

STANDARDS

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DESIGN > PRINTED CIRCUIT BOARDS > ELECTRONICS ASSEMBLY > TEST

IPC

PUBLICATIONS CATALOG

2007 – 2008



ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES®


WELCOME



Dear Colleague,

Welcome to IPC's 2007 – 2008 Publications Catalog. Today more than ever, it's important that your company stay on top of what's happening in the industry. From information on new lead free legislation to materials declaration resources, IPC has what you need to keep up with the trends and requirements in PCB and electronics assembly.

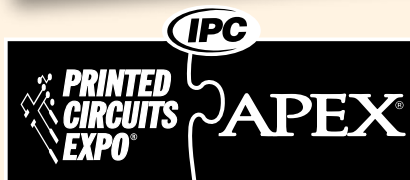
We have added many new documents and standards since the last printing of this catalog in 2004 — look for the **NEW** notation. Please take some time to review these pages carefully — I'm sure you'll find timely and relevant information to improve your company's operations.

Make sure your company has our standards that have been updated for lead free. We have introduced several new documents on lead free and have added lead free icons  to relevant documents. Let IPC help you today.

Kudos to IPC committee members. As I do every year, I'd like to extend a special thanks to our volunteer committee members. It is only through their work — researching, reviewing, developing and updating — that we can offer these valuable publications and standards. We can always use more volunteers, and I hope you'll consider bringing your expertise to the table by joining a committee.

Best regards,

Denny McGuirk
President, IPC



and the **DESIGNERS SUMMIT**

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In pursuit of these objectives, IPC will devote resources to management improvement and technology enhancement programs, the creation of relevant standards, protection of the environment and pertinent government relations.

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UPDATED FOR LEAD FREE



This symbol denotes that the document has been updated for or is applicable to lead free. See page 35 for additional lead free publications.

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HOW THIS CATALOG IS ORGANIZED

Documents are grouped by the subjects in the Table of Contents. Many documents have related documents that cannot be listed due to space considerations.

For a complete listing of related documents, go to www.ipc/onlinestore.

There are two indices in the back of this catalog. The first is alphabetized by product code, the second is in numerical order.

TABLE OF CONTENTS

IPC Certification Programs	2
General	3
Electronics Assembly	4
Printed Circuit Boards	16
Design	26
Management, Market Research and Roadmaps	31
Environmental Compliance	34
Lead Free	35
Artwork for Test Coupons	36
Multimedia Training Resources	38
Images and Posters	39
Product Index/Price List	40
Order Form	inside back cover

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IPC CERTIFICATION PROGRAMS

TRAINING AND CERTIFICATION PROGRAMS FOR INDIVIDUALS



Focus on Job Function

Earn the credential that gives you the edge over other professionals in today's competitive job market. Developed by experts in the field, the programs provide comprehensive training that will help you do your job better and increase your marketability. Insure your future success with IPC certification programs.

IPC EMS PROGRAM MANAGER TRAINING AND CERTIFICATION

Four-part training and testing program provides comprehensive, multi-focused education on business topics such as operations, finance and contracts as well as program and time management and leadership training.

CERTIFIED INTERCONNECT DESIGNER (C.I.D.)

Comprehensive training and testing program to assess a designer's knowledge of how to transform a schematic into a reliable rigid PCB design that can be easily manufactured, assembled and tested. The certification test is based on several critical IPC documents that link design principles to the end use of the printed circuit assembly. Designers may purchase study materials and prepare on their own or enroll in a comprehensive two-day IPC Designer Certification Preparation workshop.

ADVANCED CERTIFIED INTERCONNECT DESIGNER (C.I.D.+)

With the industry changing at an ever-faster pace, continuing education becomes necessary to maintain a designer's effectiveness – and marketability. That's why the Advanced PCB Designers Preparation Workshop and Examination was introduced. The Advanced Module covers 40 key objectives beyond the C.I.D. Participants who successfully complete the exam are awarded the C.I.D.+ designation.



Focus on Specifications

Get industry developed, industry approved and industry traceable training for your managers, engineers, and work force. Based on IPC standards these programs lead to individual certification—an important credential to assure customers of your dedication to quality. Each of the five programs follow a two-tier “train-the-trainer” concept. First, companies send an instructor candidate to an authorized IPC training center. Upon successful completion of the course, the candidate becomes a certified instructor and is provided with the materials needed to train and certify users. Training at the application specialist (operator/inspector/management) level is modular in all programs. This enables users to control costs by providing training only on the topics related to an individual's assigned tasks. Programs are offered through IPC authorized certification centers throughout the world. For more information, go to www.ipc.org/certification.

IPC/WHMA-A-620 TRAINING AND CERTIFICATION

Industry standard program for requirements and acceptance of cable and wire harness assemblies. Updated to support Revision A of the standard. Future course updates will include optional hands-on training. Training support is not available for superseded versions. *LEAD FREE NOW INCLUDED.* Some topics are:

- Crimp, IDC and soldered terminations
- Connectorization
- Molding, potting and marking
- Securing and shielding

IPC-7711 & IPC-7721 REWORK AND REPAIR TRAINING AND CERTIFICATION

Industry standard program for rework, repair and modification of electronic assemblies. All modules include hands-on training. Some topics are:

- Through hole and SMT
- Conductor and laminate repair

IPC J-STD-001D TRAINING AND CERTIFICATION

Industry standard program for hand and machine soldering process and material requirements. Some training modules include hands-on training. In addition to the latest program covering lead free criteria in Rev D, IPC will continue to support Rev C training as users transition to newer versions. *LEAD FREE NOW INCLUDED.* Some topics are:

- Wire and terminal assembly requirements
- Through hole technology requirements
- Surface mount technology requirements

IPC-A-600G TRAINING AND CERTIFICATION

Industry standard program for quality assurance/visual acceptance of unpopulated printed circuit boards. Training support is not available for superseded versions. Some topics are:

- Solder resist coverage
- Conductor width and spacing
- Plated-through hole requirements for copper plating thickness, voids, nodules and cracks
- Flexible, rigid-flex, and metal core printed boards

IPC-A-610D TRAINING AND CERTIFICATION

Industry standard program for quality assurance/visual acceptance of electronic assemblies based on the world's most widely used electronics assembly acceptability standard. In addition to the latest program covering lead free criteria in Rev D, IPC will continue to support Rev C training as users transition to newer versions. Some topics are:

- Soldering criteria, including lead free connections
- Soldered requirements for connecting to terminals, through hole and SMT
- Criteria for component damage, laminate conditions, cleaning and coating

CERTIFICATION FOR COMPANIES/FACILITIES



CERTIFICATION FOR RoHS LEAD FREE ELECTRONICS ASSEMBLY PROCESS CAPABILITY

Certification program that audits an electronics assembly facility. The audit involves a careful review of a facility's processes and procedures to determine whether, if followed and applied precisely and consistently, the facility is capable of producing product to meet the lead free requirements of the RoHS Directive. Because it involves inspection of procedures and processes in place at the time of the audit, certification cannot ensure, or be used to represent, that the facility's products will be RoHS lead free compliant. However, the certification audit is an excellent way to validate RoHS lead free electronics assembly process capabilities to customers and suppliers.

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

Provides descriptions and illustrations of electronics interconnect industry terminology to help users and their customers break down language barriers. Revision G contains more than 500 new or revised terms, including new terminology for ball grid array and chip scale packaging, via protection, lead free solders, assembly processes, base materials and high speed/high frequency boards. Includes commonly used industry acronyms and an index of terms by technology types for easy searching. 135 pages. Released December 2003.

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**IPC-9591****Performance Parameters (Mechanical, Electrical, Environmental and Quality/Reliability) for Air Moving Devices**

Standardizes the performance parameters for air moving devices. The phrase "air moving device" (or "air mover") refers to equipment such as fans, blowers and other forced air movement technologies. These air moving devices are used in the electronics industry for the cooling of heat-producing components, and range from small devices mounted directly to hot components such as microprocessor air moving devices, to larger devices used to force air through a chassis containing many heat dissipating components. Specification sets requirements for design, manufacture, and test application of air moving devices. The term "end user" as used in the document refers to the OEM or design/materials entity responsible for specifying the function and reliability of an air moving device in a final product application. 19 pages. Released April 2006.

The OEM Critical Components committee is working on standards for lithium ion battery manufacture and power conversion. Check www.ipc.org/online in mid-2007 for availability. Contact TonyHilvers@ipc.org to participate in the committee.

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WHY YOUR COMPANY SHOULD BE AN IPC MEMBER

IPC is a global trade association dedicated to the competitive excellence and financial success of its 2,400 member companies which represent all facets of the electronics interconnect industry, including design, printed circuit board manufacturing and electronics assembly. IPC is the leading industry source for industry standards, training, market research and public policy advocacy — supporting the needs of an estimated \$3.4 trillion global electronics industry.

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- **Promote your PCB or EMS** by listing products & services in the Products and Services Index (PSI).

IPC-TM-650**Test Methods Manual**

Contains more than 150 industry-approved test techniques and procedures for chemical, mechanical, electrical, and environmental tests on all forms of printed boards and connectors. A comprehensive collection of methodologies referenced in IPC standards and specifications, the IPC-TM-650 is updated regularly as test methods are revised or developed.

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ELECTRONICS ASSEMBLY

ACCEPTABILITY

NEW IPC J-STD-001D

Requirements for Soldered Electrical and Electronic Assemblies



ANSI Approved. Lead free acceptance criteria and pictures now included! Reformatted to find acceptance criteria easier! J-STD-001D is world-recognized as the sole industry-consensus standard covering soldering materials and processes. In addition to lead free manufacturing support, this revision has criteria for materials, methods and verification for producing quality soldered interconnections and assemblies that is easier to understand. The requirements for all three classes of construction are included. Color illustrations are provided for clarity. This standard fully complements IPC-A-610D. 60 pages. Released February 2005.

	Language
J-STD-001D	English
J-STD-001DSP	Spanish
J-STD-001DSW	Swedish

(More language translations in development. Please check the online store for the most updated list.)

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Revisions B and C available. Contact Customer Service at 847-597-2862.

NEW IPC-HDBK-001

Handbook and Guide to Supplement J-STD-001 (Includes J-STD-001 B-C-D Comparisons)



Provides J-STD-001 change history and cross reference support for Revisions B, C and D. Offers explanatory and tutorial information to help with the implementation of the requirements of J-STD-001. Provides a better understanding of the process considerations needed when producing acceptable soldered hardware. Includes Amendments 1 and 2. 188 pages. Released October 2005.

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For certification information, go to www.ipc.org/certification

**Kit includes CD and hard copy.

NEW IPC-A-610D

Acceptability of Electronic Assemblies



ANSI Approved. IPC-A-610D is the most widely used electronics assembly standard in the world. A must for all quality assurance and assembly departments, this standard illustrates industry-accepted workmanship criteria for electronics assemblies through color photographs and illustrations. Topics include lead free, component orientation and soldering criteria for through hole, SMT and discrete wiring assemblies, mechanical assembly, cleaning, marking, coating, and laminate requirements. Revision D has more than 730 new and updated illustrations of acceptability criteria and has been critically reviewed for clarity and accuracy. Synchronizes to the requirements expressed in other industry consensus documents and is used with the material and process standard IPC J-STD-001. 400 pages. Released February 2005.

	Language
A-610D	English
A-610D-CH	Chinese
A-610D-DE	German
A-610D-DK	Danish
A-610D-FI	Finnish
A-610D-FR	French
A-610D-IT	Italian
A-610D-PL	Polish
A-610D-SP	Spanish
A-610D-SW	Swedish
A-610D-VN	Vietnamese

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Revisions B and C available. Contact Customer Service at 847-597-2862.

IPC-A-610D illustrations are available as a complete set, individually or by chapter. They are available for unlimited use for in-house company training. See page 39 for more information.

TABLE OF CONTENTS

Acceptability	4
Advanced	5
Cleaning	6
Components	7
Training and Reference Guides	8
General	9
Materials	10
Process Support	12
Rework/Repair	14
Solderability	14
Optoelectronics	15

NEW IPC-HDBK-610

IPC-HDBK-610 with Amendment 1

Handbook and guide to supplement IPC-A-610 providing change history and cross reference support for Revisions B, C and D. Offers explanatory and tutorial information to help understand the requirements of IPC-A-610. 166 pages. Released October 2005.

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IPC-EA-100-K

Electronic Assembly Reference Set



Your complete source for the most important electronic assembly documents in both hard and electronic copies: IPC J-STD-001, IPC-HDBK-001, IPC-A-610 and IPC-HDBK-610. Handy, "at-your-fingertips" reference set includes high resolution color pictures in IPC-A-610, IPC J-STD-001 and black and white pictures in the handbooks. To facilitate electronic searching of requirements, single-user (print screen only) PDF copies of all four documents on CD are included.

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IPC/WHMA-A-620A

Requirements and Acceptance for Cable and Wire Harness Assemblies



Approved. Revision A, with improved readability and usability, is now available for the only industry-consensus standard for

Requirements and Acceptance of Cable and Wire Harness Assemblies. IPC and the Wire Harness Manufacturers Association (WHMA) developed this significant update, adding lead free acceptance criteria, a new chapter devoted to electrical and mechanical testing, and enhanced criteria for molding and splicing. Contains 599 color pictures and illustrations. 19 chapters include: criteria for wire prep, soldering to terminals, crimping of stamped and formed contacts and machined contacts, insulation displacement connectors, ultrasonic welding, splicing, connectors, molding, marking, coax/twinax cables, wrapping/lacing, shielding, assembly and wire-wrap terminations. 368 pages. Released July 2006.

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ADVANCED

IPC J-STD-012

Implementation of Flip Chip and Chip Scale Technology

ANSI Approved. Describes the implementation of flip chip and related chip scale semiconductor packaging technologies. The areas discussed include design considerations, assembly processes, technology choices, application and reliability data. Chip packaging variations include flip chip, HDI, micro BGA, micro SMT and SLICC. Also provides general information on implementing flip chip and chip scale technologies for creating multichip modules, I/C cards, memory cards and very dense surface mount assemblies. Developed by IPC, EIA, MCNC and Sematech. 113 pages. Released January 1996.

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IPC-SM-784

Guidelines for Chip-on-Board Technology Implementation

ANSI Approved. Discusses chip types, board selection, design issues and thermal transfer methods for Chip-on-Board (COB) applications. Details wire bonding, TAB and flip chip designs and provides information on mounting materials, including adhesives, wires and various mechanical bonding techniques. 37 pages. Released November 1990.

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IPC/EIA J-STD-026

Semiconductor Design Standard for Flip Chip Applications

Addresses semiconductor flip chip design requirements. Provides information for using standard semiconductor substrates, materials, assembly and test methods with established fabrication, bumping, test and handling practices. Electrical, thermal and mechanical chip design parameters and methodologies are covered in the standard, as well as the reliability aspects associated with these conditions and processes. The information applies to all new designs as well as modifications of non flip chip designs. Developed by IPC and EIA. 40 pages. Released August 1999.

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IPC J-STD-027

Mechanical Outline Standard for Flip Chip and Chip Size Configurations

Establishes mechanical outline requirements for devices supplied in flip chip or Chip Size Package (CSP) formats, including die surface, die terminals, and interconnection balls/bumps/lands to the next level. 13 pages. Released February 2003.

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IPC/EIA J-STD-028

Performance Standard for Construction of Flip Chip and Chip Scale Bumps

Establishes construction detail requirements for bumps and other terminal structures used for Flip Chip Scale carriers. The specific standards for different terminations are appropriately matched to a particular interconnection process and include diverse terminations such as solder bumps, columns, non-melting stand-offs and conductive polymer deposits. The document articulates a set of designations and expectations for product performance for the manufacturer and the user of flip chip or chip scale devices. Recommendations are provided to implement the best commercial practices and evolving process improvements. Developed by IPC and EIA. 36 pages. Released August 1999.

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IPC J-STD-013

Implementation of Ball Grid Array and Other High Density Technology

ANSI Approved. Establishes the requirements and interactions necessary for printed board assembly processes for interconnecting high performance/high pin count IC packages. Includes information on design principles, material selection, board fabrication, assembly technology, testing strategy and reliability expectations based on end-user environments. Developed by IPC, EIA, MCNC and Sematech. 96 pages. Released July 1996.

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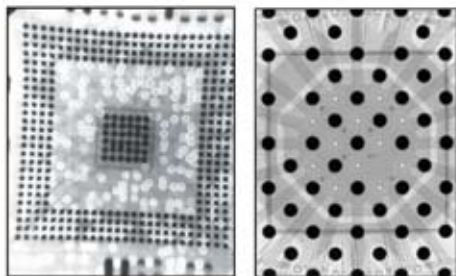
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ELECTRONICS ASSEMBLY

IPC-7095A Design and Assembly Process Implementation for BGAs

Implementing Ball Grid Array (BGA) and Fine-Pitch Ball Grid Array (FBGA) technology presents some unique challenges for design, assembly, inspection and repair personnel. Revision A of this document delivers useful and practical information to anyone currently using BGAs or considering a conversion to area array packaging formats. In addition to providing guidelines for BGA inspection and repair, IPC-7095A addresses reliability issues and the use of lead free joint criteria associated with BGAs. There are many new photographs of X-ray or endoscope illustrations to identify some of the characteristics that the industry is experiencing in the implementation of BGA assembly processes. The effect of BGA and FBGA on current technology and component types is also discussed. 118 pages. Released October 2004.

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IPC/EIA J-STD-032 Performance Standard for Ball Grid Array Balls

This standard, developed jointly by IPC and the Electronic Industries Association (EIA), establishes the construction detail requirements for balls and other terminal structures on Ball Grid Array (BGA) packages. It also establishes a set of designations and expectations for product performance. A wide variety of terminal structures are recognized for a broad range of applications — from highest reliability computer, space and military applications to disposable commodity applications. 10 pages. Released June 2002.

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IPC-MC-790 Guidelines for Multichip Module Technology Utilization

Provides information on multichip module technology, including parametric data, design and manufacturing information and a proposed categorization of various approaches to multichip interconnect substrate technologies based on dielectric family. 120 pages. Released August 1992.

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CLEANING

IPC-M-108 Cleaning Guides and Handbooks Manual*

Convenient set of nine documents includes the latest editions of IPC cleaning guides and handbooks. Helps manufacturing engineers make decisions on cleaning products and processes and provides guidance for troubleshooting.

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Save more than 55% by purchasing documents together.

IPC-5701 Users Guide for Cleanliness of Unpopulated Printed Boards

Tackling PCB cleanliness is a tough job. Residues on printed circuit boards are directly related to the reliability of the produced hardware and can result in serious failures if not known or monitored. But how do you measure "cleanliness"? How clean is "clean"? IPC-5701 provides guidance on how these issues should be approached and specified in purchasing documents, addressing levels of cleanliness, common locations for testing, and information on sample sizes. 6 pages. Released July 2003.

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IPC-8497-1 Cleaning Methods and Contamination Assessment for Optical Assembly

For more information, go to page 15.

IPC-TP-1113 Circuit Board Ionic Cleanliness Measurement: What Does It Tell Us?

Discusses ionic cleanliness measurement, testing methods and cleanliness standards in relation to product reliability. Includes a brief discussion of no-clean fluxes. Written by Dr. Jack Brous. 8 pages. Released 1994.

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NEW IPC-WP-008 Setting Up Ion Chromatography Capability

Ion chromatography has been recognized as a method for which the data output is ion specific and very precise in the quantification of ionic residues. This paper provides practical considerations that should be addressed when contemplating the setup of an ion chromatography lab, including the core components of an ion chromatograph system such as carrier solutions, pumps, injection valves and detectors. Covers support equipment, chemical considerations, consumables, waste streams and overall operating costs. 12 pages. Released December 2005.

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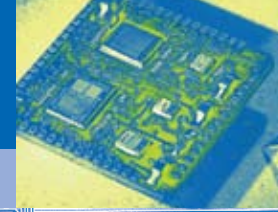
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IPC-CH-65A Guidelines for Cleaning of Printed Boards and Assemblies

ANSI Approved. A road map for current and emerging cleaning issues in the electronics industry, this handbook includes descriptions and discussion of various cleaning methods. Explains the relationship between materials, processes and contaminants in fabrication and assembly operations. Also addresses cleanliness assessment and process control in relation to cleanliness. 56 pages. Revised August 1999.

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*For a listing of included documents, visit the online store or contact customer service at 847-597-2862.



IPC-SC-60A

Post Solder Solvent Cleaning Handbook

ANSI Approved. Addresses the use of solvent cleaning technology in automated and manual soldering operations. Serves as a selection guide for cleaning solvents and equipment by discussing properties of solvents, residues, considerations on process control and environmental issues. 40 pages. Released August 1999.

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IPC-SA-61A

Post Solder Semi-Aqueous Cleaning Handbook

Covers aspects of semi-aqueous cleaning such as chemicals, manufacturing residues, equipment and processes, process control, environmental considerations and safety. Enhancements in this revision include a separate discussion of water-soluble and water-insoluble cleaning agents and expanded process and quality control. 32 pages. Released June 2002.

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IPC-AC-62A

Aqueous Post Solder Cleaning Handbook

ANSI Approved. Describes manufacturing residues, types and properties of aqueous cleaning agents, aqueous cleaning processes and equipment, process and quality control, environmental controls and considerations, worker safety, cleanliness determination, measurement and cost. 75 pages. Revised January 1996.

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IPC-TR-476A

Electrochemical Migration: Electrically Induced Failures in Printed Circuit Assemblies

Provides information on an IPC program designed to identify/evaluate electromigration on PCBs. Discusses the theory of electrochemical migration and the test procedures needed to assess the susceptibility. Includes the results of a literature review survey. 14 pages. Revised 1997.

