

IPC J-STD-001D

Amendment 1

April 2008

JOINT INDUSTRY STANDARD

Requirements for Soldered Electrical and Electronic Assemblies

Amendment 1



The Principles of Standardization

In May 1995 the IPC's Technical Activities Executive Committee (TAEC) adopted Principles of Standardization as a guiding principle of IPC's standardization efforts.

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

Notice

IPC Standards and Publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for his particular need. Existence of such Standards and Publications shall not in any respect preclude any member or nonmember of IPC from manufacturing or selling products not conforming to such Standards and Publication, nor shall the existence of such Standards and Publications preclude their voluntary use by those other than IPC members, whether the standard is to be used either domestically or internationally.

Recommended Standards and Publications are adopted by IPC without regard to whether their adoption may involve patents on articles, materials, or processes. By such action, IPC does not assume any liability to any patent owner, nor do they assume any obligation whatever to parties adopting the Recommended Standard or Publication. Users are also wholly responsible for protecting themselves against all claims of liabilities for patent infringement.

IPC Position Statement on Specification Revision Change

It is the position of IPC's Technical Activities Executive Committee that the use and implementation of IPC publications is voluntary and is part of a relationship entered into by customer and supplier. When an IPC publication is updated and a new revision is published, it is the opinion of the TAEC that the use of the new revision as part of an existing relationship is not automatic unless required by the contract. The TAEC recommends the use of the latest revision. Adopted October 6, 1998

Why is there a charge for this document?

Your purchase of this document contributes to the ongoing development of new and updated industry standards and publications. Standards allow manufacturers, customers, and suppliers to understand one another better. Standards allow manufacturers greater efficiencies when they can set up their processes to meet industry standards, allowing them to offer their customers lower costs.

IPC spends hundreds of thousands of dollars annually to support IPC's volunteers in the standards and publications development process. There are many rounds of drafts sent out for review and the committees spend hundreds of hours in review and development. IPC's staff attends and participates in committee activities, typesets and circulates document drafts, and follows all necessary procedures to qualify for ANSI approval.

IPC's membership dues have been kept low to allow as many companies as possible to participate. Therefore, the standards and publications revenue is necessary to complement dues revenue. The price schedule offers a 50% discount to IPC members. If your company buys IPC standards and publications, why not take advantage of this and the many other benefits of IPC membership as well? For more information on membership in IPC, please visit www.ipc.org or call 847/597-2872.

Thank you for your continued support.

9.1.5 Land/Conductor Reduction in Size The minimum width of printed conductors or width/length of lands **shall not**¹ be reduced by more than 20% for Class 2 and 3 and 30% for Class 1 (see IPC-A-600, IPC-6011 and IPC-6012).

(1) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.6 Flexible Circuitry Delamination Separation or bubbles **shall not**² bridge conductors in the cover layer of flexible printed circuit boards or assemblies.

(2) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.7 Flexible Circuitry Damage There **shall not**³ be evidence of blistering, charring, or melting of the insulation on flexible printed circuit boards or assemblies.

(3) Class 1-Defect
Class 2-Defect
Class 3-Defect

Note: Mechanically created indentations caused by contact between the coverlayer of flexible printed circuit boards or assemblies and molten solder are not rejectable. Additionally, care should be taken to avoid bending or flexing conductors during inspection.

9.1.8 Burns Burns **shall not**⁴ physically damage the surface of the assembly.

(4) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.9 Solder on Gold Contacts Solder **shall not**⁵ be in the contact area of gold edge connector contact lands (i.e., “gold fingers”).

(5) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.10 Measles Measling is acceptable for Class 1, 2 and 3 end printed board assemblies. Measled areas in laminate substrates exceeding 50% of the spacing between non-common conductors are a process indicator for Class 3 printed board assemblies.

