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, piezo-electric, electrostrictive, magnetostrictive, galvano-magnetic or bulk negative resistance effects and integrated circuit devices;
   - photoresistors, magnetic field dependent resistors, field effect resistors, capacitors with potential-jump barrier, resistors with potential-jump barrier or surface barrier, incoherent light emitting diodes and thin-film or thick-film circuits;
   - processes and apparatus adapted for the manufacture or treatment of such devices, except where such processes relate to single-step processes for which provision exists elsewhere.

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

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

WARNINGS

1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
   - H01L 21/301 covered by H01L 21/30
   - H01L 21/328 covered by H01L 29/66075
   - H01L 21/329 covered by H01L 29/66083
   - H01L 21/33 covered by H01L 29/66227
   - H01L 21/331 covered by H01L 29/66334
   - H01L 21/332 covered by H01L 29/66363
   - H01L 21/334 covered by H01L 29/66075
   - H01L 21/335 covered by H01L 29/66409
   - H01L 21/336 covered by H01L 29/66477
   - H01L 21/337 covered by H01L 29/66893
   - H01L 21/338 covered by H01L 29/66848
   - H01L 21/339 covered by H01L 29/66946
   - H01L 21/36-H01L 21/368 covered by H01L 21/02107
   - H01L 21/58 covered by H01L 24/80
   - H01L 21/60 covered by H01L 21/50, H01L 2021/60
   - H01L 21/66 covered by H01L 22/00
   - H01L 21/607 covered by H01L 21/50, H01L 2021/607
   - 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 21/98 covered by H01L 25/50
   - H01L 29/38 covered by H01L 29/04-H01L 29/365
   - H01L 29/96 covered by H01L 29/68-H01L 29/945
   - H01L 51/30 covered by H01L 51/0032
   - H01L 51/40 covered by H01L 51/0001
   - H01L 51/46 covered by H01L 51/0032
   - H01L 51/48 covered by H01L 51/0001
   - H01L 51/54 covered by H01L 51/0032

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

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

21/02 . . . Manufacture or treatment of semiconductor devices or of parts thereof

21/02002 . . . (Preparing wafers)

NOTES

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

2. This group does not cover:
   - simple use of grinding or polishing machines B24B
   - 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)]

CPC - 2020.05
WARNING

Groups H01L 21/0204 – H01L 21/0209 are incomplete pending reclassification of documents from groups H01L 21/06, H01L 21/16, and H01L 21/20.

Groups H01L 21/0210 – H01L 21/0269 are incomplete pending reclassification of documents from groups H01L 21/212, H01L 21/312, H01L 21/314, H01L 21/316, and H01L 21/318.

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

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

NOTE

Layers comprising sublayers, i.e. multi-layers, are additionally classified in H01L 21/022; porous layers are additionally classified in H01L 21/0203.
H01L 21/02164 (continued)

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

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

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

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

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

21/02178 . . . . . . (the material containing aluminium, e.g. Al₂O₃)

21/02181 . . . . . . (the material containing hafnium, e.g. HfO₂)

21/02183 . . . . . . (the material containing tantalum, e.g. Ta₂O₅)

21/02186 . . . . . . (the material containing titanium, e.g. TiO₂)

21/02189 . . . . . . (the material containing zirconium, e.g. ZrO₂)

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

21/02194 . . . . . . (the material containing more than one metal element)

21/02197 . . . . . . (the material having a perovskite structure, e.g. BaTiO₃)

21/022 . . . . . . (the layer being a laminate, i.e. composed of sublayers, e.g. stacks of alternating high-k metal oxides (adhesion layers or buffer layers H01L 21/02304, H01L 21/02362))

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)

21/02219 . . . . . . (the compound comprising silicon and nitrogen)

NOTE: This group does not cover mixtures of silane and nitrogen

21/02222 . . . . . . (the compound being a silazane)

21/02225 . . . . . . (characterised by the process for the formation of the insulating layer)

21/02227 . . . . . . (formation by a process other than a deposition process)

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

21/0223 . . . . . . (formation by oxidation, e.g. oxidation of the substrate)

21/02233 . . . . . . (of the semiconductor substrate or a semiconductor layer)

21/02236 . . . . . . (group IV semiconductor)

21/02238 . . . . . . (silicon in uncombined form, i.e. pure silicon)

21/02241 . . . . . . (III-V semiconductor)

21/02244 . . . . . . (of a metallic layer)

21/02247 . . . . . . (formation by nitridation, e.g. nitridation of the substrate)

21/02249 . . . . . . (formation by combined oxidation and nitridation performed simultaneously)

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

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

21/02258 . . . . . . (formation by anodic treatment, e.g. anodic oxidation)

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

21/02263 . . . . . . (deposition from the gas or vapour phase)

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

21/02266 . . . . . . (deposition by physical ablation of a target, e.g. sputtering, reactive sputtering, physical vapour deposition or pulsed laser deposition)
NOTE
Subject matter relating to molecular beam epitaxy is classified in this group.

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

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.

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 21/02337, H01L 21/02343, H01L 21/02345 and subgroups.

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.

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

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

[Substrates]
[Materials]
[Group 14 semiconducting materials]
[Carbon, e.g. diamond-like carbon]
[Silicon carbide]
[Silicon, silicon germanium, germanium]
[including tin]
[Group 13/15 materials]
[Nitrides]
[Phosphides]
[Arsenides]
[Antimonides]
[Group 12/16 materials]
[Oxides]
[Sulfides]
[Selenides]
[Tellurides]
[Oxide semiconducting materials not being Group 12/16 materials, e.g. ternary compounds]
[Other chalcogenide semiconducting materials not being oxides, e.g. ternary compounds]
[Insulating materials]
[Conductive materials]
[Structure]
[Layer structure]
[Monolayers]
[consisting of two layers]
[consisting of more than two layers]
[Alternating layers, e.g. superlattice]
[Graded layers]
[Microstructure]
[Crystal orientation]
[Deposited layers]
[Materials]
[Group 14 semiconducting materials]
[Carbon, e.g. diamond-like carbon]
[Silicon carbide]
[Silicon, silicon germanium, germanium]
[including tin]
[Group 13/15 materials]
[Nitrides]
[Phosphides]
[Arsenides]
[Antimonides]
[Group 12/16 materials]
[Oxides]
[Sulfides]
[Selenides]
[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-mono
crystalline 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 . . . . . . (Pendoeptaxy)
21/02653 . . . . . . (Vapour-deposition growth)
21/02656 . . . . . . (Special treatments)
21/02658 . . . . . . (Pretreatments (cleaning in general
H01L 21/024))

21/02661 . . . . . . (In-situ cleaning)
21/02664 . . . . . . (Aftertreatments (planarisation in general
H01L 21/304))

21/02667 . . . . . . (Crystallisation or recrystallisation of
non-mono
crystalline 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 conductive 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)
21/0283 . . . . (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
the devices having semiconductor bodies
comprising selenium or tellurium in
uncombined form other than as impurities in
the devices having semiconductor bodies
comprising crystalline silicon carbide
(multistep processes for the manufacture of
said devices H01L 29/66053)

[Passivating silicon carbide surfaces]

[Making n or p doped regions or layers, e.g.
using diffusion]

{Making electrodes}

{Joining of semiconductor bodies for
junction formation}

{Intermixing or interdiffusion or disordering
of III-V heterostructures, e.g. IILD}

{Characterised by the substrate,
and the substrate being of crystalline
insulating material, e.g. sapphire}

[Making n- or p-doped regions]
[Joining of semiconductor bodies for
junction formation]

{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)]

[Characterised by the substrate
(H01L 21/203, H01L 21/205,
H01L 21/208 take precedence)]

{Bipolar junctions}

{Conduction in semiconductor
materials, e.g. lattice
adaptation, heteroepitaxy}

{Preparation of the complete device, e.g.
electroforming, ageing}
H01L

21/2018 . . . . . . {Selective epilaxial 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 AIII BV compounds}

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

21/2053 . . . . . . {Epitaxial deposition of elements of Group IV of the Periodic System, e.g. Si, Ge}

21/2056 . . . . . . {Epitaxial deposition of AIII BV compounds}

21/208 . . . . . . {using liquid deposition}

21/2085 . . . . . . {Epitaxial deposition of AIII BV compounds}

21/22 . . . . . . {Diffusion of impurity materials, e.g. doping materials, electrode materials, or 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}

21/2205 . . . . . . {Diffusion into or out of AIII BV compounds}

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}

21/2251 . . . . . . {Diffusion into or out of group IV semiconductors}

21/2252 . . . . . . {using predeposition of impurities into the semiconductor surface, e.g. from a gaseous phase}

21/2253 . . . . . . {by ion implantation}

**NOTE**

In groups H01L 21/2254 - H01L 21/2257 one should consider the main compositional parts of the applied layer just before the diffusion step

21/2254 . . . . . . {from or through or into an applied layer, e.g. photore sist, nitrides}

21/2255 . . . . . . {the applied layer comprising oxides only, e.g. P2O5, PSG, HfBO4, 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}

21/2258 . . . . . . {using diffusion into or out of a solid from or into a liquid phase, e.g. alloy diffusion processes}

21/24 . . . . . . {Alloying of impurity materials, e.g. doping materials, electrode materials, with a semiconductor body}

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}

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}

21/2633 . . . . . . {for etching, e.g. sputteretching}

21/2636 . . . . . . {for heating, e.g. electron beam heating}

21/265 . . . . . . {producing ion implantation (ion beam tubes for localised treatment H01J 37/30)}

21/26506 . . . . . . {in group IV semiconductors}

21/26513 . . . . . . {of electrically active species}

21/2652 . . . . . . {Through-implantation}

21/26526 . . . . . . {Recoil-implantation}

21/26533 . . . . . . {of electrically inactive species in silicon to make buried insulating layers}

21/2654 . . . . . . {in AIII BV compounds}

21/26546 . . . . . . {of electrically active species}

21/26553 . . . . . . {Through-implantation}

21/26556 . . . . . . {characterised by the implantation of both electrically active and inactive species in the same semiconductor region to be doped}

21/26566 . . . . . . {of a cluster, e.g. using a gas cluster ion beam}

2021/26573 . . . . . . {in diamond}

21/2658 . . . . . . {of a molecular ion, e.g. decaborane}

21/26586 . . . . . . {characterised by the angle between the ion beam and the crystal planes or the main crystal surface}
[at a temperature lower than room temperature]

using masks (H01L 21/26586 takes precedence)

using electromagnetic radiation, e.g. laser radiation

[using X-ray lasers]

[using incoherent radiation]

Manufacture of electrodes on semiconductor bodies using processes or apparatus not provided for in groups H01L 21/20 - H01L 21/268 (etching for patterning the electrodes H01L 21/311, H01L 21/321; multistep manufacturing processes for data storage electrodes H01L 29/4011)

(Making conductor-insulator-semiconductor electrodes)

{ the insulator being formed after the semiconductor body, the semiconductor being silicon

NOTE

This group covers deposition of the insulators, including epitaxial insulators, and the conductors within the same process or chamber

(characterised by the conductor (H01L 21/28176 takes precedence))

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

{ the final conductor layer next to the insulator being silicon, e.g. polysilicon, with or without impurities (H01L 21/28105 takes precedence)

NOTE

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

{ the conductor comprising at least another non-silicon conductive layer

{ the conductor comprising a silicide layer formed by the silicidation reaction of silicon with a metal layer (formed by metal ion implantation H01L 21/28044)

{ the conductor comprising a metal or metallic silicide formed by deposition, e.g. sputter deposition, i.e. without a silicidation reaction (H01L 21/28052 takes precedence)

NOTE

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

{ the final conductor layer next to the insulator being Si or Ge or C and their alloys except Si

{ the final conductor layer next to the insulator being a single metal, e.g. Ta, W, Mo, Al

{ the final conductor layer next to the insulator being a composite, e.g. TiN

{ the final conductor layer next to the insulator having a lateral composition or doping variation, or being formed laterally by more than one deposition step

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

NOTE

Documents are also classified in groups H01L 21/28035 - H01L 21/2810 when the composition is also relevant

{ 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

{ 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

Making conductor-insulator-semiconductor electrodes

NOTE

This group covers deposition of the insulators, including epitaxial insulators, and the conductors within the same process or chamber
21/28176 . . . . . . . [with a treatment, e.g. annealing, after the formation of the definitive gate conductor]
21/28185 . . . . . . . [with a treatment, e.g. annealing, after the formation of the gate insulator and before the formation of the definitive gate conductor]
21/28194 . . . . . . . [by deposition, e.g. evaporation, ALD, CVD, sputtering, laser deposition (H01L 21/28202 takes precedence)]
21/28202 . . . . . . . [in a nitrogen-containing ambient, e.g. nitride deposition, growth, oxynitridation, NH3 nitridation, N2O oxidation, thermal nitridation, RTN, plasma nitridation, RPN]
21/28211 . . . . . . . [in a gaseous ambient using an oxygen or a water vapour, e.g. RTO, possibly through a layer (H01L 21/28194 and H01L 21/28202 take precedence)]

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

21/2822 . . . . . . . [with substrate doping, e.g. N, Ge, C implantation, before formation of the insulator]
21/28229 . . . . . . . [by deposition of a layer, e.g. metal, metal compound or polysilicon, followed by transformation thereof into an insulating layer]
21/28238 . . . . . . . [with sacrificial oxide]
21/28247 . . . . . . . [passivation or protection of the electrode, e.g. using re-oxidation]
21/28255 . . . . . . . [the insulator being formed after the semiconductor body, the semiconductor belonging to Group IV and not being elemental silicon, e.g. Ge, SiGe, SiGeC]
21/28264 . . . . . . . [the insulator being formed after the semiconductor body, the semiconductor being a III-V compound]
21/283 . . . . . . . Deposition of conductive or insulating materials for electrodes [conducting electric current]
21/285 . . . . . . . from a gas or vapour, e.g. condensation
21/28506 . . . . . . . [of conductive layers]
21/28512 . . . . . . . [on semiconductor bodies comprising elements of Group IV of the Periodic System]
21/28518 . . . . . . . [the conductive layers comprising silicides (H01L 21/28537 takes precedence)]
21/28525 . . . . . . . [the conductive layers comprising semiconducting material (H01L 21/28518, H01L 21/28537 take precedence)]
21/28531 . . . . . . . [Making of side-wall contacts]
21/28537 . . . . . . . [Deposition of Schottky electrodes]
21/2855 . . . . . . . [by physical means, e.g. sputtering, evaporation (H01L 21/28518 - H01L 21/28537 and H01L 21/28568 take precedence)]
21/28566 . . . . . . . [by chemical means, e.g. CVD, LPCVD, PECVD, laser CVD (H01L 21/28518 - H01L 21/28537 and H01L 21/28568 take precedence)]
21/28562 . . . . . . . [Selective deposition]
21/28568 . . . . . . . [the conductive layers comprising transition metals (H01L 21/28518 takes precedence)]
21/28575 . . . . . . . [on semiconductor bodies comprising A8B5 compounds]
21/28581 . . . . . . . [Deposition of Schottky electrodes]
21/28587 . . . . . . . [characterised by the sectional shape, e.g. T, inverted T]
21/28593 . . . . . . . [asymmetrical sectional shape]
21/288 . . . . . . . from a liquid, e.g. electrolytic deposition
21/2885 . . . . . . . [using an external electrical current, i.e. electro-deposition]
21/30 . . . . . . . Treatment of semiconductor bodies using processes or apparatus not provided for in groups H01L 21/20 - H01L 21/26 (manufacture of electrodes thereon H01L 21/28)
21/3003 . . . . . . . [Hydrogenation or deuterisation, e.g. using atomic hydrogen from a plasma]
21/3006 . . . . . . . [of A8B5 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)
21/3064 . . . . . . . [Chemical etching]
21/3068 . . . . . . . [Anisotropic liquid etching (H01L 21/3063 takes precedence)]
21/30612 . . . . . . . [Etching of A8B5 compounds]
21/30617 . . . . . . . [Anisotropic liquid etching]
21/30621 . . . . . . . [Vapour phase etching]
21/30625 . . . . . . . [With simultaneous mechanical treatment, e.g. mechano-chemical polishing]
21/3063 . . . . . . . Electrolytic etching
layers

H01L 21/56

masking or by using photolithographic techniques (layers forming electrodes

H01L 21/28; encapsulating layers

H01L 21/56): After treatment of these layers

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]

21/31 . . . . . . . Etching the insulating layers

(by chemical or physical means

(H01L 21/31058 takes precedence))

21/31105 . . . . . . . [Etching inorganic layers]

21/31111 . . . . . . . [by chemical means]

21/31116 . . . . . . . [by dry-etching]

21/31122 . . . . . . . [of layers not containing Si, e.g. PZT, Al2O3]

21/31127 . . . . . . . [Etching organic layers]

21/31133 . . . . . . . [by chemical means]

21/31138 . . . . . . . [by dry-etching]

21/31144 . . . . . . . [using masks]

21/3115 . . . . . . . Doping the insulating layers

21/31155 . . . . . . . [by ion implantation]

21/312 . . . . . . . Organic layers, e.g. photoresist

(H01L 21/3105, H01L 21/32 take precedence; (photoresists per se G03C))

WARNING

Groups H01L 21/312 –

H01L 21/328 are no longer used for the classification of documents as of May 1, 2011. The content of these groups is being reclassified into groups H01L 21/02107 –

H01L 21/02326.

Groups H01L 21/02107 –

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

21/3121 . . . . . . . [Layers comprising organo-silicon compounds]

21/3122 . . . . . . . [layers comprising polysiloxane compounds]

21/3124 . . . . . . . [layers comprising hydrogen silsesquioxane]

21/3125 . . . . . . . [layers comprising silazane compounds]

21/3127 . . . . . . . [Layers comprising fluoro (hydro)carbon compounds, e.g. polytetrafluoroethylene]

21/3128 . . . . . . . [by Langmuir-Blodgett techniques]

21/314 . . . . . . . Inorganic layers (H01L 21/3105, H01L 21/32 take precedence)

WARNING

Groups H01L 21/314 –

H01L 21/3185 are no longer used for the classification of documents as of May 1, 2011. The content of these groups is being reclassified into groups H01L 21/02107 –

H01L 21/02326.

Groups H01L 21/02107 –

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

21/3141 . . . . . . . [Deposition using atomic layer deposition techniques [ALD]]

21/3142 . . . . . . . [of nano-laminates, e.g. alternating layers of Al2O3-HfO2]

21/3143 . . . . . . . [composed of alternated layers or of mixtures of nitriles and oxides or of oxinitrides, e.g. formation of oxinitride by oxidation of nitride layers]

21/3144 . . . . . . . [on silicon]

21/3145 . . . . . . . [formed by deposition from a gas or vapour]

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

21/3147 . . . . . . . [Epitaxial deposition of insulating materials]

21/3148 . . . . . . . [Silicon Carbide layers]

2021/3149 . . . . . . . [Langmuir-Blodgett techniques]
H01L

21/316 ......... composed of oxides or glassy oxides or oxide based glass

**WARNING**

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

21/31604 ......... {Deposition from a gas or vapour (H01L 21/31691, H01L 21/31695 take precedence)}

21/31608 ......... {Deposition of SiO$_2$ (H01L 21/31625, H01L 21/31629 and H01L 21/31633 take precedence)}

21/31612 ......... [on a silicon body]

21/31616 ......... {Deposition of Al$_2$O$_3$}

21/3162 ......... [on a silicon body]

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

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

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

21/31637 ......... {Deposition of Tantalum oxides, e.g. Ta$_2$O$_5$}

21/31641 ......... {Deposition of Zirconium oxides, e.g. ZrO$_2$}

21/31645 ......... {Deposition of Hafnium oxides, e.g. HfO$_2$}

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

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

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

21/31662 ......... {of silicon in uncombined form}

21/31666 ......... {of AlIII BV compounds}

21/3167 ......... {of anodic oxidation}

21/31675 ......... {of silicon}

21/31679 ......... {of AlIII BV compounds}

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

21/31687 ......... {by anodic oxidation}

21/31691 ......... {with perovskite structure}

21/31695 ......... {Deposition of porous oxides or porous glassy oxides or oxide based porous glass}

21/318 ......... composed of nitrides

**WARNING**

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

21/3185 ......... {of silicon nitrides}

21/32 ......... using masks

21/3205 ......... Deposition of non-insulating-, e.g. conductive- or resistive-, layers on insulating layers; After-treatment of these layers (manufacture of electrodes H01L 21/28)

21/32051 ......... {Deposition of metallic or metal-silicide layers}

21/32053 ......... {of metal-silicide layers}

21/32055 ......... {Deposition of semiconductive layers, e.g. poly - or amorphous silicon layers}

21/32056 ......... {Deposition of conductive or semi-conductive organic layers (H01L 21/32058 takes precedence)}

21/32058 ......... {Deposition of superconductive layers}

21/321 ......... After treatment

21/32105 ......... {Oxidation of silicon-containing layers}

21/3211 ......... {Nitridation of silicon-containing layers}

21/32115 ......... {Planarisation}

21/3212 ......... {by chemical mechanical polishing [CMP]}

21/32125 ......... {by simultaneously passing an electrical current, i.e. electrochemical mechanical polishing, e.g. ECMP}

21/3213 ......... Physical or chemical etching of the layers, e.g. to produce a patterned layer from a pre-deposited extensive layer

21/32131 ......... {by physical means only}

21/32132 ......... {of silicon-containing layers}

21/32133 ......... {by chemical means only}

21/32134 ......... {by liquid etching only}

21/32135 ......... {by vapour etching only}

21/32136 ......... {using plasmas}

21/32137 ......... {of silicon-containing layers}
Doping the layers

[21/3139]

Doping the layers

[21/315]

Doping the layers

[21/3155]

[Doping polycrystalline - or amorphous silicon layers]

[21/322]

to modify their internal properties, e.g. to produce internal imperfections

[21/3221]

{of silicon bodies, e.g. for gettering}

[21/3223]

{using cavities formed by hydrogen or noble gas ion implantation}

[21/3225]

[Thermally inducing defects using oxygen present in the silicon body for intrinsic gettering (H01L 21/3226 takes precedence)]

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 21/005, H01L 21/045), 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
21/477 . . . . . . 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)
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)
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 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:)}

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}
H01L

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, glassing, 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]
H01L

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 21/67721 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 waers]
21/67781 . . . . [Batch transfer of wafers]
21/67784 . . . . [using air tracks]
21/67787 . . . . [with angular orientation of the workpieces]
21/67789 . . . . [the workpieces being stored in a carrier, involving loading and unloading]
21/67793 . . . . [with orientating and positioning by means of a vibratory bowl or track]
21/67796 . . . . [with angular orientation of workpieces (H01L 21/67787 and H01L 21/6793 take precedence)]
21/68 . . . . for positioning, orientation or alignment (for conveying H01L 21/677)
21/681 . . . . [using optical controlling means]
21/682 . . . . [Mask-wafer alignment (in general G03F 7/70, G03F 9/70)]
21/683 . . . . [for supporting or gripping (for conveying H01L 21/677, for positioning, orientation or alignment H01L 21/68)]
21/6831 . . . . [using electrostatic chucks]
21/6833 . . . . [Details of electrostatic chucks]
21/6835 . . . . [using temporarily an auxiliary support]

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

21/6836 . . . . [Wafer tapes, e.g. grinding or dicing support tapes (adhesive tapes in general C09J 7/20)]
21/6838 . . . . [with gripping and holding devices using a vacuum; Bernoulli devices]
21/687 . . . . [using mechanical means, e.g. chucks, clamps or pinches (using electrostatic chucks H01L 21/6831)]
21/6870 . . . . [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 carousell]
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 21/273, 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 AIII-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 AIII BV compounds]
21/7607 . . . . . [between components manufactured in an active substrate comprising AIV 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]
21/76202 . . . . . [using a local oxidation of silicon, e.g. LOCOS, SWAMI, SILO (H01L 21/76235 takes precedence; together with vertical isolation, e.g. LOCOS in a SOI substrate, H01L 21/76264)]
21/76205 . . . . . [in a region being recessed from the surface, e.g. in a recess, groove, tub or trench region]
21/76208 . . . . . [using auxiliary pillars in the recessed region, e.g. to form LOCOS over extended areas]
21/7621 . . . . . [the recessed region having a shape other than rectangular, e.g. rounded or oblique shape (H01L 21/76208 takes precedence)]
21/76213 . . . . . [introducing electrical inactive or active impurities in the local oxidation region, e.g. to alter LOCOS oxide growth characteristics or for additional isolation purpose]
21/76216 . . . . . [introducing electrical active impurities in the local oxidation region for the sole purpose of creating channel stoppers]
21/76218 . . . . . [introducing both types of electrical active impurities in the local oxidation region for the sole purpose of creating channel stoppers, e.g. for isolation of complementary doped regions]
21/76221 . . . . . [with a plurality of successive local oxidation steps]
21/76224 . . . [using trench refilling with dielectric materials (trench filling with polycrystalline silicon H01L 21/763; together with vertical isolation, e.g. trench refilling in a SOI substrate H01L 21/76264)]
21/76227 . . . . . [the dielectric materials being obtained by full chemical transformation of non-dielectric materials, such as polycrystalline silicon, metals]
21/76229 . . . [Concurrent filling of a plurality of trenches having a different trench shape or dimension, e.g. rectangular and V-shaped trenches, wide and narrow trenches, shallow and deep trenches]
21/76232 . . . . . [of trenches having a shape other than rectangular or V-shape, e.g. rounded corners, oblique or rounded trench walls (H01L 21/76229 takes precedence)]
21/76235 . . . . . [trench shape altered by a local oxidation of silicon process step, e.g. trench corner rounding by LOCOS]
21/76237 . . . . . [introducing impurities in trench side or bottom walls, e.g. for forming channel stoppers or alter isolation behavior]
21/7624 . . . [using semiconductor on insulator (SOI) technology (H01L 21/76297 takes precedence; manufacture of integrated circuits on insulating substrates H01L 21/84; silicon on sapphire [SOS] technology H01L 21/86)]
21/76243 . . . . . [using silicon implanted buried insulating layers, e.g. oxide layers, i.e. SIMOX techniques]
21/76245 . . . . . [using full isolation by porous oxide silicon, i.e. FIPOS techniques]
21/76248 . . . . . [using lateral overgrowth techniques, i.e. ELO techniques]
21/76251 . . . . . [using bonding techniques]
21/76254 . . . . . [with separation/delamination along an ion implanted layer, e.g. Smart-cut, Unibond]
21/76256 . . . . . [using silicon etch back techniques, e.g. BESOI, ELTRAN]
21/76259 . . . . . [with separation/delamination along a porous layer]
21/76262 . . . . . [using selective deposition of single crystal silicon, i.e. SEG techniques]
NOTE

Groups

H01L 21/768 - H01L 21/76898 (cover)

multi-step processes for manufacturing interconnections. Information peculiar to single-step processes should also be classified in the corresponding group, e.g.

- cleaning H01L 21/02041
- etching H01L 21/311, H01L 21/3213
- masking H01L 21/027, H01L 21/033, H01L 21/31144, H01L 21/32139
- planarizing H01L 21/3105, H01L 21/321

[characterised by the formation of the after-treatment of the dielectrics, e.g. smoothing]

H01L 21/76801

[by forming openings in dielectrics]

H01L 21/76802

[by forming tapered via holes]

H01L 21/76804

[the opening being a via or contact hole penetrating the underlying conductor]

H01L 21/76805

[for dual damascene structures]

H01L 21/76807

[involved intermediate temporary filling with material]

H01L 21/76808

[involved one or more buried masks]

H01L 21/7681

[involved multiple stacked pre-patterned masks]

H01L 21/76811

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

H01L 21/76814

[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)]

H01L 21/76816

[using printing or stamping techniques]

H01L 21/76817

[Smoothing of the dielectric (planarisation of insulating materials per se H01L 21/31051)]

H01L 21/76819

[the dielectric comprising air gaps]

H01L 21/7682

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

H01L 21/76823

[transforming an insulating layer into a conductive layer]

H01L 21/76825

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

H01L 21/76826

(by contacting the layer with gases, liquids or plasmas)

H01L 21/76828

[thermal treatment]

H01L 21/76829

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

H01L 21/76831

[in via holes or trenches, e.g. non-conductive sidewall liners]

H01L 21/76832

[Multiple layers]

H01L 21/76834

[Formation of thin insulating films on the sidewalls or on top of conductors (H01L 21/76831 takes precedence)]

H01L 21/76835

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

H01L 21/76837

[Filling up the space between adjacent conductive structures; Gap-filling properties of dielectrics]

H01L 21/76838

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

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

H01L 21/7684

[Smoothing; Planarisation]

H01L 21/76841

[Barrier, adhesion or liner layers]

H01L 21/76843

[formed in openings in a dielectric]

H01L 21/76844

[Bottomless liners]

H01L 21/76846

[Layer combinations]
Material, e.g. pillars, studs

Deposition of protective insulating layers

By forming conductive members before filling of holes, grooves or trenches, e.g. conductive material

Post-treatment or after-treatment of the better fill the contact hole

H01L 21/0272

Layer, e.g. lift-off (lift-off per se general H01L 21/288)

Plating (plating on semiconductors in C.V.D. on semiconductor material, material in the vias, e.g. selective for PVD, CVD or deposition from a liquids (PVD H01L 21/2855; CVD H01L 21/28556; deposition from liquids H01L 21/288))

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 21/288)

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

By rendering at least a portion of the conductor non conductive, e.g. oxidation

By forming silicides of refractory metals

By forming superconducting materials

Modifying the pattern

[using a laser, e.g. laser cutting, laser direct writing, laser repair]

Local interconnects; Local pads, as exemplified by patent document EP0896365

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)

[formed through a semiconductor substrate]

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 27/11; 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

Comprising a plurality of TFTs on a non-semiconducting substrate, e.g. driving circuits for AMLCDs

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)

[invoking the separation of the active layers from a substrate]

[leaving a reusable substrate, e.g. epitaxial lift off]

To produce devices, each consisting of a single circuit element (H01L 21/82 takes precedence)

The substrate being a semiconductor body
each consisting of a plurality of components to produce devices, e.g. integrated circuits, the substrate being other than a semiconductor body, e.g. insulating body.

(21/8206) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8213) (with the substrate being a semiconductor, using SiC technology (H01L 21/8258 takes precedence))

(21/822) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8221) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8222) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8224) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8226) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8228) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/82285) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8229) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8232) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8234) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823406) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823412) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823418) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823425) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823431) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823437) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823443) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/82345) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823456) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823462) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823468) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823475) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823481) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823487) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823493) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/8238) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823807) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823814) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823821) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823828) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823835) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/823842) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))

(21/82385) (with the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence))
Parts as such; Structural arrangements therefor
of parts without further processing to modify the
treatment; Reliability measurements, i.e. testing or
measuring during manufacture or treatment, or specially adapted for reliability
measurements
Connection or disconnection of sub-entities or redundant parts of a device in response to a measurement (testing and repair of stores after manufacture including at wafer scale G01C 29/00; fuses per se H01L 23/525)
Optical enhancement of defects or not directly visible states, e.g. selective electrolytic deposition, bubbles in liquids, light emission, colour change (voltage contrast G01R 31/311)
Acting in response to an ongoing measurement without interruption of processing, e.g. endpoint detection, in-situ thickness measurement (endpoint detection arrangements in CMP apparatus B24B 37/013, in discharge apparatus H01J 37/32)
Structural arrangements specially adapted for testing or measuring during manufacture or treatment, or especially adapted for reliability measurements
Additional lead-in metallisation on a device or substrate, e.g. additional pads or pad portions, lines in the scribe line, sacrificed conductors (arrangements for conducting electric current to or from the solid state body in operation H01L 23/48)
Circuits for electrically characterising or monitoring manufacturing processes, e.g. whole test die, wafers filled with test structures, on-board-devices incorporated on each die, process control monitors or pad structures thereof, devices in scribe line (switching, multiplexing, gating devices G01R 19/25; process control with lithography, e.g. dose control, G03F 7/20; structures for alignment control by optical means G03F 7/0633)
Details of semiconductor or other solid state devices (H01L 25/00) takes precedence (; structural arrangements for testing or measuring during manufacture or treatment, or for reliability measurements H01L 22/00; arrangements for connecting or disconnecting semiconductor or solid-state bodies, or methods related thereto H01L 24/00; finger print sensors G06K 9/00006)
NOTE
This group does not cover:
• details of semiconductor bodies or of electrodes of devices provided for in group H01L 29/00, which details are covered by that group;
• details peculiar to devices provided for in a single main group of groups
H01L

H01L 23/00 (continued)

H01L 31/00 - H01L 51/00, which details are covered by those groups.

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 nitrides or carbides, e.g. ceramics, glass]

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

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

23/296 . . . [Organo-silicon 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 23/3178 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 H05K)

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]
Cooling facilitated by selection of materials for the device (or materials for thermal expansion adaptation, e.g. carbon)

23/373

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

23/3731

[having a heterogeneous or anisotropic structure, e.g. powder or fibres in a matrix, wire mesh, porous structures (H01L 23/3732, H01L 23/3737, H01L 23/3738 take precedence)]

23/3732

[Diamonds]

23/3733

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

23/3735

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

23/3736

[Organic materials with or without a thermococonductive filler]

23/3737

[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 25/000)]

2023/4018

[characterised by the type of device to be heated or cooled]

2023/4025

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

2023/4031

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

2023/4037

[characterised by thermal path or place of attachment of heatsink]

2023/4043

[heatsink to have chip]

2023/405

[heatsink to package]

2023/4056

[heatsink to additional heatsink]

2023/4062

[heatsink to or through board or cabinet]

2023/4068

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

2023/4075

[Mechanical elements]

2023/4081

[Compliant clamping elements not primarily serving heat-conduction]

2023/4087

[Mounting accessories, interposers, clamping or screwing parts]

23/4093

[Snap-on arrangements, e.g. clips]

23/42

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

23/427

[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

[involve 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 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

[Bores 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-foils 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])
23/49822 . . . . . (Multilayer substrates (multilayer metallisation on monolayer substrate (H01L 23/4981))
23/49827 . . . . . (Via connections through the substrates, e.g. pins going through the substrate, coaxial cables (H01L 23/49822, H01L 23/49833, H01L 23/49835, H01L 23/49861 take precedence))
23/49833 . . . . . (the chip support structure consisting of a plurality of insulating substrates)
23/49838 . . . . . (Geometry or layout)
23/49844 . . . . . (for devices being provided for in H01L 29/00)
23/4985 . . . . . (Flexible insulating substrates (H01L 23/49572 and H01L 23/49555 take precedence))
23/49855 . . . . . (for flat-cards, e.g. credit cards (cards per se G06K 19/00))
23/49861 . . . . . (Lead-frames fixed on or encapsulated in insulating substrates (H01L 23/4985, H01L 23/49805 take precedence))
23/49866 . . . . . (characterised by the materials (materials of the substrates H01L 23/14, of the lead-frames H01L 23/49579))
23/49872 . . . . . (the conductive materials containing semiconductor material)
23/49877 . . . . . (Carbon, e.g. fullerenes (superconducting fullerenes H01L 39/123))
23/49883 . . . . . (the conductive materials containing organic materials or pastes, e.g. for thick films (for printed circuits H05K 1/092))
23/49888 . . . . . (the conductive materials containing superconducting material)
23/49894 . . . . . (Materials of the insulating layers or coatings)
23/50 . . . for integrated circuit devices, (e.g. power bus, number of leads) (H01L 23/482 - H01L 23/498 take precedence)
23/52 . . . Arrangements for conducting electric current within the device in operation from one component to another, {i.e. interconnections, e.g. wires, lead frames (optical interconnections G02B 6/00)}
23/522 . . . including external interconnections consisting of a multilayer structure of conductive and insulating layers inseparably formed on the semiconductor body
23/5221 . . . (Crossover interconnections)
23/5222 . . . (Capacitive arrangements or effects of, or between wiring layers (other capacitive arrangements H01L 23/642))
23/5223 . . . (Capacitor integral with wiring layers)
23/5225 . . . (Shielding layers formed together with wiring layers)
23/5226 . . . (Via connections in a multilevel interconnection structure)
23/5227 . . . (Inductive arrangements or effects of, or between, wiring layers (other inductive arrangements H01L 23/645))
23/5228 . . . (Resistive arrangements or effects of, or between, wiring layers (other resistive arrangements H01L 23/647))
23/525 . . . with adaptable interconnections
23/5252 . . . (comprising anti-fuses, i.e. connections having their state changed from non-conductive to conductive)
23/5254 . . . . (the change of state resulting from the use of an external beam, e.g. laser beam or ion beam)
23/5256 . . . . (comprising fuses, i.e. connections having their state changed from conductive to non-conductive)
23/5258 . . . . (the change of state resulting from the use of an external beam, e.g. laser beam or ion beam)
23/5258 . . . . [Geometry or] layout of the interconnection structure ([H01L 27/0207 takes precedence; algorithms G06F 30/00)]
23/5258 . . . . [Cross-sectional geometry]
23/5258 . . . . [Arrangements of power or ground buses]
23/5312 . . . . characterised by the materials
23/53204 . . . . [Conductive materials]
23/53209 . . . . [based on metals, e.g. alloys, metal silicides (H01L 23/5385 takes precedence)]
23/53214 . . . . [the principal metal being aluminium]
23/53219 . . . . [Aluminium alloys]
23/53223 . . . . [Additional layers associated with aluminium layers, e.g. adhesion, barrier, cladding layers]
23/53228 . . . . [the principal metal being copper]
23/53233 . . . . [Copper alloys]
23/53238 . . . . [Additional layers associated with copper layers, e.g. adhesion, barrier, cladding layers]
23/53242 . . . . [the principal metal being a noble metal, e.g. gold]
23/53247 . . . . [Noble-metal alloys]
23/53252 . . . . [Additional layers associated with noble-metal layers, e.g. adhesion, barrier, cladding layers]
23/53257 . . . . [the principal metal being a refractory metal]
23/53259 . . . . [Sputtering]
23/53261 . . . . [Refractory-metal alloys]
23/53266 . . . . [Additional layers associated with refractory-metal layers, e.g. adhesion, barrier, cladding layers]
23/53271 . . . . [containing semiconductor material, e.g. polysilicon]
23/53276 . . . . [containing carbon, e.g. fullerenes (superconducting fullerenes H01L 39/123)]
23/5328 . . . . [containing conductive organic materials or pastes, e.g. conductive adhesives, inks]
23/53285 . . . . [containing superconducting materials]
23/5329 . . . . [Insulating materials]
23/53295 . . . . [Stacked insulating layers]
23/535 . . . . including internal interconnections, e.g. cross-under constructions ([internal lead connections H01L 23/481])
23/538 . . . . the interconnection structure between a plurality of semiconductor chips being formed on, or in, insulating substrates ([H05K takes precedence; manufacture or treatment H01L 21/4846; mountings per se H01L 23/142; (materials H01L 23/4986)])
23/5381 . . . . [Crossover interconnections, e.g. bridge stepovers]
23/5382 . . . . [Adaptable interconnections, e.g. for engineering changes]
23/5383 . . . . [Multilayer substrates (H01L 23/5385 takes precedence; multilayer metallisation on monolayer substrates H01L 23/538)]
23/5384 . . . . [Conductive vias through the substrate with or without pins, e.g. buried coaxial conductors (H01L 23/5383, H01L 23/5385 take precedence; pins attached to insulating substrates H01L 23/49811)]
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, layout 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 22/23/544 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
H01L

H01L 23/66

(continued)

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 23/5389;
   • structural electrical arrangements, which are covered by groups H01L 24/080 - H01L 23/666;
   • assemblies of semiconductor or other solid state devices, which are covered by groups H01L 25/000 - 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.

