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6.4. Cum ne pot ajuta standardele specifice industriei electronice

Standardele au apărut ca o necesitate de a crea produse de calitate, competitive, într-o piață deschisă concurenței. Ele reprezintă un nivel de experiență și tehnologie care face ca prezența industriei în elaborarea lor să fie indispensabilă. Sunt coerente și consecvente: standardele sunt elaborate de către comitetele tehnice care sunt coordonate de către un organism specializat și asigură depășirea barierelor dintre diferitele domenii de activitate și diferite politici comerciale; de asemenea, reflectă rezultatele activității desfășurate în comun ce implică toate părțile competente și sunt validate prin consens pentru a reprezenta toate interesele relevante: producători, utilizatori, laboratoare, autorități, consumatori etc. Standardele sunt revizuite periodic sau după cum dictează circumstanțele pentru a le asigura actualitatea și, de aceea, evoluează împreună cu progresul social și tehnologic. Au recunoaștere națională sau internațională: standardele sunt documente care sunt recunoscute ca valabile la nivel național, regional sau internațional, după caz.

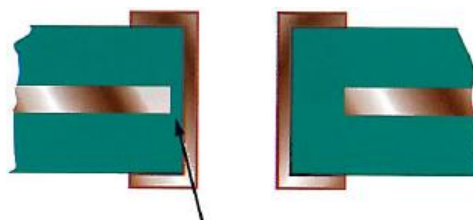
Ca regula generală, standardele nu sunt obligatorii, acestea având o aplicare voluntară. În anumite cazuri, implementarea poate fi obligatorie (cum ar fi în domeniile legate de securitate, instalații electrice sau în contracte publice).

Standardizarea facilitează și accelerează transferul de tehnologie în domeniile care sunt esențiale atât pentru companii, cât și pentru persoane fizice (noi materiale, sisteme de informare, biotehnologie, produse electronice, fabricarea integratelor pentru computere, etc.)

Un factor pentru selectarea strategică a companiilor : participarea la standardizare înseamnă introducerea soluțiilor adaptate la competența unei companii și echiparea acelei companii pentru a putea concura într-un mediu economic competitiv.

În domeniul electronicii standardele IPC sunt foarte răspândite. Întrucât standardele IPC sunt elaborate și aprobate prin consens, acestea sunt recunoscute și apreciate în întreaga lume a electronicii. Aplicarea și recunoașterea cerințelor din aceste standarde de către producători, clienți și furnizori permite acestora să se înțeleagă între ei, de oriunde ar fi, prin folosirea aceluiași limbaj tehnic. Datorită acceptării pe scară internațională a acestor standarde, folosirea lor în procesul de producție facilitează atragerea de noi clienți de pe piață și menținerea celor prezenți prin satisfacerea cerințelor lor.

Cum ne pot ajuta standardele specifice industriei electronice? Se știe că în practica realizării cablajelor imprimate apar anumite abateri de la situația ideală, fie că este vorba de dimensiunile plăcii, de diametrul viasurilor, de spațierea traseelor sau alinierea găurilor. Acestea sunt acceptabile în limita unor toleranțe prestabilite în funcție de clasa de acceptabilitate dorită. Sta în sarcina clientului, respectiv, a proiectantului stabilirea clasei de acceptabilitate în funcție de destinația produsului. De exemplu, în cazul nealinerii găurilor metalizate la un cablaj multistrat pot apărea situații când distanța de izolare între un strat interior și pereții găurii variază (fig.6.4.1). Distanța minimă este stabilită de diferența de potențial dintre cele două conductoare. Pentru un proiectant este dificil să stabilească pentru fiecare caz în parte care este distanța minimă necesară pentru a fi specificată în cerințele pentru producătorul de cablaje. El însă poate cere producătorului să se conformeze Standardului IPC-A-600 referitoare la materialul dielectric, care prevede în acest caz o distanță minimă de 0.1mm.



distanța minimă

Fig.6.4.1. Distanța minimă pentru găuri metalizate (IPC-A-600)

Standardele IPC sunt structurate pe mai multe secțiuni:

- Acceptabilitate;
- Tehnologii avansate;
- Curățare;

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- Componente;
- Cerințe generale;
- Materiale;
- Suport de proces;
- Reparații și reprocesări;
- Evaluarea solderabilității.

