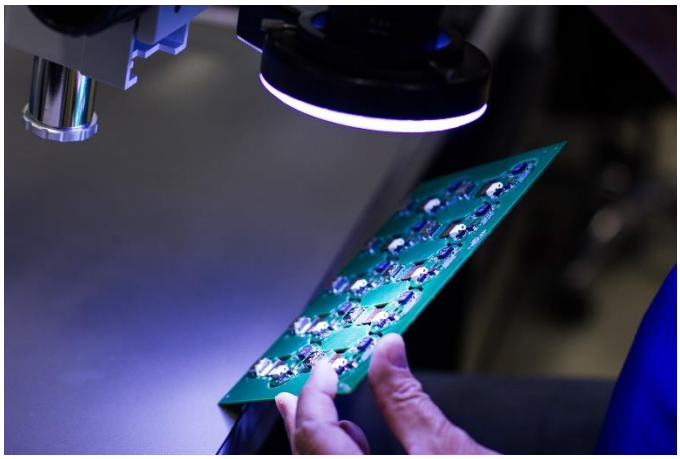
S & Q EUROPE B.V.

Your One Stop PCB Service Centre

Capabilities PCB Service Centre



The principle “Unless specified otherwise” is used. This means that in case nothing additionally is specified the IPC specifications IPC-A600 do apply including the General Printed Circuit Board Specification. The testing from the pcb’c is according IPC-9252 Level B. In case the General Printed Circuit Board Specification gives a tighter tolerance, this Specification prevails. The pcba’s are according the IPC-A610.

In a number of cases the customer can have special requirements and/or there are specific product requirements. These requirements have priority over the general specification and/or IPC specifications.

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Content

1. Applicable Industry Standards

PCBAs supplied by S & Q Europe B.V. are conforming to the latest version of following standards, and of standards referenced therein.

IPC-6010	Series of Performance Specification for PCBs.
IPC-A-600	Acceptability of Printed Boards.
IPC-A-610	Acceptability of Electronic Assemblies
IPC-J-STD-003	Solder ability tests for printed boards.
IPC/JEDEC-J-STD-609	Marking and labelling of components, PCBs and PCBAs to Identify Lead (Pb), Pb-free and Other Attributes.
IPC-9252 Level B	Electrical test for bare boards

Disclaimer:

All information is provided on an as is basis. Although supplier has done it utmost to have this information complete and correct, supplier cannot be held responsible for any incorrect and/or incomplete information. Supplier can never be held responsible for any damages resulting from the use of this information. Supplier has the right to alter this information at any time without notice.

2. General

2.1. The assembly shop is dedicated to do a fast turnaround of assembly projects with focus on Quality and Flexibility.

- Small series of complex printed circuit assembly
- Tools, training programs and experience of the team is focused on manual mounting of parts. IPC610 trained and qualified staff.
- Automated assemblies, due to positioning requirements and/or quantities, are executed in close cooperation with partner companies.
- Fast turnaround: 3WDS for quotations and 2-5 WDS for assembly (lead-time components and complexity of the project do impact the lead-time)

2.2. PCBA are conform IPC610, Class II, ISO9001

2.3. All bare PCBs are conforming to EC-Regulation nr. 1907/2006 – REACH.
No substances classified as “Substances of Very High Concern” (SVHC) present.
All components are conforming to EC-Regulation nr. 1907/2006 – REACH

2.4. All bare PCBs are conforming to Directive 2011/65/EU of the European Parliament and of the Council, RoHS 2 (Restriction of Hazardous Substances).
All components are, unless specific components are specified, conforming to Directive 2011/65/EU of the European Parliament and of the Council, RoHS 2

2.5. Unless explicitly specified otherwise:

- PCBs are manufactured according IPC-6000 series.
- PCBS are inspected according to the IPC-A-600 (class II).
- All test methods should be according IPC-TM-650.

3. Definitions

PCB:	Printed circuit board not populated
PCBA:	Printed circuit board populated with components
PCS:	Single piece printed circuit board
Panel:	Composition of one or more pieces (PCS) PCB of the same design
Tooling:	A set of data / films / masks to manufacture the PCB
Stencil:	To apply the solder paste on the PCB
NRE:	Non recurring engineering cost (all one-time cost made to execute the project, stencil and tooling can be part of it)
CoC:	Certificate of Conformity
BGA:	Ball Grid Array
SOT:	Small-Outline Transistor

4. Documentation

For all documents the latest version with the latest date is valid for production.

