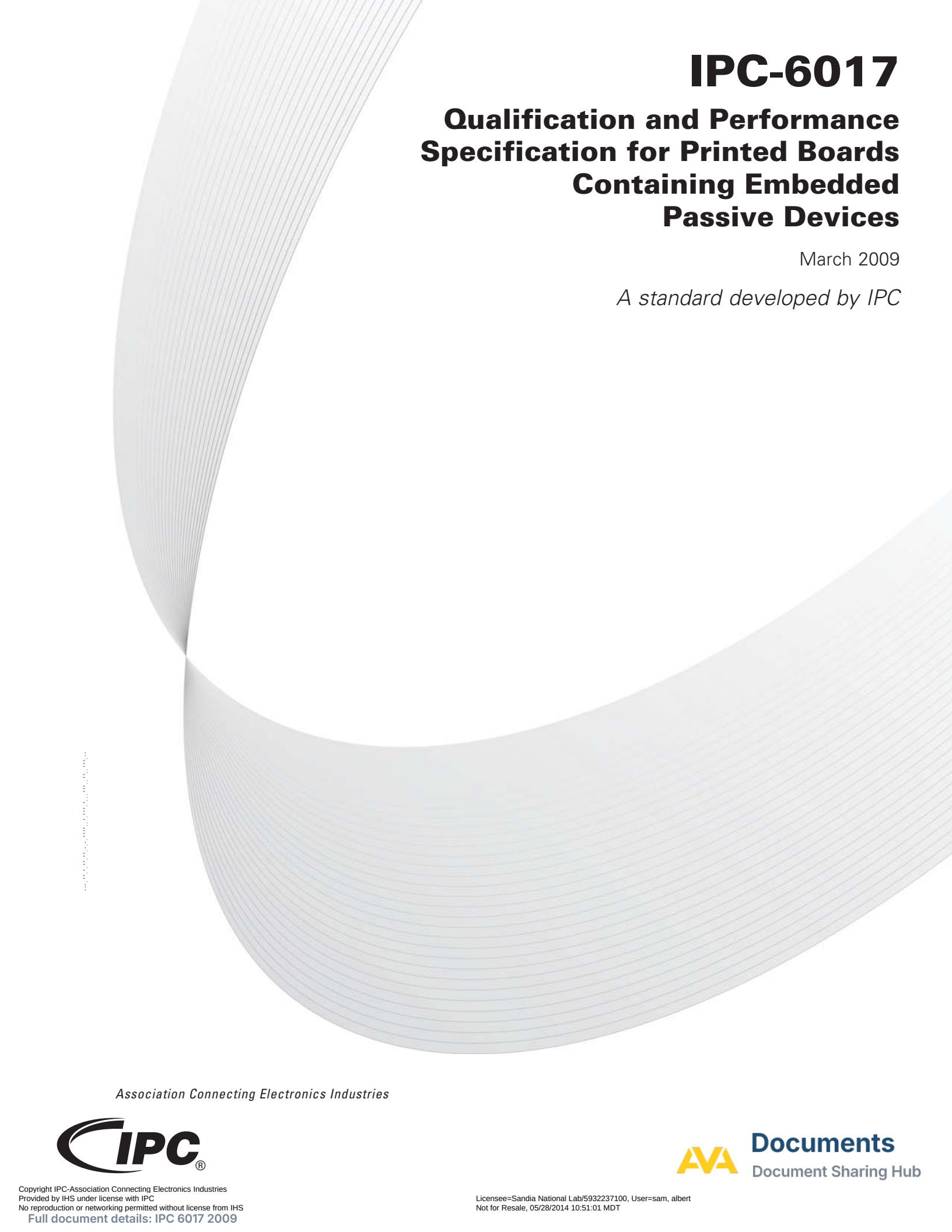




IPC-6017

Qualification and Performance Specification for Printed Boards Containing Embedded Passive Devices

March 2009

A standard developed by IPC

Association Connecting Electronics Industries



Copyright IPC-Association Connecting Electronics Industries
Provided by IHS under license with IPC
No reproduction or networking permitted without license from IHS
Full document details: [IPC 6017 2009](#)



Licensee=Sandia National Lab/5932237100, User=sam, albert
Not for Resale, 05/28/2014 10:51:01 MDT

The Principles of Standardization

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

Standards Should:

- Show relationship to Design for Manufacturability (DFM) and Design for the Environment (DFE)
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

Standards Should Not:

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended with data

Notice

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

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

IPC Position Statement on Specification Revision Change

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

Why is there a charge for this document?

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

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

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

Thank you for your continued support.



