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Specification for Flexible Base Dielectrics for Use in Flexible Printed Boards

Supersedes IPC-4202B
December 2016

An international standard developed by IPC



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Developed by the Flexible Circuits Base Materials Subcommittee (D-13)
of the Flexible Circuits Committee (D-10) of IPC

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

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Specification for Flexible Base Dielectrics for Use in Flexible Printed Boards

1 SCOPE

This standard establishes the classification system, the qualification and quality conformance requirements for flexible base dielectric materials to be used for the fabrication of flexible printed boards.

1.1 Nomenclature Designation System The system described in 1.1.1 through 1.1.2.4 identifies flexible base dielectrics.

1.1.1 Nonspecific Designation A nonspecific designation is intended for use by **designers** on master drawings to designate their material choice. At the end of this standard is a series of material specification sheets identified by specification sheet numbers. Each sheet outlines engineering and performance data for a flexible base dielectric, indicating base material type and method of reinforcement.

Example of nonspecific designation: **IPC-4202/1**, Where “1” refers to the specification sheet detailing unsupported polyimide flexible base dielectrics.

If further material specification details (such as dielectric thickness) are required, they should be highlighted in cross sectional views or notes on the master drawing.

1.1.2 Specific Designation The specific designation should be in the form shown in the following example, and is intended for use on material purchase orders by printed board manufacturers (see 6.1). The specific designation should not be used by designers on master drawings to indicate their material selection. Master drawings **shall** indicate the material design by designers on master drawings to indicate their material selection, as the designation is lengthy and requires fabricator level knowledge in making the detailed selections.

Example of specific designation:

IPC-4202/1 – E1E2

Where:

IPC-4202/1 – Nonspecific Designation (see 1.1.1), for unsupported polyimide flexible base dielectrics.

E – Base Dielectric Material Type Designation (see 1.1.2.1), specifying polyimide.

1 – Reinforcement Method Designation (see 1.1.2.2), specifying nonreinforced.

E – Reinforcement Type Designation (see 1.1.2.3), specifying nonreinforced film.

2 – Base Dielectric Material Thickness Designation (see 1.1.2.4), specifying 50 μm [1970 μin] thickness.

1.1.2.1 Base Dielectric Material Type

The type of dielectric material **shall** be designated per Table 1-1.

Table 1-1 Base Dielectric Type Designation

Designation	Base Dielectric Type
A	Polyvinyl fluoride (PVF)
B	Polyethylene Terephthalate Polyester (PET)
C	Fluorinated Ethylene-Propylene Copolymer (FEP)
D	Polytetrafluoroethylene (PTFE)
E	Polyimide
F	Aramid
G	Polyamide-imide
H	Epoxy
J	Polyetherimide
K	Polysulfone
L	Polyethylene Naphthalate (PEN)
M	Thermotropic Liquid Crystal Polymer

1.1.2.2 Reinforcement Method The reinforcement method **shall** be designated per Table 1-2.

Table 1-2 Reinforcement Method Designation

Designation	Reinforcement Method
1	Nonreinforced
2	Nonwoven reinforcement
3	Woven reinforcement
4	Combination woven and nonwoven reinforcement

1.1.2.3 Reinforcement Type The reinforcement type **shall** be designated per Table 1-3.

Table 1-3 Reinforcement Type Designation

Designation	Reinforcement Type
A	Glass
B	Polyester
C	Aramid
D	Cellulose
E	Film (nonreinforced)

Note: Combinations will use two letters separated by slash.

1.1.2.4 Base Dielectric Material Thickness The base material thickness **shall** be designated per Table 1-4.

Table 1-4 Nominal Dielectric Thickness Designation

Designator	Thickness ¹
1	25 µm [980 µin]
2	50 µm [1970 µin]
3	75 µm [2950 µin]
4	100 µm [3940 µin]
5	125 µm [4920 µin]
A	2.5 µm [100 µin]
B	5 µm [200 µin]
C	7.5 µm [300 µin]
D	10 µm [390 µin]
E	12.5 µm [490 µin]
F	15 µm [590 µin]
H	18 µm [710 µin]
J	20 µm [790 µin]
K	23 µm [910 µin]
L	38 µm [1500 µin]
X	Specified on purchase order Thicker or Thinner

¹ See 3.5.4.

1.2 Qualification The flexible base dielectric materials that meet all the requirements of this standard **shall** be qualified products (see 4.8).

1.3 Quality Conformance This standard establishes a quality conformance system for the suppliers to demonstrate the continual conformance of a flexible base dielectric material to the quality requirements of the standard. See 4.9 for quality conformance inspection requirements.

1.4 Material Characteristics The flexible materials made to this standard use established requirements to enable the material to be applied in a broad range of applications. Materials made to this standard may have characteristics that provide specific enhanced performance. Both the user and supplier should review these enhancements. These enhancements may meet or exceed the specification requirements and will be as designated in the purchasing documentation, AABUS.

1.5 New Materials The flexible base dielectrics contained in this standard represent known materials. As new or revised materials become available, they may be approved and added to this document by committee ballot as an amendment. This amendment would be independent of a full document revision, addition or change. When this occurs, the new or revised specification sheet **shall** become part of the standard. Users and material developers are encouraged to supply information on new flexible materials using the Blank Specification Sheet at end of this standard for review by the IPC Flexible Circuits Base Materials Subcommittee (D-13). Per 6.1, the specification sheet revision date **shall** be specified in the order.

1.6 Measurement Units This Standard uses International System of Units (SI) units per ASTM SI10, IEEE/ASTM SI 10, Section 3 [Imperial English equivalent units are in brackets for convenience]. The SI units used in this Standard are millimeters (mm) [in] for dimensions and dimensional tolerances, Celsius (°C) [°F] for temperature and temperature tolerances, grams (g) [oz] for weight, and lumens (lm) [footcandles] for illuminance.

1.7 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.

1.8 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. For Class 1 and 2 products, the use of “statistical process control (SPC)” **shall** be optional and should be based on factors such as design stability, lot size, production quantities, and the needs of the manufacturer. See paragraph 4.10 for the quality assurance section regarding SPC.

1.9 Order of Precedence

The contract **shall** take precedence over this Standard, referenced standards and drawings.

In the event of conflict, the following order of precedence applies:

- 1) Procurement as agreed and documented between customer and supplier.
- 2) Master drawing reflecting the customer’s detailed requirements.
- 3) When invoked by the customer or per contractual agreement, this standard.

When documents other than this standard are cited, the order of precedence **shall** be defined in the procurement documents.

The User has the opportunity to specify alternate acceptance criteria.

1.9.1 Conflict In the event of conflict between the requirements of this standard and the applicable drawing(s) and documentation, the applicable user-approved drawing(s) and documentation govern.

Some examples of documentation include the contract, purchase order, technical data package, engineering specification or performance specification. In the event of a conflict between the text of this standard and the applicable documents cited herein, the text of this standard takes precedence. In the event of conflict between the requirements of this standard and drawing(s) and documentation that has not been user approved, this standard governs.

1.9.2 Clause References When a clause in this document is referenced, its subordinate clauses apply, unless the requirement references specific subordinate clauses.

1.9.3 Appendices Appendices to this standard are not binding requirements unless separately and specifically required by this standard, the applicable contracts, assembly drawing(s), documentation or purchase orders.