

## H05K

### PRINTED CIRCUITS; CASINGS OR CONSTRUCTIONAL DETAILS OF ELECTRIC APPARATUS; MANUFACTURE OF ASSEMBLAGES OF ELECTRICAL COMPONENTS

#### Definition statement

*This place covers:*

Constructional features of:

- Details of electronic circuit boards such as their materials or their interconnections;
- Printed circuit boards;
- Casings, cabinets or drawers for electric apparatus;
- Constructional details common to different types of electric apparatus such as modifications to facilitate cooling, ventilating or heating, e.g. cooling arrangement for casings/cabinets;
- Constructional details of screening for electric apparatus or components against electric or magnetic fields, e.g. EMI shielding arrangements for casings/cabinets;
- Manufacture of assemblages of electrical components;
- Machines for mounting electronic components on circuit boards.

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Constructional details of instruments or comparable details of other apparatus not otherwise provided for	<a href="#">G12B</a>
Non-printed means for electric connections to or between printed circuits, electric connections or line connectors, apparatus or processes for manufacturing, assembling, maintaining or repairing such connections or connectors	<a href="#">H01R</a>
Integrated devices having multiple passive components formed in or on insulating or conducting substrates	<a href="#">H10D 86/80</a>

#### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

printed circuits	the expression covers all kinds of mechanical arrangements of circuits that consist of an insulating base or substrate, having at least one conductive layer permanently formed on the base. The base often extends in a two-dimensional plane. Other conductive layers may be formed in a layer structure within the base. The base may support components on its surface or between its layers. Each conductive layer is formed as separate patterns or tracks to connect the components as required. The expression is also applied adjectivally to processes or apparatus for manufacturing such circuits, e.g. by mechanical or chemical treatment of conductive foil, paste or film that has been applied to an insulating base, support or substrate.
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## H05K 1/00

### Printed circuits

#### Definition statement

*This place covers:*

- Details of printed circuit boards [PCBs], e.g. structural aspects or use of materials for PCBs;
- Printed elements for electrical connection to or between printed circuits;
- Printed electric components in PCBs, e.g. resistors, capacitors or inductors formed by printing materials onto the board, or within its layer structure;
- Structural association of two or more PCBs;
- Structural association of PCBs and non-printed electric components, e.g. within internal layers.

#### Relationships with other classification places

There is no clear boundary between the field of printed circuit boards and other more specific fields, e.g. inductors ([H01F](#)), antennas ([H01Q](#)), waveguides ([H01P](#)), chip cards ([G06K 19/07](#)), other packaging levels (semiconductor packages [H10W 99/00](#), [H10W 90/00](#)), connectors ([H01R](#)) and various electronic components. The materials and methods (deposition, patterning, connection, etc.) used for manufacture of printed circuit boards have their general fields.

Documents often contain information relevant to several technical fields and have to be circulated for classification in these fields, in particular to [H10](#) (semiconductors) but also the other parts of [H05K](#), [H01R](#) (connectors).

#### References

##### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Record carriers with integrated circuit chips, e.g. chip cards	<a href="#">G06K 19/07</a>
Thin film inductors	<a href="#">H01F</a>
Waveguides	<a href="#">H01P</a>
Antennas	<a href="#">H01Q</a>
Connectors	<a href="#">H01R</a>
Integrated devices having multiple passive components formed in or on insulating or conducting substrates	<a href="#">H10D 86/80</a>
Semiconductor assemblies	<a href="#">H10W 90/00</a>

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Backplanes	<a href="#">H05K 7/14</a>
Screening against electric or magnetic fields	<a href="#">H05K 9/00</a>
Electrostatic discharge protection for electric apparatus in general	<a href="#">H05K 9/0067</a> , <a href="#">H05K 9/0079</a>
Handling/transporting	<a href="#">H05K 13/0061</a> , <a href="#">B65G</a> , <a href="#">H10P 72/50</a>
Cleaning	<a href="#">B08B</a>

Casting of metals	<a href="#">B22D</a>
Metal powder processing	<a href="#">B22F</a>
Mechanical drilling	<a href="#">B23B</a>
Mechanical milling, e.g. metal milling	<a href="#">B23C</a>
Slotting	<a href="#">B23D</a>
Erosion by electric discharge	<a href="#">B23H</a>
Soldering or welding	<a href="#">B23K</a>
Laser ablation, e.g. patterning by laser ablation	<a href="#">B23K 26/00</a>
Details of machining apparatus	<a href="#">B23Q</a>
Grinding, polishing	<a href="#">B24B</a>
Abrasive working	<a href="#">B24C</a>
Cutting; Punching	<a href="#">B26D</a> , <a href="#">B26F</a>
Laminating	<a href="#">B32B 37/00</a>
Printing forms, e.g. masks	<a href="#">B41C</a> , <a href="#">B41N</a>
Printing apparatus	<a href="#">B41F</a>
Inkjet printing	<a href="#">B41J 2/00</a>
Printing processes	<a href="#">B41M</a>
Selective transfer processes	<a href="#">B41M 5/00</a>
Handling flexible substrates	<a href="#">B65G</a>
Etching polymeric substrates	<a href="#">C08J 7/00</a>
Coating by dipping in molten metal	<a href="#">C23C 2/00</a>
Coating by spraying with molten metal	<a href="#">C23C 4/00</a>
Coating by physical vapour deposition or sputtering or ion implantation	<a href="#">C23C 14/00</a>
Coating by chemical deposition	<a href="#">C23C 16/00</a>
Coating by decomposition of compounds	<a href="#">C23C 18/00</a> , <a href="#">C23C 20/00</a>
Coating by electroless plating	<a href="#">C23C 18/16</a>
Conversion coating of metals	<a href="#">C23C 22/00</a>
Coating by powder methods	<a href="#">C23C 24/00</a>
Other coating methods	<a href="#">C23C 26/00</a>
Coating metal with enamel (glass)	<a href="#">C23D</a>
Corrosion protection of metal	<a href="#">C23F</a>
Cleaning or degreasing of metal	<a href="#">C23G</a>
Electroplating of metal	<a href="#">C25D</a>
Electroforming of metal	<a href="#">C25D 1/00</a>
Anodizing of metal	<a href="#">C25D 11/00</a>
Electrophoretic coating of metal	<a href="#">C25D 13/00</a>
Electrolytic etching of metal	<a href="#">C25F</a>
Lighting devices	<a href="#">F21K</a> , <a href="#">F21S</a> , <a href="#">F21V</a> , <a href="#">H05B</a>
Drying	<a href="#">F26B</a>
Testing, inspection of material	<a href="#">G01N</a>

Electrical testing	<a href="#">G01R 31/00</a>
Electro-optical devices comprising optical waveguides, e.g. modules/PCBs having optical waveguides	<a href="#">G02B 6/00</a>
Coupling light guides with opto-electronic components	<a href="#">G02B 6/42</a>
Liquid crystal displays [LCD]	<a href="#">G02F 1/13</a>
Photolithography masks	<a href="#">G03F 1/00</a>
Lithography, e.g. photoresists	<a href="#">G03F 7/00</a>
Photolithography registration	<a href="#">G03F 9/00</a>
Electrography	<a href="#">G03G</a>
Computers	<a href="#">G06F</a>
Touch screens	<a href="#">G06F 3/00</a>
Security details of computer components	<a href="#">G06F 21/70</a>
Designing of the conductive pattern	<a href="#">G06F 30/00</a>
Circuits for displays	<a href="#">G09F 9/00</a>
Disk drive suspensions	<a href="#">G11B 5/00</a>
Memory modules	<a href="#">G11C 5/00</a>
Cables	<a href="#">H01B</a>
Flat cables	<a href="#">H01B 7/00</a> , <a href="#">H01B 13/00</a>
Resistors, e.g. printed resistors	<a href="#">H01C</a>
Printed inductors	<a href="#">H01F</a>
Inductors	<a href="#">H01F</a>
Printed capacitors	<a href="#">H01G</a>
Capacitors, e.g. printed capacitors	<a href="#">H01G</a>
Switches, fuses	<a href="#">H01H</a>
Plasma displays	<a href="#">H01J 17/49</a>
Batteries; Cells	<a href="#">H01M</a>
Laser devices	<a href="#">H01S</a>
Spark gaps; Overvoltage arresters	<a href="#">H01T</a>
Emergency protective circuits	<a href="#">H02H</a>
Power conversion	<a href="#">H02M</a>
Receivers/transceivers (modules)	<a href="#">H04B 1/00</a>
Telephones	<a href="#">H04M</a>
Optical modules	<a href="#">H04N</a> , <a href="#">G03B</a>
Electromechanical transducers	<a href="#">H04R</a>
Semiconductor devices per se and integrated devices consisting of a plurality of semiconductor or active solid-state devices	<a href="#">H10</a>
Polymeric semiconductor devices	<a href="#">H10K 99/00</a>
Thermoelectric devices	<a href="#">H10N 10/00</a>
Piezoelectric devices	<a href="#">H10N 30/00</a>
Treatment apparatus for semiconductor components	<a href="#">H10P 72/50</a>

Impedance arrangements, e.g. impedance matching, reduction of parasitic impedance for semiconductor devices	<a href="#">H10W 44/20</a>
Semiconductor packages	<a href="#">H10W 99/00</a> , <a href="#">H10W 72/00</a>

### Special rules of classification

In this main group, both "invention information" and "additional information" are classified by the appropriate CPC group symbol.

Indexing Codes are also attributed to provide additional information when no CPC sub-group exists, i.e. to subdivide subject matter belonging to a sub-group.