Note: Measling is an internal condition which may not propagate under thermal stress and has not been conclusively shown to be a catalyst for CAF growth. Delamination is an internal condition which may propagate under thermal stress and may be a catalyst for CAF growth. The IPC-9691 user's guide for CAF resistance testing and IPC-TM-650, Method 2.6.25, provide additional information for determining laminate performance regarding CAF growth. Users who wish to incorporate additional criteria for measles conditions may consider incorporating the provisions of the Performance Specification Sheet for Space and Military Electronics in IPC-6012B.

9.2 Marking Assembly identification such as part numbers and serial numbers **shall**⁶ remain legible (capable of being read and understood) after all tests, cleaning and other processes to which the item is subjected. Additional markings (such as labels added during the manufacturing process) should not obscure the original supplier's markings. Individual component markings, reference designators and polarity indicators should remain legible and components should be mounted in such a manner that markings are visible.

(6) Class 1-Not Est
Class 2-Defect
Class 3-Defect

9.3 Bow and Twist (Warpage) Bow and twist after soldering should not exceed 1.5% for through-hole, or 0.75% for surface mount printed board applications (see IPC-TM-650, 2.4.22). Bow and twist **shall not**⁷ cause damage during post solder assembly operations or use.

(7) Class 1-Defect
Class 2-Defect
Class 3-Defect

10 COATING AND ENCAPSULATION

When coating or encapsulation materials are applied to glass body components, the components **shall**⁸ be sleeved to prevent cracking, unless the material has been selected so as not to damage the components/assembly in its service environment.

(8) Class 1-Defect
Class 2-Defect
Class 3-Defect

10.1 Conformal Coating Conformal coating material **shall**⁹ conform to the material specification (IPC-CC-830 or equivalent). The coating manufacturers supplier's instructions or other documented process **shall**⁹ be followed.

When curing conditions (temperature, time, Infra Red (I.R.) intensity, etc.) vary from supplier recommended instructions, they **shall**⁹ be documented and available for review.

The material **shall**⁹ be used within the time period specified (both shelf life and pot life) or used within the time period indicated by a documented system the manufacturer (assembler) has established to mark and control age-dated material.

(9) Class 1-Defect
Class 2-Defect
Class 3-Defect

10.1.1 Application Coating **shall**¹⁰ be applied in a continuous manner to all areas designated for coverage on the assembly drawing/documentation.

The coating fillets should be kept to a minimum. When used, masking materials **shall**¹⁰ have no deleterious effect and **shall**¹⁰ be removable without leaving contaminant residue.

Dimensions of masked areas **shall not**¹⁰ be decreased in length, width, or diameter by more than 0.75 mm [0.0295 in] by application of conformal coating.

(10) Class 1-Defect
Class 2-Defect
Class 3-Defect

10.1.1.1 Components Required to be Uncoated The adjustable portion of adjustable components, as well as electrical and mechanical mating surfaces such as connector contacts, probe points, screw threads, bearing surfaces (e.g., card guides) **shall**¹¹ be left uncoated as specified on the assembly drawing(s)/documentation.

(11) Class 1-Defect
Class 2-Defect
Class 3-Defect

10.1.1.2 Conformal Coating on Connectors Mating connector surfaces of printed circuit assemblies **shall not**¹² be coated with conformal coating.

(12) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.5 Land/Conductor Reduction in Size The minimum width of printed conductors or width/length of lands **shall not**¹ be reduced by more than 20% for Class 2 and 3 and 30% for Class 1 (see IPC-A-600, IPC-6011 and IPC-6012).

(1) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.6 Flexible Circuitry Delamination Separation or bubbles **shall not**² bridge conductors in the cover layer of flexible printed circuit boards or assemblies.

(2) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.7 Flexible Circuitry Damage There **shall not**³ be evidence of blistering, charring, or melting of the insulation on flexible printed circuit boards or assemblies.

(3) Class 1-Defect
Class 2-Defect
Class 3-Defect

Note: Mechanically created indentations caused by contact between the coverlayer of flexible printed circuit boards or assemblies and molten solder are not rejectable. Additionally, care should be taken to avoid bending or flexing conductors during inspection.

