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# IPC-6012A with Amendment 1

Qualification and Performance  
Specification for Rigid  
Printed Boards

**IPC-6012A  
with Amendment 1**

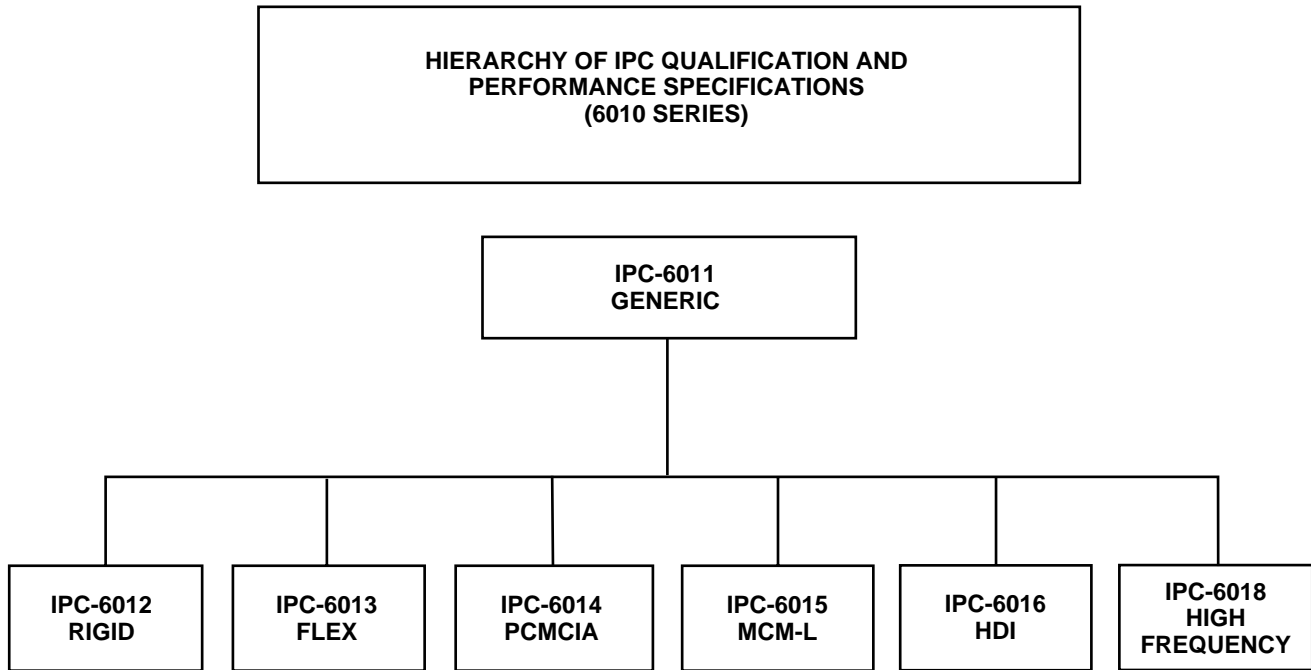
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2215 Sanders Road, Northbrook, IL 60062-6135  
Tel. 847.509.9700 Fax 847.509.9798  
[www.ipc.org](http://www.ipc.org)



#### **FOREWORD**

This specification is intended to provide information on the detailed performance criteria of rigid printed boards. It supersedes IPC-RB-276 and IPC-6012 and was developed as a revision to those documents. The information contained herein is also intended to supplement the generic requirements identified in IPC-6011. When used together, these documents should lead both manufacturer and customer to consistent terms of acceptability.

IPC's documentation strategy is to provide distinct documents that focus on specific aspects of electronic packaging issues. In this regard, document sets are used to provide the total information related to a particular electronic packaging topic. A document set is identified by a four digit number that ends in zero (0) (i.e., IPC-6010).

Included in the set is the generic information, which is contained in the first document of the set. The generic specification is supplemented by one or multiple performance documents, each of which provide a specific focus on one aspect of the topic or the technology selected.