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IPC-TR-582

Cleaning & Cleanliness Test Program for Phase 3 — Low Solids, Fluxes and Pastes Processed in Ambient Air

Details the test procedures, test results and team conclusions for the IPC Cleaning and Cleanliness Testing Program, Phase 3, Low Solids Flux in Ambient Air. This effort has been part of a multi-stage program to investigate material and process alternatives to the use of chlorofluorocarbons (CFCs) in electronics manufacturing. This Phase 3 effort has been dedicated to characterizing the cleanliness aspects of low solids fluxes, sometimes referred to as "no-clean" fluxes. 163 pages. Released November 1994.

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IPC members:	\$25.00
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IPC-TR-583

An In-Depth Look At Ionic Cleanliness Testing

Report provides quantified results to help users determine what variables most influence ionic cleanliness test results. Includes how solvent temperature influences the final cleanliness results, criticality of a 75% isopropyl to 25% water ratio, value of spraying the solvent, etc. Original research was a cooperative effort between the EMPF and IPC, released as EMPF-RR-0013 in 1993. 229 pages. Released July 2002.

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IPC-9201

Surface Insulation Resistance Handbook

Covers the terminology, theories, test procedures and test vehicles of surface insulation resistance (SIR) or temperature-humidity (TH) testing. Discussions on failure modes and troubleshooting are also included. 65 pages. Released July 1990.

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IPC-TP-104-K

Cleaning & Cleanliness Test Program, Phase 3, Water Soluble Fluxes, Parts 1 & 2


Combined for ease of use, these two technical papers present the results of the IPC Cleaning and Cleanliness Test Program, Phase 3; Parts 1 and 2. The Phase 3 program was designed as a test for evaluating manufacturing materials and processes as alternatives to current manufacturing practices that require the use of CFCs. 122 pages. Originally released in October 1992, these reports are still current in 2006.

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COMPONENTS

IPC-M-109

Component Handling Manual*

 Set includes the latest editions of eight IPC standards and guidelines related to the classification and use of moisture sensitivity components, including how to package, handle, store and test them, so that all components will be compatible with the assembly process.

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ELECTRONICS ASSEMBLY

IPC/JEDEC J-STD-020C

Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices



Test method to establish a classification level of nonhermetic solid state surface mount devices that are sensitive to moisture-induced stress during assembly. Revision includes test classification parameters for components that will be processed at higher temperatures for lead free assembly or rework. These devices can be properly packaged, stored, and handled using IPC/JEDEC J-STD-033 to avoid subsequent thermal/mechanical damage during solder reflow attachment and/or repair operation. Revision D is being developed (projected early 2007 release) to incorporate lessons learned from the increased user base of lead free assemblers. Developed by IPC and JEDEC. 12 pages. Released July 2004.

Revision D coming soon – check the online store.

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IPC J-STD-033B

Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices



Provides Surface Mount Device (SMD) manufacturers and users with standardized methods for handling, packing, shipping and use of moisture/reflow sensitive SMDs. These methods help avoid damage from moisture absorption and exposure to solder reflow temperatures that can result in yield and reliability degradation. By using these procedures, safe and damage-free reflow can be achieved with the dry packing process, providing a minimum shelf life of 12 months from the seal date when using sealed dry bags. Developed by IPC and JEDEC. 17 pages. Released October 2005.

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IPC/JEDEC J-STD-035

Acoustic Microscopy for Non-Hermetic Encapsulated Electronic Components

This test method defines the procedures for performing acoustic microscopy on non-hermetic encapsulated electronic components. Provides users with an acoustic microscopy process flow for detecting defects non-destructively in plastic packages while achieving reproducibility. Developed by IPC and JEDEC. 16 pages. Released April 1999.

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TRAINING AND REFERENCE GUIDES

IPC's Guides are directly referenced to industry-consensus standards. Because each Guide is focused on a narrow range of technology covered by an IPC standard, its small size makes it easy to use. However, in some cases the text and illustrations were modified to help with interpretation of the criteria. They should not be used as standards.

IPC-DRM-18G

Component Identification Training & Reference Guide

Assembly operators can have a convenient component identification resource at their workstations - with the Component Identification Training and Reference Guide (formally known as "Desk Reference Manual"). This comprehensive reference and training aid contains color photographs, computer graphics, schematic symbols and full descriptions of more than 40 of the most commonly used through hole and surface mount components, interconnections and hardware used in electronic assembly today. Includes a terminology section with quick facts on polarity, orientation, lead styles and Component Reference Designators (CRDs). The band reading section has easy-to-use color code charts and other component value data. 65 pages.

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IPC-DRM-SMT-D

Surface Mount Solder Joint Evaluation Training and Reference Guide



Help your workforce understand and apply the surface mount acceptance criteria from IPC standards. DRM-SMT-D contains 3-D color illustrations for Chip component, Gull Wing and J-Lead solder joints. Drawings clearly show the minimum acceptable condition for each type of component misalignment and the minimum solder connections. All three classes of product are color-coded to make it convenient to use as a reference guide. Manual also contains high quality color photographs of the major solder defects and conditions, with the appropriate specification/paragraph reference to IPC-A-610D and J-STD-001D. 38 pages.

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IPC-DRM-PTH-D

Through-Hole Solder Joint Evaluation Training and Reference Guide



Includes computer-generated 3-D graphics, as well as close-up photography, to help users understand IPC standards A-610D and J-STD-001D. Provides illustrations of component, barrel and solder-side coverage per requirements in the standards. Covers solder fillet, contact angle, wetting, vertical fill, land coverage and numerous defect conditions for Class 1, 2 and 3 solder joints. Also includes a Terminology section. 30 pages.

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IPC-DRM-56

Wire Preparation & Crimping Desk Reference Manual

Explains the most important stamped and formed crimp criteria from the industry standard on wire harness acceptability, IPC/WHMA-A-620. Easy-to-understand graphics and simple instructions help ensure that your company's products meet the required industry standards. Covers wire types, gauges, insulation stripping and contact types, IPC product categories and acceptance criteria, wire preparation, strand and insulation damage, conductor deformations, open and closed barrel crimp definitions and criteria, crimp deformations, cut-off tabs, punctures, insulation support crimps, inspection windows, bellmouth, conductor crimp requirements, conductor brush, closed barrel crimps, insulation damage and a glossary of related wire prep/crimping terminology. 30 pages.

Revision A coming soon – check the online store.

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IPC-DRM-53

Introduction to Electronics Assembly Desk Reference Manual

Learning resource for new hires, operators, sales, purchasing, human resources, administrative personnel, students or anyone interested in understanding the basic processes for both through hole and surface mount assembly. Explains electronics assembly to the uninitiated in easy-to-understand language and includes more than 70 color photographs and graphic drawings to clearly illustrate assembly technologies. Key terms are defined in a glossary to help simplify the industry lexicon. Also explains how electronics assembly fits into the electronics industry. Each section includes references for additional training and industry specifications that provides further information. 31 pages.

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GENERAL

IPC-M-103

Standards for Surface Mount Assemblies Manual*

IPC has taken the most requested documentation for surface mounting and packaged all 26 documents into one convenient set. Includes standards to support working with moisture-sensitive components, as well as all IPC adhesive documents.

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IPC-M-104

Standards for Printed Board Assembly Manual*

Conveniently packaged set contains 14 of the most widely used documents on printed board assembly.

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IPC-TA-724

Technology Assessment Series on Clean Rooms

Best compendium available today for information and technical articles on cleanrooms. All articles are reprinted in their entirety with credit to the original author (when given). Released April 1998.

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IPC-SM-780

Component Packaging and Interconnecting with Emphasis on Surface Mounting

Examines key issues in advanced packaging techniques. Provides information on types of parts available, techniques and processes necessary for their proper use, possible advantages/disadvantages or problems, how to start implementation and additional resources. 138 pages. Released March 1988.

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IPC-SM-785

Guidelines for Accelerated Reliability Testing of Surface Mount Attachments

Used when evaluating and extrapolating the results of these tests toward actual use environments of electronic assemblies. 50 pages. Released November 1992.

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IPC-9701A

Performance Test Methods and Qualification Requirements for Surface Mount Solder Attachments



Provides specific test methods to evaluate the performance and reliability of surface mount solder attachments of electronic assemblies. Establishes levels of performance and reliability of the solder attachments of surface mount devices to rigid, flexible and rigid-flex circuit structures. When used with IPC-SM-785, it provides an understanding of the physics of SMT solder joint failure and an approximate means of relating performance tests results to the reliability of solder attachments in their use environments. Revision A includes Appendix B which provides recommended changes to the thermal cycling profiles given in the document when utilizing lead free solder joints. 24 pages. Released February 2006.

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IPC/JEDEC-9702

Monotonic Bend Characterization of Board-Level Interconnects



Characterizes the fracture strength of a component's board-level interconnect.

Provides a common methodology for measuring fracture resistance to flexural loading that may occur during conventional non-cyclic board assembly and test operations. Applicable to surface mount components attached to printed boards using conventional solder reflow technologies. Document supplements existing standards which address mechanical shock or impact during shipping, handling or field operation. 17 pages. Released June 2004.

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ELECTRONICS ASSEMBLY



IPC-9704

IPC/JEDEC Printed Wiring Board Strain Gage Test Guideline



Strain gage testing of board assemblies allows for objective analysis of the strain and strain rate levels that a surface mount package is subjected to during assembly, test and operation. Characterization of worst-case board assembly strain is critical due to the susceptibility of component solder joints to strain-induced failures. This document describes specific guidelines for strain gage testing in the manufacturing process, including board assembly, test, system integration and board shipping, and provides coverage of test setup and equipment requirements, strain measurement techniques and test report formats. Contains 20 color photographs and illustrations depicting instrumented boards and gage placement. 22 pages. Released June 2005.

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IPC-PD-335

Electronic Packaging Handbook

Contains a general introduction of electronic packaging followed by system integration, electronic equipment subsystems, subsystem intraconnection, subassembly, discrete component, active and passive device interconnections, package components and unpackaged devices. A must for anyone involved in electronic packaging. 470 pages. Released December 1989.

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IPC-7525

Stencil Design Guidelines

Provides guidelines for the design and fabrication of stencils for solder paste and surface mount adhesive. This is the first industry consensus document for stencil design. Stencil design for surface-mount technology, as well as mixed technology with through hole or flip chip components is discussed, including overprint, two-print and step stencil designs. A sample order form and a user inspection checklist are also included for stencil design. Revision A with expanded coverage of stencils used with lead free paste is projected for release by the end of 2006. 14 pages. Released May 2000.

Revision A coming soon – check the online store.

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IPC-T-50G

Terms and Definitions for Interconnecting and Packaging Electronic Circuits

For more information, go to page 3.

IPC-TM 650

Test Methods Manual

For more information, go to page 3.

IPC-QL 653A

Certification of Facilities that Inspect/Test Printed Boards, Components and Materials

For more information, go to page 25.

IPC-9191

General Guidelines for Implementation of Statistical Process Control

For more information, go to page 24.

IPC-TR-581

IPC Phase III Controlled Atmosphere Soldering Study

The IPC Phase 3 Controlled Atmosphere Soldering Study evaluated the use of nitrogen as an inerting blanket with two low residue fluxes in a no-clean mode. Additionally, two resin fluxes using ambient atmosphere cleaned with methyl chloroform solvent served as controls. IPC-B-24 served as the test vehicle. The test format evaluated flux materials in different configurations of clean vs. no-clean processing with the test combs both soldered and not soldered. 90 pages. Released August 1994.

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MATERIALS

IPC J-STD-004A

Requirements for Soldering Fluxes



ANSI Approved. Revision A covers requirements for qualification and classification

of rosin, resin, organic and inorganic fluxes according to the activity level and halide content of the fluxes. Includes solder fluxes, flux-containing materials and low residue fluxes for no-clean processes. Updated test methods are available through free download at the online store. Supersedes QQ-S-571 and MIL-F-14256. 16 pages. Released January 2004.

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IPC/EIA J-STD-005

Requirements for Soldering Pastes — Includes Amendment 1

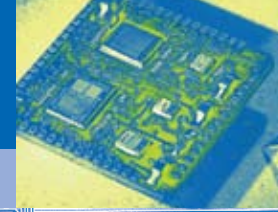


ANSI Approved. Lists requirements for qualification and characterization of solder

paste. Test methods and criteria for metal content, viscosity, slump, solder ball, tack and wetting of solder pastes are included. Supersedes QQ-S-571. Developed by IPC and EIA. 47 pages. Released January 1995.

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NEW IPC-HDBK-005

Guide to Solder Paste Assessment



Companion to the solder paste standard J-STD-005 and considered a guide to help assess the applicability of a solder paste for its use in surface mount technology (SMT) processes. Suggests test methods that can help with designing and testing solder pastes. Intended for use by both vendors and users of solder paste. Written as a guide to assess the applicability of a solder paste for a specific process, given the tremendous number of permutations of different materials, atmospheres and process variables currently available. 50 pages. Released January 2006.

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NEW IPC J-STD-006B

Requirements for Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders for Electronic Soldering Applications



Prescribes the nomenclature, requirements and test methods for electronic grade solder alloys; fluxed and non-fluxed bar, ribbon, and powder solders; electronic soldering applications; and "special" electronic grade solders. This is a quality control standard and is not intended to relate directly to the material's performance in the manufacturing process. Solders for applications other than electronics should be procured using ASTM B-32.

One of a set of three joint industry standards that prescribe the requirements and test methods for soldering materials for use in the electronics industry. Also see IPC/EIA J-STD-004 and IPC/EIA J-STD-005. 27 pages. Released January 2006.

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NEW IPC J-STD-030

Guideline for Selection and Application of Underfill Material for Flip Chip and Other Micropackages



Provides users of underfill material with guidance in selecting and evaluating underfill material. Underfill material is used to increase reliability of electronic devices by two methods: alleviate CTE mismatch (between the electronic package and the assembly substrate) and/or increase mechanical strength. Materials used in underfill applications should neither adversely affect device reliability (e.g. ionic impurities and alpha emitters) nor degrade electrical performance. When correctly selected and applied, underfill material should increase the life of the assembled solder joints. Three types of currently available underfill materials addressed in this document are: capillary flow underfill, no-flow/fluxing underfill and removable/reworkable underfill. 33 pages. Released September 2005.

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IPC-SM-817

General Requirements for Dielectric Surface Mounting Adhesives

Covers requirements for dielectric adhesives. Includes test methods to ensure components adhere to the board and survive soldering processes. 22 pages. Released November 1989.

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IPC-WP-006

Round Robin Testing & Analysis: Lead-Free Alloys—Tin, Silver, & Copper



Summarizes a round robin test program on the assembly properties of three lead free solder alloys. Melt characterization, wetting balance responses and solder spread tests were performed by IPC-SPVC members on the three tin-silver-copper alloys in the following percentages respectively: 96.5/3.0/0.5; 95.5/3.8/0.7; and 95.5/4.0/0.5. Includes examples of statistical analysis, data analysis of the tests, data tables of testing participants and a reproduction of IPC test methods used. 19 pages. Released August 2003.

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IPC-CA-821

General Requirements for Thermally Conductive Adhesives

Covers requirements and test methods for thermally conductive dielectric adhesives used to bond components in place. Permanent, removable and self-shimming adhesives are addressed. 18 pages. Released January 1995.

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IPC-3406

Guidelines for Electrically Conductive Surface Mount Adhesives

IPC-3406 offers guidelines for selecting electrically conductive adhesives for use in electronics manufacturing as solder alternatives. The process discussion attempts to stay within the bounds of the existing solder assembly infrastructure. Major types of adhesives, isotropic (conducting equally in all directions) and anisotropic (unidirectional conductivity) are covered. Polymer adhesives, thermosets and thermoplastics are described. 15 pages. Released July 1996.

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ELECTRONICS ASSEMBLY

IPC-3408

General Requirements for Anisotropically Conductive Adhesive Films

Covers requirements and test methods for anisotropically conductive adhesive films used to bond and electrically connect components. Applications include: flexible PCB-to-glass, flexible PCB-to-rigid PCB, flip chip-to-glass, flip chip-to-flexible PCB, flip chip-to-rigid PCB, and fine pitch SMD. The adhesive film may be supplied pre-attached to a flexible circuit or other product. 25 pages. Released November 1996.

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IPC-CC-830B

Qualification and Performance of Electrical Insulating Compound for Printed Wiring Assemblies

Industry standard for qualification and quality conformance of conformal coating. Shows how to obtain maximum information with minimum test redundancy. Includes requirements and evaluations of material properties using standardized test vehicles. Revision B updates include sample reports to document qualification, retention and conformance inspection. 18 pages. Released August 2002.

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IPC-HDBK-830

Guidelines for Design, Selection and Application of Conformal Coatings

Compilation of the conformal coating industry's practical experience. Assists designers and users of conformal coatings in making informed choices. Users will better understand the properties of the various coatings, the results to be achieved and how to verify goals have been met. Use document as a supplement in conjunction with the industry standard for qualification and quality conformance of conformal coating, IPC-CC-830B. 88 pages. Released October 2002.

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IPC-SM-840C

Qualification and Performance of Permanent Solder Mask — Includes Amendment 1

ANSI Approved. Covers requirements for the qualification and quality conformance of liquid and dry film solder mask. Streamlines solder mask classes into two classifications: H (high reliability) and T (telecommunications). Integrates Bellcore/Telcordia requirements (class T) and provides minimum voltage breakdown, defines mask formulation latitude, adds new mask chemistries and more. 18 pages. Amendment 1, released June 2000.

Revision D coming soon — check the online store.

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IPC ELEC-MICRO

Handbook of Lead-Free Solder Technology for Microelectronic Assemblies Reference Book

For more information, go to page 35.

PROCESS SUPPORT

IPC J-STD-001D

Requirements for Soldered Electrical and Electronic Assemblies.

For more information, go to page 4.

IPC-TP-1114

The Layman's Guide to Qualifying a Process to J-STD-001

Originally developed for J-STD-001B, it is applicable to current assembly standards. Electronics manufacturers are faced with the difficult task of proving that a candidate manufacturing process can produce acceptable hardware, either to the customer of the product or for internal quality control. Users have to determine many of the process qualification steps on their own. Document leads you through the task of qualifying a candidate process to J-STD-001. 13 pages. Released January 1998.

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IPC-AJ-820

Assembly & Joining Handbook

Contains descriptions of proven techniques for assembly and soldering. Individual articles were developed by industry experts and reviewed by a standing committee. Sections include: terms and definitions; specification references and synopsis; design; printed circuit boards; component/lead types; joining materials; component mounting; solderability; joining techniques and packaging; cleaning and coating; and quality assurance and testing. 336 pages. Released April 1997.

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IPC-7530

Guidelines for Temperature Profiling for Mass Soldering (Reflow & Wave) Processes

During mass soldering, it is important that all solder joints reach the minimum soldering (reflow) temperature to assure metallurgical bonding of the solder alloy and the base metals to be soldered. Metallurgical bonding requires that both surfaces to be soldered, as well as the solder, reach this minimum soldering temperature for a sufficient time to allow the wetting of the solder surfaces. Document provides guidelines for the construction of appropriate profiling test vehicles and various techniques and methodologies for temperature profiling. 18 pages. Released May 2001.

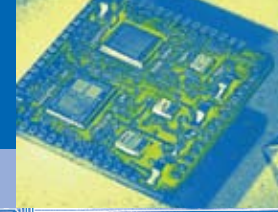
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IPC-9701A

Performance Test Methods and Qualification Requirements for Surface Mount Solder Attachments

For more information, go to page 9.

**Kit includes CD and hard copy.



IPC-TP-1090

The Layman's Guide to Qualifying New Fluxes

Easily understood test document gives you practical guidance and technical pointers on how to demonstrate a new process capable of producing reliable hardware. Written by Doug Pauls for MIL-STD-2000A or MT-0002, but applicable to current assembly standards. 18 pages. Released July 1996.

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IPC members: **\$25.00**

Nonmembers: **\$50.00**

IPC-TP-1115

Selection and Implementation Strategy for a Low-Residue No-Clean Process

Provides direction to electronics manufacturers interested in adopting low residue, (LR) no-clean assembly technology. Addresses concerns of transitioning from operations with post solder cleaning and no-clean using standard residue-level (SR) materials. Includes 13 technical papers and presentation materials from the IPC No-Clean Conference. 120 pages. Released December 1998.

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IPC members: **\$25.00**

Nonmembers: **\$50.00**

IPC-S-816

SMT Process Guideline and Checklist

Why waste time looking for answers? This handy, easy-to-use troubleshooting guide lists all types of processing problems and solutions for surface mount assembly. Covers bridging, skips, misalignment, placement and more. 38 pages. Released July 1993.

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IPC-PE-740A

Troubleshooting for Printed Board Manufacture and Assembly

For more information, see page 16.

IPC-CM-770E

Component Mounting Guidelines for Printed Boards

Provides effective guidelines in the preparation and attachment of components for printed circuit board assembly and reviews pertinent design criteria, impacts and issues. Contains techniques for assembly (both manual and machines including SMT, BGA and flip chip) and consideration of, and impact upon, subsequent soldering, cleaning, and coating processes. 150 pages. Revised January 2004.

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KIT**

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IPC-7912A

End-Item DPMO for Printed Circuit Board Assemblies

ANSI Approved. Finally—an end to the confusion when calculating defect opportunities for benchmarking! First revision to the industry's first consensus document on calculating benchmark indices for defects and quality. Provides consistent methodologies for DPMO Index, Component DPMO, Placement DPMO, Termination DPMO, and Overall Manufacturing Index (OMI). This document is for end-of-process benchmarking. Revision A provides support for unpopulated terminations and has much clearer examples than those in the original document. 12 pages. Released January 2004.

