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Sectional Design Standard for High Density Interconnect (HDI) Printed Boards

Developed by the IPC-2221/2222 Task Group (D-31b) of the Rigid Printed Board Committee (D-30) of IPC

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

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Sectional Design Standard for High Density Interconnect (HDI) Printed Boards

1 SCOPE

This standard establishes requirements and considerations for the design of organic and inorganic high density interconnect (HDI) printed boards and structures for component mounting and interconnections.

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 IPC-2221. In addition, when the core material reflects requirements identified in the sectional standards (IPC-2222, IPC-2223, and IPC-2225), that information becomes a mandatory part of this standard.

The standard provides recommendations for signal, power, ground, and mixed distribution layers, dielectric separation, via formation and metallization requirements and other design features that are necessary for HDI substrates.

1.2 Document Hierarchy Document hierarchy **shall** be in accordance with the generic standard IPC-2221.

1.3 Presentation All dimensions and tolerances in this standard are represented in SI (metric) units with Imperial units following as a hard conversion for reference only (e.g., 0.01 cm [0.0039 in]). In instances of metric based components, dimensions in this standard are represented in SI (metric) units only to prevent an accumulation of errors in rounding with Imperial units. When using predominately metric components, IPC highly recommends doing design layout in a metric environment.

1.4 Interpretation Interpretation **shall** be in accordance with the generic standard IPC-2221.

1.5 Classification of HDI Types Classification **shall** be by category in accordance with the requirements based on end use and as stated in 1.5.1 and 1.5.2 of this standard.

1.5.1 Core Types When HDI products utilize core interconnections, the core type(s) and their materials **shall** be in accordance with IPC-2222 for rigid and IPC-2223 for flexible core interconnections. For passive or constraining core boards the materials **shall** be in accordance with IPC-2221.

1.5.2 HDI Types The design designation system of this standard recognizes the six industry approved design types (see 5.2) used in the manufacture of HDI printed boards. The designations in this section determine the HDI design type by defining the number and location of HDI layers that may or may not be combined with a substrate (core [C] or passive [P]).

For instance, an HDI printed board with two layers of HDI on one side of the core and one layer of HDI on the other side of the core would be 2 [C] 1.

The following definitions apply to all forms of HDI. Blind vias may exist in all types.

TYPE I 1 [C] 0 or 1 [C] 1 – with through vias connecting the outer layers (see 5.2.1).
TYPE II 1 [C] 0 or 1 [C] 1 – with buried vias in the core and may have through vias connecting the outer layers (see 5.2.2).
TYPE III ≥ 2 [C] ≥0 – may have buried vias in the core and may have through vias connecting the outer layers (see 5.2.3).
TYPE IV ≥ 1 [P] ≥0 – where P is a passive substrate with no electrical connection (see 5.2.4).
TYPE V Coreless constructions using layer pairs (see 5.2.5).
TYPE VI Alternate constructions (see 5.2.6).

1.6 Producibility Level When appropriate, this standard will provide three design producibility levels of features, tolerances, measurements, assembly, testing of completion or verification of the manufacturing process that reflect progressive increases in sophistication of tooling, materials or processing and, therefore progressive increases in fabrication cost. These levels are: