The Institute for Interconnecting and Packaging Electronic Circuits

IPC-ML-960

Qualification and Performance Specification for Mass Laminated Panels for Multilayer Printed Boards

IPC-ML-960

July 1994

A standard developed by the Institute for Interconnecting and Packaging Electronic Circuits

2215 Sanders Road
Northbrook, Illinois
60062-6135

Tel 847 509.9700
Fax 847 509.9798
URL: http://www.ipc.org

Table of Contents

Tables

Qualification and Performance Specification for Mass Laminated Panels for Multilayer Printed Boards

1.0 SCOPE

This specification covers qualification and performance of rigid mass laminated panels for use in multilayer printed boards.

1.1 Purpose The purpose of this specification is to provide requirements for qualification and performance of rigid mass laminated panels for use in multilayer printed boards which will be fabricated for industry and government use to the requirements of IPC-RB-276. When mass laminated panels are to be used in Class 2 or Class 3 multilayer printed boards intended for military usage, they **shall** be fabricated by a mass laminator who has been qualified by the final board fabricator to the applicable requirements of IPC-RB-276. This does not apply to boards intended for non-deliverable hardware.

1.2 Classification This specification recognizes that the mass laminated panels supplied by the vendor will be used to produce multilayer printed boards which will be subject to classification by intended end use. Three general classes have been established to reflect progressive increases in sophistication, functional performance requirements and testing/inspection frequency. It should be recognized that there may be overlap of equipment categories in different classes. The user has the responsibility to specify in the contract or purchase order the performance class required for each product and **shall** indicate any exceptions to specific parameters, where appropriate.

Class 1 General Electronic Products Includes consumer products, some computer and computer peripherals, as well as general military* hardware suitable for applications where cosmetic imperfections are not important and the major requirement is function of the completed printed board.

Class 2 Dedicated Service Electronic Products Includes communications equipment, sophisticated business machines, instruments and military* equipment where high performance and extended life is required and for which uninterrupted service is desired but not critical. Certain cosmetic imperfections are allowed.

Class 3 High Reliability Electronic Products Includes the equipment for commercial and military* products where continued performance or performance on demand is critical. Equipment downtime cannot be tolerated and must function when required such as in life support items or weapon systems. Printed boards in this class are suitable for applications where high levels of assurance are required and service is essential.

***Note:** Where special military requirements exist, they will be noted in the document.

Requirements in this specification have been separated so that performance of the mass laminated panels 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 the same class. Selection should be based on minimum need; however, crossover between classes or other separation requires a complete definition of test requirements in the procurement documentation.

Note: Unless otherwise specified, military electronics **shall** be Class 3 and mass laminated panels furnished under this specification for military usage **shall** be fabricated by a mass laminator who has qualified by inspection in accordance with paragraph 4.3.

1.3 Dimensions and Tolerances All dimensions and tolerances specified herein are applicable only to the end product. Dimensions are expressed in millimeters. Inches, shown in brackets [ ], are not direct conversions in order to provide usable numbers. Users are cautioned to employ a single system and not intermix metric and inch-based equivalents. Reference information is shown in parentheses ( ).

1.3.1 Acceptability when limiting values are specified Specified limiting values of 63.5 mm [2.5 in] maximum, 63.50 mm [2.50 in] maximum, 63.500 mm [2.500 in] maximum are taken to mean that, for the purposes of determining conformance to this specification, an observed value **shall** be rounded off to the nearest 2.5 mm [0.1 in], 0.25 mm [0.01 in] and 0.025 mm [0.001 in], respectively, and then compared to the specified limiting value.

1.3.2 Rounding Convention When measurements are made to greater precision than is required by this specification, it becomes necessary to round results to a specified value in order to determine conformance. The following rounding convention **shall** be used.

The figure in the last place to be retained **shall** be kept unchanged when the figure in the next place:

- is less than 5 or,
- is 5 followed by no other figures or only by zeroes, and the figure in the last place retained is even.

The figure in the last place to be retained **shall** be increased by 1 when the figure in the next place:

- is more than 5 or,
- is 5 followed by no other figure or only by zeroes, and the figure in the last place to be retained is odd or,
- is 5, followed by any figure or figures other than zero.

The final rounded figure **shall** be obtained from the most precise value available and not from a series of successive roundings.

1.4 Statistical Process Control (SPC) This specification requires the implementation of statistical process control per the requirements of IPC-PC-90. (See para. 4.8)

1.5 Interpretation ''**shall**,'' the emphatic form of the verb, is used throughout this specification whenever a requirement is intended to express a provision that is binding. Deviation from a ''**shall**'' requirement may be considered if sufficient data is supplied to justify the exception.

The words ''should'' and ''may'' are used whenever it is necessary to express nonmandatory provisions.

''Will'' is used to express a declaration of purpose.

To assist the reader, the word ''**shall**'' is presented in bold character.

2.0 APPLICABLE DOCUMENTS

The following documents of the issue in effect on the date of issuance of this specification, form a part of this specification to the extent specified herein. Subsequent issues of, or amendments to, these documents **shall** become a part of this specification unless otherwise stated.

2.1 IPC[1]

IPC-T-50 Terms and Definitions

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

IPC-L-108 Specification for Thin Metal Clad Base Materials for Multilayer Printed Boards

IPC-L-109 Specification for Resin Impregnated Fabric (Prepreg) for Multilayer Printed Boards

IPC-L-115 Specification for Rigid Metal Clad Base Materials for Printed Boards

IPC-CF-148 Resin Coated Metal Foil for Multilayer Printed Boards

IPC-MF-150 Metal Foil for Printed Wiring Applications

IPC-D-275 Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies

IPC-RB-276 Qualification and Performance Specification for Rigid Printed Boards

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

IPC-A-600 Acceptability of Printed Boards

IPC-AI-642 Users Guidelines for Automated Inspection of Artwork, Inner Layers, and Unpopulated Printed Boards

IPC-TM-650[2] Test Methods Manual

2.4.8 Peel Strength, Metal Foil

2.4.22 Bow and Twist, Rigid Printed Wiring Materials

IPC-QL-653 Qualification for Test Laboratories for Boards

IPC-R-700 Suggested Guidelines for Modification, Rework and Repair of Printed Boards and Assemblies

IPC-SF-818 General Requirements for Electronic Soldering Fluxes

2.2 Military[3] Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

MIL-STD-202 Test Methods for Electronic and Electrical Component Parts

MIL-STD-480 Configuration Control, Engineering Changes-Deviations and Waivers

MIL-P-13949 Plastic Sheet, Laminated, Copper-Clad (For Printed Wiring)

MIL-F-14256 Flux, Soldering, Liquid (Rosin Base)

MIL-STD-45662 Calibration Systems Requirements

MIL-P-55110 Printed Wiring Boards, General Specification for

2.3 Other Publications

2.3.1 Underwriter's Laboratories (UL)[4]

UL 746E Standard Polymeric Materials, Materials Used in Printed Wiring Boards

1. IPC documents are available from IPC, 2215 Sanders Road, Northbrook, IL 60062-6135
2. For convenience, all IPC-TM-650 test methods referenced herein are reprinted at the end of this standard.
3. Military documents are available from: Standardization Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094
4. U. L. documents are available from: Underwriter's Laboratories, 333 Pfingsten Road, Northbrook, IL 60062