24/02

{Bonding areas (on insulating substrates, e.g. chip carriers, H01L 23/49816, H01L 23/49838, H01L 23/5389; Manufacturing methods related thereto)}

WARNING

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

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

24/03

{Manufacturing methods}

24/04

{Structure, shape, material or disposition of the bonding areas prior to the connecting process}

24/05

{of an individual bonding area}

24/06

{of a plurality of bonding areas}

24/07

{Structure, shape, material or disposition of the bonding areas after the connecting process}

24/08

{of an individual bonding area}

24/09

{of a plurality of bonding areas}

24/10

{Bump connectors (bumps on insulating substrates, e.g. chip carriers, H01L 23/49816; Manufacturing methods related thereto)}

24/11

{Manufacturing methods (for bumps on insulating substrates H01L 21/4853)}

24/12

{Structure, shape, material or disposition of the bump connectors prior to the connecting process}

24/13

{of an individual bump connector}

24/14

{of a plurality of bump connectors}

24/15

{Structure, shape, material or disposition of the bump connectors after the connecting process}

24/16

{of an individual bump connector}

24/17

{of a plurality of bump connectors}

24/18

{High density interconnect (HDI) connectors; Manufacturing methods related thereto (interconnection structure between a plurality of semiconductor chips H01L 23/5389)}

WARNING

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

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

24/19

{Manufacturing methods of high density interconnect preforms}

24/20

{Structure, shape, material or disposition of high density interconnect preforms}

24/23

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

24/24

{of an individual high density interconnect connector}

24/25

{of a plurality of high density interconnect connectors}

24/26

{Layer connectors, e.g. plate connectors, solder or adhesive layers; Manufacturing methods related thereto}
Manufacturing methods related thereto {Apparatus for manufacturing arrangements for connecting or disconnecting semiconductor or solid-state bodies}

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

[Manufacturing methods]

Structure, shape, material or disposition of the layer connectors prior to the connecting process

[Apparatus for manufacturing means for bonding, e.g. connectors]

[Apparatus for manufacturing interconnects]

[Apparatus for manufacturing bump connectors]

[Apparatus for manufacturing build-up interconnects]

[Apparatus for manufacturing with build-up interconnects]

[Apparatus for manufacturing with layer connectors]

[Apparatus for manufacturing with strap connectors]

[Apparatus for manufacturing with build-up interconnects]

[Apparatus for manufacturing with wire connectors]

[Apparatus for manufacturing with wire connectors]

[Apparatus for manufacturing with wire connectors]

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[Apparatus for manufacturing with build-up interconnects]
25/065 . . . the devices being of a type provided for in group H01L 27/00

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

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

25/0655 . . . . [the devices being arranged next to each other]

25/0657 . . . . [Stacked arrangements of devices]

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

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

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

25/072 . . . . [the devices being arranged next to each other]

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

25/074 . . . . [Stacked arrangements of non-apertured devices]

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

25/0753 . . . . [the devices being arranged next to each other]

25/0756 . . . . [Stacked arrangements of devices]

25/10 . . . . the devices having separate containers

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

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

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

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

25/112 . . . . [Mixed assemblies]

25/115 . . . . [the devices being arranged next to each other]

25/117 . . . . [Stacked arrangements of devices]

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

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

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

25/165 . . . . [Containers]

25/167 . . . . [comprising optoelectronic devices, e.g. LED, photodiodes]
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 29/000 - H01L 51/00; assemblies consisting of a plurality of individual solid state devices H01L 25/00)

NOTES

1. In this group, with the exception of groups H01L 27/115 - H01L 27/1597, 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.

27/02 . 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 [SiTIL]]

27/0229 . [of bipolar structures]

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

27/0237 . [using vertical injector structures]

27/024 . [using field effect injector structures]

27/0244 . [I2L structures integrated in combination with analog structures]

27/0248 . [for electrical or thermal protection, e.g. electrostatic discharge [ESD] protection]

27/0251 . [for MOS devices]

27/0255 . [using diodes as protective elements]

27/0259 . [using bipolar transistors as protective elements]

27/0262 . [including a PNP transistor and a NPN transistor, wherein each of said transistors has its base coupled to the collector of the other transistor, e.g. silicon controlled rectifier [SCR] devices]

27/0266 . [using field effect transistors as protective elements]

27/0274 . [specially adapted to provide an electrical current path other than the field effect induced current path]

27/0277 . [including a parasitic bipolar transistor triggered by the electrical biasing of the gate electrode of the field effect transistor, e.g. gate coupled transistors]

27/0278 . [using passive elements as protective elements, e.g. resistors, capacitors, inductors, spark-gaps]

27/0292 . [using a specific configuration of the conducting means connecting the protective devices, e.g. ESD buses]

27/0296 . [involving a specific disposition of the protective devices]

27/0298 . the substrate being a semiconductor body

27/0299 . including a plurality of individual components in a non-repetitive configuration

27/0605 . [integrated circuits made of compound material, e.g. Au-B]z

27/0611 . [integrated circuits having a two-dimensional layout of components without a common active region]

27/0617 . [comprising components of the field-effect type (H01L 27/0251 takes precedence)]

27/0623 . [in combination with bipolar transistors]

27/0629 . [in combination with diodes, or resistors, or capacitors]

27/0635 . [in combination with bipolar transistors and diodes, or resistors, or capacitors]

27/0641 . [without components of the field effect type]

27/0647 . [ Bipolar transistors in combination with diodes, or capacitors, or resistors, e.g. vertical bipolar transistor and bipolar lateral transistor and resistor]
H01L

27/0652 . . . . . . . [Vertical bipolar transistor in combination with diodes, or capacitors, or resistors]
27/0658 . . . . . . . [Vertical bipolar transistor in combination with resistors or capacitors]
27/0664 . . . . . . . [Vertical bipolar transistor in combination with diodes]
27/067 . . . . . . . [Lateral bipolar transistor in combination with diodes, or capacitors, or resistors]
27/0676 . . . . . . . [comprising combinations of diodes, or capacitors or resistors]
27/0682 . . . . . . . [comprising combinations of capacitors and resistors]
27/0688 . . . . . . . [Integrated circuits having a three-dimensional layout]
27/0694 . . . . . . . [comprising components formed on opposite sides of a semiconductor substrate]
27/07 . . . . . . . the components having an active region in common
27/0705 . . . . . . . [comprising components of the field effect type]
27/0711 . . . . . . . [in combination with bipolar transistors and diodes, or capacitors, or resistors]
27/0716 . . . . . . . [in combination with vertical bipolar transistors and diodes, or capacitors, or resistors]
27/0722 . . . . . . . [in combination with lateral bipolar transistors and diodes, or capacitors, or resistors]
27/0727 . . . . . . . [in combination with diodes, or capacitors or resistors]
27/0733 . . . . . . . [in combination with capacitors only]
27/0738 . . . . . . . [in combination with resistors only]
27/0744 . . . . . . . [without components of the field effect type]
27/075 . . . . . . . [Bipolar transistors in combination with diodes, or capacitors, or resistors, e.g. lateral bipolar transistor, and vertical bipolar transistor and resistor]
27/0755 . . . . . . . [Vertical bipolar transistor in combination with diodes, or capacitors, or resistors]
27/0761 . . . . . . . [Vertical bipolar transistor in combination with diodes only]
27/0766 . . . . . . . [with Schottky diodes only]
27/0772 . . . . . . . [Vertical bipolar transistor in combination with resistors only]
27/0777 . . . . . . . [Vertical bipolar transistor in combination with capacitors only]
27/0783 . . . . . . . [Lateral bipolar transistors in combination with diodes, or capacitors, or resistors]
27/0788 . . . . . . . [comprising combinations of diodes or capacitors or resistors]
27/0794 . . . . . . . [Combinations of capacitors and resistors]
27/08 . . . . . . . including only semiconductor components of a single kind
27/0802 . . . . . . . [Resistors only]
27/0805 . . . . . . . [Capacitors only]
27/0808 . . . . . . . [Varactor diodes]
27/0811 . . . . . . . [MIS diodes]
27/0814 . . . . . . . [Diodes only]
27/0817 . . . . . . . [Thyristors only]
27/082 . . . . . . . including bipolar components only
27/0821 . . . . . . . [Combination of lateral and vertical transistors only]
27/0823 . . . . . . . [including vertical bipolar transistors only]
27/0825 . . . . . . . [Combination of vertical direct transistors of the same conductivity type having different characteristics, e.g. Darlington transistors]
27/0826 . . . . . . . [Combination of vertical complementary transistors]
27/0828 . . . . . . . [Combination of direct and inverse vertical transistors]
27/085 . . . . . . . including field-effect components only
27/088 . . . . . . . the components being field-effect transistors with insulated gate
27/0883 . . . . . . . [Combination of depletion and enhancement field effect transistors]
27/0886 . . . . . . . [including transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET]
27/092 . . . . . . . complementary MIS field-effect transistors
27/0921 . . . . . . . [Means for preventing a bipolar, e.g. thyristor, action between the different transistor regions, e.g. Latchup prevention]
27/0922 . . . . . . . [Combination of complementary transistors having a different structure, e.g. stacked CMOS, high-voltage and low-voltage CMOS]
27/0924 . . . . . . . [including transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET]
27/0925 . . . . . . . [comprising an N-well only in the substrate]
27/0927 . . . . . . . [comprising a P-well only in the substrate]
27/0928 . . . . . . . [comprising both N- and P-wells in the substrate, e.g. twin-tub]
27/095 . . . . . . . the components being Schottky barrier gate field-effect transistors
27/098 . . . . . . . the components being PN junction gate field-effect transistors
27/10 . . . . . . . including a plurality of individual components in a repetitive configuration
27/101 . . . . . . . [including resistors or capacitors only]
27/102 . . . . . . . including bipolar components
27/1021 . . . . . . . [including diodes only]
27/1022 . . . . . . . [including bipolar transistors]
27/1023 . . . . . . . [Bipolar dynamic random access memory structures]
27/1024 . . . . . . . [Arrays of single bipolar transistors only, e.g. read only memory structures]
27/1025 . . . . . . . [Static bipolar memory cell structures]
27/1026 . . . . . . . [Bipolar electrically programmable memory structures (using fuses H01L 23/525)]
27/1027 . . . . . . . [Thyristors]
[NOTE]
In this group and its subgroups classification is made in any appropriate place

[Memory structures and multistep manufacturing processes therefor not provided for in groups H01L 27/1055 - H01L 27/112]

[comprising charge coupled devices of the so-called bucket brigade type]

[comprising charge coupled devices [CCD] or charge injection devices [CID]}

Dynamic random access memory structures

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

{comprising floating-body transistors, e.g. floating-body cells]

{with one-transistor one-capacitor memory cells]

{the storage electrode stacked over transistor]

{with bit line higher than capacitor]

{with capacitor higher than bit line level}

{the storage electrode having multiple wings]

{the capacitor extending under transfer transistor area]

{the transistor having a trench structure in the substrate]

{the transistor being of the FinFET type]

{the capacitor being in a substrate trench]

{the capacitor extending under or around transfer transistor area]

{having storage electrode extension stacked over transistor]

{the capacitor and the transistor being in one trench]

{the transistor being vertical]

{Multistep manufacturing methods]

{for structures comprising one transistor one-capacitor memory cells]

{with at least one step of making the capacitor or connections thereto]

{the capacitor extending over the access transistor]

{with at least one step of making a connection between transistor and capacitor, e.g. plug]

{the capacitor extending under the access transistor area]
[with transistors on different levels, e.g. 3D ROM]

Peripheral circuit regions

[of memory structures of the ROM-only type]

Electrically programmable read-only memories; Multistep manufacturing processes therefor

with ferroelectric memory capacitors

caracterised by the top-view layout

caracterised by the memory core region

caracterised by the peripheral circuit region

caracterised by the boundary region between the core and peripheral circuit regions

caracterised by the three-dimensional arrangements, e.g. with cells on different height levels with floating gate

caracterised by the top-view layout

caracterised by the memory core region (three-dimensional arrangements H01L 27/11551)

with cell select transistors, e.g. NAND

caracterised by the peripheral circuit region

of memory regions comprising cell select transistors, e.g. NAND

Simultaneous manufacturing of periphery and memory cells

including only one type of peripheral transistor

with a control gate layer also being used as part of the peripheral transistor

with an inter-gate dielectric layer also being used as part of the peripheral transistor

with a floating-gate layer also being used as part of the peripheral transistor

with a tunnel dielectric layer also being used as part of the peripheral transistor

including different types of peripheral transistor

characterised by the boundary region between the core and peripheral circuit regions

characterised by three-dimensional arrangements, e.g. with cells on different height levels

with source and drain on different levels, e.g. with sloping channels

the channels comprising vertical portions, e.g. U-shaped channels

the control gate being a doped region, e.g. single-poly memory cells

the floating gate being an electrode shared by two or more components

with charge-trapping gate insulators, e.g. MNOS or NROM

caracterised by the top-view layout

characterised by the memory core region (three-dimensional arrangements H01L 27/11578)

with cell select transistors, e.g. NAND

characterised by the peripheral circuit region

characterised by the boundary region between the core and peripheral circuit regions

characterised by three-dimensional arrangements, e.g. with cells on different height levels

with source and drain on different levels, e.g. with sloping channels

the channels comprising vertical portions, e.g. U-shaped channels

with the gate electrodes comprising a layer used for its ferroelectric memory properties, e.g. metal-ferroelectric-semiconductor [MFS] or metal-ferroelectric-metal-insulator-semiconductor [MFMS]

characterised by the top-view layout

characterised by the memory core region

characterised by the peripheral circuit region

characterised by the boundary region between core and peripheral circuit regions

characterised by three-dimensional arrangements, e.g. cells on different height levels

Masterslice integrated circuits

using bipolar technology

using field effect technology

[A3B5 or A3B6 gate arrays]

[CMOS gate arrays]

[Microarchitecture]

{ Basic cell P to N transistor count }

{ 4-T CMOS basic cell }

{ 5-T CMOS basic cell }

{ 6-T CMOS basic cell }

{ 7-T CMOS basic cell }

{ 8-T CMOS basic cell }

{ relative P to N transistor sizes }

{ for current drive capability }

{ for delay time adaptation }

{ for capacitive loading }

{ Isolation loading }

{ FET isolation }
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]
2027/11889 . . . . . . . . . . [Latch-up prevention]
2027/11892 . . . . . . . . . . [Noise prevention (crosstalk)]
2027/11894 . . . . . . . . . . [Radiation hardened circuits]
27/11896 . . . . . . . . . . [using combined field effect/bipolar technology]
27/11898 . . . . . . . . . . [Input and output buffer/driver structures]
27/12 . . . . . . . . . . . . . . the substrate being other than a semiconductor body, e.g. an insulating body
27/1203 . . . . . . . . . . . . . . [the substrate comprising an insulating body on a semiconductor body, e.g. SOI (three-dimensional layout H01L 27/0688)]
27/1207 . . . . . . . . . . . . . . [combined with devices in contact with the semiconductor body, i.e. bulk/SOI hybrid circuits]
27/1211 . . . . . . . . . . . . . . [combined with field-effect transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET]
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. InGaZnO]
27/1229 . . . . . . . . . . [with different crystal properties within a device or between different devices]
27/1233 . . . . . . . . . . [with different thicknesses of the active layer in different devices]
27/1237 . . . . . . . . . . [with a different composition, shape, layout or thickness of the gate insulator in different devices]
27/124 . . . . . . . . . . . . . . [with a particular composition, shape or layout of the wiring layers specially adapted to the circuit arrangement, e.g. scanning lines in LCD pixel circuits (wiring structures per se H01L 23/52)]
27/1244 . . . . . . . . . . [for preventing breakage, peeling or short circuiting]
27/1248 . . . . . . . . . . [with a particular composition or shape of the interlayer dielectric specially adapted to the circuit arrangement]
27/1251 . . . . . . . . . . [comprising TFTs having a different architecture, e.g. top- and bottom gate TFTs]
27/1255 . . . . . . . . . . [integrated with passive devices, e.g. auxiliary capacitors]
27/1259 . . . . . . . . . . [Multistep manufacturing methods]
27/1262 . . . . . . . . . . [with a particular formation, treatment or coating of the substrate]
27/1266 . . . . . . . . . . [the substrate on which the devices are formed not being the final device substrate, e.g. using a temporary substrate]
27/127 . . . . . . . . . . . . . . [with a particular formation, treatment or patterning of the active layer specially adapted to the circuit arrangement]
27/1274 . . . . . . . . . . [using crystallisation of amorphous semiconductor or recrystallisation of crystalline semiconductor]
27/1277 . . . . . . . . . . [using a crystallisation promoting species, e.g. local introduction of Ni catalyst]
27/1281 . . . . . . . . . . [by using structural features to control crystal growth, e.g. placement of grain filters]
27/1285 . . . . . . . . . . [using control of the annealing or irradiation parameters, e.g. using different scanning direction or intensity for different transistors]
light sources only H01L 31/14
such radiation ( radiation-sensitive components of the energy of such radiation into electrical and specially adapted either for the conversion of shorter wavelength or corpuscular radiation infra-red radiation, light, electromagnetic radiation including semiconductor components sensitive to couplings of light Devices controlled by radiation H01L 31/046
solar cells deposited on the same substrate modules composed of a plurality of thin film 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)
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)
Devices controlled by radiation
Devices controlled by radiation (with at least one potential jump or surface barrier)
[an in a repetitive configuration]
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 . . . . . . [Structural or functional details 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 5/3699)]
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]
27/14618 . . . . . . [Containers]
27/1462 . . . . . . [Coatings]
27/14621 . . . . . . [Colour filter arrangements]
27/14623 . . . . . . [Optical shielding]
27/14625 . . . . . . [Optical elements or arrangements associated with the device]
27/14627 . . . . . . [Microlenses]
27/14629 . . . . . . [Reflectors]
27/1463 . . . . . . [Pixel isolation structures]
27/14632 . . . . . . [Wafer-level processed structures]
27/14634 . . . . . . [Assemblies, i.e. Hybrid structures]
27/14636 . . . . . . [Interconnect structures]
27/14638 . . . . . . [Structures specially adapted for transferring the charges across the imager perpendicular to the imaging plane]
27/1464 . . . . . . [Back illuminated imager structures]
27/14641 . . . . . . [Electronic components shared by two or more pixel-elements, e.g. one amplifier shared by two pixel elements]
27/14643 . . . . . . [Photodiode arrays; MOS imagers]
27/14645 . . . . . . [Colour imagers]
27/14647 . . . . . . [Multicolour imagers having a stacked pixel-element structure, e.g. npn, npnpn or MQW elements]
27/14649 . . . . . . [Infra-red imagers]
27/1465 . . . . . . [of the hybrid type]
27/14652 . . . . . . [Multispectral infra-red imagers, having a stacked pixel-element structure, e.g. npn, npnpn or MQW structures]
27/14654 . . . . . . [Blooming suppression]
27/14656 . . . . . . [Overflow drain structures]
27/14658 . . . . . . [X-ray, gamma-ray or corpuscular radiation imagers (measuring X-, gamma- or corpuscular radiation G01T 1/00)]
27/14659 . . . . . . [Direct radiation imagers structures]
27/14661 . . . . . . [of the hybrid type]
27/14663 . . . . . . [Indirect radiation imagers, e.g. using luminescent members]
27/14665 . . . . . . [Imagers using a photoconductor layer]
27/14667 . . . . . . [Colour imagers]
27/14669 . . . . . . [Infra-red imagers]
27/1467 . . . . . . [of the hybrid type]
27/14672 . . . . . . [Blooming suppression]
27/14674 . . . . . . [Overflow drain structures]
27/14676 . . . . . . [X-ray, gamma-ray or corpuscular radiation imagers (measuring X-, gamma- or corpuscular radiation G01T 1/00)]
27/14678 . . . . . . [Contact-type imagers]
27/14679 . . . . . . [Junction field effect transistor [JFET] imagers; static induction transistor [SIT] imagers]
27/14681 . . . . . . [Bipolar transistor imagers]
27/14683 . . . . . . [Processes or apparatus peculiar to the manufacture or treatment of these devices or parts thereof (not peculiar thereto H01L 21/00)]
27/14685 . . . . . . [Process for coatings or optical elements]
27/14687 . . . . . . [Wafer level processing]
27/14689 . . . . . . [MOS based technologies]
27/1469 . . . . . . [Assemblies, i.e. hybrid integration]
27/14692 . . . . . . [Thin film technologies, e.g. amorphous, poly, micro- or nanocrystalline silicon]
H01L.

27/14694 . . . . . . . . . . . . {The active layers comprising only AlGaN compounds, e.g. GaAs, InP}
27/14696 . . . . . . . . . . . . {The active layers comprising only AlGaN+ compounds, e.g. CdS, ZnS, CdTe}
27/14698 . . . . . . . . . . . . {Post-treatment for the devices, e.g. annealing, impurity-gettering, shor-circuit elimination, recrystallisation}
27/148 . . . . . . . . . . . . Charge coupled imagers { (individual charge coupled devices H01L 29/765) }
27/14806 . . . . . . . . . . . . {Structural or functional details thereof}
27/14812 . . . . . . . . . . . . {Special geometry or disposition of pixel-elements, address lines or gate-electrodes}
27/14818 . . . . . . . . . . . . {Optical shielding}
27/14825 . . . . . . . . . . . . {Linear CCD imagers}
27/14831 . . . . . . . . . . . . {Area CCD imagers}
27/14837 . . . . . . . . . . . . {Frame-interline transfer}
27/14843 . . . . . . . . . . . . {Interline transfer}
27/1485 . . . . . . . . . . . . {Frame transfer}
27/14856 . . . . . . . . . . . . {Time-delay and integration}
27/14862 . . . . . . . . . . . . {CID imagers}
27/14868 . . . . . . . . . . . . {CCD or CID colour imagers}
27/14875 . . . . . . . . . . . . {Infra-red CCD or CID imagers}
27/14881 . . . . . . . . . . . . {of the hybrid type}
27/14887 . . . . . . . . . . . . {Blooming suppression}
27/14893 . . . . . . . . . . . . {comprising a photoconductive layer deposited on the CCD structure}
27/15 . . . . . . . . . . . . including semiconductor components with at least one potential-jump barrier or surface barrier specially adapted for light emission { (monolithically integrated components including semiconductor laser components H01S 5/026) }
27/153 . . . . . . . . . . . . {in a repetitive configuration, e.g. LED bars}
27/156 . . . . . . . . . . . . {two-dimensional arrays}
27/16 . . . . . . . . . . . . including thermolectric components with or without a junction of dissimilar materials; including thermomagnetic components {using the Peltier effect only for cooling of semiconductor or other solid state devices H01I 23/38}
27/18 . . . . . . . . . . . . including components exhibiting superconductivity
27/20 . . . . . . . . . . . . including piezo-electric components; including electrostrictive components; including magnetostrictive components
27/22 . . . . . . . . . . . . including components using galvano-magnetic effects, e.g. Hall effects; using similar magnetic field effects
27/222 . . . . . . . . . . . . {Magnetic non-volatile memory structures, e.g. MRAM}
27/224 . . . . . . . . . . . . {comprising two-terminal components, e.g. diodes, MIM elements}
27/226 . . . . . . . . . . . . {comprising multi-terminal components, e.g. transistors}
27/228 . . . . . . . . . . . . {of the field-effect transistor type}
27/24 . . . . . . . . . . . . including solid state components for rectifying, amplifying or switching without a potential-jump barrier or surface barrier, e.g. resistance switching non-volatile memory structures
27/2409 . . . . . . . . . . . . {comprising two-terminal selection components, e.g. diodes}
27/2418 . . . . . . . . . . . . {of the metal-insulator-metal type}
27/2427 . . . . . . . . . . . . {of the Ovonic threshold switching type}
27/2436 . . . . . . . . . . . . {comprising multi-terminal selection components, e.g. transistors}
27/2445 . . . . . . . . . . . . {of the bipolar type}
27/2454 . . . . . . . . . . . . {of the vertical channel field-effect transistor type}
27/2463 . . . . . . . . . . . . {Arrangements comprising multiple bistable or multistable switching components of the same type on a plane parallel to the substrate, e.g. cross-point arrays, details of the horizontal layout}
27/2472 . . . . . . . . . . . . {the switching components having a common active material layer}
27/2481 . . . . . . . . . . . . {arranged in a direction perpendicular to the substrate, e.g. 3D cell arrays, details of the vertical layout}
27/249 . . . . . . . . . . . . {the switching components being connected to a common vertical conductor}
27/26 . . . . . . . . . . . . including bulk negative resistance effect components
27/265 . . . . . . . . . . . . {Gunn effect devices}
27/28 . . . . . . . . . . . . including components using organic materials as the active part, or using a combination of organic materials with other materials as the active part
27/281 . . . . . . . . . . . . {Integrated circuits having a three-dimensional layout}
27/283 . . . . . . . . . . . . {comprising components of the field-effect type}
27/285 . . . . . . . . . . . . {Integrated circuits with a common active layer, e.g. cross point devices}
27/286 . . . . . . . . . . . . {with an active region comprising an inorganic semiconductor}
27/288 . . . . . . . . . . . . {Combination of organic light sensitive components with organic light emitting components, e.g. optocoupler}
27/30 . . . . . . . . . . . . with components specially adapted for sensing infra-red radiation, light, electromagnetic radiation of shorter wavelength, or corpuscular radiation; with components specially adapted for either the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation { (combination of organic light sensitive components with organic light emitting components, e.g. optocoupler H01L 27/2881) }
27/301 . . . . . . . . . . . . {Energy conversion devices}
27/302 . . . . . . . . . . . . {comprising multiple junctions, e.g. tandem cells}
27/304 . . . . . . . . . . . . {in form of a fiber or a tube, e.g. photovoltaic fibers}
27/305 . . . . . . . . . . . . {Devices controlled by radiation}
27/307 . . . . . . . . . . . . {Imager structures}

WARNING

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

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

27/308 . . . . . . . . . . . . {Devices specially adapted for detecting X-ray radiation (measuring X-radiation G01T 1/00)
27/32 . . . with components specially adapted for light emission, e.g. flat-panel displays using organic light-emitting diodes [OLED] [(combination of organic light sensitive components with organic light emitting components, e.g. optocoupler H01L 27/288)]

27/3202 . . . [OLEDs electrically connected in parallel]
27/3204 . . . [OLEDs electrically connected in series]
27/3206 . . . [Multi-colour light emission]
27/3209 . . . [using stacked OLED]
27/3211 . . . [using RGB sub-pixels]
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 27/23 takes precedence)]
27/3227 . . . [the other component being a light sensitive element, e.g. inorganic solar cell, inorganic photodiode (H01L 27/28 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 27/241 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.

27/3248 . . . (Connection of the pixel electrode to the TFT)
27/3251 . . . (Double substrate, i.e. with OLED and TFT on different substrates)
27/3253 . . . [Electrical connection of the two substrates]
27/3255 . . . [Chiplets]
27/3258 . . . [Insulating layers formed between TFT elements and OLED elements]
27/326 . . . [special geometry or disposition of pixel-elements]
27/3262 . . . [of TFT]
27/3265 . . . [of capacitor]

27/3267 . . . . . . [Dual display, i.e. having two independent displays]
27/3269 . . . . . . [Including photosensors to control luminance]
27/3272 . . . . . . [Shielding, e.g. of TFT]
27/3274 . . . . . . [including organic thin film transistors [OTFT]]
27/3276 . . . . . . [Wiring lines]

**WARNING**

Group H01L 27/3276 is incomplete pending reclassification of documents from group H01L 27/2397. Groups H01L 27/2397 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 27/2395. Groups H01L 27/2395 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 27/2397. Groups H01L 27/2397 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]

*(Frozen)*

**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.
H01L.

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

28/10  .  [Inductors]
28/20  .  [Resistors]
28/22  . .  [with an active material comprising carbon, e.g. diamond or diamond-like carbon (DLC)]
28/24  . .  [with an active material comprising a refractory, transition or noble metal, metal compound or metal alloy, e.g. silicides, oxides, nitrides]
28/26  . .  [with an active material comprising an organic conducting material, e.g. conducting polymers]
28/40  .  [Capacitors]
28/55  . .  [with a dielectric comprising a perovskite structure material]
28/56  . .  {the dielectric comprising two or more layers, e.g. comprising buffer layers, seed layers, gradient layers}
28/57  . .  {comprising a barrier layer to prevent diffusion of hydrogen or oxygen}
28/60  . .  [Electrodes]
28/65  . .  {comprising a noble metal or a noble metal oxide, e.g. platinum (Pt), ruthenium (Ru), ruthenium dioxide (RuO₂), iridium (Ir), iridium dioxide (IrO₂)}
28/75  . .  {comprising two or more layers, e.g. comprising a barrier layer and a metal layer}
28/82  . .  {with an enlarged surface, e.g. formed by texturisation}
28/84  . . .  {being a rough surface, e.g. using hemispherical grains}
28/86  . . .  {having horizontal extensions}
28/87  . . .  {made by depositing layers, e.g. by depositing alternating conductive and insulating layers}
28/88  . . .  {made by patterning layers, e.g. by etching conductive layers}
28/90  . . .  {having vertical extensions}
28/91  . . .  {made by depositing layers, e.g. by depositing alternating conductive and insulating layers}
28/92  . . .  {made by patterning layers, e.g. by etching conductive layers}

29/00  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}

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being part of a semiconductor device which amplified or switched and such electrode not carrying current to be rectified, with semiconductor regions connected to an electrode carrying current to be rectified, with semiconductor regions connected to junctions between the regions characterised by the shape of the body

specially adapted for altering the breakdown voltage by removing semiconductor material at, or in the neighbourhood of, a reverse biased junction, e.g. by bevelling, moat etching, depletion etching

the shape of the body defining a nanostructure (nanotechnology per se

Nanowires or nanotubes (carbon nanotubes as material of solid-state device active part)

oriented parallel to a substrate

oriented perpendicular or at an angle to a substrate

comprising a junction

characterised by the shape, relative sizes or dispositions of the semiconductor regions or junctions between the regions

characterised by the particular shape of a junction between semiconductor regions

Surface layout

(of cellular field-effect devices, e.g. multicellular DMOS transistors or IGBTs)

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

Emitter regions of bipolar transistors

(of lateral transistors)

(Non-interconnected multi-emitter structures)

(of heterojunction bipolar transistors (H01L 29/7375 takes precedence))

Collector regions of bipolar transistors

Pedestal collectors

Anode or cathode regions of thyristors or gated bipolar-mode devices

Anode regions of thyristors or gated bipolar-mode devices, e.g. supplementary regions surrounding anode regions

Cathode regions of thyristors

Source or drain regions of field-effect devices

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)

drains of field-effect transistors with insulated gate

of DMOS transistors

WARNING

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

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

Source regions

Impurity concentration or distribution

Disposition

Shape (cell layout

Shape

of field-effect transistors with Schottky gate

Tunnel injectors

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

Base region of bipolar transistors

of lateral transistors

Base regions of thyristors (H01L 29/083 takes precedence)

Anode base regions of thyristors

Cathode base regions of thyristors

Channel region of field-effect devices

of field-effect transistors

(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))
H01L

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 10/17, applied in semiconductor lasers H01S 5/34)

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

29/151 . . . . . {Compositional structures (H01L 29/157 and H01L 29/158 take precedence)}

29/152 . . . . . {with quantum effects only in vertical direction, i.e. layered structures with quantum effects solely resulting from vertical potential variation}

29/154 . . . . . {comprising at least one long range structurally disordered material, e.g. one-dimensional vertical amorphous superlattices}

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

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

29/158 . . . . . {Structures without potential periodicity in a direction perpendicular to a major surface of the substrate, i.e. vertical direction, e.g. lateral superlattices, lateral surface superlattices [LSS]} 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 , e.g. alloys (H01L 29/1604 takes precedence)

29/165 . . . . . in different semiconductor regions , e.g. heterojunctions

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

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

29/185 . . . . . {Amorphous materials}

29/20 . . . . . including, apart from doping materials or other impurities, only A\textsubscript{III}B\textsubscript{V} compounds

29/2003 . . . . . {Nitride compounds}

29/2006 . . . . . {Amorphous materials}

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

29/205 . . . . . in different semiconductor regions , e.g. heterojunctions

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

29/22 . . . . . including, apart from doping materials or other impurities, only A\textsubscript{III}B\textsubscript{V} compounds

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

29/2206 . . . . . {Amorphous materials}

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

29/225 . . . . . in different semiconductor regions , e.g. heterojunctions

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

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

29/242 . . . . . {A\textsubscript{III}B\textsubscript{V} or A\textsubscript{III}B\textsubscript{VII} compounds, e.g. CuO, Cu I (H01L 29/247 takes precedence)}

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

29/247 . . . . . {Amorphous materials}

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

29/263 . . . . . {Amorphous materials}
in different semiconductor regions (e.g. heterojunctions (H01L 29/263 takes precedence))

characterised by physical imperfections; having polished or roughened surface

the imperfections being within the semiconductor body

the imperfections being on the surface

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

{Planar doping, e.g. atomic-plane doping, delta-doping}

Electrodes (: Multistep manufacturing processes therefor)

{Multistep manufacturing processes}

WARNING

Group H01L 29/401 is impacted by reclassification into groups H01L 29/4011, H01L 29/40111, H01L 29/40114 and H01L 29/40117.

Groups H01L 29/401, H01L 29/4011, H01L 29/40111, H01L 29/40114 and H01L 29/40117 should be considered in order to perform a complete search.

{for data storage electrodes}

WARNING

Group H01L 29/4011 is incomplete pending reclassification of documents from group H01L 29/401.

Group H01L 29/401 and H01L 29/4011 should be considered in order to perform a complete search.

{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.

{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.

{the electrodes comprising a charge-trapping insulator}

WARNING

Group H01L 29/40117 is incomplete pending reclassification of documents from group H01L 29/401.

Group H01L 29/401 and H01L 29/40117 should be considered in order to perform a complete search.