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IPC members: **\$25.00 \$30.00**

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Purchase both IPC-7912A and IPC-9261 together and save! (See IPC-DPMO-202)

IPC-9261

In-Process DPMO and Estimated Yield for PWAs

ANSI Approved. Defines consistent methodologies for computation of in-process defects per million opportunities (DPMO) metrics for any evaluation stage in the assembly process. Intended for use in measuring in-process assembly steps rather than end-product determination. A guide to defect categorization is provided that can serve as a base for summarizing and reporting in-process defects when used with IPC-J-STD-001C and IPC-A-610C. Also used to develop process step estimated yield—the expected percentage of assemblies with no defects for a particular process step or combined process steps, based on historical defect rates. 14 pages. Released March 2002.

Revision A coming soon – check the online store.

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IPC members: **\$25.00 \$30.00**

Nonmembers: **\$50.00 \$55.00**

IPC-DPMO-202

IPC-7912/9261 End Item and In-Process DPMO Set

Both of the industry's standards for computing DPMO bundled together at a reduced cost. Save 30%.

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IPC ELEC-SOLDER

Modern Solder Technology for Competitive Electronics Manufacturing Reference Book

Details the most current soldering techniques along with the fundamental principles involved in each process and clearly relates these principles to today's practical applications found in many manufacturing environments. Ideal for material and process troubleshooting and includes solder data tables for quick reference. Highlights include market driving forces, wetting and solderability, no-clean and water-clean manufacturing, fine pitch, flip chip, IC lead coating and BGA technology. Written by Dr. Jennie S. Hwang. 622 pages. Published by McGraw Hill, 1996.

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IPC members: **\$100.00**

Nonmembers: **\$100.00**

***Kit includes CD and hard copy.*

ELECTRONICS ASSEMBLY

IPC-9850-K

Surface Mount Placement Equipment Characterization — KIT

ANSI Approved. Developed to standardize the parameters, measurement procedures and methodologies used for the specification, evaluation and continuing verification of assembly equipment characterization parameters. Establishes the procedures to characterize and document machine placement capability of surface mount assembly equipment while maintaining a placement accuracy to placement speed relationship. Kit includes a printed copy of the standard and a CD with the support spreadsheet, forms and drawing files (Gerber format) necessary to make the test materials (not read-only). 60 pages. Released July 2002.

Revision A coming soon – check the online store.

KIT**

IPC members: **\$40.00**

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IPC-9850-TM-KW, IPC-9850-TM-K

Test Materials Kit for Surface Mount Placement Equipment Standardization

Kit includes materials needed to perform the SMT placement equipment characterization tests to IPC-9850. The CMM Measurement Verification Panel, placement verification panels and glass slugs include NIST certification documentation as required by the Standard. Glass slug components are available with or without white background, depending on which is required for your equipment. When ordering specify **9850-TM-KW** for components WITH white backgrounds, **9850-TM-K** for components WITHOUT white backgrounds. Test kit includes:

- Four IPC-9850 . Placement Accuracy Verification Panels
- One IPC-9850 . CMM Measurement Verification Panel
- 150 IPC-9850 . QFP-100 Glass Components
- 130 IPC-9850 . QFP-208 Glass Components
- 150 IPC-9850 . BGA-228 Glass Components
- NIST Traceable Measurement Certificate
- Custom Storage Case

Technology Information Corporation certifies that the IPC-9850 Kit meets the highly demanding specifications of IPC-9850. For pricing information, contact IPC Customer Service at 847-597-2862.

Note: The Standard is shown above.



For certification information, go to www.ipc.org/certification

**Kit includes CD and hard copy.

REWORK/REPAIR



IPC-7711/21A

Rework and Repair Guide

Everything you need to know for repair and rework of electronic assemblies and printed circuit boards! IPC-7711A, *Rework of Electronic Assemblies*, and IPC-7721A, *Repair and Modification of Printed Boards and Electronic Assemblies*, now include additional support for BGAs and flex-print repair and all previously released document updates. IPC-7711A contains procedural requirements, tools, materials and methods to be used in removing and replacing conformal coatings, surface mount and through hole components. IPC-7721A details procedures for repairing, modifying and reworking boards and assemblies. This guide with color illustrations is provided in a three ring binder for easy updating. Future updates can be downloaded free from the online store. Supersedes IPC-7711, IPC-7721 and IPC-R-700. 300+ pages. Released October 2003.

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KIT**

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Nonmembers:	\$360.00

SOLDERABILITY

IPC/EIA/JEDEC J-STD-002B

Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires



ANSI Approved. Provides tools to assess solderability of electronic component leads, terminations, solid wire, stranded wire, lugs and tabs. Notes a significant change in the type of flux required to be used for solderability testing. The standard contains test method choices, defect definitions, acceptance criteria and illustrations for both suppliers and users. Produced by IPC. 34 pages. Released February 2003.



IPC/EIA/JEDEC J-STD-002C coming soon – check the online store.

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IPC/EIA J-STD-003A

Solderability Tests for Printed Boards

Offers industry-recommended test methods, defect definitions and illustrations for suppliers and users to assess the solderability of printed board surface conductors, lands and plated-through holes. Notes a significant change in the type of flux required to be used for solderability testing. Test methods covered include edge dip, rotary dip, solder float, wave solder, and wetting balance. Produced by IPC and EIA. 26 pages. Released February 2003.



IPC/EIA J-STD-003B coming soon – check the online store.

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IPC-TR-585

Time, Temperature and Humidity Stress of Final Board Finish Solderability



Details the investigations into identifying stress tests that distinguish between robust and nonrobust surface finishes. A robust finish will pass a test for solderability whereas a nonrobust finish will fail. The stress tests identified do not necessarily duplicate real world environment (fabrication of the bare printed board through assembly), but they must correlate to solderability performance. The Sequential Electrochemical Reduction Analysis (SERA) was used extensively to evaluate the solderability performance of the finishes after stress exposure. 54 pages. Released May 2006.

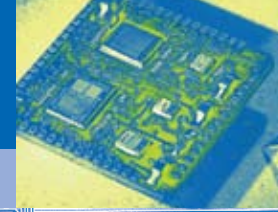
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IPC-TR-461

Solderability Evaluation of Thick and Thin Fused Coatings

Identifies and evaluates the effects of thick and thin fused coatings on the solderability of PCBs. 29 pages. Released March 1979.

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IPC-TR-462

Solderability Evaluation of Printed Boards with Protective Coatings Over Long-Term Storage

Provides conclusions and recommendations for the effectiveness of different protective coatings and coating application methods. PCB solderability in typical storage conditions after various time periods as well as the correlation of time and storage conditions to thickness and coating characteristics are addressed. 63 pages. Released October 1987.

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IPC members: **\$30.00**

Nonmembers: **\$60.00**

IPC-TR-464

Accelerated Aging for Solderability Evaluations

Developed to meet the growing need for a standard method of evaluating the solderability retention capability of printed boards during inventory storage. 32 pages. Revised April 1984. Includes seven page addendum, released December 1987.

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IPC-TR-465-1

Round Robin Test on Steam Ager Temperature Control Stability

Provides test data from 7 companies using 13 different models of steam agers. Program intent was to evaluate the variability of steam aging equipment and develop a test procedure to quantify variability so that it may be controlled. 20 pages. Released 1993.

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IPC-TR-465-2

The Effect of Steam Aging Time and Temperature on Solderability Test Results

Details the results of a two-year study to determine the effect of steam aging exposure on components. Concludes that 98°C for eight hours is the optimal condition for industry specifications for both component leads and printed boards. 51 pages. Released July 1996.

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IPC members: **\$25.00**

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IPC-TR-465-3

Evaluation of Steam Aging on Alternative Finishes, Phase 11A

Reviews the results of a 2-year study to determine the effect of steam aging exposure on components. A variety of solderable finishes were used. A small production simulation utilized preconditioned and as-received samples and tested a total of 2,000 joints. 15 pages. Released July 1996.

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IPC-TR-466

Technical Report: Wetting Balance Standard Weight Comparison Test

Discusses the results of a program to study the precision of weight measurements taken on the wetting balance and to correlate weight measurements between all test users and equipment manufacturers. 16 pages. Released April 1995.

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SMC-WP-001

Soldering Capability White Paper Report

Five different industry perspectives provide analysis of concerns in the electronic packaging industry about solderability problems. Covers design for the soldering process, solderable PCBs, solderable components and soldering process. Developed by Foster Gray, PC Interconnects. 35 pages. Released August 1991.

FREE DOWNLOAD

SMC-WP-005

PCB Surface Finishes

Seven PCB fabrication experts present their findings on surface finishes available for printed boards and the needs of surface mount assembly. Topics range from surface finish technology drivers and fine pitch packaging for components to direct chip attach and solder paste applications. Developed by Foster Gray, PC Interconnects. 46 pages. Released August 1997.

FREE DOWNLOAD

OPTOELECTRONICS

IPC-0040

Optoelectronics Assembly and Packaging Technology

Addresses implementation of optical and optoelectronic packaging technologies. Areas discussed include: technology choices, design considerations, material properties, component mounting and interconnecting structures, assembly processes, testing, application, rework, and reliability of completed optoelectronic products. Optoelectronic packaging technologies include active and passive components and discrete fiber cable, their characteristics, and the manner in which these parts become an integral part of the functioning module, board or subassembly. 161 pages. Released May 2003.

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IPC-8413-1

Specification for Process Carriers Used to Handle Optical Fibers in Manufacturing

Defines standard practices for handling various kinds of optical fiber and the specifications and guidelines to be used in the design of carriers for these fibers in component manufacturing. Identified in the overarching IPC-0040, *Optoelectronic Assembly and Packaging Technology*. Does not define a particular carrier design, but does define enough parameters to facilitate the use of fiber carriers in optoelectronic component manufacturing, particularly in automated or semi-automated processes. 15 pages. Released April 2003.

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IPC-8497-1

Cleaning Methods and Contamination Assessment for Optical Assembly

Describes the methods for inspecting and cleaning all optical interfaces so that interconnectivity integrity of the optical signal is maintained. Information focuses on techniques and methods to accomplish maximum quality of the interface and contamination prevention. 38 pages. Released January 2006.

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PRINTED CIRCUIT BOARDS

GENERAL

IPC-M-105

Rigid Printed Board Manual*

The latest standards addressing the dimensioning, tolerancing, qualifying and performance aspects of rigid printed boards. Provides an in-depth focus on solderability testing, polymer thick film printed boards, land pattern and high speed circuitry design. An invaluable tool for anyone contemplating the design and performance characteristics of rigid printed boards. 30 documents are included.

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IPC-D-325A

Documentation Requirements for Printed Boards

ANSI Approved. Establishes the general requirements for documentation necessary to fully describe end product printed boards, regardless of raw material, special fabrication requirements, layer count or end product usage. Includes master drawing requirements, board definition and artwork/phototooling. 94 pages. Revised May 1995.

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IPC-D-326A

Information Requirements for Manufacturing Printed Circuit Boards and Other Electronic Assemblies

Covers the information requirements for the procurement of material, box build, assembly, system integration, inspection, test, burn-in, delivery and/or distribution of electronic assemblies. 5 pages. Released January 2004.

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IPC members:	\$25.00	\$30.00
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IPC-PE-740A

Troubleshooting for Printed Board Manufacture and Assembly

Useful for day-to-day problem solving. Contains case histories of problems and corrective action in the design, manufacture, assembly and testing of printed circuit products. Sections reflect today's manufacturing challenges. Addressing documentation, phototooling, raw materials, mechanical operations, hole-preparation, plated-through hole, cleaning procedures, imaging, electroplating, etching, innerlayer fabrication lamination, soldering, metallic protective coatings, non metallic protective coatings, component preparation and assembly, inspection and test, rework and repair, and an assembly chapter that includes soldering, cleaning and post soldering processes. 388 pages. Released December 1997.

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Nonmembers:	\$210.00	\$215.00

ACCEPTABILITY

IPC-6010 SERIES

IPC-6010 Qualification and Performance Series

IPC's qualification and performance specification standards for every type of printed circuit board. The series is built around IPC-6011, the base document which includes all generic requirements for printed boards, regardless of substrate. Along with IPC-6011, use the appropriate sectional standard: IPC-6012B, IPC-6013A, IPC-6015, IPC-6016, and IPC-6018A.

Includes updated surface plating/coating criteria, new conductor thickness minimums for internal and external conductors, expanded coverage of annular ring and breakout conditions, and flexible circuit requirements including laminate integrity, coverlayer coverage and squeeze-out.

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IPC-6011

Generic Performance Specification for Printed Boards

Establishes the general requirements and responsibilities for suppliers and users of printed boards. As the foundation of the IPC-6010 *Qualification and Performance Series*, it describes mandatory quality and reliability assurance requirements. Use with IPC-6012 through IPC-6018. 15 pages. Released July 1996.

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IPC-6012B

Qualification and Performance Specification for Rigid Printed Boards

Covers qualification and performance of rigid printed boards, including single-sided, double-sided, multi-layer with or without blind/buried vias and metal core boards. Addresses final finish and surface plating coating requirements, conductor tolerances, holes/vias as well as electrical, mechanical and environmental requirements. Revision B provides requirements for surface finishes including nickel under gold for wire bonding and electroless nickel/immersion gold. Includes requirements for hole size and pattern accuracy, annular ring and breakout detection, defects within BGA pads, minimum internal and external conductor thickness, plating voids and thermal stress testing. For use with IPC-6011. 43 pages. Released August 2004.

		Language
IPC-6012B		English
IPC-6012B-IT		Italian NEW
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IPC-6013A

Qualification and Performance Specification for Flexible Printed Boards – Includes Amendment 2

For more information, go to page 21.

*For a listing of included documents, visit the online store or contact customer service at 847-597-2862.

**Kit includes CD and hard copy.

IPC-6015
Qualification & Performance
Specification for Organic Multichip
Module Mounting and Interconnecting
Structures

Establishes the specific requirements for organic mounting structures used to interconnect chip components which, in combination, form the completed functional organic single-chip module (SCM-L) or organic multichip module (MCM-L) assembly. Includes the quality and reliability assurance requirements that must be met for their acquisition. For use with IPC-6011. 25 pages. Released February 1998.

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IPC-6016
Qualification and Performance
Specification for High Density
Interconnect (HDI) Layers or Boards.

For more information, go to page 19.

IPC-6018A
Microwave End Product Board Inspection
and Test

For more information, go to page 21.

IPC-A-600G
Acceptability of Printed Boards

The definitive illustrated guide to printed circuit board acceptability! This full color document provides photographs and illustrations of the target, acceptable and nonconforming conditions that are either internally or externally observable on finished printed boards. Make sure your operators, inspectors, and engineers have the most current industry consensus information. Revision G provides coverage on topics such as lifted lands, surface roughness of wire bond pads and smear removal. Also covers measling of printed boards, foreign inclusions, annular ring requirements, layer-to-layer spacing and internal and external conductor thicknesses, as well as cover-layer coverage, adhesive squeeze-out and laminate integrity for both flex and rigid-flex boards. With more than 300 illustrations and photographs, the document synchronizes to the requirements expressed in IPC-6012B and IPC-6013A. 126 pages. Released September 2004.

	Language	
IPC-A-600G	English	
IPC-A-600G-CH	Chinese	NEW
IPC-A-600G-IT	Italian	NEW
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Nonmembers:	\$90.00	\$95.00
KIT**		
IPC members:	\$70.00	
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IPC-QE-605A
Printed Board Quality Evaluation
Handbook

Contains a variety of photographic illustrations of anomalies and characteristics of printed boards for identification of anomalies that are sometimes seen during inspection and evaluation processes. The handbook has been divided into 14 distinct sections covering topics such as solder resist, plated-through holes, conductor characteristics and surface plating to aid the user in determining specific accept/nonconforming criteria for various anomalies. 52 pages. Released February 1999.

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TABLE OF CONTENTS

General	16
Acceptability	16
Fabrication	18
High density/fine pitch	19
High speed/high frequency	20
Flexible circuits	21
Materials/general	22
Materials/laminate	22
Materials/foils	22
Materials/reinforcements	23
Quality and test	24

IPC-HM-860
Specification for Multilayer
Hybrid Circuits

Covers the qualification and performance requirements of multilayer circuits used in hybrid packaging. These circuits consist of three or more layers of conductor patterns separated from each other by insulating materials and interconnected by a continuous metallic interlayer connection. The substrate may include passive elements. 66 pages. Released January 1987.

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IPC-TF-870
Qualification and Performance of Polymer
Thick Film Printed Boards

Covers the materials, qualification, certification and performance requirements for multilayer polymer thick film (PTF) printed, extrusion deposited, or otherwise applied conductor, insulator and through hole technology. May also be used for procurement of single- and double-sided boards. 59 pages. Released November 1989.

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PRINTED CIRCUIT BOARDS

IPC-ML-960

Qualification and Performance Specification for Mass Lamination Panels for Multilayer Printed Boards

ANSI Approved. Covers qualification and performance requirements of rigid mass laminated panels for use in multilayer printed boards. Testing procedures and criteria are addressed. 21 pages. Released July 1994.

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IPC-TR-481

Results of Multilayer Tests Program Round Robin

This report, a round robin test program, was designed to collect and evaluate data on multilayer boards and the effects of materials and processing on MLB reliability. 86 pages. Released April 1981.

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IPC-TR-551

Quality Assessment of Printed Boards Used for Mounting and Interconnecting Electronic Components

Test report with a compendium of technical methods and techniques used for evaluating the quality aspects of present and future interconnection products and electronic assemblies. Addresses base materials, conductor physical requirements, internal planes, construction, registration, plated-through holes, component mounting areas, cleaning evaluation, solder mask, and printed board electrical requirements. 104 pages. Released July 1993.

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IPC members:	\$30.00
Nonmembers:	\$60.00

IPC-TR-579

Round Robin Reliability Evaluation of Small Diameter Plated-Through Holes in PCBs

Approximately 200,000 plated-through holes, (PTH) covering primarily electroplated but also electroless technology, were exposed to several different thermal cycles. A number of PTH diameters, board constructions and plating thicknesses were evaluated. 80 pages. Released September 1988.

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IPC members:	\$30.00	\$35.00
Nonmembers:	\$60.00	\$65.00

FABRICATION



IPC-4761

Design Guide for Protection of Printed Board Via Structures

Sole industry guideline providing PCB designers, manufacturers and users with detailed information on all existing methods for protecting vias on printed boards, including all types of via tenting, plugging, filling and capping. Production issues, long term reliability concerns and material specification and selection are provided to aid in evaluating the benefits and concerns for employing each type of via protection. 16 pages. Released July 2006.

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IPC-4552

Specification for Electroless Nickel/Immersion Gold (ENIG) Plating for Printed Circuit Boards



ANSI Approved. Provides guidance on Electroless Nickel/Immersion Gold (ENIG). Establishes requirements for the use of ENIG as a surface finish for printed circuit boards. Contains full color photographs. Includes requirements for ENIG deposit thicknesses based on performance criteria. Invaluable resource for use by suppliers, board fabricators, electronics manufacturing services (EMS) and original equipment manufacturers (OEMs). Appendix includes a copy of the highly sought after technical paper, "Standard Developments Efforts of Electroless Nickel Immersion Gold" by George Milad and Gerard O'Brien. 29 pages. Released October 2002.

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IPC members:	\$40.00	\$45.00
Nonmembers:	\$80.00	\$85.00



IPC-4553

Specification for Immersion Silver Plating for Printed Circuit Boards



ANSI Approved. Establishes metrics for immersion silver (IAG) deposit thickness based on performance criteria and illustrates the requirements using color photographs and illustrations for clarity. Second document in a series of specifications (the first being IPC-4552) that sets the requirements for printed circuit board surface finishes that are alternates to eutectic tin lead. Intended for use by suppliers, printed circuit manufacturers, electronics manufacturing services (EMS) providers and original equipment manufacturers (OEM). Appendices include a well-written explanatory paper by Gerard O'Brien and George Milad, entitled "Standard Developments Efforts of Immersion Silver" as well as an excellent tutorial, entitled "X-Ray Fluorescence (XRF) Spectroscopy" by Frank Ferrandino that provides information on this analytical equipment's use as a plating thickness control mechanism. 29 pages. Released June 2005.

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IPC members:	\$40.00	\$45.00
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IPC-4554

Specification for Immersion Tin Plating for Printed Circuit Boards

This document is coming soon – check the online store.

**Kit includes CD and hard copy.

IPC-TR-585

Time, Temperature and Humidity Stress of Final Board Finish Solderability

For more information, go to page 14.

IPC-DR-572

Drilling Guidelines for Printed Boards

Provides guidelines for drilling quality holes in a wide range of printed board materials. 11 pages. Released April 1988.

Revision A coming soon – check the online store.

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Nonmembers:	\$40.00	\$45.00

IPC-IT-95080

Improvements/Alternatives to Mechanical Drilling of PCB Vias

Defines and characterizes alternatives to mechanical drilling of small holes and discusses advances in mechanical drilling technology. 76 pages. Released August 1995.

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IPC members:	\$150.00
Nonmembers:	\$300.00

IPC-SM-839

Pre- & Post-Solder Mask Application Cleaning Guidelines

Covers all aspects of cleaning related to solder mask application, including board preparation, in-process control and maintenance of cleanliness during pre-assembly processes. 22 pages. Released April 1990.

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IPC members:	\$20.00	\$25.00
Nonmembers:	\$40.00	\$45.00

IPC-SM-840C

Qualification and Performance of Permanent Solder Mask — Includes Amendment 1

For more information, go to page 12.

