Loop shape

Arched

Helix

Kinked

the kinked part being in proximity to the bonding area on the semiconductor or solid-state body

the kinked part being in proximity to the bonding area outside the semiconductor or solid-state body

Disposition

Connecting bonding areas at the same height, 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

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 wire connector extending above another semiconductor or solid-state body

Connecting within a semiconductor or solid-state body, i.e. fly wire, bridge wire

with an intermediate bond, e.g. continuous wire 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

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 pin of the item

connecting the wire to a potential ring 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

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 a pin of the item

connecting the wire to a potential ring of the item

Connecting between the body and an opposite side of the item with respect to the body

the item being metallic
Connecting portions wedge-on-ball, ball-on-ball on the bonding areas, e.g. pre-ball, connected to auxiliary connecting means body being a wedge bond area of the semiconductor or solid-state body being a plurality of pre-balls disposed side-to-side the connecting portion being a wedge bond, i.e. wedge on pre-ball on the semiconductor or solid-state body outside the semiconductor or solid-state body the connecting portion being a ball bond, i.e. ball on pre-ball on the semiconductor or solid-state body outside the semiconductor or solid-state body the connecting portion being a ball bond, i.e. ball on pre-ball on the semiconductor or solid-state body outside the semiconductor or solid-state body being an additional member attached to the bonding area through an adhesive or solder, e.g. buffer pad not being interposed between the wire connector and the bonding area 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 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 the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950 °C
non metalloid inorganic material
bonding area being a non metallic, with a principal constituent of the
nitrides or fluorides
Glasses, e.g. amorphous oxides, ceramics H01L 2224/48688
at a temperature of greater than the principal constituent melting
1550°C or equal to 950°C and less than 1550°C
Principal constituent of the bonding area being a non metallic, e.g. polonium (Po), and alloys thereof
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 1550°C
1550°C
the principal constituent melting at a temperature of greater than 1550°C
1550°C
the principal constituent melting at a temperature of greater than 1550°C
the principal constituent melting at a temperature of greater than 1550°C
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 2224/48669, 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 2224/48698, 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
the principal constituent melting at a temperature of less than 400°C
with a principal constituent of the bonding area 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 greater than 950 °C and less than 1550°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
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
Tungsten (W) as principal constituent
with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/4857 - 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 2224/4857 - H01L 2224/4879
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 Copper (Cu)
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
H01L 2224/488

- Liquid not provided for in groups H01L 2224/4889

- 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

- Auxiliary members for wire connectors, e.g. flow-barriers, reinforcing structures, spacers, alignment aids

- 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

- Of a plurality of wire connectors

- Structure

- Connectors having different sizes, e.g. different diameters

- Shape

- Connectors having different shapes

- Different loop heights

- Loop shape arrangement

- Parallel in plane

- Horizontal

- Vertical

- Connecting at different heights

- On the semiconductor or solid-state body

- The connectors being bonded to at least one common bonding area, e.g. daisy chain

- The connectors connecting two common bonding areas, e.g. Litz or braid wires

- The connectors connecting a common bonding area on the semiconductor or solid-state body to different bonding areas outside the body, e.g. diverging wires

- 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

- Layout

- Crossed wires

- Fan-out arrangements

- Radial fan-out arrangements

- Stacked arrangements

- Parallel arrangements

- Wire connectors having the same loop shape and height

- Combinations of different arrangements

- 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 2224/4888)

- 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 2224/488 - H01L 2224/4889, 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 2224/488 - H01L 2224/4889
Corner adaptations, i.e. disposition of the wire 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

Connecting portions

the connecting portions being stacked

Ball bonds

on the semiconductor or solid-state body

outside the semiconductor or solid-state body

Wedge bonds

on the semiconductor or solid-state body

outside the semiconductor or solid-state body

Wedge and ball bonds

the connecting portions being staggered

outside the semiconductor or solid-state body

Wire connectors having connecting portions of different types on the semiconductor or solid-state body, e.g. regular and reverse stitches

Material

Connectors having different materials

Tape automated bonding [TAB] connectors, i.e. film carriers; Manufacturing methods related thereto

Connectors not provided for in any of the groups

Apparatus for manufacturing means for bonding, e.g. connectors

Apparatus for manufacturing bump connectors

Apparatus for manufacturing strap connectors

Apparatus for manufacturing layer connectors

Apparatus for manufacturing bump and layer connectors

Bump and layer connectors

the bump connector being embedded into the layer connector

Bump and strap connectors

Bump and wire connectors

Bump and HDI connectors

Bump and TAB connectors

Strip and strap connectors

Strip and HDI connectors

Wire and TAB connectors

Wire and HDI connectors

HDI and TAB connectors

daughter and TAB connectors

different types provided

two or more of groups

HDI and TAB connectors

Wire and TAB connectors

HDI and TAB connectors

Apparatus for manufacturing arrangements for connecting or disconnecting semiconductor or solid-state bodies and for methods related thereto

Apparatus for manufacturing means for bonding, e.g. connectors

Apparatus for manufacturing bump connectors

Apparatus for manufacturing layer connectors

Apparatus for manufacturing strap connectors

Apparatus for manufacturing wire connectors

Tools for reworking, e.g. for shaping

Apparatus for connecting with bump connectors or layer connectors

Calibration means

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

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

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
Circuity 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
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
Stable and mobile yokes
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
Ultrasonic horns
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
Mechanical means, e.g. for planarising, pressing, stamping
Means for supplying the connector to be connected in the bonding apparatus
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, e.g. in the bonding head
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 bonding head
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 bonding head
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 bonding head
Suction holding means
Apparatus for connecting with build-up

Means for depositing environment, e.g. valves, vacuum pumps

Means for controlling the bonding applying flux or plasma ice blasting, using gas-flow, by etching, by blasting, for ultrasonic cleaning, for dry cleaning, for spray coating, i.e. nozzle

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

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

Means for monitoring the connection process

using a computer, e.g. fully- or semi-automatic bonding

Load or pressure adjusting means, e.g. sensors

Vibration adjusting means, e.g. sensors

Means for forming additional members

specially adapted for batch processes

Apparatus chuck

Shape

doing the mounting surface

of other portions

Material

Auxiliary members on the pressing surface

Shape of the auxiliary member

Material of the auxiliary member

Apparatus for connecting with build-up interconnects

Calibration means

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

Means for controlling the bonding environment, e.g. valves, vacuum pumps

Chamber

Vacuum chamber

High pressure chamber

Means for depositing

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]

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

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

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

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

by infrared heating, e.g. infrared heating lamp

by means of pressure

Pressing head

Shape

of the pressing surface

being curved

comprising protrusions

of other parts

Material

Removable pressing 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
Design, e.g. of the wave guide

Means for forming additional members

Means for chemical vapour deposition

Means for evaporation

Means for sputtering, e.g. target

Means for coating, e.g. valves, vacuum pumps

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

Means for controlling the bonding environment, e.g. valves, vacuum pumps

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
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<tr>
<td>2224/77701</td>
<td>in the lower part of the bonding apparatus, e.g. in the apparatus chuck</td>
</tr>
<tr>
<td>2224/77702</td>
<td>in the upper part of the bonding apparatus, e.g. in the wedge</td>
</tr>
<tr>
<td>2224/77703</td>
<td>Mechanical holding means</td>
</tr>
<tr>
<td>2224/77704</td>
<td>in the lower part of the bonding apparatus, e.g. in the apparatus chuck</td>
</tr>
<tr>
<td>2224/77705</td>
<td>in the upper part of the bonding apparatus, e.g. in the wedge</td>
</tr>
<tr>
<td>2224/77723</td>
<td>Electrostatic holding means</td>
</tr>
<tr>
<td>2224/77724</td>
<td>in the lower part of the bonding apparatus, e.g. in the apparatus chuck</td>
</tr>
<tr>
<td>2224/77725</td>
<td>in the upper part of the bonding apparatus, e.g. in the wedge</td>
</tr>
<tr>
<td>2224/77733</td>
<td>Magnetic holding means</td>
</tr>
<tr>
<td>2224/77734</td>
<td>in the lower part of the bonding apparatus, e.g. in the apparatus chuck</td>
</tr>
<tr>
<td>2224/77735</td>
<td>in the upper part of the bonding apparatus, e.g. in the wedge</td>
</tr>
<tr>
<td>2224/77743</td>
<td>Suction holding means</td>
</tr>
<tr>
<td>2224/77744</td>
<td>in the lower part of the bonding apparatus, e.g. in the apparatus chuck</td>
</tr>
<tr>
<td>2224/77745</td>
<td>in the upper part of the bonding apparatus, e.g. in the wedge</td>
</tr>
<tr>
<td>2224/77753</td>
<td>Means for optical alignment, e.g. sensors</td>
</tr>
<tr>
<td>2224/77754</td>
<td>Guiding structures</td>
</tr>
<tr>
<td>2224/77755</td>
<td>in the lower part of the bonding apparatus, e.g. in the apparatus chuck</td>
</tr>
<tr>
<td>2224/77756</td>
<td>in the upper part of the bonding apparatus, e.g. in the wedge</td>
</tr>
<tr>
<td>2224/7778</td>
<td>Means for moving parts</td>
</tr>
<tr>
<td>2224/77801</td>
<td>Lower part of the bonding apparatus, e.g. XY table</td>
</tr>
<tr>
<td>2224/77802</td>
<td>Rotational mechanism</td>
</tr>
<tr>
<td>2224/77803</td>
<td>Pivoting mechanism</td>
</tr>
<tr>
<td>2224/77804</td>
<td>Translational mechanism</td>
</tr>
</tbody>
</table>