{Field plates}

{Multiple field plate structures}

{Resistive arrangements, e.g. resistive or semi-insulating field plates}

{Recessed field plates, e.g. trench field plates, buried field plates}

{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}

characterised by their shape, relative sizes or dispositions

{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)}

{Emitter or collector electrodes for bipolar transistors}

{Cathode or anode electrodes for thyristors}

{Source or drain electrodes for field effect devices (with monocrystalline semiconductor on source/drain region H01L 29/0843)}

{for thin film transistors with insulated gate}

{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

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

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

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

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

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

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

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

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

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

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

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

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

29/432 . . . . . . . [Heterojunction gate for field effect devices]

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

29/437 . . . . . . . [Superconductor materials]

29/445 . . . . . . . Ohmic electrodes

29/452 . . . . . . . [on AIII-BV compounds]

29/454 . . . . . . . [on thin film AIII-BV compounds]

29/456 . . . . . . . [on silicon]

29/458 . . . . . . . [for thin film silicon, e.g. source or drain electrode]

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

29/475 . . . . . . . [on AIII-BV compounds]

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

NOTE

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

29/4908 . . . . . . . (for thin film semiconductor, e.g. gate of TFT)

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 take 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. Polycode gate (with a barrier layer between the silicide and silicon layers H01L 29/4941))
diamond, diamond-like carbon, graphene \{ comprising semiconducting carbon, e.g. of devices having a semiconductor body \} amplified or switched, e.g. three-terminal devices \{ does not carry the current to be rectified, potential applied, to an electrode which \} rectified, amplified, oscillated or switched, \{ of the electrodes carrying the current to be \} variation of the electric current supplied or \{ 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 \} (H01L 29/6608 \{ comprising semiconductor bodies \} comprising group 14 or group 13/15 material comprising semiconducting carbon \} H01L 29/66053 \{ of devices having a semiconductor body comprising crystalline silicon carbide \} H01L 29/66045 \{ Field-effect transistors \} H01L 29/6605 \{ 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 \} (H01L 29/6606 \{ 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 \} (H01L 29/66083 \{ comprising an air gap \} 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. Insulating materials associated therewith \{ (for MIS structures on thin film semiconductor H01L 29/4908) \} \{ with a compositional variation, e.g. multilayer structures (H01L 29/516 takes precedence) \} \{ the variation being parallel to the channel plane \} \{ the variation being perpendicular to the channel plane \} \{ with cavities, e.g. containing a gas \} \{ with at least one ferroelectric layer \} \{ the insulating material comprising a metallic compound, e.g. metal oxide, metal silicate (H01L 29/518 takes precedence) \} \{ the insulating material containing nitrogen, e.g. nitride, oxynitride, nitrogen-doped material \} Types of semiconductor device \{ Multistep manufacturing processes therefor \} \{ Multistep manufacturing processes \} \{ of devices having a semiconductor body comprising semiconducting carbon, e.g. diamond, diamond-like carbon, graphene \} \{ 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 \} \{ Diodes \} \{ 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 \} \{ Diodes \} \{ Schottky diodes \} \{ with a heterojunction, e.g. resonant tunneling diodes [RTD] \} \{ 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 \} \{ Bipolar junction transistors [BJT] \} \{ Heterojunction transistors [HBT] (with an active layer made of a group 13/15 material H01L 29/66318) \}
{Lateral transistors (H01L 29/66242 and H01L 29/66265 take precedence)}

{Schottky transistors}

{Thin film bipolar transistors (H01L 29/66242 takes precedence)}

{Silicon vertical transistors (H01L 29/66242, H01L 29/66257 and H01L 29/66265 take precedence)}

{Inverse transistors}

{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)}

{with main current going through the whole silicon substrate, e.g. power bipolar transistor}

{with multi-emitter, e.g. interdigitated, multi-cellular or distributed emitter}

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

{Heterojunction transistors}

{controlled by field-effect, e.g. insulated gate bipolar transistors [IGBT]}

{Vertical insulated gate bipolar transistors}

{with a recess formed by etching in the source/emitter contact region (H01L 29/66348 takes precedence; etching of semiconductor bodies H01L 21/302)}

{with a recessed gate}

{Gated diodes, e.g. field controlled diodes [FCD], static induction thyristors [SITh], field controlled thyristors [FCTh]}

{structurally associated with another device, e.g. built-in diode (making integrated circuits H01L 21/82)}

{the other device being a controlling field-effect device}

{Bidirectional thyristors}

{Lateral or planar thyristors}

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

{Unipolar field-effect transistors}

{Static induction transistors [SIT] (with an active layer made of a group 13/15 material H01L 29/66446)}

{Permeable base transistors [PBT]}

{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)}

{with a one- or zero-dimensional channel, e.g. quantum wire FET, in-plane gate transistor [IGP], 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 insulated gate, i.e. MISFET}

{with multiple gate, at least one gate being an insulated gate (H01L 29/66492 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 29/66545 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 29/66545 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 29/66553 takes precedence)}

{with initial gate mask or masking layer complementary to the prospective gate location, e.g. with dummy source and drain contacts}
MISFETs with channel well and drain region (making lateral high-voltage or base region adjoining a drain drift with a channel accommodating body)

Vertical transistors

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

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

Lateral single gate single channel transistors

Vertical DMOS transistors

Amorphous silicon or polysilicon transistors

Thin film unipolar transistors

Vertical DMOS transistors
(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 a PN homojunction 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])

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 21/0365)

{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 only by 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}

{Double base diodes}

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

{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 27/075)}

{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}

{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}

{Inverse vertical transistors}

{Lateral transistors}

{Hetero-junction transistors}

{Vertical transistors}

{having a two-dimensional base, e.g. modulation-doped base, inversion layer base, delta-doped base}

{having an emitter comprising one or more non-monocrystalline elements of group IV, e.g. amorphous silicon, alloys comprising group IV elements}

{Resonant tunnelling transistors}

{comprising lattice mismatched active layers, e.g. SiGe strained layer transistors}

controlled by field-effect, e.g. bipolar static induction transistors [BSIT] (unijunction transistors [H01L 29/705])

{Gated diode structures}

(with PN junction gate, e.g. field controlled thyristors (FCTh), static induction thyristors (SITh))

{Insulated gate bipolar mode transistors, i.e. IGBT; IGT; COMFET}

(on an insulating layer or substrate, e.g. thin film device or device isolated from the bulk substrate (H01L 29/7398 takes precedence)}

{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

{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))

{and a gate structure lying on a slanted or vertical surface or formed in a groove, e.g. trench gate IGBT}

{with both emitter and collector contacts in the same substrate side)

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

Charge transfer devices

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

with field effect produced by an insulated gate

Input structures

Output structures

Structures for regeneration, refreshing, leakage compensation or the like

Buried channel CCD

Two-Phase CCD

Three-Phase CCD

Four-Phase CCD

Surface Channel CCD

Two-Phase CCD

Three-Phase CCD

Four-Phase CCD

Field effect transistors

using static field induced regions, e.g. SIT, PBT

with delta-doped channel (H01L 29/778 takes precedence)

Velocity modulation transistors, i.e. VMT

with one dimensional charge carrier gas channel, e.g. quantum wire FET

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))

with inverted single heterostructure, i.e. with active layer formed on top of wide bandgap layer, e.g. IHETM

with confinement of carriers by at least two heterojunctions, e.g. DHHEMT, quantum well HEMT, DHMODFET

(using III-V semiconductor material)

with delta or planar doped donor layer (H01L 29/7785 takes precedence)

with more than one donor layer

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

with wide bandgap charge-carrier supplying layer, e.g. direct single heterostructure MODFET

Vertical transistors

the two-dimensional charge carrier gas being at least partially not parallel to a main surface of the semiconductor body

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

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)

Vertical DMOS transistors, i.e. VDMOS transistors

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.

the other device being a pn-junction diode

in antiparallel, e.g. freewheel diode

the other device being a Schottky barrier diode

the other device being a breakdown diode, e.g. Zener diode
LDMOS transistors}

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.

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.

NOTE

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

NOTE

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)

NOTE

Means being an applied insulating layer

NOTE

Means being a conductive material, e.g. silicided S/D or Gate

NOTE

Means being located in the lateral device isolation region, e.g. STI

NOTE

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
FinFETs H01L 29/785

insulator layer H01L 29/0653

the source or the drain region on an thin film (transistors having only }

Thin film transistors, {i.e. transistors with a channel being at least partly a thin film (transistors having only the source or the drain region on an insulator layer H01L 29/0653; thin film FinFETs H01L 29/785)}

characterised by the insulating substrate or support (H01L 29/78657 takes precedence)

with supplementary region or layer in the thin film or in the insulated bulk substrate supporting it for controlling or increasing the safety of the device (H01L 29/78642, H01L 29/78645 take precedence)

for preventing leakage current (H01L 29/78618 takes precedence)

for preventing the kink- or the snapback effect, e.g. discharging the minority carriers of the channel region for preventing bipolar effect

characterised by the drain or the source properties, e.g. the doping structure, the composition, the sectional shape or the contact structure (silicide contacts, electrodes in general H01L 29/456)

with LDD structure or an extension or an offset region or characterised by the doping profile

the source and the drain regions being asymmetrical

[with a significant overlap between the lightly doped drain and the gate electrode, e.g. GOLDD]

[with an LDD consisting of more than one lightly doped zone or having a non-homogeneous dopant distribution, e.g. graded LDD]

[with a light shield]

[with supplementary region or layer for improving the flatness of the device]

[with a drain or source connected to a bulk conducting substrate]

[Vertical transistors]

[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

arranged on opposing sides of the channel

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

Monocrystalline silicon transistors

SOS transistors

Non-monocrystalline silicon transistors

Amorphous silicon transistors

with normal-type structure, e.g. with top gate

with inverted-type structure, e.g. with bottom gate

Polycrystalline or microcrystalline silicon transistor

with normal-type structure, e.g. with top gate

with inverted-type structure, e.g. with bottom gate

having a semiconductor body comprising A\textsubscript{m}B\textsubscript{V} or A\textsubscript{m}B\textsubscript{V1} or A\textsubscript{m}B\textsubscript{V1} semiconductor materials, or Se or Te

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)

with a multilayer structure or superlattice structure

having a semiconductor body comprising an oxide semiconductor material, e.g. zinc oxide, copper aluminium oxide, cadmium stannate

the semiconducting 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]
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)

31/00 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)

31/02 Details
31/02002 . . . [Arrangements for conducting electric current to or from the device in operations]
31/02005 . . . [for device characterised by at least one potential jump barrier or surface barrier]
31/02008 . . . [for solar cells or solar cell modules]
31/0201 . . . [comprising specially adapted module bus-bar structures]
31/02013 . . . . . . [comprising output lead wires elements]
31/02016 . . . [Circuit arrangements of general character for the devices]
31/02019 . . . [for devices characterised by at least one potential jump barrier or surface barrier]
31/02021 . . . [for solar cells (electrical connection means, e.g. junction boxes, specially adapted for structural association with photovoltaic modules H02S 40/34)]
31/02024 . . . [Position sensitive and lateral effect photodetectors; Quadrant photodiodes]
31/02027 . . . . . . [for devices working in avalanche mode]
31/0203 . . . [Containers; Encapsulations, e.g. encapsulation of photodiodes (for photovoltaic devices H01L 31/048; for organic photosensitive devices H01L 51/44)]
31/0216 . . . Coatings (H01L 31/041 takes precedence)
31/02161 . . . [for devices characterised by at least one potential jump barrier or surface barrier]
31/02162 . . . . . . [for filtering or shielding light, e.g. multicolour filters for photodetectors]
31/02164 . . . . . . [for shielding light, e.g. light blocking layers, cold shields for infra-red detectors]
31/02165 . . . . . . [using interference filters, e.g. multilayer dielectric filters (interference filters G02B 5/28)]
31/02167 . . . [for solar cells]
31/02168 . . . . . . [the coatings being antireflective or having enhancing optical properties for the solar cells]
31/0224 . . . Electrodes
31/022408 . . . . . . [for devices characterised by at least one potential jump barrier or surface barrier]
31/022416 . . . . . . [comprising ring electrodes]
31/022425 . . . [for solar cells]
31/022433 . . . . . . . [Particular geometry of the grid contacts]
31/022441 . . . . . . . [Electrode arrangements specially adapted for back-contact solar cells]
31/02245 . . . . . . . [for metallisation wrap-through [MWT] type solar cells]
31/022458 . . . . . . . [for emitter wrap-through [EWT] type solar cells, e.g. interdigitated emitter-base back-contacts]
31/022466 . . . [made of transparent conductive layers, e.g. TCO, ITO layers]
31/022475 . . . . . . . [composed of indium tin oxide [ITO]]
31/022483 . . . . . . . [composed of zinc oxide [ZnO]]
31/022491 . . . [composed of a thin transparent metal layer, e.g. gold]
31/0232 . . . Optical elements or arrangements associated with the device (H01L 31/0236 takes precedence; for photovoltaic cells H01L 31/054; for photovoltaic modules H02S 40/20)
31/02322 . . . . [including ternary or quaternary GaN]
31/02325 . . . [the optical elements not being integrated nor being directly associated with the device]
31/02327 . . . [the optical elements being integrated or being directly associated to the device, e.g. back reflectors (optical coatings H01L 31/0216)]
31/0235 . . . 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]
31/0236 . . . Arrangements for cooling, heating, ventilating or temperature compensation (for photovoltaic devices H01L 31/052)
31/0248 . . . characterised by their semiconductor bodies
31/0256 . . . characterised by the material
31/0264 . . . Inorganic materials
31/0272 . . . Selenium or tellurium
31/0275 . . . [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 AlN 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 AlN 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]
characterised by their crystalline structure or some other impurities, only Group IV of the Periodic System, e.g. SiC

including, apart from doping materials or other impurities, only compounds not provided for in groups H01L 31/0327 - H01L 31/0328

characterised by the doping material (H01L 31/0323, H01L 31/0325 take precedence)

comprising only Bi2Te3 compounds, e.g. Cu In Se2, Cu Ga Se2, Cu In Ga Se2

characterised by the doping material

comprising only A3B5C7 compounds, e.g. PbSnTe

characterised by the doping material

comprising only A5B7C9 compounds, e.g. Cu2ZnSnSe4, Cu2ZnSnS4

characterised by the doping material

including, apart from doping materials or other impurities, semiconductor materials provided for in two or more of groups H01L 31/0327 - H01L 31/0328

in different semiconductor regions, e.g. Cu2X/CdX hetero-junctions, X being an element of Group VI of the Periodic System

comprising only Cu2X / CdX heterojunctions, X being an element of Group VI of the Periodic System

[Organic materials]

characterised by their shape or by the shapes, relative sizes or disposition of the semiconductor regions

comprising a quantum structures

the quantum structure being quantum dots

the quantum structure being quantum wires, or nanorods (carbon nanotubes H01L 51/0048)

Superlattices; Multiple quantum well structures

characterised by amorphous semiconductor layers

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

Doping superlattices, e.g. nipi superlattices

characterised by at least one potential jump barrier or surface barrier

Shape of the body

Shape of the potential jump barrier or surface barrier

characterised by their crystalline structure or particular orientation of the crystalline planes

including polycrystalline semiconductors (H01L 31/0326 takes precedence)

including only elements of Group IV of the Periodic System

[including only elements of Group IV of the Periodic System]

[including A3B5C7 compounds or alloys, e.g. SiGe, SiC]

(presenting light-induced characteristic variations, e.g. Staebler-Wronski effect)

comprising only other non-monocrystalline materials, e.g. semiconductor particles embedded in an insulating material (H01L 31/0329 takes precedence)

comprising semiconductor nanoparticles embedded in a semiconductor matrix (in an insulating matrix 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 H01L 31/03266)

including only elements of Group IV of the Periodic System

including A3B5C7 compounds, e.g. CIS, CIGS

including A5B7C9 compounds, e.g. CdTe, CdS

comprising a flexible substrate

including A7B9C11 compounds, e.g. CIS, CIGS deposited on metal or polymer foils

adapted as photovoltaic [PV] conversion devices (testing thereof during manufacture [H01L 22/2000]; testing thereof after manufacture H02S 50/10)

Provisions for preventing damage caused by corpuscular radiation, e.g. for space applications

PV modules or arrays of single PV cells (supporting structures for PV modules H02S 20/00)

Mechanically stacked PV cells

including bypass diodes (bypass diodes in the junction box H02S 40/34)

comprising bypass diodes integrated or directly associated with the devices, e.g. bypass diodes integrated or formed in on 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 (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 H01L 31/046)

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 H01L 31/0224; electrical interconnection of thin film solar cells formed on a common substrate H01L 31/046; particular structures for electrical interconnecting of adjacent thin film solar cells in the module H01L 31/0465; electrical interconnection means specially adapted for electrically connecting two or more PV modules H02S 40/36)

(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 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 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]

where light is absorbed and re-emitted at a different wavelength by the optical element directly associated or integrated with the PV cell, e.g. by using luminescent material, fluorescent concentrators or up-conversion arrangements

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. rear-side 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 compound inverted metamorphic multi-junction cells]

the devices including, apart from doping material or other impurities, only A IBniV compounds, e.g. GaAs or InP solar cells

the potential barriers being only of the Schottky type

the potential barriers being only of the PN heterojunction type

Multiple junction or tandem solar cells

comprising only A IBniV compound semiconductors, e.g. CdS/CdTe solar cells

comprising only A IBniV compound semiconductors, e.g. GaAs/AlGaAs or InP/GanAs 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 A IBniV 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 A IBniV compound, e.g. CdS/CulnSe 2 [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. photoresistors
31/085 . . . [the device being sensitive to very short wavelength, e.g. X-ray, Gamma-rays]
31/09 . . . Devices sensitive to infra-red, visible or ultraviolet radiation (H01L 31/101 takes precedence)
31/095 . . . [comprising amorphous semiconductors]
31/10 . . . characterised by at least one potential-jump barrier or surface barrier, e.g. phototransistors
31/101 . . . Devices sensitive to infra-red, visible or ultraviolet radiation
31/1013 . . . [devices sensitive to two or more wavelengths, e.g. multi-spectrum radiation detection devices]
31/1016 . . . [comprising transparent or semitransparent devices]
31/102 . . . characterised by only one potential barrier or surface barrier
31/1025 . . . [the potential barrier being of the point contact type]
31/103 . . . [the potential barrier being of the PN homojunction type]
31/1032 . . . [the devices comprising active layers formed only by A\textsubscript{iii}B\textsubscript{v} compounds, e.g. HgCdTe IR photodiodes]
31/1035 . . . [the devices comprising active layers formed only by A\textsubscript{iii}B\textsubscript{vi} compounds]
31/1037 . . . [the devices comprising active layers formed only by A\textsubscript{iv}B\textsubscript{vi} compounds]
31/105 . . . [the potential barrier being of the Schottky type]
31/1055 . . . [the devices comprising amorphous materials of Group IV of the Periodic System]
31/107 . . . [the potential barrier working in avalanche mode, e.g. avalanche photodiode]
31/1075 . . . [in which the active layers, e.g. absorption or multiplication layers, form an heterostructure, e.g. SAM structure]
31/108 . . . [the potential barrier being of the Schottky type]
31/1085 . . . [the devices being of the Metal-Semiconductor-Metal [MSM] Schottky barrier type]
31/109 . . . [the potential barrier being of the PN heterojunction type]
31/11 . . . characterised by two potential barriers or surface barriers, e.g. bipolar phototransistor
31/1105 . . . [the device being a bipolar phototransistor]
31/111 . . . characterised by at least three potential barriers, e.g. phototriacistor
31/1113 . . . [the device being a phototriacistor]
31/1116 . . . [of the static induction type]
31/112 . . . [characterised by field-effect operation, e.g. junction field-effect phototransistor]
31/1121 . . . [Devices with Schottky gate]
31/1122 . . . [the device being a CCD device]
31/1123 . . . [the device being a photo MESFET]
31/1124 . . . [Devices with PN homojunction gate]
31/1125 . . . [the device being a CCD device]
31/1126 . . . [the device being a field-effect phototransistor]
31/1127 . . . [Devices with PN heterojunction gate]
31/1128 . . . [the device being a CCD device]
31/1129 . . . . . . [the device being a field-effect phototransistor]
31/113 . . . [the device 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
31/1167 . . . [of the bulk effect radiation detector type, e.g. Ge-Li compensated PIN gamma-ray detectors]
31/1175 . . . [Li compensated PIN gamma-ray detectors]
31/118 . . . [of the surface barrier or shallow PN junction detector type, e.g. surface barrier alpha-particle detectors]
31/1185 . . . [of the shallow PN junction detector type]
31/119 . . . [characterised by field-effect operation, e.g. MIS type detectors]
31/12 . . . structurally associated with, e.g. formed in or on a common substrate with, one or more electric light sources, e.g. electroluminescent light sources, and electrically or optically coupled thereto (semiconductor devices with at least one potential barrier or surface barrier adapted for light emission H01L 33/00; amplifiers using electroluminescent element and photocell H03F 17/00; electroluminescent light sources per se H05B 33/00)
31/125 . . . [Composite devices with photosensitive elements and electroluminescent elements within one single body]
31/14 . . . the light source or sources being controlled by the semiconductor device sensitive to radiation, e.g. image converters, image amplifiers or image storage devices
31/141 . . . [the semiconductor device sensitive to radiation being without a potential-jump barrier or surface barrier]
31/143 . . . [the light source being a semiconductor device with at least one potential-jump barrier or surface barrier, e.g. light emitting diode]
31/145 . . . [the semiconductor device sensitive to radiation being characterised by at least one potential-jump barrier or surface barrier]
31/147 . . . [the light sources and the devices sensitive to radiation all being semiconductor devices characterised by at least one potential or surface barrier]
31/153 . . . [formed in, or on, a common substrate]
31/16 . . . [the semiconductor device sensitive to radiation being controlled by the light source or sources]
31/161 . . . [Semiconductor device sensitive to radiation without a potential-jump or surface barrier, e.g. photodiodes]
31/162 . . . [the light source being a semiconductor device with at least one potential-jump barrier or surface barrier, e.g. a light emitting diode]
31/164 . . . [Optical potentiometers]
SEMICONDUCTOR DEVICES WITH AT LEAST ONE POTENTIAL-JUMP BARrier OR SURFACE BARRIER SPECIALLY ADAPTED FOR LIGHT EMISSION; PROCESSES OR APPARATUS SPECIALLY ADAPTED FOR THE MANUFACTURE OR TREATMENT THEREOF OR OF PARTS THEREOF; DETAILS THEREOF (H01L 51/50)

NOTE

This group covers light emitting diodes [LEDs] or superluminescent diodes [SLDs], including LEDs or SLDs emitting infra-red [IR] light or ultra-violet [UV] light.
NOTE
When classifying in this group, classification is also made in group H01L 33/26 or one of its subgroups in order to identify the chemical composition of the light emitting region

33/20 . . . with a particular shape, e.g. curved or truncated substrate
33/22 . . . Roughened surfaces, e.g. at the interface between epitaxial layers
33/24 . . . of the light emitting region, e.g. non-planar junction
33/26 . . . Materials of the light emitting region
33/28 . . . containing only elements of group II and group VI of the periodic system
33/285 . . . [characterised by the doping materials]
33/30 . . . containing only elements of group III and group V of the periodic system
33/305 . . . [characterised by the doping materials]
33/32 . . . containing nitrogen
33/325 . . . . [characterised by the doping materials]
33/34 . . . containing only elements of group IV of the periodic system
33/343 . . . [characterised by the doping materials]
33/346 . . . [containing porous silicon]
33/36 . . . characterised by the electrodes
33/38 . . . with a particular shape
33/382 . . . [the electrode extending partially in or entirely through the semiconductor body]
33/385 . . . [the electrode extending at least partially onto a side surface of the semiconductor body]
33/387 . . . [with a plurality of electrode regions in direct contact with the semiconductor body and being electrically interconnected by another electrode layer]
33/40 . . . Materials therefor
33/405 . . . [Reflective materials]
33/42 . . . Transparent materials
33/44 . . . characterised by the coatings, e.g. passivation layer or anti-reflective coating
33/46 . . . Reflective coating, e.g. dielectric Bragg reflector
33/465 . . . [with a resonant cavity structure]
33/48 . . . characterised by the semiconductor body packages

NOTE
This group covers elements in intimate contact with the semiconductor body or integrated with the 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]

35/00 Thermoelectric devices comprising a junction of dissimilar materials, i.e. exhibiting Seebeck or Peltier effect with or without other thermoelectric effects or thermmagnetic effects; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof; Details thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; refrigerating machines using electric or magnetic effects F25B 21/00; thermometers using thermoelectric or thermomagnetic elements G01K 7/00; obtaining energy from radioactive sources G21H)

35/02 . . . Details
35/04 . . . Structural details of the junction; Connections of leads
35/06 . . . detachable, e.g. using a spring
35/08 . . . non-detachable, e.g. cemented, sintered, soldered, [e.g. thin films]
35/10 . . . Connections of leads
35/12 . . . Selection of the material for the legs of the junction
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_{III}B_{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 27/000; [radiation pyrometers using pyroelectric detectors G01J 5/34] thermometers using thermo-electric or thermomagnetic elements G01K 7/000; selection of materials for magnetography, e.g. for Curie-point writing G03G 5/00)
37/02 . using thermal change of dielectric constant, e.g. working above and below Curie point (e.g. pyroelectric devices)
37/025 . . . [Selection of materials]
37/04 . using thermal change of magnetic permeability, e.g. working above and below the Curie point (e.g. pyromagnetic devices)

39/00 Devices using superconductivity; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/000; [light detection G01J, G02F 2/000; application to memories G11C 11/44, G11C 15/00, G11C 19/32]; superconducting conductors cables or transmission lines H01B 12/00; [microwaves H01P 7/000, H01P 11/000; superconductive coils or windings H01F; amplifiers using superconductivity H03F 19/000; impulse generators and logic circuits H03K 3/38, H03K 17/92, H03K 19/195; lasers H01S 3/00, H01S 5/000])

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, 70} (fullerennes in general C07C 13/000)]
39/125 . . . [Ceramic materials]
39/126 . . . . [comprising copper oxide]
39/128 . . . . [Multi-layered structures, e.g. super lattices]
39/14 . . . Permanent superconductor devices
39/141 . . . [comprising metal borides, e.g. MgB_2]
39/143 . . . [comprising high Tc ceramic materials]
39/145 . . . [Three or more electrode devices (H01L 39/228 takes precedence)]
39/146 . . . [Field effect devices]
39/148 . . . [Abrikosov vortex devices]
39/16 . . . Devices switchable between superconductive and normal states , e.g. switches, current limiters (circuits for current limitation using superconductor elements H02H 9/023)]
39/18 . . . Cryotrons
39/20 . . . Power cryotrons
39/22 . . . Devices comprising a junction of dissimilar materials, e.g. Josephson-effect devices
39/221 . . . [Single electron tunnelling devices]
39/223 . . . [Josephson-effect devices]
39/225 . . . [comprising high Tc ceramic materials]
39/226 . . . [comprising metal borides, e.g. MgB_2]
39/228 . . . [three or more electrode devices, e.g. transistor-like structures]
39/24 . . . Processes or apparatus peculiar to the manufacture or treatment of devices provided for in H01L 39/000 or of parts thereof
39/2403 . . . [Processes peculiar to the manufacture or treatment of composite superconductor filaments (comprising copper oxide H01L 39/2419)]
39/2406 . . . [of devices comprising Nb or an alloy of Nb with one or more of the elements of group 4, e.g. Ti, Zr, Hf]
39/2409 . . . [of devices comprising an intermetallic compound of type A-15, e.g. Nb-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 metallographic chemical 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}
39/2477 . . . . . . . . {Manufacture or deposition of contacts or electrodes}
39/247 . . . . . . . . {Processes including the use of precursors}
39/248 . . . . . . . . {Processes peculiar to the manufacture or treatment of filaments or composite wires}
39/2483 . . . . . . . . {Introducing flux pinning centres}
39/2487 . . . . . . . . {of devices comprising metal borides, e.g. MgB₂}
39/249 . . . . . . . . {Treatment of superconductive layers by irradiation, e.g. ion-beam, electron-beam, laser beam, X-rays (irradiation devices G21K, H01L)}
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
41/04 . . . . . . . . . . . . {Drive or control circuitry or methods for piezo-electric or electrostrictive devices not otherwise provided for}
41/04 . . . . . . . . . . . . {for piezoelectric transformers (conversion of DC or AC power H02M; for operating discharge lamps H05B 41/282)}
41/04 . . . . . . . . {Electrodes [or electrical connection arrangements]}
41/04 . . . . . . . . . . . . {Individual layer electrodes of multilayer piezoelectric or electrostrictive devices, e.g. internal electrodes}
41/04 . . . . . . . . {Connection electrodes of multilayer piezoelectric or electrostrictive devices, e.g. external electrodes}
41/04 . . . . . . . . . . . . {embedded within piezoelectric or electrostrictive material, e.g. via connections}
41/04 . . . . . . . . {Further connection or lead arrangements, e.g. flexible wiring boards, terminal pins}
41/04 . . . . . . . . {Conductive materials (in general H01B 1/00)}
41/04 . . . . . . . . . . . . {the principal material being non-metallic, e.g. oxide or carbon based}
41/05 . . . . . . . . {Mounts, supports, enclosures or casings}
41/05 . . . . . . . . . . . . {Further insulation means against electrical, physical or chemical damage, e.g. protective coatings}
41/16 Selection of materials
41/18 for piezoelectric or electrostrictive devices \(, \text{ e.g. bulk piezoelectric crystals} \)
41/183 \(, \text{ e.g. having 1-3 or 2-2 type connectivity} \)
41/187 \(, \text{ e.g. synthetic inorganic polycrystalline compounds incl. epitaxial, quasi-crystalline materials} \)
41/1871 \(, \text{ e.g. alkaline earth metal based oxides, e.g. barium titanates} \)
41/1873 \(, \text{ e.g. alkali metal based oxides, e.g. lithium, sodium or potassium niobates} \)
41/1875 \(, \text{ e.g. lead based oxides} \)
41/1876 \(, \text{ e.g. lead zirconate titanate based} \)
41/1878 \(, \text{ e.g. bismuth based oxides} \)
41/193 \(, \text{ e.g. piezoelectric polymers} \)
41/20 for magnetostrictive devices
41/22 Processes or apparatus specially adapted for the assembly, manufacture or treatment of piezoelectric or electrostrictive devices or of parts thereof
41/23 Forming enclosures or casings
41/25 Assembling devices that include piezoelectric or electrostrictive parts
41/253 Treating devices or parts thereof to modify a piezoelectric or electrostrictive property, e.g. polarisation characteristics, vibration characteristics or mode tuning
41/257 by polarising
41/27 Manufacturing multilayered piezoelectric or electrostrictive devices or parts thereof, e.g. by stacking piezoelectric bodies and electrodes
41/273 by integrally sintering piezoelectric or electrostrictive bodies and electrodes
41/277 by stacking bulk piezoelectric or electrostrictive bodies and electrodes
41/29 Forming electrodes, leads or terminal arrangements
41/293 Connection electrodes of multilayered piezoelectric or electrostrictive parts

**NOTE**
Integral individual layer electrode and connection electrode are classified in both H01L 41/293 and H01L 41/297
41/297 Individual layer electrodes of multilayered piezoelectric or electrostrictive parts

**NOTE**
Integral individual layer electrode and connection electrode are classified in both H01L 41/293 and H01L 41/297
41/31 Applying piezoelectric or electrostrictive parts or bodies onto an electrical element or another base
41/311 Mounting of piezoelectric or electrostrictive parts together with semiconductor elements, or other circuit elements, on a common substrate
41/312 by laminating or bonding of piezoelectric or electrostrictive bodies
41/313 by metal fusing or with adhesives
41/314 by depositing piezoelectric or electrostrictive layers, e.g. aerosol or screen printing
41/316 by vapour phase deposition
41/317 by liquid phase deposition
41/318 by sol-gel deposition
41/319 using intermediate layers, e.g. for growth control
41/33 Shaping or machining of piezoelectric or electrostrictive bodies
41/331 by coating or depositing using masks, e.g. lift-off
41/332 by etching, e.g. lithography
41/333 by moulding or extrusion
41/335 by machining
41/337 by polishing or grinding
41/338 by cutting or dicing
41/339 by punching
41/35 Forming piezoelectric or electrostrictive materials
41/37 Composite materials
41/39 Inorganic materials
41/41 by melting
41/43 by sintering
41/45 Organic materials
41/47 Processes or apparatus specially adapted for the assembly, manufacture or treatment of magnetostrictive devices or of parts thereof

**43/00 Devices using galvanomagnetic or similar magnetic effects**

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Details
43/02 of Hall-effect devices
43/04 Hall-effect devices
43/06 \(, \text{ e.g. for growth} \)
43/05 \(, \text{ e.g. for growth} \)
43/065 \(, \text{ e.g. for growth} \)
43/06 \(, \text{ e.g. for growth} \)
43/07 \(, \text{ e.g. for growth} \)
43/08 \(, \text{ e.g. for growth} \)
43/10 Selection of materials
43/12 Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof (not peculiar thereto H01L 21/00)
43/14 \(, \text{ for Hall-effect devices} \)

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**45/00 Solid state devices adapted for rectifying, amplifying, oscillating or switching without a potential-jump barrier or surface barrier**

e.g. diode triodes; Ovshinsky-effect devices; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; devices with potential-jump barrier, or surface barrier controllable by variation of a magnetic field H01L 29/02)
45/005 \(, \text{ e.g. for growth} \)
45/02 \(, \text{ e.g. for growth} \)
45/04 \(, \text{ e.g. for growth} \)

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**60 CPC - 2020.05**
H01L

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 pillay 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 nitrates]
45/146 . . . [Binary metal oxides, e.g. TaOx]
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)]
47/002 . . . [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; theroelectric 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]
H01L

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. polyethylene (per se C08G 73/026), polyphenylene (per se C08G 61/010), 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 . . . [Polyethylene dioxyphiphene [PEDOT] and derivatives]
51/0038 . . . [Poly-phenylenevinylenes and derivatives (per se C08G 61/10)]
51/0039 . . . [Polyethylene and derivatives]
51/004 . . . [comprising aliphatic or olefinic chains, e.g. poly-N-vinylcarbazol, PVC, PTFE]
51/0041 . . . [Polymethylene (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, fullerences (per se C01B 32/15)]
51/0046 . . . [Fullerenes, e.g. C60, C70]
51/0047 . . . [comprising substituents, e.g. PCBM]
51/0048 . . . [Carbon nanotubes]
51/0049 . . . [comprising substituents]
51/005 . . . [Macromolecular systems with low molecular weight, e.g. cyanine dyes, coumarine dyes, tetrathiafulvalene (H01L 51/0045, H01L 51/0077, H01L 51/0093, H01L 51/0094 take precedence)]
51/0051 . . . [Charge transfer complexes]
51/0052 . . . [Polycyclic condensed aromatic hydrocarbons, e.g. anthracene]
51/0053 . . . [Aromatic anhydride or imide compounds, e.g. perylene tetra-carboxylic dihydride, perylene tetracarboxylic diimide]
51/0054 . . . [containing four rings, e.g. pyrene]
51/0055 . . . [containing five rings, e.g. pentacene]
51/0056 . . . [containing six or more rings]
51/0057 . . . [containing at least one aromatic ring having 7 or more carbon atoms, e.g. azulene]
51/0058 . . . [containing more than one polycyclic condensed aromatic rings, e.g. bis-anthracene]
51/0059 . . . [Amine compounds having at least two aryl rest on at least one amine-nitrogen atom, e.g. triphenylamine (per se C07C 211/00)]
51/006 . . . [comprising polycyclic condensed aromatic hydrocarbons as substituents on the nitrogen atom]
51/0061 . . . [comprising heteroaromatic hydrocarbons as substituents on the nitrogen atom]
51/0062 . . . [aromatic compounds comprising a hetero atom, e.g.: N,P,S]
51/0064 . . . [Cyanine Dyes]
51/0065 . . . [containing only oxygen as heteroatom]
51/0067 . . . [containing only nitrogen as heteroatom (H01L 51/0064 takes precedence)]
51/0068 . . . [comprising only sulfur as heteroatom]
51/0069 . . . [comprising two or more different heteroatoms per ring, e.g. S and N (H01L 51/0064 takes precedence)]
51/007 . . . [Oxadiazole compounds]
51/0071 . . . [Polycyclic condensed heteroaromatic hydrocarbons]
51/0072 . . . [comprising only nitrogen in the heteroaromatic polycrystalline ringsystem, e.g. phenantrolene, carbazole]
51/0073 . . . [comprising only oxygen in the heteroaromatic polycrystalline ringsystem, e.g. umarine dyes]
51/0074 . . . [comprising only sulfur in the heteroaromatic polycrystalline ringsystem, e.g. benzothiophene]
51/0075 . . . [Langmuir Blodgett films (per se B05D 1/202)]
specially adapted for rectifying, amplifying, oscillating or switching, or capacitors or resistors with at least one potential-jump barrier or surface barrier [multistep processes for their manufacture]

51/0504 . . . . (the devices being controllable only by the electric current supplied or the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched, e.g. three-terminal devices)

51/0508 . . . . [Field-effect devices, e.g. TFTs]
51/0512 . . . . [insulated gate field effect transistors]
51/0516 . . . . [characterised by the gate dielectric]
51/052 . . . . [the gate dielectric comprising only organic materials]
51/0525 . . . . [the gate dielectric comprising only inorganic materials]
51/0529 . . . . [the gate dielectric having a multilayered structure]
51/0533 . . . . [Combinations of organic and inorganic layers]
51/0537 . . . . [the gate dielectric comprising composite materials, e.g. TiO₂ particles in a polymer matrix]
51/0541 . . . . [Lateral single gate single channel transistors with non inverted structure, i.e. the organic semiconductor layer is formed before the gate electrode]
organic electroluminescent displays G09G 3/3208 or PLED H05B 45/60
lasers H01S 5/36
emitting devices \(\text{[PLED]}\) (organic semiconductor light emitting diodes \(\text{[OLED]}\) or polymer light emitting devices \(\text{[PLED]}\) with the inorganic nanostructures being nanotubes or nanowires, e.g. CdTe nanotubes in P3HT)

interpenetrating networks

with spacer layers between the emissive layers

light sensitive field effect devices

Devices having a m-i-s structure

Devices having a p-i-n structure

Details of devices

Electrodes

[transparent electrodes, e.g. ITO, TCO]

[comprising arrangements for extracting the current from the cell, e.g. metal finger grid systems to reduce the serial resistance of transparent electrodes]

Light trapping means

Passivation, containers, encapsulations

specially adapted for light emission, e.g. organic light emitting diodes \(\text{[OLED]}\) or polymer light emitting devices \(\text{[PLED]}\) \(\text{[organic semiconductor lasers H01S 5/36 ; circuit arrangements for OLED or PLED H05B 45/60; control arrangements for organic electroluminescent displays G09G 3/3208]}\)

characterised by the interrelation between parameters of constituting active layers, e.g. HOMO-LUMO relation

[Intermediate layers comprising a mixture of materials of the adjoining active layers]

[Electroluminescent \(\text{[EL]}\) layer]

[triplet emission]

[comprising active inorganic nanostructures, e.g. luminescent quantum dots]

[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]

[for assisting energy transfer, e.g. sensitisation]

[Light emitting electrochemical cells \(\text{[LEC]}, \text{i.e. with mobile ions in the active layer}]

[Multicolour light emission, e.g. colour tuning, polymer blend, stack of electroluminescent layers]

[Stack of electroluminescent layers]

[with spacer layers between the emissive layers]

[Carrier transporting layer]

[Frozen]

[W]arning

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.