HIGH DENSITY/FINE PITCH

IPC-HDI-1

High Density Interconnect Microvia Technology Compendium*

The collection is complete. From materials to design and manufacture, IPC-HDI-1 compiles the standards, specifications and guidelines your company needs to produce high density interconnect (HDI) and microvia boards. This comprehensive resource comes with multiple documents, including three joint IPC/Japan Printed Circuit Association (JPCA) documents.

	HARD COPY	CD OR DOWNLOAD
IPC members:	\$140.00	\$145.00
Nonmembers:	\$280.00	\$285.00

Save at least 50% by purchasing documents together.

IPC/JPCA-4104

Specification for High Density Interconnect (HDI) and Microvia Materials

ANSI Approved. Covers the various conductive and dielectric materials that can be used for the fabrication of HDI and microvias. The 23 specification sheets included in IPC/JPCA-4104 cover the qualification and conformance requirements for such materials as photoimageable dielectric dry films and liquids, epoxy blends and coated foils. IPC/JPCA-4104 also includes six new test methods developed specifically for the testing of HDI and microvia materials. 92 pages. Released May 1999.

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IPC members:	\$45.00	\$50.00
Nonmembers:	\$90.00	\$95.00

IPC-2226

Sectional Design Standard for High Density Interconnect (HDI) Printed Boards

For more information, go to page 27.

IPC-6016

Qualification & Performance Specification for High Density Interconnect (HDI) Layers or Boards

ANSI Approved. Establishes the specific electrical, mechanical and environmental requirements for organic HDI layers with microvia technology. The acceptance criteria of the HDI layers are organized into specification sheets that reflect typical end-use applications, such as cellular phones, avionics, automotive and personal computers. Key concepts include: HDI conductive surface requirements, microvia integrity, HDI electrical properties and end use application slash sheets. For use with IPC-6011/6012. 55 pages. Released May 1999.

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IPC members:	\$35.00	\$40.00
Nonmembers:	\$70.00	\$75.00

IPC/JPCA-6801

IPC/JPCA Terms & Definitions, Test Methods, and Design Examples for Build-Up/High Density Interconnect (HDI) Printed Circuit Boards

Recognizing Japan's leadership in microvia substrate production, the IPC HDI Committee chose to adopt JPCA-BU01 as IPC/JPCA-6801 to ensure global consistency in the terminology, requirements and test methods for HDI and microvia applications. Lists terms specific to HDI and test methods for CTE for materials and HDI PCBs, peel strength and thermal shock. Includes design criteria table and background information for the development of a standard for HDI PCBs. 32 pages. Released January 2000.

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PRINTED CIRCUIT BOARDS

IPC-DD-135

Qualification Testing for Deposited Organic Interlayer Dielectric Materials for Multichip Modules

Includes qualification and requirements for deposited organic interlayer dielectric materials for MCM-D applications. Enables a vendor to evaluate dielectric materials and express properties in a uniform format. Provides guidelines for reporting history of specimen processing. 42 pages. Released August 1995.

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IPC-IT-96060

High Density PCB Microvia Evaluation (October Project) Phase 1, Round 1

First in a series covering the evaluation of several microvia technologies. Addresses basic microvia technology with the intent of educating PCB fabricators and suppliers so that they can make informed and appropriate investments in resources. Includes IT-96061, *Microvia Manufacturing Technology Cost Analysis*. 76 pages. Released June 1996.

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IPC-IT-97071

High Density PCB Microvia Evaluation, Phase 1, Round 2

Second in a series covering the evaluation of several microvia technologies. Includes a complete analysis of different microvia manufacturing technologies and their compared reliability. 11 pages. Released July 1997.

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IPC-IT-30101

High Density PCB Microvia Evaluation, Phase 1, Round 3

Third in a series, evaluates 16 microvia fabricators that represent 18 different technologies, the most extensive evaluation to date. Details the suitability of microvia technology in high speed/high frequency applications using data to explain the electrical performance of microvias. 83 pages. Released March 2000.

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IPC-IT-98123

Microvia Manufacturing Technology Cost Analysis Report

Cost analysis of microvias conducted by IBIS Associates. Aids PCB manufacturers during the purchasing process, to help suppliers improve their working relationships with PCB manufacturers and to help OEMs with new product design issues. Provides a comparison of classic through hole technology to the same design in microvia technology. 67 pages. Released December 1998.

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HIGH SPEED/HIGH FREQUENCY

IPC-2141A

Design Guide for High-Speed Controlled Impedance Circuit Boards

Controlled impedance is the maintenance of some specified tolerance in the characteristic impedance of an interconnect line (transmission line) that is used to connect different devices on a circuit. Controlled impedance is often a design consideration for high-speed digital or high-frequency analog circuits. Guide is intended to be used by circuit designers, packaging engineers, printed board fabricators, and procurement personnel. Revision A includes expanded data for logic families, updated equations for unbalanced lines, new equations for balanced line configurations, and detailed comparisons between capacitive lines and transmission lines, including propagation within transmission lines. 53 pages. Released March 2004.

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IPC-2251

Design Guide for the Packaging of High Speed Electronic Circuits

Addresses the major factors influencing the design of high-speed circuitry. Considerations include electrical noise, electromagnetic interference, signal propagation time, impedance, thermo-mechanical environmental protection, and heat dissipation. Supersedes IPC-D-317A. Key improvements include updated impedance models for embedded microstrip, centered stripline and dual stripline geometries, expanded EMI layout practices, signal integrity design constraints, enhanced graphics and updated terms and definitions. 99 pages. Released December 2003.

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IPC-2252

Design Guide for RF/Microwave Circuit Boards

Provides RF and microwave circuit design engineers, printed circuit board engineers, packaging engineers and drafters with information necessary to design practical, functional and cost effective microwave circuit boards in the frequency range of 100 MHz to 30 GHz. Guide also applies to operations in the region where distributed circuits are used instead of conventional lumped circuit elements. 30 pages. Released June 2002.

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IPC-4103

Specification for Base Materials for High Speed/High Frequency Applications

ANSI Approved. Covers the requirements for high speed/high frequency laminate or bonding layers to be used primarily for the fabrication of rigid or multilayer printed boards for high speed/high frequency electrical and electronic circuits. Supersedes IPC-L-125A. Improvements include updated bonding layer testing parameters, inspection lot requirements, revised visual acceptance criteria and new specification sheets for hydrocarbon and polyester resin systems. 40 pages. Released January 2002.

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IPC-6018A Microwave End Product Board Inspection and Test

Establishes requirements for qualification and performance of high frequency (microwave) printed circuit boards. Covers both end product inspection and test of microwave boards for microstrip, stripline, mixed dielectric and multilayer stripline applications. Enhancements over previous version include updated tables for surface finish requirements and annular ring, as well as revised requirements for microsectioned test specimen and production boards. 34 pages. Released January 2002.

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FLEXIBLE CIRCUITS

IPC-M-102 Flexible Circuits Compendium*

Comprehensive compendium of IPC's documentation for flexible circuits. Includes 15 documents.

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IPC-2223A Sectional Design Standard for Flexible Printed Boards

For more information, see page 26.

IPC-4202 Flexible Base Dielectrics for Use in Flexible Printed Circuitry



ANSI Approved. Establishes the requirements for flexible base dielectric materials that are used in

the fabrication of flexible printed circuitry and flexible flat cable. Provides comprehensive data that will help users more easily determine both material capability and compatibility. Includes flexible base dielectric material specification sheets which are identified by material type. Closely aligned with IPC-4203 and IPC-4204. Supersedes IPC-FC-231C with Amendment 1 and all former revisions of IPC-FC-231. 32 pages. Released May 2002.

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IPC-4203 Adhesive Coated Dielectric Films for Use as Cover Sheets for Flexible Printed Circuitry and Flexible Adhesive Bonding Films



ANSI Approved. Establishes the requirements for adhesive coated dielectric film materials used in the cover sheets and flexible adhesive bonding films of fabricated flexible printed circuitry and flexible flat cable. Provides comprehensive data that will help users more easily determine both material capability and compatibility. Includes adhesive-coated flexible dielectric film material specification sheets which are identified by material type. Closely aligned with IPC-4202 and IPC-4204. Supersedes IPC-FC-232C with Amendment 1 and all former revisions of IPC-FC-232 and IPC-FC-233. 45 pages. Released May 2002.

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IPC-4204 Flexible Metal-Clad Dielectrics for Use in Fabrication of Flexible Printed Circuitry



ANSI Approved. Establishes the requirements for metal-clad dielectric film materials used in flexible printed circuitry fabrication and flexible flat cable. Provides comprehensive data that will more easily help users determine both material capability and compatibility. Includes the metal-clad dielectric film material specification sheets which are identified by material type. Closely aligned with IPC-4202 and IPC-4203. Supersedes IPC-FC-241C and all former revisions of IPC-FC-241. 57 pages. Released May 2002.

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NEW IPC-6013A Qualification and Performance Specification for Flexible Printed Boards – Includes Amendment 2

Covers qualification and performance requirements for flexible printed boards designed to IPC-2221 and IPC-2223. The flexible printed board may be single-sided, double-sided, multilayer or rigid-flex multilayer. All of these constructions may include stiffeners, plated-through holes and blind/buried vias. Revision A with Amendment 2 incorporates updated requirements for surface plating, microsection evaluations and acceptance testing frequency. Supersedes IPC-6013A with Amendment 1. For use with IPC-6011. 40 pages. Released April 2006.

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IPC/JPCA-6202 IPC/JPCA Performance Guide Manual for Single- and Double-Sided Flexible Printed Wiring Boards

Covers the requirements and considerations for single- and double-sided flexible printed boards. IPC/JPCA-6202 includes more than 30 figures on accept/reject criteria for flexible printed boards and an appendix on the handling of polyimide-based flexible printed boards. Also included are all seven Japanese Industrial Standards (JIS) test methods referenced in IPC/JPCA-6202. 96 pages. Released February 1999.

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IPC members:	\$45.00	\$50.00
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IPC-FA-251 Guidelines for Assembly of Single- and Double-Sided Flex Circuits

ANSI Approved. Describes the type of materials and processes that may be used to accomplish proper electronic assembly. 30 pages. Released February 1992.

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PRINTED CIRCUIT BOARDS

IPC-FC-234

PSA Assembly Guidelines for Single- & Double-Sided Flexible Printed Circuits

Suggests guidelines for the use of pressure sensitive adhesives (PSAs) in single- or double-sided flexible printed circuits, membrane switches and component attachments. Provides information on adhesive types and the materials and processes recommended for their proper use in assembly. 30 pages. Released December 1997.

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MATERIALS/GENERAL

IPC-M-107

Standards for Printed Board Materials Manual*

With all the different recipes available for the manufacture of laminate for PCBs, it is important to stay current on available materials. Manual set of 18 documents contains the requirements for the various reinforcements, foils, laminates and prepregs.

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IPC-MI-660

Incoming Inspection of Raw Materials Manual

Contains background information, applicable specification references and industry-approved test methods for inspection and evaluation of incoming raw materials. Material categories include laminates, multilayer board materials, various interconnection substrates, resists and other coatings, processing chemicals, artwork, registration tools, accessories, soldering materials, tooling accessories and other materials. 150 pages. Released February 1984.

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IPC-4821

Specification for Embedded Passive Device Capacitor Materials for Rigid and Multilayer Printed Boards

Describes materials that can be used for the fabrication of embedded passive capacitor devices within the finished printed circuit board substrate. For this document, embedded passive devices and the phrase embedded passives are considered to be equivalent. Provides information on general designations and associated characteristics of embedded passive device (EPD) capacitor materials. Use document as a qualification and conformance standard for these materials. Contains material designation, conformance (requirements), qualification (characterization) and quality assurance specifications. Covers requirements for dielectric, conductive, and insulating materials that are used with materials for the manufacture of printed circuit boards containing embedded passive capacitor functionality. 34 pages. Released May 2006.

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MATERIALS/LAMINATE



IPC-4101B

Specification for Base Materials for Rigid and Multilayer Printed Boards



Covers the requirements for base materials (laminate and prepreg) to be used primarily for rigid or multilayer printed boards for electrical and electronic circuits. Contains more than 50 separate specification sheets and uses search terms to help find similar groups of materials from these sheets. Provides user with information and data on printed circuit board materials that can better withstand the newer assembly operations employing higher thermal exposures, including assembly practices that utilize the commonly encountered lead free solders. 112 pages. Released June 2006.

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IPC-4121

Guidelines for Selecting Core Construction for Multilayer Printed Wiring Board Applications

ANSI Approved. A "must have" for those responsible for purchasing laminate materials for their company. Provides industry-approved guidelines for selecting core constructions for multilayer printed circuit boards (PCBs). Contains sheets that categorize the different core constructions by laminate type and nominal thickness. The constructions are rated for characteristics such as dielectric constant (DK), dimensional stability (DS), flatness, smoothness and drillability. Supersedes IPC-CC-110A. 12 pages. January 2000.

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MATERIALS/FOILS

IPC-4562

Metal Foil for Printed Wiring Applications



ANSI Approved. Covers the nomenclature and requirements for metal foils used in laminate and PCB

fabrication. Includes specification sheets to assist buyers and suppliers in understanding and using consistent purchasing and quality criteria for metal foils. Supersedes IPC-MF-150F. Amendment 1 is available as a free download at the online store. 27 pages. Released May 2000.

Revision A coming soon – check the online store.

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IPC-CF-148A

Resin Coated Metal for Printed Boards

ANSI Approved. Establishes the requirements for metal foils coated with a resin or composite of resins on one side to be used for the fabrication of PCBs. Includes a series of specification sheets that outline engineering and performance data for resin-coated metal foil, indicating foil material type and resin type. 76 pages. Released September 1998.

IPC-4563, Resin Coated Metal for Printed Boards Guidelines coming soon – check the online store.

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IPC-CF-152B

Composite Metallic Materials Specification for Printed Circuit Boards

Details the requirements for copper/invar/copper (CIC), copper/molybdenum/copper (CMC) and three-layer composites for use in electronic applications. Includes specification sheets that outline engineering and performance data for each type of composite metallic materials. 39 pages. Revised March 1997.

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IPC-TR-485

Results of Copper Foil Rupture Strength Test Round Robin Study

Evaluation of rupture strength testing as a means for determining the mechanical properties of electrodeposited and rolled copper foil. 27 pages. Released March 1985.

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MATERIALS/REINFORCEMENTS



IPC-4412A

Specification for Finished Fabric Woven from "E" Glass for Printed Boards

Exhaustively covers the classification and requirements for finished fabrics woven from "E" glass fiber yarns. These yarns are formed from filaments of electrical-grade glass and are intended as reinforcing materials in laminated plastics for electrical and electronic uses. The fabrics covered by this specification are all of a plain-weave construction. Includes two extensive tables of finished fabric glass styles, one in SI units and the other in US units. Supersedes IPC-4412, IPC-EG-140 with Amendments 1 & 2 and IPC-EG-140. 19 pages. Released January 2006.

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IPC-4130

Specification & Characterization Methods for Nonwoven "E" Glass Mat

ANSI Approved. Determines the nomenclature, definitions and requirements for materials made from nonwoven "E" glass fibers. Includes specification sheets for selecting and purchasing these materials. 14 pages. Released September 1998.

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IPC-4110

Specification and Characterization Methods for Nonwoven Cellulose Based Paper for Printed Boards

ANSI Approved. Determines the nomenclature and chemical and physical requirements of paper made from cellulose fibers for PCB fabrication. Includes specification sheets for selecting and purchasing these materials. 11 pages. Released August 1998.

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IPC-4411A

Specification and Characterization Methods for Nonwoven Para-Aramid Reinforcement

Covers the nomenclature and requirements for reinforcement made from nonwoven para-aramid fibers which are primarily used in PCBs for HDI and high speed/high frequency applications. Includes specification sheets, that can be used when selecting and purchasing nonwoven para-aramid reinforcement. Incorporates 14 new specification sheets. Due to a test method correction, all specification sheets have been updated. 22 pages. Released November 2003.

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IPC-SG-141

Specification for Finished Fabric Woven from "S" Glass for Printed Boards

Covers the classification and requirements for finished fabrics woven from "S" glass, electrical grade glass fiber yarns intended as a reinforcing material in laminated plastics for electrical and electronic use. 12 pages. Released February 1992.

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IPC-A-142

Specification for Finished Fabric Woven from Aramid for Printed Boards

Covers finished fabrics woven from aramid yarns that are intended as reinforcing material in laminated plastics for electrical and electronic use. All fabrics covered by this specification are plain weave. 9 pages. Released June 1990.

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IPC-QF-143

Specification for Finished Fabric Woven from Quartz (Pure Fused Silica) for Printed Boards

ANSI Approved. Covers classification and requirements for finished fabrics woven from quartz fiber yarns that are intended as a reinforcing material in laminated plastics for electrical and electronic use. 13 pages. Released February 1992.

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PRINTED CIRCUIT BOARDS

QUALITY AND TEST

NEW IPC-9691

User Guide for the IPC-TM-650, Method 2.6.25, Conductive Anodic Filament (CAF) Resistance Test (Electrochemical Migration Testing)

Drafted to provide guidance regarding how the IPC-TM-650, Method 2.6.25, Conductive Anodic Filament (CAF) Resistance Test can best be used for evaluating the effects of mechanical stress, laminate material fracturing, ionic contamination, moisture content prior to press lamination, and other material processing characteristics on conductive anodic filament (CAF) growth. CAF test method provides a proven standard for determining the risk of temperature/humidity/bias (THB) failure within rather than on the surface of printed circuit boards (PCBs), typically filament formation along the boundary between the resin and laminate reinforcement. 22 pages. Released June 2005.

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IPC-2524 PWB Fabrication Data Quality Rating System

Describes a PCB fabrication data quality rating system used by fabricators to evaluate incoming data package integrity. Includes information on conformance to both fabricator and customer design rules and can be used by printed board designers as an output quality check. 16 pages. Released February 1999.

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IPC-9151A

Printed Board Process, Capability, Quality and Relative Reliability (PCQR²) Benchmark Test Standard and Database

Many printed circuit board buyers have developed internal processes to evaluate the capabilities of their printed circuit board manufacturers/IMS companies. Manufacturers often receive multiple requests from multiple customers to manufacture test panels as part of qualification procedures. The PCQR² program provides an industry standard for the design of these benchmark process capability test panels. Data resulting from this process provides database subscribers with the ability to review detailed results from individual manufacturers and to compare the capabilities of multiple fabricators across the industry. IPC-9151A describes the process for evaluating the manufacturing capability of key attributes specified in the design and acceptability standards controlled by IPC. More information is available at www.pcbquality.com. 7 pages. Released May 2003.

FREE DOWNLOAD

IPC-9191

General Guidelines for Implementation of Statistical Process Control (SPC)

ANSI Approved. Outlines the SPC philosophy, implementation strategies, tools and techniques used for relating process control and capability to final product requirements. Reflects the principles of statistical process control (SPC) represented by ISO/DIS 11462-1, *Guidelines for Implementation of Statistical Process Control (SPC) – Part 1: Elements of SPC*. Supersedes IPC-PC-90. 43 pages. Released November 1999.

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NEW

IPC-9194

Implementation of Statistical Process Control (SPC) Applied to Printed Board Assembly Manufacture Guideline

Intended to aid in interpretation of the requirements in IPC-9191, *General Guidelines for Implementation of Statistical Process Control*, specifically for printed board assembly (PBA) manufacture. Promotes process thinking and control of process inputs, in-process parameters and process outputs, including product parameters. Organizes various aspects of process control in the Plan, Do, Check and Act (PDCA) cycle. Establishes practical guidelines for the implementation of SPC in the electronics manufacturing operations for continually improving processes and reducing waste. Should be used in tandem with IPC-9191; the standards are cross-referenced to each other in the Appendices of IPC-9194. 36 pages. Released September 2004.

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IPC-9199

Statistical Process Control (SPC) Quality Rating

Used as a tool for a customer or supplier organization's internal audit group to assess a statistical process control (SPC) system against the requirements of IPC-9191. Valuable to customers and suppliers of any size and for any commodity. Can be used to perform an assessment of the use of SPC at both organizational and process levels. The questions on the evaluation form provided are based on the guidelines for SPC implementation given in IPC-9191. Includes instructions to obtain Microsoft Word™ Template format of sections 4 through 6 for electronically recording information gained during the audit process. 41 pages. Released September 2002.

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IPC-9252
Guidelines and Requirements for Electrical Testing of Unpopulated Printed Boards

Defines different levels of appropriate testing and assists in the selection of the test analyzer, test parameters, test data and fixturing required to perform electrical test(s) on unpopulated boards and inner layers. Supersedes IPC-ET-652A. 20 pages. Released February 2001.

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IT-97061
PCB Hole to Land Misregistration: Causes and Reliability

Discusses the root causes of misregistration, recommendations for proper constructions and the need for an intact annular ring with the overall intent of aiding in the manufacture of reliable, high density PCB products. Project critically examined registration requirements, primarily through a reliability test program, literature searches and surveys of manufacturers. 11 pages. Released June 1997.

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IT-98103
Reliability of Misregistered and Landless Innerlayer Interconnects in Thick Panels

Explains interconnect configuration, design and manufacturing relationships and their influence on interconnect reliability. Effort is a continuation of the "PCB Hole-to-Land Misregistration: Causes and Reliability" study that intact annular ring requirements may be too conservative. Study expands on that conclusion by incorporating more board variables and test considerations. Results indicate that hole size, glass transition temperature and foil thickness influence reliability while interconnect configuration and conductor width have less impact. 180 pages. Released October 1998.

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IPC-MS-810
Guidelines for High Volume Microsection

Discusses the many variables and problems associated with the process, from sample removal to micro-etch, and the variables common to high volume microsection. Process variables and problems are organized to ease research of a specific issue or overview the variables of a process area. 31 pages. Released October 1993.

