CPC field-specific training

H05K1, H05K3: Printed circuit boards
Agenda

- Introduction – Definitions
- H05K1 & H05K3 Schemes
- Relationships with other classification places
- Special rules of classification, Indexing Codes
- Example
- Conclusion
Introduction – Definitions

- **H05** Class – Electric techniques not otherwise provided for

  - **H05K1** Main Group – **Printed circuits [PCBs]**
    
    *Definition statement – This group covers:*
    Details of PCBs, use of materials for PCBs, printed elements for electrical connection to or between PCBs, printed components, structural associations (with PCBs or non-printed components).

  - **H05K3** Main Group – **Manufacturing printed circuits**
    
    *Definition statement – This group covers:*
    General processing of printed circuit boards (PCBs), e.g. of insulating or conductive layers; forming printed elements; manufacturing multilayer printed circuits; secondary treatments.
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- Introduction – Definitions
- **H05K1 & H05K3 Schemes**
- Relationships with other classification places
- Special rules of classification, Indexing Codes
- Example
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### H05K1 & H05K3 Schemes

**IPC vs. CPC**

<table>
<thead>
<tr>
<th>IPC</th>
<th>CPC</th>
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<tbody>
<tr>
<td>▪ 34 sub-groups</td>
<td>▪ 335 sub-groups (main trunk)</td>
</tr>
<tr>
<td></td>
<td>▪ 632 indexing codes</td>
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<tr>
<td>▪ classified by all patent offices</td>
<td>▪ classified by <strong>EPO classifiers</strong></td>
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<tr>
<td></td>
<td>(now also by other CPC offices)</td>
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</tbody>
</table>

> 40% of documents classified in IPC H05K1 & H05K3 are **classified in CPC**.
H05K1 & H05K3 Schemes
H05K1: Printed Circuits (main sub-groups)

H05K1/02 • Details

H05K1/16 • incorporating printed electric components, e.g. printed resistor, capacitor, inductor  ([{thick-film or thin-film circuits H01L27/01, H01L27/13}])

H05K1/18 • Printed circuits structurally associated with non-printed electric components  ([{H05K1/0201, H05K1/023, H05K1/0243}, } H05K1/16 take precedence)
H05K1 & H05K3 Schemes

H05K1: Printed Circuits (CPC sub-groups for Details)

- **H05K1/0201**
  - Thermal arrangements, e.g. for cooling, heating or preventing overheating

- **H05K1/0213**
  - Electrical arrangements not otherwise provided for (screening H05K9/00; emergency protective circuits H02H)

- **H05K1/0266**
  - Marks, test patterns, inspection means or identification means

- **H05K1/0271**
  - Arrangements for reducing stress or warp in rigid printed circuit boards, e.g. caused by loads, vibrations or differences in thermal expansion

- **H05K1/0272**
  - Adaptations for fluid transport, e.g. channels, holes

- **H05K1/0274**
  - Optical details, e.g. printed circuits comprising integral optical means (H05K1/0269 takes precedence; coupling light guides with opto-electronic components G02B6/42)

- **H05K1/0275**
  - Security details, e.g. tampering prevention or detection (security details of computer components G06F21/70)

- **H05K1/0277**
  - Bendability or stretchability details (not used, see subgroups: H06K1/038, H05K3/4891 take precedence)

- **H05K1/0284**
  - Details of three-dimensional rigid printed circuit boards (H05K1/119 takes precedence; shaping of the substrate H05K3/0014)

- **H05K1/0286**
  - Programmable, customizable or modifiable circuits (by programmable non-printed jumper connections H05K3/222)

- **H05K1/0296**
  - Conductive pattern lay-out details not covered by sub groups H05K1/02 - H05K1/0295 H05K1/11 takes precedence; lay-out adapted to mounted component configuration H05K1/18)

- **H05K1/03**
  - Use of materials for the substrate (substrates for semiconductor chips H01L23/00)

- **H05K1/09**
  - Use of materials for the metallic pattern (or other conductive pattern (materials for conductors H01B1/00))

- **H05K1/11**
  - Printed elements for providing electric connections to or between printed circuits

- **H05K1/14**
  - Structural association of two or more printed circuits (providing electric connection to or between printed circuits H05K1/11, H01R9/09, H01R23/88)
H05K1 & H05K3 Schemes

H05K3: PCB processes & manufacturing (main sub-groups 1/2)

H05K3/02 • in which the conductive material is applied to the surface of the insulating support and is thereafter removed from such areas of the surface which are not intended for current conducting or shielding

H05K3/10 • in which conductive material is applied to the insulating support in such a manner as to form the desired conductive pattern