H01L
2224/77821 . . . . Upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge
2224/77822 . . . . Rotational mechanism
2224/77823 . . . . Pivoting mechanism
2224/77824 . . . . Translational mechanism
2224/77841 . . . . of the pressing portion, e.g. tip or head
2224/77842 . . . . Rotational mechanism
2224/77843 . . . . Pivoting mechanism
2224/779 . . . . Means for monitoring the connection process
2224/77901 . . . . using a computer, e.g. fully- or semi-automatic bonding
2224/7792 . . . . Load or pressure adjusting means, e.g. sensors
2224/77925 . . . . Vibration adjusting means, e.g. sensors
2224/7795 . . . . Means for forming additional members
2224/7798 . . . . specially adapted for batch processes
2224/77981 . . . . Apparatus chuck
2224/77982 . . . . Shape
2224/77983 . . . . of the mounting surface
2224/77984 . . . . of other portions
2224/77985 . . . . Material
2224/77986 . . . . Auxiliary members on the pressing surface
2224/77987 . . . . Shape of the auxiliary member
2224/77988 . . . . Material of the auxiliary member
2224/78 . . . . Apparatus for connecting with wire connectors
2224/78001 . . . . Calibration means
2224/7801 . . . . 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
2224/781 . . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
2224/78101 . . . . Chamber
2224/78102 . . . . Vacuum chamber
2224/7811 . . . . High pressure chamber
2224/7815 . . . . Means for applying permanent coating, e.g. in-situ coating
2224/782 . . . . Protection means against electrical discharge
2224/7825 . . . . Means for applying energy, e.g. heating means
2224/78251 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/78252 . . . . in the upper part of the bonding apparatus, e.g. in the capillary or wedge
2224/78253 . . . . adapted for localised heating
2224/7826 . . . . Polychromatic heating lamp
2224/78261 . . . . Laser
2224/78262 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/78263 . . . . in the upper part of the bonding apparatus, e.g. in the capillary or wedge
2224/78264 . . . . by induction heating, i.e. coils
2224/78265 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/78266 . . . . in the upper part of the bonding apparatus, e.g. in the capillary or wedge
2224/78267 . . . . Flame torch, e.g. hydrogen torch
2224/78268 . . . . Discharge electrode
2224/78269 . . . . Shape of the discharge electrode
2224/7827 . . . . Material of the discharge electrode
2224/78271 . . . . Circuitry of the discharge electrode
2224/78272 . . . . Oven
2224/7828 . . . . Resistance welding electrodes, i.e. for ohmic heating
2224/78281 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/78282 . . . . in the upper part of the bonding apparatus, e.g. in the capillary or wedge
2224/78283 . . . . by infrared heating, e.g. infrared heating lamp
2224/783 . . . . by means of pressure
2224/78301 . . . . Capillary
2224/78302 . . . . Shape
2224/78303 . . . . of the pressing surface, e.g. tip or head
2224/78304 . . . . comprising protrusions
2224/78305 . . . . of other portions
2224/78306 . . . . inside the capillary
2224/78307 . . . . outside the capillary
2224/78308 . . . . Removable capillary
2224/78309 . . . . Material
2224/7831 . . . . Auxiliary members on the pressing surface
2224/78311 . . . . Removable auxiliary member
2224/78312 . . . . Shape of the auxiliary member
2224/78313 . . . . Wedge
2224/78314 . . . . Shape
2224/78315 . . . . of the pressing surface, e.g. tip or head
2224/78316 . . . . comprising protrusions
2224/78317 . . . . of other portions
2224/78318 . . . . inside the capillary
2224/78319 . . . . outside the capillary
2224/7832 . . . . Removable wedge
2224/78321 . . . . Material
2224/78325 . . . . Auxiliary members on the pressing surface
2224/78326 . . . . Removable auxiliary member
2224/78327 . . . . Shape of the auxiliary member
2224/78328 . . . . Material of the auxiliary member
2224/78334 . . . . Eccentric cams
2224/78344 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/78346 . . . . in the upper part of the bonding apparatus, e.g. in the capillary or wedge
2224/78347 . . . . Piezoelectric transducers
2224/78348 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/78349 . . . . in the upper part of the bonding apparatus, e.g. in the capillary or wedge
2224/7835 . . . . Stable and mobile yokes
2224/78351 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/78352 . . . . in the upper part of the bonding apparatus, e.g. in the capillary or wedge
2224/78353 . . . . Ultrasonic horns
2224/78354 . . . . in the lower part of the bonding apparatus, e.g. in the mounting chuck
2224/78355 . . . . Design, e.g. of the wave guide
2224/7875 . . . . Cooling means
2224/78501 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
Means for monitoring the connection process

Means for aligning

Means for forming additional members

Means for moving parts

Means for transporting the components to be connected

Means for chemical vapour deposition

Means for applying energy, e.g. heating means

Means for controlling the bonding environment, e.g. valves, vacuum pumps

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members

Means for forming additional members
H01L

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
2224/79343 . . . . . . . . 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
2224/7978 . . . . . . . . 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
Apparatus chuck
Shape
of the mounting surface
of other portions
Material
Auxiliary members on the pressing surface
Shape of the auxiliary member
Material of the auxiliary member
for disconnecting

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

by connecting a bonding area directly to another bonding area, i.e. connectorless bonding, e.g. bumpless bonding

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 protecting the bonding area during or after the bonding process

Pre-treatment of the bonding area

Cleaning the bonding area, 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 2224/8001

Applying permanent coating to the bonding area in the bonding apparatus, e.g. in-situ coating

Applying flux to the bonding area in the bonding apparatus

Reshaping the bonding area in the bonding apparatus, e.g. flattening the bonding area

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 bonding areas, 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

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

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 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
Bonding interfaces of the bonding area or solid state body

- 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 2224/08488)
- 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 2224/04093 - H01L 2224/08491. 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 2224/04093 - H01L 2224/08491
- with a principal constituent of the material being a gas not provided for in groups H01L 2224/04093 - H01L 2224/08491
- 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 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
- with a principal constituent of the material being a solid
- with a principal constituent of the material being a liquid 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 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 [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 2224/80687)

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 2224/806 - 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)

Glassess, 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 2224/807 - H01L 2224/80791

with a principal constituent of the material being a blend 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 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 from H01L 2224/807 - H01L 2224/8088, e.g. for hybrid thermoplastic-thermosetting adhesives

using an inorganic non metallic glass type adhesive, e.g. solder glass
2224/80893 . . . . Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
2224/80894 . . . . Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
2224/80895 . . . . between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
2224/80896 . . . . between electrically insulating surfaces, e.g. oxide or nitride layers
2224/80897 . . . . Mechanical interlocking, e.g. anchoring, hook and loop-type fastening or the like
2224/80898 . . . . Press-fitting, i.e. pushing the parts together and fastening by friction, e.g. by compression of one part against the other
2224/80899 . . . . using resilient parts in the bonding area with the bonding area not providing any mechanical bonding
2224/8090 . . . . Pressing a bonding area against another bonding area or connector (detachable pressure contact H01L 2224/72)
2224/80901 . . . . by means of a further bonding area
2224/80902 . . . . by means of a bump or layer connector
2224/80903 . . . . by means of an encapsulation layer or foil
2224/80904 . . . . Combinations of bonding methods provided for in at least two different groups from H01L 2224/808 - H01L 2224/8094
2224/80906 . . . . Specific sequence of method steps
2224/80907 . . . . Intermediate bonding, i.e. intermediate bonding step for temporarily bonding the semiconductor or solid-state body, followed by at least a further bonding step
2224/80908 . . . . involving monitoring, e.g. feedback loop
2224/80909 . . . . Post-treatment of the bonding area
2224/8091 . . . . Cleaning, e.g. oxide removal step, desmearing
2224/8091 . . . . Chemical cleaning, e.g. etching, flux
2224/8091 . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/8091 . . . . Plasma cleaning
2224/8091 . . . . Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
2224/8091 . . . . Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8091 - H01L 2224/8094
2224/8092 . . . . Applying permanent coating, e.g. protective coating
2224/8093 . . . . Reshaping
2224/8093 . . . . by chemical means, e.g. etching
2224/8093 . . . . by heating means, e.g. reflowing
2224/8093 . . . . using a polychromatic heating lamp
2224/8093 . . . . using a laser
2224/8094 . . . . Induction heating, i.e. eddy currents
2224/8094 . . . . using a flame torch, e.g. hydrogen torch
2224/8094 . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/8094 . . . . by mechanical means, e.g. ?pull-and-cut?, pressing, stamping
2224/80948 . . . . Thermal treatments, e.g. annealing, controlled cooling
2224/80951 . . . . Forming additional members, e.g. for reinforcing
2224/80986 . . . . Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
2224/81 . . . . using a bump connector
2224/81001 . . . . involving a temporary auxiliary member not forming part of the bonding apparatus
2224/81002 . . . . being a removable or sacrificial coating
2224/81005 . . . . being a temporary or sacrificial substrate
2224/81007 . . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the bump connector during or after the bonding process
2224/81009 . . . . Pre-treatment of the bump connector or the bonding area
2224/8101 . . . . Cleaning the bump connector, e.g. oxide removal step, desmearing
2224/81011 . . . . Chemical cleaning, e.g. etching, flux
2224/81012 . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/81013 . . . . Plasma cleaning
2224/81014 . . . . Thermal cleaning, e.g. decomposition, sublimation
2224/81019 . . . . Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8101 - H01L 2224/8104
2224/8102 . . . . Applying permanent coating to the bump connector in the bonding apparatus, e.g. in-situ coating
2224/81022 . . . . Cleaning the bonding area, e.g. oxide removal step, desmearing
2224/81024 . . . . Applying flux to the bonding area
2224/81026 . . . . Applying a precursor material to the bonding area
2224/8103 . . . . Reshaping the bump connector in the bonding apparatus, e.g. flattening the bump connector
2224/81031 . . . . by chemical means, e.g. etching, anodisation
2224/81035 . . . . by heating means
2224/81037 . . . . using a polychromatic heating lamp
2224/81039 . . . . using a laser
2224/81041 . . . . Induction heating, i.e. eddy currents
2224/81047 . . . . by mechanical means, e.g. severing, pressing, stamping
2224/81048 . . . . Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
2224/81051 . . . . Forming additional members
2224/81052 . . . . Detaching bump connectors, e.g. after testing (unsoldering in general B23K 1/018)
2224/81053 . . . . Bonding environment
2224/81054 . . . . Composition of the atmosphere
2224/81055 . . . . being oxidating
2224/81065 . . . . being reducing
2224/81075 . . . . being inert
2224/81085 . . . . being a liquid, e.g. for fluidic self-assembly
2224/8109 . . . . Vacuum
2224/81091 . . . . Under pressure
2224/81092 . . . . Atmospheric pressure
Applying energy for connecting