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IPC-QL-653A
Certification of Facilities that Inspect/ Test Printed Boards, Components & Materials

Establishes the certification requirements for facilities that inspect/test printed boards, components and materials. Provides a minimum standardized basis for evaluating or auditing a technically oriented inspection/testing facility. 15 pages. Revised November 1997.

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IPC-TR-483
Dimensional Stability Testing of Thin Laminates—Report on Phases 1 and 2 International Round Robin Test Programs

Provides test results of project to define a test procedure to evaluate thin laminate material (phase 1) and expand that project by adding a thermal stress cycle to the existing IPC Test Method 2.4.39 (phase 2). 74 pages. Revised March 1991.

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IPC-TR-486
Report on Round Robin Study to Correlate IST & Microsectioning Evaluations for Detecting the Presence of Inner-Layer Separation

Provides full detail of the round robin study charged with assessing the use of Interconnect Stress Test (IST) for incoming inspection in lieu of Thermal Stress in the detection of innerlayer separations in plated-through holes. Includes background on the Post Separation Task Group, test results, round robin test plan, conclusions and test methods used. 51 pages. Released July 2001.

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GENERAL

IPC-M-106

Technology Reference for Design Manual*

Provides an excellent compilation of standards essential to the library of any designer considering physical design principles, customer reliability requirements and surface mount and high-speed logic design. Set of 28 documents brings sharp focus on aspects of printed board technology such as high density interconnects, flexible printed board design, controlled impedance, usage of phototooling to improve artwork quality, and Design for Reliability (DFR) procedures.

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REQUIREMENTS

IPC-2220

Design Standards Series

Put IPC's design library at your fingertips! The IPC-2220 Design Standards Series includes all IPC current design standards in the IPC-2220 family. The series is built around IPC-2221A, *Generic Standard on Printed Board Design*, the base document that covers all generic requirements for printed board design, regardless of materials. The designer can choose the appropriate sectional standard for a technology. Contains IPC-2221-2226.

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IPC-2221A

Generic Standard on Printed Board Design

Considered the foundation design standard for all documents in the IPC-2220 series. Establishes the generic requirements for the design of printed boards and other forms of component mounting or interconnecting structures, whether single-sided, double-sided or multilayer. Revision A includes new criteria for surface plating, internal and external foil thicknesses, component placement and hole tolerances.

Expanded coverage is provided for material properties, dimensioning and tolerancing rules and via structures, as well as updated coupon designs for quality assurance. 112 pages. Released May 2003.

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IPC-2222

Sectional Standard on Rigid Organic Printed Boards

Used in conjunction with IPC-2221A, IPC-2222 establishes the design requirements of rigid organic printed boards and other component mounting and interconnecting structures. Applies to single-sided, double-sided or multilayered boards. Key concepts include: rigid laminate properties, designer/end user materials section map, scoring parameters and lead to hole relationships. IPC-2221A and IPC-2222 supersede IPC-D-275. 35 pages. Released February 1998.

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IPC members:	\$20.00	\$25.00
Nonmembers:	\$40.00	\$45.00

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IPC members:	\$35.00
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IPC-2223A

Sectional Design Standard for Flexible Printed Boards

Used in conjunction with IPC-2221A, IPC-2223A establishes the requirements for the design of single-sided, double-sided, multilayer, or rigid-flex flexible circuits. Revision A includes updated design rules for panel sizes, hole spacing, bend radii, shielding, palletization, nonfunctional lands, coverlayer access/spacing and conductor edge spacing. 24 pages. Released June 2004.

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IPC members:	\$25.00	\$30.00
Nonmembers:	\$50.00	\$55.00

IPC-2224

Sectional Standard on Design of PCB for PC Cards

Used in conjunction with IPC-2221A, IPC-2224 establishes the design requirements of printed boards for PC card form factors. Key concepts include bow and twist constraints, heat dissipation considerations and component placement requirements. 26 pages. Released January 1998.

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IPC members:	\$15.00	\$20.00
Nonmembers:	\$30.00	\$35.00

IPC-2225

Sectional Design Standard for Organic Multichip Modules (MCM-L) and MCM-L Assemblies

ANSI Approved. Used in conjunction with IPC-2221A, IPC-2225 establishes the requirements and considerations (thermal, electrical, electromechanical and mechanical) for the design of single chip module (SCM-L), multichip module (MCM) and MCM-L assemblies. Key concepts include adhesive interconnection information, typical die attach materials, microvia material properties and relationships with Design for Manufacturability (DFM) and Design for the Environment (DFE). 44 pages. Released May 1998.

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IPC members:	\$20.00	\$25.00
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*For a listing of included documents, visit the online store or contact customer service at 847-597-2862.

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IPC-2226

Sectional Design Standard for High Density Interconnect (HDI) Printed Boards

Used in conjunction with IPC-2221A, this standard establishes requirements and considerations for the design of high density interconnect (HDI) printed boards and its forms of component mounting and interconnecting structures. Provides recommendations for signal, power, ground and mixed distribution layers, dielectric separation, via formation and metallization requirements and other design features that are necessary for HDI-advanced IC interconnection substrates. Trade-off analyses required to match the mounting structure to the selected chip set also included. 49 pages. Released April 2003.

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IPC members:	\$35.00	\$40.00
Nonmembers:	\$70.00	\$75.00



IPC-7351

Generic Requirements for Surface Mount Land Pattern and Design Standard



The successor to IPC-SM-782A, this standard covers land pattern design for all types of passive and active components, including resistors, capacitors, MELFs, SSOPs, TSSOPs, QFPs, BGAs, QFNs and SONs. Provides many new features, such as intelligent land pattern naming convention, zero component rotations for CAD systems, and a set of three separate land pattern geometries for each component that allows the user to select a land pattern based on desired component density. Also includes updates to existing sections addressing land pattern guidelines for wave or reflow soldering, via location guidelines, fiducials and courtyard boundaries. IPC-7351 includes both the standard and an IPC-7351 land pattern viewer on CD-ROM. Replaces IPC-SM-782A. 92 pages. Released February 2005.

Revision A coming soon – please check the online store.

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IPC members:	\$50.00	\$55.00
Nonmembers:	\$100.00	\$105.00

IPC-D-859

Design Standard for Thick Film Multilayer Hybrid Circuits

ANSI Approved. Covers the requirements and considerations for the design of multilayer hybrid circuits based on industry manufacturing capabilities. 80 pages. Released December 1989.

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IPC members:	\$20.00	\$25.00
Nonmembers:	\$40.00	\$45.00

IPC-1902

IPC/IEC Grid Systems for Printed Circuits

An international standard adopted by IPC that ensures compatibility between printed circuits and the components to be mounted on them at grid intersections. Includes discussion of the need to develop specialized modular grids so as to permit flexibility in future designs. 6 pages. Released in December 1998.

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IPC members:	\$15.00	\$20.00
Nonmembers:	\$30.00	\$35.00

GUIDELINES

IPC/JPCA-2315

Design Guide for High Density Interconnects & Microvias

Provides an easy to follow tutorial on the selection of HDI and microvia design rules and structures. Addresses various considerations when designing an HDI printed circuit board, including design examples and processes, selection of materials, general descriptions, and various microvia technologies. Offers designers and manufacturers one source for reliable design and manufacturability information for commonly produced HDI boards. Includes more than 30 full color illustrations. Published jointly with the Japan Printed Circuit Association. 33 pages. Released June 2000.

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IPC members:	\$45.00	\$50.00
Nonmembers:	\$90.00	\$95.00

TABLE OF CONTENTS

General	26
Requirements	26
Guidelines	27
Certification.	28
Data Transfer	28

IPC-2615

Printed Board Dimensions and Tolerances

The definitive standard on printed board dimensioning and tolerancing. Consistent with other IPC printed board standards such as IPC-6012 and IPC-2221. Includes fundamental dimensioning and tolerancing rules; positional, profile, orientation and form tolerances; and detailed geometric symbolology. Invaluable to the PCB designer, this document will help manufacturers and board purchasers achieve the most manufacturable board designs. Supersedes IPC-D-300G for fundamental dimensioning and tolerancing rules. 66 pages. Released July 2000.

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IPC members:	\$30.00	\$35.00
Nonmembers:	\$60.00	\$65.00

IPC-A-311

Process Controls for Phototool Generation and Use

Covers the information and data to be collected during the generation and use of phototools to improve artwork quality, thereby improving yields downstream. Helps establish and maintain ISO 9000 certification and statistical process control (SPC) by facilitating troubleshooting, standardizing the process for both experienced and inexperienced operators and by identifying process improvements for the ultimate elimination of inspection and touchup of artwork. 6 pages. Released March 1996.

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IPC-D-279

Design Guidelines for Reliable Surface Mount Technology Printed Board Assemblies

Establishes design concepts, guidelines and procedures for reliable printed circuit assemblies. Focuses on SMT or mixed technology PWAs, specifically addressing the interconnect structure and the solder joint itself. Discusses substrates, components, attachment materials, coatings and assembly processes and testing considerations. Contains detailed appendices covering: solder attachments, plated-through via structures, insulation resistance, thermal considerations, environmental stresses, coefficient of thermal expansion, electrostatic discharge, solvents, testability, corrosion, aerospace and high altitude concerns. 137 pages. Released July 1996.

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Nonmembers:	\$90.00	\$95.00
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IPC members:	\$70.00	
Nonmembers:	\$140.00	

IPC-D-310C

Guidelines for Phototool Generation and Measurement Techniques

ANSI Approved. Provides manufacturing and design considerations, input data requirements, test coupons, process control, tape and preform artwork, cut and strip artwork, vector photoplotting, rasterplotting, direct imaging, measurement and quality assurance. 68 pages. Revised June 1991.

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IPC members:	\$30.00	\$35.00
Nonmembers:	\$60.00	\$65.00

IPC-D-322

Guidelines for Selecting Printed Wiring Board Sizes Using Standard Panel Sizes

ANSI Approved. Defines guidelines for choosing sizes of printed circuit boards using standard fabrication panel sizes. 4 pages. Reaffirmed September 1991.

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IPC members:	\$20.00	\$25.00
Nonmembers:	\$40.00	\$45.00

IPC-D-422

Design Guide for Press Fit Rigid Printed Board Backplanes

Contains backplane design information from the fabrication and assembly perspective. Includes sections on design and documentation, fabrication, assembly, repair, and inspection. 17 pages. Revised September 1982.

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Nonmembers:	\$40.00	\$45.00

CERTIFICATION

IPC-PWBADV-SG02 (Hard Copy)

IPC-PWBADV-CD (CD)

PCB Advanced Designer Certification Study Guide

Establishes the criteria and provides all necessary information to prepare designers for the IPC Advanced PCB Designer Certification Exam. Covers all ten sections of the exam: layout, electrical considerations, material, component requirements, assembly requirements, board fabrication, physical board characteristics, documentation, inspection and reliability. Follows the same approach used in the IPC Advanced PCB Designer Certification Preparation Workshop. May be used as a self-study guide. 293 pages. Released January 2002.

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IPC members:	\$75.00	\$185.00
Nonmembers:	\$150.00	\$285.00

IPC-PWB-CRT-SG01 (Hard Copy)

IPC-PWB-CERTCD01 (CD)

PCB Designer Certification Study Guide

Prepares designers for the IPC PCB Designer Certification Exam. Covers design considerations, layout principles, component and assembly issues, printed board characteristics, documentation and dimensioning. Addresses each of the ten sections of the exam, including electrical considerations, material properties, board fabrication, testing technology and reliability. Follows the same approach used in the IPC PCB Designer Certification Preparation Workshop. May be used as a self-study document. 174 pages.

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IPC members:	\$35.00	\$125.00
Nonmembers:	\$70.00	\$225.00

DATA TRANSFER

IPC-2501

Definition for Web-Based Exchange of XML Data

ANSI Approved. Establishes the governing semantics and an XML based syntax for shop floor communication between electronic assembly equipment and associated software applications. Outlines the communication architecture and supporting XML messages. Describes a messaging interface that is based upon an architecture whereby a single logical middleware server (the Message Broker) exchanges messages among clients in a domain. 32 pages. Released July 2003.

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IPC members:	\$35.00
Nonmembers:	\$70.00

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IPC-2531

Standard Recipe File Format (SRFF) Specification

Outlines the requirements that an SRFF file must meet. Describes the file format, outlines the file sections and indicates how data should be represented through objects. Objects can either be vendor independent (generic objects defined in this document) or vendor specific (objects created by a vendor). Includes error codes that should be used to report specific information about improperly constructed files. General guidelines for producing an SRFF file and vendor specific objects are also included. 125 pages. Published March 1999.

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IPC-2541

Generic Requirements for Electronics Manufacturing Shop Floor Equipment Communication (CAMX)

ANSI Approved. Defines an XML encoding schema to facilitate plug-and-play characteristics in a factory's shop-floor information system. Describes the generic event message content and should be used together with the IPC-2540 series sectional documents, which define the set of messages and key attributes of specific classes of equipment used in the electronics manufacturing area. 175 pages. Released October 2001.

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IPC members: **\$35.00**

Nonmembers: **\$70.00**

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IPC-2547

Sectional Requirements for Shop Floor Equipment Communication Messages (CAMX) for Printed Circuit Board Test

ANSI Approved. Describes event message content and an XML encoding scheme, which enables a detailed definition of messages in the domain of electronics inspection, test and repair/rework (i.e. product and process quality). These messages are to be encoded at a level appropriate to facilitate interoperability in the factory shop floor equipment and information system integration process. Should be used with the generic document, IPC-2541. 52 pages. Released January 2002.

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IPC-2578

Sectional Requirements for Supply Chain Communication of Bill of Material and Product Design Configuration Data — Product Data eXchange

ANSI Approved. Provides an XML encoding scheme for use by electronics manufacturing supply chain partners to exchange sufficient product data to enable distributed manufacturing. Information includes bills of material (BOM), approved manufacturer lists (AML), approved supplier lists (ASL), change history and engineering change orders, and a high-level description of the components listed on a bill of material. 34 pages. Released November 2001.

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IPC-2546

Sectional Requirements for Shop-Floor Equipment Communication Messages (CAMX) for Printed Circuit Board Assembly – with Amendments 1 & 2

ANSI Approved. Describes the event message content specific to assembly equipment. The types of processes covered by IPC-2546 include material movement systems like conveyors and buffers, manual placement, automated screen printing, automated adhesive dispensing, automated surface mount placement, automated plated-through hole placement, forced convection and infrared reflow ovens, and wave soldering. Amendment 1 provides the requirements for screen printing equipment. 108 pages. Released January 2003. Amendment 2 covers the Dispensing Equipment, Reflow Equipment, and Final Assembly and Packaging sections of IPC-2546 and is a supplement to the standard. 131 pages. Released January 2005.

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IPC-2571

Generic Requirements for Electronics Manufacturing Supply Chain Communication—Product Data eXchange (PDX)

ANSI Approved. Defines an XML encoding schema which enables a total product definition to be described at a level appropriate to facilitate supply chain interactions. The schema is defined for bill of materials (BOM), approved manufacturer list (AML), changes (engineering, manufacturing, product) and references to documents describing geometric and other definition characteristics. 43 pages. Released November 2001.

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IPC-2576

Sectional Requirements for Electronics Manufacturing Supply Chain Communication of As-Built Product Data — Product Data eXchange

ANSI Approved. Covers the sectional requirements for product genealogy or as-built manufacturing information. Facilitates the exchange of manufacturing information between supply chain partners to support warranty tracking, product excursion containment and product quality functions. 9 pages. Released November 2001.

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IPC-2511A

Generic Requirements for Implementation of Product Manufacturing Description Data & Transfer Methodology

Revision A of IPC-2511 (GenCAM 1.5) identifies the generic requirements for implementation of product manufacturing description data and transfer using BNF code. Helps users transfer design requirements and manufacturing expectations from computer-aided design systems to computer-aided manufacturing systems for printed board fabrication, assembly and test. Establishes the rules and protocol of describing data for electronic transfer in a neutral format. GenCAM® is a user-friendly standardized format documented in a series of seven major sectional standards identified as IPC-2510. All seven documents, numbered IPC-2512A through IPC-2518A, were released in November 2000. For more information go to the online store. 199 pages. Released January 2000.

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IPC-2511B Generic Requirements for Implementation of Product Manufacturing Description Data & Transfer XML Schema Methodology

ANSI Approved. Specifies the XML schema that represents the data file format used to describe printed board and printed board assembly products with details sufficient for tooling, manufacturing, assembly, inspection and testing requirements. Format may be used for transmitting information between a printed board designer and a manufacturing or assembly facility. Data is most useful when the manufacturing cycle includes computer-aided processes and numerical control machines. 182 pages. Released January 2002.

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IPC-2512A Sectional Requirements for Implementation of Administrative Methods for Manufacturing Data Description

Sectional requirement for implementation of administration information related to ordering and specifying printed boards, printed board assemblies, fixtures and components. IPC-2511 is a mandatory part of this standard. It is part of the GenCAM® Series. 18 pages. Released November 2000.

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IPC-2513A Sectional Requirements for Implementation of Drawing Methods for Manufacturing Data Description

Defines the sectional requirements for implementation of drawing methods for manufacturing data description. IPC-2511 is a mandatory part of this standard. It is part of the GenCAM® Series. 26 pages. Released November 2000.

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IPC-2514A Sectional Requirements for Implementation of Printed Board Fabrication Data Description

Defines the sectional requirements for implementation of printed board fabrication data description. IPC-2511 is a mandatory part of this standard. It is part of the GenCAM® Series. 23 pages. Released November 2000.

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IPC-2515A Sectional Requirements for Implementa- tion of Bare-Board Product Testing Data Description

Defines the sectional requirements for implementation of bare board product electrical testing data description. IPC-2511 is a mandatory part of this standard. It is part of the GenCAM® Series. 20 pages. Released November 2000.

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IPC-2516A Sectional Requirements for Implementation of Assembled Board Product Manufactur- ing Data Description

Defines the sectional requirements for implementation of assembled board product manufacturing data description. IPC-2511 is a mandatory part of this standard. It is part of the GenCAM® Series. 19 pages. Released November 2000.

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IPC-2517A Sectional Requirements for Implementation of Assembly In-Circuit Test Data Description

Defines the sectional requirements for implementation of assembly in-circuit test data description. IPC-2511 is a mandatory part of this standard. It is part of the GenCAM® Series. 24 pages. Released November 2000.

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IPC-2518A Sectional Requirements for Implementation of Parts List Product Manufacturing Data Description

Defines the sectional requirements for implementation of parts list product data description. IPC-2511 is a mandatory part of this standard. It is part of the GenCAM® Series. 18 pages. Released November 2000.

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IPC-D-356B Bare Substrate Electrical Test Data Format

Describes a data format for transmitting bare board electrical test information in digital form including data suitable for computer-aided repair. When used as a netlist input to test data processing, the receiver of IPC-D-356B data will determine test point assignments and positioning. Enhancements to Revision B include updates to the concept of testable areas to account for SMD pads and unusually shaped pads, updating of complex records for representing all inter-layer connections in nets, a simple polygon description format that improves graphical representation of the bare board, and new methods for identifying endpoints and midpoints. 61 pages. Released October 2002.

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IPC members: **\$30.00 \$35.00**
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IPC-2581 Generic Requirements for Printed Board Assembly Products Manufacturing Description Data and Transfer Methodology

ANSI Approved. Specifies the XML schema used to describe printed board and printed board assembly products with details sufficient for tooling, manufacturing, assembly, and inspection requirements. The format is a convergence of the Valor Computerized Systems ODB++ and IPC-2511B GenCAM® format structure in XML schema. Format may be used for transmitting information between a printed board designer and a manufacturing or assembly facility. The data is most useful when the manufacturing cycle includes computer-aided processes and numerical control machines. 161 pages. Released March 2004.

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MANAGEMENT, MARKET RESEARCH AND ROADMAPS



TABLE OF CONTENTS

General	31
EMTF Studies	32
Wage and Compensation Studies .	33

GENERAL

IPC-1710A

OEM Standard for Printed Board Manufacturers' Qualification Profile (MQP)

Sets the standard for assessing PWB manufacturer capabilities and allows PCB manufacturers to more readily satisfy customer requirements. Eases auditing processes and reduces the frequency of audits, thereby decreasing paperwork and enhancing manufacturer effectiveness. Revision A consists of a single, easy to use electronic file (Microsoft Word™ template) providing the capability of electronically consolidating and organizing data. This process improves the system of updating and transferring information between manufacturers and customers. 49 pages. Released July 2004. **FREE DOWNLOAD**

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IPC-1720A

Assembly Qualification Profile

Categorizes electronic assembly manufacturer capabilities and supplies the OEM customer with detailed, substantive information. Simplifies auditing processes and reduces the frequency of audits, thereby decreasing paperwork and improving efficiency. Includes company and site description, site capability snap shot, equipment profile (pre-site audit), technology profile specifics, quality profile, manufacturing. Revision A consists of a single, easy to use electronic file (Microsoft Word™ template) providing the capability of electronically consolidating and organizing data. 56 pages. Released July 2004. **FREE DOWNLOAD**

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IPC-1730A

Laminator Qualification Profile

Categorizes a laminate manufacturer's capabilities, which furnishes customer access to detailed information. Simplifies auditing processes and reduces the frequency of audits, decreasing paperwork and improving efficiency for single or multiple sites or locations. Includes a description, approval and certification profile and a quality profile. Supplemented by a Microsoft Word™ template file, which enables entering, storing and updating the various sections electronically and submitting the data to customers with ease. 22 pages. Released June 2000. **FREE DOWNLOAD**

Available only as a download.