### H05K 1/0203

{Cooling of mounted components ([H05K 1/0272](#) takes precedence)}

#### References

##### Limiting references

*This place does not cover:*

Adaptations for fluid transport, e.g. channels, holes	<a href="#">H05K 1/0272</a>
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### H05K 1/0204

{using means for thermal conduction connection in the thickness direction of the substrate ([H05K 1/0207](#) takes precedence)}

#### References

##### Limiting references

*This place does not cover:*

Using internal conductor planes parallel to the surface for thermal conduction, e.g. power planes	<a href="#">H05K 1/0207</a>
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### H05K 1/0213

{Electrical arrangements not otherwise provided for}

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Screening	<a href="#">H05K 9/00</a>
Emergency protective circuits	<a href="#">H02H</a>

**H05K 1/0216**

{Reduction of cross-talk, noise or electromagnetic interference (grounding [H05K 1/0215](#))}

**References****Limiting references**

*This place does not cover:*

Grounding	<a href="#">H05K 1/0215</a>
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**H05K 1/0218**

{by printed shielding conductors, ground planes or power plane ([H05K 1/0236](#) takes precedence)}

**References****Limiting references**

*This place does not cover:*

Electromagnetic band-gap structures	<a href="#">H05K 1/0236</a>
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**H05K 1/0221**

{Coaxially shielded signal lines comprising a continuous shielding layer partially or wholly surrounding the signal lines}

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Coaxially shielded vias	<a href="#">H05K 1/0222</a>
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**H05K 1/0228**

{Compensation of cross-talk by a mutually correlated lay-out of printed circuit traces, e.g. for compensation of cross-talk in mounted connectors (balanced signal pairs [H05K 1/0245](#))}

**References****Limiting references**

*This place does not cover:*

Balanced signal pairs	<a href="#">H05K 1/0245</a>
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**H05K 1/023**

{using auxiliary mounted passive components or auxiliary substances (printed passive components [H05K 1/16](#))}

**References****Limiting references**

*This place does not cover:*

Incorporating printed electric components, e.g. printed resistor, capacitor, inductor	<a href="#">H05K 1/16</a>
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**H05K 1/0236**

{Electromagnetic band-gap structures}

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Conductive planes with an opening or a split	<a href="#">H05K 1/0225</a> , <a href="#">H05K 1/0227</a>
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**H05K 1/025**

{Impedance arrangements, e.g. impedance matching, reduction of parasitic impedance ([H05K 1/024](#) and [H05K 1/0243](#) take precedence; for semiconductor devices [H10W 44/20](#))}

**References****Limiting references**

*This place does not cover:*

Dielectric details, e.g. changing the dielectric material around a transmission line	<a href="#">H05K 1/024</a>
Printed circuits associated with mounted high frequency components	<a href="#">H05K 1/0243</a>
Impedance arrangements of semiconductor or other solid state devices	<a href="#">H10W 44/00</a>
High frequency adaptations of semiconductor or other solid state devices	<a href="#">H10W 44/20</a>

**Special rules of classification**

Indexing Codes are used to additionally specify how impedance is adjusted, e.g. for change in trace width of differential pair [H05K 1/0245](#).

## H05K 1/0253

{Impedance adaptations of transmission lines by special lay-out of power planes, e.g. providing openings ([H05K 1/0251](#) takes precedence)}

### References

#### Limiting references

*This place does not cover:*

Impedance arrangements related to vias or transitions between vias and transmission lines	<a href="#">H05K 1/0251</a>
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### Special rules of classification

The lay-out of the power plane is additionally classified with Indexing Codes, e.g. when slotted [H05K 1/0236](#). Except for [H05K 1/0224](#) because that is the default layout in [H05K 1/0253](#).

## H05K 1/0254

{High voltage adaptations; Electrical insulation details; Overvoltage or electrostatic discharge protection (electrostatic discharge protection for electric apparatus in general [H05K 9/0067](#), [H05K 9/0079](#)); Arrangements for regulating voltages or for using plural voltages}

### References

#### Limiting references

*This place does not cover:*

Devices for protecting against damage from electrostatic discharge	<a href="#">H05K 9/0067</a>
Electrostatic discharge protection, e.g. ESD treated surface for rapid dissipation of charges	<a href="#">H05K 9/0079</a>

## H05K 1/026

{Spark gaps}

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Spark gaps per se	<a href="#">H01T</a>
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**H05K 1/0263**

{High current adaptations, e.g. printed high current conductors or using auxiliary non-printed means; Fine and coarse circuit patterns on one circuit board ([H05K 1/0293](#) takes precedence)}

**References****Limiting references**

*This place does not cover:*

Individual printed conductors which are adapted for modification, e.g. fusible or breakable conductors, printed switches	<a href="#">H05K 1/0293</a>
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**H05K 1/0274**

{Optical details, e.g. printed circuits comprising integral optical means ([H05K 1/0269](#) takes precedence; coupling light guides with opto-electronic components [G02B 6/42](#))}

**References****Limiting references**

*This place does not cover:*

Marks, test patterns, inspection means or identification means for visual or optical inspection	<a href="#">H05K 1/0269</a>
Coupling light guides with opto-electronic components	<a href="#">G02B 6/42</a>

**H05K 1/0275**

{Security details, e.g. tampering prevention or detection}

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Security details of computer components	<a href="#">G06F 21/70</a>
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**H05K 1/0277**

{Bendability or stretchability details ([H05K 1/038](#), [H05K 3/4691](#) take precedence)}

**References****Limiting references**

*This place does not cover:*

Textiles	<a href="#">H05K 1/038</a>
Rigid-flexible multilayer circuits comprising rigid and flexible layers, e.g. having in the bending regions only flexible layers	<a href="#">H05K 3/4691</a>

**H05K 1/0284**

{Details of three-dimensional rigid printed circuit boards ([H05K 1/119](#) takes precedence; shaping of the substrate [H05K 3/0014](#))}

**References****Limiting references**

*This place does not cover:*

Details of rigid insulating substrates therefor, e.g. three-dimensional details	<a href="#">H05K 1/119</a>
Shaping of the substrate	<a href="#">H05K 3/0014</a>

**H05K 1/0286**

{Programmable, customizable or modifiable circuits (by programmable non-printed jumper connections [H05K 3/222](#))}

**References****Limiting references**

*This place does not cover:*

Completing of printed circuits by adding non-printed jumper connections	<a href="#">H05K 3/222</a>
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**H05K 1/0296**

{Conductive pattern lay-out details not covered by sub groups [H05K 1/02](#) - [H05K 1/0295](#) ([H05K 1/11](#) takes precedence; lay-out adapted to mounted component configuration [H05K 1/18](#))}

**References****Limiting references**

*This place does not cover:*

Printed elements for providing electric connections to or between printed circuits	<a href="#">H05K 1/11</a>
Lay-out adapted to mounted component configuration	<a href="#">H05K 1/18</a>

**References out of a residual place**

*Examples of places in relation to which this place is residual:*

Details	<a href="#">H05K 1/02</a> - <a href="#">H05K 1/0295</a>
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**H05K 1/03****Use of materials for the substrate****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Substrates for semiconductor chips	<a href="#">H10W 99/00</a>
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**H05K 1/05****Insulated {conductive substrates, e.g. insulated} metal substrate****Definition statement**

*This place covers:*

Insulated electrically conductive substrates, e.g. insulated metal substrates, specially adapted for PCBs.

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Thermal coupling of mounted components and metal substrate	<a href="#">H05K 1/0204</a> , <a href="#">H05K 1/021</a>
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**H05K 1/09****Use of materials for the {conductive, e.g. } metallic pattern****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Materials for conductors	<a href="#">H01B 1/00</a>
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**H05K 1/092****{Dispersed materials, e.g. conductive pastes or inks}****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Conductive inks in general	<a href="#">C09D 11/52</a>
Conductive material dispersed in non-conductive material in general	<a href="#">H01B 1/14</a> – <a href="#">H01B 1/24</a>

## H05K 1/14

**Structural association of two or more printed circuits (providing electric connection to or between printed circuits [H05K 1/11](#), [H01R 12/00](#))**

### References

#### Limiting references

*This place does not cover:*

Providing electric connections to or between printed circuits	<a href="#">H05K 1/11</a> , <a href="#">H01R 12/00</a>
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#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Connectors for printed circuits	<a href="#">H01R 9/00</a>
Two-part coupling devices for connection to or between printed circuits	<a href="#">H01R 24/68</a>

## H05K 1/16

**incorporating printed electric components, e.g. printed resistors, capacitors or inductors**

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Integrated devices having multiple passive components formed in or on semiconductor substrates	<a href="#">H10D 84/201</a>
Integrated devices having multiple passive components formed in or on insulating or conducting substrates	<a href="#">H10D 86/80</a>

## H05K 1/18

**structurally associated with non-printed electric components ([H05K 1/16](#) takes precedence)**

### References

#### Limiting references

*This place does not cover:*

Incorporating printed electric components, e.g. printed resistors, capacitors or inductors	<a href="#">H05K 1/16</a>
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#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Thermal arrangements, e.g. for cooling, heating or preventing overheating	<a href="#">H05K 1/0201</a>
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Reduction of cross-talk, noise or electromagnetic interference using auxiliary mounted passive components or auxiliary substances	<a href="#">H05K 1/023</a>
Printed circuits associated with mounted high frequency components	<a href="#">H05K 1/0243</a>

## H05K 3/00

### Apparatus or processes for manufacturing printed circuits

#### Definition statement

*This place covers:*

General processing of printed circuit boards [PCBs]:

- Processing of insulating substrates or layers for PCBs or processing of conductive layers for PCBs.
- Forming printed elements for providing electric connection to or between printed circuits.
- Manufacturing multilayer printed circuits.
- Manufacturing metal core printed circuits.
- Secondary treatment of PCBs.
- Mounting or printing electric components on PCBs.
- Assembling PCBs with other PCBs.

[H05K 3/00](#) covers mainly manufacturing (apparatuses and process) of printed circuits. However certain sub-groups of [H05K 3/00](#) cover also the respective structural aspects (e.g. [H05K 3/303](#), [H05K 3/306](#)) and materials (e.g. [H05K 3/386](#)).

#### Relationships with other classification places

There is no clear boundary between the field of printed circuit boards and other more specific fields, e.g. inductors ([H01F](#)), antennas ([H01Q](#)), waveguides ([H01P](#)), chip cards ([G06K 19/07](#)), thin film and thick film circuits ([H10D 84/201](#), [H10D 86/80](#)), other packaging levels (semiconductor packages [H10W 99/00](#), [H10W 90/00](#)), connectors ([H01R](#)) and various electronic components. The materials and methods e.g. deposition, patterning or connection, used for manufacture of printed circuit boards have their general fields.