Mounting

Aligning
discharge, e.g. removing electrostatic charge

Applying isostatic pressure, e.g. degassing
using vacuum or a pressurised liquid

Using an electron beam (electron beam welding in general B23K 15/00)

Using electro-static corona discharge

Using means for applying energy being within the device, e.g. integrated heater

Using vacuum or a pressurised liquid

Using a reflow oven

Using energy in the form of electromagnetic radiation

Using an autocatalytic reaction, e.g.
exothermic brazing

Using an electron beam (electron beam welding in general B23K 15/00)

Using induction heating, i.e. eddy currents

Using a laser

Using means for applying energy being within the device, e.g. integrated heater

Using vacuum or a pressurised liquid

Using a reflow oven

Using energy in the form of electromagnetic radiation

Using electro-static corona discharge

Using means for applying energy being within the device, e.g. integrated heater

Using an electron beam (electron beam welding in general B23K 15/00)

Using electrical resistance welding, i.e. ohmic heating

Using a laser

Using an electron beam (electron beam welding in general B23K 15/00)

Using means for applying energy being within the device, e.g. integrated heater

Using vacuum or a pressurised liquid

Applying isostatic pressure, e.g. degassing
using vacuum or a pressurised liquid

Applying electro-static corona discharge

Applying means for applying energy being within the device, e.g. integrated heater

Applying energy for connecting
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
- 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
- with a principal constituent of the material being a liquid not provided for in groups

with a principal constituent of the material being a gas not provided for in groups

- 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 or equal to 950°C and less than 1550°C

- 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

- 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
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
Coating material polonium [Po], and alloys thereof antimony [Sb], tellurium [Te] and silicium [Si], germanium [Ge], arsenic [As], metalloid, e.g. boron [B], silicon 

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 gas not provided for in groups H01L 2224/816 - H01L 2224/81691 

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 

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C 

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 or equal to 950°C and less than 1550°C 

the principal constituent melting at a temperature of greater than 1550°C 

the principal constituent melting at a temperature of greater than 1550°C 

the principal constituent melting at a temperature of greater than 1550°C 

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the principal constituent melting at a temperature of greater than 1550°C 

the principal constituent melting at a temperature of greater than 1550°C 

the principal constituent melting at a temperature of greater than 1550°C
Bonding techniques

- Polyester based on silicone, epoxy, polyimide,
- Sintering
- Glasses, e.g. amorphous oxides, nitrates 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 2224/8179 - 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 2224/8179 - H01L 2224/81791

- with a principal constituent of the material being a gas not provided for in groups H01L 2224/8179 - 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

- 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 bump 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 from H01L 2224/8185 - H01L 2224/8188, 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
- 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 2224/818 - 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

- Plasma cleaning
- Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
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

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

the guiding structures being at least partially left in the finished device

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 bodies to be connected, e.g. XY table

Rotational movements

Translational movements

being the upper part of the bonding apparatus, e.g. nozzle

connecting first on the semiconductor or solid-state body, on-chip

connecting first outside the semiconductor or solid-state body, i.e. off-chip

connecting first both on and outside the semiconductor or solid-state body

Applying energy for connecting

Compression bonding

Thermocompression bonding

Ultrasonic bonding

Thermosonic bonding

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 electron beam, (electron beam in general B23K 15/00)

using electric resistance welding, i.e. ohmic heating

Bonding interfaces of the connector

Shape, e.g. interlocking features
H01L.

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
2224/8283 . . . . Solid-solid interdiffusion
2224/8284 . . . . 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
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 2224/82897
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
2224/82948 . . . . Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
2224/82951 . . . . Forming additional members
2224/82986 . . . . Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
2224/83 . . . . using a layer connector
2224/83001 . . . . involving a temporary auxiliary member not forming part of the bonding apparatus
2224/83002 . . . . being a removable or sacrificial coating
2224/83005 . . . . being a temporary or sacrificial substrate
2224/83007 . . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the layer connector during or after the bonding process
2224/83009 . . . . Pre-treatment of the layer connector or the bonding area
2224/8301 . . . . Cleaning the layer connector, e.g. oxide removal step, desmearing
2224/83011 . . . . Chemical cleaning, e.g. etching, flux
2224/83012 . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/83013 . . . . Plasma cleaning
2224/83014 . . . . Thermal cleaning, e.g. decomposition, sublimation
2224/83019 . . . . Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8301 - H01L 2224/83014
2224/8302 . . . . Applying permanent coating to the layer connector in the bonding apparatus, e.g. in-situ coating
2224/83022 . . . . Cleaning the bonding area, e.g. oxide removal step, desmearing
2224/83024 . . . . Applying flux to the bonding area
2224/83026 . . . . Applying a precursor material to the bonding area
2224/8303 . . . . Reshaping the layer connector in the bonding apparatus, e.g. flattening the layer connector
2224/83031 . . . . by chemical means, e.g. etching, anodisation
2224/83035 . . . . by heating means
2224/83037 . . . . using a polychromatic heating lamp
2224/83039 . . . . using a laser
2224/83041 . . . . Induction heating, i.e. eddy currents
Aligning discharge, e.g. removing electrostatic charge involving protection against electrical
the layer connector being supplied to the parts
as prepreg comprising a layer connector, e.g. provided in an insulating plate member
using surface energy, e.g. capillary forces
by applying pressure, e.g. by injection
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
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 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
Translation movements
Arrangement of the layer connectors prior to mounting
wherein the layer connectors are disposed only on the semiconductor or solid-state body
wherein the layer connectors are disposed only on another item or body to be connected to the semiconductor or solid-state body
wherein the layer 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 layer 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 isotropic 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 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 2224/29099 and H01L 2224/29599, and subgroups)
Bonding interfaces outside the semiconductor or solid-state body
2224/83385 . . . . . . Shape, e.g. interlocking features
2224/83395 . . . . . . having an external coating, e.g. protective bond-through coating
2224/83399 . . . . . . Material
2224/834 . . . . . . 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
2224/83401 . . . . . . the principal constituent melting at a temperature of less than 400°C
2224/83405 . . . . . . Gallium [Ga] as principal constituent
2224/83409 . . . . . . Indium [In] as principal constituent
2224/83411 . . . . . . Tin [Sn] as principal constituent
2224/83413 . . . . . . Bismuth [Bi] as principal constituent
2224/83414 . . . . . . Thallium [Tl] as principal constituent
2224/83416 . . . . . . Lead [Pb] as principal constituent
2224/83417 . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/83418 . . . . . . Zinc [Zn] as principal constituent
2224/8342 . . . . . . Antimony [Sb] as principal constituent
2224/83423 . . . . . . Magnesium [Mg] as principal constituent
2224/83424 . . . . . . Aluminium [Al] as principal constituent
2224/83438 . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/83439 . . . . . . Silver [Ag] as principal constituent
2224/83444 . . . . . . Gold [Au] as principal constituent
2224/83447 . . . . . . Copper [Cu] as principal constituent
2224/83449 . . . . . . Manganese [Mn] as principal constituent
2224/83455 . . . . . . Nickel [Ni] as principal constituent
2224/83457 . . . . . . Cobalt [Co] as principal constituent
2224/8346 . . . . . . Iron [Fe] as principal constituent
2224/83463 . . . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/83464 . . . . . . Palladium [Pd] as principal constituent
2224/83466 . . . . . . Titanium [Ti] as principal constituent
2224/83469 . . . . . . Platinum [Pt] as principal constituent
2224/8347 . . . . . . Zirconium [Zr] as principal constituent
2224/83471 . . . . . . Chromium [Cr] as principal constituent
2224/83472 . . . . . . Vanadium [V] as principal constituent
2224/83473 . . . . . . Rhodium [Rh] as principal constituent
2224/83476 . . . . . . Ruthenium [Ru] as principal constituent
2224/83478 . . . . . . Iridium [Ir] as principal constituent
2224/83479 . . . . . . Niobium [Nb] as principal constituent
2224/8348 . . . . . . Molybdenum [Mo] as principal constituent
2224/83481 . . . . . . Tantalum [Ta] as principal constituent
2224/83483 . . . . . . Rhenium [Re] as principal constituent
2224/83484 . . . . . . Tungsten [W] as principal constituent
2224/83486 . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/83487 . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83488)
2224/83488 . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8349 . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/83491 . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/83493 . . . . . . 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
2224/83494 . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/834 - H01L 2224/83491
2224/83495 . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/834 - H01L 2224/83491
2224/83498 . . . . . . 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
2224/83499 . . . . . . Material of the matrix
2224/835 . . . . . . 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
2224/83501 . . . . . . the principal constituent melting at a temperature of less than 400°C
2224/83505 . . . . . . Gallium [Ga] as principal constituent
2224/83509 . . . . . . Indium [In] as principal constituent
2224/83511 . . . . . . Tin [Sn] as principal constituent
2224/83513 . . . . . . Bismuth [Bi] as principal constituent
2224/83514 . . . . . . Thallium [Tl] as principal constituent
2224/83516 . . . . . . Lead [Pb] as principal constituent
2224/83517 . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/83518 . . . . . . Zinc [Zn] as principal constituent
2224/8352 . . . . . . Antimony [Sb] as principal constituent
2224/83523 . . . . . . Magnesium [Mg] as principal constituent
2224/83524 . . . . . . Aluminium [Al] as principal constituent
2224/83538 . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/83539 . . . . . . Silver [Ag] as principal constituent
2224/83544 . . . . . . Gold [Au] as principal constituent
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Fillers

Base material with a principal constituent of the material being a liquid or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof.

Graphite, carbon-nanotubes, diamond e.g. allotropes of carbon, fullerene, H01L 2224/83591, not provided for in groups H01L 2224/835 - H01L 2224/83591.

The principal constituent being a solid material being a gas with a principal constituent melting at a temperature of greater than 1550°C.

The principal constituent being a polymer, e.g. 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.

Fillers

Base material with a principal constituent of the material being a liquid or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof.