[W]arning

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.

[W]arning

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.
51/5243 . . . . . [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
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 . . . . . 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
2224/00  Indexing scheme for arrangements for connecting or disconnecting semiconductor or solid-state bodies and methods related thereto as covered by H01L.

2224/01  Means for bonding being attached to, or being formed on, the surface to be connected, e.g. chip-to-package, die-attach, “first-level” interconnects; Manufacturing methods related thereto
Manufacturing methods

Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate

Involving a permanent auxiliary member, i.e. a member which is left at least partly in the finished device, e.g. coating, dummy feature forming part of the manufacturing apparatus, Involving a temporary auxiliary member not therebetween

Manufacture and pre-treatment of the bonding area, e.g. coating, dummy feature a member which is left at least partly in the finished device, e.g. coating, dummy feature forming part of the manufacturing apparatus, Involving a temporary auxiliary member not therebetween

Material of the insulating layers

Material of the redistribution layers

Printing patterns on the bonding area preform

Applying permanent coating for protecting parts during the process

Applying permanent coating, e.g. in-situ desmearing

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

Physical or chemical etching

Selective modification

Selective modification

 Aerosol deposition, i.e. blanket deposition of the material of the bonding area

Applying permanent coating, e.g. in-situ desmearing

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

Physical or chemical etching

Selective modification

Paste or layer lamination

Wave coating

Film defects

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

by chemical or physical modification of a pre-existing or pre-deposited material

Pre-existing or pre-deposited material

Sintering

Anodisation

Curing and solidification, e.g. of a photosensitive material

Self-assembly, e.g. self-agglomeration of the material in a fluid

Auxiliary means therefor, e.g. for self-assembly activation

with special adaptation of the surface of the body to be connected or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process

Selective modification

Selective modification

Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin

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

Mechanical treatment, e.g. polishing, grinding

Physical or chemical etching

by physical means only

by chemical means only

Chemical mechanical polishing [CMP]

with selective exposure, development and removal of a photosensitive material, e.g. of a photosensitive conductive resin

Photo lithography

using masks

using a laser or a focused ion beam [FIB]

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

involving monitoring, e.g. feedback loop

Post-treatment of the bonding area

Cleaning, e.g. oxide removal step, desmearing

Applying permanent coating, e.g. in-situ coating

Spray coating

by dipping, e.g. in a solder bath

Immersion coating, e.g. in a solder bath
Bonding area integrally formed with a redistribution layer on the semiconductor or solid-state body, e.g.

Bonding area integrally formed with a via connection of the semiconductor or solid-state body

Shape

comprising apertures or cavities

in top view

being rectangular

being square

being circular or elliptic

in side view

comprising protrusions or indentations

being a conformal layer on a patterned surface

being a non conformal layer on a patterned surface

the internal layer being at least partially embedded in the surface

the whole internal layer protruding from the surface

the internal layer being disposed on a redistribution layer on the semiconductor or solid-state body

the internal layer being disposed on a via connection of the semiconductor or solid-state body

the internal layer being disposed in a recess of the surface

the internal layer extending out of an opening

Single internal layer

Plural internal layers

being mutually engaged together, e.g. through inserts

being disposed next to each other, e.g. side-to-side arrangements

being stacked

Two-layer arrangements

Three-layer arrangements

Four-layer arrangements

with additional elements, e.g. vias arrays, interposed between the stacked layers

Structure, shape, material or disposition of the bonding areas prior to the connecting process

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

Structure

Dual damascene structure

comprising a core and a coating
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

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, or the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C or the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

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 950°C and less than 1550°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 2224/05288)
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, 2224/052 - H01L 2224/05291, 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, 2224/052 - H01L 2224/05291
with a principal constituent of the material being a gas not provided for in groups H01L, 2224/052 - H01L 2224/05291
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 2224/05388)
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
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 2224/053 - H01L 2224/05391, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/053 - H01L 2224/05391
with a principal constituent of the material being a gas not provided for in groups H01L 2224/053 - H01L 2224/05391
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
Tellurium [Te] 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 905°C and less than 1550°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituentMagnesium [Mg] as principal constituentAluminium [Al] as principal constituent
Tungsten [W] as principal constituent
Rhenium [Re] as principal constituentTantalum [Ta] as principal constituent
Molybdenum [Mo] as principal constituentNiobium [Nb] as principal constituent
Iridium [Ir] as principal constituent
Rhodium [Rh] as principal constituentVanadium [V] as principal constituent
Chromium [Cr] as principal constituentZirconium [Zr] as principal constituent
Platinum [Pt] as principal constituent
Iron [Fe] as principal constituent
Palladium [Pd] as principal constituentTitanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituentChromium [Cr] as principal constituentVanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituentNiobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
the principal constituent melting at a temperature of 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 constituentZirconium [Zr] as principal constituentChromium [Cr] as principal constituentVanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituentNiobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent

with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the material being a solid not provided for in groups H01L 2224/05491, e.g. allotropes of carbon, fullerene, graphite, carbon nanotubes, diamond
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/05491
with a principal constituent of the material being a gas not provided for in groups H01L 2224/05491
with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
Shape or distribution of the fillers
External layer
Structure
Dual damascene structure
comprising a core and a coating
Bonding area integrally formed with a redistribution layer on the semiconductor or solid-state body
Shape
comprising apertures or cavities
in top view
being rectangular
being square
being circular or elliptic
in side view
comprising protrusions or indentations
conformal layer on a patterned surface
non conformal layer on a patterned surface
Disposition
On the entire surface of the internal layer
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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>2224/05562</td>
<td>On the entire exposed surface of the internal layer</td>
</tr>
<tr>
<td>2224/05563</td>
<td>Only on parts of the surface of the internal layer</td>
</tr>
<tr>
<td>2224/05564</td>
<td>Only on the bonding interface of the bonding area</td>
</tr>
<tr>
<td>2224/05565</td>
<td>Only outside the bonding interface of the bonding area</td>
</tr>
<tr>
<td>2224/05566</td>
<td>Both on and outside the bonding interface of the bonding area</td>
</tr>
<tr>
<td>2224/05567</td>
<td>The external layer being at least partially embedded in the surface</td>
</tr>
<tr>
<td>2224/05568</td>
<td>The whole external layer protruding from the surface</td>
</tr>
<tr>
<td>2224/05569</td>
<td>The external layer being disposed on a redistribution layer on the semiconductor or solid-state body</td>
</tr>
<tr>
<td>2224/0557</td>
<td>The external layer being disposed on a via connection of the semiconductor or solid-state body</td>
</tr>
<tr>
<td>2224/05571</td>
<td>The external layer being disposed in a recess of the surface</td>
</tr>
<tr>
<td>2224/05572</td>
<td>The external layer extending out of an opening</td>
</tr>
<tr>
<td>2224/05573</td>
<td>Single external layer</td>
</tr>
<tr>
<td>2224/05574</td>
<td>Plural external layers</td>
</tr>
<tr>
<td>2224/05575</td>
<td>Being mutually engaged together, e.g. through inserts</td>
</tr>
<tr>
<td>2224/05576</td>
<td>Being disposed next to each other, e.g. side-to-side arrangements</td>
</tr>
<tr>
<td>2224/05577</td>
<td>Being stacked</td>
</tr>
<tr>
<td>2224/05578</td>
<td>Two-layer coating</td>
</tr>
<tr>
<td>2224/05579</td>
<td>Three-layer coating</td>
</tr>
<tr>
<td>2224/05580</td>
<td>Four-layer coating</td>
</tr>
<tr>
<td>2224/05599</td>
<td>Material</td>
</tr>
</tbody>
</table>

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

- 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

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

- Palladium [Pd] as principal constituent

- Titanium [Ti] as principal constituent

- Platinum [Pt] as principal constituent

- Zirconium [Zr] as principal constituent

- Chromium [Cr] as principal constituent

- Vanadium [V] as principal constituent

- Rhodium [Rh] as principal constituent

- Ruthenium [Ru] as principal constituent

- Iridium [Ir] as principal constituent

- Niobium [Nb] as principal constituent

- Molybdenum [Mo] as principal constituent

- Tantalum [Ta] as principal constituent

- Rhenium [Re] as principal constituent

- Tungsten [W] as principal constituent

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

- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics [H01L 2224/0788])

- 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 2224/07 - H01L 2224/0791], e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
Fillers

Base material

H01L 2224/057 not provided for in groups of the material being a gas with a principal constituent

2224/05795 with a principal constituent of the material being a gas not provided for in groups H01L 2224/057 - H01L 2224/05791

2224/058 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

2224/05801 the principal constituent melting at a temperature of less than 400°C

2224/05805 Gallium [Ga] as principal constituent

2224/05809 Indium [In] as principal constituent

2224/05811 Tin [Sn] as principal constituent

2224/05813 Bismuth [Bi] as principal constituent

2224/05814 Thallium [Tl] as principal constituent

2224/05816 Lead [Pb] as principal constituent

2224/05817 the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

2224/05818 Zinc [Zn] as principal constituent

2224/0582 Antimony [Sb] as principal constituent

2224/05823 Magnesium [Mg] as principal constituent

2224/05824 Aluminium [Al] as principal constituent

2224/05838 the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

2224/05839 Silver [Ag] as principal constituent

2224/05844 Gold [Au] as principal constituent

2224/05847 Copper [Cu] as principal constituent

2224/05849 Manganese [Mn] as principal constituent

2224/05855 Nickel [Ni] as principal constituent

2224/05857 Cobalt [Co] as principal constituent

2224/0586 Iron [Fe] as principal constituent

2224/05863 the principal constituent melting at a temperature of greater than 1550°C

2224/05864 Palladium [Pd] as principal constituent

2224/05866 Titanium [Ti] as principal constituent

2224/05869 Platinum [Pt] as principal constituent

2224/0587 Zirconium [Zr] as principal constituent

2224/05871 Chromium [Cr] as principal constituent

2224/05872 Vanadium [V] as principal constituent

2224/05873 Rhodium [Rh] as principal constituent

2224/05876 Ruthenium [Ru] as principal constituent

2224/05878 Iridium [Ir] as principal constituent

2224/05879 Niobium [Nb] as principal constituent

2224/0588 Molybdenum [Mo] as principal constituent

2224/05881 Tantalum [Ta] as principal constituent

2224/05883 Rhenium [Re] as principal constituent

2224/05884 Tungsten [W] as principal constituent

2224/05886 with a principal constituent of the material being a non metallic, non metalloid inorganic material

2224/05887 Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05888)

2224/05888 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

2224/05891 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

2224/05893 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

2224/05894 with a principal constituent of the material being a liquid not provided for in groups H01L 2224/058 - H01L 2224/05891

2224/05895 with a principal constituent of the material being a gas not provided for in groups H01L 2224/058 - H01L 2224/05891
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.


The principal constituent being a non metallic, non metalloid inorganic material, e.g. crystalline carbides, nitrides or oxides (glass ceramics, 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 2224/05988, 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 2224/05991, 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 2224/05991, 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.
H01L

2224/05999 ................. Shape or distribution of the fillers of a plurality of bonding areas
2224/06 .................. Structure
2224/0601 .................. Bonding areas having different sizes, e.g. different heights or widths
2224/0605 .................. Shape
2224/06051 ................. Bonding areas having different shapes
2224/061 .................. Disposition
2224/06102 ................. the bonding areas being at different heights
2224/0612 .................. Layout
2224/0613 .................. Square or rectangular array
2224/06131 ................ being uniform, i.e. having a uniform pitch across the array
2224/06132 ................ being non uniform, i.e. having a non uniform pitch across the array
2224/06133 ................ with a staggered arrangement, e.g. depopulated array
2224/06134 ................ covering only portions of the surface to be connected
2224/06135 ................ Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/06136 ................ Covering only the central area of the surface to be connected, i.e. central arrangements
2224/06137 ................ with specially adapted redistribution layers [RDL]
2224/06138 ................ being disposed in a single wiring level, i.e. planar layout
2224/06139 ................ being disposed in different wiring levels, i.e. resurf layout
2224/0614 .................. Circular array, i.e. array with radial symmetry
2224/06141 ................ being uniform, i.e. having a uniform pitch across the array
2224/06142 ................ being non uniform, i.e. having a non uniform pitch across the array
2224/06143 ................ with a staggered arrangement, e.g. depopulated array
2224/06144 ................ covering only portions of the surface to be connected
2224/06145 ................ Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/06146 ................ Covering only the central area of the surface to be connected, i.e. central arrangements
2224/06147 ................ with specially adapted redistribution layers [RDL]
2224/06148 ................ being disposed in a single wiring level, i.e. planar layout
2224/06149 ................ being disposed in different wiring levels, i.e. resurf layout
2224/0615 ................. Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry
2224/06151 ................ being uniform, i.e. having a uniform pitch across the array
2224/06152 ................ being non uniform, i.e. having a non uniform pitch across the array
2224/06153 ................ with a staggered arrangement, e.g. depopulated array
2224/06154 ................. covering only portions of the surface to be connected
2224/06155 ................. Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/06156 ................. Covering only the central area of the surface to be connected, i.e. central arrangements
2224/06157 ................. with specially adapted redistribution layers [RDL]
2224/06158 ................. being disposed in a single wiring level, i.e. planar layout
2224/06159 ................. being disposed in different wiring levels, i.e. resurf layout
2224/0616 .................. Random array, i.e. array with no symmetry
2224/06163 ................ with a staggered arrangement
2224/06164 ................. covering only portions of the surface to be connected
2224/06165 ................. Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/06166 ................. Covering only the central area of the surface to be connected, i.e. central arrangements
2224/06167 ................ with specially adapted redistribution layers [RDL]
2224/06168 ................. being disposed in a single wiring level, i.e. planar layout
2224/06169 ................. being disposed in different wiring levels, i.e. resurf layout
2224/06177 ................. Combinations of arrays with different layouts
2224/06179 ................. Corner adaptations, i.e. disposition of the bonding areas at the corners of the semiconductor or solid-state body
2224/0618 ................. being disposed on at least two different sides of the body, e.g. dual array
2224/06181 ................ On opposite sides of the body
2224/06182 ................ with specially adapted redistribution layers [RDL]
2224/06183 ................ On contiguous sides of the body
2224/06187 ................ with specially adapted redistribution layers [RDL]
2224/06188 ................ being disposed in a single wiring level, i.e. planar layout
2224/06189 ................. being disposed in different wiring levels, i.e. resurf layout
2224/0619 ................. Material
2224/06505 ................. Bonding areas having different materials
2224/0651 .................. Function
2224/06515 ................. Bonding areas having different functions
2224/06517 ................. including bonding areas providing primarily mechanical bonding
2224/06519 ................. including bonding areas providing primarily thermal dissipation
2224/06 .................. Structure, shape, material or disposition of the bonding areas after the connecting process
2224/08 ................. of an individual bonding area
2224/0801 ................. Structure
2224/0805 ................. Shape
2224/08052 ................. 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 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 to a bonding area protruding from the surface of the item
the bonding area connecting to a bonding area protruding from the surface of the item
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the bonding area connecting to a bonding area protruding from the surface of the item
Bump connectors; Manufacturing methods related thereto

Auxiliary members for bump connectors, e.g. spacers

Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate

for supporting the semiconductor or solid-state body

for holding or transferring the bump preform

for aligning the bump connector, e.g. marks, spacers

for protecting parts during manufacture

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

for holding or confining the bump connector, e.g. solder flow barrier

for aligning the bump connector, e.g. marks, spacers

for protecting parts during the process

Manufacture and pre-treatment of the bump connector preform

Shaping

Applying permanent coating

by local deposition of the material of the bump connector

in liquid form
H01L

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

Spray coating

Curtain coating

by dipping, e.g. in a solder bath (hot-dipping C23C 2/00)

Immersion coating, e.g. in a solder bath (immersion processes C23C 2/00)

Chemical solution deposition [CSD], i.e. using a liquid precursor

Wave coating

in solid form

Lamination of a preform, e.g. foil, sheet or layer

the preform being at least partly pre-patterned

by transfer printing

using a powder

in gaseous form

Physical vapour deposition [PVD], e.g. evaporation, or sputtering

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

Plating

Electroplating

Electroless plating

Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface

using a lift-off mask

Profile of the lift-off mask

Multilayer masks

Permanent masks, i.e. masks left in the finished device, e.g. passivation layers

by chemical or physical modification of a pre-existing or pre-deposited material

Pre-existing or pre-deposited material

Sintering

Anodisation

Curing and solidification, e.g. of a photosensitive bump material

Self-assembly, e.g. self-agglomeration of the bump material in a fluid

Auxiliary means therefor, e.g. for self-assembly activation

with special adaptation of the surface or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process

involving the material of the bonding area, e.g. bonding pad or under bump metallisation [UBM]

Selective modification

using a laser or a focussed ion beam [FIB]

Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin

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

Mechanical treatment, e.g. polishing, grinding

Physical or chemical etching

by physical means only

by chemical means only

Chemical mechanical polishing [CMP]

with selective exposure, development and removal of a photosensitive bump material, e.g. of a photosensitive conductive resin

using masks

Photolithography

using a laser or a focused ion beam [FIB]

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

involving monitoring, e.g. feedback loop

Post-treatment of the bump connector

Cleaning, e.g. oxide removal step, desmearing

Applying permanent coating, e.g. in-situ coating

Spray coating

by dipping, e.g. in a solder bath

Immersion coating, e.g. in a solder bath

Chemical solution deposition [CSD], i.e. using a liquid precursor

Plating, e.g. electroplating, electroless plating

Physical vapour deposition [PVD], e.g. evaporation, or sputtering

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

Reworking, e.g. shaping (reflowing H01L 22/1849)

involving a chemical process, e.g. etching the bump connector

involving a mechanical process, e.g. planarising the bump connector

Chemical mechanical polishing [CMP]

Thermal treatments, e.g. annealing, controlled cooling

Reflowing

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

with repetition of the same manufacturing step

Multiple masking steps

using different masks

with modification of the same mask
2224/1191 . . . . . . . Forming a passivation layer after forming the bump connector
2224/11912 . . . . . . . the bump being used as a mask for patterning other parts
2224/11914 . . . . . . . the under bump metallisation [UBM] being used as a mask for patterning other parts
2224/11916 . . . . . . . a passivation layer being used as a mask for patterning other parts
2224/12 . . . . . . . Structure, shape, material or disposition of the bump connectors prior to the connecting process
2224/12105 . . . . . . . Bump connectors formed on an encapsulation of the semiconductor or solid-state body, e.g. bumps on chip-scale packages
2224/13 . . . . . . . of an individual bump connector
2224/13001 . . . . . . . Core members of the bump connector
2224/13005 . . . . . . . Structure
2224/13006 . . . . . . . Bump connector larger than the underlying bonding area, e.g. than the under bump metallisation [UBM]
2224/13007 . . . . . . . Bump connector smaller than the underlying bonding area, e.g. than the under bump metallisation [UBM]
2224/13008 . . . . . . . Bump connector integrally formed with a redistribution layer on the semiconductor or solid-state body
2224/13009 . . . . . . . Bump connector integrally formed with a via connection of the semiconductor or solid-state body
2224/1301 . . . . . . . Shape
2224/13011 . . . . . . . comprising apertures or cavities, e.g. hollow bump
2224/13012 . . . . . . . in top view
2224/13013 . . . . . . . being rectangular or square
2224/13014 . . . . . . . being circular or elliptic
2224/13015 . . . . . . . comprising protrusions or indentations
2224/13016 . . . . . . . in side view
2224/13017 . . . . . . . being non uniform along the bump connector
2224/13018 . . . . . . . comprising protrusions or indentations
2224/13019 . . . . . . . at the bonding interface of the bump connector, i.e. on the surface of the bump connector
2224/1302 . . . . . . . Disposition
2224/13021 . . . . . . . the bump connector being disposed in a recess of the surface
2224/13022 . . . . . . . the bump connector being at least partially embedded in the surface
2224/13023 . . . . . . . the whole bump connector protruding from the surface
2224/13024 . . . . . . . the bump connector being disposed on a redistribution layer on the semiconductor or solid-state body
2224/13025 . . . . . . . the bump connector being disposed on a via connection of the semiconductor or solid-state body
2224/13026 . . . . . . . relative to the bonding area, e.g. bond pad, of the semiconductor or solid-state body
2224/13027 . . . . . . . the bump connector being offset with respect to the bonding area, e.g. bond pad
2224/13028 . . . . . . . the bump connector being disposed on at least two separate bonding areas, e.g. bond pads
2224/13075 . . . . . . . Plural core members
2224/13076 . . . . . . . being mutually engaged together, e.g. through inserts
2224/13078 . . . . . . . being disposed next to each other, e.g. side-to-side arrangements
2224/1308 . . . . . . . being stacked
2224/13082 . . . . . . . Two-layer arrangements
2224/13083 . . . . . . . Three-layer arrangements
2224/13084 . . . . . . . Four-layer arrangements
2224/13099 . . . . . . . Material
2224/131 . . . . . . . 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
2224/13101 . . . . . . . Gallium [Ga] as principal constituent
2224/13105 . . . . . . . Indium [In] as principal constituent
2224/13109 . . . . . . . Tin [Sn] as principal constituent
2224/13111 . . . . . . . Bismuth [Bi] as principal constituent
2224/13113 . . . . . . . Thallium [TI] as principal constituent
2224/13114 . . . . . . . Lead [Pb] as principal constituent
2224/13117 . . . . . . . Antimony [Sb] as principal constituent
2224/13121 . . . . . . . Magnesium [Mg] as principal constituent
2224/13123 . . . . . . . Aluminium [Al] as principal constituent
2224/13124 . . . . . . . Indium [In] as principal constituent
2224/13138 . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C
2224/1314 . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/13142 . . . . . . . Tin [Sn] as principal constituent
2224/13144 . . . . . . . Silver [Ag] as principal constituent
2224/13147 . . . . . . . Copper [Cu] as principal constituent
2224/13149 . . . . . . . Manganese [Mn] as principal constituent
2224/13155 . . . . . . . Nickel [Ni] as principal constituent
2224/13157 . . . . . . . Cobalt [Co] as principal constituent
2224/1316 . . . . . . . Iron [Fe] as principal constituent
2224/13163 . . . . . . . the principal constituent melting at a temperature of greater than 1550°C

H01L
Material of the matrix

- 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
- Palladium [Pd] as 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 of the material being a gas not provided for in groups H01L 2224/131 - H01L 2224/1319
- Titanium [Ti] as principal constituent
- Platinum [Pt] as principal constituent
- Zirconium [Zr] as principal constituent

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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
with the principal constituent melting at a temperature of less than 400°C
Coating material

- 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 2224/1348)
- Glasses, e.g. amorphous oxides, nitrates 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 2224/1338 - H01L 2224/1339

- 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 2224/1338 - H01L 2224/1339

- with a principal constituent of the material being a gas not provided for in groups H01L 2224/1338 - H01L 2224/1339

- 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

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Coating Disposition Shape Structure

core, i.e. partial coating

only on parts of the surface of the core, i.e. partial coating

on the bondin interface of the bump connector

only on the bonding interface of the bump connector

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

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 2224/1366)

glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyurethane, 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 2224/1386 - H01L 2224/1381, 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 2224/1386 - H01L 2224/1381

with a principal constituent of the material being a gas not provided for in groups H01L 2224/1386 - H01L 2224/1381

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 of the matrix

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

...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 polymer, e.g. silicone, 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 2224/13691

...with a principal constituent of the material being a gas not provided for in groups H01L 2224/136 - H01L 2224/13691

...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
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

2224/13805

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, 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 2224/137 - H01L 2224/13791, 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 2224/13791

with a principal constituent of the material being a gas not provided for in groups H01L 2224/137 - H01L 2224/13791

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

2224/13805

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

2224/13805

2224/13871

2224/13872

2224/13873

2224/13874

2224/13876

2224/13878

2224/13879

2224/13804

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

Iron [Fe] as principal constituent

Cobalt [Co] 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

2224/13804

2224/13838

2224/13839

2224/13844

2224/13847

2224/13849

2224/13855

2224/13857

2224/1386

2224/13863

2224/13864

2224/13866

2224/13869

2224/1387

2224/13871

2224/13872

2224/13873

2224/13874

2224/13876

2224/13878

2224/13879
Coating material  

 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 with a principal constituent not provided for in groups H01L 2224/13891- H01L 2224/13891 of the material being a liquid with a principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C, 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 2224/13891- H01L 2224/13891  

 Glasses, e.g. amorphous oxides, nitriles or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy. The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/138 - 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 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  

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of a plurality of bump connectors

- Shape or distribution of the fillers

- Bump connectors having different sizes, e.g. different diameters, heights or widths

- Shape

- Bump connectors having different shapes

- Disposition relative to the bonding areas, e.g. bond pads, of the semiconductor or solid-state body

- the bump connectors being bonded to at least one common bonding area

- Layout

- Square or rectangular array

- being uniform, i.e. having a uniform pitch across the array

- being non uniform, i.e. having a non uniform pitch across the array

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

- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13987)

- 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 2224/13991, e.g. allotropes of carbon, fullerenes, graphite, carbon-nanotubes, diamond

- with a principal constituent of the material being a liquid not provided for in groups H01L 2224/139 - H01L 2224/13991

- with a principal constituent of the material being a gas not provided for in groups H01L 2224/139 - H01L 2224/13991

- with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

- Material

- Rhenium [Re] as principal constituent

- Tungsten [W] as principal constituent

- 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

- Comer 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 bonding

including bump connectors providing primarily thermal dissipation

Structure, shape, material or disposition of the bump connectors after the connecting process

of an individual bump connector

Structure relative to the bonding area, e.g. bond pad

the bump connector being larger than the bonding area, e.g. bond pad

the bump connector being smaller than the bonding area, e.g. bond pad

Shape

in top view

being rectangular or square

being circular or elliptic

comprising protrusions or indentations

in side view

being non uniform along the bump connector

comprising protrusions or indentations

of bonding interfaces, e.g. interlocking features

Disposition relative to the bonding area, e.g. bond pad

the bump connector connecting bonding areas 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 bonding area disposed in a recess of the surface of the item

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

the item being metallic

the bump connector connecting to a potential ring of the item

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

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

the item being a discrete passive component

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

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

the body and the item being stacked

the item being non-metallic, e.g. insulating substrate with or without metallisation

the bump connector connecting to a bond pad of the item

the bump connector connecting to a pin of the item

the bump connector connecting to a potential ring of the item

the bump connector connecting to a via metallisation of the item
the bump connector connecting to a bonding area disposed in a recess of the surface of the item

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

the bump connector connecting between the body and an opposite side of the item with respect to the body

the item being metallic

the bump connector connecting to a potential ring of the item

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

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

the bump connector connecting between the body and an opposite side of the item with respect to the body

the item being a discrete passive component

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

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

Material

at the bonding interface

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

Structure

Bump connectors having different sizes, e.g. different diameters, heights or widths

Shape

Bump connectors having different shapes

of their bonding interfaces

Disposition

relative to the bonding areas, e.g. bond pads

the bump connectors being bonded to at least one common bonding area

the bump connectors connecting two common bonding areas

Layout (layout of bump connectors prior to the connecting process H01L 2224/1412)

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

Covering only the central area of the surface to be connected, i.e. central 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

Covering only the central area of the surface to be connected, i.e. central arrangements

Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

Random layout, i.e. layout with no symmetry

with a staggered arrangement

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

Combinations of arrays with different layouts

Corner adaptations, i.e. disposition of the bump connectors at the corners of the semiconductor or solid-state body being disposed on at least two different sides of the body, e.g. dual array

On opposite sides of the body

On contiguous sides of the body

Material

Bump connectors having different materials

Function
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
of an individual HDI interconnect
Structure
Connecting portions
Disposition
of a plurality of HDI interconnects
Structure
Shape
Connecting portions
Material
HDI interconnects having different materials
Structure, shape, material or disposition of the high density interconnect connectors after the connecting process
of an individual high density interconnect connector
Deposit, e.g. MCM-D type
Laminated, e.g. MCM-L type
Shape
Conformal with the semiconductor or solid-state device
Disposition
Connecting bonding areas at the same height
Connecting bonding areas at different heights
Connecting within a semiconductor or solid-state body
Connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
the bodies being arranged next to each other, e.g. on a common substrate
the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
the bodies being stacked
the HDI interconnect connecting to the same level of the lower semiconductor or solid-state body at which the upper semiconductor or solid-state body is mounted, e.g. the upper semiconductor or solid-state body being mounted in a cavity or on a protrusion of the lower semiconductor or solid-state body
Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
the body and the item being arranged next to each other, e.g. on a common substrate
the item being non-metallic, e.g. insulating substrate with or without metallisation
the item being metallic
the item being a discrete passive component
the body and the item being stacked
the item being non-metallic, e.g. insulating substrate with or without metallisation
the HDI interconnect connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted on a protrusion of the item
the item being metallic
the HDI interconnect connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
the item being metallic
the HDI interconnect connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted on a protrusion of the item
the item being metallic
Connecting portions
Material
Auxiliary members for HDI interconnects, e.g. spacers, alignment aids
being formed on the semiconductor or solid-state body to be connected
Flow barrier
2224/24996 . . . . . . being formed on an item to be connected not being a semiconductor or solid-state body
2224/24997 . . . . . . Flow barrier
2224/24998 . . . . . . Reinforcing structures, e.g. ramp-like support
2224/25 . . . . . . of a plurality of high density interconnect connectors
2224/2501 . . . . . . Structure
2224/2505 . . . . . . Shape
2224/251 . . . . . . Disposition
2224/25105 . . . . . . Connecting at different heights
2224/25111 . . . . . . the connectors being bonded to at least one common bonding area
2224/25111 . . . . . . the connectors connecting two common bonding areas
2224/25112 . . . . . . the connectors connecting a common bonding area on the semiconductor or solid-state body to different bonding areas outside the body
2224/25113 . . . . . . the connectors connecting different bonding areas on the semiconductor or solid-state body to a common bonding area outside the body
2224/2512 . . . . . . Layout
2224/25171 . . . . . . Fan-out arrangements
2224/25174 . . . . . . Stacked arrangements
2224/25175 . . . . . . Parallel arrangements
2224/25177 . . . . . . Combinations of a plurality of arrangements
2224/2518 . . . . . . being disposed on at least two different sides of the body, e.g. dual array
2224/254 . . . . . . Connecting portions
2224/2541 . . . . . . the connecting portions being stacked
2224/2543 . . . . . . the connecting portions being staggered
2224/255 . . . . . . Material
2224/26 . . . . . . Layer connectors, e.g. plate connectors, solder or adhesive layers; Manufacturing methods related thereto
2224/2612 . . . . . . Auxiliary members for layer connectors, e.g. spacers
2224/26122 . . . . . . being formed on the semiconductor or solid-state body to be connected
2224/26125 . . . . . . Reinforcing structures
2224/26135 . . . . . . Alignment aids
2224/26145 . . . . . . Flow barriers
2224/26152 . . . . . . being formed on an item to be connected not being a semiconductor or solid-state body
2224/26155 . . . . . . Reinforcing structures
2224/26165 . . . . . . Alignment aids
2224/26175 . . . . . . Flow barriers
2224/27 . . . . . . Manufacturing methods
2224/27001 . . . . . . Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate
2224/27002 . . . . . . for supporting the semiconductor or solid-state body
2224/27003 . . . . . . for holding or transferring the layer preform
2224/27005 . . . . . . for aligning the layer connector, e.g. marks, spacers
2224/27009 . . . . . . for protecting parts during manufacture
2224/27011 . . . . . . Involving a permanent auxiliary member, i.e. a member which is left at least partly in the finished device, e.g. coating, dummy feature
2224/27013 . . . . . . for holding or confining the layer connector, e.g. solder flow barrier
2224/27015 . . . . . . for aligning the layer connector, e.g. marks, spacers
2224/27019 . . . . . . for protecting parts during the process
2224/271 . . . . . . Manufacture and pre-treatment of the layer connector preform
2224/2711 . . . . . . Shaping
2224/2712 . . . . . . Applying permanent coating
2224/273 . . . . . . by local deposition of the material of the layer connector
2224/2731 . . . . . . in liquid form
2224/27312 . . . . . . Continuous flow, e.g. using a microsyringe, a pump, a nozzle or extrusion
2224/27318 . . . . . . by dispensing droplets
2224/2732 . . . . . . Screen printing, i.e. using a stencil
2224/2733 . . . . . . in solid form
2224/27332 . . . . . . using a powder
2224/27334 . . . . . . using preformed layer
2224/274 . . . . . . by blanket deposition of the material of the layer connector
2224/2741 . . . . . . in liquid form
2224/27416 . . . . . . Spin coating
2224/27418 . . . . . . Spray coating
2224/2742 . . . . . . Curtain coating
2224/27422 . . . . . . by dipping, e.g. in a solder bath (hot-dipping C23C 2/00)
2224/27424 . . . . . . Immersion coating, e.g. in a solder bath (immersion processes C23C 2/00)
2224/27426 . . . . . . Chemical solution deposition [CSD], i.e. using a liquid precursor
2224/27428 . . . . . . Wave coating
2224/2743 . . . . . . in solid form
2224/27436 . . . . . . Lamination of a preform, e.g. foil, sheet or layer
2224/27438 . . . . . . the preform being at least partly pre-patterned
2224/2744 . . . . . . by transfer printing
2224/27442 . . . . . . using a powder
2224/27444 . . . . . . in gaseous form
2224/2745 . . . . . . Physical vapour deposition [PVD], e.g. evaporation, or sputtering
2224/27452 . . . . . . Chemical vapour deposition [CVD], e.g. laser CVD
2224/2746 . . . . . . Plating
2224/27462 . . . . . . Electroplating
2224/27464 . . . . . . Electroless plating
2224/27466 . . . . . . Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface
2224/2747 . . . . . . using a lift-off mask
2224/27472 . . . . . . Profile of the lift-off mask
2224/27474 . . . . . . Multilayer masks
2224/2748 . . . . . . Permanent masks, i.e. masks left in the finished device, e.g. passivation layers
2224/275 . . . . . . by chemical or physical modification of a pre-existing or pre-deposited material
2224/27502 . . . . . . Pre-existing or pre-deposited material
2224/27505 . . . . . . Sintering
Anodisation
Curing and solidification, e.g. of a photosensitive layer material
Self-assembly, e.g. self-agglomeration of the layer material in a fluid
Auxiliary means therefor, e.g. for self-assembly activation
with special adaptation of the surface or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process
involving the material of the bonding area, e.g. bonding pad
Selective modification
using a laser or a focussed ion beam [FIB]
Stereo Lithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin
by patterning a pre-deposited material (treatment of parts prior to assembly of the devices H01L 21/48)
Mechanical treatment, e.g. polishing, grinding
Physical or chemical etching
by physical means only
by chemical means only
Chemical mechanical polishing [CMP]
with selective exposure, development and removal of a photosensitive layer material, e.g. of a photosensitive conductive resin using masks
Photolithography
using a laser or a focused ion beam [FIB]
Ablation by means of a laser or focused ion beam [FIB]
involving monitoring, e.g. feedback loop
Post-treatment of the layer connector
Cleaning, e.g. oxide removal step, desmearing
Applying permanent coating, e.g. in-situ coating
Spray coating
by dipping, e.g. in a solder bath
Immersion coating, e.g. in a solder bath
Chemical solution deposition [CSD], i.e. using a liquid precursor
Plating, e.g. electroplating, electroless plating
Physical vapour deposition [PVD], e.g. evaporation, or sputtering
Chemical vapour deposition [CVD], e.g. laser CVD
Reworking, e.g. shaping (reflowing H01L 2224/27849)
involving a chemical process, e.g. etching the layer connector
involving a mechanical process, e.g. planarising the layer connector
Chemical mechanical polishing [CMP]
Thermal treatments, e.g. annealing, controlled cooling
Reflowing
Methods of manufacturing layer connectors involving a specific sequence of method steps
with repetition of the same manufacturing step
Multiple masking steps
using different masks
with modification of the same mask
Forming a passivation layer after forming the layer connector
the layer being used as a mask for patterning other parts
a passivation layer being used as a mask for patterning other parts
Structure, shape, material or disposition of the layer connectors prior to the connecting process
Layer connectors formed on an encapsulation of the semiconductor or solid-state body, e.g. layer connectors on chip-scale packages
of an individual layer connector
Core members of the layer connector
Structure
Layer connector larger than the underlying bonding area
Layer connector smaller than the underlying bonding area
Layer connector integrally formed with a redistribution layer on the semiconductor or solid-state body
Layer connector integrally formed with a via connection of the semiconductor or solid-state body
Shape
comprising apertures or cavities
in top view
being rectangular or square
being circular or elliptic
comprising protrusions or indentations
in side view
being non uniform along the layer connector
comprising protrusions or indentations
at the bonding interface of the layer connector, i.e. on the surface of the layer connector
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
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

Glasses, e.g. amorphous oxides,

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics

Glasses, e.g. amorphous oxides,

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 non metallic, non metalloid inorganic material

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 2224/291 - H01L 2224/2919

with a principal constituent of the material being a liquid not provided for in groups

H01L 2224/291 - H01L 2224/2919

with a principal constituent of the material being a gas not provided for in groups

H01L 2224/291 - H01L 2224/2919

H01L 2224/291
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, nitrdes or oxides (glass ceramics).