IPC-1731

Strategic Raw Materials Supplier Qualification Profile

ANSI Approved. Suppliers of raw materials for laminate manufacturing now have an industry-approved questionnaire to supply current and potential customers with a self-assessment of their facilities. Gives suppliers of raw materials the opportunity to create a profile of their manufacturing facility that will be consistent with those developed by other industry suppliers. Using the Microsoft Word™ template enables easy file creation and maintenance and results in an electronic file that can be easily forwarded to customers. 36 pages. Published June 2000. **FREE DOWNLOAD**

Available only as a download.



ROADMAP-05

2004-2005 The International Technology Roadmap for Electronic Interconnections

Provides vision and direction for product development, process development and services required to satisfy the current and future needs of companies that are building electronic and optoelectronic equipment in the U.S. Presents findings and recommendations based on OEM requirements and an updated cost model that considers circuit density (for board fabrication) and assembly complexity (for assembly manufacture). Encompasses the supply chain infrastructure needed for single-chip and multichip packaging, printed board issues, assembly considerations, optoelectronics and related management/environmental key pressure points. Each chapter contains specific recommendations addressing current, near-term, mid-term and long-term requirements, proposed actions and opportunities. A valuable resource for companies throughout the global electronic equipment manufacturing industry. Can be used for business, technology, and strategic planning for the short and long term. 613 pages. Released October 2005.

CD

IPC members: **\$125.00**

Nonmembers: **\$250.00**



IPC-SKILL-201

IPC Skill Standards for Printed Circuit Board Manufacturing

Industry-consensus PCB skill standards provide conditions of performance, statements of work, performance criteria, assessment and credentialing approaches for more than 40 critical areas of PCB manufacturing. Document helps human resource personnel and managers make intelligent hiring, promotion and training decisions. Includes the complete IPC-T-50 Terms and Definitions, as well as job descriptions. PCB skill standards are an essential ingredient in a company's workforce improvement plan. 185 pages. Released May 1999.

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MANAGEMENT, MARKET RESEARCH AND ROADMAPS

EXECUTIVE MARKET & TECHNOLOGY FORUM

ABOUT IPC'S EXECUTIVE MARKET & TECHNOLOGY FORUM (EMTF)

Executive Forum membership is open to all IPC members. It provides access to extensive market research studies and industry reports specifically designed for the electronics interconnect industry. Executive Forum conferences held worldwide, bring together top management people from across the supply chain, creating unique opportunities for networking and shaping the future of the industry. For information about joining the Executive Forum, go to www.ipc.org/ExecForum2006 or contact Sharon Starr at 1-847-597-2817 or SharonStarr@ipc.org.

NEW IPC-EMTF-05W World PCB Production and Laminate Market Report for the Year 2005

Consensus estimates of PCB production value and laminate area consumption by product type and country, from a panel of the world's leading industry analysts, including analysis on regional trends and flexible circuits. Published exclusively for members of IPC's Executive Market & Technology Forum. IPC members can obtain this report by joining the Executive Forum. Go to www.ipc.org/ExecForum2006 for membership information and application form. 36 pages. Released July 2006.

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NEW IPC-EMTF-06F 2005-2006 Industry Analysis and Forecast for Flexible Circuits in North America

Survey-based study presents data and analysis on trends in the North American flexible circuit industry, including growth estimates and sales history, number of fabricators, global footprint of U.S.-based fabricators, trends in materials, sales by product type, production mix (high-volume vs. quick-turn vs. prototype), trends in line width and spacing, revenue trends from value-added services, industry end-markets by product type, and U.S. imports and exports. The five participating companies represent 27% of North American flexible circuit sales. 31 pages. Released July 2006.

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NEW IPC-EMTF-06R 2005-2006 Industry Analysis and Forecast for Rigid PCBs and Laminates in North America

Survey-based study presents data and analysis on trends in the North American rigid PCB industry, including industry growth forecast, industry end-markets served, sales history by product type, trends in high-density multilayer boards, production mix trends (high-volume vs. quick-turn vs. prototype), new vs. existing business growth, number and average value of PCBs and panels produced, panel size, and U.S. imports and exports. Laminate sales, trade data and application trends are also covered. Survey sample of 23 companies represents approximately 33% of the rigid PCB industry and about 65% of the laminate industry in North America. 47 pages. Released July 2006.

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NEW IPC-EMTF-06T Technology Trends in Printed Circuit Boards for the Year 2005

Survey-based study presents data and analysis on trends in rigid PCB conductor width and spacing, metallic finishes, solder mask usage, multilayer production, laminate thickness and temperature, surface mounting, fine-pitch technology, and other leading-edge technologies. Survey sample of 22 companies represents about 29% of the rigid PCB industry and approximately 65% of the laminate industry in North America. 27 pages. Released September 2005.

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NEW IPC-EMTF-06E 2005-2006 Industry Analysis and Forecast for the Worldwide Electronics Manufacturing Services (EMS) Industry

Survey-based study presents data and analysis on the global electronics assembly and EMS industry, examining trends in sources of industry revenue, number of facilities, revenue trends based on services offered and markets served, manufacturing technology, capital investment, spending on equipment and materials, and market size including forecasts. 49 pages. Released September 2006.

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NEW IPC-EMTF-06MED

Medical Electronics Market Opportunities for Interconnect Manufacturers

Commissioned study reveals emerging developments in the worldwide medical electronics marketplace and technology. Explains the challenges and potential opportunities for component and materials suppliers, PCB fabricators, and product assemblers, as well as market drivers and regulatory requirements. Includes market and technology forecasts for suppliers to the medical electronics industry covering the near term (3-5 years) and long term (5-10 years). Implications of this growing market for laminate materials, PCB fabrication, components and component packaging, connector technology, assembly and test, and system level requirements are explored. Conducted by Prismark Partners for IPC's Executive Forum. Expected publication date: September 2006.

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NEW IPC-EMTF-06HSP

Worldwide High Speed Electronics Technology and Market Trends for the Years 2006-2016

In-depth commissioned study explains market trends driving high-speed electronic system architectures (from 2 Gbps to +40Gbps) and expectations for the technology requirements both in the near future (3-5 years), and the long term (5-10 years). Key systems studied are servers, switches, routers and telecom infrastructure equipment, including the impact of their evolution on PCB design and fabrication, inspection, low-loss laminates, connectors, board assembly, board test and IC packaging. Emerging challenges and opportunities are identified for all segments in the supply chain. Technology roadmaps are included, along with forecasts of market demand for the key systems, high-speed PCBs and low loss laminates. Conducted by BPA Consulting. Expected publication date: September 2006.

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WAGE AND COMPENSATION STUDIES

NEW IPC-WAGEE-04

IPC Wage Rate & Salary Report for the EMS Industry 2004-2005

Results of IPC's wage and salary survey for independent electronic assembly / electronics manufacturing services (EMS) companies in North America for 2004, including some 2005 estimates. Presents aggregate data on 30 positions and the related job descriptions. Wage and salary data are shown by regions and by company size. Includes aggregate data on the 28 company respondents' personnel and compensation policies, benefits, and sales compensation structure. 34 pages. Released December 2005.

DOWNLOAD ONLY

Survey participants:	Free
IPC members:	\$250.00
Nonmembers:	\$500.00

NEW IPC-WAGEP-04

IPC Wage Rate & Salary Report for the PCB Industry 2004-2005

Results of IPC's wage and salary survey for independent printed circuit board (PCB) manufacturers in North America for 2004, including some 2005 estimates. Presents aggregate data on 41 positions and the related job descriptions. Historical and current wage and salary data are shown by regions and by company size. Includes aggregate data on the 15 respondents' personnel and compensation policies, benefits, and sales compensation structure. 36 pages. Released December 2005.

DOWNLOAD ONLY

Survey participants:	Free
IPC members:	\$250.00
Nonmembers:	\$500.00

NEW IPC-EXCOMP-06

IPC Executive Compensation Study for the PCB and EMS Industries 2005-2006

Results of IPC's executive compensation survey for North American EMS and PCB companies for 2005 and 2006, reported by industry segment, region and company size. Examines base salaries, bonuses and other forms of compensation and benefits. Includes historical trend data and covers 12 key executive positions. Expected publication date: October 2006.

DOWNLOAD ONLY

Survey participants:	Free
IPC members:	\$495.00
Nonmembers:	\$990.00

ENVIRONMENTAL COMPLIANCE

MATERIALS DECLARATION

NEW IPC-1065

Material Declaration Handbook



Aids printed circuit board (PCB) manufacturers and users in completing materials declarations that follow the format and guidance of the *Joint Industry Material Composition Declaration Guide*. The handbook includes information on what a manufacturer should do when a materials declaration request is received, a list of chemical substances likely to be found in a PCB, simplified sample calculations for a materials declaration of a PCB, and guidelines for determining the composition of an electronic product using analytical techniques. Appendices include a table of chemical lists and laboratory analysis methods, detailed calculation of a materials declaration of a PCB, uncertainty of calculated data values, a list of analytical laboratories, a list of relevant documents, and analytical techniques for substances removed from the final version of the joint industry guide. 72 pages. Released January 2005.

	HARD COPY	CD OR DOWNLOAD
IPC members:	\$30.00	\$35.00
Nonmembers:	\$60.00	\$65.00

NEW IPC-1066

Marking, Symbols and Labels for Identification of Lead-Free and Other Reportable Materials in Lead-Free Assemblies, Components and Devices



Establishes the requirements for a distinctive symbol and labels to be used to identify materials that are lead free and capable of providing Pb-free second level interconnects, and to indicate certain types of Pb-free materials and the maximum allowable soldering temperature. 20 pages. Published December 2004.

IPC/JEDEC J-STD-609 coming soon – check the online store.

	HARD COPY ONLY	
IPC members:	\$15.00	
Nonmembers:	\$30.00	FREE DOWNLOAD

**NEW Certification for RoHS
Lead Free Electronics Assembly
Process Capability Program.**
For more information see page 2.

NEW IPC-1752

Materials Declaration Management



Establishes the requirements for exchanging materials and substances data between suppliers and their customers for electrical and electronic equipment (EEE). Applies to products, components, subparts and materials that are supplied to EEE manufacturers for incorporation into their products. Covers materials and substances that may be present in the supplied product or subpart. Available only as a Zip file. The file contains IPC-1751, *Generic Requirements for Declaration Process Management*; IPC-1752, *XML Schema*; IPC-1752-1, *PDF Form for General and Class I Materials Declarations*; IPC 1752-2, *PDF Form for Class II Materials Declarations*; and IPC-1752-3, *Users Guide for Materials Declaration Forms*.

FREE DOWNLOAD

NEW E3TOOL-CD

E3 Survival Toolkit



Find out how to minimize the burdens associated with reporting and better understand what will be required of your company in order to comply with the European Union's WEEE and RoHS Directives. The toolkit includes an interactive CD-ROM and diagnosis tools to assess a company's compliance status considering product line, markets, sales levels, supply chain management and materials used. Based on input, a compliance assessment report is generated that summarizes actions to consider. Created by eco3, an environmental consultancy based in the U.K.

	SINGLE USER CD	GLOBAL LICENSE CD
IPC members:	\$99.00	\$450.00
Nonmembers:	\$149.00	\$600.00

NEW ROHSAUDIT-CD

ERA RoHS Directive Supplier Audit Form Package



To ensure more accurate information from suppliers, the U.K. research and consulting firm ERA developed a Supplier RoHS Audit Form to help companies collect information from suppliers, in addition to or in lieu of an audit visit. In addition to information gathering, the form asks probing questions that test supplier understanding of the requirements. Package includes a license to make copies for distribution to suppliers.

Pricing at various license levels is available – check the online store.

ENVIRONMENT, HEALTH AND SAFETY

IPC-1331

Voluntary Safety Standard for Electrically Heated Process Equipment

Establishes minimum requirements for design, installation, operation and maintenance of electrically heated process equipment to minimize electrical hazards and prevent fires in combustible tanks, tank liners and drying equipment. Available as download only. 11 pages. Published March 2000.

FREE DOWNLOAD

IPC-ENVIRONMENT

Environmental Best Practices Guide Book

Details the industry's environmental success in reducing its environmental impact. From recommendations to minimize copper wastewater discharges to detailed steps on adopting environmental management systems, it presents detailed steps to prevent pollution and minimize generation of waste. Published by the British PCB Association (PCIF). 108 pages. Published 1999.

HARD COPY ONLY

IPC members:	\$75.00
Nonmembers:	\$150.00

IPC-WP/TR-584


IPC White Paper and Technical Report on Halogen-Free Materials Used for Printed Circuit Boards and Assemblies

This combination IPC white paper and technical report summarizes both the IPC position as well as significant data on the subject of "halogen-free" materials for the electronics industry. Developed in three years by a team representing every level of the electronics supply chain. Reviewed and accepted by the IPC's Technical Activities Executive Committee (TAEC) and is applicable to materials for interconnecting electronics reflecting the state of technology as of December 1, 2002. 29 pages. Released April 2003.

	HARD COPY	CD OR DOWNLOAD
IPC members:	\$25.00	\$30.00
Nonmembers:	\$50.00	\$55.00

**Print restrictions apply for single-user
CD and download formats.**

**Prices are subject to change –
check the online store.**

IPC standards that have been updated for or are applicable to lead free are included in the various sections of this catalog with this symbol: . The following items are additional tools for your use.

TEXT BOOKS

ELEC-ELEC

Implementing Lead-Free Electronics

Provides timely information on the choices and tradeoffs facing manufacturers seeking the most efficient and cost-effective ways of converting to lead free manufacturing. The book is laid out as a quick guide, providing successful examples in conjunction with the basic principles of the implementation and production of lead free electronics on a global basis. Written by Dr. Jennie S. Hwang; McGraw-Hill. 466 pages. Released 2005.

HARD COPY ONLY

IPC members: **\$100.00**

Nonmembers: **\$125.00**

ELEC-06

Lead-Free Electronics

Offers guidance on the design and use of lead free electronics as well as technical and legislative perspectives. Addresses all the complex challenges confronting the electronics industry. Includes the most recent data on cyclic thermomechanical deformation properties of lead free SnAgCu alloys and a comparison of the properties of standard Sn-Pb versus lead free alloys, using the energy partitioning approach. Written by leading experts in the field and carefully edited to ensure a consistent approach. Edited by Sanka Ganesan and Michael Pecht; John Wiley & Sons, Inc. 766 pages. Released April 2006.

HARD COPY ONLY

IPC members: **\$100.00**

Nonmembers: **\$150.00**

ELEC-MICRO

Handbook of Lead-Free Solder Technology for Microelectronic Assemblies

Complete walk-through of the conversion from standard tin lead to lead free solder microelectronic assemblies for low-end and high-end applications. Analyzes the health risks associated with lead; estimates the environmental benefits of using lead free substitutes in microelectronics; summarizes

new regulations, legislation, and marketplace trends affecting the industry; and outlines changes and challenges on the materials, equipment, and process levels for manufacture of lead free microelectronics. Written by more than 45 researchers and practitioners. Edited by Karl J. Puttlitz and Kathleen A. Stalter; Marcel Dekker, Inc. 1,026 pages. Published 2004.

HARD COPY ONLY

IPC members: **\$175.00**

Nonmembers: **\$220.00**

ELEC-RELIA

Lead-Free Solder Interconnect Reliability

Provides the most up-to-date information and statistics available on the reliability of lead free solder interconnects. Addresses fundamental research and practical considerations. Ideal resource for practitioners in the electronics industry who need to understand the reliability of solder interconnects for design, testing, quality assurance, and failure analysis. Will also benefit industry and academic researchers, educators, and students. Published by ASM International and edited by Dr. Dongkai Shang-guan. 292 pages. Released May 2006.

HARD COPY ONLY

IPC members: **\$150.00**

Nonmembers: **\$175.00**

ADDITIONAL REFERENCE BOOKS AND MORE DETAILS ARE AVAILABLE AT THE ONLINE STORE.

TEST REPORT

SPVC2005-CD

Round Robin Testing and Analysis of Lead Free Solder Pastes with Alloys of Tin, Silver and Copper

Result of a three-year one million dollar investment to determine which solder alloy to recommend. Report includes 18 appendices with nearly 100 megabytes of data and research charts. Data supports recommendation of 96.5/3.0/0.5 tin/silver/copper (SAC305) as the alloy of choice for lead free applications. 50 pages. Published 2005.

SINGLE	GLOBAL
USER CD	LICENSE CD

IPC members: **\$99.00**

\$499.00

Nonmembers: **\$199.00**

\$799.00

MORE RESOURCES

Additional resources such as desk reference guides, posters, and computer-based training are available at <http://leadfree.ipc.org>. The following standards have been updated for lead free and released. Many others are underway.

- IPC-J-STD-001D: *Requirements for Soldered Electrical & Electronic Assemblies*
- IPC-J-STD-002C: *Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires*
- IPC-J-STD-003B: *Solderability Tests for Printed Boards*
- IPC-J-STD-004A: *Requirements for Soldering Fluxes*
- IPC-HDBK-005: *Guide to Solder Paste Assessment*
- IPC-J-STD-005: *Requirements for Soldering Pastes*
- IPC-WP-006: *Round Robin Testing & Analysis: Lead-Free Alloys—Tin, Silver, & Copper*
- IPC-J-STD-006B: *Requirements for Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders*
- IPC/JEDEC J-STD-020C: *IPC/JEDEC Moisture/Re-flow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices*
- J-STD-030: *Guideline for Selection and Application of Underfill Material for Flip Chip and Other Micropackages*
- IPC/JEDEC J-STD-033B: *Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices*
- IPC-TR-585: *Time, Temperature and Humidity Stress of Final Board Finish Solderability*
- IPC-A-610D: *Acceptability of Electronic Assemblies*
- IPC/WHMA-A-620A: *Requirements and Acceptance for Cable and Wire Harness Assemblies*
- IPC-4101B: *Specification for Base Materials for Rigid and Multilayer Printed Boards*
- IPC-4552: *Specification for Electroless Nickel/Immersion Gold (ENIG) Plating for Printed Circuit Boards*
- IPC-4553: *Specification for Immersion Silver Plating for Printed Circuit Boards*
- IPC-7351: *Generic Requirements for Surface Mount Land Pattern and Design Standard*
- IPC-9701A: *Performance Test Methods and Qualification Requirements for Surface Mount Solder Attachments*
- IPC/JEDEC-9702: *Monotonic Bend Characterization of Board-Level Interconnects*
- IPC-9704: *IPC/JEDEC Printed Wiring Board Strain Gage Test Guideline*

ARTWORK FOR TEST COUPONS

IPC-9251

Test Vehicles for Evaluating Fine Line Capability

Test patterns for evaluating fine line capabilities; were developed by CAT, Inc. and Du Pont and are made available with their permission through IPC.

[FREE DOWNLOAD](#)

IPC-A-20/21-GKIT

Standard Pitch Stencil Pattern for Slump

Files contain patterns for developing solder paste stencils by laser or chemical etching. Land widths of 0.4 mm, 0.63 mm and 1.25 mm are provided with varying pitch to evaluate solder paste slump. Includes J-STD-005, Requirements for Soldering Pastes.

A-20/21-G KIT (Gerber Format)

IPC members: **\$75.00**
Nonmembers: **\$150.00**

IPC-A-22

UL Recognition Test Pattern

Recognition vehicle for UL-796 (base materials) and UL-746 (printed wiring boards). Tests for conductor width plating quality-PTH, flammability, etc. (1 pc. 41 x 57 cm 1:1). Includes IPC-A-22 Sample Preparation and Instruction Booklet in hardcopy only.

A-22-G-KIT (Gerber Format)

IPC members: **\$30.00**
Nonmembers: **\$60.00**

A-22-D-KIT (IPC-D-350 Format)

IPC members: **\$30.00**
Nonmembers: **\$60.00**

IPC-A-24

Surface Insulation Resistance

Single-sided (4 up) pattern evaluates the interaction of solder flux and paste residues. Board was used in the Phase 3 portion of the test program that evaluates alternative technologies to eliminate CFCs in assembly operations. Contains four comb patterns with 0.4 mm lines and 0.5 mm spaces. A stencil pattern is provided (2 pcs 30 x 45 cm 1:1) No components are provided. Includes Master Drawing IPC-100024, Aperture List and IPC-B-24 test board design criteria in hardcopy only. For prefabricated boards go to www.ipc.org and click on "Technical Resources" for a listing of board vendors carrying the IPC-B-24 board.

A-24-G-KIT (Gerber Format)

IPC members: **\$40.00**
Nonmembers: **\$80.00**

IPC-A-25

Multipurpose 1 & 2 Sided Test Pattern

Referenced in IPC-CC-830 and IPC-SM-840C. Primarily for surface insulation resistance testing. The film format (3pcs. 30 x 46 cm scale 2:1) contains the solder mask layer pattern, but does not include the drill file. IPC-SM-840C, *Qualification and Performance of Permanent Solder Mask*, is included. Includes a hardcopy of the Master Drawing IPC-B25/55110.

A-25-G-KIT (Gerber Format)

IPC members: **\$40.00**
Nonmembers: **\$80.00**

A-25-D-KIT (IPC-D-350-Format)

IPC members: **\$40.00**
Nonmembers: **\$80.00**

IPC-A-25A

Multipurpose 1 Sided Test Pattern

Artwork for standard test boards as referenced in IPC-CC-830 and IPC-SM-840C. Used primarily for surface insulation resistance testing and solder mask testing. IPC-SM-840C, *Qualification and Performance of Permanent Solder Mask*, is included. The A revision combines IPC-A-24 and IPC-A-25 comb patterns on a single-sided board. Revised February 1996.