H05K3/22 • Secondary treatment of printed circuits (H05K3/1283 takes precedence; embedding circuits in grooves by pressure H05K3/107)

H05K3/30 • Assembling printed circuits with electric components, e.g. with resistor

H05K3/36 • Assembling printed circuits with other printed circuits (H05K7/142 takes precedence)

H05K3/38 • Improvement of the adhesion between the insulating substrate and the metal (Laminates per se B32B)

H05K3/40 • Forming printed elements for providing electric connections to or between printed circuits

H05K3/44 • Manufacture insulated metal core circuits (or other insulated electrically conductive core circuits (H05K3/0058, H05K3/4641, H05K3/4608 take precedence))

H05K3/46 • Manufacturing multilayer circuits (incorporating non-printed electric components in internal layers H05K1/185)
H05K1 & H05K3 Schemes

H05K3: PCB processes & manufacturing (main sub-groups 2/2)

- **H05K3/0002**: {for manufacturing artworks for printed circuits}
- **H05K3/0005**: {for designing circuits by computer}
- **H05K3/0008**: {for aligning or positioning of tools relative to the circuit board (H05K3/4638, H05K3/4679 take precedence; for manufacturing assemblages of components H05K1J/0015)}
- **H05K3/0011**: {Working of insulating substrates or insulating layers (making copper-clad substrates H05K3/022; surface treatment for improvement of adhesion H05K3/381)}
- **H05K3/0058**: {Laminating printed circuit boards onto other substrates, e.g. metallic substrates (H05K1/0281 takes precedence)}
- **H05K3/007**: {Manufacture or processing of a substrate for a printed circuit board supported by a temporary or sacrificial carrier (H05K1/187, H05K3/20 and H05K3/4682 take precedence)}
- **H05K3/0073**: {Masks not provided for in groups H05K3/02 - H05K3/46, e.g. for photomechanical production of patterned surfaces}
- **H05K3/0085**: {Apparatus for treatments of printed circuits with liquids not provided for in groups H05K3/02 - H05K3/46; conveyors and holding means therefor (apparatus specially adapted for manufacturing assemblages of electric components, e.g. printed circuit boards, H05K13/00)}
- **H05K3/0091**: {Apparatus for coating printed circuits using liquid non-metallic coating compositions}
- **H05K3/0094**: {Filling or covering plated through-holes or blind plated vias, e.g. for masking or for mechanical reinforcement}
- **H05K3/0097**: {Processing two or more printed circuits simultaneously, e.g. made from a common substrate, or temporarily stacked circuit boards (H05K3/0052 takes precedence)}
H05K1 & H05K3 Schemes

Remarks

- Some parts of H05K1, for instance the [H05K1/16 - H05K1/188] range, also include manufacturing aspects
- H05K3/303 & H05K3/306 also include structural aspects
- Some parts of H05K3, for instance the [H05K3/386 - H05K3/389] range, ("by the use of ...") also relates to materials
Agenda

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- H05K1 & H05K3 Schemes
- Relationships with other classification places
- Special rules of classification, Indexing Codes
- Example
- Conclusion
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 (G06K19/07),
  - thin film and thick film circuits (H01L27/00),
  - other packaging levels (semiconductor packages H01L21/48, H01L23/00, H01L25/00),
  - 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, in particular to H01R (connectors), H01L (semiconductors), and the other parts of H05K.
Relationships with other classification places

**Question:**
What factors are used to determine when classification should be in H05K or in an application specific subclass, such as H04M or H04N?

When the claims describe a printed circuit board and the disclosure includes use of the PCB in a TV or mobile phone, how do you determine when to classify in H05K?

**Answer:**
When the invention consists in details (structural or manufacturing) of the printed circuit itself it is classified in H05K1 or H05K3 and their subgroups.

When the invention concerns only aspects external to the printed circuit (e.g. details of the device in which the printed circuit is used), the document is **not** classified in H05K1 or H05K3 and their subgroups.

- However, often documents (and in particular the contribution over the prior art described therein) relate to various aspects and should be classified in both places (i.e. the printed circuit groups and the device/application specific groups).

**Examples:**
H05K3 / B23K / C23F
Agenda

- Introduction – Definitions
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Special rules of classification, Indexing Codes

Special rules of classification

- Both "invention information" and "additional information" are classified by the appropriate CPC group symbol.