Documents often contain information relevant to several technical fields and have to be circulated for classification in these fields, in particular to [H10](#) (semiconductors) but also the other parts of [H05K](#), or [H01R](#) (connectors).

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Apparatus specially adapted for manufacturing assemblages of electric components, e.g. for mounting electronic components on circuit boards	<a href="#">H05K 13/00</a> , <a href="#">H05K 13/04</a>
Working of metal by electro-erosion per se	<a href="#">B23H</a>
Soldering, e.g. brazing, or unsoldering in general	<a href="#">B23K 1/00</a>
Tools, devices, or special appurtenances for soldering, e.g. brazing, or unsoldering, not specially adapted for particular methods	<a href="#">B23K 3/00</a>
Machining by laser in general	<a href="#">B23K 26/00</a>
Selection of soldering or welding materials proper, i.e. solder compositions per se	<a href="#">B23K 35/24</a>
Laminates in general	<a href="#">B32B</a>

Printing apparatus in general	<a href="#">B41F</a>
Printing techniques in general	<a href="#">B41M</a>
Screens or stencils, manufacturing thereof in general	<a href="#">B41N 1/24</a> , <a href="#">B41C 1/14</a>
Covering metals by metal spraying	<a href="#">C23C 4/00</a>
Coating by vacuum evaporation	<a href="#">C23C 14/00</a>
Covering materials by cathodic sputtering	<a href="#">C23C 14/34</a>
Chemical coating of a substrate by decomposition in general	<a href="#">C23C 18/00</a>
Electroless plating in general	<a href="#">C23C 18/16</a>
Non-mechanical removal of metallic material from surfaces	<a href="#">C23F</a>
Local etching in general	<a href="#">C23F 1/02</a>
Apparatus for etching in general	<a href="#">C23F 1/08</a>
Etchants in general	<a href="#">C23F 1/10</a> - <a href="#">C23F 1/46</a>
Electroplating in general	<a href="#">C25D</a>
Photomechanical production of textured or patterned surfaces, materials or originals therefor, apparatus specially adapted therefor, in general	<a href="#">G03F</a>
Etching masks applied by electrographic, electrophotographic or magnetographic methods in general	<a href="#">G03G</a>
Electron-beam or ion-beam tubes for localised treatment	<a href="#">H01J 37/30</a>
Discharge devices for covering materials by cathodic sputtering	<a href="#">H01J 37/34</a>
Electrically-conductive connections between two or more conductive members in direct contact using electrically conductive adhesives, in general	<a href="#">H01R 4/04</a>
Connectors for printed circuits	<a href="#">H01R 12/00</a>
Processes or apparatus adapted for the manufacture or treatment of semiconductor or solid state devices or of parts thereof	<a href="#">H10P 95/00</a>

### Special rules of classification

In this main group, both "invention information" and "additional information" are classified by the appropriate CPC group symbol.

Indexing Codes are also attributed to provide additional information when no CPC sub-group exists, i.e. to subdivide subject matter belonging to a sub-group.

### H05K 3/0008

{for aligning or positioning of tools relative to the circuit board ([H05K 3/4638](#), [H05K 3/4679](#) take precedence; for manufacturing assemblages of components [H05K 13/0015](#))}

### References

#### Limiting references

*This place does not cover:*

Aligning and fixing the circuit boards before lamination; Detecting or measuring the misalignment after lamination; Aligning external circuit patterns or via connections relative to internal circuits	<a href="#">H05K 3/4638</a>
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Aligning added circuit layers or via connections relative to previous circuit layers	<a href="#">H05K 3/4679</a>
Apparatus or processes specially adapted for manufacturing or adjusting assemblages of electric components	<a href="#">H05K 13/0015</a>

## H05K 3/0011

**{Working of insulating substrates or insulating layers}**

### Definition statement

*This place covers:*

- Shaping of the substrate, e.g. by moulding
- Etching of the substrate by chemical or physical means
- Mechanical working of the substrate, e.g. drilling or punching
- After-treatment, e.g. cleaning or desmearing of holes

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Making copper-clad substrates	<a href="#">H05K 3/022</a>
Surface treatment for improvement of adhesion	<a href="#">H05K 3/38</a>

## H05K 3/0058

**{Laminating printed circuit boards onto other substrates, e.g. metallic substrates ([H05K 1/0281](#) takes precedence)}**

### References

#### Limiting references

*This place does not cover:*

Reinforcement details	<a href="#">H05K 1/0281</a>
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## H05K 3/007

**{Manufacture or processing of a substrate for a printed circuit board supported by a temporary or sacrificial carrier ([H05K 1/187](#), [H05K 3/20](#) and [H05K 3/4682](#) take precedence)}**

### References

#### Limiting references

*This place does not cover:*

Patterned circuits being prefabricated circuits, which are not yet attached to a permanent insulating substrate, e.g. on a temporary carrier	<a href="#">H05K 1/187</a>
Applying conductive material to the insulating support by affixing prefabricated conductor pattern	<a href="#">H05K 3/20</a>

Manufacture of core-less build-up multilayer circuits on a temporary carrier or on a metal foil	<a href="#">H05K 3/4682</a>
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## H05K 3/0073

{Masks not provided for in groups [H05K 3/02](#) - [H05K 3/46](#), e.g. for photomechanical production of patterned surfaces}

### References

#### References out of a residual place

*Examples of places in relation to which this place is residual:*

Apparatus or processes for manufacturing printed circuits	<a href="#">H05K 3/02</a> - <a href="#">H05K 3/46</a>
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## H05K 3/0085

{Apparatus for treatments of printed circuits with liquids not provided for in groups [H05K 3/02](#) - [H05K 3/46](#); conveyors and holding means therefor (apparatus specially adapted for manufacturing assemblages of electric components, e.g. printed circuit boards, [H05K 13/00](#))}

### References

#### Limiting references

*This place does not cover:*

Apparatus or processes specially adapted for manufacturing or adjusting assemblages of electric components	<a href="#">H05K 13/00</a>
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#### References out of a residual place

*Examples of places in relation to which this place is residual:*

Apparatus or processes for manufacturing printed circuits	<a href="#">H05K 3/02</a> - <a href="#">H05K 3/46</a>
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## H05K 3/0097

{Processing two or more printed circuits simultaneously, e.g. made from a common substrate, or temporarily stacked circuit boards ([H05K 3/0052](#) takes precedence)}

### References

#### Limiting references

*This place does not cover:*

De-panelling, i.e. dividing a panel into circuit boards; Working of the edges of circuit boards	<a href="#">H05K 3/0052</a>
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**H05K 3/022**

{Processes for manufacturing precursors of printed circuits, i.e. copper-clad substrates}

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Laminates in general	<a href="#">B32B</a>
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**H05K 3/027**

{the conductive material being removed by irradiation, e.g. by photons, alpha or beta particles}

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Machining by laser in general	<a href="#">B23K 26/00</a>
Electron or ion beam tubes therefor	<a href="#">H01J 37/00</a>

**H05K 3/06**

the conductive material being removed chemically or electrolytically, e.g. by photo-etch process {(semi-additive methods [H05K 3/108](#))}

**References****Limiting references**

This place does not cover:

Semi-additive methods	<a href="#">H05K 3/108</a>
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**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Non-mechanical removal of metallic material from surfaces	<a href="#">C23F</a>
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**H05K 3/061**

{Etching masks}

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Local etching	<a href="#">C23F 1/02</a>
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**H05K 3/065****{applied by electrographic, electrophotographic or magnetographic methods}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Electrography, electrophotography, magnetography in general	<a href="#">G03G</a>
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**H05K 3/067****{Etchants}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Etching compositions in general	<a href="#">C23F 1/10</a> – <a href="#">C23F 1/46</a>
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**H05K 3/068****{Apparatus for etching printed circuits}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Apparatus for etching in general	<a href="#">C23F 1/08</a>
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**H05K 3/08****the conductive material being removed by electric discharge, e.g. by spark erosion****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Working of metal by electro-erosion per se	<a href="#">B23H</a>
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**H05K 3/106****{by photographic methods}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Photographic processes in general	<a href="#">G03C</a>
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**H05K 3/12****using {thick film techniques, e.g.} printing techniques to apply the conductive material {or similar techniques for applying conductive paste or ink patterns}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Printing apparatus	<a href="#">B41F</a>
Printing techniques in general	<a href="#">B41M</a>

**H05K 3/1225****{Screens or stencils; Holders therefor}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Stencil holders for applying liquids	<a href="#">B05C 17/08</a>
Manufacturing of screens or stencils	<a href="#">B41C 1/14</a>
Screens or stencils in general	<a href="#">B41N 1/24</a>

**H05K 3/125****{by ink-jet printing}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Ink-jet printers in general	<a href="#">B41J</a>
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**H05K 3/1266****{by electrographic or magnetographic printing}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Electrography, magnetography in general	<a href="#">G03G</a>
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**H05K 3/14****using spraying techniques to apply the conductive material {, e.g. vapour evaporation}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Covering metals by metal spraying	<a href="#">C23C 4/00</a>
Coating by vacuum evaporation	<a href="#">C23C 14/00</a>

**H05K 3/16****by cathodic sputtering****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Covering materials by cathodic sputtering	<a href="#">C23C 14/34</a>
Discharge devices therefor	<a href="#">H01J 37/34</a>

**H05K 3/18****using precipitation techniques to apply the conductive material****Definition statement***This place covers:*

Apparatus or process for manufacturing printed circuits, in which conductive material is applied to the insulating support in such a manner as to form the desired conductive pattern using precipitation techniques to apply the conductive material, e.g. electroless plating or electroplating.

**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Chemical coating of a substrate by decomposition	<a href="#">C23C 18/00</a>
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**H05K 3/181**

{by electroless plating (adhesives therefor [H05K 3/387](#))}

**References****Limiting references**

*This place does not cover:*

Adhesives therefor	<a href="#">H05K 3/387</a>
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**Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Electroless plating in general	<a href="#">C23C 18/16</a>
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**H05K 3/20**

by affixing prefabricated conductor pattern {([H05K 1/187](#), [H05K 3/046](#), [H05K 3/4658](#), [H05K 3/4682](#) takes precedence)}

**References****Limiting references**

*This place does not cover:*

Patterned circuits being prefabricated circuits, which are not yet attached to a permanent insulating substrate, e.g. on a temporary carrier	<a href="#">H05K 1/187</a>
Selective transfer or selective detachment of a conductive layer	<a href="#">H05K 3/046</a>
Adding a circuit layer by laminating a metal foil or a preformed metal foil pattern	<a href="#">H05K 3/4658</a>
Manufacture of core-less build-up multilayer circuits on a temporary carrier or on a metal foil	<a href="#">H05K 3/4682</a>

**H05K 3/22**

Secondary treatment of printed circuits {([H05K 3/1283](#) takes precedence; embedding circuits in grooves by pressure [H05K 3/107](#))}

**Definition statement**

*This place covers:*

- Completing of printed circuits by adding non-printed jumper connections
- Correcting or repairing of printed circuits
- Drying of printed circuits
- Reinforcing the conductive pattern
- Cleaning or polishing of the conductive pattern
- Applying non-metallic protective coatings

## References

### Limiting references

*This place does not cover:*

Embedding circuits in grooves by pressure	<a href="#">H05K 3/107</a>
After-treatment of the printed patterns, e.g. sintering or curing methods	<a href="#">H05K 3/1283</a>

## H05K 3/225

{Correcting or repairing of printed circuits ([H05K 1/0292](#), [H05K 3/222](#), [H05K 3/288](#), [H05K 3/4685](#) take precedence)}

## References

### Limiting references

*This place does not cover:*

Programmable, customizable or modifiable circuits	<a href="#">H05K 1/0286</a>
Completing of printed circuits by adding non-printed jumper connections	<a href="#">H05K 3/222</a>
Removal of non-metallic coatings, e.g. for repairing	<a href="#">H05K 3/288</a>

## H05K 3/24

Reinforcing of the conductive pattern {(by solder coating [H05K 3/3465](#))}

## References

### Limiting references

*This place does not cover:*

By solder coating	<a href="#">H05K 3/3465</a>
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## H05K 3/241

{characterised by the electroplating method; means therefor, e.g. baths or apparatus}

## References

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Electroplating in general	<a href="#">C25D</a>
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**H05K 3/28**

Applying non-metallic protective coatings {(H05K 3/0091 takes precedence; methods for intermediate insulating layers for build-up multilayer circuits [H05K 3/4673](#))}

**References****Limiting references**

*This place does not cover:*

Apparatus for coating printed circuits using liquid non-metallic coating compositions	<a href="#">H05K 3/0091</a>
Methods for intermediate insulating layers for build-up multilayer circuits	<a href="#">H05K 3/4673</a>

**H05K 3/284**

{for encapsulating mounted components ([H05K 1/185](#) takes precedence)}

**References****Limiting references**

*This place does not cover:*

Components encapsulated in the insulating substrate of the printed circuit or incorporated in internal layers of a multilayer circuit	<a href="#">H05K 1/185</a>
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**H05K 3/321**

by conductive adhesives

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Using electrically conductive adhesives in general	<a href="#">H01R 4/04</a>
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**H05K 3/34**

by soldering

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Soldering or de-soldering apparatus	<a href="#">H05K 13/04</a> , <a href="#">B23K 1/00</a> , <a href="#">B23K 3/00</a>
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**H05K 3/346****Solder materials or compositions specially adapted therefor****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Solder compositions per se	<a href="#">B23K 35/24</a>
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**H05K 3/36****Assembling printed circuits with other printed circuits {([H05K 7/142](#) takes precedence)}****References****Limiting references***This place does not cover:*

Spacers not being card guides	<a href="#">H05K 7/142</a>
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**Special rules of classification**

[H05K 3/36](#) relates to the method of assembling at least two printed circuits to form a single entity as a final product, whereas [H05K 3/0097](#) relates to processing two printed circuits at the same time. This implicitly means that after processing, the printed circuits are again separated from one another.

**H05K 3/38****Improvement of the adhesion between the insulating substrate and the metal****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Laminates per se	<a href="#">B32B</a>
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**H05K 3/44****Manufacturing insulated metal core circuits {or other insulated electrically conductive core circuits ([H05K 3/0058](#), [H05K 3/4608](#), and [H05K 3/4641](#) take precedence)}****References****Limiting references***This place does not cover:*

Laminating printed circuit boards onto other substrates, e.g. metallic substrates	<a href="#">H05K 3/0058</a>
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Special circuit board as base or central core comprising an electrically conductive core	<a href="#">H05K 3/4608</a>
Laminating two or more circuit boards having integrally laminated metal sheets or special power cores	<a href="#">H05K 3/4641</a>

## H05K 3/46

### Manufacturing multilayer circuits

#### References

##### Informative references

Attention is drawn to the following places, which may be of interest for search:

Incorporating non-printed electric components in internal layers	<a href="#">H05K 1/185</a>
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## H05K 5/00

### Casings, cabinets or drawers for electric apparatus

#### Definition statement

*This place covers:*

Constructional features of electronic housings that are not characterised by their inner electronic arrangement, such as:

- means for assembling the housing parts
- means for associating or coupling several housings
- venting means
- sealing means
- interlocking means
- mounting and fixing means
- handling means

#### References

##### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Electronic boxes of vehicles, e.g. electric distribution centers	<a href="#">B60R 16/00</a>
LCD display panels	<a href="#">G02F 1/13</a>
Projectors	<a href="#">G03B 21/00</a>
Desktop and laptop computer housings	<a href="#">G06F 1/16</a>
Casings and housings of instrument	<a href="#">G12B 9/00</a>
Plasma display panels	<a href="#">H01J 29/00</a>
Receptacles for batteries	<a href="#">H01M 50/00</a>
Constructional details, e.g. cabinets, of receivers	<a href="#">H04B 1/08</a>
Mobile phone housings	<a href="#">H04M 1/02</a>
Constructional details of receivers, e.g. cabinets or dust covers	<a href="#">H04N 5/64</a>

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Furniture/cabinets	<a href="#">A47B 87/00</a>
Handles and grip in general	<a href="#">B65D</a>
Locks and Latches in general	<a href="#">E05B</a> , <a href="#">E05C</a>
Hinges in general	<a href="#">E05D</a>
Sealing in general	<a href="#">F16J 15/00</a>
Stands and supports for apparatus in general	<a href="#">F16M 11/00</a>
Constructional details of record carriers in general	<a href="#">G06K 7/00</a>
Connectors in general	<a href="#">H01R</a>
Details for decorative purposes in mobiles phones	<a href="#">H04M 1/0283</a>
CRT Television housings	<a href="#">H04N 5/00</a>

**H05K 5/06**

**Hermetically-sealed casings {(specially adapted for small components [H05K 5/0095](#))}**

**References****Limiting references**

*This place does not cover:*

Specially adapted for small components	<a href="#">H05K 5/0095</a>
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**H05K 7/00**

**Constructional details common to different types of electric apparatus (casings, cabinets, drawers [H05K 5/00](#))**

**Definition statement**

*This place covers:*

- Constructional features of electronic housings common to different types of electric apparatus;
- Constructional features of standardized electronic cabinets and racks for receiving Printed Circuit Boards (PCB) such as guides, retainers, drawers, plug-in modules;
- Constructional features of Servers, Data Center Rooms, 19-inch computer racks such as mounting means of blades within cabinets, cable management, power distribution, mobile data centers arranged in shipping containers;
- Constructional features of industrial controllers such as PLCs;
- Cooling features of electronic housings,
- Cooling features of standardized electronic cabinets and racks for receiving Printed Circuit Boards (PCB);
- Cooling features of Servers, Data Center Rooms, 19-inch computer racks;
- Cooling features of power electronics, such as inverters;
- Cooling features of vehicle control units;
- Cooling features of display panels;
- Cooling features of outdoor telecommunication equipments, such as base stations.

## References

### Limiting references

*This place does not cover:*

Casings, cabinets, drawers	<a href="#">H05K 5/00</a>
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### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Constructional details of optoelectronic equipment	<a href="#">G02B 6/42</a>
Cooling arrangements of desktop and laptop computers	<a href="#">G06F 1/20</a>
Constructional details of Hard disk drives	<a href="#">G11B 33/00</a>
Cooling of batteries	<a href="#">H01M 10/60</a>
Arrangements for cooling of semiconductor or other solid state devices	<a href="#">H10W 40/00</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Blowers and fans in general	<a href="#">F04D 29/00</a>
Cooling tubular elements with fins for cooling	<a href="#">F28F 1/10</a>
Cooling element with means for increasing heat exchange area	<a href="#">F28F 3/02</a>
Program control systems PLC without constructional details	<a href="#">G05B 19/00</a>
Inner arrangements of desktop and laptop computers	<a href="#">G06F 1/18</a>
Bus systems and interfaces of computers	<a href="#">G06F 13/409</a>
Constructional details of record carriers	<a href="#">G06K 7/00</a>
Telecommunication distribution frames and equipments	<a href="#">H04Q 1/00</a>
Stacked arrangements of semiconductor devices	<a href="#">H10W 90/00</a>

## H05K 7/10

### Plug-in assemblages of components {, e.g. IC sockets}

## References

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

IC sockets for connection on printed circuit board	<a href="#">H01R 12/00</a>
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**H05K 7/12****Resilient or clamping means for holding component to structure****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Holding two-part couplings together	<a href="#">H01R 13/00</a>
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**H05K 7/14****Mounting supporting structure in casing or on frame or rack****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Construction of racks or frames	<a href="#">H05K 7/18</a>
Test adapters	<a href="#">G01R 31/2808</a>

**H05K 7/1462****{for programmable logic controllers [PLC] for automation or industrial process control}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Programmable logic controllers per se	<a href="#">G05B 19/05</a>
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**H05K 7/1469****{Terminal blocks for connecting sensors}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Terminal blocks in general	<a href="#">H01R 9/24</a>
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## H05K 7/20

### Modifications to facilitate cooling, ventilating, or heating

#### Definition statement

*This place covers:*

Arrangements for cooling, ventilating or heating of electric apparatus by:

- using a gaseous coolant in electronic enclosures
- using a liquid coolant without phase change in electronic enclosures
- using a liquid coolant with phase change in electronic enclosures
- heat transfer by conduction from the heat generating element to a dissipating body

#### References

##### Application-oriented references

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Cooling, ventilating, or heating of printed circuits	<a href="#">H05K 1/02</a>
Cooling or ventilating of personal computers	<a href="#">G06F 1/20</a>
Cooling, ventilating, or heating of resistors	<a href="#">H01C</a>
Cooling, ventilating, or heating of capacitors	<a href="#">H01G</a>
Cooling or ventilating of photovoltaic modules	<a href="#">H02S 40/42</a>
Cooling or ventilating of solar cells	<a href="#">H10F 77/63</a>
Cooling or ventilating of LEDs	<a href="#">H10H 20/858</a>
Cooling or ventilating of individual semiconductor components	<a href="#">H10W 40/00</a>

## H05K 7/20172

### {Fan mounting or fan specifications}

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Blowers in general	<a href="#">F04D 29/601</a>
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## H05K 7/20181

### {Filters; Louvers}

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Filters in general	<a href="#">B01D 46/00</a>
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**H05K 7/20954****{for display panels}****References****Application-oriented references**

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Heating or cooling of liquid crystal cells	<a href="#">G02F 1/133382</a>
Cooling for projectors	<a href="#">G03B 21/16</a>
Cooling means for computer displays	<a href="#">G06F 1/20</a>
Plasma display panels per se	<a href="#">H01J 17/49</a>

**H05K 9/00**

**Screening of apparatus or components against electric or magnetic fields  
(devices for absorbing radiation from an antenna [H01Q 17/00](#))**

**Definition statement**

*This place covers:*

- Screening of electronic equipment against magnetic or electromagnetic fields, or electrostatic discharges;
- Shielding features applied to rooms or buildings for protecting against external electromagnetic interference;
- Shielded electronic casings achieving electromagnetic compatibility;
- Shielding features of electronic equipment having standardized dimensions, such as 19-inch racks;
- Shielding materials therefor.

**References****Limiting references**

*This place does not cover:*

Devices for absorbing radiation from an antenna	<a href="#">H01Q 17/00</a>
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**Application-oriented references**

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Grounding and RFI shielding of Desktop and laptop computers	<a href="#">G06F 1/182</a>
Magnetic shielding of transformers	<a href="#">H01F 27/36</a>
Screening of dynamo-electric machines	<a href="#">H02K 11/00</a>
Screening of semiconductor devices	<a href="#">H10W 42/20</a> , <a href="#">H10W 72/00</a>
Protection against electrostatic charges or discharges of semiconductor devices, e.g. Faraday shields	<a href="#">H10W 42/60</a>

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Screening of human body against electromagnetic influences	<a href="#">A61N 1/16</a>
Anechoic chambers	<a href="#">G01R 29/0821</a>
Shielding of Nuclear magnetic Resonance devices	<a href="#">G01R 33/42</a>
Screening against nuclear radiation	<a href="#">G21F</a>
Conductive materials in general	<a href="#">H01B 1/00</a>
Magnetic materials in general	<a href="#">H01F 1/00</a>
RFI Filter construction	<a href="#">H03H 1/0007</a>
Prevention of electrostatic charge in general	<a href="#">H05F 1/00</a>

**H05K 9/0001**

{Rooms or chambers (anechoic chambers [G01R 29/0821](#))}

**References****Limiting references**

This place does not cover:

Anechoic chambers	<a href="#">G01R 29/0821</a>
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**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Building construction in general	<a href="#">E04B</a>
Nuclear magnetic resonance	<a href="#">G01R 33/42</a>

**H05K 9/0005**

{Shielded windows}

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Windows for building construction in general	<a href="#">E06B 5/00</a>
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**H05K 9/0066**

{Constructional details of transient suppressor}

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Protective circuits	<a href="#">H02H</a>
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**H05K 9/0067****{Devices for protecting against damage from electrostatic discharge}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Materials for electrostatic discharge protection	<a href="#">H05K 9/0079</a>
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**H05K 9/0075****{Magnetic shielding materials}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Magnetic material in general	<a href="#">H01F 1/00</a>
For transformer	<a href="#">H01F 27/28</a>
For electrical motor	<a href="#">H02K 11/00</a>

**H05K 9/0077****{comprising superconductors}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Superconductors in general	<a href="#">H10N 60/00</a>
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**H05K 9/009****{comprising electro-conductive fibres, e.g. metal fibres, carbon fibres, metallised textile fibres, electro-conductive mesh, woven, non-woven mat, fleece, cross-linked}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Screening during electrotherapy	<a href="#">A61N 1/16</a>
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**H05K 10/00**

**Arrangements for improving the operating reliability of electronic equipment, e.g. by providing a similar standby unit**

**References****Application-oriented references**

*Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:*

Electric redundant control systems	<a href="#">G05B 9/03</a>
Error detection or correction of data by redundancy in digital computer hardware	<a href="#">G06F 11/16</a>
Security signalling or alarm systems	<a href="#">G08B 29/16</a>
Redundant emergency protective circuit arrangements	<a href="#">H02H 3/05</a>
Arrangements for feeding a single network from two or more generators or sources in parallel; Arrangements for feeding already energised networks from additional generators or sources in parallel	<a href="#">H02J 3/38</a>
Circuit arrangements with stand-by power supply	<a href="#">H02J 9/04</a>
Modifications for increasing the reliability of logic circuits or inverting circuits	<a href="#">H03K 19/003</a>
Fail-safe logic circuits or inverting circuits	<a href="#">H03K 19/007</a>
Redundant clock signal generation in generators of electronic oscillations or pulses	<a href="#">H03L 7/07</a>
Transmission systems using redundant channels or apparatus	<a href="#">H04B 1/74</a>
Redundant apparatus for increasing reliability of arrangements used for the transmission of digital information	<a href="#">H04L 1/22</a>

**H05K 11/00**

**Combinations of a radio or television receiver with apparatus having a different main function {(combined with clocks [G04B 47/00](#); controlled by a clock [G04C 21/28](#))}**

**References****Limiting references**

*This place does not cover:*

Combinations of a radio or television receiver with clocks	<a href="#">G04B 47/00</a>
Radio or television receiver controlled by a clock	<a href="#">G04C 21/28</a>

## H05K 13/00

### Apparatus or processes specially adapted for manufacturing or adjusting assemblages of electric components

#### Definition statement

*This place covers:*

Apparatus and methods for placing components, e.g. onto the printed circuit boards. This group only relates to bare printed circuit boards and not circuit boards already fitted in an apparatus (thus no displays or hard disks, etc.).

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Manufacture of printed circuit boards	<a href="#">H05K 1/00</a>
Assembling printed circuits with electric components	<a href="#">H05K 3/30</a>
Apparatus and methods for soldering	<a href="#">B23K</a>
Manipulators	<a href="#">B25J</a>
Packaging, Packing or unpacking	<a href="#">B65B</a>
Manufacture or treatments of solid state devices	<a href="#">H10P</a>

#### Synonyms and Keywords

*In patent documents, the following abbreviations are often used:*

PCB	Printed Circuit Board
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## H05K 13/0007

{using handtools (for mounting on a circuit board [H05K 13/0447](#))}

#### Definition statement

*This place covers:*

Hand-tools specially adapted for adjusting assemblages of electric components

#### References

##### Limiting references

*This place does not cover:*

Hand-tools for mounting electric components on a circuit board	<a href="#">H05K 13/0447</a>
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**H05K 13/0015****{Orientation; Alignment; Positioning}****Definition statement***This place covers:*

orientation, alignment and positioning only of the printed circuit boards

**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Orientation, alignment and positioning of the printed circuit boards for testing	<a href="#">G01R 31/00</a>
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**H05K 13/003****{Placing of components on belts holding the terminals}****Definition statement***This place covers:*

preparing the components before delivering to mounting machines by grouping the components for batch mounting

**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Attaching a series of articles, e.g. small electrical components, to a continuous web	<a href="#">B65B 15/04</a>
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**Special rules of classification**

Only concerns filling of belts as a separate operation

**H05K 13/0038****{placing the components in a predetermined order}****Definition statement***This place covers:*

Filling of belts according to the mounting order of different types of components.

**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Attaching a series of articles, e.g. small electrical components, to a continuous web	<a href="#">B65B 15/04</a>
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## Special rules of classification

Must concern different type of components

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Belt	continuous web holding the components in order to be delivered in rolls to the mounting machines
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## H05K 13/0053

**{Arrangements for assisting the manual mounting of components, e.g. special tables or light spots indicating the place for mounting}**

### Definition statement

*This place covers:*

Manual mounting posts for components on PCB

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Hand-tools for mounting electric components on a circuit board	<a href="#">H05K 13/0447</a>
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## H05K 13/0061

**{Tools for holding the circuit boards during processing; handling transport of printed circuit boards}**

### Definition statement

*This place covers:*

Provision for displacing printed circuit boards [PCB] between machines or for displacing PCBs inside mounting machines

Gripping PCBs for transport or conveyance

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Transport of articles, e.g. conveyors	<a href="#">B65G</a>
Apparatus specially adapted for handling semiconductor or electric solid state devices during manufacture or treatment thereof	<a href="#">H10P 72/00</a>

## Special rules of classification

Documents must include movement of printed circuit board

**H05K 13/0069****{Holders for printed circuit boards}****Definition statement**

*This place covers:*

Fixation of printed circuit boards inside mounting machines

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Fixation of printed circuit boards in testing machines	<a href="#">G01R 31/00</a>
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**Special rules of classification**

Printed circuit board must be static relative to holder.