În continuare se prezintă arborele Specificațiilor IPC aplicabile în industria electronică și titlurile Standardelor în scopul ușurării muncii de căutare a normelor aplicabile unui anumit domeniu.

Specificatiile IPC aplicabile in industria electronica



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J-STD-001D	Requirements for Soldered Electrical and Electronic Assembly
IPC-HDBK-001	Handbook and Guide to the Requirements of Soldered Electronic Assemblies to Supplement ANSI/J-STD-001B
IPC-A-610D	Acceptability of Electronic
IPC-DRM-SMT	Surface Mount Solder Joint Evaluation - Desk Reference Manual

Acceptanta circuitelor de cablaj imprimat (PWB)

IPC-A-600E	Acceptability of Printed Boards
IPC-6011	Generic Performance Specification for Printed Boards
IPC-6012	Qualification and Performance Specification for Rigid Printed Boards (cu IPC-6011, inlocuieste IPC-RB-276)
IPC-DW-424	General Requirements for Encapsulated Discrete Wire Interconnection Boards
IPC-DW-425A	Design and End Product Requirements for Discrete Wiring Boards (Includes Amendment 1)
IPC-HM-860	Specification for Multilayer Hybrid Circuits
IPC-TR-470	Thermal Characteristics of Multilayer Interconnection Boards
IPC-6015	Qualification and Performance Specification for Organic Multichip Module (MCM-L) Mounting and Interconnecting Structures
IPC-TR-481	Results of Multilayer Test Program Round Robin
IPC-TR-551	Quality Assessment of Printed Boards Used for Mounting and Interconnecting Electronic Components
IPC-QE-605A	Printed Board Quality Evaluation Handbook
IPC-TR-578	Leading Edge Manufacturing Technology Report
IPC-TR-579	Round Robin Reliability Evaluation of Small Diameter Plated-Through Holes in PWBs
IPC-MC-324	Performance Specification for Metal Core Boards
IPC-TF-870	Qualification and Performance of Polymer Thick Film Printed Boards
IPC-ML-960	Qualification and Performance Specification for Mass Lamination Panels for Multilayer Printed Boards

Cablaje imprimate flexibile

IPC/JPCA-6202	Performance Guide Manual for Single-Sided and Double-Sided Flexible Printed Wiring Boards
IPC-6013	Qualification and Performance Specification for Flexible Printed Boards (cu IPC-6011, inlocuieste IPC-RF-245 și IPC-FC-250A)
IPC-2223	Sectional Design Standard for Flexible Printed Boards(cu IPC-2221, inlocuieste IPC-D-249)
IPC-M-102	Flexible Circuit Compendium
IPC-FC-231C	Flexible Bare Dielectrics for Use in Flexible Printed Wiring
IPC-FC-232C	Adhesive Coated Dielectric Films for Use as Cover Sheets for Flexible Printed Wiring and Flexible Bonding Films (inlocuieste IPC-FC-233A)
IPC-FC-234	Pressure Sensitive Adhesive Assembly Guidelines for Single-Sided and Double-Sided Printed Circuits
IPC-FA-251	Assembly Guidelines for Single-Sided and Double-Sided Flexible Printed Circuits
IPC-FC-241C	Flexible Metal-Clad Dielectrics for Use in Fabrication of Flexible Printed Wiring

Calitate/Test

IPC-MS-810	Guidelines for High Volume Microsection
IPC-QS-95	General Requirements for Implementation of ISO-9000 Quality Systems
IPC-2524	PWB Fabrication Data Quality Rating System
IPC-AI-642	User's Guidelines for Automated Inspection of Artwork, Innerlayers, and unpopulated PWBs

