



INTERNATIONAL ELECTROTECHNICAL COMMISSION

QUALITY ASSESSMENT SYSTEM FOR ELECTRONIC COMPONENTS (IECQ)

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TITLE: Implementation of IECQ Capability Approval using
the IPC-6010 series of Standards

Document History

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2008-05	Original Issue (Version 1)



1. Introduction

This IECQ Operational Document has been developed to enable manufacturers of (unpopulated) printed circuit boards (PCBs) to be granted IECQ capability approval against the requirements of the IPC-6010 series of PCB performance Standards. This Operational Document was considered and approved during the 2008 IECQ annual Meetings.

2. Purpose

The rules for IECQ Capability Approval are detailed in IEC QC 001002-3 clause 4 which anticipates the existence of a Customer Detail Specification (CDS).

This document fulfils the role of a default CDS.

3. Related Documents

IEC QC 001002-3	IEC Quality Assessment System for Electronic Components (IECQ) – Rules of Procedure – Part 3: Approval Procedures
IPC-6011	Generic Performance Specification for Printed Boards
IPC-6012	Qualification and Performance Specification for Rigid Printed Boards
IPC-6013	Qualification and Performance Specification for Flexible Printed Boards

Note: IPC-6012 and also IPC-6013 are each considered to fulfil the rôles of both a Sectional Specification and a Capability Detail Specification for the purposes of IECQ Capability Approval.

4. Requirements

The PCB performance classes detailed in clause 1.2 of IPC-6011 are acknowledged, and it is anticipated that the demonstration of class 3 performance will be expected in many application where IECQ certification is sought. However, it has been found that the costs of the specified lot-by-lot testing (particularly in respect to internal annular ring registration) acts as a significant deterrent to the use of the Standards as written.

Table 1 details substitute customer requirements to those given in IPC-6012. Table 2 details substitute customer requirements to those given in IPC-6013. These are the minimum requirements permitted for IECQ certification. Applications for IECQ Capability Approval for IPC-6011 Class 1 will not be accepted.

Customers for PCBs are encouraged to study the requirements of the Standards and determine an appropriate class of performance for their application. This may result in requirements different to those given in the Standards as modified by this IECQ OD, with consequent differences in the cost of the delivered product.



Table 1; Substitute requirements applicable to IPC-6012

Characteristic	IPC-6012 Reference	Sample Type		IPC-6012 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
Material					
Material	3.2.1 – 3.2.1.4			Verifiable CofC or SPC program	Use of suppliers' declarations
Visual					
Edges of Board	3.3.1	X		Per board	Use of a combination of Automated Optical Inspection (AOI) and human inspection is allowed. Procedures and practice shall ensure that the minimum requirements of IPC-6012 are set as AOI default acceptance criteria.
Laminate Imperfections	3.3.2	X		Per board	
Workmanship	3.3.9	X		Per board	
Lifted lands	3.3.4	X		Per board	
Marking and traceability	3.3.5	X	Coupons and board	Per board	
Voids in plated hole	3.3.3	X		Per panel	Test as specified for declared class
Solderability					
Surface	3.3.6	X	M	Per board	Test as specified for declared class
Hole	3.3.6	X	A or A/B or S	Per board	
Dimensional					
Board dimensional	3.4	X		Per board	Use of a combination of Automated Optical Inspection (AOI) and human inspection is
Hole size	3.4.1	X		Per board	
Hole pattern accuracy	3.4.1	X		Supplier	



Characteristic	IPC-6012 Reference	Sample Type		IPC-6012 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
Pattern feature accuracy	3.4.1	X		certification allowed	allowed. Procedures and practice shall ensure that the minimum requirements of IPC-6012 are set as AOI default acceptance criteria.
Annular ring (external)	3.4.2	X		Per panel	
Solder resist coverage	3.7 – 3.7.1	X		Per board	
Bow and Twist	3.4.3	X		Per board	Test as specified
Plating / coating thickness (electronic)	3.6.2.11	X	C or N	Per panel	Test as specified for declared class.
Conductor width					
Internal	3.5.1	X		Per internal panel layer	Use of a combination of Automated Optical Inspection (AOI) and human inspection is allowed. Procedures and practice shall ensure that the minimum requirements of IPC-6012 are set as AOI default acceptance criteria.
External	3.5.1	X		Per board	
Conductor spacing					
Internal	3.5.2			Per panel layer (minimum 5 evaluations per layer set)	Use of a combination of Automated Optical Inspection (AOI) and human inspection is allowed. Procedures and practice shall ensure that the minimum requirements of IPC-6012 are set as AOI default acceptance criteria.
External	3.5.2	X		Per board	
Conductive surfaces (surface only)					
Edge board contact, junction of gold plate to solder finish	3.3.8	X		Per panel	