Graphite, carbon-nanotubes, diamond e.g. allotropes of carbon, fullerene, H01L 2224/83591, not provided for in groups H01L 2224/835 - H01L 2224/83591.

The principal constituent being a solid material being a gas with a principal constituent melting at a temperature of greater than 1550°C.

The principal constituent being a polymer, e.g. 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.
Coating material as a hybrid material, e.g. segmented of a matrix with a filler, i.e. being two or more materials in the form of 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.
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 2224/8388)
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 2224/8378, 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 2224/8379
with a principal constituent of the material being a gas not provided for in groups H01L 2224/8379
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
Sintering
using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
being an anisotropic conductive adhesive
Hardening the adhesive by curing, i.e. thermosetting
Pre-cured adhesive, i.e. B-stage adhesive
Localised curing of parts of the layer 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 from H01L 2224/8385 - H01L 2224/8388, e.g. for hybrid thermoplastic-thermosetting adhesives
Involving a self-assembly process, e.g. self-agglomeration of a material dispersed in a fluid
Auxiliary means therefor, e.g. for self-assembly activation
with special adaptation of the surface of the body to be connected, e.g. surface shape specially adapted for the self-assembly process
involving the material of the bonding area, e.g. bonding pad
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
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 layer connector or in the bonding area
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 2224/83901 - 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 2224/83911 - 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
2224/83986 . . . 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
Bonding interfaces outside the semiconductor or solid state body

Bonding interfaces of the semiconductor or solid-state body, i.e. bonding head,

Bonding interfaces of the connector

Material

Shape, e.g. interlocking features

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

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

Polychromatic or infrared lamp heating

using a laser

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 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

Bonding interfaces outside the semiconductor or solid-state body

Shape, e.g. interlocking features
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84488)

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 2224/844 - 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 2224/844 - H01L 2224/84491

with a principal constituent of the material being a gas not provided for in groups H01L 2224/844 - H01L 2224/84491

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

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 2224/84588)

Glasses, e.g. amorphous oxides, nitrides or fluorides (glass ceramics H01L 2224/84588)

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 2224/845 - H01L 2224/8451, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
<table>
<thead>
<tr>
<th>CPC Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2224/84594</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/845 - H01L 2224/84591</td>
</tr>
<tr>
<td>2224/84595</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/845 - H01L 2224/84591</td>
</tr>
<tr>
<td>2224/84598</td>
<td>Fillers</td>
</tr>
<tr>
<td>2224/846</td>
<td>Base material</td>
</tr>
<tr>
<td>2224/84601</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>2224/84605</td>
<td>Gallium [Ga] as principal constituent</td>
</tr>
<tr>
<td>2224/84609</td>
<td>Indium [In] as principal constituent</td>
</tr>
<tr>
<td>2224/84611</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/84613</td>
<td>Bismuth [Bi] as principal constituent</td>
</tr>
<tr>
<td>2224/84614</td>
<td>Thallium [Tl] as principal constituent</td>
</tr>
<tr>
<td>2224/84616</td>
<td>Lead [Pb] as principal constituent</td>
</tr>
<tr>
<td>2224/84617</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>2224/84618</td>
<td>Zinc [Zn] as principal constituent</td>
</tr>
<tr>
<td>2224/8462</td>
<td>Antimony [Sb] as principal constituent</td>
</tr>
<tr>
<td>2224/84623</td>
<td>Magnesium [Mg] as principal constituent</td>
</tr>
<tr>
<td>2224/84624</td>
<td>Aluminium [Al] as principal constituent</td>
</tr>
<tr>
<td>2224/84638</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>2224/84639</td>
<td>Silver [Ag] as principal constituent</td>
</tr>
<tr>
<td>2224/84644</td>
<td>Gold [Au] as principal constituent</td>
</tr>
<tr>
<td>2224/84647</td>
<td>Copper [Cu] as principal constituent</td>
</tr>
<tr>
<td>2224/84649</td>
<td>Manganese [Mn] as principal constituent</td>
</tr>
<tr>
<td>2224/84655</td>
<td>Nickel [Ni] as principal constituent</td>
</tr>
<tr>
<td>2224/84657</td>
<td>Cobalt [Co] as principal constituent</td>
</tr>
<tr>
<td>2224/8466</td>
<td>Iron [Fe] as principal constituent</td>
</tr>
<tr>
<td>2224/84663</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
</tr>
<tr>
<td>2224/84664</td>
<td>Palladium [Pd] as principal constituent</td>
</tr>
<tr>
<td>2224/84666</td>
<td>Titanium [Ti] as principal constituent</td>
</tr>
<tr>
<td>2224/84669</td>
<td>Platinum [Pt] as principal constituent</td>
</tr>
<tr>
<td>2224/8467</td>
<td>Zirconium [Zr] as principal constituent</td>
</tr>
<tr>
<td>2224/84671</td>
<td>Chromium [Cr] as principal constituent</td>
</tr>
<tr>
<td>2224/84672</td>
<td>Vanadium [V] as principal constituent</td>
</tr>
<tr>
<td>2224/84673</td>
<td>Rhodium [Rh] as principal constituent</td>
</tr>
<tr>
<td>2224/84676</td>
<td>Ruthenium [Ru] as principal constituent</td>
</tr>
<tr>
<td>2224/84678</td>
<td>Iridium [Ir] as principal constituent</td>
</tr>
<tr>
<td>2224/84679</td>
<td>Niobium [Nb] as principal constituent</td>
</tr>
<tr>
<td>2224/8468</td>
<td>Molybdenum [Mo] as principal constituent</td>
</tr>
<tr>
<td>2224/84681</td>
<td>Tantalum [Ta] as principal constituent</td>
</tr>
<tr>
<td>2224/84683</td>
<td>Rhenium [Re] as principal constituent</td>
</tr>
<tr>
<td>2224/84684</td>
<td>Tungsten [W] as principal constituent</td>
</tr>
<tr>
<td>2224/84686</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>2224/84687</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84688)</td>
</tr>
<tr>
<td>2224/84688</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
</tr>
<tr>
<td>2224/8469</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>2224/84691</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>2224/84693</td>
<td>with a principal constituent of the material being a solid not provided for in groups H01L 2224/846 - H01L 2224/84691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond</td>
</tr>
<tr>
<td>2224/84694</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/846 - H01L 2224/84691</td>
</tr>
<tr>
<td>2224/84695</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/846 - H01L 2224/84691</td>
</tr>
<tr>
<td>2224/84698</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>2224/84699</td>
<td>Coating material</td>
</tr>
</tbody>
</table>
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
- 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

- 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 2224/84788)
- 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 2224/847 - H01L 2224/84791, 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 2224/847 - H01L 2224/84791

with a principal constituent of the material being a gas not provided for in groups H01L 2224/847 - H01L 2224/84791

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
post-treatment of the connector or bonding area

modifying the loop shape

Reshaping, e.g. for severing the strap,
modifying the loop shape

Reshaping, e.g. for severing the strap,
coating

Applying permanent coating, e.g. protective
coating

Reshaping, e.g. for severing the strap,
modifying the loop shape

Reshaping, e.g. for severing the strap,
coating

Applying permanent coating, e.g. protective
coating

Reshaping, e.g. for severing the strap,
modifying the loop shape

Reshaping, e.g. for severing the strap,
coating

Applying permanent coating, e.g. protective
coating

Reshaping, e.g. for severing the strap,
modifying the loop shape

Reshaping, e.g. for severing the strap,
coating

Applying permanent coating, e.g. protective
coating

Reshaping, e.g. for severing the strap,
modifying the loop shape

Reshaping, e.g. for severing the strap,
coating

Applying permanent coating, e.g. protective
coating

Reshaping, e.g. for severing the strap,
aligning discharge, e.g. removing electrostatic charge connected in the bonding apparatus

the connector being supplied to the parts to be connected in the bonding apparatus

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, 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

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 bodies to be connected, e.g. XY table

rotational movements

translational movements

being the upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge

rotational movements

translational movements

connecting first on the semiconductor or solid-state body, i.e. on-chip, regular stitch

connecting first outside the semiconductor or solid-state body, i.e. off-chip, reverse stitch

connecting first both on and outside the semiconductor or solid-state body, i.e. regular and reverse stitches

involve intermediate connecting steps before cutting the wire connector

Applying energy for connecting

Compression bonding

Thermocompression bonding

Ultrasonic bonding

Direction of oscillation

Thermosonic bonding

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

dispersing using electron beam (using electron beam in general B23K 15/00)

using electric resistance welding, i.e. ohmic heating

Bonding interfaces of the 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

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 (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
segmented structures, foams filler, i.e. being a hybrid material, e.g. materials in the form of a matrix with a principal constituent of the material being a gas not provided for in groups H01L 2224/85491

- Carbon-nanotubes, diamond allotropes of carbon, fullerene, graphite, Graphite (C) as principal constituent

- Based polymer, epoxy being a polymer, e.g. polyester, phenolic

- Glasses, e.g. amorphous oxides, nitrides or fluorides

- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85488)

- with a principal constituent of the material being a non metallic, non metalloid inorganic material

- 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 2224/854 - H01L 2224/85491, 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 2224/854 - H01L 2224/85491

- with a principal constituent of the material being a gas not provided for in groups H01L 2224/854 - H01L 2224/85491

- 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

- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

- Tungsten (W) as principal constituent

- Rhenium (Re) as principal constituent

- Tantalum (Ta) as principal constituent

- Niobium (Nb) as principal constituent

- Iridium (Ir) as principal constituent

- Ruthenium (Ru) as principal constituent

- Palladium (Pd) as principal constituent

- Platinum (Pt) as principal constituent

- Titanium (Ti) as principal constituent

- Palladium (Pd) as principal constituent

- 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

- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

- Tungsten (W) as principal constituent

- Rhenium (Re) as principal constituent

- Tantalum (Ta) as principal constituent

- Niobium (Nb) as principal constituent

- Iridium (Ir) as principal constituent

- Ruthenium (Ru) as principal constituent

- Palladium (Pd) as principal constituent

- Platinum (Pt) as principal constituent

- Titanium (Ti) as principal constituent

- Palladium (Pd) as principal constituent

- 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

- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

- Tungsten (W) as principal constituent

- Rhenium (Re) as principal constituent

- Tantalum (Ta) as principal constituent

- Niobium (Nb) as principal constituent

- Iridium (Ir) as principal constituent

- Ruthenium (Ru) as principal constituent

- Palladium (Pd) as principal constituent

- Platinum (Pt) as principal constituent

- Titanium (Ti) as principal constituent

- Palladium (Pd) as principal constituent

- 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

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- 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

