



IPC-6011A

Generic Performance Specification for Printed Boards

Developed by the Performance Standards Subcommittee (D-33)
of the Rigid Printed Board Committee (D-30) of IPC

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1 SCOPE

This specification establishes the generic requirements for printed boards associated with the IPC-601X series of performance specifications and their quality and reliability assurance requirements.

1.1 Purpose The intent of this specification is to allow the printed board user and supplier flexibility to develop optimum procedures for the procurement and manufacture of printed boards.

1.2 Performance Classification This standard recognizes that electrical and electronic products are subject to classifications by intended end-item use. Three general end-product classes have been established to reflect differences in producibility, complexity, functional performance requirements, and verification (inspection/test) frequency. It should be recognized that there may be overlaps of product between classes.

The user is responsible for defining the product class. The procurement documentation package **shall** state the product class and any exceptions to specific parameters, where appropriate.

Criteria defined in this document reflect three classes, which are as follows:

Class 1 General Electronic Products – Includes products suitable for applications where the major requirement is function of the completed assembly.

Class 2 Dedicated Service Electronic Products – Includes products where continued performance and extended life is required, and for which uninterrupted service is desired but not critical. Typically, the end-use environment would not cause failures.

Class 3 High Performance/Harsh Environment Electronic Products – Includes products where continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-use environment may be uncommonly harsh, and the equipment must function when required, such as life support or other critical systems.

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 greater than or equal to 1.0 mm [0.0394 in] will be expressed in millimeters and inches. All dimensions less than 1.0 mm [0.0394 in] will be expressed in micrometers and microinches.

1.3.1 Acceptability When Limiting Values Are Specified Specified limiting values of 63.5 mm maximum, 63.50 mm maximum, and 63.500 mm maximum are taken to mean that, for the purposes of determining conformance to this specification, an observed value **shall** be rounded off to the nearest 0.1 mm, 0.01 mm, 0.001 mm if metric units are used [to the nearest 0.1 inch, 0.01 inch, 0.001 inch if imperial units are used] and compared to the specified limiting value. Rounding applies to both maximum and minimum values.

1.3.2 Rounding Convention When a figure is to be rounded to fewer digits than the total number available, the procedure **shall** be as follows:

- a) When the first digit discarded is less than 5, the last digit retained should not be changed. For example, 3.4634, if rounded to 4 digits would be 3.463; if rounded to three digits, 3.46.
- b) When the first digit discarded is greater than 5, or if it is a 5 followed by at least one digit other than 0, the last digit retained should be increased by one unit. For example, 8.37652, if rounded to four digits would be 8.377; if rounded to three digits, 8.38.
- c) When the first digit to be discarded is exactly 5, followed only by zeros, the last digit retained should be rounded upward if it is an odd number, but no adjustment made if it is an even number. For example, 4.365, when rounded to three digits, becomes 4.36. The number 4.355 would also round to the same value 4.36, if rounded to three digits.

The final rounded figure **shall** be obtained from the most precise value available and not from a series of successive roundings.

1.3.3 Metric to Soft Imperial Conversion When converting dimensions from metric to imperial, the imperial conversion may be rounded due to measurement equipment accuracy limitations as follows:

- a) When converting metric numbers greater than 1.0 mm, the imperial number may be rounded to the nearest thousandth of an inch (0.001 in).
- b) When converting metric numbers less than 1.0 mm, the imperial number may be rounded to the nearest hundred microinches (100 μ in).