Characteristic	IPC-6012 Reference	Sample Type		IPC-6012 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
Nicks, dents, pinholes	3.5.4.1	X		Per board	Test as specified for declared class.
Dewetting / nonwetting / final finish coverage	3.5.4.5 3.5.4.6 3.5.4.7	X		Per board	
Edge board connector	3.5.4.4	X		Per board	
Surface mount	3.5.4.2	X		Minimum 10 evaluations per panel	
Physical					
Plating adhesion	3.3.7	X	C or N	Per panel (1 coupon)	Test as specified for declared class.
Solder resist cure and adhesion	3.7 3.7.2	X	G	Per panel (1 coupon)	
Cleanliness					
Cleanliness prior to solder resist application	3.9.1	X		Per lot	Test as specified for declared class.
Structural integrity after stress types 3-6 (microsection)					
Plating integrity	3.6.2.1		A and B or A/B	Per panel	The sampling requirements of class 2 shall be used. Customers may opt for the class 3 sampling requirements but should be aware of the expense of this option.
Laminate voids	3.6.2.3		A and B or A/B	Per panel	
Etchback / negative etchback	3.6a, 3.6b 3.6.2.6 3.6.2.8		A and B or A/B	Per panel	



Characteristic	IPC-6012 Reference	Sample Type		IPC-6012 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
Annular ring (internal)	3.6a 3.6b 3.6.2.9		A and B or A/B	Twice per panel opposite corners	For assessment of 'Annular ring internal' the following options may be considered: a) The sampling requirements of class 2 may be used, or b) The use of X-ray techniques may be used, or c) The use of special electrical coupons may be used. Note: the techniques described in (b) and (c) are permitted by clause 3.6.2.9 of IPC-6012
Lifted lands	3.6.2.10		A and B or A/B	Per panel	The sampling requirements of class 2 shall be used. Customers may opt for the class 3 sampling requirements but should be aware of the expense of this option.
Hole plating thickness	3.6a 3.6b 3.6.2.11		A and B or A/B	Per panel	
Surface plating and conductor thickness	3.6a 3.6b 3.6.2.11 3.6.2.13		A and B or A/B	Per panel	
Conductor thickness (internal)	3.6a 3.6b 3.6.2.12		A and B or A/B	Per panel	
Metal core spacing	3.6.2.14		A and B or A/B	Per panel	



Characteristic	IPC-6012 Reference	Sample Type		IPC-6012 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
Dielectric thickness	3.6a 3.6b 3.6.2.15		A and B or A/B	Per panel	
Resin fill of buried vias	3.6.2.16		A and B or A/B	Per panel	
Structural integrity after stress type 2 (microsection)					
Plating integrity	3.6.2.1		A and B or A/B	Per panel	The sampling requirements of class 2 shall be used. Customers may opt for the class 3 sampling requirements but should be aware of the expense of this option.
Laminate voids	3.6a 3.6b 3.6.2.3		A and B or A/B	Per panel	
Lifted lands	3.6.2.10		A and B or A/B	Per panel	
Hole plating thickness	3.6a 3.6b 3.6.2.11		A and B or A/B	Per panel	
Surface plating and conductor thickness	3.6a 3.6b 3.6.2.11 3.6.2.13		A and B or A/B	Per panel	
Surface plating and conductor thickness	3.6a 3.6b		A and B or A/B	Per panel	



Characteristic	IPC-6012 Reference	Sample Type		IPC-6012 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
	3.6.2.11 3.6.2.13				
Circuit continuity	3.8.2.1	X		Per board	Test as specified for declared class.
Insulation resistance	3.8.2.2	X			

Characteristic	IPC-6012 Requirement & Test Method	Test Coupon		Test Frequency		Substitute Customer Requirement
		Type 1	Types 2 – 6	Class2	Class 3	
Quality conformance maintenance testing						
Rework simulation (when specified)	3.10.11		A or A/B	Not Applicable	Monthly	Test as specified for declared class.
Bond strength	3.10.12	B or A/B		Quarterly	Monthly	
Dielectric withstanding voltage	3.8.1	E	E	Quarterly	Monthly	
Moisture and Insulation resistance	3.8.4	E	E	Quarterly	Monthly	



Table 2; Substitute requirements applicable to IPC-6013

Characteristic	IPC-6013 Reference	Sample Type		IPC-6013 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
Material					
Material	3.2.1 – 3.2.1.2			Verifiable CofC or SPC program	Use of suppliers' declarations
Visual					
Edges; rigid section	3.3.1.1	X		Per board	Use of a combination of Automated Optical Inspection (AOI) and human inspection is allowed. Procedures and practice shall ensure that the minimum requirements of IPC-6013 are set as AOI default acceptance criteria.
Edges; flex section	3.3.1.2	X		Per board	
Transition zone; rigid area to flex area	3.3.1.3	X		Per board	
Construction imperfections	3.3.2	X		Per board	
Marking and traceability	3.3.4	X	(Retained Coupons)	Per board	
Edge board contact; junction of gold plate to solder finish	3.3.7	X		Per panel	
Lifted lands	3.3.8	X		Per board	
Workmanship	3.3.9	X		Per board	
Plating and coating voids in holes	3.3.3	X		Per panel. Types 2,3,4	



