IPC-2221B

Generic Standard on Printed Board Design

Developed by the IPC-2221 Task Group (D-31b) of the Rigid Printed Board Committee (D-30) of IPC

Supersedes:
IPC-2221A - May 2003
IPC-2221 - February 1998

Users of this publication are encouraged to participate in the development of future revisions.

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1 SCOPE

This standard establishes the generic requirements for the design of organic printed boards and other forms of component mounting or interconnecting structures, including PC card form factors. The organic materials may be homogeneous, reinforced, or used in combination with inorganic materials; the interconnections may be single, double, or multilayered.

1.1 Purpose The requirements contained herein are intended to establish design principles and recommendations that **shall** be used in conjunction with the detailed requirements of a specific interconnecting structure sectional standard (see 1.2) to produce detailed designs intended to mount and connect components. This standard is not intended for use as a performance specification for finished printed boards nor as an acceptance document for electronic assemblies.

1.2 Documentation Hierarchy This standard identifies generic physical design principles, and is supplemented by various sectional standards that provide sharper focus on specific aspects of printed board technology. These include:

IPC-2222 Rigid organic printed board design
IPC-2223 Flexible printed board design
IPC-2225 Organic, MCM-L, printed board design
IPC-2226 High Density Interconnect (HDI) printed board design

The documents are a part of the Family of Design Documents which is identified as IPC-2220. The number IPC-2220 is for ordering purposes only and includes this standard and the four listed above.

Note: IPC-2224, a sectional design standard for PC card form factors, was cancelled by the IPC. Relevant PC form factor design information has been transferred to this revision of IPC-2221 and to IPC-2222.

1.3 Presentation All dimensions and tolerances in this standard are expressed in hard SI (metric) units and parenthetical soft imperial (inch) units. Users of this standard are expected to use metric dimensions. All dimensions greater than or equal to 0.1 mm [0.0039 in] will be expressed in millimeters and inches. All dimensions less than 0.1 mm [0.0039 in] will be expressed in micrometers and microinches.

1.3.1 Dimensional Units The following is taken from National Institute of Standards and Technology - Metric Information and Conversions: ''Beginning January 1, 2010, the European Union Council Directive 80/181/EEC (Metric Directive) allowed the use of only metric units, and prohibited the use of any other measurements for most products sold in the European Union (EU). The Metric Directive made the sole use of metric units obligatory in all aspects of life in the European Union, extending to areas such as product literature and advertising.''

Most component datasheets are provided in metric units. Many printed board designers spend a lot of time converting between imperial (inch) and SI (metric). Round-off errors, when converting units, can result in inaccuracies that result in marginal or failed designs. However, the printed board fabrication vendors often default to imperial units. Electronic Computer Aided Design (ECAD) tools accommodate both metric and imperial library components being placed on the same printed board because dimensional precision is large enough to describe most standard components accurately.

Problems arise when importing information from third party software or trying to mix units during printed board layout. For example, if a portion of the printed board design is an imported Drawing Exchange Format (.DXF) file with metric units that needs to interface with a digital portion done in imperial units, a problem can occur where the data from the two grids are mixed. Unlike importing from libraries, a conversion to printed board units is not always done when importing DXF.

While a user can convert printed board units from metric to imperial in modern day tools without problems, this should not be done too often during the design phase as repeated conversions can introduce unexpected errors. A single set of units should be used in the layout of the printed board. If imported data is in metric units, the layout portion of the process should use metric units. Once the layout is complete and verified, the designer can convert the printed board to imperial units for documentation, if necessary.

1.4 Interpretation ''**Shall**,'' the imperative form of the verb, is used throughout this standard whenever a requirement is intended to express a provision that is mandatory. Deviation from a ''**shall**'' requirement may be considered if sufficient data is supplied to justify the exception.