ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES

IPC-6018

Microwave End Product Board Inspection and Test

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IPC-HF-318B**

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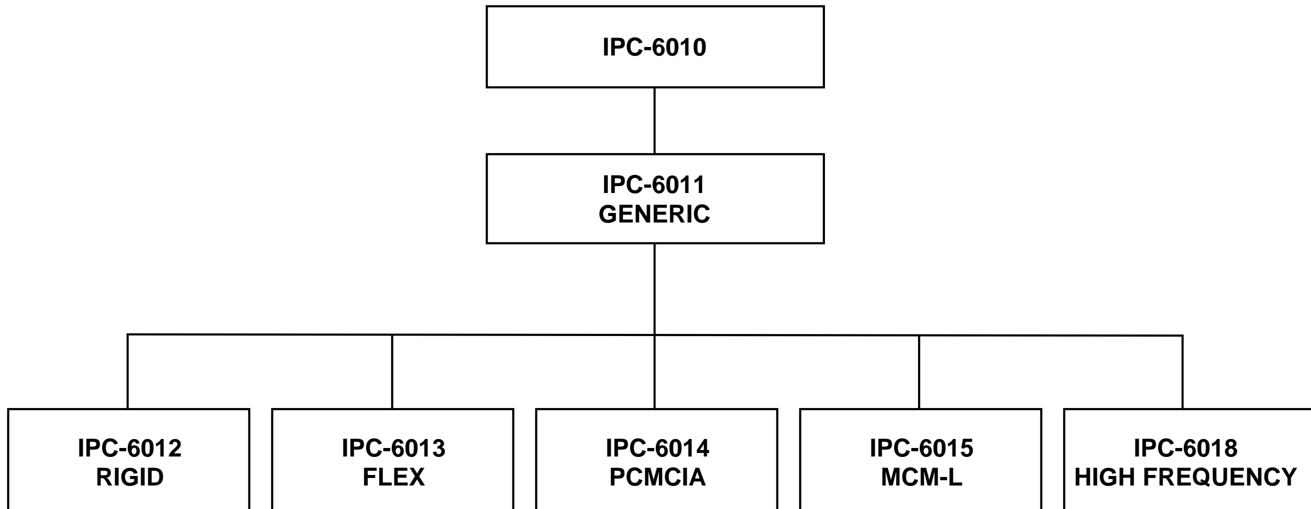

FOREWORD

This specification is intended to provide information on the detailed performance criteria of high frequency printed boards. It supersedes IPC-HF-318A and was developed as a revision to that document. 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 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.

Table of Contents

1.0 SCOPE 1
1.1 Classifications 1
1.2 Types 1
1.3 Dimensions and Tolerances 1
1.4 Master Drawing 1

2.0 APPLICABLE DOCUMENTS 1
2.1 IPC 1
2.2 Military 2
2.3 American Society of Mechanical Engineers 2
2.4 American Society for Testing and Materials 2

3.0 REQUIREMENTS 2
3.1 Terms and Definitions 2
3.2 General 2
3.2.1 Master Drawing 2
3.2.2 Production Master 3
3.3 Visual 3
3.3.1 Edges of Microwave Boards 3
3.3.2 Plated-through Hole, Visual Examination 3
3.3.3 Incoming Material 3
3.3.4 Marking 3
3.3.5 Workmanship 3
3.3.6 Repair 3
3.3.7 Rework 3
3.4 Solderability 4
3.5 Dimensional 4
3.5.1 Plating (General) 4
3.5.2 Hole Pattern Accuracy 4
3.5.3 Conductor Pattern and Edges 4
3.5.4 Undercutting 4
3.5.5 Conductor Width and Spacing 4
3.5.6 Conductive Circuitry 5
3.5.7 Laminate Defects 5
3.5.8 Registration 6
3.5.9 Annular Ring (External) 6
3.6 Mechanical 6
3.6.1 Plating Adhesion 6
3.6.2 Lap Shear 6
3.6.3 Copper 6
3.7 Construction Integrity 7
3.7.1 Plated-through Hole Integrity 7
3.7.2 Dielectric Layer Thickness 7
3.7.3 Lifted Lands 7
3.7.4 Annular Ring (Internal) 7
3.7.5 Resin Smear 7
3.7.6 Thermal Stress 8
3.8 Circuitry 8
3.8.1 Circuitry Continuity (Qualification) 8
3.8.2 Circuitry Continuity (Production) 8
3.8.3 Circuit Shorts 8
3.9 Environmental 9
3.9.1 Thermal Shock 9
3.9.2 Water Absorption 9
3.9.3 Moisture and Insulation Resistance 9
3.9.4 Ionic Cleanliness (Resistivity of Solvent Extract) 9