Glasses, e.g. amorphous oxides, nitrdes 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 2224/298291, 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 2224/298291.

with a principal constituent of the material being a gas not provided for in groups H01L 2224/298291.

Fillers.

Base material.
with a principal constituent
of the material being a metal
or a metalloid, e.g. boron [B],
silicon [Si], germanium [Ge],
ar senic [As], ant imony [Sb],
tellurium [Te] and polon ium
[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

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

The principal constituent
being an elastomer, e.g.
silicones, isoprene, neoprene

Ceramic material

Segmented structures, foams

being a hybrid material, e.g.
segmented structures, foams

Inorganic material

Metallic, non metalloid

Inorganic material

Non metallic, non metalloid

Inorganic material

Metals, e.g. platinum, palladium

coating material

Segmented structures, foams

being a hybrid material, e.g.
segmented structures, foams
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

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 2224/294 - H01L 2224/29491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond with a principal constituent of the material being a liquid not provided for in groups H01L 2224/294 - H01L 2224/29491 with a principal constituent of the material being a gas not provided for in groups H01L 2224/294 - H01L 2224/29491 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Shape or distribution of the fillers
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 2224/29688)

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
Material of the matrix
with a principal constituent of the material being a 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 2224/29791
the principal constituent melting at a temperature of less than 400°C
- H01L 2224/29795
Gallium [Ga] as principal constituent
- H01L 2224/29796
Indium [In] as principal constituent
- H01L 2224/29797
Tin [Sn] as principal constituent
- H01L 2224/29798
Bismuth [Bi] as principal constituent
- H01L 2224/29799
Thallium [Tl] as principal constituent
- H01L 2224/29800
Lead [Pb] as principal constituent
- H01L 2224/29801
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
- H01L 2224/29802
Zinc [Zn] as principal constituent
- H01L 2224/29803
Antimony [Sb] as principal constituent
- H01L 2224/29804
Magnesium [Mg] as principal constituent
- H01L 2224/29805
Aluminium [Al] as principal constituent
- H01L 2224/29806
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- H01L 2224/29807
Silver [Ag] as principal constituent
- H01L 2224/29808
Gold [Au] as principal constituent
- H01L 2224/29809
Copper [Cu] as principal constituent
- H01L 2224/29810
Manganese [Mn] as principal constituent
- H01L 2224/29811
Nickel [Ni] as principal constituent
- H01L 2224/29812
Cobalt [Co] as principal constituent
- H01L 2224/29813
2224/29799 . . . . . . . . . . . . Base material with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

2224/2988 . . . . . . . . . . . . the principal constituent melting at a temperature of less than 400°C

2224/29805 . . . . . . . . . . . . Gallium [Ga] as principal constituent

2224/29809 . . . . . . . . . . . . Indium [In] as principal constituent

2224/29811 . . . . . . . . . . . . Tin [Sn] as principal constituent

2224/29813 . . . . . . . . . . . . Bismuth [Bi] as principal constituent

2224/29814 . . . . . . . . . . . . Thallium [Tl] as principal constituent

2224/29816 . . . . . . . . . . . . Lead [Pb] as principal constituent

2224/29817 . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

2224/29818 . . . . . . . . . . . . Zinc [Zn] as principal constituent

2224/2982 . . . . . . . . . . . . Antimony [Sb] as principal constituent

2224/29823 . . . . . . . . . . . . Magnesium [Mg] as principal constituent

2224/29824 . . . . . . . . . . . . Aluminium [Al] as principal constituent

2224/29838 . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

2224/29839 . . . . . . . . . . . . Silver [Ag] as principal constituent

2224/29844 . . . . . . . . . . . . Gold [Au] as principal constituent

2224/29847 . . . . . . . . . . . . Copper [Cu] as principal constituent

2224/29849 . . . . . . . . . . . . Manganese [Mn] as principal constituent

2224/29855 . . . . . . . . . . . . Nickel [Ni] as principal constituent

2224/29857 . . . . . . . . . . . . Cobalt [Co] as principal constituent

2224/2986 . . . . . . . . . . . . Iron [Fe] as principal constituent

2224/29863 . . . . . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C

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

2224/2989 . . . . . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/298 - H01L 2224/29891, e.g. allotropes of carbon, fullerene, graphite, carbon nanotubes, diamond with a principal constituent of the material being a liquid not provided for in groups H01L 2224/298 - H01L 2224/29891

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
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

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29988)

Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a solid not provided for in groups H01L 2224/299 - H01L 2224/29991, 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 2224/299 - H01L 2224/29991 with a principal constituent of the material being a gas not provided for in groups H01L 2224/299 - 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

Structure

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

Layout

Square or rectangular array

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

with a staggered arrangement, e.g. depopulated array

covering only portions of the surface to be connected

Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements

Covering only the central area of the surface to be connected, i.e. central arrangements

Circular array, i.e. array with radial symmetry

being uniform, i.e. having a uniform pitch across the array

being non uniform, i.e. having a non uniform pitch across the array

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

Layer connectors having different materials

Function

Layer connectors having different functions

including layer connectors providing primarily mechanical bonding

including layer connectors providing primarily thermal dissipation

Structure, shape, material or disposition of the layer connectors after the connecting process

of an individual layer connector

Structure

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

Shape

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

Disposition

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 bodies being stacked

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 layer connector connecting to a via connection in the semiconductor or solid-state body

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 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 body and the item being stacked

the item being metallic

the layer connector connecting to a potential ring of the item

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

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

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

Material

at the bonding interface

comprising an eutectic alloy

comprising an intermetallic compound

outside the bonding interface, e.g. in the bulk of the layer connector

comprising an eutectic alloy

comprising an intermetallic compound

of a plurality of layer connectors

Structure

Layer connectors having different sizes, e.g. different heights or widths

Shape

Layer connectors having different shapes

of their bonding interfaces

Disposition

relative to the bonding areas, e.g. bond pads
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
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

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37188)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/371 - H01L 2224/37191, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/371 - H01L 2224/37191

with a principal constituent of the material being a gas not provided for in groups H01L 2224/371 - H01L 2224/37191

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Material of the matrix
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 2224/37288)

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 2224/372 - H01L 2224/37291, 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 2224/372 - H01L 2224/37291

with a principal constituent of the material being a gas not provided for in groups H01L 2224/372 - H01L 2224/37291

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

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 metallic inorganic material

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups

H01L 2224/373 - H01L 2224/37391, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups

H01L 2224/373 - H01L 2224/37391

with a principal constituent of the material being a gas not provided for in groups

H01L 2224/373 - H01L 2224/37391

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Coating material

with a principal constituent of the material being a metal or a 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
The principal constituent melting at a temperature greater than 1550°C and less than 950°C 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 2224/37488). 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 2224/374 - H01L 2224/37491, 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 2224/374 - H01L 2224/37491.

With a principal constituent of the material being a gas not provided for in groups H01L 2224/374 - H01L 2224/37491.

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

Material of the matrix 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 liquid not provided for in groups H01L 2224/376 - H01L 2224/37691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

Material of the matrix with a principal constituent of the material being a gas not provided for in groups H01L 2224/376 - H01L 2224/37691, with a principal constituent of the material being a solid not provided for in groups H01L 2224/376 - H01L 2224/37691, with a principal constituent of the material being a non metallic, non metalloid inorganic material

Material of the matrix with a principal constituent of the material being a non metallic, non metalloid inorganic material

Material of the matrix with a principal constituent of the material being a non metallic, non metalloid inorganic material

Material of the matrix with a principal constituent of the material being a non metallic, non metalloid inorganic material

Material of the matrix with a principal constituent of the material being a non metallic, non metalloid inorganic material

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Material of the matrix with a principal constituent of the material being a non metallic, non metalloid inorganic material

Material of the matrix with a principal constituent of the material being a non metallic, non metalloid inorganic material

Material of the matrix with a principal constituent of the material being a non metallic, non metalloid inorganic material

Material of the matrix with a principal constituent of the material being a non metallic, non metalloid inorganic material
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C.

- Zinc [Zn] as principal constituent
- Antimony [Sb] as principal constituent
- Magnesium [Mg] as principal constituent
- Aluminium [Al] as principal constituent
- Silver [Ag] as principal constituent
- 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 2224/37787)

- Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

Fillers

- with a principal constituent of the material being a liquid not provided for in groups H01L 2224/37791, 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 2224/37791

- Fillers

- Base material

- with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

- the principal constituent melting at a temperature of less than 400°C

- Gallium [Ga] as principal constituent

- Indium [In] as principal constituent

- Tin [Sn] as principal constituent

- Bismuth [Bi] as principal constituent

- Thallium [Tl] as principal constituent

- Lead [Pb] as principal constituent

- the principal constituent melting at a temperature of greater than 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
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 2224/37888)
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 2224/378 - H01L 2224/37891,
e.g. allotropes of carbon, fullerene, graphite, carbon nanotubes, diamond
with a principal constituent
of the material being a liquid
not provided for in groups H01L 2224/378 - H01L 2224/37891
with a principal constituent
of the material being a gas
not provided for in groups H01L 2224/378 - H01L 2224/37891
with a principal constituent
of the material being a combination of two or more materials in the form of a matrix with a filler, i.e.
being a hybrid material, e.g. segmented structures, foams
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
Sn [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
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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
Rhenium [Re] as principal constituent
Tantalum [Ta] as principal constituent
Molybdenum [Mo] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Nickel [Ni] as principal constituent
Manganese [Mn] as principal constituent
Copper [Cu] as principal constituent
Gold [Au] as principal constituent
Silver [Ag] as principal constituent

2224/37993 . . . . . . . . . . . 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 . . . . . . . . . . . with 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

2224/37999 . . . . . . . . . . . Shape or distribution of the fillers
2224/38 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . of a plurality of strap connectors
2224/39 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Structure, shape, material or disposition of the strap connectors after the connecting process
2224/40 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . of an individual strap connector
2224/4001 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Structure
2224/4005 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Shape
2224/4007 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . of bonding interfaces, e.g. interlocking features
2224/4009 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Loop shape
2224/40091 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Arched
2224/40095 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Kinked
2224/401 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Disposition
2224/40101 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Connecting bonding areas at the same height, e.g. horizontal bond
2224/40105 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Connecting bonding areas at different heights
2224/40106 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . the connector being orthogonal to a side surface of the semiconductor or solid-state body, e.g. parallel layout
2224/40108 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . the connector not being orthogonal to a side surface of the semiconductor or solid-state body, e.g. fanned-out connectors, radial layout
2224/40111 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . the strap connector extending above another semiconductor or solid-state body
2224/4013 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Connecting within a semiconductor or solid-state body, i.e. fly strap, bridge strap
2224/40132 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . with an intermediate bond, e.g. continuous strap daisy chain
2224/40135 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
2224/40137 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . the bodies being arranged next to each other, e.g. on a common substrate
2224/40139 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . with an intermediate bond, e.g. continuous strap daisy chain
2224/40141 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
H01L

the bodies being stacked
2224/40145
with an intermediate bond, e.g. continuous strap daisy chain
2224/40147
Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
2224/40151
the body and the item being arranged next to each other, e.g. on a common substrate
2224/40153
the item being non-metallic, e.g. insulating substrate with or without metallisation
2224/40155
Connecting the strap to a bond pad of the item
2224/40157
the bond pad being disposed in a recess of the surface of the item
2224/40158
the bond pad protruding from the surface of the item
2224/40159
Connecting the strap to a pin of the item
2224/4016
Connecting the strap to a potential ring of the item
2224/40165
Connecting the strap to a via metallisation of the item
2224/40175
the item being metallic
2224/40177
Connecting the strap to a bond pad of the item
2224/40178
the bond pad being disposed in a recess of the surface of the item
2224/40179
the bond pad protruding from the surface of the item
2224/40183
Connecting the strap to a potential ring of the item
2224/40195
the item being a discrete passive component
2224/40179
the body and the item being stacked
2224/40221
the item being non-metallic, e.g. insulating substrate with or without metallisation
2224/40227
Connecting the strap to a bond pad of the item
2224/40228
the bond pad being disposed in a recess of the surface of the item
2224/40229
the bond pad protruding from the surface of the item
2224/4023
Connecting the strap to a pin of the item
2224/40233
Connecting the strap to a potential ring of the item
2224/40235
Connecting the strap to a via metallisation of the item
2224/40237
Connecting the strap to a die pad of the item
2224/4024
Connecting between the body and an opposite side of the item with respect to the body
2224/4024
the item being metallic
2224/40245
Connecting the strap to a bond pad of the item
2224/40247
the bond pad being disposed in a recess of the surface of the item
2224/40248
the bond pad protruding from the surface of the item
2224/40249
Connecting the strap to a potential ring of the item
2224/40253
Connecting the strap to a die pad of the item
2224/40257
Connecting between the body and an opposite side of the item with respect to the body
2224/4026
the item being a discrete passive component
2224/40265
Connecting portions
2224/404
with multiple bonds on the same bonding area
2224/4046
connected to auxiliary connecting means on the bonding areas
2224/40475
being a pre-ball (i.e. a ball formed by capillary bonding)
2224/40477
on the semiconductor or solid-state body
2224/40479
outside the semiconductor or solid-state body
2224/4048
being a plurality of pre-balls disposed side-to-side
2224/40484
on the semiconductor or solid-state body
2224/40486
outside the semiconductor or solid-state body
2224/40487
being an additional member attached to the bonding area through an adhesive or solder, e.g. buffer pad
2224/40491
not being interposed between the connector and the bonding area
2224/40496
Material of the auxiliary connecting means
2224/40499
Material
2224/405
at the bonding interface
2224/40505
comprising an eutectic alloy
2224/40506
comprising an intermetallic compound
2224/40507
Morphology of the connecting portion, e.g. grain size distribution
2224/4051
Bonding interface between the connecting portion and the bonding area
2224/4052
Auxiliary members for strap connectors, e.g. flow-barriers, spacers
2224/4099
being formed on the semiconductor or solid-state body to be connected
2224/40991
Reinforcing structures
2224/40992
Alignment aids
2224/40993
being formed on an item to be connected not being a semiconductor or solid-state body
2224/40996
Reinforcing structures
2224/40997
Alignment aids
2224/40998
of a plurality of strap connectors
2224/41
Structure
2224/4101
Connectors having different sizes
2224/4103
Shape
2224/4105
Connectors having different shapes
Methods of manufacturing wire connectors involving a specific sequence of method steps

...thereto

Core members of the connector

Different loop heights

Connecting at different heights

on the semiconductor or solid-state body being

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

Strip 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 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, 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 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

Ribon 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
Material of the matrix
2224/4522 with a principal constituent of the material being an elastomer, e.g. silicones, isoprene, neoprene
2224/4523 with a principal constituent of the material being a solid not provided for in groups H01L 2224/451 - H01L 2224/45191, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/4524 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
2224/4525 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
H01L

2224/45218 . . . Zinc (Zn) as principal constituent
2224/45222 . . . Antimony (Sb) as principal constituent
2224/45223 . . . Magnesium (Mg) as principal constituent
2224/45224 . . . Aluminium (Al) as principal constituent
2224/45238 . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/45239 . . . Silver (Ag) as principal constituent
2224/45244 . . . Gold (Au) as principal constituent
2224/45247 . . . Copper (Cu) as principal constituent
2224/45249 . . . Manganese (Mn) as principal constituent
2224/45255 . . . Nickel (Ni) as principal constituent
2224/45257 . . . Cobalt (Co) as principal constituent
2224/4526 . . . Iron (Fe) as principal constituent
2224/45263 . . . the principal constituent melting at a temperature of greater than 1550°C
2224/45264 . . . Palladium (Pd) as principal constituent
2224/45266 . . . Titanium (Ti) as principal constituent
2224/45269 . . . Platinum (Pt) as principal constituent
2224/4527 . . . Zirconium (Zr) as principal constituent
2224/45271 . . . Chromium (Cr) as principal constituent
2224/45272 . . . Vanadium (V) as principal constituent
2224/45273 . . . Rhodium (Rh) as principal constituent
2224/45276 . . . Ruthenium (Ru) as principal constituent
2224/45278 . . . Iridium (Ir) as principal constituent
2224/45279 . . . Niobium (Nb) as principal constituent
2224/4528 . . . Molybdenum (Mo) as principal constituent
2224/45281 . . . Tantalum (Ta) as principal constituent
2224/45283 . . . Rhenium (Re) as principal constituent
2224/45284 . . . Tungsten (W) as principal constituent
2224/45286 . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/45287 . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45288)
2224/45288 . . . 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
2224/45289 . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/4529 . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/452 - H01L 2224/45291, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/45294 . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/452 - H01L 2224/45291
2224/45295 . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/452 - H01L 2224/45291
2224/453 . . . Fillers
2224/45301 . . . the principal constituent melting at a temperature of less than 400°C
2224/45305 . . . Gallium (Ga) as principal constituent
2224/45309 . . . Indium (In) as principal constituent
2224/45311 . . . Tin (Sn) as principal constituent
2224/45313 . . . Bismuth (Bi) as principal constituent
2224/45314 . . . Thallium (Tl) as principal constituent
2224/45316 . . . Lead (Pb) as principal constituent
2224/45317 . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45318 . . . Zinc (Zn) as principal constituent
2224/4532 . . . Antimony (Sb) as principal constituent
2224/45323 . . . Magnesium (Mg) as principal constituent
2224/45324 . . . Aluminium (Al) as principal constituent
2224/45338 . . . 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
Rhenium (Re) as principal constituent
Molybdenum (Mo) as principal constituent
Niobium (Nb) as principal constituent
Zinc (Zn) as principal constituent
Antimony (Sb) as principal constituent
Thallium (Tl) as principal constituent
Tantalum (Ta) as principal constituent
Tin (Sn) as principal constituent
Indium (In) as principal constituent
Gallium (Ga) as principal constituent
Bismuth (Bi) as principal constituent
Aluminium (Al) as principal constituent
Gallium (Ga) as principal constituent
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
of the material being a solid
not provided for in groups
H01L 2224/45391
and alloys thereof
Coating material
with a principal constituent
of the material being a metal
or a metalloid, e.g. boron (B),
silicon (Si), germanium (Ge),
ar senic (As), antimony (Sb),
tellurium (Te) and polonium (Po), and alloys thereof
the principal constituent melting at a temperature of less than 400°C
Aluminium (Al) as principal constituent
Tantalum (Ta) as principal constituent
Tungsten (W) as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Thorium (Th) as principal constituent
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics
H01L 2224/45388)
Glasses, e.g. amorphous oxides, nitrides or fluorides
with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
with a principal constituent of the material being a solid
not provided for in groups
H01L 2224/45391
and polonium
H01L 2224/45391
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 2224/453 - H01L 2224/45391
with a principal constituent
of the material being a gas
not provided for in groups
H01L 2224/453 - H01L 2224/45391
the 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 non metallic, non metalloid
inorganic material
H01L 2224/45387
2224/45394
2224/45395
2224/45398
2224/45399
2224/45401
2224/45405
2224/45409
2224/45411
2224/45413
2224/45414
2224/45416
2224/45417
2224/45418
2224/4542
2224/45423
2224/45424
2224/45438
2224/45439
2224/45444
H01L.

2224/45447 ............................ Copper (Cu) as principal constituent
2224/45449 ............................ Manganese (Mn) as principal constituent
2224/45455 ............................ Nickel (Ni) as principal constituent
2224/45457 ............................ Cobalt (Co) as principal constituent
2224/4546 ............................. Iron (Fe) as principal constituent
2224/45463 ............................ the principal constituent melting at a temperature of greater than 1550°C
2224/45464 ............................ Palladium (Pd) as principal constituent
2224/45466 ............................ Titanium (Ti) as principal constituent
2224/45469 ............................ Platinum (Pt) as principal constituent
2224/4547 ............................. Zirconium (Zr) as principal constituent
2224/45471 ............................ Chromium (Cr) as principal constituent
2224/45472 ............................ Vanadium (V) as principal constituent
2224/45473 ............................ Rhodium (Rh) as principal constituent
2224/45476 ............................ Ruthenium (Ru) as principal constituent
2224/45478 ............................ Iridium (Ir) as principal constituent
2224/45479 ............................ Niobium (Nb) as principal constituent
2224/4548 ............................. Molybdenum (Mo) as principal constituent
2224/45481 ............................ Tantalum (Ta) as principal constituent
2224/45483 ............................ Rhenium (Re) as principal constituent
2224/45484 ............................ Tungsten (W) as principal constituent
2224/45486 ............................ with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/45487 ............................ Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45488)
2224/45488 ............................ Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/45491 ............................ The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/45493 ............................ with a principal constituent of the material being a solid not provided for in groups H01L 2224/454 - H01L 2224/45491, e.g. allotropes of carbon, fullerenes, graphite, carbon-nanotubes, diamond
2224/45494 ............................ with a principal constituent of the material being a liquid not provided for in groups H01L 2224/454 - H01L 2224/45491
2224/45495 ............................ with a principal constituent of the material being a gas not provided for in groups H01L 2224/454 - H01L 2224/45491
2224/45496 ............................ 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 ............................ Gallium (Ga) as principal constituent
2224/45605 ............................ Indium (In) as principal constituent
2224/45609 ............................ Tin (Sn) as principal constituent
2224/45611 ............................ Bismuth (Bi) as principal constituent
2224/45613 ............................ Thallium (Tl) as principal constituent
2224/45614 ............................ Lead (Pb) as principal constituent
2224/45616 ............................ the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45617 ............................ Zinc (Zn) as principal constituent
2224/45618 ............................ Antimony (Sb) as principal constituent
2224/4562 .............................. Magnesium (Mg) as principal constituent
2224/45623 ............................ Aluminium (Al) as principal constituent
2224/45624 ............................ 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
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
with a principal constituent of the material being a polymer, e.g. polyesters, phenolic based polymer, epoxies
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 2224/45691, 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 2224/45691
with a principal constituent of the material being a gas not provided for in groups
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
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
Cobalt (Co) as principal constituent
Nickel (Ni) as principal constituent
Manganese (Mn) as principal constituent
with a principal constituent of the material being a liquid not provided for in groups H01L 2224/45791
with a principal constituent of the material being a gas not provided for in groups H01L 2224/45791
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
Greater than 1550°C melting at a temperature of the principal constituent
950°C and less than 1550°C of the principal constituent
400°C and less than 950°C of the principal constituent
Less than 400°C melting at a temperature of the principal constituent
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
Zinc (Zn) as principal constituent
Antimony (Sb) as principal constituent
Magnesium (Mg) as principal constituent
Aluminium (Al) as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Silver (Ag) as principal constituent
Gold (Au) as principal constituent
Copper (Cu) as principal constituent
Manganese (Mn) as principal constituent
Nickel (Ni) as principal constituent
Cobalt (Co) as principal constituent
Iron (Fe) as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
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H01L

2224/45864 Palladium (Pd) as principal constituent
2224/45866 Titanium (Ti) as principal constituent
2224/45869 Platinum (Pt) as principal constituent
2224/4587 Zirconium (Zr) as principal constituent
2224/45871 Chromium (Cr) as principal constituent
2224/45872 Vanadium (V) as principal constituent
2224/45873 Rhodium (Rh) as principal constituent
2224/45876 Ruthenium (Ru) as principal constituent
2224/45878 Iridium (Ir) as principal constituent
2224/45879 Niobium (Nb) as principal constituent
2224/4588 Molybdenum (Mo) as principal constituent
2224/45881 Tantalum (Ta) as principal constituent
2224/45883 Rhenium (Re) as principal constituent
2224/45884 Tungsten (W) as principal constituent
2224/45886 with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/45887 Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L.2224/45888)
2224/45888 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
2224/4589 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/45893 with a principal constituent of the material being a solid not provided for in groups H01L.2224/458 - H01L.2224/45891 e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/45894 with a principal constituent of the material being a liquid not provided for in groups H01L.2224/458 - H01L.2224/45891
2224/45895 with a principal constituent of the material being a gas not provided for in groups H01L.2224/458 - H01L.2224/45891

2224/45898 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

2224/45899 Coating material

2224/459 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

2224/45901 the principal constituent melting at a temperature of less than 400°C

2224/45905 Gallium (Ga) as principal constituent
2224/45909 Indium (In) as principal constituent
2224/45911 Tin (Sn) as principal constituent
2224/45913 Bismuth (Bi) as principal constituent
2224/45914 Thallium (Tl) as principal constituent
2224/45916 Lead (Pb) as principal constituent
2224/45917 the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45918 Zinc (Zn) as principal constituent
2224/4592 Antimony (Sb) as principal constituent
2224/45923 Magnesium (Mg) as principal constituent
2224/45924 Aluminium (Al) as principal constituent
2224/45938 the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/45939 Silver (Ag) as principal constituent
2224/45944 Gold (Au) as principal constituent
2224/45947 Copper (Cu) as principal constituent
2224/45949 Manganese (Mn) as principal constituent
2224/45955 Nickel (Ni) as principal constituent
2224/45957 Cobalt (Co) as principal constituent
2224/4596 Iron (Fe) as principal constituent
2224/45963 the principal constituent melting at a temperature of greater than 1550°C
2224/45964 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 (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 2224/45988)
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
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 2224/459 - H01L 2224/45991, 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 2224/459 - H01L 2224/45991
with a principal constituent of the material being a gas not provided for in groups H01L 2224/459 - H01L 2224/45991
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
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
with an intermediate bond, e.g. continuous wire daisy chain
the wire connector connecting to a bonding area protruding from the surface
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 wire 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

Connecting 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

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

Connecting the wire 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 wire to a bond pad of the item

the bond pad being disposed in a recess of the surface of the item

the bond pad protruding from the surface of the item

Connecting the wire to a potential ring of the item

Connecting the wire to a 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

Details of ball bonds

Shape

of the interface with the bonding area

Details of wedge bonds

Shape

of the interface with the bonding area

the connecting portion on the bonding area of the semiconductor or solid-state body being a ball bond

the other connecting portion not on the bonding area also being a ball bond, i.e. ball-to-ball

the other connecting portion not on the bonding area being a wedge bond, i.e. ball-to-wedge, regular stitch

the other connecting portion not on the bonding area of the semiconductor or solid-state body being a wedge bond

the other connecting portion not on the bonding area being a ball bond, i.e. wedge-to-ball, reverse stitch

connected to auxiliary connecting means on the bonding areas, e.g. pre-ball, wedge-on-ball, ball-on-ball

between the wire connector and the bonding area

being a pre-ball (i.e. a ball formed by capillary bonding)

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 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 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 less than 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 Silver (Ag) as principal constituent Gold (Au) as principal constituent Copper (Cu) as principal constituent Manganese (Mn) as principal constituent Nickel (Ni) as principal constituent Cobalt (Co) as principal constituent Iron (Fe) as principal constituent the principal constituent melting at a temperature of greater than 1550°C Palladium (Pd) as principal constituent Titanium (Ti) as principal constituent Platinum (Pt) as principal constituent Zirconium (Zr) as principal constituent Chromium (Cr) as principal constituent Vanadium (V) as principal constituent Rhodium (Rh) as principal constituent Iridium (Ir) as principal constituent Niobium (Nb) as principal constituent Molybdenum (Mo) as principal constituent Tantalum (Ta) as principal constituent Rhenium (Re) as principal constituent Tungsten (W) as principal constituent with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material Glasses, e.g. amorphous oxides, nitrides or oxides (glass ceramics H01L, 2224/48688) Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L, 2224/48688)
<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H01L 2224/4869</td>
<td>with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>H01L 2224/48691</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>H01L 2224/48693</td>
<td>with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/486 - H01L 2224/4869, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond</td>
</tr>
<tr>
<td>H01L 2224/48694</td>
<td>with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/486 - H01L 2224/4869</td>
</tr>
<tr>
<td>H01L 2224/48698</td>
<td>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</td>
</tr>
<tr>
<td>H01L 2224/48699</td>
<td>Principal constituent of the connecting portion of the wire connector being Aluminium (Al)</td>
</tr>
<tr>
<td>H01L 2224/487</td>
<td>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</td>
</tr>
<tr>
<td>H01L 2224/48701</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>H01L 2224/48705</td>
<td>Gallium (Ga) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48709</td>
<td>Indium (In) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48711</td>
<td>Tin (Sn) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48713</td>
<td>Bismuth (Bi) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48714</td>
<td>Thallium (Tl) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48716</td>
<td>Lead (Pb) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48717</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>H01L 2224/48718</td>
<td>Zinc (Zn) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/4872</td>
<td>Antimony (Sb) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48723</td>
<td>Magnesium (Mg) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48724</td>
<td>Aluminium (Al) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48738</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>H01L 2224/48739</td>
<td>Silver (Ag) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48744</td>
<td>Gold (Au) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48747</td>
<td>Copper (Cu) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48749</td>
<td>Manganese (Mn) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48755</td>
<td>Nickel (Ni) as principal constituent</td>
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<tr>
<td>H01L 2224/48757</td>
<td>Cobalt (Co) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/4876</td>
<td>Iron (Fe) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48763</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
</tr>
<tr>
<td>H01L 2224/48764</td>
<td>Palladium (Pd) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48766</td>
<td>Titanium (Ti) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48769</td>
<td>Platinum (Pt) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/4877</td>
<td>Zirconium (Zr) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48771</td>
<td>Chromium (Cr) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48772</td>
<td>Vanadium (V) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48773</td>
<td>Rhodium (Rh) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48778</td>
<td>Iridium (Ir) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48779</td>
<td>Niobium (Nb) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/4878</td>
<td>Molybdenum (Mo) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48781</td>
<td>Tantalum (Ta) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48783</td>
<td>Rhenium (Re) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48784</td>
<td>Tungsten (W) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/48786</td>
<td>with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>H01L 2224/48787</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/48788)</td>
</tr>
<tr>
<td>H01L 2224/48788</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
</tr>
<tr>
<td>H01L 2224/4879</td>
<td>with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>H01L 2224/48791</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
</tbody>
</table>
H01L.

2224/48793 . . . . . . . . with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/487 - H01L 2224/4879, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

2224/48794 . . . . . . . . with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/487 - H01L 2224/4879

2224/48798 . . . . . . . . with a principal constituent of the bonding area being a combination of two or more material regions, i.e. being a hybrid material, e.g. segmented structures, island patterns

2224/48799 . . . . . . . . Principal constituent of the connecting portion of the wire connector being Copper (Cu)

2224/488 . . . . . . . . with a principal constituent of the bonding area being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof

2224/48801 . . . . . . . . the principal constituent melting at a temperature of less than 400°C

2224/48805 . . . . . . . . Gallium (Ga) as principal constituent

2224/48809 . . . . . . . . Indium (In) as principal constituent

2224/48811 . . . . . . . . Tin (Sn) as principal constituent

2224/48813 . . . . . . . . Bismuth (Bi) as principal constituent

2224/48814 . . . . . . . . Thallium (Tl) as principal constituent

2224/48816 . . . . . . . . Lead (Pb) as principal constituent

2224/48817 . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950 °C

2224/48818 . . . . . . . . Zinc (Zn) as principal constituent

2224/4882 . . . . . . . . Antimony (Sb) as principal constituent

2224/48823 . . . . . . . . Magnesium (Mg) as principal constituent

2224/48824 . . . . . . . . Aluminium (Al) as principal constituent

2224/48838 . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C

2224/48839 . . . . . . . . Silver (Ag) as principal constituent

2224/48844 . . . . . . . . Gold (Au) as principal constituent

2224/48847 . . . . . . . . Copper (Cu) as principal constituent

2224/48849 . . . . . . . . Manganese (Mn) as principal constituent

2224/48855 . . . . . . . . Nickel (Ni) as principal constituent

2224/48857 . . . . . . . . Cobalt (Co) as principal constituent

2224/4886 . . . . . . . . Iron (Fe) as principal constituent

2224/48863 . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C

2224/48864 . . . . . . . . Palladium (Pd) as principal constituent

2224/48866 . . . . . . . . Titanium (Ti) as principal constituent

2224/48869 . . . . . . . . Platinum (Pt) as principal constituent

2224/4887 . . . . . . . . Zirconium (Zr) as principal constituent

2224/48871 . . . . . . . . Chromium (Cr) as principal constituent

2224/48872 . . . . . . . . Vanadium (V) as principal constituent

2224/48873 . . . . . . . . Rhodium (Rh) as principal constituent

2224/48878 . . . . . . . . Iridium (Ir) as principal constituent

2224/48879 . . . . . . . . Niobium (Nb) as principal constituent

2224/4888 . . . . . . . . Molybdenum (Mo) as principal constituent

2224/48881 . . . . . . . . Tantalum (Ta) as principal constituent

2224/48883 . . . . . . . . Rhenium (Re) as principal constituent

2224/48884 . . . . . . . . Tungsten (W) as principal constituent

2224/48886 . . . . . . . . with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material

2224/48887 . . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/48886)

2224/48888 . . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides

2224/4889 . . . . . . . . with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy

2224/48891 . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

2224/48893 . . . . . . . . with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/488 - H01L 2224/4889, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

2224/48894 . . . . . . . . with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/488 - H01L 2224/4889
H01L

2224/48898 . . . . . . with a principal constituent of the bonding area being a combination of two or more material regions, i.e. being a hybrid material, e.g. segmented structures, island patterns

2224/48899 . . . . . . Auxiliary members for wire connectors, e.g. flow-barriers, reinforcing structures, spacers, alignment aids

2224/48891 . . . . . . being formed on the semiconductor or solid-state body to be connected

2224/48892 . . . . . . Reinforcing structures

2224/48896 . . . . . . being formed on an item to be connected not being a semiconductor or solid-state body

2224/48897 . . . . . . Reinforcing structures

2224/48898 . . . . . . Alignment aids

2224/49 . . . . . . of a plurality of wire connectors

2224/4901 . . . . . . Structure

2224/4903 . . . . . . Connectors having different sizes, e.g. different diameters

2224/4905 . . . . . . Shape

2224/49051 . . . . . . Connectors having different shapes

2224/49052 . . . . . . Different loop heights

2224/4909 . . . . . . Loop shape arrangement

2224/49095 . . . . . . parallel in plane

2224/49096 . . . . . . vertical

2224/49097 . . . . . . Disposition

2224/49105 . . . . . . Connecting at different heights

2224/49107 . . . . . . on the semiconductor or solid-state body

2224/49109 . . . . . . outside the semiconductor or solid-state body

2224/4911 . . . . . . the connectors being bonded to at least one common bonding area, e.g. daisy chain

2224/49111 . . . . . . the connectors connecting two common bonding areas, e.g. Litz or braid wires

2224/49112 . . . . . . the connectors connecting a common bonding area on the semiconductor or solid-state body to different bonding areas outside the body, e.g. diverging wires

2224/49113 . . . . . . the connectors connecting different bonding areas on the semiconductor or solid-state body to a common bonding area outside the body, e.g. converging wires

2224/4912 . . . . . . Layout

2224/4917 . . . . . . Crossed wires

2224/49171 . . . . . . Fan-out arrangements

2224/49173 . . . . . . Radial fan-out arrangements

2224/49174 . . . . . . Stacked arrangements

2224/49175 . . . . . . Parallel arrangements

2224/49176 . . . . . . Wire connectors having the same loop shape and height

2224/49177 . . . . . . Combinations of different arrangements

2224/49179 . . . . . . Corner adaptations, i.e. disposition of the wire connectors at the corners of the semiconductor or solid-state body

2224/4918 . . . . . . being disposed on at least two different sides of the body, e.g. dual array

