



IPC J-STD-001GA/IPC-A-610GA

If a conflict occurs between the English language and translated versions of this document, the English version will take precedence.

Automotive Addendum to IPC J-STD-001G Requirements for Soldered Electrical and Electronic Assemblies and IPC-A-610G Acceptability of Electronic Assemblies

Developed by the J-STD-001 and IPC-A-610 Automotive Addendum Task Group (7-31bv) of the Product Assurance Committee (7-30) of IPC

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

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0.1 Scope This Addendum provides requirements to be used in addition to, and in some cases, in place of, those published in J-STD-001G and IPC-A-610G to ensure the reliability of mission-critical soldered automotive electrical and electronic assemblies in the field under harsh environments, considering the conditions of automated high-volume production.

0.2 Purpose When required by procurement documentation/drawings, this Addendum supplements or replaces specifically identified requirements of J-STD-001 and IPC-A-610.

0.3 Existing or Previously Approved Designs This Addendum **shall not** constitute the sole cause for the redesign of previously approved designs. When drawings for existing or previously approved designs undergo revision, they should be reviewed and changes made that allow for conformance with the requirements of this Addendum.

0.4 Use This Addendum is not to be used as a standalone document.

Where criteria are not supplemented, the Class 3 requirements of J-STD-001G **shall** apply. Where J-STD-001G criteria are supplemented or new criteria are added by this Addendum, the clause is listed in J-STD-001GA, and the entire J-STD-001G clause is replaced by this Addendum except as specifically noted.

The clauses modified by this Addendum do not include subordinate clauses unless specifically stated, e.g., 1.4 does not include 1.4.1. Clauses, Tables, Figures, etc., in J-STD-001G that are not listed in this Addendum are to be used as published. J-STD-001GA must be used with J-STD-001G.

This Addendum **shall** be used only in conjunction with the corresponding automotive addendum pertaining to IPC-A-610G.

In the context of this Addendum, IPC-A-610 **shall** be used as a companion document to J-STD-001. The revisions of J-STD-001 and IPC-A-610 **shall** correspond, e.g., J-STD-001G and IPC-A-610G. The likelihood of criteria not aligning increases when different revisions are used together.

If there is a conflict between the documents referenced in this section, the order of precedence is documented in 1.7.

1.6 General Requirements Use of this Addendum implies that the product belongs to Class 3.

The soldering operations, equipment, and conditions described in this document are based on electrical/electronic circuits designed and fabricated in accordance with the specifications listed in Table 1-1GA.

Table 1-1GA Design, Fabrication and Acceptability Specifications

| Board Type | Design Specification | Fabrication/Acceptability Specification |
|----------------------|----------------------|---|
| Generic Requirements | IPC-2221 | IPC-6011 |
| Rigid Printed Boards | IPC-2222 | IPC-6012, IPC-6012 Automotive Addendum, IPC-A-600 |
| Flexible Circuits | IPC-2223 | IPC-6013 |
| Rigid Flex Board | IPC-2223 | IPC-6013 |

1.7 Order of Precedence The contract **shall** take precedence over this Addendum, referenced standards and User-approved drawings.

1.7.1 Conflict In the event of a conflict between this Addendum and the applicable documents cited herein, this Addendum takes precedence. Where referenced criteria of this Addendum differ from J-STD-001G, this Addendum takes precedence. In the event of conflict between the requirements of this Addendum and the applicable assembly drawing(s)/documentation, the applicable User approved assembly drawing(s)/documentation take precedence.

In the event of conflict between the requirements of the J-STD-001G and the applicable assembly drawing(s) and documentation, the applicable User approved assembly drawing(s) and documentation govern. Some examples of documentation include the contract, purchase order, technical data package, engineering specification or performance specification. In the event of conflict between the requirements of the J-STD-001G and assembly drawing(s) and documentation that have not been User approved, the J-STD-001G governs.

In the case of a conflict between this Addendum and IPC-A-610GA, this Addendum takes precedence.

See below for a summary of the order of precedence for using this Addendum.

User approved drawings → J-STD-001GA → J-STD-001G → IPC-A-610GA → IPC-A-610G

1.8 Terms and Definitions

1.8.6 Manufacturer (Assembler) The individual, organization, or company responsible for the assembly process and verification operations necessary to ensure full compliance of assemblies to this Addendum.

1.8.7 Objective Evidence Documentation in the form of hard copy, computer data, video, or other media that demonstrates requirements have been met (for examples, see Appendix C). Such documentation may include, but is not limited to:

- a. Work instructions.
- b. Procedures and records required by the quality management system.
- c. Chemical and physical test data.
- d. Reliability calculations based on recognized industry reliability standards.
- e. Manufacturer data sheets/reports, now acceptable record of performance by selected suppliers.
- f. External and/or internal audit reports.
- g. Test/inspection reports including actual measured values.
- h. Training records.
- i. Soldering temperature versus time profiles.
- j. Technical basis for changes in materials and/or processes, e.g., see Appendix C.
- k. Historical data, e.g., 0 kilometer failures, field failures/warranties, product/process validation, pilot runs, safe launch data.
- l. Competency Matrix, i.e., skills checklist.

Note: Objective evidence is used to demonstrate or validate process control.

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The following topics are addressed in this Addendum.

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The following reference numbers are to IPC-A-610G Clauses that are modified or added in this Addendum.

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0.1 Scope This Addendum provides a collection of visual acceptability criteria for electronic assemblies to be used in addition to, and in some cases, in place of, those published IPC-A-610G intended to ensure the reliability of mission-critical soldered automotive electrical and electronic assemblies in the field under harsh environments, considering the conditions of automated high-volume production. This Addendum does not provide criteria for cross-section evaluation or evaluation of images generated by automated optical and/or X-ray inspection systems.

0.2 Use This Addendum is not to be used as a standalone document.

Where criteria are not supplemented, the Class 3 requirements of IPC-A-610G **shall** apply. Where IPC-A-610G criteria are supplemented or new criteria are added by this Addendum, the clause is listed in IPC-A-610 Automotive Addendum Acceptability section and the entire IPC-A-610G clause is replaced by this Addendum except as specifically noted.

The clauses modified by this Addendum do not include subordinate clauses unless specifically stated, e.g., 1.4 does not include 1.4.1. Clauses, Tables, Figures, etc., in IPC-A-610G that are not listed in this Addendum are to be used as published IPC-A-610GA must be used with IPC-A-610G.

This Addendum **shall** be used only in conjunction with the corresponding automotive addendum pertaining to J-STD-001G, J-STD-001GA.

In the context of this Addendum, IPC-A-610 **shall** be used as a companion document to J-STD-001. The revisions of J-STD-001 and IPC-A-610 **shall** correspond, e.g. J-STD-001G and IPC-A-610G. The likelihood of criteria not aligning increases when different revisions are used together.

For the order of precedence, see clause 1.7.

1 General

1.2 Purpose The visual acceptability criteria in this document reflect the requirements of existing IPC and other applicable specifications. In order for the user to apply and use the content of this document, the assembly/product **shall** comply with other existing IPC requirements, such as IPC-7351, IPC-2220-FAM, IPC-6010-FAM and IPC-A-600 or customer unique/specified automotive standards, testing, reliability data, etc. If the assembly does not comply with these or with equivalent requirements, it **shall** be the shared responsibility of the User and the Design Authority to define, agree to, and document specific acceptance criteria.

In the case of a discrepancy, the description or written criteria, i.e., Tables, Notes addressing criteria, always takes precedence over the illustrations, i.e., photos, graphics.

Standards may be updated at any time, including with the use of amendments. The use of an amendment or newer revision is not automatically required, otherwise if agreed between customer and supplier.

Table 1-1 Summary of Related Documents

| Document Purpose | Spec.# | Definition |
|--|--|--|
| Design Standard | IPC-2220-FAM IPC-7351 IPC-CM-770 | Design requirements reflecting three levels of complexity (Levels A, B, and C) indicating finer geometries, greater densities, more process steps to produce the product. Component and Assembly Process Guidelines to assist in the design of the bare board and the assembly where the bare board processes concentrate on land patterns for surface mount and the assembly concentrates on surface mount and through-hole principles which are usually incorporated into the design process and the documentation. |
| PCB Requirements | IPC-6010-FAM IPC-A-600 | Requirements and acceptance documentation for rigid, rigid flex, flex and other types of substrates. |
| End Item Documentation | IPC-D-325 | Documentation depicting bare board specific end product requirements designed by the customer or end item assembly requirements. Details may or may not reference industry specifications or workmanship standards as well as customer's own preferences or internal standard requirements. |
| End Item Standards | J-STD-001 | Requirements for soldered electrical and electronic assemblies depicting minimum end product acceptable characteristics as well as methods for evaluation (test methods), frequency of testing and applicable ability of process control requirements. |
| Acceptability Standard | IPC-A-610 | Pictorial interpretive document indicating various characteristics of the board and/or assembly as appropriate relating to desirable conditions that exceed the minimum acceptable characteristics indicated by the end item performance standard and reflect various out-of-control (process indicator or defect) conditions to assist the shop process evaluators in judging need for corrective action. |
| Training Programs (Optional) | | Documented training requirements for teaching and learning process procedures and techniques for implementing acceptance requirements of either end item standards, acceptability standards, or requirements detailed on the customer documentation. |
| Rework and Repair | IPC-7711/7721 | Documentation providing the procedures to accomplish conformal coating and component removal and replacement, solder resist repair, and modification/repair of laminate material, conductors, and plated through-holes. |
| Automotive Industry Action Group Standards | AIAG-CQI-17 | Special Process: Electronic Assembly Manufacturing – Soldering System Assessment |
| Automotive Electronics Council Standards | AEC-Q100 AEC-Q101 AEC-Q102 AEC-Q104 AEC-Q200 | Automotive Electronics Council – Failure Mechanism Based Stress Test Qualification |

1.3 Classification Accept and/or reject decisions **shall** be based on applicable documentation such as contracts, drawings, specifications, standards and reference documents. Criteria defined in this document reflect Class 3 visual criteria. Class 3 will not appear after the condition [Target, Acceptable, etc.].

1.4.1 Verification of Dimensions Actual measurement of specific component placement, quantity and dimensions of the solder connection, and determination of percentages, **shall not** be used, except for referee purposes.