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IPC-OI-645	Standard for Visual Optical Inspection Aids
IPC-ET-652	Guidelines and Requirements for Electrical Testing of Unpopulated Printed Boards
IPC-TM-650	Test Methods Manual
IPC-PC-90	General Requirements for Implementation of Statistical Process Control
IPC-QL-653A	Qualification of Facilities that Inspect/Test Printed Boards, Components and Materials

Circuite de cablaj imprimat/Generalitati

IPC-T-50F	Terms and Definitions for Interconnecting and Packaging Electronic Circuits
IPC-M-105	Rigid Printed Board Manual
IPC-SKILL-201	IPC Skill Standards For Printed Wiring Board Manufacturing
IPC-PE-740A	Troubleshooting Guide for Printed Board Manufacture and Assembly
IPC-1710	QEM Standard for Printed Board Manufacturers' Qualification Profile (MQP)
IPC-D-325A	Documentation Requirements for Printed Boards
IPC-TA-724	Technology Assessment on Cleanrooms

Componente

IPC/JEDEC J-STD-020A	Moisture/Reflow Sensitivity Classification for Plastic Integrated Circuit Surface Mount Devices (Inlocuieste IPC-SM-786A)
IPC-M-109	Components Handling Series
IPC/JEDEC J-STD-033	Standard for Handling, Packing, Shipping and Use of Moisture Reflow Sensitive Surface Mount Devices (Inlocuieste IPC-SM-786A)
IPC-9501 PWB	Assembly Process Simulation for Evaluation of Electronic Components (Preconditioning IC Components)
IPC/JEDEC J-STD-035	Acoustic Microscopy for Non-Hermetic Encapsulated Electronic Components (Inlocuieste IPC-TM-650 method 2.6.22)
IPC-DRM-18	Component Identification - Desk Reference Manual
IPC-9502	PWB Assembly Soldering Process Guideline for Electronic Components
IPC-9503	Moisture Sensitivity Classification for Non-IC Components
IPC-9504	Assembly Process Simulation for Evaluation of Non-IC Components (Preconditioning Non-IC Components)

Curatare

IPC-M-108	Assembly Cleaning Guides and Handbooks
IPC-SC-60	Post Solder Solvent Cleaning handbook
IPC-SA-61	Post-Solder Semiaqueous Cleaning Handbook
IPC-AC-62A	Post-Solder Aqueous Cleaning Handbook
IPC-A-24	Surface Insulation Resistance
IPC-CH-65	Guidelines for Cleaning of Printed Boards and Assemblies
IPC-TR-582	Cleaning and Cleanliness Testing Program Test Results for: Phase 3 - Low Solids Fluxes and Pastes Processed in Ambient Air
IPC-SM-839	Pre- and Post-Solder Mask Application Cleaning Guidelines
IPC-9201	Surface Insulation Resistance Handbook

Fabricatie

IPC-DR-570A	General Specification for 1/8 Inch Diameter Shank Carbide Drills for Printed Boards
IPC-NC-349	Computer Numerical Control Formatting for Drillers and Routers
IPC-DR-572	Drilling Guidelines for Printed Boards
IPC-D-300G	Printed Board Dimensions and Tolerances
IPC-MB-380	Guidelines for Molded Interconnection Devices
IPC-CD-B1	Printed Board Fabrication Clip Art Graphics
IPC-BP-421	General specification for Rigid Printed Board Backplanes with Press-Fit Contacts
IPC-TA-721	Technology Assessment Handbook on Multilayer Boards

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Fire discrete

IPC-DW-426	Specification for Assembly of Discrete Wiring
IPC-BP-421	General Specification for Rigid Printed Board Backplanes with Press-fit Contacts
IPC-TR-474	An Overview of Discrete Wiring Techniques
IPC-D-422	Design guide for Press Fit Rigid Printed Board Backplanes

