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ELECTRONICS INDUSTRIES®

IPC-4121

Guidelines for Selecting Core Constructions for Multilayer Printed Wiring Board Applications

Developed by the Design Guidelines for MLB Materials Task Group
(3-11c) of the Base Materials Committee (3-10) of IPC



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

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1 SCOPE

1.1 Purpose This specification defines guidelines for selecting core constructions in terms of fiberglass fabric style and configuration for use in multilayer PWB applications. Each core construction is given a registration number for ordering purposes. Every effort **shall** be made to periodically review the construction guideline and include or exclude constructions based on current data.

1.2 Recommendations This document groups the core constructions into categories based on relative nominal thickness. Within a nominal thickness category, the different core constructions are characterized in terms of resin content, dielectric thickness, glass transition temperature (T_g), availability, and cost. The core constructions are also compared for performance attributes, including machinability, dimensional stability, Z-axis expansion, measles resistance, chemical resistance, and flatness.

1.3 Clarifications

1.3.1 Resin System The guideline to registered core constructions is applicable only to laminates as referenced in the appropriate slash sheet.

Slash Sheet 1 Laminates comprised of a majority of difunctional epoxy resin with a T_g of 110°C to 150°C [230°F to 302°F] (IPC-4101/21).

Slash Sheet 2 Laminates comprised of a modified difunctional epoxy resin with a T_g range of 150°C to 200°C [302°F to 392°F] (IPC-4101/23, IPC-4101/24, and IPC-4101/26).

Slash Sheet 3 Laminates comprised of a majority of cyanate ester resin with a T_g range of 170°C to 220°C [338°F to 428°F] (IPC-4101/30).

Slash Sheet 4 Laminates comprised of a bismaleimide triazine resin with a T_g range of 170°C to 230°C [338°F to 446°F] (IPC-4101/71).

Slash Sheet 5 Laminates comprised of a majority polyimide resin with a minimum T_g of 200°C [392°F] (IPC-4101/40, IPC-4101/41, and IPC-4101/42).

1.3.2 Reinforcement The guideline to registered core constructions is applicable only to laminates comprised of woven “E” glass fabrics of plain weave as documented in IPC-4412.

1.3.2.1 Fabric Interchangeability This guideline only references glass style 2313. Glass styles 2113 and 3313 may be used as substitutes for 2313 in each construction shown.

1.3.3 Alternate Constructions For each thickness category, other possibilities for constructions may exist and be manufactured commercially. The constructions indicated in the construction selection guide have been chosen based on the consensus of industry experts (both laminate suppliers and PWB fabricators). Alternate constructions may be found that perform better than those listed in the guideline for specific applications and may be used upon agreement between user and supplier.

1.3.4 Grading System The grading system of the slash sheets are numbered 1 through 5, with each number indicating the relative performance between constructions for a particular property or characteristic. The following are the slash sheet core construction indicators.

- 1 Core constructions with the most applicable performance.
- 2 Core constructions with better than intermediate levels of performance.
- 3 Core constructions with intermediate levels of performance.
- 4 Core constructions with less than intermediate levels of performance.
- 5 Core constructions with the least applicable performance.

2 APPLICABLE DOCUMENTS

2.1 IPC¹

IPC-T-50 Terms and Definitions for Interconnecting and Packaging Electronic Circuits

IPC-4412 Specification for Finished Fabric Woven from “E” Glass for Printed Boards

IPC-4101 Specification for Base Materials for Rigid and Multilayer Printed Boards

3 TERMS AND DEFINITIONS

Terms and definitions **shall** be in accordance with IPC-T-50 and 3.1 through 3.16.

1. IPC, 2215 Sanders Road, Northbrook, IL 60062, www.ipc.org