**Glossary of terms**

*In this place, the following terms or expressions are used with the meaning indicated:*

Chuck	Holder, usually using vacuum
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**H05K 13/0076****{Straightening or aligning terminal leads of pins mounted on boards, during transport of the boards}****Definition statement**

*This place covers:*

Transport of boards temporary fitted with components before definitive fixation, e.g. soldering.

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Straightening or aligning terminal leads of pins mounted on boards, during the mounting operation, after fitting components on the board	<a href="#">H05K 13/0473</a>
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**Special rules of classification**

Components are not definitively fixed.

**H05K 13/0084****{Containers and magazines for components, e.g. tube-like magazines}****Definition statement**

*This place covers:*

Any type of container for delivering components to mounting machines and manufacture thereof

## Definition statement

Details of component tubes, trays or belts.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Filling of containers	<a href="#">H05K 13/02</a>
Use of said containers in mounting machines	<a href="#">H05K 13/04</a>
Containers for storage or transport	<a href="#">B65D</a>

## Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Stick	tube-like container
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## H05K 13/0092

{Treatment of the terminal leads as a separate operation (during transport [H05K 13/0076](#), [H05K 13/023](#); during mounting [H05K 13/04](#))}

## Definition statement

This place covers:

Preparing leads of components before bringing to mounting machines

Special separate machines for lead treatment.

## References

### Limiting references

This place does not cover:

Treatment of the terminal leads as a separate operation during transport	<a href="#">H05K 13/0076</a> , <a href="#">H05K 13/023</a>
Treatment of leads after fitting in printed circuit boards	<a href="#">H05K 13/04</a>

## Special rules of classification

Must be a separate machine.

## Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Clinching	bending of leads
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**H05K 13/02****Feeding of components****Definition statement**

*This place covers:*

Feeding of components to containers before fitting said container to machines, e.g. filling or refilling of containers

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Emptying of containers by the mounting machine itself	<a href="#">H05K 13/04</a>
Feeding of components in general	<a href="#">B65G</a>

**H05K 13/021**

**{Loading or unloading of containers ([H05K 13/028](#) takes precedence)}**

**Definition statement**

*This place covers:*

Loading or unloading containers with components, the containers not being in use by the mounting machine.

**References****Limiting references**

*This place does not cover:*

Simultaneously loading a plurality of loose objects, e.g. by means of vibrations, pressure differences, magnetic fields	<a href="#">H05K 13/028</a>
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**Special rules of classification**

Do not classify here documents concerning pick and place in the mounting machine

**H05K 13/022**

**{with orientation of the elements}**

**Definition statement**

*This place covers:*

Giving orientation to components before feeding into containers

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Orientation in general	<a href="#">B23P 19/00</a>
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**H05K 13/023****{with bending or straightening of the terminal leads}****Definition statement***This place covers:*

Feeding of components with bending or straightening of the terminal leads, e.g. in order to fit into containers

**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Treatment of the terminal leads as a separate operation (not during transport)	<a href="#">H05K 13/0092</a>
Bending and cutting after the mounting on a pc board	<a href="#">H05K 13/0473</a>

**Special rules of classification**

Not during or after mounting of component.

**H05K 13/024****{Straightening or aligning terminal leads}****Definition statement***This place covers:*

Straightening or aligning leads during the feeding

**H05K 13/025****{of components having oppositely extending terminal leads}****Definition statement***This place covers:*

Straightening or aligning leads of e.g. resistors

**H05K 13/026****{of components having terminal leads in side by side relationship, e.g. using combing elements}****Definition statement***This place covers:*

Straightening or aligning lead of chips.

**Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

Dual in line	chip with two rows of parallel leads
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**H05K 13/027****{Fluid transport of components}****Definition statement***This place covers:*

Transport of components using fluids, e.g. jets of air, water.

**H05K 13/028****{Simultaneously loading a plurality of loose objects, e.g. by means of vibrations, pressure differences, magnetic fields}****Definition statement***This place covers:*

Feeding bulk components simultaneously to containers

**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Orientation of the elements	<a href="#">H05K 13/022</a>
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**H05K 13/029****{Feeding axial lead components, e.g. using vibrating bowls, magnetic fields  
([H05K 13/022](#) takes precedence)}****Definition statement***This place covers:*

Feeding bulk axial components to containers.

**References****Limiting references***This place does not cover:*

Orientation of the elements	<a href="#">H05K 13/022</a>
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**H05K 13/04****Mounting of components {, e.g. of leadless components}****Definition statement***This place covers:*

Mounting of components such as:

- mounting machines for components on printed circuit boards;
- attaching containers to mounting machines for components delivery.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Assembling printed circuits with electric components	<a href="#">H05K 3/30</a>
Manipulators	<a href="#">B25J</a>

## H05K 13/0404

{Pick-and-place heads or apparatus, e.g. with jaws}

### Definition statement

*This place covers:*

Pick-and-place-heads for picking components out of a container and placing them on a printed circuit board using gripping devices.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Manipulators	<a href="#">B25J</a>
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## Special rules of classification

Orientation while holding component is not classified here

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Jaws	gripping device having means moving towards each other for pinching component
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## H05K 13/0408

{Incorporating a pick-up tool}

### Definition statement

*This place covers:*

Pick-and-place-heads for picking components out of a container and placing them on a printed circuit board by suction, e.g. using vacuum.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Manipulators	<a href="#">B25J</a>
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### Special rules of classification

Orientation while holding component is not classified here

### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Nozzle	vacuum or air suction device
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## H05K 13/0413

**{with orientation of the component while holding it; Drive mechanisms for gripping tools, e.g. lifting, lowering or turning of gripping tools}**

### Definition statement

*This place covers:*

Orientation of component held by mounting head just before or during mounting.

Mechanical and vacuum holders for components with orientation provisions.

Vision devices for orientation or correct placing of components.

Includes camera looking at the PC boards before mounting

### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Vision system	camera
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## H05K 13/0417

**{Feeding with belts or tapes}**

### Definition statement

*This place covers:*

Delivery of components to a mounting machine via belts or tapes; tape feeders; attachment of tape feeders to the mounting machine; details related to the picking up of components by mounting head from tapes/belts.

### Special rules of classification

Interconnection/splicing of belts/tapes to be classified in [H05K 13/021](#).

### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Blister, belt, tape	Belt or tape wound on a reel/roll and carrying electronic devices
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### Synonyms and Keywords

Blister	component belt in rolls
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**H05K 13/0421****{with treatment of the terminal leads}****Definition statement***This place covers:*

Treatment of leads during or after picking up.

**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Feeding one by one by other means than belts	<a href="#">H05K 13/043</a>
Bending and cutting after fitting on a circuit board	<a href="#">H05K 13/0473</a>

**H05K 13/0426****{for components being oppositely extending terminal leads ([H05K 13/0421](#) takes precedence)}****Definition statement***This place covers:*

For resistor type components.

**References****Limiting references***This place does not cover:*

Treatment of the terminal leads (bending and cutting after fitting on a circuit board	<a href="#">H05K 13/0421</a>
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**H05K 13/043****{Feeding one by one by other means than belts}****Definition statement***This place covers:*

Delivery of single components by other type of containers.

**H05K 13/0434****{with containers}****Definition statement***This place covers:*

Delivery with containers, e.g. trays.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Components belts	<a href="#">H05K 13/0417</a>
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## H05K 13/0439

{incorporating means for treating the terminal leads only before insertion}

### Definition statement

*This place covers:*

Treatment of leads before insertion.

## H05K 13/0443

{incorporating means for treating the terminal leads before and after insertion or only after insertion}

### Definition statement

*This place covers:*

Treatment of leads before and/or only after insertion.

## H05K 13/0452

{Mounting machines or lines comprising a plurality of tools for guiding different components to the same mounting place ([H05K 13/0406](#), [H05K 13/041](#) take precedence)}

### Definition statement

*This place covers:*

Mounting machine for several types of components.

Mounting of different type of components to the same mounting place.

Multi nozzle machines

Machines with several holders for pc boards

## References

### Limiting references

*This place does not cover:*

Drive mechanisms for pick-and-place heads	<a href="#">H05K 13/0406</a>
Pick-and-place heads having multiple pick-up tools	<a href="#">H05K 13/041</a>

## Special rules of classification

Multiple work tables and multiple heads, e.g. revolver heads, are classified here

**Glossary of terms**

*In this place, the following terms or expressions are used with the meaning indicated:*

Revolver head	turning multiple head with multiple nozzles or grippers
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**H05K 13/0456**

**{simultaneously punching the circuit board}**

**Definition statement**

*This place covers:*

Mounting machines including hole puncher

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Hole shaping and details of holes	<a href="#">H05K 3/00</a>
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**H05K 13/046**

**{Surface mounting (surface mounted components [H05K 3/341](#))}**

**Definition statement**

*This place covers:*

Methods and apparatus for surface mounting electric components in general

**References****Limiting references**

*This place does not cover:*

Surface mounted components	<a href="#">H05K 3/341</a>
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**Glossary of terms**

*In this place, the following terms or expressions are used with the meaning indicated:*

SMD	Surface mounted device
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**H05K 13/0465**

**{by soldering ([H05K 13/0469](#) takes precedence)}**

**Definition statement**

*This place covers:*

Soldering machines of surface mounted components

## References

### Limiting references

*This place does not cover:*

Surface mounting by applying a glue or viscous material	<a href="#">H05K 13/0469</a>
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### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Surface mounting on PCBs by soldering	<a href="#">H05K 3/341</a>
Reflow soldering apparatus and process; Soldering process per se	<a href="#">B23K</a>

## H05K 13/0469

**{by applying a glue or viscous material}**

### Definition statement

*This place covers:*

Use of glue or viscous material with dispenser nozzles.

## References

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Details of glue fixation between component and PC board	<a href="#">H05K 3/00</a>
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## H05K 13/0473

**{Cutting and clinching the terminal ends of the leads after they are fitted on a circuit board}**

### Definition statement

*This place covers:*

Treatment of leads after insertion out of mounting process

## References

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Cutting and clinching the terminal ends of the leads after they are fitted on a circuit board during transport	<a href="#">H05K 13/0076</a>
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**H05K 13/0478****{Simultaneously mounting of different components}****Definition statement***This place covers:*

simultaneous mounting of different components placed on PC board at the same moment.