- **Orthogonal 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.
  - **H05K2201/00** Indexing scheme relating to printed circuits
  - **H05K2203/00** Indexing scheme relating to apparatus or processes for manufacturing printed circuits

- About **50%** of the documents classified in CPC in H05K1 or H05K3 (main trunk) also have one or more indexing codes.
Special rules of classification, Indexing Codes

H05K2201 – Overview

- H05K2201/01 Dielectrics
- H05K2201/02 Fillers; Particles; Fibers; Reinforcement materials
- H05K2201/03 Conductive materials
- H05K2201/04 Assemblies of printed circuits
- H05K2201/05 Flexible printed circuits [FPCs]
- H05K2201/06 Thermal details
- H05K2201/07 Electric details
- H05K2201/08 Magnetic details
- H05K2201/09 Shape and layout
- H05K2201/10 Details of components or other objects attached to or integrated in a printed circuit board
- H05K2201/20 Details of printed circuits not provided for in H05K2201/01 - H05K2201/10
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H05K2203/01</td>
<td>Tools for processing; Objects used during processing</td>
</tr>
<tr>
<td>H05K2203/02</td>
<td>Details related to mechanical or acoustic processing, e.g. drilling, punching, cutting, using ultrasound</td>
</tr>
<tr>
<td>H05K2203/03</td>
<td>Metal processing</td>
</tr>
<tr>
<td>H05K2203/04</td>
<td>Soldering or other types of metallurgic bonding (using molten metal H05K2203/128)</td>
</tr>
<tr>
<td>H05K2203/05</td>
<td>Patterning and lithography; Masks; Details of resist</td>
</tr>
<tr>
<td>H05K2203/06</td>
<td>Lamination</td>
</tr>
<tr>
<td>H05K2203/07</td>
<td>Treatments involving liquids, e.g. plating, rinsing</td>
</tr>
<tr>
<td>H05K2203/08</td>
<td>Treatments involving gases</td>
</tr>
<tr>
<td>H05K2203/09</td>
<td>Treatments involving charged particles</td>
</tr>
<tr>
<td>H05K2203/10</td>
<td>Using electric, magnetic and electromagnetic fields; Using laser light</td>
</tr>
<tr>
<td>H05K2203/11</td>
<td>Treatments characterised by their effect, e.g. heating, cooling, roughening</td>
</tr>
<tr>
<td>H05K2203/12</td>
<td>Using specific substances</td>
</tr>
<tr>
<td>H05K2203/13</td>
<td>Moulding and encapsulation; Deposition techniques; Protective layers</td>
</tr>
<tr>
<td>H05K2203/14</td>
<td>Related to the order of processing steps</td>
</tr>
<tr>
<td>H05K2203/15</td>
<td>Position of the PCB during processing</td>
</tr>
<tr>
<td>H05K2203/16</td>
<td>Inspection; Monitoring; Aligning</td>
</tr>
<tr>
<td>H05K2203/17</td>
<td>Post-manufacturing processes</td>
</tr>
<tr>
<td>H05K2203/30</td>
<td>Details of processes not otherwise provided for in H05K2203/01 - H05K2203/17</td>
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</table>
Special rules of classification, Indexing Codes

Special rules of classification – INV or ADD?

**Question:**
How do you decide inventive information versus additional information when classifying in H05K?

**Answer:**
As a general rule, invention-type symbols are given for the most important aspects of the document - the contribution over the prior art, the technical problem solved.

Symbols for additional information are given for aspects that are not important per se but only in combination with the inventive aspects. The combination of invention information and additional information should allow easier and faster retrieval of documents during search.

Information which is trivial even in combination with the inventive information should not be identified by ADD symbols.
Special rules of classification, Indexing Codes

Tip
Look at the CPC Definitions
(easy access in Espacenet)
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Laser processing method of multilayer flexible printed wiring board

There is provided a laser processing method of forming via holes 23 and 24 by removing processed layers including a flexible insulating base member 1, in which conformal masks 7 and 8a are provided on the surface, and an adhesive layer 12 having a higher absorbance in a wavelength area of processing laser and a lower decomposition temperature than the insulating base member 1, the method including radiating one shot of pulse light having a first energy density that can remove the insulating base member 1 by one shot without causing the deformation and penetration of a conducting film 2A, and subsequently radiating pulse light having a second energy density that is lower than the first energy density and can remove the rest of the processed layers by a predetermined number of shots without causing the deformation and penetration of the conducting film 2A.
Example: US 2013/0089658 A1

Bibliographic data: US2013089658 (A1) — 2013-04-11

- CCI (Invention information) in bold font
- CCA (Additional information) in normal font
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Supplementary information

- **CPC Scheme, Definitions, Training material**
  www.cpcinfo.org

- **Search CPC by symbol or keyword**
  worldwide.espacenet.com/classification?

- **Guide to the IPC**

- **Guide to the CPC**
  www.cooperativepatentclassification.org/publications/GuideToTheCPC.pdf
Conclusion

*Always keep in mind when classifying:*

The purpose of classification is to **retrieve easily and quickly documents** according to their technical teaching.