2224/494 . . . . . . Connecting portions

2224/4941 . . . . . . the connecting portions being stacked

2224/4942 . . . . . . Ball bonds

2224/49421 . . . . . . on the semiconductor or solid-state body

2224/49422 . . . . . . outside the semiconductor or solid-state body

2224/49425 . . . . . . Wedge bonds

2224/49426 . . . . . . on the semiconductor or solid-state body

2224/49427 . . . . . . outside the semiconductor or solid-state body

2224/49429 . . . . . . Wedge and ball bonds

2224/4943 . . . . . . the connecting portions being staggered

2224/49431 . . . . . . on the semiconductor or solid-state body

2224/49433 . . . . . . outside the semiconductor or solid-state body

2224/4945 . . . . . . Wire connectors having connecting portions of different types on the semiconductor or solid-state body, e.g. regular and reverse stitches

2224/495 . . . . . . Material

2224/4950 . . . . . . Connectors having different materials

2224/50 . . . . . . Tape automated bonding [TAB] connectors, i.e. film carriers; Manufacturing methods related thereto

2224/63 . . . . . . Connectors not provided for in any of the groups H01L 2224/10 - H01L 2224/50 and subgroups; Manufacturing methods related thereto

2224/64 . . . . . . Manufacturing methods

2224/65 . . . . . . Structure, shape, material or disposition of the connectors prior to the connecting process

2224/66 . . . . . . of an individual connector

2224/67 . . . . . . of a plurality of connectors

2224/68 . . . . . . Structure, shape, material or disposition of the connectors after the connecting process

2224/69 . . . . . . of an individual connector

2224/70 . . . . . . of a plurality of connectors

2224/71 . . . . . . Means for bonding not being attached to, or not being formed on, the surface to be connected

2224/72 . . . . . . Detachable connecting means consisting of mechanical auxiliary parts connecting the device, e.g. pressure contacts using springs or clips

2224/73 . . . . . . Means for bonding being of different types provided for in two or more of groups H01L 2224/10, H01L 2224/18, H01L 2224/26, H01L 2224/34, H01L 2224/42, H01L 2224/50, H01L 2224/63, H01L 2224/71

2224/731 . . . . . . Location prior to the connecting process

2224/73101 . . . . . . on the same surface

2224/73103 . . . . . . Bump and layer connectors

2224/73104 . . . . . . the bump connector being embedded into the layer connector

2224/73151 . . . . . . on different surfaces

2224/73153 . . . . . . Bump and layer connectors

2224/732 . . . . . . Location after the connecting process

2224/73201 . . . . . . on the same surface
2224/73203 . . . . . . Bump and layer connectors
2224/73204 . . . . . . the bump connector being embedded into
the layer connector
2224/73205 . . . . . . Bump and strap connectors
2224/73207 . . . . . . Bump and wire connectors
2224/73209 . . . . . . Bump and HDI connectors
2224/73211 . . . . . . Bump and TAB connectors
2224/73213 . . . . . . Layer and strap connectors
2224/73215 . . . . . . Layer and wire connectors
2224/73217 . . . . . . Layer and HDI connectors
2224/73219 . . . . . . Layer and TAB connectors
2224/73221 . . . . . . Strap and wire connectors
2224/73223 . . . . . . Strap and HDI connectors
2224/73225 . . . . . . Strap and TAB connectors
2224/73227 . . . . . . Wire and HDI connectors
2224/73229 . . . . . . Wire and TAB connectors
2224/73231 . . . . . . HDI and TAB connectors
2224/73251 . . . . . . on different surfaces
2224/73253 . . . . . . Bump and layer connectors
2224/73255 . . . . . . Bump and strap connectors
2224/73257 . . . . . . Bump and wire connectors
2224/73259 . . . . . . Bump and HDI connectors
2224/73261 . . . . . . Bump and TAB connectors
2224/73263 . . . . . . Layer and strap connectors
2224/73265 . . . . . . Layer and wire connectors
2224/73267 . . . . . . Layer and HDI connectors
2224/73269 . . . . . . Layer and TAB connectors
2224/73271 . . . . . . Strap and wire connectors
2224/73273 . . . . . . Strap and HDI connectors
2224/73275 . . . . . . Strap and TAB connectors
2224/73277 . . . . . . Wire and HDI connectors
2224/73279 . . . . . . Wire and TAB connectors
2224/73281 . . . . . . HDI and TAB connectors
2224/73281 . . . . . . Apparatus for manufacturing arrangements for
connecting or disconnecting semiconductor or solid-
state bodies and for methods related thereto
2224/73401 . . . . . . Apparatus for manufacturing means for bonding,
e.g. connectors
2224/73402 . . . . . . Apparatus for manufacturing bump connectors
2224/73403 . . . . . . Apparatus for manufacturing layer connectors
2224/73404 . . . . . . Apparatus for manufacturing strap connectors
2224/73405 . . . . . . Apparatus for manufacturing wire connectors
2224/73409 . . . . . . Tools for reworking, e.g. for shaping
2224/7345 . . . . . . Apparatus for connecting with bump connectors
or layer connectors
2224/73501 . . . . . . Calibration means
2224/73501 . . . . . . 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
2224/7351 . . . . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
2224/7351 . . . . . . Chamber
2224/73512 . . . . . . Vacuum chamber
2224/73511 . . . . . . High pressure chamber
2224/73515 . . . . . . Means for applying permanent coating, e.g. in-situ coating
2224/73515 . . . . . . Means for direct writing
2224/73512 . . . . . . Syringe
2224/73513 . . . . . . integrated into the bonding head
2224/73515 . . . . . . Jetting means, e.g. ink jet
2224/73518 . . . . . . including a laser
2224/75161 . . . . . . Means for screen printing, e.g. roller,
squeegee, screen stencil
2224/7517 . . . . . . Means for applying a preform, e.g. laminator
2224/75171 . . . . . . including a vacuum-bag
2224/7518 . . . . . . Means for blanket deposition
2224/75181 . . . . . . for spin coating, i.e. spin coater
2224/75182 . . . . . . for curtain coating
2224/75183 . . . . . . for immersion coating, i.e. bath
2224/75184 . . . . . . for spray coating, i.e. nozzle
2224/75185 . . . . . . Means for physical vapour deposition
[PVD], e.g. evaporation, sputtering
2224/75186 . . . . . . Means for sputtering, e.g. target
2224/75187 . . . . . . Means for evaporation
2224/75188 . . . . . . Means for chemical vapour deposition
[CVD], e.g. for laser CVD
2224/75189 . . . . . . Means for plating, e.g. for electroplating,
electroless plating
2224/752 . . . . . . Protection means against electrical discharge
2224/7525 . . . . . . Means for applying energy, e.g. heating means
2224/75251 . . . . . . in the lower part of the bonding apparatus,
e.g. in the apparatus chuck
2224/75252 . . . . . . in the upper part of the bonding apparatus,
e.g. in the bonding head
2224/75253 . . . . . . adapted for localised heating
2224/7526 . . . . . . Polychromatic heating lamp
2224/75261 . . . . . . Laser
2224/75262 . . . . . . in the lower part of the bonding apparatus,
e.g. in the apparatus chuck
2224/75263 . . . . . . in the upper part of the bonding apparatus,
e.g. in the bonding head
2224/75264 . . . . . . by induction heating, i.e. coils
2224/75265 . . . . . . in the lower part of the bonding apparatus,
e.g. in the apparatus chuck
2224/75266 . . . . . . in the upper part of the bonding apparatus,
e.g. in the bonding head
2224/75267 . . . . . . Flame torch, e.g. hydrogen torch
2224/75268 . . . . . . Discharge electrode
2224/75269 . . . . . . Shape of the discharge electrode
2224/7527 . . . . . . Material of the discharge electrode
2224/75271 . . . . . . Circuitry of the discharge electrode
2224/75272 . . . . . . Oven
2224/7528 . . . . . . Resistance welding electrodes, i.e. for ohmic heating
2224/75281 . . . . . . in the lower part of the bonding apparatus,
e.g. in the apparatus chuck
2224/75282 . . . . . . in the upper part of the bonding apparatus,
e.g. in the bonding head
2224/75283 . . . . . . by infrared heating, e.g. infrared heating lamp
2224/753 . . . . . . by means of pressure
2224/75301 . . . . . . Bonding head
2224/75302 . . . . . . Shape
2224/75303 . . . . . . of the pressing surface
2224/75304 . . . . . . being curved
2224/75305 . . . . . . comprising protrusions
2224/7531 . . . . . . of other parts
2224/75312 . . . . . . Material
2224/75313 . . . . . . Removable bonding head
2224/75314 . . . . . . Auxiliary members on the pressing surface
2224/75315 . . . . . . Elastomer inlay
2224/75316 . . . . . . with retaining mechanisms
2224/75317 . . . . . . Removable auxiliary member
Means for aligning
Means for transporting the components to be connected in the bonding apparatus
Means for supplying the connector to be pressing, stamping
Mechanical means, e.g. for planarising, etching, for ultrasonic cleaning, for dry ice blasting, using gas-flow, by etching, by applying flux or plasma
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 applying a preform, e.g. laminator
Means for a vacuum-bag
Means for blanket deposition
Means for optical alignment, e.g. sensors
Guiding structures
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
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
of 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
Means for applying a preform, e.g. laminator
Means for a vacuum-bag
Means for blanket deposition
Means for applying energy, e.g. heating means
by infrared heating, e.g. infrared heating
Resistive welding electrodes, i.e. for ohmic heating
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
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
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
Means for transporting the components to be interconnect
Means for supplying the material of the interconnect
Means for transporting the components to be connected
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
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Piezoelectric transducers
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
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
Ultrasonic horns
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
Design, e.g. of the wave guide
Cooling means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Mechanical means, e.g. for planarising, pressing, stamping
for drilling
for abrasive blasting, e.g. sand blasting, wet blasting, hydro-blasting, dry ice blasting
Means for supplying the material of the interconnect
Belt conveyor
Chain conveyor
Vibrating conveyor
Pneumatic conveyor
in a fluid
Means for aligning
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Mechanical holding means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Electrostatic holding means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Magnetic holding means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Suction holding means
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Means for optical alignment, e.g. sensors
Guiding structures
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus
Means for moving parts
Lower part of the bonding apparatus, e.g. XY table
2224/76802 . . . . Rotational mechanism
2224/76803 . . . . Pivoting mechanism
2224/76804 . . . . Translational mechanism
2224/76821 . . . . Upper part of the bonding apparatus, i.e. bonding head
2224/76822 . . . . Rotational mechanism
2224/76823 . . . . Pivoting mechanism
2224/76824 . . . . Translational mechanism
2224/76841 . . . . of the bonding head
2224/76842 . . . . Rotational mechanism
2224/76843 . . . . Pivoting mechanism
2224/769 . . . . Means for monitoring the connection process
2224/76901 . . . . using a computer, e.g. fully- or semi-automatic bonding
2224/7692 . . . . Load or pressure adjusting means, e.g. sensors
2224/76925 . . . . Vibration adjusting means, e.g. sensors
2224/7695 . . . . Means for forming additional members
2224/7698 . . . . specially adapted for batch processes
2224/76981 . . . . Apparatus chuck
2224/76982 . . . . Shape
2224/76983 . . . . of the mounting surface
2224/76984 . . . . of other portions
2224/76985 . . . . Material
2224/76986 . . . . Auxiliary members on the pressing surface
2224/76987 . . . . Shape of the auxiliary member
2224/76988 . . . . Material of the auxiliary member
2224/77 . . . . Apparatus for connecting with strap connectors
2224/77001 . . . . Calibration means
2224/7701 . . . . 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
2224/771 . . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
2224/77101 . . . . Chamber
2224/77102 . . . . Vacuum chamber
2224/77111 . . . . High pressure chamber
2224/7715 . . . . Means for applying permanent coating, e.g. in-situ coating
2224/77151 . . . . Means for direct writing
2224/77152 . . . . Syringe
2224/77153 . . . . integrated into the capillary or wedge
2224/77155 . . . . Jetting means, e.g. jet ink
2224/77158 . . . . including a laser
2224/77161 . . . . Means for screen printing, e.g. roller, squeegee, screen stencil
2224/7717 . . . . Means for applying a preform, e.g. laminator
2224/77171 . . . . including a vacuum-bag
2224/7718 . . . . Means for blanket deposition
2224/77181 . . . . for spin coating, i.e. spin coater
2224/77182 . . . . for curtain coating
2224/77183 . . . . for immersion coating, i.e. bath
2224/77184 . . . . for spray coating, i.e. nozzle
2224/77185 . . . . Means for physical vapour deposition [PVD], e.g. evaporation, sputtering
2224/77186 . . . . Means for sputtering, e.g. target
2224/77187 . . . . Means for evaporation
2224/77188 . . . . Means for chemical vapour deposition [CVD], e.g. for laser CVD
2224/77189 . . . . Means for plating, e.g. for electroplating, electroless plating
2224/772 . . . . Protection means against electrical discharge
2224/7725 . . . . Means for applying energy, e.g. heating means
2224/77251 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77252 . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77253 . . . . adapted for localised heating
2224/7726 . . . . Polychromatic heating lamp
2224/77261 . . . . Laser
2224/77262 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77263 . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77264 . . . . by induction heating, i.e. coils
2224/77265 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77266 . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77267 . . . . Flame torch, e.g. hydrogen torch
2224/77268 . . . . Discharge electrode
2224/77269 . . . . Shape of the discharge electrode
2224/7727 . . . . Material of the discharge electrode
2224/77271 . . . . Circuity of the discharge electrode
2224/77272 . . . . Oven
2224/7728 . . . . Resistance welding electrodes, i.e. for ohmic heating
2224/77281 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77282 . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77283 . . . . by infrared heating, e.g. infrared heating lamp
2224/773 . . . . by means of pressure
2224/77313 . . . . Wedge
2224/77314 . . . . Shape
2224/77315 . . . . of the pressing surface, e.g. tip or head
2224/77316 . . . . comprising protrusions
2224/77317 . . . . of other portions
2224/77318 . . . . inside the capillary
2224/77319 . . . . outside the capillary
2224/7732 . . . . Removable wedge
2224/77321 . . . . Material
2224/77325 . . . . Auxiliary members on the pressing surface
2224/77326 . . . . Removable auxiliary member
2224/77327 . . . . Shape of the auxiliary member
2224/77328 . . . . Material of the auxiliary member
2224/7734 . . . . by ultrasonic vibrations
2224/77344 . . . . Eccentric cams
2224/77345 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77346 . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77347 . . . . Piezoelectric transducers
2224/77348 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77349 . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/7735 . . . . Stable and mobile yokes
2224/77351 . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck

H01L
2224/77352 . . . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77353 . . . . . . Ultrasonic horns
2224/77354 . . . . . . in the lower part of the bonding apparatus, e.g. in the mounting chuck
2224/77355 . . . . . . Design, e.g. of the wave guide
2224/775 . . . . . . Cooling means
2224/77501 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77502 . . . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/7755 . . . . . . Mechanical means, e.g. for severing, pressing, stamping
2224/776 . . . . . . Means for supplying the connector to be connected in the bonding apparatus
2224/77601 . . . . . . Storing means
2224/77611 . . . . . . Feeding means
2224/77621 . . . . . . Holding means, e.g. wire clammers
2224/77631 . . . . . . Means for wire tension adjustments
2224/7765 . . . . . . Means for transporting the components to be connected
2224/77651 . . . . . . Belt conveyor
2224/77652 . . . . . . Chain conveyor
2224/77653 . . . . . . Vibrating conveyor
2224/77654 . . . . . . Pneumatic conveyor
2224/77655 . . . . . . in a fluid
2224/777 . . . . . . Means for aligning
2224/77701 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77702 . . . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77703 . . . . . . Mechanical holding means
2224/77704 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77705 . . . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77723 . . . . . . Electrostatic holding means
2224/77724 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77725 . . . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77733 . . . . . . Magnetic holding means
2224/77734 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77735 . . . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77743 . . . . . . Suction holding means
2224/77744 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77745 . . . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/77753 . . . . . . Means for optical alignment, e.g. sensors
2224/77754 . . . . . . Guiding structures
2224/77755 . . . . . . in the lower part of the bonding apparatus, e.g. in the apparatus chuck
2224/77756 . . . . . . in the upper part of the bonding apparatus, e.g. in the wedge
2224/778 . . . . . . Means for moving parts
2224/77801 . . . . . . Lower part of the bonding apparatus, e.g. XY table
2224/77802 . . . . . . Rotational mechanism
2224/77803 . . . . . . Pivoting mechanism
2224/77804 . . . . . . Translational mechanism
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 . . . . . . Vibrating 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
2224/778 . . . . . . 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 . . . . . . Circuity of the discharge electrode
2224/78272 . . . . . . Oven
2224/7828 . . . . . . Resistance welding electrodes, i.e. for ohmic heating
Cooling means e.g. in the apparatus chuck in the lower part of the bonding apparatus, by means of pressure lamp in the upper part of the bonding apparatus, e.g. in the apparatus chuck.

Means for transporting the components to be connected in the bonding apparatus, e.g. in the capillary or wedge.

Means for supplying the connector to be connected in the bonding apparatus.

Mechanical means, e.g. for severing, pressing, stamping

Means for wire tension adjustments

Means for transporting the components to be connected

Means for monitoring the connection process

Means for transporting the components to be connected in the bonding apparatus

Rotational mechanism

Pivoting mechanism

Translational mechanism

Upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge.
Means for applying energy, e.g. heating means
- Electric heating means
- Laser heating
- Polychromatic heating lamp

Protection means against electrical discharge
- 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

Means for cleaning, e.g. brushes, for hydroblasting, 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

Mechanical means, e.g. for pressing, stamping
- Cooling means
- Design, e.g. of the wave guide

Means for forming additional members
- Means for controlling the bonding apparatus
- Means for applying a preform, e.g. laminator
- Means for forming additional members
- Means for applying a preform, e.g. laminator
- Means for forming additional members
Means for forming additional members
Means for monitoring the connection process
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 pressing head
Means for optical alignment, e.g. sensors
in the lower part of the bonding apparatus, e.g. in the apparatus chuck
in the upper part of the bonding apparatus, e.g. in the apparatus chuck
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 apparatus chuck
Means for moving parts
in the lower part of the bonding apparatus, e.g. XY table
Rotational mechanism
Pivoting mechanism
Upper part of the bonding apparatus, i.e. pressing head
Rotational mechanism
Pivoting mechanism
Translational mechanism
of the pressing 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

Means for forming part of the bonding apparatus
involving a temporary auxiliary member not being left in the finished device, e.g. aids for protecting the bonding area during or after the bonding process

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

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

H01L 2224/8001
by connecting a bonding area directly to another bonding area, i.e. connectorless bonding, e.g. bumpless bonding

H01L 2224/80014
Applying permanent coating to the bonding area in the bonding apparatus, e.g. in-situ coating

H01L 2224/8003
Reshaping the bonding area in the bonding apparatus, e.g. flattening the bonding area
by chemical means, e.g. etching, anodisation

H01L 2224/80035
by heating means

H01L 2224/80048
Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

H01L 2224/80051
Forming additional members

H01L 2224/80052
Detaching bonding areas, e.g. after testing (unsoldering in general B23K 1/018)

H01L 2224/80053
Composition of the atmosphere

H01L 2224/80055
being oxidating

H01L 2224/80065
being reducing

H01L 2224/80075
being inert
Applying energy for connecting
Aligning
dischARGE, e.g. removing electrostatic charge
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"
including 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
including movement of a part of the bonding
apparatus
being the lower part of the bonding
apparatus, i.e. holding means for the
bodies to be connected, e.g. XY table
Rotational movements
Translational movements
being the upper part of the bonding
apparatus, i.e. bonding head
Rotational movements
Translational movements
Arrangement of the bonding areas prior to
mounting
Lateral distribution of the bonding areas
Applying energy for connecting
Compression bonding
Thermocompression bonding, e.g.
diffusion bonding, pressure joining,
thermocompression welding or solid-state
welding
with a graded temperature profile
Ultrasonic bonding
Direction of oscillation
Thermosonic bonding
applying unidirectional static pressure

applying isostatic pressure, e.g. degassing
using vacuum or a pressurised liquid
using a reflow oven
with a graded temperature profile
with energy being in the form of
electromagnetic radiation
Induction heating, i.e. eddy currents
using a laser
Polychromatic or infrared lamp heating
using an autocatalytic reaction, e.g.
exothermic brazing
using means for applying energy being
within the device, e.g. integrated heater
using electro-static corona discharge
using an electron beam (electron beam
welding in general B23K 15/00)
using electric resistance welding, i.e. ohmic
heating
Bonding interfaces of the bonding area
Shape, e.g. interlocking features
having an external coating, e.g. protective
bonds-through coating
being flush with the surface
Material
Bonding interfaces of the semiconductor or
solid state body
Shape, e.g. interlocking features
having an external coating, e.g. protective
bonds-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
bonds-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
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 combination of two or more materials in the form of a matrix with a principal constituent of the material being a gas not provided for in groups H01L 2224/80491 being a liquid not provided for in groups H01L 2224/804 being a solid not provided for in groups H01L 2224/80491 being a polymer, e.g. polyester, phenolic glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy the principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/804 - H01L 2224/80491, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond with a principal constituent of the material being a liquid not provided for in groups H01L 2224/804 - H01L 2224/80491 with a principal constituent of the material being a gas not provided for in groups H01L 2224/804 - H01L 2224/80491 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams material of the matrix with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof with a 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater than 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C temperature of greater 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 950°C and less than 1550°C the principal constituent melting at a temperature of greater than 1550°C
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

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 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

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80598)

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 2224/805 - H01L 2224/80591, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/805 - H01L 2224/80591

with a principal constituent of the material being a gas not provided for in groups H01L 2224/805 - H01L 2224/80591

Fillers

Base material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

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

2224/80687 Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80688)
2224/80688 Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8069 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/80691 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/80693 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
2224/80694 with a principal constituent of the material being a liquid not provided for in groups H01L 2224/806 - H01L 2224/80691
2224/80695 with a principal constituent of the material being a gas not provided for in groups H01L 2224/806 - H01L 2224/80691
2224/80698 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
2224/80699 Coating material
2224/807 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
2224/80701 Gallium [Ga] as principal constituent
2224/80705 Indium [In] as principal constituent
2224/80711 Tin [Sn] as principal constituent
2224/80713 Bismuth [Bi] as principal constituent
2224/80714 Thallium [Tl] as principal constituent
2224/80716 Lead [Pb] as principal constituent
2224/80717 the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/80718 Zinc [Zn] as principal constituent
2224/8072 Antimony [Sb] as principal constituent
2224/80723 Magnesium [Mg] as principal constituent
2224/80724 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
2224/80738 Silver [Ag] as principal constituent
2224/80744 Gold [Au] as principal constituent
2224/80747 Copper [Cu] as principal constituent
2224/80749 Manganese [Mn] as principal constituent
2224/80755 Nickel [Ni] as principal constituent
2224/80757 Cobalt [Co] as principal constituent
2224/8076 Iron [Fe] as principal constituent
2224/80763 the principal constituent melting at a temperature of greater than 1550°C
2224/80764 Palladium [Pd] as principal constituent
2224/80766 Titanium [Ti] as principal constituent
2224/80769 Platinum [Pt] as principal constituent
2224/8077 Zirconium [Zr] as principal constituent
2224/80771 Chromium [Cr] as principal constituent
2224/80772 Vanadium [V] as principal constituent
2224/80773 Rhodium [Rh] as principal constituent
2224/80776 Ruthenium [Ru] as principal constituent
2224/80778 Iridium [Ir] as principal constituent
2224/80779 Niobium [Nb] as principal constituent
2224/8078 Molybdenum [Mo] as principal constituent
2224/80781 Tantalum [Ta] as principal constituent
2224/80783 Rhenium [Re] as principal constituent
2224/80784 Tungsten [W] as principal constituent
2224/80786 with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/80787 Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80788)
2224/80788 Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/80791 . . . . . . . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/80793 . . . . . . . . . . . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/80791
2224/80794 . . . . . . . . . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/80791
2224/80795 . . . . . . . . . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/80791
2224/80798 . . . . . . . . . . . . . . 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
2224/80799 . . . . . . . . . . . . . . Shape or distribution of the fillers
2224/808 . . . . . . . . . . . . . . Bonding techniques
2224/80801 . . . . . . . . . . . . . . Soldering or alloying
2224/80805 . . . . . . . . . . . . . . involving forming a eutectic alloy at the bonding interface
2224/8081 . . . . . . . . . . . . . . involving forming an intermetallic compound at the bonding interface
2224/80815 . . . . . . . . . . . . . . Reflow soldering
2224/8082 . . . . . . . . . . . . . . Diffusion bonding
2224/80825 . . . . . . . . . . . . . . Solid-liquid interdiffusion
2224/8083 . . . . . . . . . . . . . . Solid-solid interdiffusion
2224/8084 . . . . . . . . . . . . . . Sintering
2224/8085 . . . . . . . . . . . . . . using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
2224/80855 . . . . . . . . . . . . . . Hardening the adhesive by curing, i.e. thermosetting
2224/80856 . . . . . . . . . . . . . . Pre-cured adhesive, i.e. B-stage adhesive
2224/80859 . . . . . . . . . . . . . . Localised curing of parts of the bonding area
2224/80862 . . . . . . . . . . . . . . Heat curing
2224/80865 . . . . . . . . . . . . . . Microwave curing
2224/80868 . . . . . . . . . . . . . . Infrared [IR] curing
2224/80871 . . . . . . . . . . . . . . Visible light curing
2224/80874 . . . . . . . . . . . . . . Ultraviolet [UV] curing
2224/80877 . . . . . . . . . . . . . . Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
2224/8088 . . . . . . . . . . . . . . Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
2224/80885 . . . . . . . . . . . . . . Combinations of two or more hardening methods provided for in at least two different groups from H01L 2224/80855 - H01L 2224/80888, e.g. for hybrid thermoplastic-thermosetting adhesives
2224/8089 . . . . . . . . . . . . . . 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
2224/809 . . . . . . . . . . . . . . with the bonding area not providing any mechanical bonding
2224/80901 . . . . . . . . . . . . . . Pressing a bonding area against another bonding area by means of a further bonding area or connector (detachable pressure contact H01L 2224/72)
2224/80902 . . . . . . . . . . . . . . by means of a further bonding area
2224/80903 . . . . . . . . . . . . . . by means of a bump or layer connector
2224/80904 . . . . . . . . . . . . . . by means of an encapsulation layer or foil
2224/80905 . . . . . . . . . . . . . . Combinations of bonding methods provided for in at least two different groups from H01L 2224/8081 - H01L 2224/8083
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
2224/80911 . . . . . . . . . . . . . . Chemical cleaning, e.g. etching, flux
2224/80912 . . . . . . . . . . . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/80913 . . . . . . . . . . . . . . Plasma cleaning
2224/80914 . . . . . . . . . . . . . . Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
2224/80919 . . . . . . . . . . . . . . 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
2224/80931 . . . . . . . . . . . . . . by chemical means, e.g. etching
2224/80935 . . . . . . . . . . . . . . by heating means, e.g. reflowing
2224/80937 . . . . . . . . . . . . . . using a polychromatic heating lamp
2224/80939 . . . . . . . . . . . . . . using a laser
2224/80941 . . . . . . . . . . . . . . Induction heating, i.e. eddy currents
2224/80943 . . . . . . . . . . . . . . using a flame torch, e.g. hydrogen torch
2224/80945 . . . . . . . . . . . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/80947 . . . . . . . . . . . . . . by mechanical means, e.g. ?pull-and-cut?, pressing, stamping
H01L

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 cleaning
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 2224/81014
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
2224/81093 . . . Transient conditions, e.g. gas-flow
2224/81095 . . . Temperature settings
2224/81096 . . . Transient conditions
2224/81097 . . . Heating
2224/81098 . . . Cooling
2224/81099 . . . Ambient temperature
2224/811 . . . the bump connector being supplied to the parts to be connected in the bonding apparatus
2224/81101 . . . as prepeg comprising a bump connector, e.g. provided in an insulating plate member
2224/8111 . . . involving protection against electrical discharge, e.g. removing electrostatic charge
2224/8112 . . . Aligning
2224/81121 . . . Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
2224/81122 . . . by detecting inherent features of, or outside, the semiconductor or solid-state body
2224/81123 . . . Shape or position of the body
2224/81125 . . . Bonding areas on the body
2224/81127 . . . Bonding areas outside the body
2224/81129 . . . Shape or position of the other item
2224/8113 . . . using marks formed on the semiconductor or solid-state body
2224/81132 . . . using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
2224/81136 . . . involving guiding structures, e.g. spacers or supporting members
2224/81138 . . . the guiding structures being at least partially left in the finished device
2224/81139 . . . Guiding structures on the body
2224/8114 . . . Guiding structures outside the body
2224/81141 . . . Guiding structures both on and outside the body
2224/81143 . . . Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
2224/81148 . . . involving movement of a part of the bonding apparatus
2224/81149 . . . being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
2224/8115 . . . Rotational movements
2224/8116 . . . Translational movements
2224/81169 . . . being the upper part of the bonding apparatus, i.e. bonding head
2224/8117 . . . Rotational movements
2224/8118 . . . Translational movements
2224/8119 . . . Arrangement of the bump connectors prior to mounting
2224/81191 . . . wherein the bump connectors are disposed only on the semiconductor or solid-state body
2224/81192 . . . wherein the bump connectors are disposed only on another item or body to be connected to the semiconductor or solid-state body
2224/81193 . . . wherein the bump connectors are disposed on both the semiconductor or solid-state body and another item or body to be connected to the semiconductor or solid-state body
2224/81194 . . . Lateral distribution of the bump connectors
2224/812 . . . Applying energy for connecting
2224/81201 . . . . . . . Compression bonding
2224/81203 . . . . . . . Thermocompression bonding, e.g. diffusion bonding, pressure joining, thermocompression welding or solid-state welding
2224/81204 . . . . . . . with a graded temperature profile
2224/81205 . . . . . . . Ultrasonic bonding
2224/81206 . . . . . . . Direction of oscillation
2224/81207 . . . . . . . Thermosonic bonding
2224/81208 . . . . . . . applying unidirectional static pressure
2224/81209 . . . . . . . applying isostatic pressure, e.g. degassing using vacuum or a pressurised liquid
2224/8121 . . . . . . . using a reflow oven
2224/81211 . . . . . . . with a graded temperature profile
2224/81212 . . . . . . . with energy being in the form of electromagnetic radiation
2224/81222 . . . . . . . Induction heating, i.e. eddy currents
2224/81224 . . . . . . . using a laser
2224/8123 . . . . . . . Polychromatic or infrared lamp heating
2224/81232 . . . . . . . using an autocatalytic reaction, e.g. exothermic brazing
2224/81234 . . . . . . . using means for applying energy being within the device, e.g. integrated heater
2224/81236 . . . . . . . using electro-static corona discharge
2224/81237 . . . . . . . using an electron beam (electron beam welding in general B23K 15/00)
2224/81238 . . . . . . . using electric resistance welding, i.e. ohmic heating
2224/8134 . . . . . . . Bonding interfaces of the bump connector
2224/81345 . . . . . . . Shape, e.g. interlocking features
2224/81355 . . . . . . . having an external coating, e.g. protective bond-through coating
2224/81359 . . . . . . . Material
2224/8136 . . . . . . . Bonding interfaces of the semiconductor or solid state body
2224/81365 . . . . . . . Shape, e.g. interlocking features
2224/81375 . . . . . . . having an external coating, e.g. protective bond-through coating
2224/81379 . . . . . . . Material (material of the bump connector prior to the connecting process H01L 2224/13099 and H01L 2224/13599, and subgroups)
2224/8138 . . . . . . . Bonding interfaces outside the semiconductor or solid-state body
2224/81385 . . . . . . . Shape, e.g. interlocking features
2224/81395 . . . . . . . having an external coating, e.g. protective bond-through coating
2224/81399 . . . . . . . Material
2224/814 . . . . . . . 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
2224/81401 . . . . . . . the principal constituent melting at a temperature of less than 400°C
2224/81405 . . . . . . . Gallium [Ga] as principal constituent
2224/81409 . . . . . . . Indium [In] as principal constituent
2224/81411 . . . . . . . Tin [Sn] as principal constituent
2224/81413 . . . . . . . Bismuth [Bi] as principal constituent
2224/81414 . . . . . . . Thallium [Tl] as principal constituent
2224/81416 . . . . . . . Lead [Pb] as principal constituent
2224/81417 . . . . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/81418 . . . . . . . Zinc [Zn] as principal constituent
2224/8142 . . . . . . . Antimony [Sb] as principal constituent
2224/81423 . . . . . . . Magnesium [Mg] as principal constituent
2224/81424 . . . . . . . Aluminium [Al] as principal constituent
2224/81438 . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/81439 . . . . . . . Silver [Ag] as principal constituent
2224/81444 . . . . . . . Gold [Au] as principal constituent
2224/81447 . . . . . . . Copper [Cu] as principal constituent
2224/81449 . . . . . . . Manganese [Mn] as principal constituent
2224/81455 . . . . . . . Nickel [Ni] as principal constituent
2224/81457 . . . . . . . Cobalt [Co] as principal constituent
2224/8146 . . . . . . . Iron [Fe] as principal constituent
2224/81463 . . . . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/81464 . . . . . . . Palladium [Pd] as principal constituent
2224/81466 . . . . . . . Titanium [Ti] as principal constituent
2224/81469 . . . . . . . Platinum [Pt] as principal constituent
2224/8147 . . . . . . . Zirconium [Zr] as principal constituent
2224/81471 . . . . . . . Chromium [Cr] as principal constituent
2224/81472 . . . . . . . Vanadium [V] as principal constituent
2224/81473 . . . . . . . Rhodium [Rh] as principal constituent
2224/81476 . . . . . . . Ruthenium [Ru] as principal constituent
2224/81478 . . . . . . . Iridium [Ir] as principal constituent
2224/81479 . . . . . . . Niobium [Nb] as principal constituent
2224/8148 . . . . . . . Molybdenum [Mo] as principal constituent
2224/81481 . . . . . . . Tantalum [Ta] as principal constituent
2224/81483 . . . . . . . Rhenium [Re] as principal constituent
2224/81484 . . . . . . . Tungsten [W] as principal constituent
2224/81486 . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/81487 . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/81488)
2224/81488 . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8149 . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/81491 . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/81493 . . . . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/814 - H01L 2224/8191, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/81494 . . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/814 - H01L 2224/8191
with a principal constituent of the material being a gas not provided for in groups H01L 2224/8149 - H01L 2224/81491

with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams

Material of the matrix

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

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 2224/81588)

Glasses, e.g. amorphous oxides, nitrides or fluorides

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/815 - H01L 2224/81591, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/815 - H01L 2224/81591

with a principal constituent of the material being a gas not provided for in groups H01L 2224/815 - H01L 2224/81591