**H05K 13/0482****{using templates; using magazines, the configuration of which corresponds to the sites on the boards where the components have to be attached}****Definition statement***This place covers:*

Simultaneous mounting of different components being arranged beforehand in preset positions.

Templates, trays and special multi heads.

**H05K 13/0486****{Replacement and removal of components}****Definition statement***This place covers:*

Method and apparatus for taking off or replacing misplaced components

**Special rules of classification**

No recycling.

May include a de-soldering device

**H05K 13/0491****{Hand tools therefor}****Definition statement***This place covers:*

Hand tools for repairing printed circuit boards or exchanging components.

**Special rules of classification**

No recycling.

**H05K 13/0495****{having a plurality of work-stations}****Definition statement***This place covers:*

Arrangements of mounting machines in clusters or lines



**H05K 13/06****Wiring by machine****Definition statement**

*This place covers:*

Placing of wires on or in printed circuit boards by machines; machines therefor.

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Multiplex wire bundles for vehicles	<a href="#">B60R</a>
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**H05K 13/065****{Accessories therefor, e.g. light spots}****Definition statement**

*This place covers:*

Accessories for wiring, e.g. special tables or light spots.

**H05K 13/08****Monitoring manufacture of assemblages****Definition statement**

*This place covers:*

- Control or planning of manufacturing processes of assemblages, e.g. of processes for mounting components on printed circuit boards
- Control of apparatus therefor
- Planning of production facilities and apparatus layout
- Visual inspection after placing of components

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Electrical testing of finished printed circuit boards	<a href="#">G01R 31/00</a>
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**H05K 2201/0133****Elastomeric or compliant polymer****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Elastomeric connector or conductor, e.g. rubber with metallic filler	<a href="#">H05K 2201/0314</a>
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**H05K 2201/017****Glass ceramic coating, e.g. formed on inorganic substrate****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Printed circuits with inorganic insulating substrates, e.g. ceramic, glass	<a href="#">H05K 1/0306</a>
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**H05K 2201/0233****Deformable particles****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Insulating particles having an electrically conductive coating	<a href="#">H05K 2201/0221</a>
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**H05K 2201/0236****Plating catalyst as filler in insulating material****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Catalytic ink or adhesive for electroless plating	<a href="#">H05K 2203/0709</a>
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**H05K 2201/0239****Coupling agent for particles****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Improvement of the adhesion between the insulating substrate and the metal of printed circuits by the use of a coupling agent, e.g. silane	<a href="#">H05K 3/389</a>
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**H05K 2201/0248****Needles or elongated particles; Elongated cluster of chemically bonded particles****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Non-conductive microfibers	<a href="#">H05K 2201/0251</a>
Stacked conductors	<a href="#">H05K 2201/0379</a>

**H05K 2201/0251****Non-conductive microfibers****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Needles or elongated particles	<a href="#">H05K 2201/0248</a>
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**H05K 2201/0257****Nanoparticles****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Inks used for the metallic pattern of printed circuits, comprising nanoparticles and specially adapted for being sintered at low temperature	<a href="#">H05K 1/097</a>
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**H05K 2201/0284****Paper, e.g. as reinforcement****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Paper sheets used as material for the substrate of printed circuits	<a href="#">H05K 1/0386</a>
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**H05K 2201/029****Woven fibrous reinforcement or textile****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Textiles used as material for the substrate of printed circuits	<a href="#">H05K 1/038</a>
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**H05K 2201/0314****Elastomeric connector or conductor, e.g. rubber with metallic filler****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Elastomeric or compliant polymer	<a href="#">H05K 2201/0133</a>
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**H05K 2201/0338****Layered conductor, e.g. layered metal substrate, layered finish layer or layered thin film adhesion layer****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Etched tri-metal structure, i.e. metal layers or metal patterns on both sides of a different central metal layer which is later at least partly etched	<a href="#">H05K 2201/0361</a>
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**H05K 2201/0347****Overplating, e.g. for reinforcing conductors or bumps; Plating over filled vias****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Reinforcing the conductive pattern as secondary treatment of printed circuits	<a href="#">H05K 3/24</a>
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**H05K 2201/0367****Metallic bump or raised conductor not used as solder bump****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Solder materials or compositions for electrically connecting electric components or wires to printed circuits	<a href="#">H05K 3/346</a>
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**H05K 2201/0373****Conductors having a fine structure, e.g. providing a plurality of contact points with a structured tool****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Providing micro- or nanometer scale roughness on a metal surface, e.g. by plating of nodules or dendrites	<a href="#">H05K 2203/0307</a>
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**H05K 2201/0397****Tab****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Integral conductive tabs of printed circuits	<a href="#">H05K 3/4092</a>
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**H05K 2201/046****Planar parts of folded PCBs making an angle relative to each other****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Assembling printed circuits substantially perpendicularly to each other	<a href="#">H05K 3/366</a>
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**H05K 2201/066****Heatsink mounted on the surface of the printed circuit board [PCB]****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Metallic blocks or heatsinks completely inserted in a printed circuit board [PCB]	<a href="#">H05K 2201/10416</a>
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**H05K 2201/073****High voltage adaptations****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Overvoltage protection of printed circuits	<a href="#">H05K 1/0257</a>
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**H05K 2201/09036****Recesses or grooves in insulating substrate****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Recess in conductor, e.g. in pad or in metallic substrate	<a href="#">H05K 2201/09745</a>
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**H05K 2201/09045****Locally raised area or protrusion of insulating substrate****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Rigid curved substrate	<a href="#">H05K 2201/09018</a>
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**H05K 2201/0919**

Exposing inner circuit layers or metal planes at the side edge of the printed circuit board [PCB] or at the walls of large holes

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Shielding provided by an inner layer of printed circuit board [PCB]	<a href="#">H05K 2201/0723</a>
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**H05K 2201/092**

Exposing inner circuit layers or metal planes at the walls of high aspect ratio holes

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Plated through-holes [PTH] for providing electric connections to or between printed circuits	<a href="#">H05K 3/42</a>
Cutting around hole of printed circuits, e.g. for disconnecting land or PTH	<a href="#">H05K 2203/0242</a>

**H05K 2201/09236**

Parallel layout

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Lay-out of balanced signal pairs of printed circuits, e.g. differential lines or twisted lines	<a href="#">H05K 1/0245</a>
Superposed layout of at least two types of conductors provided for in <a href="#">H05K 2201/09218</a> - <a href="#">H05K 2201/095</a> , i.e. in different planes	<a href="#">H05K 2201/09672</a>

**H05K 2201/09245**

Crossing layout

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Alternating conductors, e.g. alternating different shaped pads, twisted pairs or alternating components	<a href="#">H05K 2201/097</a>
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**H05K 2201/09281****Layout details of a single conductor****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Meander	<a href="#">H05K 2201/09263</a>
Layout details of angles or corners	<a href="#">H05K 2201/09272</a>

**H05K 2201/093****Layout of power planes, ground planes or power supply conductors, e.g. having special clearance holes therein****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Reduction of cross-talk, noise or electromagnetic interference of printed circuits by patterned shielding planes, ground planes or power planes	<a href="#">H05K 1/0224</a>
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**H05K 2201/09354****Ground conductor along edge of main surface****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Edge contacts; Windows or holes in the substrate having plural connections on the walls thereof for providing electric connection to or between printed circuits	<a href="#">H05K 3/403</a>
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**H05K 2201/09381****Shape of non-curved single flat metallic pad, land or exposed part thereof;  
Shape of electrode of leadless component****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Notches in edge pads	<a href="#">H05K 2201/09181</a>
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**H05K 2201/094**

Array of pads or lands differing from one another, e.g. in size, pitch or thickness; Using different connections on the pads

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Using different types of conductors	<a href="#">H05K 2201/0391</a>
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**H05K 2201/09463**

Partial lands, i.e. lands or conductive rings not completely surrounding the hole

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Plated through-holes or blind vias without lands	<a href="#">H05K 2201/09545</a>
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**H05K 2201/09472**

Recessed pad for surface mounting; Recessed electrode of component

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Recess in conductor, e.g. in pad or in metallic substrate	<a href="#">H05K 2201/09745</a>
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**H05K 2201/09481**

Via in pad; Pad over filled via

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Pads for surface mounting with via provided in pad to provide electric connections to or between printed circuits	<a href="#">H05K 1/113</a>
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**H05K 2201/0949****Pad close to a hole, not surrounding the hole****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Pads for surface mounting with pad being close to via, but not surrounding the via	<a href="#">H05K 1/114</a>
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**H05K 2201/09563****Metal filled via****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Plated through-holes or plated blind vias filled with insulating material	<a href="#">H05K 2201/0959</a>
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**H05K 2201/09572****Solder filled plated through-hole in the final product****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Lead-in-hole components for electrically connecting electric components or wires to printed circuits by soldering	<a href="#">H05K 3/3447</a>
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**H05K 2201/09609****Via grid, i.e. two-dimensional array of vias or holes in a single plane****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Interposers attached to or integrated in a printed circuit board [PCB]	<a href="#">H05K 2201/10378</a>
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**H05K 2201/09627****Special connections between adjacent vias, not for grounding vias****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Redundant conductors or connections, i.e. more than one current path between two points	<a href="#">H05K 2201/0979</a>
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**H05K 2201/09663****Divided layout, i.e. conductors divided in two or more parts****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Branched layout	<a href="#">H05K 2201/09254</a>
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**H05K 2201/09672****Superposed layout, i.e. in different planes****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Parallel layout	<a href="#">H05K 2201/09236</a>
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**H05K 2201/09754****Connector integrally incorporated in the printed circuit board [PCB] or in housing****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Non-printed connector	<a href="#">H05K 2201/10189</a>
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**H05K 2201/09772**

**Conductors directly under a component but not electrically connected to the component**

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Thermal arrangements for printed circuits using means for thermal conduction connection by printed thermal vias	<a href="#">H05K 1/0206</a>
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**H05K 2201/09809**