Failure to have all information available prior to building a board may result in a conflict in terms of acceptability.

As technology changes, a performance specification will be updated, or new focus specifications will be added to the document set. The IPC invites input on the effectiveness of the documentation and encourages user response through completion of "Suggestions for Improvement" forms located at the end of each document.

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# Qualification and Performance Specification for Rigid Printed Boards

## 1 SCOPE

**1.1 Scope** This specification covers qualification and performance of rigid printed boards. The printed board may be single-sided, double-sided, with or without plated-through holes, multilayer with plated-through holes, multilayer with or without buried/blind vias, and metal core boards.

**1.2 Purpose** The purpose of this specification is to provide requirements for qualification and performance of rigid printed boards.

### 1.3 Performance Classification and Type

**1.3.1 Classification** This specification recognizes that rigid printed boards will be subject to variations in performance requirements based on end-use. The printed boards are classified by a Performance Class of 1, 2 or 3. Performance classes are defined in IPC-6011, Generic Performance Specification for Printed Boards.

**1.3.2 Board Type** Printed boards without plated-through holes (Type 1) and with plated-through holes (Types 2-6) are classified as follows:

*Type 1*—Single-Sided Board

*Type 2*—Double-Sided Board

*Type 3*—Multilayer board without blind or buried vias

*Type 4*—Multilayer board with blind and/or buried vias

*Type 5*—Multilayer metal core board without blind or buried vias

*Type 6*—Multilayer metal core board with 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 shown in IPC-D-325.

**1.3.3.1 Selection (Default)** The procurement documentation should specify the requirements that can be selected within this specification; however, in the event selections are not made in the documentation, Table 1-1 **shall** apply.

### 1.3.4 Material, Plating Process and Final Finish

**1.3.4.1 Laminate Material** Laminate material is identified by numbers and/or letters, classes, types as specified by the appropriate specification listed in the procurement documentation.

Table 1-1 Default Requirements

Category	Default Selection
Performance Class	Class 2
Material	Epoxy-Glass Laminate
Final Finish	Finish X (Electrodeposited tin-lead, fused or solder coated)
Minimum Starting Foil	1/2 oz. for all internal and external layers except Type 1 which <b>shall</b> start with 1 oz.
Copper Foil Type	Electrodeposited
Hole Diameter Tolerance Plated, components Plated, via only  Unplated	(±) 100 µm [0.0040 in] (+) 80 µm [0.0031 in], (-) no requirement, (may be totally or partially plugged) (±) 80 µm [0.0031 in]
Conductor Width tol.	Class 2 requirements per para. 3.5.1
Conductor Spacing tol.	Class 2 requirements per para. 3.5.2
Dielectric Separation	90 µm [0.0035 in] minimum
Lateral Conductor Spacing	100 µm [0.0040 in] minimum
Marking Ink	Contrasting color, nonconductive
Solder Resist	Not applied, if not specified
Solder Resist, specified	Class T of IPC-SM-840 if class not specified
Solderability Test	Category 2 of J-STD-003
Test Voltage, Insulation Resistance	40 Volts
Qualification not specified	See IPC-6011

**1.3.4.2 Plating Process** The copper plating process which is used to provide the main conductor in the holes is identified by one number as follows:

- 1 Acid copper electroplating only
- 2 Pyrophosphate copper electroplating only
- 3 Acid and/or pyrophosphate copper electroplating
- 4 Additive/electroless copper

**1.3.4.3 Final Finish** The final finish can be but is not limited to one of the finishes specified below or a combination of several platings and is dependent on assembly processes and end-use. Thickness, where required, **shall** be specified in the procurement documentation unless listed in Table 3-2. Coating thickness may be exempted in Table 3-2 (i.e., tin-lead plate or solder coating). Designators for final finish are as follows:

