



**IPC-1602A**

# **Standard for Printed Board Handling and Storage**

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

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# IPC-1602A Standard for Printed Board Handling and Storage

## 1 SCOPE

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 Pb-free assembly processes or do not cover newer laminates or final finishes.

**1.1 Purpose** This standard provides requirements and recommendations for proper handling, packaging materials and methods, environmental conditions and storage for printed boards. The requirements and recommendations 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 Pb-free soldering.

This standard provides control measures to prevent uptake of excess moisture prior to soldering, including:

- Process controls during printed board fabrication.
- Dry packaging of finished printed boards for shipment and storage.
- Process controls whenever printed boards are removed from dry packaging, for example before assembly and soldering.

These measures are intended to prevent the need to remove moisture by baking. Along with increasing cost and cycle time, baking increases risks for solderability degradation and handling damage.

Unlike standards that apply to moisture-sensitive microcircuits and other electronic components (e.g., IPC-J-STD-020, IPC-J-STD-033, IPC-J-STD-075), this standard does not include requirements for Moisture Sensitivity Level testing or characterization, floor life or moisture removal by baking. Characterizing or testing moisture sensitivity for a particular printed board design is often impractical because boards differ in many important respects from moisture-sensitive components. A printed board's rate of moisture uptake and sensitivity to moisture damage varies with the board thickness, distribution of copper features, the materials of construction and other features particular to the board design. In addition, printed board designs are usually unique to a particular user and used in much lower quantities than the components that are assembled to them.

**Note:** This document covers all phases from the manufacture of the bare printed board, through delivery, receiving, stocking, assembly and soldering.

**1.2 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 for all of these functions.

**1.3 Measurement Units** All dimensions and tolerances in this specification are expressed in hard SI (metric) units and bracketed soft imperial [inch] units. Users of this specification are expected to use metric dimensions. All dimensions  $\geq 1$  mm [0.0394 in] will be expressed in millimeters and inches. All dimensions  $< 1$  mm [0.0394 in] will be expressed in micrometers and microinches.

**1.4 Definition of Requirements** The words **shall** or **shall not** are used in the text of this document wherever there is a requirement for materials, preparation, process control or acceptance.

The word "should" reflects recommendations and is used to reflect general industry practices and procedures for guidance only.

Line drawings and illustrations are depicted herein to assist in the interpretation of the written requirements of this standard. The text takes precedence over the figures.

**1.5 Process Control Requirements** The primary goal of process control is to continually reduce variation in the processes, products, or services to provide products or processes meeting or exceeding user requirements. Process control tools such as IPC-9191 or other user-approved system may be used as guidelines for implementing process control.

A documented process control system, if established, **shall** define process control and corrective action limits.

This may or may not be a statistical process control system. The use of "statistical process control" (SPC) is optional and should be based on factors such as design stability, lot size, production quantities and the needs of the Manufacturer.