IPC-4811

Specification for Embedded Passive Device Resistor Materials for Rigid and Multilayer Printed Boards

Developed by the Embedded Component Materials Subcommittee (D-52) of the Embedded Components Committee (D-50) of IPC

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

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# Table of Contents

1 SCOPE .......................................................... 1
   1.1 General .................................................. 1
   1.2 Designation System ...................................... 1
   1.2.1 Resistor Passive Device Designations ............ 2
2 APPLICABLE DOCUMENTS ...................................... 2
   2.1 IPC .................................................... 3
   2.2 National Conference of Standards Laboratories (NCSL) ........................................................................ 3
   2.3 JEDEC Standards ......................................... 3
3 REQUIREMENTS .................................................. 3
   3.1 Terms and Definitions ..................................... 3
   3.1.1 AABUS (As Agreed Upon Between User and Supplier) .......................................................... 3
   3.2 Specification Sheets ....................................... 3
   3.3 Supplier’s Quality Profile ............................... 3
   3.4 Qualification (Characterization) Testing .......... 3
   3.4.1 Material Qualification .................................. 4
   3.4.1.1 Samples ................................................. 4
   3.4.1.2 Frequency ................................................. 4
   3.4.1.3 Production Board Qualification Assessment of Materials ................................................. 4
   3.5 Conformance Testing ..................................... 4
   3.5.1 Samples .................................................. 5
   3.5.2 Frequency ................................................ 5
   3.6 Verification of Supplier’s Quality System ....... 5
   3.7 Conflict ..................................................... 5
   3.8 Materials ................................................... 5
   3.8.1 Resistor Materials in Laminate-Like Form ... 5
   3.8.2 Resistor Materials in Nonlaminate-Like Form .......................................................... 6
   3.8.3 Encapsulant Materials in Nonlaminate-Like Form .......................................................... 6
   3.8.4 Conductor/Termination Materials .................. 6
   3.8.4.1 Copper Foil or Other Metal Cladding .......... 6
   3.8.4.2 Plated Copper .......................................... 6
   3.8.4.3 Conductive Paste .................................... 6
   3.8.4.4 Other Plated Metals .................................. 6
   3.9 General Acceptability .................................... 6
   3.9.1 General Acceptability of Resistor Materials .. 6
   3.9.2 General Acceptability of Conductive Paste Materials .......................................................... 6
   3.9.3 Inspection ............................................... 6
   3.9.3.1 Inspection Lot .......................................... 6
   3.9.3.2 Preparation of Samples .......................... 6
   3.9.3.3 Standard Laboratory Conditions ............... 6
   3.10 Visual Requirements .................................... 7
   3.10.1 Visual Requirements of Laminate-Like Resistor Materials .................................................. 7
   3.10.1.1 Metal Cladding Indentations .................... 7
   3.10.1.2 Scratches .............................................. 7
   3.10.1.3 Surface Finish of Foil after Curing - Except Double-Treat Foil ........................................... 7
   3.10.1.4 Wrinkles and Creases ............................ 7
   3.10.1.5 Surface and Subsurface Imperfections ...... 7
   3.10.1.5.1 Voids, Cracks or Pin Holes in the Resistive Layer .......................................................... 7
   3.10.2 Visual Requirements of Nonlaminate-Like Resistor and Associated Materials .......................... 8
   3.10.2.1 Foreign Material ..................................... 8
   3.10.2.2 Voids or Pin Holes in the Resistive Layer .... 8
   3.10.2.3 Delamination .......................................... 8
   3.11 Dimensional Requirements ............................ 8
   3.11.1 Dimensional Requirements of Laminate-Like Resistor Materials .................................................. 8
   3.11.1.1 Thickness .............................................. 8
   3.11.1.2 Metal Cladding Weight ............................ 8
   3.11.2 Dimensional Requirements of Nonlaminate-Like Resistor Materials ........................................... 8
   3.11.2.1 Thickness .............................................. 8
   3.12 Mechanical Requirements ............................. 8
   3.12.1 Mechanical Requirements of Laminate-Like Resistor Materials .................................................. 8
   3.12.1.1 Peel Strength .......................................... 8
   3.12.2 Mechanical Requirements of Nonlaminate-Like Resistor Materials ........................................... 8
   3.12.2.1 Adhesion ............................................... 8
   3.12.2.2 Viscosity .............................................. 9
   3.13 Electrical Requirements ............................... 9
   3.13.1 Electrical Requirements of Laminate-Like Resistor Materials .................................................. 9
   3.13.1.1 Sheet Resistivity .................................... 9
   3.13.1.2 Temperature Coefficient of Resistance (TCR) .......................................................... 9
   3.13.1.3 Power Density ....................................... 9
   3.13.2 Electrical Requirements of Nonlaminate-Like Resistor Materials ........................................... 9
   3.13.2.1 Sheet Resistivity .................................... 9
   3.13.2.2 Temperature Coefficient of Resistance (TCR) .......................................................... 9
3.13.2.3 Power Density ................................................. 9
3.13.2.4 Conductivity of Conductor Paste ............... 9
3.14 Environmental Requirements .......................... 9
3.14.1 Environmental Requirements of Laminate-
Like Resistor Materials ................................... 9
3.14.1.1 Moisture Resistance by Pressure Vessel Test (Optional) ................................................. 9
3.14.1.2 Temperature and Humidity Aging ............ 10
3.14.1.3 Thermal Stress (Solder Float) .................. 10
3.14.1.4 Thermal Shock .............................................. 10
3.14.2 Environmental Requirements of Nonlaminate-
Like Resistor Materials ........................................ 10
3.14.2.1 Moisture Resistance by Pressure Vessel Test (Optional) ................................................. 10
3.14.2.2 Temperature and Humidity Aging ............ 10
3.14.2.3 Thermal Stress (Solder Float) .................. 10
3.14.2.4 Thermal Shock .............................................. 10
3.15 Workmanship ................................................. 11
3.16 Material Safety Data Sheets .......................... 11
3.17 Shelf Life ....................................................... 11
3.18 Marking ......................................................... 11
4 QUALITY ASSURANCE PROVISIONS ................. 11
4.1 Quality System .............................................. 11
4.2 Responsibility for Inspection ...................... 11
4.2.1 Test Equipment and Inspection Facilities .... 11
4.2.2 Standard Laboratory Conditions .............. 11
4.3 Qualification (Characterization) Testing ....... 11
4.3.1 Samples ......................................................... 11
4.3.2 Structurally Similar Construction ............. 11
4.4 Quality Conformance Inspection ................. 11
4.4.1 Frequency ...................................................... 11
4.4.2 Inspection of Product for Delivery .......... 12
4.4.3 Acceptance Criteria ....................................... 12
4.4.4 Rejected Lots ................................................ 12
4.5 Statistical Process Control (SPC) ................. 12
5 PREPARATION FOR DELIVERY ...................... 12
5.1 Packaging ...................................................... 12
6 NOTES ........................................................ 12
6.1 Ordering Data ................................................ 12
6.2 Electrostatic Discharge (ESD) Testing ............ 12
6.3 Short Time Overload .................................... 12
7 REFERENCES .................................................. 13
Specification Sheets for Embedded Passive Device Materials .......................... 14