IPC-6017

Qualification and Performance Specification for Printed Boards Containing Embedded Passive Devices

Developed by the Embedded Devices Performance Subcommittee (D-53) of the Embedded Devices Committee (D-50) of IPC

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

Contact:

IPC
3000 Lakeside Drive, Suite 309S
Bannockburn, Illinois
60015-1249
Tel 847 615.7100
Fax 847 615.7105



This Page Intentionally Left Blank

Acknowledgment

Any document involving a complex technology draws material from a vast number of sources. While the principal members of the Embedded Devices Performance Subcommittee (D-53) of the Embedded Devices Committee (D-50) are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

Embedded Devices Committee	Embedded Devices Performance Subcommittee	Technical Liaisons of the IPC Board of Directors
Chair David R. McGregor E. I. du Pont de Nemours and Co.	Chair Michael Luke Raytheon Company	Peter Bigelow IMI Inc.
Vice-Chair Richard Snogren Bristlecone LLC	Vice-Chair G. Sidney Cox, Ph.D. E. I. du Pont de Nemours and Co.	Sammy Yi Flextronics International
Embedded Devices Performance Subcommittee		
John Andresakis, Oak-Mitsui, Inc.	Timothy Estes, Conductor Analysis Technologies, Inc.	J. Lee Parker, JLP
Lance Auer, Raytheon Missile Systems	Jason Ferguson, NSWC Crane	Joel Peiffer, 3M Company
John Bauer, Rockwell Collins	Gary Ferrari, FTG Circuits	Joseph Schmidt, Raytheon Missile Systems
Daniel Brandler, Ohmega Technologies Inc.	Dennis Fritz, MacDermid, Inc.	Akikazu Shibata, JPCA-Japan Electronics Packaging and Circuits Association
Jeffrey Ciesla, Defense Supply Center Columbus	Mahendra Gandhi, Northrop Grumman Space Technology	Gordon Sullivan, Huntsman Advanced Technology Center
Christine Coapman, Delphi Electronics and Safety	Michael Green, Lockheed Martin Space Systems Company	Crystal Vanderpan, Underwriters Laboratories Inc.
David Corbett, Defense Supply Center Columbus	Rocky Hilburn, CAC, Inc.	Jiming Zhou, Delphi Electronics and Safety
Dennis DeBord, Nortel	Steven Nolan, Lockheed Martin Maritime Systems & Sensors	
C. Don Dupriest, Lockheed Martin Missiles and Fire Control	Jan Obrzut, NIST	

Table of Contents

1 SCOPE	1	3.5.2 Spacing	3
1.1 Statement of Scope	1	3.5.3 Conductive Surfaces	3
1.2 Purpose	1	3.5.4 Nicks and Pinholes	3
1.3 Performance Classification	1	3.6 Structural Integrity	3
1.4 Embedded Passive Device Categories	1	3.6.1 Thermal Stress	4
1.5 Documentation Hierarchy	1	3.6.2 Microsection Integrity	4
1.6 Selection for Procurement	1	3.7 Protective Coverage	4
1.7 Selection (Default)	1	3.7.1 Solder Mask Coverage Requirements	4
1.8 Terms and Definitions	1	3.7.2 Other Protective Coatings	4
1.8.1 As Agreed Upon Between User and Supplier (AABUS)	1	3.8 Electrical Requirements	4
2 APPLICABLE DOCUMENTS	1	3.8.1 Electrical Requirements of Embedded Passives Devices in PBs	4
2.1 IPC	1	3.8.2 Dielectric Withstanding Voltage	4
2.2 Underwriters Laboratories	2	3.8.3 Circuitry	5
3 REQUIREMENTS	2	3.8.4 Moisture and Insulation Resistance (MIR)	5
3.1 General	2	3.9 Cleanliness	5
3.2 Materials	2	3.10 Special Requirements	5
3.2.1 Rigid Laminates	2	3.10.1 Heat Dissipation	5
3.2.2 Flexible Films	2	3.10.2 Thermal Shock	5
3.2.3 Microwave High Speed Materials	2	3.11 Repair	5
3.2.4 Bonding Materials	2	4 QUALITY ASSURANCE PROVISIONS	5
3.2.5 Resistor Materials	2	4.1 General	5
3.2.6 Capacitor and Capacitance Materials	3	4.2 Acceptance Tests	5
3.2.7 Metal Foils	3	4.2.1 C=0 Zero Acceptance Number Sampling Plan	5
3.2.8 Metallic Plating and Coatings	3	4.2.2 Referee Tests	5
3.2.9 Solder Mask	3		
3.2.10 Polymer Coatings for Embedded Passive Devices	3		
3.2.11 Marking Inks	3		
3.2.12 Other Materials	3		
3.3 Visual Examination	3		
3.4 PB Dimensional Requirements	3		
3.5 Embedded Passive Pattern Definition	3		
3.5.1 Size Verification	3		

Tables

Table 3-1	Embedded Passive Device Finished PB Tolerance Requirements	4
Table 3-2	Dielectric Withstanding Voltages	4
Table 4-1	C=0 Sampling Plan (Sample Size for Specific Index Value)	6
Table 4-2	Acceptance Testing and Frequency	6