S	Solder Coating	(Table 3-2)
T	Electrodeposited Tin-Lead, (fused)	(Table 3-2)
X	Either Type S or T	(Table 3-2)
TLU	Electrodeposit Tin-Lead (unfused)	(Table 3-2)
G	Gold Electroplate for Edge Board Connectors	(Table 3-2)
GS	Gold Electroplate for Areas to be Soldered	(Table 3-2)
N	Nickel for Edge Board Connectors	(Table 3-2)
NB	Nickel as a Barrier to Copper-Tin Diffusion	(Table 3-2)
OSP	Organic Solderability Protector (tarnish and sol- derability protection during storage and assem- bly processes)	(Table 3-2)
C	Bare Copper	(Table 3-2)
SMOBC	Solder Mask over Bare Copper	
EN	Electroless Nickel	
EG	Electroless Gold	
IG	Immersion Gold	
IS	Immersion Silver	
IT	Immersion Tin	
TN	Tin-Nickel	
R	Rhodium	
P	Palladium	
TP	Tin Plating	
Y	Other	

## 2 APPLICABLE DOCUMENTS

The following specifications of the revision in effect at the time of order form a part of this document to the extent specified herein. If a conflict of requirements exists between IPC-6012 and the listed applicable documents, IPC-6012 **shall** take precedence.

### 2.1 IPC<sup>1</sup>

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

**IPC-DD-135** Qualification for Deposited Organic Inter-layer Dielectric Materials for Multichip Modules

**IPC-CF-148** Resin Coated Metal for Printed Boards

**IPC-CF-152** Composite Material Specifications for Printed Wiring Boards

**IPC-FC-232** Adhesive Coated Dielectric Films for Use as Cover Sheets for Flexible Printed Wiring and Flexible Bonding Films

**IPC-D-325** Documentation Requirements for Printed Boards, Assemblies, and Support Drawings

**IPC-A-600** Acceptability of Printed Boards

**IPC-AI-642** User Guideline for Automated Inspection of Artwork, Innerlayer and Unpopulated PWBs

**IPC-TM-650** Test Methods Manual<sup>2</sup>

2.1.1D 03/98 Microsectioning

2.1.1.2 07/93 Microsectioning, Semi or Automatic Technique Microsection Equipment (Alternate)

2.3.15C 08/92 Purity, Copper Foil or Plating

2.3.25B 08/97 Detection and Measurement of Ionizable Surface Contaminants

2.3.38B 08/97 Surface Organic Contaminant Detection Test

2.3.39B 08/97 Surface Organic Contaminant Identification Test (Infrared Analytical Method)

2.4.1D 08/97 Adhesion, Tape Testing

2.4.18.1 08/97 Tensile Strength and Elongation, In-House Plating

2.4.21D 08/97 Land Bond Strength, Unsupported Component Hole

2.4.22C 06/99 Bow and Twist

2.4.28.1C 03/98 Adhesion, Solder Resist (Mask), Tape Test Method

2.4.36B 08/97 Rework Simulation, Plated-Through Holes for Leaded Components

2.4.41.2 08/97 Coefficient of Thermal Expansion, Strain Gage Method

2.5.5.7 11/92 Characteristic Impedance and Time Delay of Lines on Printed Boards by TDR

2.5.7C 08/97 Dielectric Withstand Voltage, PWB

2.6.1E 08/97 Fungus Resistance, Printed Wiring Materials

2.6.3E 08/97 Moisture and Insulation Resistance, Rigid Boards

2.6.4A 08/97 Outgassing, Printed Boards

2.6.5C 08/97 Physical Shock, Multilayer Printed Wiring

1. IPC, 2215 Sanders Road, Northbrook, IL 60062-6135.

2. Current and revised IPC Test Methods are available through IPC-TM-650 subscription and on the IPC Web site ([www.ipc.org/html/testmethods.htm](http://www.ipc.org/html/testmethods.htm)).