IPC-6018D

Qualification and Performance Specification for High Frequency (Microwave) Printed Boards

Developed by the High Speed/High Frequency Board Performance Subcommittee (D-22) of the High Speed/High Frequency Committee (D-20) of IPC

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

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Qualification and Performance Specification for High Frequency (Microwave) Printed Boards

1 SCOPE

1.1 Scope This specification covers end product inspection and test of high frequency (microwave) printed boards for microstrip, stripline, mixed dielectric and multilayer stripline applications with or without buried/blind vias, and metal cores.

The printed board may contain embedded active or passive circuitry with distributive capacitive planes, capacitive or resistive components conforming to IPC-6017. The printed board may contain build up High Density Interconnect (HDI) layers.

1.2 Purpose The purpose of this specification is to provide requirements for qualification and performance of high frequency (microwave) printed boards.

1.3 Performance Classification and Types

1.3.1 Classifications This specification establishes acceptance criteria for the performance classification of high frequency printed boards based on customer and/or end-use requirements. Printed boards are classified by one of three general Performance Classes as defined in IPC-6011.

1.3.1.1 Requirement Deviations Requirements deviating from these heritage classifications **shall** be as agreed between user and supplier (AABUS).

1.3.1.2 Space and Military Avionics Requirement Deviations

Space and military avionics performance classification deviations are provided in the IPC-6018DS Addendum and are applicable when the addendum is specified within the procurement documentation.

1.3.2 Printed Board Type This specification will define eight types of high frequency (microwave) printed boards.

Type 1 – Single Sided

Type 2 – Double Sided

Type 3 – Homogeneous Dielectric Multilayer Construction

Type 4 – Mixed Dielectric Multilayer

Type 5 – Homogeneous Dielectric Multilayer with blind and/or buried vias

Type 6 – Mixed Dielectric Multilayer with blind and/or buried vias

Type 7 – Metal and/or composite backed printed boards, single sided or double sided

Type 8 – Multilayer metal and/or composite backed or core printed boards with or without blind and/or buried vias

1.3.3 Selection for Procurement For procurement purposes, Performance Class **shall** be specified in the procurement documentation.

The documentation **shall** provide sufficient information to the supplier so that he can fabricate the printed board and ensure that the user receives the desired product. Information that should be included in the procurement documentation is to be in accordance with IPC-2611 and IPC-2614.

The procurement documentation should specify the thermal stress test method to be used to meet the requirement of 3.6.1. Selection **shall** be from those depicted in 3.6.1.1, 3.6.1.1.1, 3.6.1.2 and 3.6.1.3. If not specified (see 6.1), the default **shall** be per Table 1-1.

During the selection process, the user should take into consideration the following when determining the appropriate thermal stress test method:

- Wave solder, selective solder, hand solder assembly processes (see 3.6.1.1 and 3.6.1.1.1)
- Conventional SnPb reflow processes (see 3.6.1.2)
- Lead-free reflow processes (see 3.6.1.3)

IPC-6016, a sectional performance specification for HDI printed boards, was canceled by the IPC. Relevant HDI conformance and acceptance criteria has been transferred to this revision of this specification.

The addition of IPC-2221 Appendix A conformance coupons (beginning with Revision B of the design standard) by the printed board manufacturer to the manufacturing panel **shall** be AABUS.

1.3.3.1 Selection (Default) The procurement documentation **shall** specify those requirements that are a result of the selection process within this specification. This includes all references to "AABUS". If the requirement selection is not made in accordance with the procurement documentation, Ordering Data (see 6.1), Customer Drawing and/or supplier control plan (SCP), then the default requirement in Table 1-1 **shall** apply.

Table 1-1 Default Requirements

Category	Default Selection
Performance Class	Class 2
Final Finish	Finish X (Electrodeposited tin lead, fused or solder coated) or alternate Finish ENIG allowed on designs (drawings) with Initial Release on or after January 01, 2021.
Minimum Starting foil	1/2 oz. For all internal and external layers except for Type 1 which **shall** start with 1 ounce. For plated HDI layers – ¼ oz. for all layers (internal or external)
Copper foil type	Electrodeposited
Hole Diameter tolerances Plated, components Plated, via only Non-plated	(±) 100µm [3,937 µin] (+) 80 µm [3150 µin], (-) no requirement, may be totally or partially plugged (±) 80 µm [3,150 µin]
Conductor Width Deviation	Class 2 deviation per 3.5.1.1
Conductor Spacing Deviation	Class 2 deviation per 3.5.1.2
Dielectric Separation	90 µm [3,543 µin] minimum per 3.2.1.1
Lateral Conductor Separation	100 µm [3,937 µin] minimum
Marking Ink	Contrasting color, nonconductive
Solder Mask	Not applied if not specified
Solderability Test	Category 2 for SnPb and Category A for Pb-free of J-STD-003, tin-lead solder per 3.3.6
Thermal Stress Test	IPC-TM-650, Method 2.6.8, Condition A per 3.6.1.1
Solder Mask Specified	Class T of IPC-SM-840 if class not specified
Test Voltage, Isolation Resistance	Per IPC-9252

1.3.3.2 Selection System Optional The following product selection identifier system is provided for clarification of the build type.

Quality Specification, the generic quality specification

Specification, the base performance specification

Type, the product type per 1.3.2

Plating process, the plating process per 1.3.4.2

Final Finish, the final finish code per 1.3.4.3

Selective Finish**,** the selective finish code adder per 1.3.4.3, enter "-"when no selective finish is required**.**

Product classification**,** the product classification per 1.3.1 or performance specification sheet

Technology Adder, the technology adder is specified in Table 1-2. Add multiple codes as required

Table 1-2 Technology Adder Examples

Technology Code	Technology
HDI	HDI build-up features
VP	Via Protection
WBP	Wire Bondable Pads
AMC	Active Metal Core
NAMC	Nonactive Metal Cores
HF	External Heat frame
EP	Embedded Passives per IPC-6017
VIP-C	Via-in-Pad Conductive Fill
VIP-N	Via-in-Pad Nonconductive Fill