Fillers

Base material

with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

the principal constituent melting at a temperature of less than 400°C

Gallium [Ga] as principal constituent
2224/81609  Indium [In] as principal constituent
2224/81611  Tin [Sn] as principal constituent
2224/81613  Bismuth [Bi] as principal constituent
2224/81614  Thallium [TI] as principal constituent
2224/81616  Lead [Pb] as principal constituent
2224/81617  the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/81618  Zinc [Zn] as principal constituent
2224/8162  Antimony [Sb] as principal constituent
2224/81623  Magnesium [Mg] as principal constituent
2224/81624  Aluminium [Al] as principal constituent
2224/81638  the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/81639  Silver [Ag] as principal constituent
2224/81644  Gold [Au] as principal constituent
2224/81647  Copper [Cu] as principal constituent
2224/81649  Manganese [Mn] as principal constituent
2224/81655  Nickel [Ni] as principal constituent
2224/81657  Cobalt [Co] as principal constituent
2224/8166  Iron [Fe] as principal constituent
2224/81663  the principal constituent melting at a temperature of greater than 1550°C
2224/81664  Palladium [Pd] as principal constituent
2224/81666  Titanium [Ti] as principal constituent
2224/81669  Platinum [Pt] as principal constituent
2224/8167  Zirconium [Zr] as principal constituent
2224/81671  Chromium [Cr] as principal constituent
2224/81672  Vanadium [V] as principal constituent
2224/81673  Rhodium [Rh] as principal constituent
2224/81676  Ruthenium [Ru] as principal constituent
2224/81678  Iridium [Ir] as principal constituent
2224/81679  Niobium [Nb] as principal constituent
2224/8168  Molybdenum [Mo] as principal constituent
2224/81681  Tantalum [Ta] as principal constituent
2224/81683  Rhenium [Re] as principal constituent
2224/81684  Tungsten [W] as principal constituent
2224/81686  with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/81687  Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/81688)
2224/81688  Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8169  with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/81691  The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/81693  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
2224/81694  with a principal constituent of the material being a liquid not provided for in groups H01L 2224/816 - H01L 2224/81691
2224/81695  with a principal constituent of the material being a gas not provided for in groups H01L 2224/816 - H01L 2224/81691
2224/81698  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
2224/81699  Coating material
2224/817  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
2224/81701  the principal constituent melting at a temperature of less than 400°C
2224/81705  Gallium [Ga] as principal constituent
2224/81709  Indium [In] as principal constituent
2224/8171  Tin [Sn] as principal constituent
2224/81711  Bismuth [Bi] as principal constituent
2224/81713  Thallium [TI] as principal constituent
2224/81714  Thallium [TI] as principal constituent
Lead [Pb] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
Zinc [Zn] as principal constituent
Antimony [Sb] as principal constituent
Magnesium [Mg] as principal constituent
Aluminium [Al] as principal constituent
the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
Silver [Ag] as principal constituent
Gold [Au] as principal constituent
Copper [Cu] as principal constituent
Manganese [Mn] as principal constituent
Nickel [Ni] as principal constituent
Cobalt [Co] as principal constituent
Iron [Fe] as principal constituent
the principal constituent melting at a temperature of greater than 1550°C
Palladium [Pd] as principal constituent
Titanium [Ti] as principal constituent
Platinum [Pt] as principal constituent
Zirconium [Zr] as principal constituent
Chromium [Cr] as principal constituent
Vanadium [V] as principal constituent
Rhodium [Rh] as principal constituent
Ruthenium [Ru] as principal constituent
Iridium [Ir] as principal constituent
Niobium [Nb] as principal constituent
Molybdenum [Mo] as principal constituent
Tantalum [Ta] as principal constituent
Rhenium [Re] as principal constituent
Tungsten [W] as principal constituent
with a principal constituent of the material being a non metallic, non metalloid inorganic material
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/81788)
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 2224/81791, 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 2224/81791 - H01L 2224/81791
with a principal constituent of the material being a gas not provided for in groups H01L 2224/81791 - 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
2224/81877 . . . . Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
2224/8188 . . . . Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
2224/81885 . . . . Combinations of two or more hardening methods provided for in at least two different groups from H01L 2224/81855 - H01L 2224/81888, e.g. for hybrid thermoplastic-thermosetting adhesives
2224/8189 . . . . using an inorganic non metallic glass type adhesive, e.g. solder glass
2224/81893 . . . . Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ion migration leading to an irreversible chemical bond
2224/81894 . . . . Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
2224/81895 . . . . between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
2224/81896 . . . . between electrically insulating surfaces, e.g. oxide or nitride layers
2224/81897 . . . . Mechanical interlocking, e.g. anchoring, hook and loop-type fastening or the like
2224/81898 . . . . Press-fitting, i.e. pushing the parts together and fastening by friction, e.g. by compression of one part against the other
2224/81899 . . . . using resilient parts in the bump connector or in the bonding area
2224/819 . . . . with the bump connector not providing any mechanical bonding
2224/81901 . . . . Pressing the bump connector against the bonding areas by means of another connector (detachable pressure contact H01L 2224/72)
2224/81902 . . . . by means of another bump connector
2224/81903 . . . . by means of a layer connector
2224/81904 . . . . by means of an encapsulation layer or foil
2224/81905 . . . . Combinations of bonding methods provided for in at least two different groups from H01L 2224/818 - H01L 2224/81904
2224/81906 . . . . Specific sequence of method steps
2224/81907 . . . . Intermediate bonding, i.e. intermediate bonding step for temporarily bonding the semiconductor or solid-state body, followed by at least a further bonding step
2224/81908 . . . . involving monitoring, e.g. feedback loop
2224/81909 . . . . Post-treatment of the bump connector or bonding area
2224/8191 . . . . Cleaning, e.g. oxide removal step, desmearing
2224/81911 . . . . Chemical cleaning, i.e. etching, flux
2224/81912 . . . . Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
2224/81913 . . . . Plasma cleaning
2224/81914 . . . . Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
2224/81919 . . . . Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8191 - H01L 2224/81914
2224/8192 . . . . Applying permanent coating, e.g. protective coating
2224/8193 . . . . Reshaping
2224/81931 . . . . by chemical means, e.g. etching
2224/81935 . . . . by heating means, e.g. reflowing
2224/81937 . . . . using a polychromatic heating lamp
2224/81939 . . . . using a laser
2224/81941 . . . . Induction heating, i.e. eddy currents
2224/81943 . . . . using a flame torch, e.g. hydrogen torch
2224/81945 . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/81947 . . . . by mechanical means, e.g. "pull-and-cut", pressing, stamping
2224/81948 . . . . Thermal treatments, e.g. annealing, controlled cooling
2224/81951 . . . . Forming additional members, e.g. for reinforcing
2224/81986 . . . . Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
2224/82 . . . . by forming build-up interconnects at chip-level, e.g. for high density interconnects [HDI]
2224/82001 . . . . involving a temporary auxiliary member not forming part of the bonding apparatus
2224/82002 . . . . being a removable or sacrificial coating
2224/82005 . . . . being a temporary or sacrificial substrate
2224/82007 . . . . 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
2224/82009 . . . . Pre-treatment of the connector or the bonding area
2224/8201 . . . . Cleaning, e.g. oxide removal step, desmearing
2224/8203 . . . . Reshaping, e.g. forming vias
2224/82031 . . . . by chemical means, e.g. etching, anodisation
2224/82035 . . . . by heating means
2224/82039 . . . . using a laser
2224/82045 . . . . using a corona discharge, e.g. electronic flame off [EFO]
2224/82047 . . . . by mechanical means, e.g. severing, pressing, stamping
2224/82048 . . . . Thermal treatments, e.g. severing, controlled pre-heating or pre-cooling
2224/82051 . . . . Forming additional members
2224/82053 . . . . Bonding environment
2224/82054 . . . . Composition of the atmosphere
2224/82085 . . . . being a liquid, e.g. for fluidic self-assembly
2224/8209 . . . . Vacuum
2224/82091 . . . . Under pressure
2224/82095 . . . . Temperature settings
2224/82096 . . . . Transient conditions
2224/82097 . . . . Heating
2224/82098 . . . . Cooling
2224/82099 . . . . Ambient temperature
2224/821 . . . . Forming a build-up interconnect
2224/82101 . . . . by additive methods, e.g. direct writing
2224/82102 . . . . using jetting, e.g. ink jet
2224/82103 . . . . using laser direct writing
... Bonding interfaces of the connector or solid-state body

... Bonding interfaces outside the semiconductor or solid-state body

... Bonding interfaces 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, 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

... 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

... 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 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 2224/8255 - H01L 2224/8288

... 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
H01L

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 2224/828 - H01L 2224/8297

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. insitu 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

2224/83047  . . . . . . . by mechanical means, e.g. severing, pressing, stamping
2224/83048  . . . . . . . Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
2224/83051  . . . . . . . Forming additional members, e.g. dam structures
2224/83052  . . . . . . . Detaching layer connectors, e.g. after testing (unsoldering in general B23K 1/018)

2224/83053  . . . . . . . Bonding environment
2224/83054  . . . . . . . Composition of the atmosphere
2224/83055  . . . . . . . being oxidating
2224/83065  . . . . . . . being reducing
2224/83075  . . . . . . . being inert
2224/83085  . . . . . . . being a liquid, e.g. for fluidic self-assembly
2224/8309  . . . . . . . Vacuum
2224/83091  . . . . . . . Under pressure
2224/83092  . . . . . . . Atmospheric pressure
2224/83093  . . . . . . . Transient conditions, e.g. gas-flow
2224/83095  . . . . . . . Temperature settings
2224/83096  . . . . . . . Transient conditions
2224/83097  . . . . . . . Heating
2224/83098  . . . . . . . Cooling
2224/83099  . . . . . . . Ambient temperature
2224/831  . . . . . . . the layer connector being supplied to the parts to be connected in the bonding apparatus
2224/83101  . . . . . . . as prepeg comprising a layer connector, e.g. provided in an insulating plate member
2224/83102  . . . . . . . using surface energy, e.g. capillary forces
2224/83104  . . . . . . . by applying pressure, e.g. by injection
2224/8311  . . . . . . . involving protection against electrical discharge, e.g. removing electrostatic charge
2224/8312  . . . . . . . Aligning
2224/83121  . . . . . . . Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
2224/83122  . . . . . . . by detecting inherent features of, or outside, the semiconductor or solid-state body
2224/83123  . . . . . . . Shape or position of the body
2224/83125  . . . . . . . Bonding areas on the body
2224/83127  . . . . . . . Bonding areas outside the body
2224/83129  . . . . . . . Shape or position of the other item
2224/8313  . . . . . . . using marks formed on the semiconductor or solid-state body
2224/83132  . . . . . . . using marks formed outside the semiconductor or solid-state body, i.e. “off-chip”
2224/83136  . . . . . . . involving guiding structures, e.g. toppers or supporting members
2224/83138  . . . . . . . the guiding structures being at least partially left in the finished device
2224/83139  . . . . . . . Guiding structures on the body
2224/8314  . . . . . . . Guiding structures outside the body
2224/83141  . . . . . . . Guiding structures both on and outside the body
2224/83143  . . . . . . . Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
2224/83148  . . . . . . . involving movement of a part of the bonding apparatus
2224/83149  . . . . . . . being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
2224/8315  . . . . . . . Rotational movements
2224/8316  . . . . . Translational movements
2224/83169 . . . . . being the upper part of the bonding apparatus, i.e. bonding head
2224/8317  . . . . . Rotational movements
2224/8318  . . . . . Translational movements
2224/8319  . . . . . Arrangement of the layer connectors prior to mounting
2224/83191 . . . . . wherein the layer connectors are disposed only on the semiconductor or solid-state body
2224/83192 . . . . . wherein the layer connectors are disposed only on another item or body to be connected to the semiconductor or solid-state body
2224/83193 . . . . . 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
2224/83194 . . . . . Lateral distribution of the layer connectors
2224/832  . . . . . Applying energy for connecting
2224/83201 . . . . . Compression bonding
2224/83203 . . . . . Thermocompression bonding, e.g. diffusion bonding, pressure joining, thermocompression welding or solid-state welding
2224/83204 . . . . . with a graded temperature profile
2224/83205 . . . . . Ultrasonic bonding
2224/83206 . . . . . Direction of oscillation
2224/83207 . . . . . Thermosonic bonding
2224/83208 . . . . . applying unidirectional static pressure
2224/83209 . . . . . applying isostatic pressure, e.g. degassing using vacuum or a pressurised liquid
2224/8321  . . . . . using a reflow oven
2224/83211 . . . . . with a graded temperature profile
2224/8322  . . . . . with energy being in the form of electromagnetic radiation
2224/83222 . . . . . Induction heating, i.e. eddy currents
2224/83224 . . . . . using a laser
2224/8323  . . . . . Polychromatic or infrared lamp heating
2224/83232 . . . . . using an autocaltatic reaction, e.g. exothermic brazing
2224/83234 . . . . . using means for applying energy being within the device, e.g. integrated heater
2224/83236 . . . . . using electro-static corona discharge
2224/83237 . . . . . using an electron beam (electron beam welding in general B23K 15/00)
2224/83238 . . . . . using electric resistance welding, i.e. ohmic heating
2224/8334  . . . . . Bonding interfaces of the layer connector
2224/83345 . . . . . Shape, e.g. interlocking features
2224/8335  . . . . . having an external coating, e.g. protective bond-through coating
2224/83359 . . . . . Material
2224/8336  . . . . . Bonding interfaces of the semiconductor or solid state body
2224/83365 . . . . . Shape, e.g. interlocking features
2224/8337  . . . . . having an external coating, e.g. protective bond-through coating
2224/83379 . . . . . Material (material of the layer connector prior to the connecting process H01L 2224/29099 and H01L 2224/29599, and subgroups)
2224/8338  . . . . . 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
2224/8343  . . . . . 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
2224/8345  . . . . . the principal constituent melting at a temperature of greater than or equal to 1550°C
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
Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83487 - H01L 2224/83488)

Glasses, e.g. amorphous oxides, nitrides or fluorides  

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxies (H01L 2224/83488)

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene (H01L 2224/83489)

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 (H01L 2224/83494)

with a principal constituent of the material being a liquid not provided for in groups H01L 2224/834 - H01L 2224/83491 (H01L 2224/83495)

with a principal constituent of the material being a gas not provided for in groups H01L 2224/834 - H01L 2224/83491 (H01L 2224/83496)

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 2224/83497)

Material of the matrix (H01L 2224/83498)

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 2224/83499)

the principal constituent melting at a temperature of less than 400°C (H01L 2224/83500)

Gallium [Ga] as principal constituent (H01L 2224/83501)

Indium [In] as principal constituent (H01L 2224/83502)

Tin [Sn] as principal constituent (H01L 2224/83503)

Bismuth [Bi] as principal constituent (H01L 2224/83504)

Thallium [Tl] as principal constituent (H01L 2224/83505)

Lead [Pb] as principal constituent (H01L 2224/83506)

the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C (H01L 2224/83507)

Zinc [Zn] as principal constituent (H01L 2224/83508)

Antimony [Sb] as principal constituent (H01L 2224/83509)

Magnesium [Mg] as principal constituent (H01L 2224/83510)

Aluminium [Al] as principal constituent (H01L 2224/83511)

the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C (H01L 2224/83512)

Silver [Ag] as principal constituent (H01L 2224/83513)

Gold [Au] as principal constituent (H01L 2224/83514)

Copper [Cu] as principal constituent (H01L 2224/83515)

Manganese [Mn] as principal constituent (H01L 2224/83516)

Nickel [Ni] as principal constituent (H01L 2224/83517)

Cobalt [Co] as principal constituent (H01L 2224/83518)

Iron [Fe] as principal constituent (H01L 2224/83519)

the principal constituent melting at a temperature of greater than or equal to 1550°C (H01L 2224/83520)

Palladium [Pd] as principal constituent (H01L 2224/83521)

Titanium [Ti] as principal constituent (H01L 2224/83522)

Platinum [Pt] as principal constituent (H01L 2224/83523)

Zirconium [Zr] as principal constituent (H01L 2224/83524)

Chromium [Cr] as principal constituent (H01L 2224/83525)

Vanadium [V] as principal constituent (H01L 2224/83526)

Rhodium [Rh] as principal constituent (H01L 2224/83527)

Ruthenium [Ru] as principal constituent (H01L 2224/83528)

Iridium [Ir] as principal constituent (H01L 2224/83529)

Niobium [Nb] as principal constituent (H01L 2224/83530)

Molybdenum [Mo] as principal constituent (H01L 2224/83531)

Tantalum [Ta] as principal constituent (H01L 2224/83532)

Tungsten [W] as principal constituent (H01L 2224/83533)

with a principal constituent of the material being a non metallic, non metalloid inorganic material (H01L 2224/83534)

Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83535 - H01L 2224/83538)

Glasses, e.g. amorphous oxides, nitrides or fluorides (H01L 2224/83536)

with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxies (H01L 2224/83537 - H01L 2224/83540)

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene (H01L 2224/83541 - H01L 2224/83544)

with a principal constituent of the material being a solid not provided for in groups H01L 2224/835 - H01L 2224/83500, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond (H01L 2224/83545 - H01L 2224/83548)
Fillers

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

Sn [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 2224/83687)

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 2224/836 - H01L 2224/83691, 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 2224/836 - H01L 2224/83691

with a principal constituent of the material being a gas not provided for in groups H01L 2224/836 - H01L 2224/83691

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 2224/83784)

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 2224/83791, 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 2224/83791

with a principal constituent of the material being a gas not provided for in groups H01L 2224/83791

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
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
Pressing the layer connector against the bonding areas by means of another connector
by means of another layer connector
by means of a bump connector
by means of an encapsulation layer or foil
Combinations of bonding methods provided for in at least two different groups from H01L 2224/838 - H01L 2224/8394
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 layer connector or bonding area
Cleaning, e.g. oxide removal step, desmearing
Chemical cleaning, e.g. etching, flux
Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
Plasma cleaning
Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8391 - H01L 2224/83914
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, fillet sealant
Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
using a strap connector
involving a temporary auxiliary member not forming part of the bonding apparatus
being a removable or sacrificial coating
being a temporary substrate
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
Pre-treatment of the connector and/or the bonding area
Cleaning, e.g. oxide removal step, desmearing
Chemical cleaning, e.g. etching, flux
Aligning discharge, e.g. removing electrostatic charge involving protection against electrical
connected in the bonding apparatus
the connector being supplied to the parts to be
composed within the device, e.g. integrated heater
partially left in the finished device
apparatus, i.e. bonding head,
connection first on the semiconductor
connecting first on the semiconductor
connecting first outside the semiconductor
connecting first both on and outside the semiconductor
involving intermediate connecting steps before cutting the strap 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
electron-static corona discharge
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
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
<table>
<thead>
<tr>
<th>Document Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2224/84401</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>2224/84405</td>
<td>Gallium [Ga] as principal constituent</td>
</tr>
<tr>
<td>2224/84409</td>
<td>Indium [In] as principal constituent</td>
</tr>
<tr>
<td>2224/84411</td>
<td>Tin [Sn] as principal constituent</td>
</tr>
<tr>
<td>2224/84413</td>
<td>Bismuth [Bi] as principal constituent</td>
</tr>
<tr>
<td>2224/84414</td>
<td>Thallium [TI] as principal constituent</td>
</tr>
<tr>
<td>2224/84416</td>
<td>Lead [Pb] as principal constituent</td>
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<tr>
<td>2224/84417</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>2224/84418</td>
<td>Zinc [Zn] as principal constituent</td>
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<tr>
<td>2224/8442</td>
<td>Antimony [Sb] as principal constituent</td>
</tr>
<tr>
<td>2224/84423</td>
<td>Magnesium [Mg] as principal constituent</td>
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<td>Aluminium [Al] as principal constituent</td>
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<tr>
<td>2224/84438</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>2224/84439</td>
<td>Silver [Ag] as principal constituent</td>
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<tr>
<td>2224/84444</td>
<td>Gold [Au] as principal constituent</td>
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<tr>
<td>2224/84447</td>
<td>Copper [Cu] as principal constituent</td>
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<td>2224/84449</td>
<td>Manganese [Mn] as principal constituent</td>
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<td>2224/84455</td>
<td>Nickel [Ni] as principal constituent</td>
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<tr>
<td>2224/84457</td>
<td>Cobalt [Co] as principal constituent</td>
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<tr>
<td>2224/8446</td>
<td>Iron [Fe] as principal constituent</td>
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<td>2224/84463</td>
<td>the principal constituent melting at a temperature of greater than 1550°C</td>
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<td>2224/84464</td>
<td>Palladium [Pd] as principal constituent</td>
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<tr>
<td>2224/84466</td>
<td>Titanium [Ti] as principal constituent</td>
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<tr>
<td>2224/84469</td>
<td>Platinum [Pt] as principal constituent</td>
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<td>2224/8447</td>
<td>Zirconium [Zr] as principal constituent</td>
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<td>2224/84471</td>
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<td>2224/84478</td>
<td>Iridium [Ir] as principal constituent</td>
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<td>2224/84479</td>
<td>Niobium [Nb] as principal constituent</td>
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<td>2224/8448</td>
<td>Molybdenum [Mo] as principal constituent</td>
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<td>2224/84481</td>
<td>Tantalum [Ta] as principal constituent</td>
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<tr>
<td>2224/84483</td>
<td>Rhenium [Re] as principal constituent</td>
</tr>
<tr>
<td>2224/84484</td>
<td>Tungsten [W] as principal constituent</td>
</tr>
<tr>
<td>2224/84486</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
</tbody>
</table>

Material bond-through coating having an external coating, e.g. protective coating with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof.

The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene.

Material of the matrix.
H01L

- Copper [Cu] as principal constituent
- Manganese [Mn] as principal constituent
- Nickel [Ni] as principal constituent
- Cobalt [Co] as principal constituent
- Iron [Fe] as principal constituent
- Palladium [Pd] as principal constituent
- Titanium [Ti] as principal constituent
- Platinum [Pt] as principal constituent
- Zirconium [Zr] as principal constituent
- Chromium [Cr] as principal constituent
- Vanadium [V] as principal constituent
- Rhodium [Rh] as principal constituent
- Ruthenium [Ru] as principal constituent
- Iridium [Ir] as principal constituent
- Niobium [Nb] as principal constituent
- Molybdenum [Mo] as principal constituent
- Tantalum [Ta] as principal constituent
- Rhenium [Re] as principal constituent
- Tungsten [W] as principal constituent
- with a principal constituent of the material being a non metallic, non metalloid inorganic material
- Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84588)
- 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 2224/845 - H01L 2224/84591, 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 2224/845 - H01L 2224/84591
- with a principal constituent of the material being a gas not provided for in groups H01L 2224/845 - H01L 2224/84591
- 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

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Coating material structures, foams 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 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof with a principal constituent melting at a temperature of less than 400°C Gallium [Ga] as principal constituent Indium [In] as principal constituent Tin [Sn] as principal constituent Bismuth [Bi] as principal constituent Thallium [Tl] as principal constituent Lead [Pb] as principal constituent 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 2224/84688) Glasses, e.g. amorphous oxides, nitrides or fluorides with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene with a principal constituent of the material being a solid not provided for in groups H01L 2224/846 - H01L 2224/84691, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond with a principal constituent of the material being a liquid not provided for in groups H01L 2224/846 - H01L 2224/84691 with a principal constituent of the material being a gas not provided for in groups H01L 2224/846 - H01L 2224/84691 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams Coating material
Bonding techniques

Soldering or alloying

Diffusion bonding

Reflow soldering

An activator having a eutectic alloy at the bonding interface

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

involving monitoring, e.g. feedback loop

Cleaning, e.g. oxide removal step, desmearing

Chemical cleaning, e.g. etching, flux

Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow

Plasma cleaning

Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge

Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8491 - H01L 2224/84913, e.g. applying permanent coating, e.g. protective coating

Reshaping, e.g. for severing the strap, modifying the loop shape

Post-treatment of the connector or bonding area

involving monitoring, e.g. feedback loop

Cleaning, e.g. oxide removal step, desmearing

Chemical cleaning, e.g. etching, flux

Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow

Plasma cleaning

Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge

Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8491 - H01L 2224/84913, e.g. applying permanent coating, e.g. protective coating

Reshaping, e.g. for severing the strap, modifying the loop shape

Post-treatment of the connector or bonding area

involving monitoring, e.g. feedback loop

Cleaning, e.g. oxide removal step, desmearing

Chemical cleaning, e.g. etching, flux

Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow

Plasma cleaning

Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge

Combinations of two or more cleaning methods provided for in at least two different groups from H01L 2224/8491 - H01L 2224/84913, e.g. applying permanent coating, e.g. protective coating

Reshaping, e.g. for severing the strap, modifying the loop shape
using a wire connector

H01L 2224/8501

Using a corona discharge, e.g. electronic flame off [EFO]

H01L 2224/85014

Combinations of two or more cleaning methods provided for in at least two different groups from

H01L 2224/8501 - H01L 2224/85014

2224/8502 Applying permanent coating, e.g. in-situ coating

H01L 2224/8501

2224/8503 Reshaping, e.g. forming the ball or the wedge of the wire connector

H01L 2224/8501

2224/85031 by chemical means, e.g. etching, anodisation

H01L 2224/8501

2224/85035 by heating means, e.g. "free-air-ball"

H01L 2224/8501

2224/85037 using a polychromatic heating lamp

H01L 2224/8501

2224/85039 using a laser

H01L 2224/8501

2224/85041 Induction heating, i.e. eddy currents

H01L 2224/8501

2224/85043 using a flame torch, e.g. hydrogen torch

H01L 2224/8501

2224/85045 using a corona discharge, e.g. electronic flame off [EFO]

H01L 2224/8501

2224/85047 by mechanical means, e.g. severing, pressing, stamping

H01L 2224/8501

2224/85048 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling

H01L 2224/8501

2224/85051 Forming additional members, e.g. for "wedge-on-ball", "ball-on-wedge", "ball-on-ball" connections

H01L 2224/8501

2224/85053 Bonding environment

H01L 2224/8501

2224/85054 Composition of the atmosphere

H01L 2224/8501

2224/85055 being oxidating

H01L 2224/8501

2224/85065 being reducing

H01L 2224/8501

2224/85075 being inert

H01L 2224/8501

2224/85085 being a liquid, e.g. for fluidic self-assembly

H01L 2224/8501

2224/85099 Vacuum

H01L 2224/8501

2224/8509 Vacuum

H01L 2224/8501

2224/85091 Under pressure

H01L 2224/8501

2224/85092 Atmospheric pressure

H01L 2224/8501

2224/85093 Transient conditions, e.g. gas-flow

H01L 2224/8501

2224/85095 Temperature settings

H01L 2224/8501

2224/85096 Transient conditions

H01L 2224/8501

2224/85097 Heating

H01L 2224/8501

2224/85098 Cooling

H01L 2224/8501

2224/85099 Ambient temperature

H01L 2224/8501

2224/8511 the connector being supplied to the parts to be connecting the bonding apparatus

H01L 2224/8501

2224/8512 Aligning

H01L 2224/8501

2224/85121 Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors

H01L 2224/8501

2224/85122 by detecting inherent features of, or outside, the semiconductor or solid-state body

H01L 2224/8501

2224/85123 Shape or position of the body

H01L 2224/8501

2224/85125 Bonding areas on the body

H01L 2224/8501

2224/85127 Bonding areas outside the body

H01L 2224/8501

2224/85129 Shape or position of the other item

H01L 2224/8501

2224/8513 using marks formed on the semiconductor or solid-state body

H01L 2224/8501

2224/85132 using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"

H01L 2224/8501

2224/85136 involving guiding structures, e.g. spacers or supporting members

H01L 2224/8501

2224/85138 the guiding structures being at least partially left in the finished device

H01L 2224/8501

2224/85143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium

H01L 2224/8501

2224/85148 involving movement of a part of the bonding apparatus

H01L 2224/8501

2224/85149 being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table

H01L 2224/8501

2224/8515 Rotational movements

H01L 2224/8501

2224/8516 Translational movements

H01L 2224/8501

2224/85169 being the upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge

H01L 2224/8501

2224/8517 Rotational movements

H01L 2224/8501

2224/8518 Translational movements

H01L 2224/8501

2224/85181 connecting first on the semiconductor or solid-state body, i.e. on-chip, regular stitch

H01L 2224/8501

2224/85186 connecting first outside the semiconductor or solid-state body, i.e. off-chip, reverse stitch

H01L 2224/8501

2224/85191 connecting first both on and outside the semiconductor or solid-state body, i.e. regular and reverse stitches
H01L

- involving intermediate connecting steps before cutting the wire connector
- Applying energy for connecting
- Compression bonding
- Thermocompression 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
- 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 (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
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- 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 2224/85488)
- 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 2224/854 - 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
<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H01L 2224/855</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>H01L 2224/85501</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>H01L 2224/85505</td>
<td>Gallium (Ga) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85524</td>
<td>Magnesium (Mg) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85538</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>H01L 2224/85539</td>
<td>Silver (Ag) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85547</td>
<td>Copper (Cu) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85555</td>
<td>Nickel (Ni) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85563</td>
<td>Iron (Fe) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85564</td>
<td>Palladium (Pd) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85566</td>
<td>Titanium (Ti) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85569</td>
<td>Platinum (Pt) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/8557</td>
<td>Zirconium (Zr) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85571</td>
<td>Chromium (Cr) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85572</td>
<td>Vanadium (V) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85573</td>
<td>Rhodium (Rh) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85576</td>
<td>Ruthenium (Ru) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85578</td>
<td>Iridium (Ir) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85579</td>
<td>Niobium (Nb) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/8558</td>
<td>Molybdenum (Mo) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85581</td>
<td>Tantalum (Ta) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85583</td>
<td>Rhenium (Re) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85584</td>
<td>Tungsten (W) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85586</td>
<td>with a principal constituent of the material being a non metallic, non metalloid inorganic material</td>
</tr>
<tr>
<td>H01L 2224/85587</td>
<td>Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85588)</td>
</tr>
<tr>
<td>H01L 2224/85588</td>
<td>Glasses, e.g. amorphous oxides, nitrides or fluorides</td>
</tr>
<tr>
<td>H01L 2224/8559</td>
<td>with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy</td>
</tr>
<tr>
<td>H01L 2224/85591</td>
<td>The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene</td>
</tr>
<tr>
<td>H01L 2224/85593</td>
<td>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</td>
</tr>
<tr>
<td>H01L 2224/85594</td>
<td>with a principal constituent of the material being a liquid not provided for in groups H01L 2224/855 - H01L 2224/85591</td>
</tr>
<tr>
<td>H01L 2224/85595</td>
<td>with a principal constituent of the material being a gas not provided for in groups H01L 2224/855 - H01L 2224/85591</td>
</tr>
<tr>
<td>H01L 2224/85598</td>
<td>Fillers</td>
</tr>
<tr>
<td>H01L 2224/85599</td>
<td>Base material</td>
</tr>
<tr>
<td>H01L 2224/856</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>H01L 2224/85601</td>
<td>the principal constituent melting at a temperature of less than 400°C</td>
</tr>
<tr>
<td>H01L 2224/85605</td>
<td>Gallium (Ga) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85609</td>
<td>Indium (In) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85611</td>
<td>Tin (Sn) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85613</td>
<td>Bismuth (Bi) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85614</td>
<td>Thallium (Tl) as principal constituent</td>
</tr>
<tr>
<td>H01L 2224/85616</td>
<td>Lead (Pb) as principal constituent</td>
</tr>
</tbody>
</table>
the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C

Zinc (Zn) as principal constituent

Antimony (Sb) as principal constituent

Magnesium (Mg) as principal constituent

Aluminium (Al) as principal constituent

Silver (Ag) as principal constituent

Gold (Au) as principal constituent

Copper (Cu) as principal constituent

Manganese (Mn) as principal constituent

Nickel (Ni) as principal constituent

Cobalt (Co) as principal constituent

Iron (Fe) as principal constituent

Palladium (Pd) as principal constituent

Titanium (Ti) as principal constituent

Platinum (Pt) as principal constituent

Zirconium (Zr) as principal constituent

Chromium (Cr) as principal constituent

Vanadium (V) as principal constituent

Rhodium (Rh) as principal constituent

Ruthenium (Ru) as principal constituent

Iridium (Ir) as principal constituent

Niobium (Nb) as principal constituent

Molybdenum (Mo) as principal constituent

Tantalum (Ta) as principal constituent

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 2224/85691, H01L 2224/85693)

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, nitrile, neoprene

with a principal constituent of the material being a solid not provided for in groups H01L 2224/85691, H01L 2224/85693, 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 2224/85691, H01L 2224/85693

with a principal constituent of the material being a gas not provided for in groups H01L 2224/85691, H01L 2224/85693

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


H01L

2224/85724 . . . . . . . . . . . . . . . . . Aluminum (Al) as principal constituent
2224/85738 . . . . . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/85739 . . . . . . . . . . . . . . . . . Silver (Ag) as principal constituent
2224/85744 . . . . . . . . . . . . . . . . . Gold (Au) as principal constituent
2224/85747 . . . . . . . . . . . . . . . . . Copper (Cu) as principal constituent
2224/85749 . . . . . . . . . . . . . . . . . Manganese (Mn) as principal constituent
2224/85755 . . . . . . . . . . . . . . . . . Nickel (Ni) as principal constituent
2224/85757 . . . . . . . . . . . . . . . . . Cobalt (Co) as principal constituent
2224/8576 . . . . . . . . . . . . . . . . . Iron (Fe) as principal constituent
2224/85763 . . . . . . . . . . . . . . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/85764 . . . . . . . . . . . . . . . . . Palladium (Pd) as principal constituent
2224/85766 . . . . . . . . . . . . . . . . . Titanium (Ti) as principal constituent
2224/85769 . . . . . . . . . . . . . . . . . Platinum (Pt) as principal constituent
2224/8577 . . . . . . . . . . . . . . . . . Zirconium (Zr) as principal constituent
2224/85771 . . . . . . . . . . . . . . . . . Chromium (Cr) as principal constituent
2224/85772 . . . . . . . . . . . . . . . . . Vanadium (V) as principal constituent
2224/85773 . . . . . . . . . . . . . . . . . Rhodium (Rh) as principal constituent
2224/85776 . . . . . . . . . . . . . . . . . Ruthenium (Ru) as principal constituent
2224/85778 . . . . . . . . . . . . . . . . . Iridium (Ir) as principal constituent
2224/85779 . . . . . . . . . . . . . . . . . Niobium (Nb) as principal constituent
2224/8578 . . . . . . . . . . . . . . . . . Molybdenum (Mo) as principal constituent
2224/85781 . . . . . . . . . . . . . . . . . Tantalum (Ta) as principal constituent
2224/85783 . . . . . . . . . . . . . . . . . Rhenium (Re) as principal constituent
2224/85784 . . . . . . . . . . . . . . . . . Tungsten (W) as principal constituent
2224/85786 . . . . . . . . . . . . . . . . . with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/85787 . . . . . . . . . . . . . . . . . Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85788)
2224/85788 . . . . . . . . . . . . . . . . . Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8579 . . . . . . . . . . . . . . . . . with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/85791 . . . . . . . . . . . . . . . . . The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/85793 . . . . . . . . . . . . . . . . . with a principal constituent of the material being a solid not provided for in groups H01L 2224/857 - H01L 2224/85791, e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/85794 . . . . . . . . . . . . . . . . . with a principal constituent of the material being a liquid not provided for in groups H01L 2224/857 - H01L 2224/85791
2224/85795 . . . . . . . . . . . . . . . . . with a principal constituent of the material being a gas not provided for in groups H01L 2224/857 - H01L 2224/85791
2224/85798 . . . . . . . . . . . . . . . . . with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/85799 . . . . . . . . . . . . . . . . . Shape or distribution of the fillers
2224/858 . . . . . . . . . . . . . . . . . . Bonding techniques
2224/85801 . . . . . . . . . . . . . . . . . Soldering or alloying
2224/85805 . . . . . . . . . . . . . . . . . involving forming a eutectic alloy at the bonding interface
2224/8581 . . . . . . . . . . . . . . . . . involving forming an intermetallic compound at the bonding interface
2224/85815 . . . . . . . . . . . . . . . . . Reflow soldering
2224/8582 . . . . . . . . . . . . . . . . . . Diffusion bonding
2224/85825 . . . . . . . . . . . . . . . . . Solid-liquid interdiffusion
2224/8583 . . . . . . . . . . . . . . . . . . Solid-solid interdiffusion, e.g. "direct bonding"
2224/8584 . . . . . . . . . . . . . . . . . Sintering
2224/8585 . . . . . . . . . . . . . . . . . . using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
2224/85855 . . . . . . . . . . . . . . . . . . Hardening the adhesive by curing, i.e. thermosetting
2224/85856 . . . . . . . . . . . . . . . . . . Pre-cured adhesive, i.e. B-stage adhesive
2224/85859 . . . . . . . . . . . . . . . . . . Localised curing of parts of the connector
2224/8586 . . . . . . . . . . . . . . . . . . Heat curing
2224/85865 . . . . . . . . . . . . . . . . . . Microwave curing
2224/85868 . . . . . . . . . . . . . . . . . . Infrared [IR] curing
2224/85871 . . . . . . . . . . . . . . . . . . Visible light curing
2224/85874 . . . . . . . . . . . . . . . . . . Ultraviolet [UV] curing
2224/85877 . . . . . . . . . . . . . . . . . . Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
2224/8588 . . . . . . . . . . . . . . . . . . Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
2224/85885 . . . . . . . . . . . . . . . . . . Combinations of two or more hardening methods provided for in at least two different groups from H01L 2224/8585 - H01L 2224/85888, e.g. for hybrid thermoplastic-thermosetting adhesives
2224/8589 . . . . . . . . . . . . . . . . . . using an inorganic non metallic glass type adhesive, e.g. solder glass
2224/85893 . . . Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond

2224/85895 . . . Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces

2224/85897 . . . between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding

2224/85898 . . . between electrically insulating surfaces, e.g. oxide or nitride layers

2224/85899 . . . Combinations of bonding methods provided for in at least two different groups from [H01L 2224/858 - H01L 2224/85988

2224/859 . . . involving monitoring, e.g. feedback loop

2224/85909 . . . Post-treatment of the connector or wire bonding area

2224/8591 . . . Cleaning, e.g. oxide removal step, desmearing

2224/85911 . . . Mechanical cleaning, e.g. etching, flux

2224/85912 . . . Induction heating, i.e. eddy currents

2224/85913 . . . Plasma cleaning

2224/85914 . . . Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge

2224/85916 . . . using a laser

2224/85917 . . . Electron beam cleaning

2224/85919 . . . Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8591 - H01L 2224/85914

2224/8592 . . . Applying permanent coating, e.g. protective coating

2224/8593 . . . Reshaping, e.g. for severing the wire, modifying the wedge or ball or the loop shape

2224/85931 . . . by chemical means, e.g. etching

2224/85935 . . . by heating means, e.g. reflowing

2224/85937 . . . using a polychromatic heating lamp

2224/85939 . . . using a laser

2224/85941 . . . Induction heating, i.e. eddy currents

2224/85943 . . . using a flame torch, e.g. hydrogen torch

2224/85945 . . . using a corona discharge, e.g. electronic flame off [EFO]

2224/85947 . . . by mechanical means, e.g. "pull-and-cut", pressing, stamping

2224/85948 . . . Thermal treatments, e.g. annealing, controlled cooling

2224/85951 . . . Forming additional members, e.g. for reinforcing

2224/85986 . . . Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence

2224/86 . . . using tape automated bonding [TAB]

2224/86001 . . . involving a temporary auxiliary member not forming part of the bonding apparatus

2224/86002 . . . being a removable or sacrificial coating

2224/86005 . . . being a temporary or sacrificial substrate

2224/86007 . . . 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

2224/86009 . . . Pre-treatment of the connector or the bonding area

2224/8601 . . . Cleaning, e.g. oxide removal step, desmearing

2224/8603 . . . Reshaping

2224/86031 . . . by chemical means, e.g. etching, anodisation

2224/86035 . . . by heating

2224/86039 . . . using a laser

2224/86045 . . . using a corona discharge, e.g. electronic flame off [EFO]

2224/86047 . . . by mechanical means, e.g. severing, pressing, stamping

2224/86048 . . . Thermal treatment, e.g. annealing, controlled pre-heating or pre-cooling

2224/86051 . . . Forming additional members

2224/86053 . . . Bonding environment

2224/86054 . . . Composition of the atmosphere

2224/86085 . . . being a liquid, e.g. fluidic self-assembly

2224/8609 . . . Vacuum

2224/86091 . . . Under pressure

2224/86095 . . . Temperature settings

2224/86096 . . . Transient conditions

2224/86097 . . . Heating

2224/86098 . . . Cooling

2224/86099 . . . Ambient temperature

2224/861 . . . the connector being supplied to the parts to be connected in the bonding apparatus

2224/8611 . . . involving protection against electrical discharge, e.g. removing electrostatic charge

2224/8612 . . . Aligning

2224/86121 . . . Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors

2224/86122 . . . by detecting inherent features of, or outside, the semiconductor or solid-state body

2224/8613 . . . using marks formed on the semiconductor or solid-state body

2224/86132 . . . using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"

2224/86136 . . . involving guiding structures, e.g. spacers or supporting members

2224/86138 . . . the guiding structures being at least partially left in the finished device

2224/86143 . . . Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium

2224/86148 . . . involving movement of a part of the bonding apparatus

2224/86149 . . . being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table

2224/8615 . . . Rotational movements

2224/8616 . . . Translational movements

2224/86169 . . . being the upper part of the bonding apparatus, e.g. nozzle

2224/8617 . . . Rotational movement

2224/8618 . . . Translational movements

2224/86181 . . . connecting first on the semiconductor or solid-state body, i.e. on-chip.
... connecting first outside the semiconductor or solid-state body, i.e. off-chip
2224/86191 . . . . . . . connecting first both on and outside the semiconductor or solid-state body

2224/862 . . . Applying energy for connecting
2224/86201 . . . Compression bonding
2224/86203 . . . Thermo-compression bonding
2224/86205 . . . Ultrasonic bonding
2224/86207 . . . Thermosonic bonding
2224/8621 . . . with energy being in the form of electromagnetic radiation
2224/86212 . . . Induction heating, i.e. eddy currents
2224/86214 . . . using a laser
2224/8623 . . . Polychromatic or infrared lamp heating
2224/86232 . . . using an autocatalytic reaction, e.g. exothermic brazing
2224/86234 . . . using means for applying energy being within the device, e.g. integrated heater
2224/86236 . . . using electro-static corona discharge
2224/86237 . . . using electron beam (electron beam in general B23K 15/00)
2224/86238 . . . using electric resistance welding, i.e. ohmic heating
2224/8634 . . . Bonding interfaces of the connector
2224/86345 . . . Shape, e.g. interlocking features
2224/86355 . . . having an external coating, e.g. protective bond-through coating
2224/86359 . . . Material
2224/8636 . . . Bonding interfaces of the semiconductor or solid state body
2224/86365 . . . Shape, e.g. interlocking features
2224/86375 . . . having an external coating, e.g. protective bond-through coating
2224/86379 . . . Material
2224/8638 . . . Bonding interfaces outside the semiconductor or solid-state body
2224/86385 . . . Shape, e.g. interlocking features
2224/86395 . . . having an external coating, e.g. protective bond-through coating
2224/86399 . . . Material
2224/866 . . . Bonding techniques
2224/86801 . . . Soldering or alloying
2224/86805 . . . involving forming a eutectic alloy at the bonding interface
2224/8681 . . . involving forming an intermetallic compound at the bonding interface
2224/86815 . . . Reflow soldering
2224/8682 . . . Diffusion bonding
2224/86825 . . . Solid-liquid interdiffusion
2224/8683 . . . Solid-solid interdiffusion
2224/8684 . . . Sintering
2224/8685 . . . using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
2224/86855 . . . Hardening the adhesive by curing, i.e. thermosetting
2224/86856 . . . Pre-cured adhesive, i.e. B-stage adhesive
2224/86859 . . . Localised curing of parts of the connector
2224/86862 . . . Heat curing
2224/86865 . . . Microwave curing
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 2224/8685 - H01L 2224/8688, 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 2224/8687
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
2224/889 . . . using at least one connector not provided for in any of the groups H01L 2224/81 - H01L 2224/86
2224/890 . . . 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
2224/891 . . . 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
2224/892 . . . Specific sequence of method steps
Forming connectors during the connecting process, e.g., in-situ formation of bumps.