A-25A-G-KIT (Gerber Format)

IPC members: **\$65.00**
Nonmembers: **\$130.00**

A-25A-D-KIT (IPC-D-350 Format)

IPC members: **\$65.00**
Nonmembers: **\$130.00**

IPC-A-36

Cleaning Alternatives Artwork

Double-sided (with plated-through holes) board evaluates cleaning alternatives to chlorofluorocarbons. Contains four quadrants utilizing both surface mount patterns and vias, each with 68 I/O chip carrier sites and 10 SIR test points. (6 pcs. 28 x 36 cm 1:1). A hard copy aperture file is included. Go to the IPC web site for a listing of board vendors manufacturing the IPC-B-36 board.

A-36-G (Gerber Format)

IPC members: **\$90.00**
Nonmembers: **\$180.00**

A-36-D (IPC-D-350 Format)

IPC members: **\$175.00**
Nonmembers: **\$350.00**

IPC-A-40

Solder Mask Artwork

Solder Mask Layer for use with IPC-A-41, IPC-A-42, IPC-A-43 & IPC-A-44. (1pc. 30 x 46 cm 1:1). Available in film only.

A-40-F-KIT (Film Format)

IPC members: **\$27.00**
Nonmembers: **\$54.00**

IPC-A-41

Single Sided Artwork

Artwork required for certification to either MIL-P-50884, MIL-P-55110, also IPC-6011, IPC-6012, IPC-6013, and IPC-MC-324D. Includes Universal Drilling and Profile Master Drawing IPC-100001 Revision A (March 1989) and Master Drawing #100041 Revision A (March 1989). Both Master Drawings in hardcopy only. (1 artwork image piece. 30 x 46 cm 1:1).

A-41-F-KIT (Film Format)

IPC members: **\$35.00**
Nonmembers: **\$70.00**

A-41-D-KIT (IPC-D-350 Format)

IPC members: **\$55.00**
Nonmembers: **\$110.00**

IPC-A-42 Double Sided Artwork

Artwork required for certification to either MIL-P-50884, MIL-P-55110, also IPC-6011, IPC-6012, IPC-6013, and IPC-MC-324D. Includes Universal Drilling and Profile Master Drawing IPC-100001 Revision A (March 1989) and Master Drawing 100042 Revision A (March 1989). Both Master Drawings in hardcopy only. (1 artwork image piece. 30 x 46 cm 1:1).

A-42-G-KIT (Gerber Format)

IPC members: **\$30.00**

Nonmembers: **\$60.00**

A-42-D-KIT (IPC-D-350 Format)

IPC members: **\$30.00**

Nonmembers: **\$60.00**

IPC-A-43 Ten-Layer Multi Artwork

Artwork required for certification of four layer, mass laminated boards to either MIL-P-50884, MIL-P-55110, also IPC-6011, IPC-6012, IPC-6013, and IPC-MC-324. Includes Universal Drilling and Profile Master Drawing IPC-100001 Revision A (March 1989) and Master Drawing # 100043 Revision A (March 1989). Both Master Drawings in hardcopy only. (4 pcs. 30 x 46 cm 1:1).

A-43-G-KIT (Gerber Format)

IPC members: **\$150.00**

Nonmembers: **\$300.00**

A-43-D-KIT (IPC-D-350 Format)

IPC members: **\$150.00**

Nonmembers: **\$300.00**

IPC-A-44 Mass Lamination Artwork

Artwork required for certification of four layer, mass laminated boards to either MIL-P-50884, MIL-P-55110, also IPC-6011, IPC-6012, IPC-6013, and IPC-MC-324. Includes Universal Drilling and Profile Master Drawing IPC-100001 Revision A (March 1989) and Master Drawing # 100044 Revision A (March 1989). Both Master Drawings in hardcopy only. (4 pcs. 30 x 46 cm 1:1).

A-44-F-KIT (Film Format)

IPC members: **\$110.00**

Nonmembers: **\$220.00**

A-44-D-KIT (IPC-D-350 Format)

IPC members: **\$165.00**

Nonmembers: **\$330.00**

IPC-A-47 Composite Test Pattern Ten-Layer Phototool

Artwork for assessing manufacturer capabilities per IPC-6012. Features test specimen A,B,D,E,F,L,G,H,M,N,R and S per IPC-2221. Hardcopy Master Drawings IPC-100103 for Type 3 (without blind or buried vias) boards and universal hole and profile drawing IPC-100002 included.

A-47-G-KIT (Gerber Format)

IPC members: **\$150.00**

Nonmembers: **\$300.00**

A-47-D-KIT (IPC-D-350 Format)

IPC members: **\$150.00**

Nonmembers: **\$300.00**

IPC-A-50 Surface Insulation Resistance Phoenix Board — Gerber Format

The Phoenix test board is used as an alternate to IPC-B-24 for evaluating the interaction of solder flux and solder paste residues. Useful for IPC/Belcore correlation studies.

A-50 (Gerber Format)

IPC members: **\$40.00**

Nonmembers: **\$80.00**

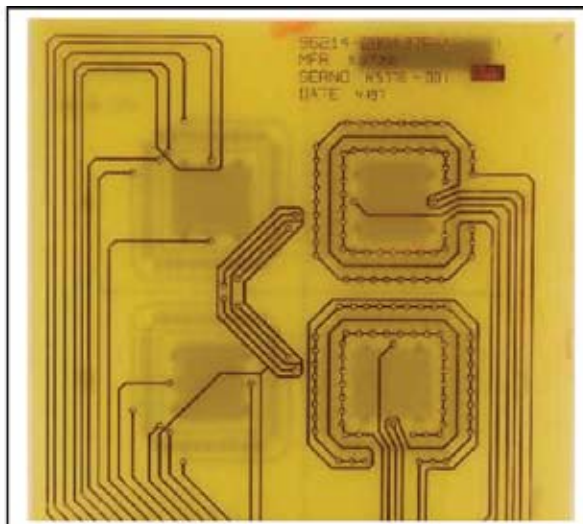
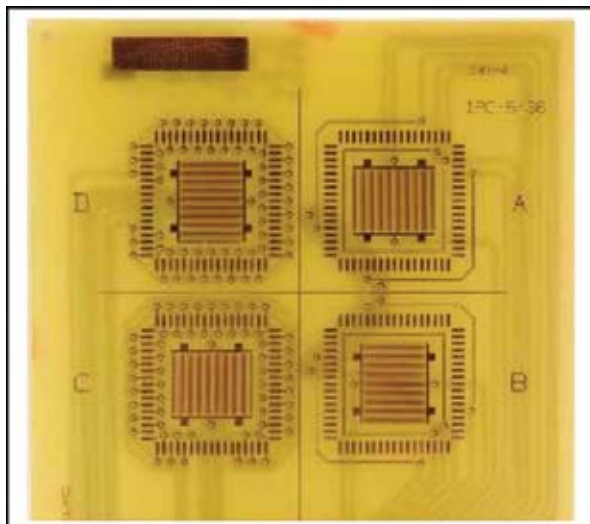
NEW IPC-A-52-G Cleanliness and Residue Evaluation Test Board

Designed to give the manufacturing process professional a tool to help assess the impact of cleanliness and residues on bare boards and finished assemblies, as well as the impact of changing manufacturing parameters on cleanliness. Artwork package provides PDF master drawings and Gerber files necessary for fabricating the test board which contains coupons applicable for surface insulation resistance (SIR) testing, ion chromatography (IC), and solder mask adhesion. Released April 2006.

A-52-G (GERBER FORMAT)

IPC Members **\$50.00**

Nonmembers **\$100.00**



MULTIMEDIA TRAINING RESOURCES

IPC has been producing industry-approved, commercial-free training media for more than 25 years...covering electronics assembly acceptance standards, hand soldering, lead free, repair & rework, ESD control, component ID, wire harness, and circuit board fabrication.

For the online catalog of our DVDs, Interactive CD-ROMs, online video resources, training and reference guides, wall posters and image archives go to <http://training.ipc.org>.

DVD—DIGITAL VIDEO

IPC's line of video training programs have been upgraded to the DVD-R format. With the added advantages of random-access menu control, high-resolution digital video, optional subtitles for the hearing-impaired (Sec. 508C compliant) and special dual-language editions (e.g. Spanish/English, Chinese/English), these products work well in group or individual training sessions. All training support materials (such as Leader's Guides, Exams and Student Certificates of Completion) are available for free download.

OVT—ONLINE VIDEO TRAINING

IPC delivers video training right to your desktop! Our Online Video Training (OVT) program gives you the tools to provide instant access to our award-winning training. Ideal for distance-learning programs, these digitized training videos can be mounted and downloaded or played directly from any server—across your network, or across the world via your intranet! Licenses are available for single locations, or for international distribution.

Coming soon — automated online testing.

TRANSLATIONS—SPANISH & CHINESE

Many of our critical topics are available on special dual-language DVDs. Languages include Spanish, Chinese, French, Vietnamese and Russian, with more titles and languages being added continuously. (Each dual-language DVD comes with the original English language as an optional audio track.)

CD-ROM/INTERACTIVE TRAINING & ELECTRONIC REFERENCE

Designed for self-paced learning with the convenience of automated testing and score-keeping... our Computer-Based Training (CBT) programs cover such topics as Hand Soldering, ESD Control and SPC. The Component ID/Electronic Reference (ER-18) and IPC-A-610 Electronic Workmanship Standards (EWS-610) programs allow the user to edit or add their own technical contents (and text in any language supported by Windows) and images. All our CD-ROM based programs can be licensed two ways—for unlimited use on a single computer (Stand-Alone License) or unlimited use over a computer network (Site License).

DRM—DESK REFERENCE MANUALS/ TRAINING & REFERENCE GUIDES

Handy and portable spiral-bound reference guides on surface mount & through hole solder joint acceptability, component identification, wire prep/crimp acceptability and basic electronics assembly.

IMAGE RESOURCES

Select digital clip art on CD-ROM from a wide variety of close-up defect photography and computer-generated graphics. Clip art sets from the IPC-A-610D, as well as a lead free solder joint image library are available. Create your own learning tools using IPC's graphic resources—for unrestricted in-house use.

WALL POSTERS

Make a "big" impression with these 20" x 28" surface mount and through hole solder joint evaluation posters. They contain the critical acceptance criteria from IPC-A-610D and IPC J-STD-001D for solder connections and are laminated with corner eyelets for easy display.

Sign up for a **FREE** demo DVD that includes reviews of all IPC multimedia training resources at <http://training.ipc.org>

You'll also find these reviews available for immediate download online.

For technical questions, please contact staff at the IPC production office at 505-758-7937 or e-mail service@ipcvideo.org.



IMAGES AND POSTERS

P-SMT2-D

Surface Mount Solder Joint Evaluation Wall Posters (Set of 3) – Class 2

What better way to demonstrate to your employees that "inspection is everyone's job," than our surface mount evaluation wall posters! Utilizing the graphics and Class 2 acceptability criteria from the IPC-A-610D, these 20 x 28-inch hanging posters serve as a constant reminder that quality is job number one. A set of three laminated surface mount evaluation/inspection posters for Class 2 comes with eyelets for easy hanging. One poster each for Chip, Gull and J-Lead (three-poster set).

IPC members: **\$100.00**

Nonmembers: **\$150.00**

P-SMT3-D

Surface Mount Solder Joint Evaluation Wall Posters (Set of 3) – Class 3

Class 3 version of IPC-SMT2-D

IPC members: **\$100.00**

Nonmembers: **\$150.00**

P-PTH2-D

Through-Hole Solder Joint Evaluation Wall Poster – Class 2

Full-color, 20 x 28-inch laminated wall poster visually defines minimum/maximum Class 2 through hole solder joint acceptability requirements from the IPC-A-610D in high-quality, 3-D graphics. This poster depicts complex through hole solder joint requirements so clearly, that all operators and inspectors can easily understand and apply this important criteria. Bring technically accurate, industry-consensus acceptability standards to your training room or inspection area. With eyelets for easy hanging. One poster, for Class 2.

IPC members: **\$50.00**

Nonmembers: **\$75.00**

P-PTH3-D

Through-Hole Solder Joint Evaluation Wall Poster – Class 3

Class 3 version of IPC-PTH2-D

IPC members: **\$50.00**

Nonmembers: **\$75.00**

Quantity pricing available on the posters – check the online store

CD-/DVD-BASED IMAGE RESOURCES

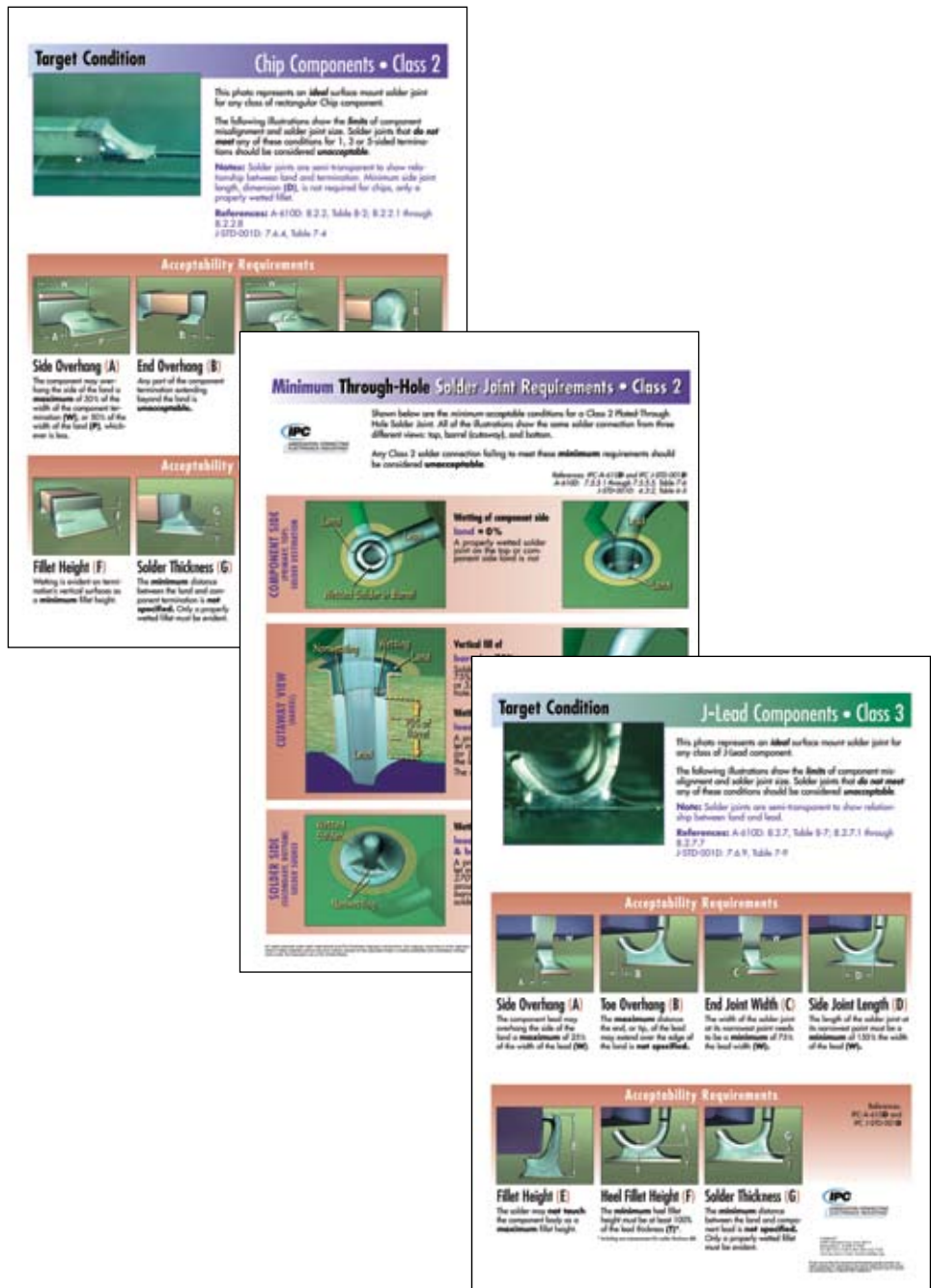
IPC-A-610D ILLUSTRATIONS

Illustrations from IPC-A-610D are available as a complete set, individually, or by chapter. They are available for unlimited use for in-house company training.

DVD-LFL

Lead Free Solder Joint Image Library

For description and pricing, check the online store.



NUMERIC PRODUCT INDEX/PRICE LIST

PRODUCT ID	IPC			PAGE	PRODUCT ID	IPC			PAGE	PRODUCT ID	IPC			PAGE
	MEMBER	NONMEMBER	PRICE			MEMBER	NONMEMBER	PRICE			MEMBER	NONMEMBER	PRICE	
IPC-HDBK-001	40.00	80.00		4	IPC-A-25-G-KIT	40.00	80.00		36	IPC-D-356B	30.00	60.00		30
IPC-J-STD-001D	40.00	80.00		4	IPC-A-25A-D-KIT	65.00	130.00		36	IPC-D-422	20.00	40.00		28
IPC-J-STD-001DSP	40.00	40.00		4	IPC-A-25A-G-KIT	65.00	130.00		36	IPC-TR-461	30.00	60.00		14
IPC-J-STD-001DSW	40.00	40.00		4	IPC-A-36-G	90.00	180.00		36	IPC-TR-462	30.00	60.00		15
SMC-WP-001	FD	FD		15	IPC-A-36-D	175.00	350.00		36	IPC-TR-464	30.00	60.00		15
IPC/EIA J-STD-002B	20.00	40.00		14	IPC-A-40-F-KIT	27.00	54.00		36	IPC-TR-465-1	20.00	40.00		15
IPC/EIA J-STD-003A	20.00	40.00		14	IPC-A-41-D-KIT	55.00	110.00		36	IPC-TR-465-2	25.00	50.00		15
IPC-J-STD-004A	25.00	50.00		10	IPC-A-41-F-KIT	35.00	70.00		36	IPC-TR-465-3	25.00	50.00		15
IPC-0040	60.00	120.00		15	IPC-A-42-D-KIT	30.00	60.00		37	IPC-TR-466	20.00	40.00		15
IPC-HDBK-005	35.00	70.00		11	IPC-A-42-G-KIT	30.00	60.00		37	IPC-TR-476A	30.00	60.00		7
IPC/EIA J-STD-005	25.00	50.00		10	IPC-A-43-D-KIT	150.00	300.00		37	IPC-TR-481	30.00	60.00		18
SMC-WP-005	FD	FD		15	IPC-A-43-G-KIT	150.00	300.00		37	IPC-TR-483	30.00	60.00		25
IPC-WP-006	20.00	30.00		11	IPC-A-44-D-KIT	165.00	330.00		37	IPC-TR-485	20.00	40.00		23
IPC-J-STD-006B	25.00	50.00		11	IPC-A-44-F-KIT	110.00	220.00		37	IPC-TR-486	50.00	100.00		25
IPC-WP-008	15.00	30.00		6	IPC-A-47-D-KIT	150.00	300.00		37	IPC-TR-551	30.00	60.00		18
IPC-PWB-CERTCD01	125.00	225.00		28	IPC-A-47-G-KIT	150.00	300.00		37	IPC-DR-572	20.00	40.00		19
IPC-PWB-CRT-SG01	35.00	70.00		28	IPC-A-50	40.00	80.00		37	IPC-TR-579	30.00	60.00		18
IPC-PWBADV-SG02	75.00	150.00		28	IPC-T-50G	40.00	80.00		3	IPC-TR-581	20.00	40.00		10
IPC-WAGEE-04	(1)	(1)		33	IPC-A-52G	50.00	100.00		37	IPC-TR-582	25.00	50.00		7
IPC-WAGEP-04	(1)	(1)		33	IPC-DRM-53	12.00	24.00		9	IPC-TR-583	30.00	60.00		7
EMTF-05W	(1)	(1)		32	IPC-DRM-56	15.00	30.00		9	IPC-WP/TR-584	25.00	50.00		34
IPC-ROADMAP-05	125.00*	250.00*		31	IPC-SC-60A	20.00	40.00		7	IPC-TR-585	40.00	80.00		14
IPC-ELEC-06	100.00	150.00		35	IPC-SA-61A	25.00	50.00		7	IPC-A-600G	45.00	90.00		17
IPC-EX-COMP-06	(1)	(1)		33	IPC-AC-62A	25.00	50.00		7	IPC-A-600G-CH	45.00	90.00		17
IPC-EMTF-06-HSP	(1)	(1)		33	IPC-CH-65A	30.00	60.00		6	IPC-A-600G-IT	45.00	90.00		17
IPC-EMTF-06-MED	(1)	(1)		33	IPC-EA-100-K	220.00	440.00		4	IPC-QE-605A	35.00	70.00		17
IPC-EMTF-06E	(1)	(1)		32	IPC-M-102	165.00	330.00		21	IPC-HDBK-610	40.00	80.00		4
IPC-EMTF-06F	(1)	(1)		32	IPC-M-103	330.00	660.00		9	IPC-A-610D	50.00	100.00		4
IPC-EMTF-06R	(1)	(1)		32	IPC-M-104	165.00	330.00		9	IPC-A-610D-CH	50.00	100.00		4
IPC-EMTF-06T	(1)	(1)		32	IPC-TP-104-K	20.00	40.00		7	IPC-A-610D-DE	50.00	100.00		4
IPC-J-STD-012	40.00	80.00		5	IPC-M-105	305.00	610.00		16	IPC-A-610D-DK	50.00	100.00		4
IPC-J-STD-013	40.00	80.00		5	IPC-M-106	275.00	550.00		26	IPC-A-610D-FI	50.00	100.00		4
IPC/JEDEC J-STD-020C	25.00	50.00		8	IPC-M-107	165.00	330.00		22	IPC-A-610D-FR	50.00	100.00		4
IPC/EIA J-STD-026	40.00	80.00		5	IPC-M-108	90.00	180.00		6	IPC-A-610D-IT	50.00	100.00		4
IPC-J-STD-027	20.00	40.00		5	IPC-M-109	85.00	170.00		7	IPC-A-610D-PL	50.00	100.00		4
IPC/EIA J-STD-028	40.00	80.00		5	IPC-DD-135	25.00	50.00		20	IPC-A-610D-SP	50.00	100.00		4
IPC-J-STD-030	40.00	80.00		11	IPC-SG-141	20.00	40.00		23	IPC-A-610D-SW	50.00	100.00		4
IPC/EIA J-STD-032	20.00	40.00		6	IPC-A-142	20.00	40.00		23	IPC-A-610D-VN	50.00	100.00		4
IPC/JEDEC J-STD-033B	25.00	50.00		8	IPC-QF-143	20.00	40.00		23	IPC/WHMA-A-620A	50.00	100.00		5
IPC/JEDEC J-STD-035	20.00	40.00		8	IPC-CF-148A	20.00	40.00		22	IPC-TM-650	220.00	440.00		3
IPC-HDI-1	140.00	280.00		19	IPC-CF-152B	20.00	40.00		23	IPC-QL-653A	20.00	40.00		25
IPC-PTH2-D	50.00	75.00		39	IPC-SKILL-201	75.00	150.00		31	IPC-MI-660	60.00	120.00		22
IPC-P-SMT2-D	100.00	150.00		39	IPC-DPMO-202	35.00	70.00		13	IPC-TA-724	70.00	140.00		9
E3TOOL-CD	99.00	149.00		34	IPC-FC-234	15.00	30.00		22	IPC-PE-740A	105.00	210.00		16
IPC-PTH3-D	50.00	75.00		39	IPC-FA-251	30.00	60.00		21	IPC-CM-770E	35.00	70.00		13
IPC-P-SMT3-D	100.00	150.00		39	IPC-D-279	45.00	90.00		28	IPC-SM-780	35.00	70.00		9
IPC-DRM-18G	30.00	60.00		8	IPC-D-310C	30.00	60.00		28	IPC-SM-784	30.00	60.00		5
IPC-A-20/21-G-KIT	75.00	150.00		36	IPC-A-311	20.00	40.00		27	IPC-SM-785	25.00	50.00		9
IPC-A-22-D-KIT	30.00	60.00		36	IPC-D-322	20.00	40.00		28	IPC-MC-790	40.00	80.00		6
IPC-A-22-G-KIT	30.00	60.00		36	IPC-D-325A	25.00	50.00		16	IPC-MS-810	35.00	70.00		25
IPC-A-24-G-KIT	40.00	80.00		36	IPC-D-326A	25.00	50.00		16	IPC-S-816	20.00	40.00		13
IPC-A-25-D-KIT	40.00	80.00		36	IPC-PD-335	195.00	390.00		10	IPC-SM-817	20.00	40.00		11