Folii

IPC-CF-148A	Resin Coated Metal for Printed Boards
IPC-MF-150F	Metal Foil for Printed Wiring Application (Includes Amendment 1)
IPC-CF-152B	Composite Metallic Material Specification for Printed Wiring Boards
IPC-TR-484	Results of IPC Copper Foil Ductility Round Robin Study
IPC-TR-485	Results of Copper Foil Rupture Strength Test Round Robin Study

Generalitati

IPC-AI-641	User's Guidelines for Automated Solder Joint Inspection Systems
IPC-D-326	Information Requirements for Manufacturing Electronic Assemblies
IPC-1720	Assembly Qualification Profile
IPC-C-406	Design and Application Guidelines for Surface Mount Connectors
IPC-C-408	Design and Application Guidelines for the Use of Solderless Surface Mount Connectors
SMC-WP-002	An Assessment of the Use of Lead in Electronic Assembly Surface Mount Council White Paper
IPC-C-408	Design and Application Guidelines for the Use of Solderless Surface Mount Connectors
IPC-TR-476A	Electrochemical Migration: Electrically Induced Failures in Printed Wiring Assemblies
EMSI T&C	EMSI Terms and Conditions Document

Intariri

IPC-CC-110A	Guidelines for Selecting Core Constructions for Multilayer Printed Wiring Board Applications
IPC-QF-143	Specification for Finished Fabric Woven from Quartz (Pure Fused Silica) for Printed Boards
IPC-EG-140	Specification for Finished Fabric Woven from "E" Glass for Printed Boards (Includes Amendment 1)
IPC-4110	Specification and Characterization Methods for Nonwoven Cellulose Based Paper for Printed Boards
IPC-SG-141	Specification for Finished Fabric Woven from "S" Glass for Printed Boards
IPC-4130	Specification and Characterization Methods for Nonwoven "E" Glass Mat
IPC-A-142	Specification for Finished Fabric Woven from Aramid for Printed Boards
IPC-4411	Specification and Characterization Methods for Nonwoven Para-Aramid

Interconexiuni de mare densitate (HDI)

IPC/JPCA-4104	Specification for High Density Interconnect (HDI) and Microvia Materials
IPC-6016	Qualification and Performance Specification for High Density Interconnect (HDI) Layers or Boards
IPC-DD-135	Qualification Testing for Deposited Organic Interlayer Dielectric Materials for Multichip Modules

Laminate

IPC-M-107	Standards for Printed Board Materials Manual
IPC-1730	Laminator Qualification Profile
IPC-TR-483	Dimensional Stability Testing of Thin Laminates - Report on Phase I and Phase II International Round Robin Test Programs

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IPC-MI-660	Incoming Inspection of Raw Materials Manual
IPC-TA-720	Technology Assessment Handbook on Laminates
IPC-4101	Specification for Base Materials for Rigid and Multilayer Printed Boards (Inlocuiește IPC-L-108, IPC-L-112A, IPC-L-115B)

Materiale

IPC-MI-660	Incoming Inspection of Raw Materials Manual
IPC-SM-817	General Requirements for Dielectric Surface Mounting Adhesives
IPC-CA-821	General Requirements for Thermally Conductive Adhesives
J-STD-004	Requirements for Soldering Fluxes(Includes Amendment 1)
IPC-3406	Guidelines for Electrically Conductive Surface Mount Adhesives
J-STD-005	Requirements for Soldering Pastes
IPC-3408	General Requirements for Anisotropically Conductive Adhesives Films
J-STD-006	Requirements for Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders for Electronic Soldering Applications
IPC-CC-830A	Qualification and Performance of Electrical Insulating Compound for Printed Board Assemblies
IPC-TP-1090	The Layman's Guide to Qualifying New Fluxes for MIL-STD-2000A or MT- 0002
IPC-SM-840C	Qualification and Performance of Permanent Solder Mask

Procesare/Reparare

IPC-7711	Rework of Electronic Assemblies
IPC-7721	Repair and Modification of Printed Boards and Eletronic Assemblies

