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

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An international standard developed by IPC

Association Connecting Electronics Industries



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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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Table of Contents

1	SCOPE	1	4.4.1	Embedded Resistors	12
1.1	Purpose	1	4.4.2	Embedded Capacitors	12
1.2	Document Hierarchy	1	4.4.3	Embedded Inductors	12
1.3	Presentation	1	4.5	HDI in Flexible Printed Boards	12
1.4	Interpretation	1	5	MECHANICAL/PHYSICAL PROPERTIES	13
1.5	Classification of HDI Types	1	5.1	HDI Feature Size	13
1.5.1	Core Types	1	5.1.1	Minimum Hole Sizes for PTH Vias	14
1.5.2	HDI Types	1	5.2	Construction Types	14
1.6	Producibility Level	1	5.2.1	HDI Type I Constructions – 1[C]0 or 1[C]1	14
1.7	Via Formation	2	5.2.2	HDI Type II Constructions – 1[C]0 or 1[C]1	15
1.8	Design Features	2	5.2.3	HDI Type III Constructions – $\geq 2[C] \geq 0$	16
2	APPLICABLE DOCUMENTS	2	5.2.4	HDI Type IV Constructions – $\geq 1 [P] \geq 0$	18
2.1	IPC	2	5.2.5	Type V Constructions (Coreless) – Using Layer Pairs	18
3	GENERAL REQUIREMENTS	3	5.2.6	Type VI Constructions	19
3.1	Terms and Definitions	3	6	ELECTRICAL PROPERTIES	19
3.1.1	Microvia	3	7	THERMAL MANAGEMENT	19
3.1.2	Capture Land (Via Top Land)	3	7.1	Thermal Management Concerns for Bump Interconnects on HDI	21
3.1.3	Target Land (Via Bottom Land)	3	7.1.1	Junction to Case Thermal Models	22
3.1.4	Stacked Microvias	3	7.2	Thermal Flow Management Through HDI Substrate	23
3.1.5	Staggered Microvias	3	8	COMPONENT AND ASSEMBLY ISSUES	25
3.1.6	Variable Depth Microvia	4	8.1	General Attachment Requirements	25
3.2	Design Tradeoffs	4	8.1.1	Flip Chip Design Considerations	25
3.3	Design Layout	4	8.2	Test Point Spacing (Electrical Test)	25
3.3.1	Design Considerations	5	9	HOLES/INTERCONNECTIONS	26
3.4	Density Evaluation	5	9.1	Microvias	26
3.4.1	Routability Prediction Methods	5	9.1.1	Microvia Formation	26
3.4.2	Design Basics	6	9.2	Via Interconnect Variations	29
3.4.3	HDI Routing Density Factors	7	9.2.1	Stacked Microvias	29
4	MATERIALS	10	9.2.2	Stacked Vias	29
4.1	Material Selection	10	9.2.3	Staggered Vias	29
4.1.1	Reinforced Material Considerations	10	9.2.4	Variable Depth Vias/Microvias	30
4.1.2	Non-Reinforced Material Considerations	10	10	GENERAL CIRCUIT FEATURE REQUIREMENTS	30
4.2	Material Description by Type	10	10.1	Conductor Characteristics	30
4.2.1	Dielectric Materials	10	10.1.1	Balanced Conductors	30
4.2.2	Materials for Conductive Paths (In-Plane or Inter-Plane)	11	10.2	Land Characteristics	30
4.2.3	Materials with Dielectric and Conductive Functionality	11	10.3	Via and Land Density	30
4.3	Copper Foil	11			
4.4	Embedded Electronic Components	12			

10.3	Trade Off Process	31
10.3.1	Wiring Factor Process	31
10.3.2	Input/Output (I/O) Variables	32
11	DOCUMENTATION	32
12	QUALITY ASSURANCE	32

Figures

Figure 1-1	Color Key	2
Figure 3-1	Microvia Definition	3
Figure 3-2	Capture and Target Land (Microvia)	3
Figure 3-3	Staggered Via	3
Figure 3-4	Staggered Microvias	3
Figure 3-5	Variable Depth Microvias	4
Figure 3-6	Feature Pitch and Feature Size Defining Channel Width	6
Figure 3-7	Feature Pitch and Conductor per Channel Combinations	7
Figure 3-8	Electromagnetic Field Effect of a Signal Conductor	8
Figure 3-9	Example of Feasibility Study of Where Components are Dispersed	9
Figure 3-10	Example Placement of Voltage and Ground Planes	9
Figure 3-11	Routing and Via Grid for BGA package (100 PIN, 0.8 mm pitch example)	10
Figure 5-1	Type I HDI Construction	15
Figure 5-2	Type II HDI Construction	15
Figure 5-3	Type III HDI Construction	16
Figure 5-4	Type III HDI Construction with Stacked Microvias	17
Figure 5-5	Type III HDI with Staggered Microvias	17
Figure 5-6	Type III HDI with Variable Depth Blind Vias ...	18
Figure 5-7	Type IV HDI Construction	18
Figure 5-8	Coreless Type V HDI Construction	19
Figure 5-9	Type VI Construction	19
Figure 7-1	HDI Thermal Path Relationships	20
Figure 7-2	Thermal Management of Chip Scale and Flip Chip Parts Mounted on HDI	21
Figure 7-3	Bump Interconnect Equivalent Model	21

Figure 7-4	Wire Bond Example	22
Figure 7-5	Approximate Thermal Model for Wire Bond	22
Figure 7-6	Flip Chip Example	22
Figure 7-7	Approximate Thermal Model for Flip Chip	23
Figure 7-8	Chip Underfill Example	23
Figure 7-9	Approximate Thermal Model for Chip Underfill	23
Figure 7-10	Thermal Paste Example	23
Figure 7-11	Approximate Thermal Model for Thermal Paste	23
Figure 7-12	Thermal Resistance	24
Figure 7-13	Parallel Resistances	24
Figure 7-14	Metallic Thermal Properties	25
Figure 8-1	Flip Chip Connection	25
Figure 9-1	Summary of the Manufacturing Processes for PIDs, Laser, and Plasma Methods of Via Generation	27
Figure 9-2	Microvia Manufacturing Processes	27
Figure 9-3	Cross-Sectional Views of Methods to Make HDI with Microvias	28
Figure 9-4	Examples of Commercially Produced PID Boards	28
Figure 9-5	HDI Boards that Employ Conductive Pastes as Vias	29
Figure 9-6	Stacked Microvias	29
Figure 9-7	Stacked Vias	29
Figure 9-8	Staggered Microvias	30
Figure 9-9	Isometric View of Staggered Vias	30
Figure 9-10	Variable Depth Vias/Microvias	30
Figure 10-1	Wiring Process Flow Chart	31

Tables

Table 3-1	PCB Design/Performance Tradeoff Checklist	4
Table 5-1	Typical Feature Sizes for HDI Construction	13
Table 5-2	Recommended Minimum Drill Hole Size	14
Table 7-1	Typical Thermal Resistance for Variable Bump Options (Triple Layer Chip)	21
Table 7-2	Typical Bump (150 μ m) Thermal Resistance Multilayer Metal Chips	21
Table 9-1	Annular Rings (Minimum)	26

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: