



# **IPC-1601** **2010**

## **Printed Board Handling and Storage Guidelines**

August 2010

*A standard developed by IPC*

*Association Connecting Electronics Industries*



**The Principles of Standardization**

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**Standards Should:**

- Show relationship to Design for Manufacturability (DFM) and Design for the Environment (DFE)
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

**Standards Should Not:**

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended with data

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IPC-1601

# Printed Board Handling and Storage Guidelines

Developed by the Board Storage and Handling Subcommittee (D-35)  
within the Rigid Printed Board Committee (D-30) of IPC

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

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## Acknowledgment

Any document involving a complex technology draws material from a vast number of sources. While the principal members of the Board Storage and Handling Subcommittee (D-35) of the Rigid Printed Board Committee (D-30) are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

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# PRINTED BOARD HANDLING AND STORAGE GUIDELINES

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## 1 INTRODUCTION

**1.1 Background** Historically, the printed board industry has relied on military specifications and guidelines to define packaging methods to preserve the quality and reliability of printed boards during shipment and storage. However, many of these documents are obsolete, incomplete, do not address lead-free assembly processes, or do not cover newer laminates or final finishes. Additionally, the proliferation of alternative final finishes has produced concerns and requirements for printed board packaging and handling to preserve the finish and assure good solderability.

**1.2 Scope** This document provides suggestions for proper handling, packaging materials and methods, environmental conditions, and storage for printed boards. These guidelines are intended to protect printed boards from contamination, physical damage, solderability degradation, electrostatic discharge (ESD) (when necessary), and moisture uptake. Moisture absorbed in printed board laminates expands at soldering temperatures, and in some cases, the resulting vapor pressure can cause internal delamination or excessive strain on plated-hole walls and other structures. This is especially challenging with the higher temperatures used for lead-free soldering.

This document covers all phases from the manufacture of the bare printed board, through delivery, receiving, stocking, assembly, and soldering. As a guideline, this information is to be used with, and is secondary to, the established requirements in such documents as the IPC-4550 series for alternate final finishes.

**1.3 Application** The target audience includes those involved in all phases of printed board design, manufacture, assembly, shipping, storage, and possible warranty activities. Information herein has been supplied by all of these functions, as well as the material and equipment suppliers.

**1.4 Terms and Definitions** The definition of all terms used herein shall be as specified in IPC-T-50 and as defined in 1.4.1 through 1.4.6.

**1.4.1 Humidity Indicator Card (HIC)** A card on which a moisture-sensitive chemical is applied such that it will make a significant, perceptible change in color (hue), typically from blue (dry) to pink (wet) when the indicated relative humidity is exceeded. The HIC is packed inside the moisture-barrier bag (MBB), along with a desiccant, to aid in determining the level of moisture to which the moisture-sensitive devices or printed boards have been subjected.

**1.4.2 Moisture Barrier Bag (MBB)** A bag designed to restrict the transmission of water vapor and used to pack moisture sensitive devices. An MBB is made of material with a low WVTR (see 4.2.1).

**1.4.3 Subcomposite** In sequential lamination, a structure composed of more than two layers that have been laminated together, and which will subsequently be laminated with other layers into a complete printed board.

**1.4.4 Water Vapor Transmission Rate (WVTR)** A measure of the permeability of plastic film or metallized plastic film material to moisture, an important rating for moisture barrier bags (MBBs).

**1.4.5 Sulfur Free** Chemicals that are unlikely to express corrosive sulfur compounds like H<sub>2</sub>S or SO<sub>2</sub>.

**1.4.6 Dry Packaging** Packaging that consists of desiccant material and a Humidity Indicator Card (HIC) sealed with the printed boards inside a Moisture Barrier Bag (MBB) (See 4.3.1).

## 2 APPLICABLE DOCUMENTS

### 2.1 IPC<sup>1</sup>

**IPC-HDBK-001** Handbook and Guide to Supplement J-STD-001

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

**IPC-A-311** Process Controls for Phototool Generation and Use

**IPC-TR-585** Time, Temperature and Humidity Stress of Final Board Finish Solderability