**Coaxial layout**

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Printed shielding conductors of printed circuits for shielding around a single via or around a group vias	<a href="#">H05K 1/0222</a>
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**H05K 2201/09827**

**Tapered, e.g. tapered hole, via or groove**

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Bevelled, chamfered or tapered edge	<a href="#">H05K 2201/09154</a>
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**H05K 2201/09872**

**Insulating conformal coating**

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Foil encapsulation, e.g. of mounted components	<a href="#">H05K 2203/1311</a>
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**H05K 2201/10234****Metallic balls****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Solder performs in the shape of solder balls	<a href="#">H05K 2203/041</a>
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**H05K 2201/10242****Metallic cylinders****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Small performs other than balls, e.g. discs, cylinders or pillars	<a href="#">H05K 2203/0415</a>
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**H05K 2201/1025****Metallic discs****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Small performs other than balls, e.g. discs, cylinders or pillars	<a href="#">H05K 2203/0415</a>
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**H05K 2201/10272****Busbars, i.e. thick metal bars mounted on the printed circuit board [PCB] as high-current conductors****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Thin metal strips as connectors or conductors	<a href="#">H05K 2201/1028</a>
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**H05K 2201/1034**

Edge terminals, i.e. separate pieces of metal attached to the edge of the printed circuit board [PCB]

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Structure of the conductor or tab	<a href="#">H05K 2201/0397</a>
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**H05K 2201/10416**

Metallic blocks or heatsinks completely inserted in a PCB

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Laminating printed circuit boards onto a metallic substrate	<a href="#">H05K 3/0061</a>
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**H05K 2201/10431**

Details of mounted components

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Printed circuits incorporating printed electric components	<a href="#">H05K 1/16</a>
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**H05K 2201/10446**

Mounted on an edge

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Edge mounted components of printed circuits by soldering, e.g. terminals	<a href="#">H05K 3/3405</a>
Edge terminals, i.e. separate pieces of metal attached to the edge of the printed circuit boards [PCB]	<a href="#">H05K 2201/1034</a>

**H05K 2201/10492****Electrically connected to another device****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Mounted components directly electrically connected to each other, i.e. not via the printed circuit board [PCB]	<a href="#">H05K 2201/1053</a>
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**H05K 2201/105****Mechanically attached to another device****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Attached components	<a href="#">H05K 2201/10537</a>
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**H05K 2201/10575****Insulating foil under component****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Permanent spacer or stand-off in a printed circuit or printed circuit assembly	<a href="#">H05K 2201/2036</a>
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**H05K 2201/10606****Permanent holder for component or auxiliary printed circuits mounted on a printed circuit board [PCB]****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Clamping a component by an element or a set of elements	<a href="#">H05K 2201/10393</a>
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**H05K 2201/10628****Leaded surface mounted device****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Surface mounted leaded components electrically connected by soldering to printed circuits	<a href="#">H05K 3/3421</a>
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**H05K 2201/10924****Leads formed from a punched metal foil****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Apparatus for manufacturing printed circuits using self-supporting metal foil pattern	<a href="#">H05K 3/202</a>
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**H05K 2201/10977****Encapsulated connections****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Secondary treatment of printed circuits by applying non-metallic protective coatings for encapsulating mounted components	<a href="#">H05K 3/284</a>
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**H05K 2201/10984****Component carrying a connection agent, e.g. solder, adhesive****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Surface leadless components having an array of bottom contacts electrically connected by soldering to printed circuits	<a href="#">H05K 3/3436</a>
Non-printed components characterised by ball grid array [BGA] or bump grid array	<a href="#">H05K 2201/10734</a>



**H05K 2201/2036****Permanent spacer or stand-off in a printed circuit or printed circuit assembly****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Pattern for applying drops or paste or applying a pattern made of drops or paste	<a href="#">H05K 2203/0545</a>
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**H05K 2201/2072****Anchoring, i.e. one structure gripping into another****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Providing micro- or nanometer scale roughness on a metal surface, e.g. by plating of nodules or dendrites	<a href="#">H05K 2203/0307</a>
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**H05K 2203/013****Inkjet printing, e.g. for printing insulating material or resist****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Conductive material of printed circuit applied to the insulating support by using printing techniques such as ink-jet printing	<a href="#">H05K 3/125</a>
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**H05K 2203/0152****Temporary metallic carrier, e.g. for transferring material****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Apparatus for manufacturing printed circuits using a pattern electroplated or electroformed on a metallic carrier	<a href="#">H05K 3/205</a>
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**H05K 2203/025****Abrading, e.g. grinding or sand blasting****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Deburring, rounding, bevelling or smoothing conductor edges	<a href="#">H05K 2203/0346</a>
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**H05K 2203/033****Punching metal foil, e.g. solder foil****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Apparatus for manufacturing printed circuits using self-supporting metal foil pattern	<a href="#">H05K 3/202</a>
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**H05K 2203/0338****Transferring metal or conductive material other than a circuit pattern, e.g. bump, solder, printed component****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Apparatus for manufacturing printed circuits by affixing prefabricated conductor pattern	<a href="#">H05K 3/20</a>
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**H05K 2203/0353****Making conductive layer thin, e.g. by etching****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Etching selective parts of metal substrate through part of its thickness, e.g. using etch resist	<a href="#">H05K 2203/0369</a>
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**H05K 2203/0392****Pretreatment of metal, e.g. before finish plating, etching****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Improvement of the adhesion between the insulating substrate and the metal of printed circuits by special treatment of the metal	<a href="#">H05K 3/382</a>
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**H05K 2203/04****Soldering or other types of metallurgic bonding****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Molten metals, e.g. casting thereof, or melting by heating and excluding molten solder	<a href="#">H05K 2203/128</a>
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**H05K 2203/041****Solder preforms in the shape of solder balls****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Surface leadless components having an array of bottom contacts electrically connected by soldering to printed circuits	<a href="#">H05K 3/3436</a>
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**H05K 2203/0542****Continuous temporary metal layer over metal pattern****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Secondary treatment of printed circuits by reinforcing the conductive pattern by the electroplating method	<a href="#">H05K 3/241</a>
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**H05K 2203/0545****Pattern for applying drops or paste; Applying a pattern made of drops or paste****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Printing techniques to apply the conductive material to the insulating substrate by using a substrate provided with a shape pattern	<a href="#">H05K 3/1258</a>
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**H05K 2203/0597****Resist applied over the edges or sides of conductors, e.g. for protection during etching or plating****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Shape or layout details	<a href="#">H05K 2201/09818</a>
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**H05K 2203/061****of previously made multilayered subassemblies****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Manufacturing multilayer circuits by laminating only or mainly similar single-sided circuit boards	<a href="#">H05K 3/4617</a>
Manufacturing multilayer circuits by laminating only or mainly similar double-sided circuit boards	<a href="#">H05K 3/462</a>

**H05K 2203/066****Transfer laminating of insulating material, e.g. resist as a whole layer, not as a pattern****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Transfer of pre-fabricated insulating pattern	<a href="#">H05K 2203/0537</a>
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**H05K 2203/0709****Catalytic ink or adhesive for electroless plating****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Plating catalyst as filler in insulating material	<a href="#">H05K 2201/0236</a>
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**H05K 2203/105****Using an electrical field; Special methods of applying an electric potential****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Electroplating, e.g. finish plating	<a href="#">H05K 2203/0723</a>
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**H05K 2203/107****Using laser light****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Manufacturing printed circuits by laser ablation of the substrate	<a href="#">H05K 3/0026</a>
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**H05K 2203/1121****Cooling, e.g. specific areas of a PCB being cooled during reflow soldering****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Cooling of mounted components of printed circuits	<a href="#">H05K 1/0203</a>
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**H05K 2203/1163****Chemical reaction, e.g. heating solder by exothermic reaction****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Oxidising metal	<a href="#">H05K 2203/0315</a>
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**H05K 2203/122****Organic non-polymeric compounds, e.g. oil, wax or thiol****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Using solvent, e.g. for cleaning or regulating solvent content of pastes or coatings for adjusting the viscosity	<a href="#">H05K 2203/0783</a>
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**H05K 2203/128****Molten metals, e.g. casting thereof, or melting by heating and excluding molten solder****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Spraying small metal particles or droplets of molten metal	<a href="#">H05K 2203/1344</a>
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**H05K 2203/1327****Moulding over PCB locally or completely****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Secondary treatment of printed circuits by applying non-metallic protective coatings for encapsulating mounted components	<a href="#">H05K 3/284</a>
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**H05K 2203/1361****Coating by immersion in coating bath****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Electrically connecting electric components or wires to printed circuits by applying molten solder	<a href="#">H05K 3/3468</a>
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**H05K 2203/1366****Spraying coating****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Apparatus for coating printed circuits using liquid non-metallic coating compositions	<a href="#">H05K 3/0091</a>
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**H05K 2203/1372****Coating by using a liquid wave****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Soldering or other types of metallurgic bonding	<a href="#">H05K 2203/04</a>
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**H05K 2203/1438****Treating holes after another process, e.g. coating holes after coating the substrate****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Metal used as mask for etching vias, e.g. by laser ablation	<a href="#">H05K 2203/0554</a>
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**H05K 2203/162****Testing a finished product, e.g. heat cycle testing of solder joints****References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Printed circuits identification means for electrical inspection or testing	<a href="#">H05K 1/0268</a>
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**H05K 2203/173**

**Adding connections between adjacent pads or conductors, e.g. for modifying or repairing**

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Programmable, customizable or modifiable circuits	<a href="#">H05K 1/0286</a>
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**H05K 2203/176**

**Removing, replacing or disconnecting component; Easily removable component**

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Thermal arrangements of printed circuits, e.g. for cooling, heating or preventing overheating	<a href="#">H05K 1/0201</a>
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**H05K 2203/302**

**Bending a rigid substrate; Breaking rigid substrates by bending**

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Rigid circuit boards or rigid supports of circuit boards locally made bendable, e.g. by removal or replacement of material	<a href="#">H05K 1/0278</a>
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