NOTE: In case of a conflict the customer will be contacted before starting production.

5. Capability Matrix

	Positioning		Soldering		
	Manual	By means of Equipment*	Manual	Vapour Phase	Vacuum Vapour Phase
BGA >0,4mm pitch	■	■		■	■
BGA ≤ 0,4mm pitch		■		■	■
ICs ≥ 0,3mm pitch	■	■	■	■	■
ICs < 0,3mm pitch	■	■		■	■
SMD ≥ shape 01005	■	■	■	■	■
Press-fit components	■	■			
Wire bonding		■			
Cleaning of PCBA	■	■			
Assembly Rigid PCB	■	■	■	■	■
Assembly Rigid Flex	■	■	■	■	■
Assembly Rigid Flex-Rigid	■	■	■	■	■
Assembly Stretch (Stretch-rigid)	■		■		
Thickness PCB <=3,6 mm	■	■	■	■	■
Thickness PCB>3,6 mm	■	■	■	■	■
Specific packages					
SOT1232		■		■	■

*Processes executed in cooperation with partners

Dimensions pcba in equipment			
in mm	with	depth	hight
UV Laser	660	600	
CNC drill/rout	400	620	
Line lineo	700	460	
Line Finesse	500	400	
Vapour phase vacuüm 230 degrees Celcius	650	650	
netto screen	600	650	
Selective soldering 295 degrees Celcius	600	500	
180 degrees turned	700	500	
Fluxshooter	600	600	
Washing	530	530	520
Washing max	700	500	
Stove	1000	500	1200
Vacuum stove	500	400	
AOI Saki	500	450	
Measuring table	700	600	
SEM	100	100	50
Rontgen rotating	500	400	
Rontgen flat	640	500	
Kelvin probe testing	700	600	
Repair station BGA/LGA	300	200	

6. Process

The Service Centre is specially organized to cope with very different projects. Therefore for all projects a project leader is appointed. The project leader takes care of:

- Are the processes needed for the assembly within the capabilities?
- Planning the project and sourcing the required components.
- Components are only sourced from A-class distributors to secure the quality.
- Planning the production of the PCBAs.
- Checking that all the parts are collected in a production bin.
- Being the main contact for the customer for all technical related issues
- That before delivery the project leader checks the project if all the agreed work has been done.

7. Inspection

7.1. Visual inspection system

7.2. 3D X-Ray inspection

7.3. No functional test

7.4. Interconnection test optional

8. Production Tools

8.1. ESD safe work spaces + ESD test equipment

8.2. Manual soldering stations

8.3. Stereo Microscopes

8.4. Pasta dispensing / screener, maximum dimensions TBD

8.5. Pre-heater

8.6. Wire bond machine (manual automat)*; with a partner

8.7. Iineo plus pick & placer

8.8. Vapour phase soldering from Rehm and Ascon, maximum dimensions: 650 x 650mm

8.9. Fluxshooter from Interflux

8.10. Selective soldering from Ersa

8.11. PCBA Cleaning machine

8.12. Cleanroom

9. Materials

Lead free and suitable for lead free soldering materials and components are used unless specified otherwise.

10. Reports

10.1. CoC, Certificate of Conformity containing minimal the following:

- Part number
- Quantity
- Reference to PO
- Statement of Conformity
  (CoC can be ordered at no additional cost at the moment of product ordering)

11. Acceptance

11.1. The PCBs are electrically tested, according IPC-9252 Level B.

11.2. Components from A class distributors are used.

11.3 All PCBAs are visually inspected for correct components, correct placing of components and quality of the soldering joints.

11.4 As the product is not functionally tested, complaints on malfunction of the PCB are not accepted which are outside the scope of activities of S & Q Europe Model-shop.

