ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES

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.

Contact:

IPC
3000 Lakeside Drive, Suite 309S
Bannockburn, Illinois
60015-1249
Tel 847 615.7100
Fax 847 615.7105

Table of Contents

Figures

Tables

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

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

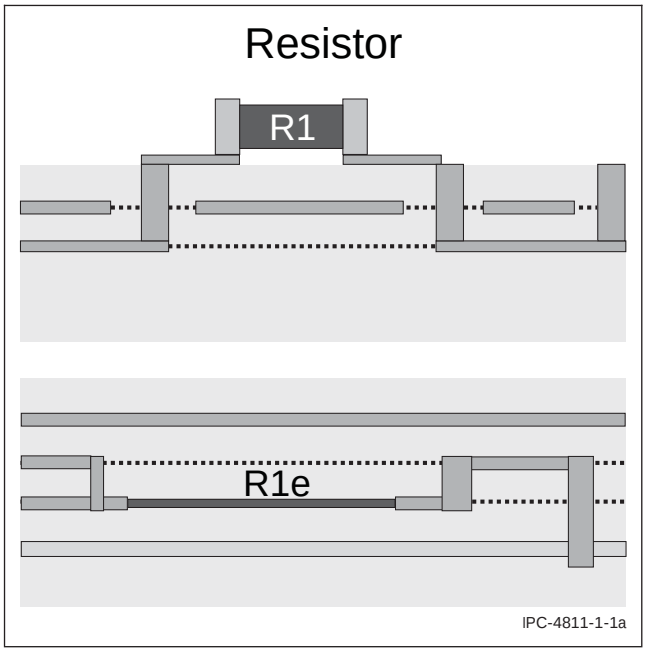

Figure 1-1A Embedded Passive Resistor Saves Valuable Surface Real Estate

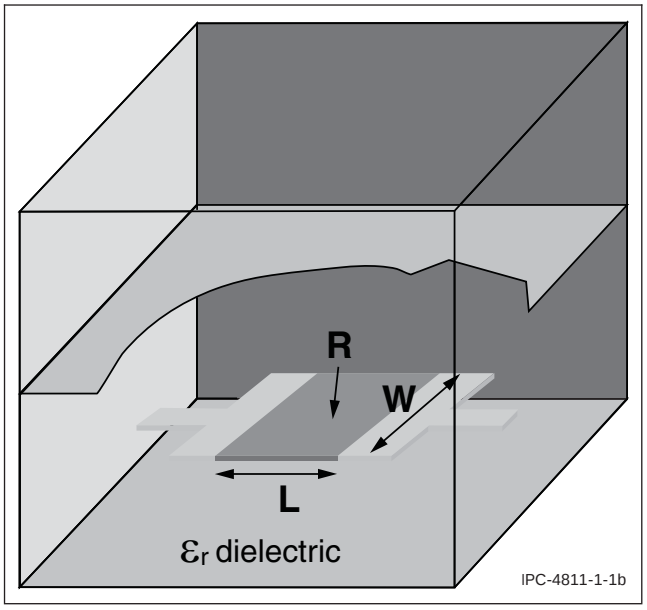

Figure 1-1B Embedded Resistor (R) Defined by Number of Squares = [Length (L) / Width (W)]