- the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

- Tungsten (W) as principal constituent

- Rhenium (Re) as principal constituent

- Tantalum (Ta) as principal constituent

- Niobium (Nb) as principal constituent

- Iridium (Ir) as principal constituent

- Ruthenium (Ru) as principal constituent

- Palladium (Pd) as principal constituent

- Platinum (Pt) as principal constituent

- Titanium (Ti) as principal constituent

- Palladium (Pd) as principal constituent
H01L

2224/85578 ............ Iridium (Ir) as principal constituent
2224/85579 ............ Niobium (Nb) as principal constituent
2224/8558 ............ Molybdenum (Mo) as principal constituent
2224/85581 ............ Tantalum (Ta) as principal constituent
2224/85583 ............ Rhenium (Re) as principal constituent
2224/85584 ............ Tungsten (W) as principal constituent
2224/85586 ............ with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/85587 ............ Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/8561)
2224/85588 ............ Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8559 ............ with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/85591 ............ The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/85593 ............ 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
2224/85594 ............ with a principal constituent of the material being a liquid not provided for in groups H01L 2224/855 - H01L 2224/85591
2224/85595 ............ with a principal constituent of the material being a gas not provided for in groups H01L 2224/855 - H01L 2224/85591
2224/85598 ............ Fillers
2224/85599 ............ Base material
2224/856 ............ 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
2224/85601 ............ the principal constituent melting at a temperature of less than 400°C
2224/85605 ............ Gallium (Ga) as principal constituent
2224/85609 ............ Indium (In) as principal constituent
2224/85611 ............ Tin (Sn) as principal constituent
2224/85613 ............ Bismuth (Bi) as principal constituent
2224/85614 ............ Thallium (Tl) as principal constituent
2224/85616 ............ Lead (Pb) as principal constituent
2224/85617 ............ the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/85618 ............ Zinc (Zn) as principal constituent
2224/8562 ............ Antimony (Sb) as principal constituent
2224/85623 ............ Magnesium (Mg) as principal constituent
2224/85624 ............ Aluminium (Al) as principal constituent
2224/85638 ............ the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/85639 ............ Silver (Ag) as principal constituent
2224/85644 ............ Gold (Au) as principal constituent
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
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85688)

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 2224/856 - H01L 2224/85691, 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 2224/856 - H01L 2224/85691

with a principal constituent of the material being a gas not provided for in groups H01L 2224/856 - H01L 2224/85691

with a principal constituent of the material being a hybrid material, e.g. segmented structures, foams

Coating material

with a principal constituent of the material 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

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 2224/85688)

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 2224/85793 - H01L 2224/85791, 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 2224/85794 - H01L 2224/85791]

with a principal constituent of the material being a gas not provided for in groups [H01L 2224/85795 - H01L 2224/85791]

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

forming a eutectic alloy at the bonding interface

forming an intermetallic compound at the bonding interface

Reflow soldering

Diffusion bonding

Solid-liquid interdiffusion

Solid-solid interdiffusion, e.g. "direct bonding"

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 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 from [H01L 2224/85855 - H01L 2224/85851, 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 2224/859 - H01L 2224/8591]

involving monitoring, e.g. feedback loop

Post-treatment of the connector or wire 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

using a laser

Electron beam cleaning

Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8591 - H01L 2224/85914]

Applying permanent coating, e.g. protective coating

Reshaping, e.g. for severing the wire, modifying the wedge or ball or 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. "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

using tape automated bonding [TAB]

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 the TAB connector during or after the bonding process
Aligning involving protection against electrical discharge, e.g. removing electrostatic charge

Bonding techniques

- Pre-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
- using a laser
- using a corona discharge, e.g. electronic flame off [EFO]
- by mechanical means, e.g. severing, pressing, stamping
- Thermal treatment, e.g. annealing, controlled pre-heating or pre-cooling
- Bonding environment
- Composition of the atmosphere
- being a liquid, e.g. fluidic self-assembly
- Vacuum
- Under pressure
- Temperature settings
- Transient conditions
- Heating
- Cooling
- Ambient temperature
- the connector being supplied to the parts to be connected in the bonding apparatus
- 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
- the guiding structures being at least partially left in the finished device
- 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 bodies to be connected, e.g. XY table
- Rotational movements
- Translational movements
- being the upper part of the bonding apparatus, e.g. nozzle
- Rotational movement
- Translational movements
- connecting first on the semiconductor or solid-state body, i.e. on-chip,
- connecting first outside the semiconductor or solid-state body
- connecting first both on and outside the semiconductor or solid-state body
- Applying energy for connecting
- Compression bonding
- Thermo-compression bonding
- Ultrasonic bonding
- Thermosonic bonding
- 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 electron beam (electron beam in general B23K 15/00)
- using electric resistance welding, i.e. ohmic heating
- Bonding interfaces of the 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
- 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
- Bonding techniques
- Soldering or alloying
- involving forming a eutectic alloy at the bonding interface
- involving forming an intermetallic compound at the bonding interface
- Rerflow 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 connector
- Heat curing
- Microwave curing
H01L

2224/86868 . . . . Infrared [IR] curing
2224/86871 . . . . Visible light curing
2224/86874 . . . . Ultraviolet [UV] curing
2224/86877 . . . . Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
2224/8688 . . . . Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
2224/86885 . . . . Combinations of two or more hardening methods provided for in at least two different groups selected from H01L 2224/86855 - H01L 2224/86888, e.g. hybrid thermoplastic-thermosetting adhesives
2224/8689 . . . . using an inorganic non metallic glass type adhesive, e.g. solder glass
2224/86893 . . . . Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
2224/86895 . . . . Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
2224/86896 . . . . between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
2224/86897 . . . . between electrically insulating surfaces, e.g. oxide or nitride layers
2224/86899 . . . . Combinations of bonding methods provided for in at least two different groups from H01L 2224/868 - H01L 2224/8697
2224/869 . . . . involving monitoring, e.g. feedback loop
2224/86909 . . . . Post-treatment of the connector or the bonding area
2224/8691 . . . . Cleaning, e.g. oxide removal step, desmearing
2224/8693 . . . . Reshaping
2224/86931 . . . . by chemical means, e.g. etching, anodisation
2224/86935 . . . . by heating means
2224/86939 . . . . using a laser
2224/86945 . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/86947 . . . . by mechanical means, e.g. severing, pressing, stamping
2224/86948 . . . . Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
2224/86951 . . . . Forming additional members
2224/86986 . . . . Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
2224/89 . . . . using at least one connector not provided for in any of the groups H01L 2224/81 - H01L 2224/86
2224/90 . . . . 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
2224/91 . . . . 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
2224/92 . . . . Specific sequence of method steps
2224/901 . . . . Forming connectors during the connecting process, e.g. in-situ formation of bumps
2224/902 . . . . Forming additional connectors after the connecting process
2224/905 . . . . Intermediate bonding steps, i.e. partial connection of the semiconductor or solid-state body during the connecting process
2224/921 . . . . Connecting a surface with connectors of different types
2224/9211 . . . . Parallel connecting processes
2224/9212 . . . . Sequential connecting processes
2224/92122 . . . . the first connecting process involving a bump connector
2224/92124 . . . . the second connecting process involving a build-up interconnect
2224/92125 . . . . the second connecting process involving a layer connector
2224/92127 . . . . the second connecting process involving a wire 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 bump 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
2224/9227  the second connecting process involving a wire connector
2224/9228  the second connecting process involving a TAB connector
2224/9224  the first connecting process involving a layer connector
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
2224/9229  Batch processes
2224/9229  at wafer-level, i.e. with connecting carried out on a wafer comprising a plurality of undiced individual devices
2224/9229  at chip-level, i.e. with connecting carried out on a plurality of singulated devices, i.e. on diced chips
2224/9229  involving a temporary auxiliary member not forming part of the bonding apparatus, e.g. removable or sacrificial coating, film or substrate
2224/9229  Bonding environment
2224/9229  being a liquid, e.g. for fluidic self-assembly
2224/9229  Under pressure
2224/9229  Atmospheric pressure, e.g. dry self-assembly
2224/9229  Transient conditions, e.g. assisted by a gas flow or a liquid flow
2224/9229  Supplying the plurality of semiconductor or solid-state bodies
2224/9229  in a liquid medium
2224/9229  being a colloidal droplet
2224/9229  using a rack or rail
2224/9229  using a roll-to-roll transfer technique
2224/9229  Aligning the plurality of semiconductor or solid-state bodies
2224/9229  Active alignment, i.e. by apparatus steering
2224/9229  by applying vibration
2224/9229  by applying a pressurised fluid flow, e.g. liquid or gas flow
2224/9229  by applying an electromagnetic field
2224/9229  Electrowetting, i.e. by changing the surface energy of a droplet
2224/9229  involving guiding structures, e.g. shape matching, spacers or supporting members
2224/9229  Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
2224/9229  Magnetic alignment, i.e. using permanent magnetic parts in the semiconductor or solid-state body
2224/9229  Electrostatic alignment, i.e. polarity alignment with Coulomb charges
2224/9229  by surface tension
2224/9229  by molecular lock-key, e.g. by DNA
2224/9229  involving movement of a part of the bonding apparatus
2224/9229  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
2224/9229  the devices being connected to a common substrate, e.g. interposer, said common substrate being separable into individual assemblies after connecting
2224/9229  Methods for disconnecting semiconductor or solid-state bodies