9.1.8 Burns Burns **shall not**⁴ physically damage the surface of the assembly.

(4) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.9 Solder on Gold Contacts Solder **shall not**⁵ be in the contact area of gold edge connector contact lands (i.e., “gold fingers”).

(5) Class 1-Defect
Class 2-Defect
Class 3-Defect

9.1.10 Measles Measling is acceptable for Class 1, 2 and 3 end printed board assemblies. Measled areas in laminate substrates exceeding 50% of the spacing between non-common conductors are a process indicator for Class 3 printed board assemblies.

Note: Measling is an internal condition which may not propagate under thermal stress and has not been conclusively shown to be a catalyst for CAF growth. Delamination is an internal condition which may propagate under thermal stress and may be a catalyst for CAF growth. The IPC-9691 user's guide for CAF resistance testing and IPC-TM-650, Method 2.6.25, provide additional information for determining laminate performance regarding CAF growth. Users who wish to incorporate additional criteria for measles conditions may consider incorporating the provisions of the Performance Specification Sheet for Space and Military Electronics in IPC-6012B.

9.2 Marking Assembly identification such as part numbers and serial numbers **shall**⁶ remain legible (capable of being read and understood) after all tests, cleaning and other processes to which the item is subjected. Additional markings (such as labels added during the manufacturing process) should not obscure the original supplier's markings. Individual component markings, reference designators and polarity indicators should remain legible and components should be mounted in such a manner that markings are visible.

(6) Class 1-Not Est
Class 2-Defect
Class 3-Defect

9.3 Bow and Twist (Warpage) Bow and twist after soldering should not exceed 1.5% for through-hole, or 0.75% for surface mount printed board applications (see IPC-TM-650, 2.4.22). Bow and twist **shall not**⁷ cause damage during post solder assembly operations or use.

(7) Class 1-Defect
Class 2-Defect
Class 3-Defect

10 COATING AND ENCAPSULATION

When coating or encapsulation materials are applied to glass body components, the components **shall**⁸ be sleeved to prevent cracking, unless the material has been selected so as not to damage the components/assembly in its service environment.

(8) Class 1-Defect
Class 2-Defect
Class 3-Defect

10.1 Conformal Coating Conformal coating material **shall**⁹ conform to the material specification (IPC-CC-830 or equivalent). The coating manufacturers supplier's instructions or other documented process **shall**⁹ be followed.

When curing conditions (temperature, time, Infra Red (I.R.) intensity, etc.) vary from supplier recommended instructions, they **shall**⁹ be documented and available for review.

The material **shall**⁹ be used within the time period specified (both shelf life and pot life) or used within the time period indicated by a documented system the manufacturer (assembler) has established to mark and control age-dated material.

(9) Class 1-Defect
Class 2-Defect
Class 3-Defect

10.1.1 Application Coating **shall**¹⁰ be applied in a continuous manner to all areas designated for coverage on the assembly drawing/documentation.

The coating fillets should be kept to a minimum. When used, masking materials **shall**¹⁰ have no deleterious effect and **shall**¹⁰ be removable without leaving contaminant residue.

Dimensions of masked areas **shall not**¹⁰ be decreased in length, width, or diameter by more than 0.75 mm [0.0295 in] by application of conformal coating.

(10) Class 1-Defect
Class 2-Defect
Class 3-Defect

10.1.1.1 Components Required to be Uncoated The adjustable portion of adjustable components, as well as electrical and mechanical mating surfaces such as connector contacts, probe points, screw threads, bearing surfaces (e.g., card guides) **shall**¹¹ be left uncoated as specified on the assembly drawing(s)/documentation.

(11) Class 1-Defect
Class 2-Defect
Class 3-Defect

10.1.1.2 Conformal Coating on Connectors Mating connector surfaces of printed circuit assemblies **shall not**¹² be coated with conformal coating.

(12) Class 1-Defect
Class 2-Defect
Class 3-Defect