12. Packaging of products

- Packaging box single or double wall corrugated boxes.
- Maximum weight of an individual box is 15 kg.
- The circuit boards are fixed in such a way that the boards cannot slide over each other or can be damaged during transport.
- PCBA will be packed in an ESD protective bag, including label.
- Each shipping container will be provided with a label with the following information:
    - Purchase order number.
    - Item number.
    - Date code (if required).
    - Quantity of PCBAs.
- In case of multiple boxes in one shipment, one box will carry the paperwork at the outside of the box and/or be clearly marked by means of sticker or coloured tape.

13. Contact

Use the following mail contacts for information or questions:

Phone	+31(0)492 598484
General	info@sq-europe.com
Buying	purchase@sq-europe.com
Sales	sales@sq-europe.com
Quality	quality@sq-europe.com
Finance	finance@sq-europe.com

• Jeroen Charmant:	Jeroen.Charmant@sq-europe.com
• John Geenen:	John.geenen@sq-europe.com
• Maurice Keulers:	Maurice.Keulers@sq-europe.com
• Jeroen Roelands:	Jeroen.Roelands@sq-europe.com
• Edward Snelleman:	edward.snelleman@sq-europe.com

14. PCB technical capabilities:

Production standards (tolerances)

According to standards: IPC-A-600 Class 2
(The standard is available on request)

Number of PCB layers

1-12 layers

Layer build-up according to requirements - **Selection**

Minimum track and gap size

Minimum track width / isolation gap: 0.1 mm

Drilling

Minimum drill diameter: 0.2 mm (PTH 0.15 mm)

Aspect ratio:1:12

Soldermask

Colors: green, blue, red, white, black

Silk screen

Colors: green, blue, red, white, black

Surface treatment

lead-free HAL
HAL SnPb
chemical NiAu

Mechanical finish

milling
V-cut

Testing methods

electrical test
optical test- AOI
controlled impedance
micro sections

Further options

Manufacturing Standard IPC-A-600 Class3

UL certification UL-file number:E258735

Controlled impedance according IPC-2141A
Total PCB thickness up to 6 mm

Edge plating
plated half-hole

carbon layer
removable paint
Via-hole filler

Z-axis milling
Interrupted grooving
press-fit holes

buried holes
blind holes - aspect Ratio 1:1

flexible printed circuit boards - material on stock

teflon, ceramic - materials on request

15. PCB Base Material - options

Please select suitable material based on its specs and features - detailed material specification.

Material available (without Cu foil)

Thickness	Isola DE104			Isola IS400			Isola IS410			Isola PCL370HR		
	18/18	35/35	70/70	18/18	35/35	70/70	18/18	35/35	70/70	18/18	35/35	70/70
0.10										■	■	
0.15	■	■					■	■		■	■	
0.20	■	■	■				■	■		■	■	■
0.30										■	■	
0.36	■	■	■				■	■		■	■	■
0.41								■				
0.46	■										■	
0.56	■	■									■	
0.61	■											
0.71	■	■	■				■	■		■	■	■

1.00													

Material available (thickness with Cu foil)

Thickness	Isola DE104				Isola IS400				Isola IS410				Isola PCL370HR			
	0/35	18/18	35/35	70/70	0/35	18/18	35/35	70/70	0/35	18/18	35/35	70/70	0/35	18/18	35/35	70/70
1.00																
1.20																
1.50																
2.00																
2.40																
3.20																

Standard prepregs (prepreg) on stock

	Isola DE104		Isola IS400		Isola IS410		Isola PCL370HR	
Type	290x350mm	290x480mm	290x350mm	290x480mm	290x350mm	290x480mm	290x350mm	290x480mm
106								
1080								
2116								
7628 01								

