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Specification for Base Materials for Rigid and Multilayer Printed Boards

Developed by the Laminate/Prepreg Materials Subcommittee (3-11) of
the Printed Board Base Materials Committee (3-10) of IPC

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

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Specification for Base Materials for Rigid and Multilayer Printed Boards

If a conflict occurs between the English language and translated versions of this document, the English version will take precedence.

Developed by the 3-11A IPC-4101 Task Group of the 3-10 Base Materials General Committee

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Specification for Base Materials for Rigid and Multilayer Printed Boards

1 SCOPE

This specification covers the requirements for base materials, herein referred to as laminate or prepreg, to be used primarily for rigid or multilayer printed boards for electrical and electronic circuits.

1.1 Classification The system shown below identifies clad and unclad laminate or prepreg base materials. The specification sheets serve as a cross-reference connecting the outlined callout system in this document to previously used systems.

Example for laminate base materials where this specification is referenced:

- L Material Designator (see 1.1.1)
- 25 Specification Sheet Number (see 1.1.1)
- 1500 Nominal Laminate Thickness (see 1.1.2)
- C1/C1 Metal Cladding Type and Nominal Weight/Thickness (see 1.1.3)
- A Thickness Tolerance Class (see 1.1.4)
- A Surface Quality Class (see 1.1.5)

Example for prepreg base materials where this specification is referenced:

- P Material Designator (see 1.1.1)
- 25 Specification Sheet Number (see 1.1.1)
- E7628 Reinforcement Style (see 1.1.6)
- TW Resin Content Method (see 1.1.7)
- RE Flow Parameter Method (see 1.1.7)
- VC Optional Prepreg Method (see 1.1.7)

1.1.1 Specification Sheet Description At the end of this document is a series of specification sheets. Each specification sheet outlines requirements for both laminate and prepreg for each product grade. The specification sheets are organized by a specific reinforcement type, resin system, and/or construction and are provided with a specification sheet number for ordering purposes. For convenience, the laminate and prepreg requirements for materials of the like composition are on the same specification sheet. Material Designator “L” indicates laminate material and Material Designator “P” indicates prepreg material as shown in designation examples in 1.1. When certifying to multiple specification sheets, the strongest performance requirements shall apply.

The headings for each specification sheet include reference definitions for the material, which cover the reinforcements, resin systems, flame retardants, and fillers used, as well as its other known identifications and glass transition temperature, T_g . The specific line items within the specification sheets are the requirements that material shall meet in order to be certified to this specification.

Specification sheets have no cancellation date. When no revision of IPC-4101 is called out, the latest revision of IPC-4101 shall apply. If previous revisions are used, then the specification sheet and revision shall be called out.

1.1.2 Nominal Laminate Thickness The nominal thickness is identified by four digits. For all substrates covered by this document, thicknesses may be specified or measured either over the cladding or over the dielectric (see 1.1.4 and 3.8.4.2). For metric specification, the first digit represents whole millimeters, the second represents tenths of millimeters, etc. For orders requiring Imperial units, the four digits indicate the thickness in ten-thousandths of an inch. In the example shown in 1.1, 1500 designates a laminate with thickness of 1.5 mm [0.0591 in], which would be specified as 0591 when using Imperial units.

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

1 SCOPE

This specification covers the requirements for base materials, herein referred to as laminate or prepreg, to be used primarily for rigid or multilayer printed boards for electrical and electronic circuits.

1.1 Purpose

The purpose of this standard is to classify and characterize base materials for use in rigid and multilayer boards for electronic applications. It is to be used for procurement and quality assurance activities.

1.2 Classification

CLASS 1 General Electronic Products

Includes products suitable for applications where the major requirement is function of the completed assembly.

CLASS 2 Dedicated Service Electronic Products

Includes products where continued performance and extended life is required, and for which uninterrupted service is desired but not critical. Typically, the end-use environment would not cause failures.

CLASS 3 High Performance/Harsh Environment Electronic Products

Includes products where continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-use environment may be uncommonly harsh, and the equipment **shall** function when required, such as life support or other critical systems.

1.3 Measurement Units

All dimensions and tolerances in this specification are expressed in hard SI (metric) units and bracketed soft imperial [inch] units. Users of this specification are expected to use metric dimensions. All dimensions ≥ 1 mm [0.0394 in] will be expressed in millimeters and inches. All dimensions < 1 mm [0.0394 in] will be expressed in micrometers and microinches.

1.4 Definition of Requirements The words **shall** or **shall not** are used in the text of this document wherever there is a requirement for materials, preparation, process control or acceptance.

The word "should" reflects recommendations and is used to reflect general industry practices and procedures for guidance only.

Line drawings and illustrations are depicted herein to assist in the interpretation of the written requirements of this standard. The text takes precedence over the figures.

1.5 Process Control Requirements

The primary goal of process control is to continually reduce variation in the processes, products, or services to provide products or processes meeting or exceeding User requirements. Process control tools such as IPC-9191, JESD557 or other User-approved system may be used as guidelines for implementing process control.

Manufacturers of Class 3 products **shall** develop and implement a documented process control system.

A documented process control system, if established, **shall** define process control and corrective action limits.

This may or may not be a statistical process control system. The use of "statistical process control" (SPC) is optional and should be based on factors such as design stability, lot size, production quantities, and the needs of the Manufacturer, see 4.5.

Process control methodologies **shall** be used in the planning, implementation and evaluation of the manufacturing processes used to produce soldered electrical and electronic assemblies. The philosophy, implementation strategies, tools and techniques may be applied in different sequences depending on the specific company, operation, or variable under consideration to relate process control and capability to end product requirements.

When a decision or requirement is to use a documented process control system, failure to implement process corrective action and/or the use of continually ineffective corrective actions would be grounds for disapproval of the process and associated documentation.

1.6 Order of Precedence The contract takes precedence over this standard, referenced standards and drawings.