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	MEMBER PRICE	NONMEMBER PRICE				MEMBER PRICE	NONMEMBER PRICE				MEMBER PRICE	NONMEMBER PRICE		
IPC-AJ-820	220.00	440.00	12		IPC-2578	35.00	70.00	29		IPC/JEDEC-9704	20.00	40.00	10	
IPC-CA-821	20.00	40.00	11		IPC-2581	35.00	70.00	30		IPC-9850-K	40.00	80.00	14	
IPC-HDBK-830	45.00	90.00	12		IPC-2615	30.00	60.00	27		IPC-9850-TM-K	Call	Call	14	
IPC-CC-830B	20.00	40.00	12		IPC-3406	15.00	30.00	11		IPC-9850-TM-KW	Call	Call	14	
IPC-SM-839	20.00	40.00	19		IPC-3408	15.00	30.00	12		IT-30101	950.00	1,900.00	20	
IPC-SM-840C	20.00	40.00	12		IPC-4101B	45.00	90.00	22		IT-95080	150.00	300.00	19	
IPC-D-859	20.00	40.00	27		IPC-4103	30.00	60.00	20		IT-96060	150.00	300.00	20	
IPC-HM-860	20.00	40.00	17		IPC/JPCA-4104	45.00	90.00	19		IT-97061	150.00	300.00	25	
IPC-TF-870	20.00	40.00	17		IPC-4110	20.00	40.00	23		IT-97071	250.00	500.00	20	
IPC-ML-960	20.00	40.00	18		IPC-4121	15.00	30.00	22		IT-98103	150.00	300.00	25	
IPC-1065	30.00	60.00	34		IPC-4130	20.00	40.00	23		IT-98123	150.00	300.00	20	
IPC-1066	15.00	30.00	34		IPC-4202	30.00	60.00	21		ELEC-ELEC	100.00	125.00	35	
IPC-TP-1090	25.00	50.00	13		IPC-4203	30.00	60.00	21		ELEC-RELIA	150.00	175.00	35	
IPC-TP-1113	15.00	30.00	6		IPC-4204	30.00	60.00	21		ELEC-MICRO	175.00	220.00	35	
IPC-TP-1114	25.00	50.00	12		IPC-4411A	45.00	90.00	23		ELEC-SOLDER	100.00	100.00	13	
IPC-TP-1115	25.00	50.00	13		IPC-4412A	30.00	60.00	23		IPC-ENVIRONMENT	75.00	150.00	34	
IPC-1331	FD	FD	34		IPC-4552	40.00	80.00	18		IPC-PWBADV-CD	185.00	285.00	28	
IPC-1710A	FD	FD	31		IPC-4553	40.00	80.00	18		IPC-DRM-SMT-D	15.00	30.00	8	
IPC-1720A	FD	FD	31		IPC-4562	20.00	40.00	22		IPC-DRM-PTH-D	15.00	30.00	8	
IPC-1730A	FD	FD	31		IPC-4761	30.00	60.00	18		RoHS-AUDIT-CD	CALL	CALL	34	
IPC-1731	FD	FD	31		IPC-4821	40.00	80.00	22						
IPC-1752	FD	FD	34		IPC-5701	15.00	30.00	6						
IPC-1902	15.00	30.00	27		IPC-6010-SERIES	110.00	220.00	16						
SPVC2005-CD	99.00	199.00	35		IPC-6011	15.00	30.00	16						
IPC-2141A	30.00	60.00	20		IPC-6012B	30.00	60.00	16						
IPC-2220	80.00	160.00	26		IPC-6012B-IT	30.00	60.00	16						
IPC-2221A	30.00	60.00	26		IPC-6013A	45.00	90.00	21						
IPC-2222	20.00	40.00	26		IPC-6015	25.00	50.00	17						
IPC-2223A	25.00	50.00	26		IPC-6016	35.00	70.00	19						
IPC-2224	15.00	30.00	26		IPC-6018A	25.00	50.00	21						
IPC-2225	20.00	40.00	26		IPC/JPCA-6202	45.00	90.00	21						
IPC-2226	35.00	70.00	27		IPC/JPCA-6801	35.00	70.00	19						
IPC-2251	35.00	70.00	20		IPC-7095A	40.00	80.00	6						
IPC-2252	25.00	50.00	20		IPC-7351	50.00	100.00	27						
IPC/JPCA-2315	45.00	90.00	27		IPC-7525	20.00	40.00	10						
IPC-2501	35.00	70.00	28		IPC-7530	25.00	50.00	12						
IPC-2511A	35.00	70.00	29		IPC-7711/21A	125.00	250.00	14						
IPC-2511B	35.00	70.00	30		IPC-7912A	25.00	50.00	13						
IPC-2512A	35.00	70.00	30		IPC-8413-1	30.00	60.00	15						
IPC-2513A	35.00	70.00	30		IPC-8497-1	35.00	70.00	15						
IPC-2514A	35.00	70.00	30		IPC-9151A	FD	FD	24						
IPC-2515A	35.00	70.00	30		IPC-9191	35.00	70.00	24						
IPC-2516A	35.00	70.00	30		IPC-9194	25.00	50.00	24						
IPC-2517A	35.00	70.00	30		IPC-9199	35.00	70.00	24						
IPC-2518A	35.00	70.00	30		IPC-9201	45.00	90.00	7						
IPC-2524	FD	FD	24		IPC-9251	FD	FD	36						
IPC-2531	35.00	70.00	28		IPC-9252	30.00	60.00	25						
IPC-2541	35.00	70.00	29		IPC-9261	25.00	50.00	13						
IPC-2546	35.00	70.00	29		IPC-9591	25.00	50.00	3						
IPC-2547	35.00	70.00	29		IPC-9691	30.00	60.00	24						
IPC-2571	35.00	70.00	29		IPC-9701A	25.00	50.00	9						
IPC-2576	35.00	70.00	29		IPC/JEDEC-9702	15.00	30.00	9						

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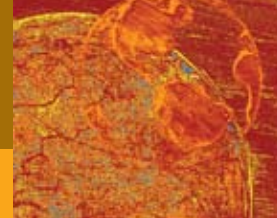
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PRODUCT ID	IPC		PAGE		PRODUCT ID	IPC		PAGE		PRODUCT ID	IPC		PAGE	
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0040	60.00	120.00	15		4411A	45.00	90.00	23		A-40-F-KIT	27.00	54.00	36	
1065	30.00	60.00	34		4412A	30.00	60.00	23		A-41-D-KIT	55.00	110.00	36	
1066	15.00	30.00	34		4552	40.00	80.00	18		A-41-F-KIT	35.00	70.00	36	
1331	FD	FD	34		4553	40.00	80.00	18		A-42-D-KIT	30.00	60.00	37	
1710A	FD	FD	31		4562	20.00	40.00	22		A-42-G-KIT	30.00	60.00	37	
1720A	FD	FD	31		4761	30.00	60.00	18		A-43-D-KIT	150.00	300.00	37	
1730A	FD	FD	31		4821	40.00	80.00	22		A-43-G-KIT	150.00	300.00	37	
1731	FD	FD	31		5701	15.00	30.00	6		A-44-D-KIT	165.00	330.00	37	
1752	FD	FD	34		6010 SERIES	110.00	220.00	16		A-44-F-KIT	110.00	220.00	37	
1902	15.00	30.00	27		6011	15.00	30.00	16		A-47-D-KIT	150.00	300.00	37	
2141A	30.00	60.00	20		6012B	30.00	60.00	16		A-47-G-KIT	150.00	300.00	37	
2220	80.00	160.00	26		6012B-IT	30.00	60.00	16		A-50	40.00	80.00	37	
2221A	30.00	60.00	26		6013-A	45.00	90.00	21		A-52G	50.00	100.00	37	
2222	20.00	40.00	26		6015	25.00	50.00	17		A-142	20.00	40.00	23	
2223A	25.00	50.00	26		6016	35.00	70.00	19		A-311	20.00	40.00	27	
2224	15.00	30.00	26		6018A	25.00	50.00	21		A-600G	45.00	90.00	17	
2225	20.00	40.00	26		6202	45.00	90.00	21		A-600G-CH	45.00	90.00	17	
2226	35.00	70.00	27		6801	35.00	70.00	19		A-600G-IT	45.00	90.00	17	
2251	35.00	70.00	20		7095A	40.00	80.00	6		A-610D	50.00	100.00	4	
2252	25.00	50.00	20		7351	50.00	100.00	27		A-610D-CH	50.00	100.00	4	
2315	45.00	90.00	27		7525	20.00	40.00	10		A-610D-DE	50.00	100.00	4	
2501	35.00	70.00	28		7530	25.00	50.00	12		A-610D-DK	50.00	100.00	4	
2511A	35.00	70.00	29		7711/21A	125.00	250.00	14		A-610D-FI	50.00	100.00	4	
2511B	35.00	70.00	30		7912A	25.00	50.00	13		A-610D-FR	50.00	100.00	4	
2512A	35.00	70.00	30		8413-1	30.00	60.00	15		A-610D-IT	50.00	100.00	4	
2513A	35.00	70.00	30		8497-1	35.00	70.00	15		A-610D-PL	50.00	100.00	4	
2514A	35.00	70.00	30		9151A	FD	FD	24		A-610D-SP	50.00	100.00	4	
2515A	35.00	70.00	30		9191	35.00	70.00	24		A-610D-SW	50.00	100.00	4	
2516A	35.00	70.00	30		9194	25.00	50.00	24		A-610D-VN	50.00	100.00	4	
2517A	35.00	70.00	30		9199	35.00	70.00	24		A-620A	50.00	100.00	5	
2518A	35.00	70.00	30		9201	45.00	90.00	7		AC-62A	25.00	50.00	7	
2524	FD	FD	24		9251	FD	FD	36		AJ-820	220.00	440.00	12	
2531	35.00	70.00	28		9252	30.00	60.00	25		CA-821	20.00	40.00	11	
2541	35.00	70.00	29		9261	25.00	50.00	13		CC-830B	20.00	40.00	12	
2546	35.00	70.00	29		9591	25.00	50.00	3		CF-148A	20.00	40.00	22	
2547	35.00	70.00	29		9691	30.00	60.00	24		CF-152B	20.00	40.00	23	
2571	35.00	70.00	29		9701A	25.00	50.00	9		CH-65A	30.00	60.00	6	
2576	35.00	70.00	29		9702	15.00	30.00	9		CM-770E	35.00	70.00	13	
2578	35.00	70.00	29		9704	20.00	40.00	10		D-279	45.00	90.00	28	
2581	35.00	70.00	30		9850-K	40.00	80.00	14		D-310C	30.00	60.00	28	
2615	30.00	60.00	27		9850-TM-K	Call	Call	14		D-322	20.00	40.00	28	
3406	15.00	30.00	11		9850-TM-KW	Call	Call	14		D-325A	25.00	50.00	16	
3408	15.00	30.00	12		A-20/21-GKIT	75.00	150.00	36		D-326A	25.00	50.00	16	
4101B	45.00	90.00	22		A-22-D-KIT	30.00	60.00	36		D-356B	30.00	60.00	30	
4103	30.00	60.00	20		A-22-G-KIT	30.00	60.00	36		D-422	20.00	40.00	28	
4104	45.00	90.00	19		A-24-G-KIT	40.00	80.00	36		D-859	20.00	40.00	27	
4110	20.00	40.00	23		A-25-D-KIT	40.00	80.00	36		DD-135	25.00	50.00	20	
4121	15.00	30.00	22		A-25-G-KIT	40.00	80.00	36		DPMO-202	35.00	70.00	13	
4130	20.00	40.00	23		A-25A-D-KIT	65.00	130.00	36		DR-572	20.00	40.00	19	
4202	30.00	60.00	21		A-25A-G-KIT	65.00	130.00	36		DRM-18G	30.00	60.00	8	
4203	30.00	60.00	21		A-36-D	175.00	350.00	36		DRM-53	12.00	24.00	9	
4204	30.00	60.00	21		A-36-G	90.00	180.00	36		DRM-56	15.00	30.00	9	

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	MEMBER PRICE	NONMEMBER PRICE				MEMBER PRICE	NONMEMBER PRICE				MEMBER PRICE	NONMEMBER PRICE		
DRM-PTH-D	15.00	30.00	8		M-103	330.00	660.00	9		TR-465-1	20.00	40.00	15	
DRM-SMT-D	15.00	30.00	8		M-104	165.00	330.00	9		TR-465-2	25.00	50.00	15	
E3TOOL-CD	99.00	149.00	34		M-105	305.00	610.00	16		TR-465-3	25.00	50.00	15	
EA-100K	220.00	440.00	4		M-106	275.00	550.00	26		TR-466	20.00	40.00	15	
ELEC-06	100.00	150.00	35		M-107	165.00	330.00	22		TR-476A	30.00	60.00	7	
ELEC-ELEC	100.00	125.00	35		M-108	90.00	180.00	6		TR-481	30.00	60.00	18	
ELEC-MICRO	175.00	220.00	35		M-109	85.00	170.00	7		TR-483	30.00	60.00	25	
ELEC-RELIA	150.00	175.00	35		MC-790	40.00	80.00	6		TR-485	20.00	40.00	23	
ELEC-SOLDER	100.00	100.00	13		MI-660	60.00	120.00	22		TR-486	50.00	100.00	25	
EMTF-05W	(1)	(1)	32		ML-960	20.00	40.00	18		TR-551	30.00	60.00	18	
EMTF-06E	(1)	(1)	32		MS-810	35.00	70.00	25		TR-579	30.00	60.00	18	
EMTF-06F	(1)	(1)	32		P-PTH2-D	50.00	75.00	39		TR-581	20.00	40.00	10	
EMTF-06R	(1)	(1)	32		P-PTH3-D	50.00	75.00	39		TR-582	25.00	50.00	7	
EMTF-06T	(1)	(1)	32		P-SMT2-D	100.00	150.00	39		TR-583	30.00	60.00	7	
EMTF-06HSP	(1)	(1)	33		P-SMT3-D	100.00	150.00	39		TR-585	40.00	80.00	14	
EMTF-06MED	(1)	(1)	33		PD-335	195.00	390.00	10		WAGEE-04	(1)	(1)	33	
ENVIRONMENT	75.00	150.00	34		PE-740A	105.00	210.00	16		WAGEP-04	(1)	(1)	33	
EXCOMP-06	(1)	(1)	33		PWB-CERTCD01	125.00	225.00	28		WP-006	20.00	30.00	11	
FA-251	30.00	60.00	21		PWB-CRT-SG01	35.00	70.00	28		WP-008	15.00	30.00	6	
FC-234	15.00	30.00	22		PWBADV-CD	185.00	285.00	28		WP/TR-584	25.00	50.00	34	
HDBK-001	40.00	80.00	4		PWBADV-SG02	75.00	150.00	28						
HDBK-005	35.00	70.00	11		QE-605A	35.00	70.00	17						
HDBK-610	40.00	80.00	4		QF-143	20.00	40.00	23						
HDBK-830	45.00	90.00	12		QL-653A	20.00	40.00	25						
HDI-1	140.00	280.00	19		ROADMAP-05	125.00	250.00	31						
HM-860	20.00	40.00	17		RoHSAUDIT-CD	CALL	CALL	34						
IT-30101	950.00	1900.00	20		S-816	20.00	40.00	13						
IT-95080	150.00	300.00	19		SA-61A	25.00	50.00	7						
IT-96060	150.00	300.00	20		SC-60A	20.00	40.00	7						
IT-97061	150.00	300.00	25		SG-141	20.00	40.00	23						
IT-97071	250.00	500.00	20		SKILL-201	75.00	150.00	31						
IT-98103	150.00	300.00	25		SM-780	35.00	70.00	9						
IT-98123	150.00	300.00	20		SM-784	30.00	60.00	5						
J-STD-001D	40.00	80.00	4		SM-785	25.00	50.00	9						
J-STD-001DSP	40.00	80.00	4		SM-817	20.00	40.00	11						
J-STD-001DSW	40.00	80.00	4		SM-839	20.00	40.00	19						
J-STD-002B	20.00	40.00	14		SM-840C	20.00	40.00	12						
J-STD-003A	20.00	40.00	14		SMC-WP-001	FD	FD	15						
J-STD-004A	25.00	50.00	10		SMC-WP-005	FD	FD	15						
J-STD-005	25.00	50.00	10		SPVC2005-CD	99.00	199.00	35						
J-STD-006B	25.00	50.00	11		T-50G	40.00	80.00	3						
J-STD-012	40.00	80.00	5		TA-724	70.00	140.00	9						
J-STD-013	40.00	80.00	5		TF-870	20.00	40.00	17						
J-STD-020C	25.00	50.00	8		TM-650	220.00	440.00	3						
J-STD-026	40.00	80.00	5		TP-104-K	20.00	40.00	7						
J-STD-027	20.00	40.00	5		TP-1090	25.00	50.00	13						
J-STD-028	40.00	80.00	5		TP-1113	15.00	30.00	6						
J-STD-030	40.00	80.00	11		TP-1114	25.00	50.00	12						
J-STD-032	20.00	40.00	6		TP-1115	25.00	50.00	13						
J-STD-033B	25.00	50.00	8		TR-461	30.00	60.00	14						
J-STD-035	20.00	40.00	8		TR-462	30.00	60.00	15						
M-102	165.00	330.00	21		TR-464	30.00	60.00	15						

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APPLICATION FOR IPC MEMBERSHIP

SITE INFORMATION:

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State

Zip/Postal Code Country

Main Switchboard Phone No.

Main Fax

Name of Primary Contact

Title

Mail Stop

Phone

Fax

E-mail

Company e-mail address

Website URL

PLEASE CHECK ONE:

- ☐ **\$1,000.00** Annual dues for Primary Site Membership (twelve months of IPC membership begins from the time the application and payment are received.)
- ☐ **\$800.00** Annual dues for Additional Facility Membership: additional membership for a site within an organization where another site is considered to be the primary IPC member.
- ☐ **\$600.00** Annual dues for an independent PCB/PWA fabricator or independent EMS provider with annual sales of less than \$1,000,000.
- ☐ **\$250.00** Annual dues for Government Agency/not-for-profit organization

EMTF MEMBERSHIP

- ☐ Please send me information about membership in the Executive Market Technology Forum (EMTF)

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IPC
3000 Lakeside Drive, Suite 309 S
Bannockburn, IL 60015
Tel: 847-615-7100
Fax: 847-615-7105
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**Overnight deliveries to this address only.*

TYPE OF COMPANY (CHECK ONE)

- ☐ Independent Printed Board Manufacturers
- ☐ Independent Electronics Assembly EMSI Company
- ☐ OEM—Manufacturer of any end product using PCB/PCAs or Captive Manufacturer of PCBs/PCAs
- ☐ Industry Supplier
- ☐ Government Agency/Academic Technical Liaison



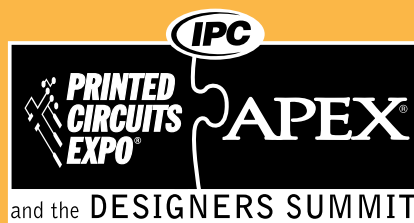
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