2225/00  Details relating to assemblies covered by the group H01L 25/00 but not provided for in its subgroups
2225/03  All the devices being of a type provided for in the same subgroup of groups H01L 27/00 - H01L 51/00
2225/04  the devices not having separate containers
2225/06  the devices being of a type provided for in group H01L 27/00
2225/06  Stacked arrangements of devices
2225/06  Wire or wire-like electrical connections between devices
2225/06  Wire or wire-like electrical connections from device to substrate
2225/06  Bump or bump-like direct electrical connections between devices, e.g. flip-chip connection, solder bumps
2225/06  Bump or bump-like direct electrical connections from device to substrate
2225/06  Bump or bump-like direct electrical connections from substrate to substrate
2225/06  Electrical connections formed on device or on substrate, e.g. a deposited or grown layer
2225/06  Special adaptation of electrical connections, e.g. rewiring, engineering changes, pressure contacts, layout
2225/06531 . . . . . . Non-galvanic coupling, e.g. capacitive coupling
2225/06534 . . . . . . Optical coupling
2225/06537 . . . . . . Electromagnetic shielding
2225/06541 . . . . . . Conductive via connections through the device, e.g. vertical interconnects, through silicon via [TSV] (manufacturing via connections see H01L 21/76898)
2225/06544 . . . . . . Design considerations for via connections, e.g. geometry or layout
2225/06548 . . . . . . Conductive via connections through the substrate, container, or encapsulation
2225/06551 . . . . . . Conductive connections on the side of the device
2225/06555 . . . . . . Geometry of the stack, e.g. form of the devices, geometry to facilitate stacking
2225/06558 . . . . . . the devices having passive surfaces facing each other, i.e. in a back-to-back arrangement
2225/06562 . . . . . . at least one device in the stack being rotated or offset
2225/06565 . . . . . . the devices having the same size and there being no auxiliary carrier between the devices
2225/06568 . . . . . . the devices decreasing in size, e.g. pyramidal stack
2225/06572 . . . . . . Auxiliary carrier between devices, the carrier having an electrical connection structure
2225/06575 . . . . . . Auxiliary carrier between devices, the carrier having no electrical connection structure
2225/06579 . . . . . . TAB carriers; beam leads
2225/06582 . . . . . . Housing for the assembly, e.g. chip scale package [CSP]
2225/06586 . . . . . . Housing with external bump or bump-like connectors
2225/06589 . . . . . . Thermal management, e.g. cooling
2225/06593 . . . . . . Mounting aids permanently on device; arrangements for alignment (use of temporary supports H01L 21/6835)
2225/06596 . . . . . . Structural arrangements for testing (testing or measuring during manufacture or treatment H01L 22/00); testing electrical properties or locating electrical faults

2225/1058 . . . . . . Bump or bump-like electrical connections, e.g. balls, pillars, posts
2225/1064 . . . . . . Electrical connections provided on a side surface of one or more of the containers
2225/107 . . . . . . Indirect electrical connections, e.g. via an interposer, a flexible substrate, using TAB (printed circuits H05K 1/00)
2225/1076 . . . . . . Shape of the containers
2225/1082 . . . . . . for improving alignment between containers, e.g. interlocking features
2225/1088 . . . . . . Arrangements to limit the height of the assembly
2225/1094 . . . . . . Thermal management, e.g. cooling

2227/00 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
2227/32 . . . . . . Devices including an organic light emitting device [OLED], e.g. OLED display
2227/323 . . . . . . Multistep processes for AMOLED
2227/326 . . . . . . Use of temporary substrate, e.g. for manufacturing of OLED displays having an inorganic driving circuit

2229/00 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

2251/00 Indexing scheme relating to organic semiconductor devices covered by group H01L 51/00
2251/10 . . . . . . Processes specially adapted for the manufacture or treatment of organic semiconductor devices
2251/105 . . . . . . Patterning of a layer by embossing, e.g. to form trenches in an insulating layer
2251/30 . . . . . . Materials
2251/301 . . . . . . Inorganic materials
2251/303 . . . . . . Oxides, e.g. metal oxides
2251/305 . . . . . . Transparent conductive oxides [TCO]
2251/306 . . . . . . composed of tin oxides, e.g. F doped SnO2
2251/308 . . . . . . composed of indium oxides, e.g. ITO
2251/50 . . . . . . Organic light emitting devices
2251/53 . . . . . . Structure
2251/5307 . . . . . . specially adapted for controlling the direction of light emission

2251/5315 . . . . . . Top emission
2251/5323 . . . . . . Two-side emission, i.e. TOLED
2251/533 . . . . . . End-face emission
2251/5338 . . . . . . Flexible OLED
2251/5346 . . . . . . Graded composition
2251/5353 . . . . . . Inverted OLED
2251/5361 . . . . . . OLED lamp
2251/5369 . . . . . . Nanoparticles used in whatever layer except emissive layer, e.g. in packaging
2251/5376 . . . . . . Combination of fluorescent and phosphorescent emission
2251/5384 . . . . . . Multiple hosts in the emissive layer
2251/5392 . . . . . . Short-circuit prevention
2251/55 . . . . . . characterised by parameters
2251/552 . . . . . . HOMO-LUMO-EF
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

2924/0002. Not covered by any one of groups H01L 2944.00, 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]
2924/01041. Niobium [Nb]
2924/01042. Molybdenum [Mo]
2924/01043. Technetium [Tc]
2924/01044. Ruthenium [Ru]
2924/01045. Rhodium [Rh]
2924/01046. Palladium [Pd]
2924/01047. Silver [Ag]
2924/01048. Cadmium [Cd]
2924/01049. Indium [In]
2924/0105. Tin [Sn]
2924/01051. Antimony [Sb]
2924/01052. Tellurium [Te]
2924/01053. Iodine [I]
2924/01054. Xenon [Xe]
2924/01055. Cesium [Cs]
2924/01056. Barium [Ba]
2924/01057. Lanthanum [La]
2924/01058. Cerium [Ce]
2924/01059. Praseodymium [Pr]
2924/0106. Neodymium [Nd]
2924/01061. Promethium [Pm]
2924/01062. Samarium [Sm]
2924/01063. Europium [Eu]
2924/01064. Gadolinium [Gd]
2924/01065. Terbium [ Tb]
2924/01066. Dysprosium [Dy]
2924/01067. Holmium [Ho]
2924/01068. Erbium [Er]
2924/01069. Thulium [Tm]
2924/0107. Ytterbium [Yb]
2924/01071. Lutetium [Lu]
2924/01072. Hafnium [Hf]
2924/01073. Tantalum [Ta]
2924/01074. Tungsten [W]
2924/01075. Rhenium [Re]
2924/01076. Osmium [Os]
2924/01077. Iridium [Ir]
2924/01078. Platinum [Pt]
2924/01079. Gold [Au]
2924/0108. Mercury [Hg]
2924/01081. Thallium [Tl]
2924/01082. Lead [Pb]
2924/01083. Bismuth [Bi]
2924/01084. Polonium [Po]
2924/01085. Astatine [At]
2924/01086. Radon [Rn]
2924/01087. Francium [Fr]
2924/01088. Radium [Ra]
Semiconductor purity grades

Groups of the periodic table

Solder alloys

Quaternary Alloys

7N purity grades, i.e. 99.99999%

6N purity grades, i.e. 99.9999%

5N purity grades, i.e. 99.999%

Halogens

Noble metals

Rare earth metals

Transition metals

Plutonium [Pu]

Neptunium [Np]

Uranium [U]

Protactinium [Pa]

Thorium [Th]

Actinium [Ac]

Peritectic Alloys, i.e. obtained by a liquid transforming into a solid and a new and different solid phase

Eutectic Alloys, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase

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

Monotectics, i.e. obtained by a liquid and a solid transforming into a new and different solid phase

Intermediate phases, i.e. intermetallics compounds

Borides 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

Ternary Alloys

Quaternary Alloys

Quinary Alloys

Solder alloys

Invar, i.e. single-phase alloy of around 36% nickel and 64% iron

Kovar, i.e. FeNiCo alloys

Alloy 42, i.e. FeNi42

Inovco, i.e. Fe-33Ni-4.5Co

Borides 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, being a combination of two or more materials provided in the groups H01L 2924/0421 - H01L 2924/0446

Actinides, being a combination of two or more materials provided in the groups H01L 2924/0451 - H01L 2924/0466

Actinides, being a combination of two or more materials provided in the groups H01L 2924/0451 - H01L 2924/0466

Actinides, being a combination of two or more materials provided in the groups H01L 2924/0451 - H01L 2924/0466

Actinides, being a combination of two or more materials provided in the groups H01L 2924/0451 - H01L 2924/0466

Actinides, being a combination of two or more materials provided in the groups H01L 2924/0451 - H01L 2924/0466

Actinides, being a combination of two or more materials provided in the groups H01L 2924/0451 - H01L 2924/0466

Actinides, being a combination of two or more materials provided in the groups H01L 2924/0451 - H01L 2924/0466
periodic table

Oxides composed of metals from groups of the periodic table

Phosphides composed of metals from groups of the periodic table

Nitrides composed of metals from groups of the periodic table

Actinides

being a combination of two or more materials provided in the groups

H01L 2924/0471 - H01L 2924/0486

having a monocristalline microstructure

having a polycristalline microstructure

having an amorphous microstructure, i.e. glass

Nitrides composed of metals from groups of the periodic table

Actinides

being a combination of two or more materials provided in the groups

H01L 2924/0506 - H01L 2924/0506

having a monocristalline microstructure

having a polycristalline microstructure

having an amorphous microstructure, i.e. glass

Halides composed of metals from groups of the periodic table

2924/0532 . 2nd Group
2924/0533 . 3rd Group
2924/0534 . 4th Group
2924/05341 . TiO2
2924/05342 . ZrO2
2924/0535 . 5th Group
2924/0536 . 6th Group
2924/0537 . 7th Group
2924/0538 . 8th Group
2924/05381 . FeOx
2924/0539 . 9th Group
2924/054 . 10th Group
2924/0541 . 11th Group
2924/0542 . 12th Group
2924/0543 . 13th Group
2924/05432 . Al2O3
2924/0544 . 14th Group
2924/05442 . SiO2
2924/0545 . Lanthanides
2924/0546 . Actinides
2924/0549 . being a combination of two or more materials provided in the groups

H01L 2924/05491 - H01L 2924/05496

having a monocristalline microstructure

having a polycristalline microstructure

having an amorphous microstructure, i.e. glass

Chalcogenides other than oxygen i.e. sulfides, selenides and tellurides composed of metals from groups of the periodic table