Characteristic	IPC-6013 Reference	Sample Type		IPC-6013 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
Physical					
Plating adhesion	3.3.6	X	C	Per panel (1 coupon)	Test as specified for declared class.
Covercoat cure and adhesion	3.3.2.11.2	X	G	Per panel (1 coupon)	
Solderability					
Surface	3.3.5	X	M	Per panel	Test as specified for declared class.
Hole	3.3.5	X	A or A/B or S	Per panel	
Dimensional					
Dimensional; flexible printed wiring	3.4	X		Per board	Use of a combination of Automated Optical Inspection (AOI) and human inspection is allowed. Procedures and practice shall ensure that the minimum requirements of IPC-6013 are set as AOI default acceptance criteria.
Hole size and hole pattern accuracy	3.4.1	X		Per board	
Etched annular ring (external)	3.4.2	X		Per board	
Solderable annular ring; external	3.4.2.1	X		Per board	
Bow and Twist (individual board or stiffener portion)	3.4.3	X		Per board	Test as specified for declared class.
Conductor definition (internal and external layers)					
Conductor imperfections	3.5.1	X		Per board	
Conductor width reduction	3.5.1.1	X		Per board	
Conductor thickness	3.5.1.2	X		Per board	



Characteristic	IPC-6013 Reference	Sample Type		IPC-6013 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
reduction					Use of a combination of Automated Optical Inspection (AOI) and human inspection is allowed. Procedures and practice shall ensure that the minimum requirements of IPC-6013 are set as AOI default acceptance criteria.
Conductor spacing	3.5.2	X		Per board	
Nicks or pinholes in ground or voltage planes	3.5.3.1	X		Per board	
Surface mount lands	3.5.3.2	X		Minimum 10 evaluations per panel	
Edge connector lands	3.5.3.3	X		Per board	
Conductor edge outgrowth	3.5.3.7	X		Per board	
Dewetting / nonwetting / final finish coverage	3.5.3.4 3.5.3.5 3.5.3.6	X		Per board	
Structural integrity after stress types 3-4 (microsection)					
Flexible and rigid laminate integrity	3.7.3 3.7.4		A and B or A/B	Per panel	The sampling requirements of class 2 shall be used. Customers may opt for the class 3 sampling requirements but should be aware of the expense of this option.
Etchback, smear removal and negative etchback (Types 3 and 4 only)	3.7.5 3.7.6 3.7.7		A and B or A/B	Per panel	
Plating integrity and wicking	3.7.8 3.7.8.1		A and B or A/B	Per panel	
Plating voids	3.7.9		A and B or A/B	Per panel	For assessment of 'Annular ring internal' the following options may be considered: a) The sampling requirements of class 2 may be used, or
Annular ring breakout (internal)	3.7.10 3.7.10.1		A and B or 2 A/B	Twice per panel,	



Characteristic	IPC-6013 Reference	Sample Type		IPC-6013 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
				diagonally opposite corners	b) The use of X-ray techniques may be used, or c) The use of special electrical coupons may be used. Note: the techniques described in (b) and (c) are permitted by clause 3.7.10.1 of IPC-6012 The sampling requirements of class 2 shall be used. Customers may opt for the class 3 sampling requirements but should be aware of the expense of this option.
Plating / coating thickness	3.7.11		A and B or A/B	Per panel	
Minimum layer / copper foil thickness	3.7.12		A and B or A/B	Per panel	
Minimum surface conductor thickness	3.7.13		A and B or A/B	Per panel	
Metal cores	3.7.14		A and B or A/B	Per panel	
Dielectric Thickness	3.7.15		A and B or A/B	Per panel	
Structural integrity after stress type 2 (microsection)					
Laminate integrity (flexible)	3.7.3		A and B or A/B	Per panel	The sampling requirements of class 2 shall be used. Customers may opt for the class 3 sampling requirements but should be aware of the expense of this option.
Plating integrity	3.7.8		A and B or A/B	Per panel	
Plating voids	3.7.9		A and B or A/B	Per panel	
Plating / coating thickness	3.7.11		A and B or A/B	Per panel	
Minimum surface conductor thickness	3.7.13		A and B or A/B	Per panel	
Dielectric Thickness	3.7.15		A and B	Per panel	



Characteristic	IPC-6013 Reference	Sample Type		IPC-6013 Table 4-3 Remarks	Substitute Customer Requirement
		Production Board	Test coupon		
			or A/B		
Circuit continuity	3.9.2.1	X		Per board	Test as specified for declared class.
Isolation (circuit shorts)	3.9.2.2	X			

Characteristic	IPC-6013 Reference	Test Coupon		Test Frequency		Substitute Customer Requirement
		Types 1 & 5	Types 2 – 4	Class2	Class 3	
Quality conformance testing						
Rework simulation	3.8		B or A/B	Two coupons per quarter	Two coupons per month	Test as specified for declared class.
Bond strength (unsupported lands)	3.6.3	B or A/B	As required			
Bond strength	3.6.4	Board	Board	As required	As required	
Dielectric withstanding voltage	3.9.1	E	E	Two coupons per quarter	Two coupons per month	
Moisture and Insulation resistance	3.10.1	E	E			