Proiectare

IPC-2221	Generic Standard on Printed Board Design
IPC-M-106	Technology Reference for Design Manual
IPC-2222	Sectional Standard on Rigid PWB Design (Replaces IPC-D-275)
IPC-2223	Sectional Design Standard for Flexible Printed Boards (cu IPC-2221, Inlocuiește IPC-D-249)
IPC-2224	Sectional Standard for Design of PWBs for PC Cards (cu IPC-2221, Inlocuiește IPC-D-249)
IPC-D-300G	Printed Board Dimensions and Tolerances
IPC-D-330	Design Guide Manual
IPC-2225	Sectional Design Standard for Organic Multi-chip Modules (MCM-L) and MCM-L Assemblies

Solderabilitate

IPC/EIA J-STD-002A	Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires
J-STD-003	Solderability Tests for Printed Boards
IPC-TR-464	Accelerated Aging for Solderability Evaluations and Addendum
IPC-TR-461	Solderability Evaluation of Thick and Thin Fused Coatings SMC-WP-005 PWB Surface Finishes
IPC-TR-465-1	Round Robin Test Report on Steam Ager Temperature Control Stability
IPC-TR-465-2	The Effect of Steam Aging time and Temperature on Solderability Test Results
IPC-TR-465-3	Evaluation of Steam Aging On Alternative Finishes, Phase IIA
IPC-TR-466	Technical Report: Wetting Balance Standard Weight Comparison Test
IPC-TR-462	Solderability Evaluation of Printed Boards with Protective Coatings Over Long Term Storage

Suport pentru proces

IPC-AJ-820	Assembly and Joining Handbook
IPC-TP-1115	Selection and Implementation Strategy for a Low-Residue, No-Clean Process

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IPC-TNG-001B	Generic Training Plan
IPC-TR-581	IPC Phase 3 Controlled Atmosphere Soldering Study
IPC-TA-722	Technology Assessment Handbook on Soldering
IPC-TA-723	Technology Assessment Handbook on Surface Mounting
IPC-CM-770	Component Mounting Guidelines for Printed Boards
IPC-SM-780	Component Packaging and Interconnecting with Emphasis on Surface Mounting
IPC-SM-785	Guidelines for Accelerated Reliability Testing of Surface Mount Attachments
IPC-S-816 SMT	Process Guideline and Checklist

Tehnica de mare viteza/mare frecventa

IPC-D-317A	Design Guidelines for Electronic Packaging Utilizing High-Speed Techniques
IPC-2141	Controlled Impedance Circuit Boards and High Speed Logic Design
IPC-6018	Microwave End Product Board Inspection and Test(cu IPC-6011, inlocuieste IPC-HF-318A)
IPC-L-125A	Specification for Plastic Substrates, Clad or Unclad, for High Speed/High Frequency Interconnections
IPC-D-316	Design Guide for Microwave Circuit Boards Utilizing soft Substrates

Tehnica avansata

J-STD-012	Implementation of Flip Chip and Chip Scale Technology
J-STD-013	Implementation of Ball Grid Array and Other High Density Technology
IPC-SM-784	Guidelines for Chip-on-Board Technology Implementation
IEC-PAS-62085	Implementation of Ball Grid Array and Other High Density Technology
IEC-PAS-62084	Implementation of Flip Chip and Chip Scale Technology
J-STD-026	Semiconductor Design Standard for Flip Chip Applications
SMC-TR-001	An Introduction to Tape Automated Bonding Fine Pitch Technology
J-STD-028	Performance Standard for Flip Chip/Chip Scale Bumps
SMC-WP-003	Chip Mounting Technology (CMT)
IPC-MC-790	Guidelines for Multichip Module Technology Utilization

Model/Testare

IPC-A-20/21	Standard Pitch Stencil Pattern for Slump
IPC-A-22	UL Recognition Test Pattern
IPC-A-23	Polymer Thick Film Artwork
IPC-A-24	Surface Insulation Resistance
IPC-A-25	Multipurpose 1&2 Sided Test Pattern