2924/055 . 1st Group
2924/0552 . 2nd Group
2924/0553 . 3rd Group
2924/0554 . 4th Group
2924/0555 . 5th Group
2924/0556 . 6th Group
2924/0557 . 7th Group
2924/0558 . 8th Group
2924/0559 . 9th Group
2924/056 . 10th Group
2924/0561 . 11th Group
2924/0562 . 12th Group
2924/0563 . 13th Group
2924/0564 . 14th Group
2924/0565 . Lanthanides
2924/0566 . Actinides
2924/0569 . being a combination of two or more materials provided in the groups

H01L 2924/05691 - H01L 2924/0566

having a monocristalline microstructure

having a polycristalline microstructure

having an amorphous microstructure, i.e. glass

Halides composed of metals from groups of the periodic table

2924/0571 . 1st Group
2924/0572 . 2nd Group
2924/0573 . 3rd Group
2924/0574 . 4th Group
2924/0575 . 5th Group
2924/0576 . 6th Group
2924/0577 . 7th Group
2924/0578 . 8th Group
2924/0579 . 9th Group
2924/058  .  10th Group
2924/0581  .  11th Group
2924/0582  .  12th Group
2924/0583  .  13th Group
2924/0584  .  14th Group
2924/0585  .  Lanthanides
2924/0586  .  Actinides
2924/0589  .  being a combination of two or more materials provided in the groups H01L 2924/057 - H01L 2924/0586
2924/05891  .  having a monocristalline microstructure
2924/05892  .  having a polycristalline microstructure
2924/05894  .  having an amorphous microstructure, i.e. glass
2924/059  .  Being combinations of any of the materials from the groups H01L 2924/042 - H01L 2924/0584, e.g. oxynitrides
2924/0591  .  having a monocristalline microstructure
2924/05992  .  having a polycristalline microstructure
2924/05994  .  having an amorphous microstructure, i.e. glass
2924/06  .  Polymers (polymers per se C08; polymer adhesives C09J)
2924/061  .  Polyolefin polymer
2924/0615  .  Styrenic polymer
2924/062  .  Halogenated polymer
2924/0625  .  Polynyl alcohol
2924/063  .  Polyvinyl acetate
2924/0635  .  Acrylic polymer
2924/064  .  Graft polymer
2924/0645  .  Block copolymer
2924/065  .  ABS
2924/0655  .  Polycetal
2924/066  .  Phenolic resin
2924/0665  .  Epoxy resin
2924/067  .  Polyphenylene
2924/0675  .  Polyester
2924/068  .  Polycarbonate
2924/0685  .  Polyether
2924/069  .  Polyurethane
2924/0695  .  Polyamide
2924/07  .  Polycarbonate or polyimide
2924/07001  .  Polyamine
2924/07025  .  Polyimide
2924/0705  .  Sulfur containing polymer
2924/0715  .  Polysiloxane
2924/073  .  Adhesive characteristics other than chemical
2924/07302  .  not being an ohmic electrical conductor
2924/07381  .  being an ohmic electrical conductor
2924/073811  .  Extrinsic, i.e. with electrical conductive fillers
2924/073812  .  Intrinsic, e.g. polyaniline [PANI]
2924/0782  .  being pressure sensitive
2924/095  .  with a principal constituent of the material being a combination of two or more materials provided in the groups H01L 2924/013 - H01L 2924/0715
2924/0951  .  Glass epoxy laminates
2924/09511  .  FR-4
2924/09512  .  FR-5
2924/09522  .  G10
2924/09523  .  G11
2924/096  .  Cermets, i.e. composite material composed of ceramic and metallic materials
2924/097  .  Glass-ceramics, e.g. devitrified glass
2924/09701  .  Low temperature co-fired ceramic [LTCC]
2924/10  .  Details of semiconductor or other solid state devices to be connected
2924/1011  .  Structure
2924/1015  .  Shape
2924/10155  .  being other than a cuboid
2924/10156  .  at the periphery
2924/10157  .  at the active surface
2924/10158  .  at the passive surface
2924/1016  .  being a cuboid
2924/10161  .  with a rectangular active surface
2924/10162  .  with a square active surface
2924/1017  .  being a sphere
2924/102  .  Material of the semiconductor or solid state bodies
2924/1025  .  Semiconducting materials
2924/10251  .  Elemental semiconductors, i.e. Group IV
2924/10252  .  Germanium [Ge]
2924/10253  .  Silicon [Si]
2924/10254  .  Diamond [C]
2924/1026  .  Compound semiconductors
2924/1027  .  IV
2924/10271  .  Silicon-germanium [SiGe]
2924/10272  .  Silicon Carbide [SiC]
2924/1032  .  III-V
2924/10321  .  Aluminum arsenide [AlAs]
2924/10322  .  Aluminum phosphide [AlP]
2924/10323  .  Aluminum nitride [AlN]
2924/10324  .  Aluminum phosphide [AlP]
2924/10325  .  Boron nitride [BN], e.g. cubic, hexagonal, nanotube
2924/10326  .  Boron nitride [BN]
2924/10327  .  Boron arsenide [BAs, B13As2]
2924/10328  .  Gallium arsenide [GaAs]
2924/10329  .  Gallium arsenide [GaAs]
2924/1033  .  Gallium nitride [GaN]
2924/10331  .  Gallium phosphide [GaP]
2924/10332  .  Indium arsenide [InAs]
2924/10333  .  Indium arsenide [InAs]
2924/10334  .  Indium nitride [InN]
2924/10335  .  Indium phosphide [InP]
2924/10336  .  Aluminum gallium arsenide [AlGaAs]
2924/10337  .  Indium gallium arsenide [InGaAs]
2924/10338  .  Gallium arsenide phosphide [GaInP]
2924/10339  .  Aluminum indium arsenide [AlInAs]
2924/1034  .  Aluminum indium antimonide [AlInSb]
2924/10341  .  Gallium arsenide nitride [GaN]
2924/10342  .  Gallium arsenide nitride [GaAsN]
2924/10343  .  Gallium arsenide nitride [GaAsP]
2924/10344  .  Aluminum gallium arsenide [AlGaAs]
2924/10345  .  Aluminum gallium nitride [AlGaN]
2924/10346  .  Gallium arsenide phosphide [GaAsP]
2924/10347  .  Indium gallium arsenide [InGaAsP]
2924/10348  .  Gallium arsenide phosphide [GaAsP]
2924/10349  .  Gallium arsenide phosphide [AlGaN]
2924/1035  .  Gallium arsenide phosphide [GaAsP]
2924/10351  .  Gallium arsenide phosphide [GaAsP]
2924/10352  .  Gallium arsenide antimonide [InGaAsSb]
2924/10353  .  Gallium arsenide antimonide [InGaAsSb]
Passive devices, e.g. 2 terminal devices

- Resistor
- Inductor
- Optical Diode
- Rectifying Diode
- Schottky diode
- Gunn diode
- Varactor
- Zener diode
- PN diode
- Cat's whisker diode
- Point contact
- LED
- Rectifier
- Photo diode
- OLED
- Capacitor
- Inductor
- Resistor
- Discrete devices, e.g. 3 terminal devices
- Thyristor
- Anode Gate Thyristor [AGT]
- Bidirectional Control Thyristor [BCT]
H01L