Forming additional connectors after the connecting process.

Intermediate bonding steps, i.e., partial connection of the semiconductor or solid-state body during the connecting process.

Connecting a surface with connectors of different types.

Parallel connecting processes.

Sequential connecting processes.

The first connecting process involving a bump connector.

The second connecting process involving a build-up interconnect.

The second connecting process involving a layer connector.

The second connecting process involving a strap connector.

The second connecting process involving a wire connector.

The second connecting process involving a TAB connector.

The first connecting process involving a TAB connector.

The second connecting process involving a bump connector.

The second connecting process involving a build-up interconnect.

The second connecting process involving a layer connector.

The second connecting process involving a strap connector.

The second connecting process involving a wire connector.

The second connecting process involving a TAB connector.

The first connecting process involving a bump connector.

The second connecting process involving a build-up interconnect.

The second connecting process involving a layer connector.

The second connecting process involving a strap connector.

The second connecting process involving a wire connector.

The second connecting process involving a TAB connector.

The first connecting process involving a TAB connector.

The second connecting process involving a build-up interconnect.

The second connecting process involving a strap connector.

The second connecting process involving a wire connector.

The second connecting process involving a TAB connector.

The first connecting process involving a strap connector.

The second connecting process involving a wire connector.

The second connecting process involving a layer connector.

The second connecting process involving a TAB connector.

The first connecting process involving a TAB connector.

The second connecting process involving a build-up interconnect.

The second connecting process involving a strap connector.

The second connecting process involving a wire connector.

The second connecting process involving a TAB connector.

The first connecting process involving a strap connector.

The second connecting process involving a wire connector.

The second connecting process involving a layer connector.

The second connecting process involving a TAB connector.

The first connecting process involving a TAB connector.

Batch processes.

At wafer-level, i.e., with connecting carried out on a wafer comprising a plurality of undiced individual devices.

At chip-level, i.e., with connecting carried out on a plurality of singulated devices, i.e., on diced chips involving a temporary auxiliary member not forming part of the bonding apparatus, e.g., removable or sacrificial coating, film or substrate.

Bonding environment.

Being a liquid, e.g., for fluidic self-assembly.

Under pressure.

Atmospheric pressure, e.g., dry self-assembly.

Transient conditions, e.g., assisted by a gas flow or a liquid flow.

Supplying the plurality of semiconductor or solid-state bodies.
Details relating to assemblies covered by the group H01L but not provided for in its subgroups

- All the devices being of a type provided for in the same subgroup of groups H01L 27/00 - H01L 51/00
- the devices not having separate containers
- the devices being of a type provided for in group H01L 27/00

- Stacked arrangements of devices
- Wire or wire-like electrical connections between devices
- Wire or wire-like electrical connections from device to substrate
- Bump or bump-like direct electrical connections between devices, e.g. flip-chip connection, solder bumps

- Bump or bump-like direct electrical connections from device to substrate
- Bump or bump-like direct electrical connections from substrate to substrate
- Electrical connections formed on device or on substrate, e.g. a deposited or grown layer
- Special adaptation of electrical connections, e.g. rewiring, engineering changes, pressure contacts, layout

- Non-galvanic coupling, e.g. capacitive coupling
- Optical coupling
- Electromagnetic shielding
- Conductive via connections through the device, e.g. vertical interconnects, through silicon via [TSV] (manufacturing via connections per se H01L 21/76898)
- Design considerations for via connections, e.g. geometry or layout
- Conductive via connections through the substrate, container, or encapsulation
- Conductive connections on the side of the device
- Geometry of the stack, e.g. form of the devices, geometry to facilitate stacking
- the devices having passive surfaces facing each other, i.e. in a back-to-back arrangement
- at least one device in the stack being rotated or offset
- the devices having the same size and there being no auxiliary carrier between the devices
- the devices decreasing in size, e.g. pyramidal stack
- Auxiliary carrier between devices, the carrier having an electrical connection structure
- Auxiliary carrier between devices, the carrier having no electrical connection structure
- TAB carriers; beam leads
- Housing for the assembly, e.g. chip scale package [CSP]
- Housing with external bump or bump-like connectors
- Thermal management, e.g. cooling
- Mounting aids permanently on device; arrangements for alignment (use of temporary supports H01L 21/6835)
- Structural arrangements for testing (testing or measuring during manufacture or treatment H01L 22/00); testing electrical properties or locating electrical faults G01R 31/00)
- the devices having separate containers
- the devices being of a type provided for in group H01L 27/00
- the containers being in a stacked arrangement
- the lowermost container comprising a device support
- the support being an insulating substrate
- the support being a lead frame
- the device being entirely enclosed by the support, e.g. high-density interconnect [HDI]
- Special adaptations for top connections of the lowermost container, e.g. redistribution layer, integral interposer
- Details of electrical connections between containers
- Wire or wire-like electrical connections
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

Devices including an organic light emitting device [OLED], e.g. OLED display
Multistep processes for AMOLED
Use of temporary substrate, e.g. for manufacturing of OLED displays having an inorganic driving circuit

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

Indexing scheme relating to organic semiconductor devices covered by group H01L 51/00

Processes specially adapted for the manufacture or treatment of organic semiconductor devices
Patterning of a layer by embossing, e.g. to form trenches in an insulating layer
Materials
Inorganic materials
Oxides, e.g. metal oxides
Transparent conductive oxides [TCO]
Tin oxides, e.g. F doped SnO₂
Indium oxides, e.g. ITO
Organic light emitting devices
Structure
Specially adapted for controlling the direction of light emission
Top emission
Two-side emission, i.e. TOLED
End-face emission
Flexible OLED
Graded composition
Inverted OLED
OLED lamp
Nanoparticles used in whatever layer except emissive layer, e.g. in packaging
Combination of fluorescent and phosphorescent emission
Multiple hosts in the emissive layer
Short-circuit prevention
Characterised by parameters
HOMO-LUMO-EF

Oxidation-reduction potential
Temperature
Thickness
Processes specially adapted for the manufacture or treatment of OLED
Aging
Application of alternating current
Division of substrate, e.g. for manufacturing of OLED displays
Repairing

Indexing scheme for arrangements or methods for connecting or disconnecting semiconductor or solid-state bodies as covered by H01L 24/00

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

Not relevant to the scope of the group, the symbol of which is combined with the symbol of this group
Relevant to the scope of the group, the symbol of which is combined with the symbol of this group
Fully indexed content
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
the subject-matter covered by the group, the symbol of which is combined with the symbol of this group, being disclosed as prior art

Chemical elements
Hydrogen [H]
Helium [He]
Lithium [Li]
Beryllium [Be]
Boron [B]
Carbon [C]
Nitrogen [N]
Oxygen [O]
Fluorine [F]
Neon [Ne]
Sodium [Na]
Magnesium [Mg]
Aluminum [Al]
Silicon [Si]
Phosphorus [P]
Sulfur [S]
Chlorine [Cl]
Argon [Ar]
Potassium [K]
Calcium [Ca]
Scandium [Sc]
Titanium [Ti]
Vanadium [V]
Chromium [Cr]
Manganese [Mn]
Iron [Fe]
Cobalt [Co]
Francium [Fr]  
Bismuth [Bi]  
Thallium [Tl]  
Mercury [Hg]  
Iridium [Ir]  
Osmium [Os]  
Tungsten [W]  
Erbium [Er]  
Dysprosium [Dy]  
Terbium [Tb]  
Gadolinium [Gd]  
Tin [Sn]  
Silver [Ag]  
Rhodium [Rh]  
Krypton [Kr]  
Gallium [Ga]  
Germanium [Ge]  
Arsenic [As]  
Selenium [Se]  
Bromine [Br]  
Krypton [Kr]  
Rubidium [Rb]  
Strontium [Sr]  
Yttrium [Y]  
Zirconium [Zr]  
Niobium [Nb]  
Molybdenum [Mo]  
Technetium [Tc]  
Ruthenium [Ru]  
Rhodium [Rh]  
 Palladium [Pd]  
Silver [Ag]  
Cadmium [Cd]  
Indium [In]  
 Tin [Sn]  
Antimony [Sb]  
Tellurium [Te]  
Iodine [I]  
Xenon [Xe]  
Cesium [Cs]  
Barium [Ba]  
Lanthanum [La]  
Cerium [Ce]  
Praseodymium [Pr]  
Neodymium [Nd]  
Promethium [Pm]  
Samarium [Sm]  
Europium [Eu]  
Gadolinium [Gd]  
Terbium [Tb]  
Dysprosium [Dy]  
Holmium [Ho]  
Erbium [Er]  
Thulium [Tm]  
Ytterbium [Yb]  
Lutetium [Lu]  
Hafnium [Hf]  
Tantalum [Ta]  
Tungsten [W]  
Rhenium [Re]  
Osmium [Os]  
Iridium [Ir]  
Platinum [Pt]  
Gold [Au]  
Mercury [Hg]  
Thallium [Tl]  
Lead [Pb]  
Bismuth [Bi]  
Polonium [Po]  
Astatine [At]  
Radon [Rn]  
Francium [Fr]  
Radium [Ra]  
Actinium [Ac]  
Thorium [Th]  
Protactinium [Pa]  
Uranium [U]  
Neptunium [Np]  
Plutonium [Pu]  
Groups of the periodic table  
Alkali metals  
Alkali earth metals  
Transition metals  
Refractory metals  
Rare earth metals  
Lanthanides, i.e. Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu  
Actinides, i.e. Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr  
Noble metals  
Metalloids or Semi-metals  
Chalcogens  
Halogens  
Noble gases  
Semiconductor purity grades  
1N purity grades, i.e. 90%  
2N purity grades, i.e. 99%  
3N purity grades, i.e. 99.9%  
4N purity grades, i.e. 99.99%  
5N purity grades, i.e. 99.999%  
6N purity grades, i.e. 99.999%  
7N purity grades, i.e. 99.9999%  
8N purity grades, i.e. 99.99999%  
Alloys  
Binary Alloys  
Isomorphous Alloys  
Eutectic Alloys, i.e. obtained by a liquid transforming into two solid phases  
Hypoeutectic alloys i.e. with compositions lying to the left of the eutectic point  
Hypereutectic alloys i.e. with compositions lying to the right of the eutectic point  
Peritectic Alloys, i.e. obtained by a liquid and a solid transforming into a new and different solid phase  
Monotectics, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase  
Intermediate phases, i.e. intermetallics compounds  
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  
Invar, i.e. Fe-33Ni-4.5Co  
Borides composed of metals from groups of the periodic table  
1st Group  
2nd Group  
3rd Group  
4th Group
periodic table

Silicides composed of metals from groups of the periodic table
Carbides composed of metals from groups of the periodic table

Lanthanides
14th Group
13th Group
12th Group
11th Group
10th Group
8th Group
7th Group
6th Group
5th Group
4th Group
3rd Group
2nd Group
1st Group

having an amorphous microstructure, i.e. glass
having a polycrystalline microstructure
having a monocrystalline microstructure

H01L 2924/0451
- H01L 2924/0466
being a combination of two or more materials provided in the groups

SiC
AlN
TaN
TiN

N

Oxides composed of metals from groups of the periodic table
Nitrides composed of metals from groups of the periodic table

H01L 2924/0506
- H01L 2924/0511
being a combination of two or more materials provided in the groups

Si,N$_2$

Phosphides composed of metals from groups of the periodic table

H01L 2924/0526
- H01L 2924/0531
being a combination of two or more materials provided in the groups
<table>
<thead>
<tr>
<th>CPC</th>
<th>Description</th>
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<tbody>
<tr>
<td>2924/0532</td>
<td>2nd Group</td>
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<tr>
<td>2924/0533</td>
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<tr>
<td>2924/05341</td>
<td>TiO₂</td>
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<td>Al₂O₃</td>
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<td>2924/05442</td>
<td>SiO₂</td>
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<td>2924/0545</td>
<td>Lanthanides</td>
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<tr>
<td>2924/0546</td>
<td>Actinides</td>
</tr>
<tr>
<td>2924/0549</td>
<td>being a combination of two or more materials provided in the groups H01L 2924/042 - H01L 2924/04546</td>
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<tr>
<td>2924/05491</td>
<td>having a monocristalline microstructure</td>
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<tr>
<td>2924/05492</td>
<td>having a polycristalline microstructure</td>
</tr>
<tr>
<td>2924/05494</td>
<td>having an amorphous microstructure, i.e. glass</td>
</tr>
<tr>
<td>2924/055</td>
<td>Chalcogenides other than oxygen i.e. sulfides, selenides and tellurides composed of metals from groups of the periodic table</td>
</tr>
<tr>
<td>2924/0551</td>
<td>1st Group</td>
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<tr>
<td>2924/0552</td>
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<tr>
<td>2924/0553</td>
<td>3rd Group</td>
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<td>2924/0554</td>
<td>4th Group</td>
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<td>2924/0563</td>
<td>13th Group</td>
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<tr>
<td>2924/0564</td>
<td>14th Group</td>
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<tr>
<td>2924/0565</td>
<td>Lanthanides</td>
</tr>
<tr>
<td>2924/0566</td>
<td>Actinides</td>
</tr>
<tr>
<td>2924/0569</td>
<td>being a combination of two or more materials provided in the groups H01L 2924/0551 - H01L 2924/0566</td>
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<tr>
<td>2924/05691</td>
<td>having a monocristalline microstructure</td>
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<td>2924/05692</td>
<td>having a polycristalline microstructure</td>
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<tr>
<td>2924/05694</td>
<td>having an amorphous microstructure, i.e. glass</td>
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<tr>
<td>2924/0587</td>
<td>Halides composed of metals from groups of the periodic table</td>
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<tr>
<td>2924/0571</td>
<td>1st Group</td>
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<tr>
<td>2924/0572</td>
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<td>2924/0584</td>
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<tr>
<td>2924/0585</td>
<td>Lanthanides</td>
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<tr>
<td>2924/0586</td>
<td>Actinides</td>
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<tr>
<td>2924/0589</td>
<td>being a combination of two or more materials provided in the groups H01L 2924/0571 - H01L 2924/0586</td>
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<tr>
<td>2924/059</td>
<td>Oxynitrides</td>
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<tr>
<td>2924/0591</td>
<td>Halogenated polymer</td>
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<tr>
<td>2924/0592</td>
<td>Polyvinyl alcohol</td>
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<tr>
<td>2924/0593</td>
<td>Polyvinyl acetate</td>
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<tr>
<td>2924/0594</td>
<td>Acrylic polymer</td>
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<td>2924/0595</td>
<td>Graft polymer</td>
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<td>2924/0596</td>
<td>Block copolymer</td>
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<tr>
<td>2924/0597</td>
<td>Polyamide</td>
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<tr>
<td>2924/0598</td>
<td>Polyamine or polyimide</td>
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<tr>
<td>2924/0599</td>
<td>Polyamine</td>
</tr>
<tr>
<td>2924/060</td>
<td>Descriptive characteristics other than chemical</td>
</tr>
<tr>
<td>2924/061</td>
<td>Not being an ohmic electrical conductor</td>
</tr>
<tr>
<td>2924/062</td>
<td>Being an ohmic electrical conductor</td>
</tr>
<tr>
<td>2924/063</td>
<td>Extrinsically, i.e. with electrical conductive fillers</td>
</tr>
<tr>
<td>2924/064</td>
<td>Intrinsic, e.g. polyaniline [PANI]</td>
</tr>
<tr>
<td>2924/065</td>
<td>Being pressure sensitive</td>
</tr>
<tr>
<td>2924/066</td>
<td>with a principal constituent of the material being a combination of two or more materials provided in the groups H01L 2924/042 - H01L 2924/04546</td>
</tr>
<tr>
<td>2924/067</td>
<td>Glass epoxy laminates</td>
</tr>
<tr>
<td>2924/068</td>
<td>FR-4</td>
</tr>
<tr>
<td>2924/069</td>
<td>FR-5</td>
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<td>2924/070</td>
<td>G10</td>
</tr>
<tr>
<td>2924/071</td>
<td>G11</td>
</tr>
<tr>
<td>2924/072</td>
<td>Cermet, i.e. composite material composed of ceramic and metallic materials</td>
</tr>
<tr>
<td>2924/073</td>
<td>Glass-ceramics, e.g. devitrified glass</td>
</tr>
</tbody>
</table>
H01L

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 . . . Aluminium antimonide [AlSb]
2924/10322 . . . Aluminium arsenide [AlAs]
2924/10323 . . . Aluminium nitride [AlN]
2924/10324 . . . Aluminium phosphide [AlP]
2924/10325 . . . Boron nitride [BN], e.g. cubic, hexagonal, nanotube
2924/10326 . . . Boron phosphate [BP]
2924/10327 . . . Boron arsenide [BaS, B13As5]
2924/10328 . . . Gallium antimonide [GaSb]
2924/10329 . . . Gallium arsenide [GaAs]
2924/1033 . . . Gallium nitride [GaN]
2924/10331 . . . Gallium phosphate [GaP]
2924/10332 . . . Indium antimonide [InSb]
2924/10333 . . . Indium arsenide [InAs]
2924/10334 . . . Indium nitride [InN]
2924/10335 . . . Indium phosphate [InP]
2924/10336 . . . Aluminium gallium arsenide [AlGaAs]
2924/10337 . . . Indium gallium arsenide [InGaAs]
2924/10338 . . . Indium gallium phosphate [InGaP]
2924/10339 . . . Aluminium indium arsenide [AlInAs]
2924/1034 . . . Aluminium indium antimonide [AlInSb]
2924/10341 . . . Gallium arsenide nitride [GaAsN]
2924/10342 . . . Gallium arsenide phosphide [GaAsP]
2924/10343 . . . Gallium arsenide antimonide [GaAsSb]
2924/10344 . . . Aluminium gallium nitride [AlGaN]
2924/10345 . . . Aluminium gallium phosphide [AlGaP]
2924/10346 . . . Indium gallium nitride [InGaN]
2924/10347 . . . Indium arsenide antimonide [InAsSb]
2924/10348 . . . Indium gallium antimonide [InGaSb]
2924/10349 . . . Aluminium gallium indium phosphide [AlGaNp]
2924/1035 . . . Aluminium gallium arsenide phosphide [AlGanPa]
2924/10351 . . . Indium gallium arsenide phosphide [InGaAsP]
2924/10352 . . . Indium gallium arsenide antimonide [InGaAsSb]
2924/10353 . . . Indium arsenide antimonide phosphide [InAsSbP]
2924/10354 . . . Aluminium indium arsenide phosphide [AlInAsP]
2924/10355 . . . Aluminium gallium arsenide nitrde [AlGaAsN]
2924/10356 . . . Indium gallium arsenide nitride [InGaAsN]
2924/10357 . . . Indium aluminium arsenide nitride [InAlAsN]
2924/10358 . . . Gallium arsenide antimonide nitride [GaAsSbN]
2924/10359 . . . Gallium indium nitride arsenide antimonide [GalnNASb]
2924/1036 . . . Gallium indium arsenide antimonide phosphide [GaInAsSbP]
2924/1037 . . . II-VI
2924/10371 . . . Cadmium selenide [CdSe]
2924/10372 . . . Cadmium sulfide [CdS]
2924/10373 . . . Cadmium telluride [CdTe]
2924/10375 . . . Zinc selenide [ZnSe]
2924/10376 . . . Zinc sulfide [ZnS]
2924/10377 . . . Zinc telluride [ZnTe]
2924/10378 . . . Cadmium zinc telluride, i.e. CZT
[ CdZnTe]
2924/10379 . . . Mercury cadmium telluride [HgZnTe]
2924/1038 . . . Mercury zinc telluride [HgZnSe]
2924/10381 . . . Mercury zinc selenide [HgZnSe]
2924/1042 . . . I-VII
2924/10421 . . . Cuprous chloride [CuCl]
2924/1047 . . . I-VI
2924/10471 . . . Copper sulfide [CuS]
2924/1052 . . . IV-VI
2924/10521 . . . Lead selenide [PbSe]
2924/10522 . . . Lead(I) sulfide [PbS]
2924/10523 . . . Lead telluride [PbTe]
2924/10524 . . . Tin sulfide [SnS, SnS2]
2924/10525 . . . Tin telluride [SnTe]
2924/10526 . . . Lead tin telluride [PbSnTe]
2924/10527 . . . Thallium tin telluride [T1SnTe5]
2924/10528 . . . Thallium germanium telluride
[ T1GeTe5]
2924/1057 . . . V-VI
2924/10571 . . . Bismuth telluride [Bi2Te3]
2924/1062 . . . II-V
2924/10621 . . . Cadmium phosphate [Cd,P2]
2924/10622 . . . Cadmium arsenide [Cd,As2]
2924/10623 . . . Cadmium antimonide [Cd,As2]
2924/10624 . . . Zinc phosphate [Zn,P2]
2924/10625 . . . Zinc arsenide [Zn,As2]
2924/10626 . . . Zinc antimonide [Zn,Sb2]
2924/1067 . . . Oxide
2924/10671 . . . Titanium dioxide, anatase, rutile, brookite [TiO2]
2924/10672 . . . Copper(I) oxide [CuO]
2924/10673 . . . Copper(II) oxide [CuO2]
2924/10674 . . . Uranium dioxide [UO2]
2924/10675 . . . Uranium trioxide [UO3]
2924/10676 . . . Bismuth trioxide [Bi2O3]
2924/10677 . . . Tin dioxide [SnO2]
2924/10678 . . . Barium titanate [BaTiO3]
<table>
<thead>
<tr>
<th>Device type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive devices, e.g. 2 terminal</td>
</tr>
<tr>
<td>Bipolar Junction Transistor [BJT]</td>
</tr>
<tr>
<td>Rectifying Diode</td>
</tr>
<tr>
<td>PIN diode</td>
</tr>
<tr>
<td>Schottky diode</td>
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<tr>
<td>Gunn diode</td>
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<tr>
<td>Varactor</td>
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<tr>
<td>Zener diode</td>
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<tr>
<td>PN diode</td>
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<tr>
<td>Cat's whisker diode</td>
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<tr>
<td>Point contact</td>
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<tr>
<td>Optical Diode</td>
</tr>
<tr>
<td>LED</td>
</tr>
<tr>
<td>LASER</td>
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<tr>
<td>Photo diode</td>
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<tr>
<td>OLED</td>
</tr>
<tr>
<td>Capacitor</td>
</tr>
<tr>
<td>Inductor</td>
</tr>
<tr>
<td>Resistor</td>
</tr>
<tr>
<td>Discrete devices, e.g. 3 terminal devices</td>
</tr>
<tr>
<td>Thyristor</td>
</tr>
<tr>
<td>Anode Gate Thyristor [AGT]</td>
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<tr>
<td>Bidirectional Control Thyristor [BCT]</td>
</tr>
</tbody>
</table>

- **H01L**

<table>
<thead>
<tr>
<th>Device type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon Controlled Rectifier [SCR]</td>
</tr>
<tr>
<td>Asymmetrical SCR [ASCR]</td>
</tr>
<tr>
<td>Transistor</td>
</tr>
<tr>
<td>Bipolar Junction Transistor [BJT]</td>
</tr>
<tr>
<td>Heterojunction bipolar transistor [HT]</td>
</tr>
<tr>
<td>Schottky transistor</td>
</tr>
<tr>
<td>Avalanche transistor</td>
</tr>
<tr>
<td>Darlington transistor</td>
</tr>
<tr>
<td>Insulated gate bipolar transistor [IGBT]</td>
</tr>
<tr>
<td>Photo transistor</td>
</tr>
<tr>
<td>Carbon nanotube field-effect transistor [CNFET]</td>
</tr>
<tr>
<td>Junction field-effect transistor [JFET]</td>
</tr>
<tr>
<td>Metal-Semiconductor Field-Effect Transistor [MESFET]</td>
</tr>
<tr>
<td>High Electron Mobility Transistor [HEMT, HFET [heterostructure FET], MODFET]</td>
</tr>
<tr>
<td>Inverted-T field effect transistor [ITFET]</td>
</tr>
<tr>
<td>FinFET, source/drain region shapes fins on the silicon surface</td>
</tr>
</tbody>
</table>
2924/13068 . . . . . . Fast-reverse epitaxial diode field-effect transistor [FREDFET]
2924/13069 . . . . . . Thin film transistor [TFT]
2924/13070 . . . . . . 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]
2924/13080 . . . . . . Nanofluidic transistor
2924/13081 . . . . . . Multigate devices
2924/13082 . . . . . . Tetrode transistor
2924/13083 . . . . . . Pentode transistor
2924/13084 . . . . . . Trigate transistor
2924/13085 . . . . . . Dual gate FETs
2924/13086 . . . . . . Junctionless Nanowire Transistor [JNT]
2924/13087 . . . . . . Vertical-Slit Field-Effect Transistor [VeSFET]
2924/13088 . . . . . . Graphene Nanoribbon Field-Effect Transistor [GNRFET]
2924/13089 . . . . . . Nanoparticle Organic Memory Field-Effect Transistor [NOMFET]
2924/13090 . . . . . . 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 [DGMOSFET]
2924/14 . . . . . . . . Integrated circuits
2924/141 . . . . . . . . Analog devices
2924/142 . . . . . . . . HF devices
2924/1421 . . . . . . . . RF devices
2924/14211 . . . . . . . . Voltage-controlled oscillator [VCO]
2924/14215 . . . . . . . . Low-noise amplifier [LNA]
2924/1422 . . . . . . . . Mixer
2924/14221 . . . . . . . . Electronic mixer
2924/14222 . . . . . . . . Frequency mixer
2924/1423 . . . . . . . . Monolithic Microwave Integrated Circuit [MMIC]
2924/1424 . . . . . . . . Operational amplifier
2924/1425 . . . . . . . . Converter
2924/14251 . . . . . . . . Frequency converter
2924/14252 . . . . . . . . Voltage converter
2924/14253 . . . . . . . . Digital-to-analog converter [DAC]
2924/1426 . . . . . . . . Driver
2924/1427 . . . . . . . . Voltage regulator [VR]
2924/143 . . . . . . . . Digital devices
2924/1431 . . . . . . . . Logic devices
2924/1432 . . . . . . . . Central processing unit [CPU]
2924/1433 . . . . . . . . Application-specific integrated circuit [ASIC]
2924/14335 . . . . . . . . Digital signal processor [DSP]
2924/1434 . . . . . . . . Memory
2924/1435 . . . . . . . . Random access memory [RAM]

2924/1436 . . . . . . . . Dynamic random-access memory [DRAM]
2924/14361 . . . . . . . . Synchronous dynamic random access memory [SDRAM]
2924/14362 . . . . . . . . RAS Only Refresh [ROR]
2924/14363 . . . . . . . . CAS before RAS refresh [CBR]
2924/14364 . . . . . . . . Multibank DRAM [MDRAM]
2924/14365 . . . . . . . . Video DRAM [VRAM]
2924/14366 . . . . . . . . Window DRAM [WRAM]
2924/14367 . . . . . . . . Fast page mode DRAM [FPM DRAM]
2924/14368 . . . . . . . . Extended data out DRAM [EDO DRAM]
2924/14369 . . . . . . . . Burst EDO DRAM [BEDO DRAM]
2924/1437 . . . . . . . . Static random-access memory [SRAM]
2924/1438 . . . . . . . . Flash memory
2924/1441 . . . . . . . . Ferroelectric RAM [FeRAM or FRAM]
2924/1442 . . . . . . . . Synchronous electric RAM [SRAM]
2924/1443 . . . . . . . . Non-volatile random-access memory [NVRAM]
2924/1444 . . . . . . . . PBDRAM
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
H01L

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 400 C and less than 950 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
2924/1576 . . . . 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

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 multi-cavities
2924/163 . . . . Connection portion, e.g. seal
2924/1631 . . . . Structure
2924/16315 . . . . Shape
2924/1632 . . . . Disposition
2924/164 . . . . Material
with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

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

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

with a principal constituent of the material being a solid not provided for in groups H01L 2924/167 - H01L 2924/15791, e.g. allotropes of carbon, fullerenes, 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

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 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 or equal to 400 C

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 2924/17791, e.g. allotropes of carbon, fullerenes, 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

Encapsulation

Structure

Shape

Exposing the passive side of the semiconductor or solid-state body

of a flip chip

of a chip with build-up interconnect

of a wire bonded chip

Disposition

Connection portion, e.g. seal
2924/18301 . . . being an anchoring portion, i.e. mechanical interlocking between the encapsulation resin and another package part

2924/186 . . . Material

2924/19 . . . Details of hybrid assemblies other than the semiconductor or other solid state devices to be connected

2924/1901 . . . Structure

2924/19011 . . . including integrated passive components

2924/19015 . . . including thin film passive components

2924/1902 . . . including thick film passive components

2924/1903 . . . including wave guides

2924/19031 . . . being a strip line type

2924/19032 . . . being a microstrip line type

2924/19033 . . . being a coplanar line type

2924/19038 . . . being a hybrid line type

2924/19039 . . . impedance transition between different types of wave guides

2924/1904 . . . Component type

2924/19041 . . . being a capacitor

2924/19042 . . . being an inductor

2924/19043 . . . being a resistor

2924/1905 . . . Shape

2924/19051 . . . Impedance matching structure [e.g. balun]

2924/191 . . . Disposition

2924/19101 . . . of discrete passive components

2924/19102 . . . in a stacked assembly with the semiconductor or solid state device

2924/19103 . . . interposed between the semiconductor or solid-state device and the die mounting substrate, i.e. chip-on-passive

2924/19104 . . . on the semiconductor or solid-state device, i.e. passive-on-chip

2924/19105 . . . in a side-by-side arrangement on a common die mounting substrate

2924/19106 . . . in a mirrored arrangement on two different sides of a common die mounting substrate

2924/19107 . . . off-chip wires

2924/20 . . . Parameters

2924/201 . . . Temperature ranges

2924/20101 . . . Temperature range T<0 C, T<273.15 K

2924/20102 . . . Temperature range 0 C=<T<60 C, 273.15 K

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

2924/2011 . . . 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]

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. 100 THz-215 THz

2924/20263 . . . IR-C 3000 nm=<W<1 mm, i.e. 300 GHz-100 THz

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

H01L.
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
2924/3010...Resistance
2924/30105...Capacitance
2924/30107...Inductance
2924/3011...Impedance
2924/30111...matching
2924/302...Electrostatic
2924/3020...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
2924/3700...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
2924/386...Wire effects
2924/3861...Sag
2924/3862...Sweep
2924/40...Details of apparatuses used for either manufacturing connectors or connecting the semiconductor or solid-state body
2924/401...LASER
2924/40101...Mode
2924/40102...being pulsed
2924/40103...being continuous
2924/40105...Beam details
2924/4015...Shape
2924/402...Type
2924/40201...being a chemical
2924/40202...Deuterium Flouride [DF] LASER
2924/40203...Hydrogen Flouride [HF] LASER
2924/40207...Dye laser
2924/4025...being a gas
2924/40251...argon-ion LASER
2924/40252...CO₂ LASER
2924/40253...He:Ne LASER
2924/40254...HeNe LASER
2924/40255...NeCu LASER
2924/403...being an Excimer
2924/40301...ArF LASER
2924/40302...F₂ LASER
2924/40303...KrCl LASER
2924/40304...KrF LASER
2924/40305...XeCl LASER
2924/40306...XeF LASER
2924/4035...being a fiber hosted LASER
2924/404...being a solid state
2924/40401...Free electron LASER
2924/40402...Photonic crystal LASER
2924/40403...Fiber solid state LASER
2924/40404...Yttrium Aluminium Garnet Nd:YAG LASER
2924/40405...Yttrium Lithium Garnet Nd:YLF LASER
2924/40406...Rubin LASER
2924/40407...Yb:YAG LASER
2924/40405...Wavelength
2924/40501...UV spectrum
2924/40502...Visible spectrum
2924/40503...IR spectrum
2933/00...Details relating to devices covered by the group H01L 33/00 but not provided for in its subgroups
2933/0008...Processes
2933/0016...related to electrodes
2933/0025...related to coatings
2933/0033...related to semiconductor body packages
2933/0041...related to wavelength conversion elements
2933/005...related to encapsulations
2933/0058...related to optical field-shaping elements
2933/0066...related to arrangements for conducting electric current to or from the semiconductor body
2933/0075...related to heat extraction or cooling elements
2933/0083...Periodic patterns for optical field-shaping in or on the semiconductor body or semiconductor body package, e.g. photonic bandgap structures
Scattering means in or on the semiconductor body or semiconductor body package (H01L 33/22 takes precedence)