4.0 QUALITY ASSURANCE PROVISIONS 9
4.1 Statistical Process Control 9
4.2 Quality Conformance Evaluations 9
4.2.1 Responsibility for Inspection 9
4.2.2 Test Equipment and Inspection Facilities 9
4.2.3 Tolerances 9
4.3 Classification of Inspections 9
4.3.1 Materials Inspection 10
4.3.2 Supplier Qualification Inspection 10
4.4 Quality Conformance Inspection 10
4.4.1 Inspection of Product for Delivery 10
4.4.2 Lot Inspection (Each Production Lot) 10
4.4.3 Group B Inspection (Periodic) 13
4.4.4 Test Coupon 13
4.5 End Product Control 15
4.5.1 End Product Control Requirements 16
4.6 In Process Control 16
4.7 Process Parameter Control 16
4.7.1 Process Parameter Control Requirements 17
4.8 Reliability Assurance 18

5.0 PACKAGING 18

6.0 NOTES 18
6.1 Ordering Data 18

Figures

Figure 1 Adhesive band near exposed conductor 3
Figure 2 Conductor edge definition 4
Figure 3 Undercut and growth 4
Figure 4 External annular ring 6
Figure 5 Layer to layer registration and annular ring measurement 7
Figure 6 Location of test circuitry 14
Figure 7 Test coupon A, mm 15
Figure 8 Test coupon C, mm 15

Figure 9 Insulation resistance, coupon E, mm 16
Figure 10 Test coupon F, mm 17
Figure A-1 Zero defects graphic illustration 19

Tables

Table 1 Surface Finish Thickness 4
Table 2 Percent of Allowable Conductor Width Deviations 5
Table 3 Percent of Allowable Conductor Space Width Deviations 5
Table 4 Percent of Allowable Conductor Width Reduction Caused By Pin Holes 5
Table 5 Percent of Reduction In Dielectric Material Thickness 5
Table 6 Plated-through Hole Integrity 8
Table 7 Minimum Annular Ring (Internal) 8
Table 8 Insulation Resistance 9
Table 9 Qualification Testing... 11
Table 10 Group A Inspection.. 12
Table 11 Group B Inspection (Process Reliability) 12
Table 12 Zero Defect Sampling Plan for Equipment Classes per Lot Size 13
Table 13 Test Frequency... 15
Table A-1 Class 3 Defect Classification Criteria................. 20

Microwave End Product Board Inspection and Test

1.0 SCOPE

This specification covers end product inspection and test of high frequency (microwave) printed boards for microstrip, stripline, hybrid and multilayer stripline applications.

1.1 Classifications This specification recognizes that the printed boards will be subject to classifications by intended end item use. Toward this end, three general classes have been established to reflect progressive increases in sophistication, functional performance requirements, and testing inspection frequency. It should also be recognized that there may be an overlap of equipment between classes. The user has the responsibility to determine the class into which the product belongs. The three classes are defined below:

Class 1 — Consumer Products
Includes TV sets, toys, entertainment electronics, and non-critical consumer or industrial control devices. Boards in this class are suitable for applications where cosmetic imperfections are not of importance, and the major requirement is function of the completed circuit.

Class 2 — General Industry
Includes computers, communication equipment, sophisticated business machines, instruments, and certain non-critical applications. Boards in this class are suitable for high performance commercial and industrial products in which extended life is required, but for which uninterrupted service is not critical. Certain cosmetic imperfections are allowable.

Class 3 — High Reliability
Includes those equipment's where continued performance is critical, equipment downtime cannot be tolerated, or the equipment is a life support item. Boards of this class are suitable for applications where high levels of assurance are required, and uninterrupted service is required.

Note: Unless otherwise specified, military electronic equipment shall be Class 3. Printed boards furnished under this specification for military usage shall be fabricated by a supplier who has been qualified by inspection in accordance with 4.3.2.

Requirements in this specification have been separated so that the performance of the printed board products may be tested to any one of the three classes. The use of one class for a specific attribute does not mean that all other attributes must meet that same class. Selection should be based on minimum need; however, cross-over between classes requires complete definition of test requirements in the procurement document.

1.2 Types This specification will define four types of high frequency (microwave) boards.

Type A — Single Sided, Microstrip
Type B — Double Sided, Microstrip
Type C — Multilayer, Stripline
Type D — Hybrid / Composite

1.3 Dimensions and Tolerances All dimensions and tolerances specified herein are applicable only to the end product. Dimensions are expressed in millimeters.