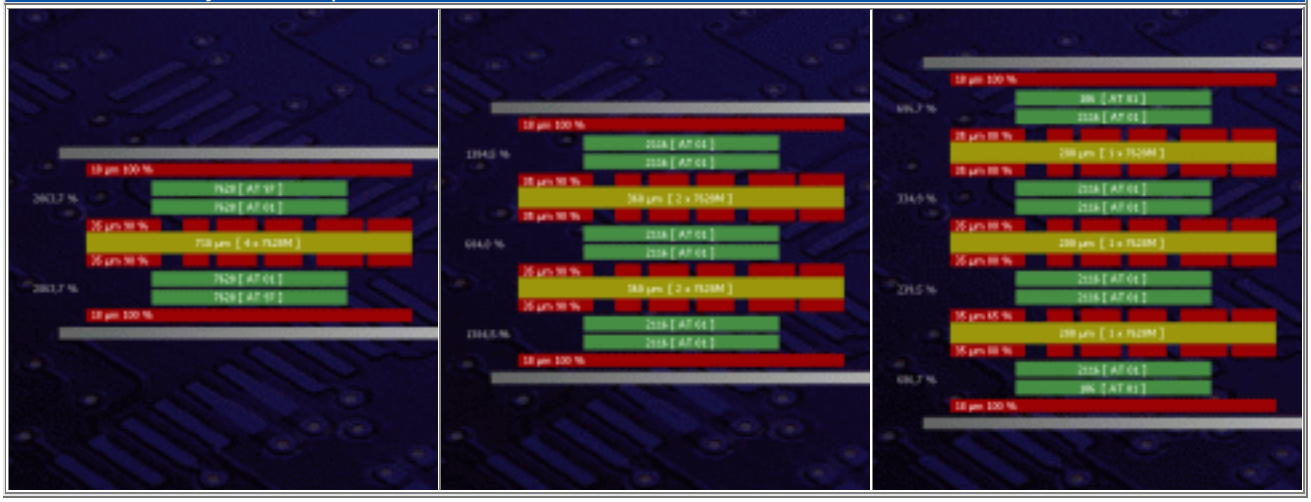
Prepreg thicknesses

Type	Isola DE104	Isola IS410	Isola PCL370HR
106	48 µm	46 µm	48 µm
1080	69 µm		
2116	109 µm	97 µm	99 µm
7628 01	178 µm		

Copper foils on stock

	Copper foil		
Thickness [µm]	312 x 380 mm	312 x 512 mm	312 x 600 mm
5			
9			
12			
18			
35			
50			
70			
105			
140			

Standard multilayer build-ups:



Multilayer PCB build-up is possible according to customer requirements.

16. Controlled impedance PCBs

Software for impedance calculation and test coupon design:
ICD Stackup Planner from In-Circuit Design Pty Ltd. (www.icd.com.au)

Controlled impedance measuring device:
Zmetrix ST300 from ZMetrix, Inc. (www.zmetrix.com)

Measurement according IPC-2141A (www.ipc.org)

Example of impedance calculation and test coupon design

2 Layer | 4 Layer | 6 Layer | 8 Layer | 10 Layer | 12 Layer | 14 Layer | 16 Layer | 18 Layer

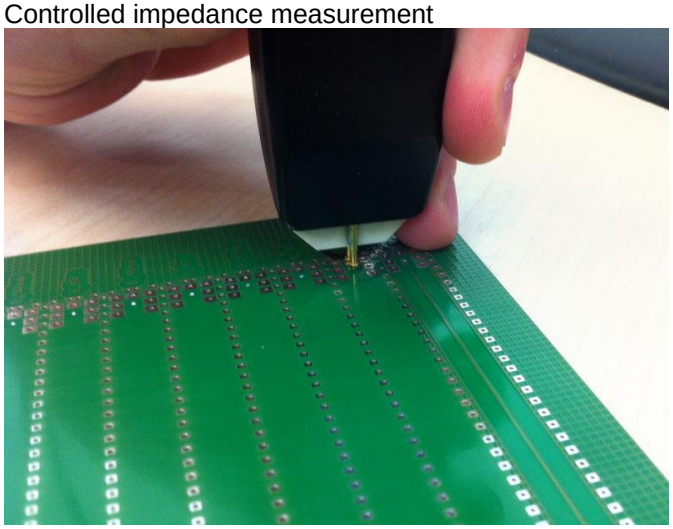
UNITS: um — ICD STACKUP PLANNER FX – www.icd.com.au — 15/11/2013 — Total Board Thickness: 1590.04 um

