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Specification for High Density Interconnect (HDI) and Microvia Materials

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A standard developed by IPC and JPCA

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1 SCOPE

This document describes various materials that can be used for the fabrication of high density interconnection (HDI) and microvias. It provides information on general classifications and associated characteristics of HDI materials. The document **shall** be used as a qualification and conformance standard for designers and users when designing or constructing HDI and microvias.

This document contains material designation, conformance (requirements), qualification (characterization), and quality assurance requirements. IPC-4104 should be used in conjunction with IPC-2315 and IPC-6016.

1.1 General This document covers the requirements for dielectric and conductive materials that are used with conventional core materials for the manufacture of HDI. The added HDI layer(s) is ≤0.15 mm in thickness.

A microvia substrate contains reduced geometries. The microvia is used to reduce size and weight and enhance electrical performance. Its nature also allows innovation in three-dimensional packaging. A microvia substrate represents the combination of multichip modules (MCM) and conventional PCB manufacturing technologies (see Figure 1-1).

Microvias are the PCB technology solution in the form of blind and buried vias ≤0.15 mm in diameter and pad diameters ≤0.35 mm. These vias are the central characteristic of HDI, as shown in Figure 1-2.

1.2 Designation System The system in 1.2.1 through 1.2.3 identifies materials used for HDI 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 HDI. These materials include dielectric insulators, conductors, and dielectric/conductor combinations. The specification sheets are provided with letters and numbers for identification and ordering purposes. For example, a user wishing to order from specification sheet 1 would substitute the number ''1'' for the ''S'' in the designation examples (i.e., IPC-4104/1) shown in 1.2.1 through 1.2.3. To start the ordering process, one can use the specification sheets in this document in combination with relevant IPC documents for each material sets (i.e., IPC-CF-148, IPC-MF-150, or IPC-4101).

The materials contained in this standard represent general material categories. As new materials become available, they will be added to future revisions. Users and material developers are encouraged to supply information on new materials for review by the IPC Microvia/High Density Interconnect Materials Subcommittee (D-42). Users who wish to invoke this specification for materials not listed **shall** list a zero for the specification sheet number (IPC-4104/0).

The committee may approve new or revised specification sheets independent from revision of the document text. When this occurs, the new or revised specification sheet **shall** be printed and made available through IPC-4104. The effective date of the new or revised specification sheet **shall** be clearly indicated on the individual sheet. Specification sheets **shall** be transferred from IPC-4104 to the appropriate parent document whenever that document is revised.

The designation system recognizes three general material types used in manufacturing HDI:

- Dielectric insulators only
- Conductors only
- Combinations of conductors and insulators

The first level of the designations system is the material type.

Level 1 Material Type
IN = Dielectric Insulator
CD = Conductor
CI = Conductor and Insulator

The other levels used to designate a particular material depend upon Level 1. Table 1-1, Table 1-2, and Table 1-3 illustrate the designation system for each of the material types. The designation listed in the specification sheets can be used to determine the exact material construction by first looking at the Level 1 designation (IN, CD, or CI) and then looking in the correct section (1.2.1, 1.2.2. or 1.2.3) for that material type. These sections contain the description of the remaining designation levels with an example table to aid in deciphering the designation.

The default designations are non-photoimageable and unreinforced. They will not be used as descriptors for simplicity (see Table 1-1, Table 1-2, and Table 1-3).