1.4 Master Drawing Printed circuit boards furnished under this specification shall meet the design features detailed in IPC-D-316 / IPC-2221 and the requirements of the approved master drawing. Type D boards will comply to IPC-D-316 for the PTFE portions and IPC-2221 for the mixed dielectric portions of the Hybrid / Composite board. In the event of conflict between the design guides and the approved master drawing, the master drawing shall govern and a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Tolerances and dimensions not specified on the master drawing shall revert to those in this document.

2.0 APPLICABLE DOCUMENTS

The following documents, of the issue in effect on the date of contract agreement, form a part of this specification to the extent provided herein.

2.1 IPC[1]

IPC-A-46 Single / Double Sided Universal Phototool

IPC-A-47 10 Layer Multilayer Universal Phototool

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

IPC-PC-90 General Requirements for Implementation of Statistical Process Control

IPC-L-125 Plastic Sheet, Laminated, Metal Clad for High Speed/High Frequency Interconnections

1. The Institute for Interconnecting and Packaging Electronic Circuits, 2215 Sanders Road, Northbrook, IL 60062-6135

IPC-D-316 Design Guide for Microwave Circuit Boards

IPC-D-325 End Product Documentation for Printed Boards

IPC-A-600 Guidelines for Acceptability of Printed Boards

IPC-TM-650 Test Methods Manual

2.1.1 Microsectioning

2.1.1.2 Microsectioning—Semi or Automatic Technique Microsection Equipment (Alternate)

2.1.9 Surface Scratch Examination Metal Clad Foil

2.2.10 Hole Location and Conductor Location

2.2.11 Registration, Terminal Pads

2.3.15 Purity, Copper Foil

2.3.25 Detection of lonizable Surface Contamination (Static Method)

2.3.26 Detection of lonizable Surface Contamination (Dynamic Method)

2.3.26.1 Resistivity of Solvent Extract

2.4.1 Adhesion, Plating

2.4.18 Tensile Strength and Elongation, Copper Foil

2.6.2.1 Water Absorption, Rigid Printed wring

2.6.3 Moisture and Insulation Resistance

2.6.7 Thermal Shock and Continuity (Flexible Printed wring)

2.6.8 Thermal Stress, Plated-Through Holes

IPC-CC-830 Qualification and Performance of Electrical Insulating Compound for Printed Board Assemblies

IPC-2221 Generic Design Standard for Printed Boards

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

J-STD-003 Solderability Test Methods for Printed Wiring Board

2.2 Military[2]

MIL-C-14550 Copper Plating (Electrodeposited)

MIL-PRF-31032 Printed Wiring Board, Multilayered with Plated-Through Holes

MIL-PRF-55110 Printed Wiring Board, Rigid, General Specification for

2.3 American Society of Mechanical Engineers[3]

ANSI-Y-14.5 Dimensioning and Tolerancing

2.4 American Society for Testing and Materials[4]

ASTM-D-3165 Strength Properties of Adhesion in Shear By Tension Loading of Laminated Assemblies

3.0 REQUIREMENTS

3.1 Terms and Definitions Terms and definitions shall be in accordance with IPC-T-50, and as defined below.

White Spots Subsurface white or translucent spots occurring in woven glass PTFE at the glass knuckles after processing. This differs from measles and crazing in that the resin is not fractured.

Hybrid (Composite) Circuit Board Mixed dielectric multilayer printed circuit board.

3.2 General Printed boards furnished under this specification shall meet or exceed all the requirements of the specific class of this specification for which the order was made. Design features and coupon configuration shall be per IPC-D-316. Boards which must meet other special requirements beyond those specified in Section 3 will be as specified by the procurement document and / or the drawing.

Boards furnished under this specification shall be as specified by the master drawing. Unless otherwise specified, the finished printed circuit board shall meet the dimensional requirements specified herein, on the master drawing and in accordance with ANSI-Y-14.5. They shall be fabricated from panels that include sufficient coupons or production boards to perform the testing requirement of the class to which the boards were produced. Test coupons used to verify registration and plating integrity shall be arranged so that they are within 6-13 mm of the production board. Board apportionment to panels shall be such that coupons and location are representative of the board panel processing, and such that the location integrity of the coupons-to-board images shall be verified. Unless otherwise specified, the test coupons shall be identified by lot and/or by board serial number when the boards are serialized, and they shall be packaged with the appropriate board(s).

Boards furnished under this specification shall be processed in such a manner as to be uniform in quality and free from defects in excess of those allowed in this specification.

3.2.1 Master Drawing The master drawing shall be prepared in accordance with IPC-D-325. It shall establish the size and shape of the board, the size and location of all holes therein, and the shape or arrangement of both conductive and non-conductive patterns or elements. Any and

2. Application for copies should be addressed to Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094
3. American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017
4. American Society for Testing and Materials, 100 Barr Habor Drive, West Conshohocken, PA 19428-2959