Figures
Figure 1-1A Embedded Passive Resistor Saves Valuable Surface Real Estate .......................................... 1
Figure 1-1B Embedded Resistor (R) Defined by Number of Squares = [Length (L) / Width (W)] ............ 1

Tables
Table 1-1 Sample Resistor Passive Device Designation .. 2
Table 3-1 Testing Requirements for Laminate-Like Resistor Materials ........................................ 4
Table 3-2 Testing Requirements for Nonlaminate-Like Materials .................................................. 5
Table 3-3 Point Value System for Metal Indentations .... 7
1 SCOPE

This document describes materials that can be used for the fabrication of embedded resistor devices within the finished printed circuit board substrate. It provides information on general classifications and associated characteristics of embedded passive device (EPD) materials. This document shall be used as a qualification and conformance standard for designers and users when designing or constructing printed circuit boards containing EPD materials. For this document, embedded passive devices and the phrase embedded passives are considered to be equivalent.

This document contains embedded resistor material designation, conformance (requirements), qualification (characterization) and quality assurance specifications. IPC-4811 should be used in conjunction with IPC-2000 series design standards and IPC-6010 series qualification and performance standards.

Embedded capacitor material designation, conformance (requirements), qualification (characterization) and quality assurance specifications are contained in IPC-4821.

1.1 General

This document covers the requirements for resistive materials that are used with conventional core materials for the manufacture of printed circuit boards containing embedded resistor functionality. Figures 1-1a & b show representations of how embedded resistors may appear in a PWB. The embedded resistor material spans the opening between conductors. The opening between conductors may actually be any shape. Figures 1-1a & b show a rectangular shape to the resistor material but other shapes are common such as serpentine, top-hat, and annular.

Embedded passive materials have advantages over typical leaded and surface mount passives such as:

- Embedded passives are used to enhance high speed, high frequency performance.
- Embedded passives are used to increase circuit density and simplify design of circuitry features such as decoupling capacitance and terminating resistors.
- Embedded passives are used to simplify assembly by mounting fewer components, thereby increasing functionality and/or reducing total board area.

1.2 Designation System

The following system identifies materials used for EPD resistor structures. This is a general identification system and does not in any way imply that all the permutations of properties and forms exist. See the series of specification sheets at the end of this document

for the specific materials available. Each specification sheet outlines engineering and performance data for materials that can be used to manufacture printed boards incorporating EPD resistor materials. These materials include thin film resistor layers supplied as laminate, material applied to conductor foil, high and low viscosity pastes, and plating