2924/13014 . . . . . . Breakover Diode [BOD]
2924/13015 . . . . . . DIAC - Bidirectional trigger device
2924/13016 . . . . . . Dynistor - Unidirectional switching device
2924/13017 . . . . . . Shockley diode - Unidirectional trigger and switching device
2924/13018 . . . . . . SIDAC - Bidirectional switching device
2924/13019 . . . . . . Trisil, SIDACtor - Bidirectional protection devices
2924/1302 . . . . . . GTO - Gate Turn-Off thyristor
2924/13021 . . . . . . DB-GTO - Distributed Buffer Gate Turn-Off thyristor
2924/13022 . . . . . . MA-GTO - Modified Anode Gate Turn-Off thyristor
2924/13023 . . . . . . IGCT - Integrated Gate Commutated Thyristor
2924/13024 . . . . . . LASCR - Light Activated SCR, or LTT - Light triggered thyristor
2924/13025 . . . . . . Light Activated Semiconducting Switch [LASS]
2924/13026 . . . . . . MCT - MOSFET Controlled Thyristor - It contains two additional FET structures for on/off control
2924/13027 . . . . . . BRT - Base Resistance Controlled Thyristor
2924/13028 . . . . . . RCT - Reverse Conducting Thyristor
2924/13029 . . . . . . PUT or PUYT - Programmable Unijunction Transistor - A thyristor with gate on n-type layer near to the anode used as a functional replacement for unijunction transistor
2924/1303 . . . . . . SCS - Silicon Controlled Switch or Thyristor Tetrode - A thyristor with both cathode and anode gates
2924/13032 . . . . . . SITH - Static Induction Thyristor, or FCTh - Field Controlled Thyristor - containing a gate structure that can shut down anode current flow
2924/13033 . . . . . . TRIAC - Triode for Alternating Current - A bidirectional switching device containing two thyristor structures with common gate contact
2924/13034 . . . . . . Silicon Controlled Rectifier [SCR]
2924/13035 . . . . . . Asymmetrical SCR [ASCR]
2924/1304 . . . . . . Transistor
2924/1305 . . . . . . Bipolar Junction Transistor [BJT]
2924/13051 . . . . . . Heterojunction bipolar transistor [HBT]
2924/13052 . . . . . . Schottky transistor
2924/13053 . . . . . . Avalanche transistor
2924/13054 . . . . . . Darlington transistor
2924/13055 . . . . . . Insulated gate bipolar transistor [IGBT]
2924/13056 . . . . . . Photo transistor
2924/1306 . . . . . . Field-effect transistor [FET]
2924/13061 . . . . . . Carbon nanotube field-effect transistor [CNFET]
2924/13062 . . . . . . Junction field-effect transistor [JFET]
2924/13063 . . . . . . Metal-Semiconductor Field-Effect Transistor [MESFET]
2924/13064 . . . . . . High Electron Mobility Transistor [HEMT, HFET [heterostructure FET], MODFET]
2924/13066 . . . . . . Inverted-T field effect transistor [ITFET]
2924/13067 . . . . . . FinFET, source/drain region shapes fins on the silicon surface
2924/13068 . . . . . . Fast-reverse epitaxial diode field-effect transistor [FREDFET]
2924/13069 . . . . . . Thin film transistor [TFT]
2924/1307 . . . . . . Organic Field-Effect Transistor [OFET]
2924/13071 . . . . . . Ballistic transistor
2924/13072 . . . . . . Sensor FET
2924/13073 . . . . . . ion-sensitive field-effect transistor [ISFET]
2924/13074 . . . . . . Electrolyte-oxide-semiconductor field effect transistor [EOSFET], e.g. Neurochip
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 [GRNFET]
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 [DGOSFET]
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 . . . . . . . Multilayer 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 . . . . . . . PBRAM
2924/1445 . . . . . . . Read-only memory [ROM]
2924/1451 . . . . . . . EPROM
2924/14511 . . . . . . . EEPROM
2924/1453 . . . . . . . PROM
2924/146 . . . . . . . Mixed devices
2924/1461 . . . . . . . MEMS
2924/15 . . . . . . . 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
2924/15153 . . . . . . . the die mounting substrate comprising a recess for hosting the device
2924/15155 . . . . . . . the shape of the recess being other than a cuboid
2924/15156 . . . . . . . Side view
2924/15157 . . . . . . . Top view
2924/15158 . . . . . . . the die mounting substrate being other than a cuboid
2924/15159 . . . . . . . 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
2924/15182 . . . . . . . Fan-in arrangement of the internal vias
2924/15183 . . . . . . . in a single layer of the multilayer substrate
2924/15184 . . . . . . . in different layers of the multilayer substrate
2924/15192 . . . . . . . Resurf arrangement of the internal vias
2924/152 . . . . . . . Disposition
2924/153 . . . . . . . Connection portion
2924/1531 . . . . . . . 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
2924/1533 . . . . . . . the connection portion being formed both on the die mounting surface of the substrate and outside the die mounting surface of the substrate
2924/15331 . . . . . . . being a ball array, e.g. BGA
2924/15332 . . . . . . . being a pin array, e.g. PGA
2924/15333 . . . . . . . being a land array, e.g. LGA
2924/156 . . . . . . . Material
2924/157 . . . . . . . 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
2924/15701 . . . . . . . the principal constituent melting at a temperature of less than 400 C
2924/15717 . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950 C and less than 1550 C
2924/15724 . . . . . . . Aluminium [Al] as principal constituent
2924/15738 . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950 C and less than 1550 C
2924/15747 . . . . . . . Copper [Cu] as principal constituent
2924/15756 . . . . . . . Iron [Fe] as principal constituent
2924/15763 . . . . . . . the principal constituent melting at a temperature of greater than 1550 C
2924/15786 . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2924/15787 . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides
2924/15788 . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2924/1579 . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2924/15791 . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2924/15793 . . . . . . . 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
2924/15798 . . . . . . . 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
2924/161 . . . . . . . Cap
2924/1611 . . . . . . . Structure
2924/1615 . . . . . . . Shape

H01L
2924/16151 . . . . Cap comprising an aperture, e.g. for pressure control, encapsulation
2924/16152 . . . . Cap comprising a cavity for hosting the device, e.g. U-shaped cap
2924/16153 . . . . Cap enclosing a plurality of side-by-side cavities [e.g. E-shaped cap]
2924/1616 . . . . Cavity shape
2924/1617 . . . . Cavity coating
2924/16171 . . . . Material
2924/16172 . . . . 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
2924/16173 . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2924/16174 . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/16175)
2924/16175 . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2924/16176 . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2924/16177 . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2924/16178 . . . . 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
2924/16179 . . . . 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
2924/1619 . . . . Cavity coating shape
2924/16195 . . . . Flat cap [not enclosing an internal cavity]
2924/16196 . . . . Cap forming a cavity, e.g. being a curved metal foil
2924/162 . . . . Disposition
2924/16235 . . . . Connecting to a semiconductor or solid-state bodies, i.e. cap-to-chip
2924/16251 . . . . Connecting to an item not being a semiconductor or solid-state body, e.g. cap-to-substrate
2924/1626 . . . . Cap-in-cap assemblies
2924/1627 . . . . stacked type assemblies, e.g. stacked multicavities
2924/163 . . . . Connection portion, e.g. seal
2924/1631 . . . . Structure
2924/16315 . . . . Shape
2924/1632 . . . . Disposition
2924/164 . . . . Material

2924/165 . . . . 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
2924/16586 . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2924/16587 . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides
2924/16588 . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2924/1659 . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2924/16593 . . . . 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
2924/16598 . . . . 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
2924/166 . . . . Material
2924/167 . . . . 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
2924/16701 . . . . the principal constituent melting at a temperature of less than 400 C
2924/16717 . . . . the principal constituent melting at a temperature of greater than or equal to 400 C and less than 950 C
2924/16724 . . . . Aluminium [Al] as principal constituent
2924/16738 . . . . the principal constituent melting at a temperature of greater than or equal to 950 C and less than 1550 C
2924/16747 . . . . Copper [Cu] as principal constituent
2924/1676 . . . . Iron [Fe] as principal constituent
2924/16763 . . . . the principal constituent melting at a temperature of greater than 1550 C
2924/16786 . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2924/16787 . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides
2924/16788 . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2924/1679 . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2924/16791 . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2924/16793 . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2924/167 - H01L 2924/16791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
Encapsulation

Frame comprising an aperture, e.g. for pressure control, encapsulation

Disposition

Shape

Structure

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 the principal constituent melting at a temperature of less than 400 °C

the principal constituent melting at a temperature of greater than or equal to 400 °C and less than 950 °C

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

Copper [Cu] as principal constituent

Iron [Fe] as principal constituent

the principal constituent melting at a temperature of greater than 1550 °C

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

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 2924/177 - H01L 2924/1779, 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

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

2924/183 Encapsulation

2924/1811 Structure

2924/1815 Shape

2924/1816 Exposing the passive side of the semiconductor or solid-state body

2924/18161 of a flip chip

2924/18162 of a chip with build-up interconnect

2924/18165 of a wire bonded chip

2924/182 Disposition

2924/183 Connection portion, e.g. seal

2924/1804 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

2924/20103 Temperature range 60 C=<T<100 C, 333.15 K

2924/20104 Temperature range 100 C=<T<150 C, 373.15 K

2924/20105 Temperature range 150 C=<T<200 C, 423.15 K

2924/20106 Temperature range 200 C=<T<250 C, 473.15 K

2924/20107 Temperature range 250 C=<T<300 C, 523.15 K

2924/20108 Temperature range 300 C=<T<350 C, 573.15 K

2924/20109 Temperature range 350 C=<T<400 C, 623.15 K

2924/20110 Temperature range 400 C=<T<450 C, 673.15 K

2924/20111 Temperature range 450 C=<T<500 C, 723.15 K

2924/202 Electromagnetic wavelength ranges [W]
H01L.

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
2924/20263 . . . IR-C 3000 nm<=W<1 mm, i.e. 300 GHz-100THz
2924/2027 . . . Radio 1 mm - km 300 GHz - 3 Hz
2924/20271 . . . Microwave radiation 1 mm - 1 meter, i.e 300 GHz - 300 MHz
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
2924/20753 . . . larger or equal to 30 microns less than 40 microns
2924/20754 . . . larger or equal to 40 microns less than 50 microns
2924/20755 . . . larger or equal to 50 microns less than 60 microns
2924/20756 . . . larger or equal to 60 microns less than 70 microns
2924/20757 . . . larger or equal to 70 microns less than 80 microns
2924/20758 . . . larger or equal to 80 microns less than 90 microns
2924/20759 . . . larger or equal to 90 microns less than 100 microns
2924/2076 . . . equal to or larger than 100 microns
2924/30 . . . Technical effects
2924/301 . . . Electrical effects
2924/30101 . . . Resistance
2924/30105 . . . Capacitance
2924/30107 . . . Inductance
2924/3011 . . . Impedance
2924/30111 . . . matching
2924/302 . . . Electrostatic
2924/30201 . . . Charge
2924/30205 . . . Discharge
2924/3025 . . . Electromagnetic shielding
2924/35 . . . Mechanical effects
2924/351 . . . Thermal stress
2924/3511 . . . Warping
2924/3512 . . . Cracking
2924/35121 . . . Peeling or delaminating
2924/36 . . . Material effects
2924/364 . . . Polymers
2924/3641 . . . Outgassing
2924/365 . . . Metallurgical effects
2924/3651 . . . Formation of intermetallics
2924/36511 . . . Purple plague
2924/3656 . . . Formation of Kirkendall voids
2924/37 . . . Effects of the manufacturing process
2924/37001 . . . Yield
2924/37002 . . . Shelf life
2924/3701 . . . increased through put
2924/38 . . . Effects and problems related to the device integration
2924/381 . . . Pitch distance
2924/384 . . . Bump effects
2924/3841 . . . Solder bridging

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Details of apparatuses used for either manufacturing connectors or connecting the semiconductor or solid-state body

-LASER
-Mode
-being pulsed
-being continuous
-Beam details
-Shape
-Type
-being a chemical
-Deuterium Flouride [DF] LASER
-Hydrogen Flouride [HF] LASER
-Dye laser
-being a gas
-argon-ion LASER
-CO₂ LASER
-HeAg LASER
-HeNe LASER
-NeCu LASER
-being an Excimer
-ArF LASER
-F₂ LASER
-KrCl LASER
-KrF LASER
-XeCl LASER
-XeF LASER
-being a fiber hosted LASER
-being a solid state
-Free electron LASER
-Photonic crystal LASER
-Fiber solid state LASER
-Yttrium Aluminium Garnet Nd:YAG LASER
-Yttrium Lithium Flouride Nd:YLF LASER
-Ruby LASER
-Yb:YAG LASER
-Wavelength
-UV spectrum
-Visible spectrum
-IR spectrum

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