Differential Pairs > Pair 1

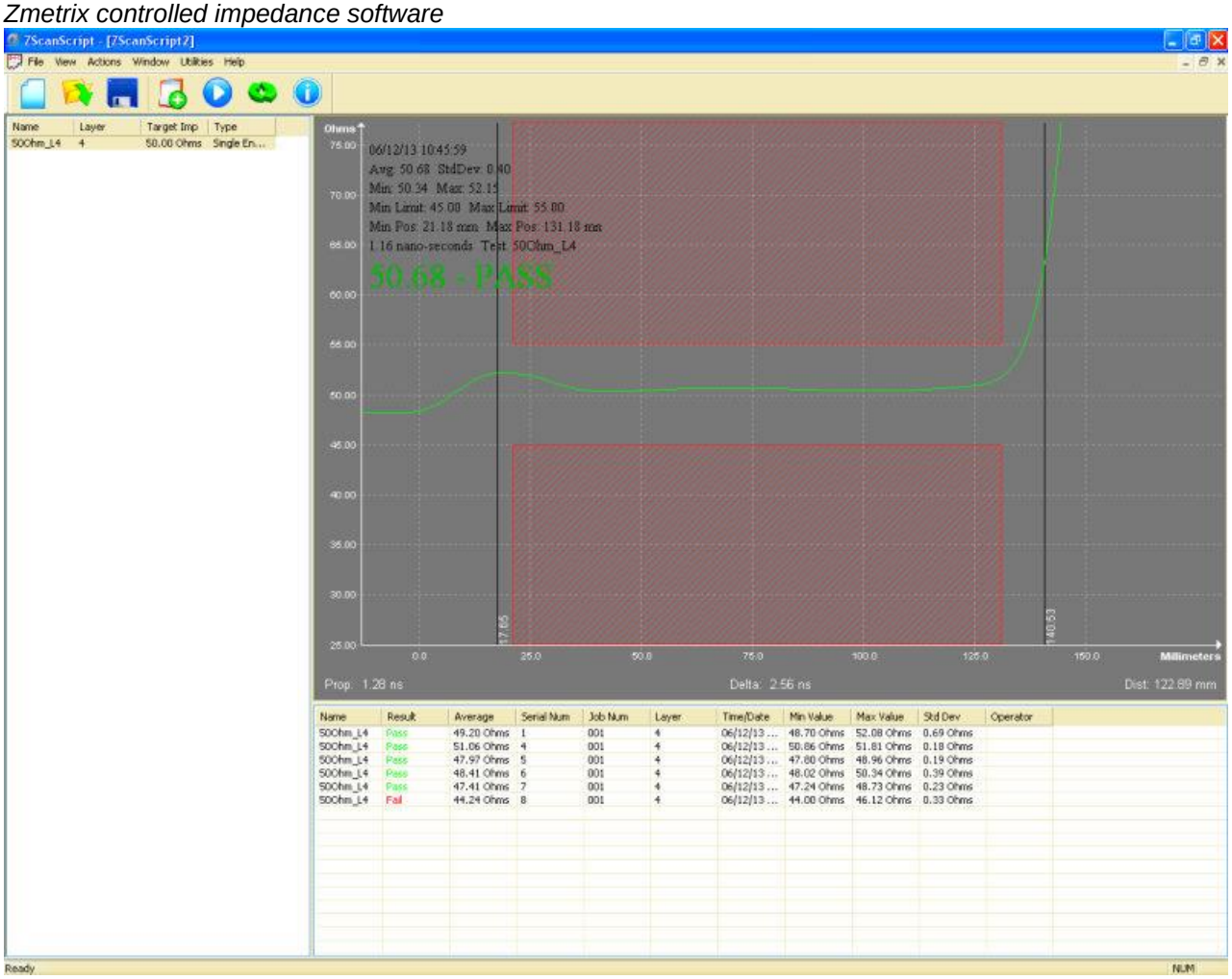
Layer No.	Via	Description	Layer Name	Material Type	Dielectric Constant	Dielectric Thickness	Copper Thickness	Trace Clearance	Trace Width	Current (Amps)	Characteristic Impedance (Zo)	Edge Coupled Differential (Zdiff)	Broadside Coupled Differential (Zdbs)	Notes
		Soldermask		Dielectric	3.3	12.7								
1	203	Signal	Top	Conductive			35.56	123	179	0.47	59.74	93.52		
		Prepreg		370HR ; 1080 ; Rc= 64% (100 MHz)	4.00	71.12								Tg=180C; Df=0.0170
		Prepreg		370HR ; 1080 ; Rc= 64% (100 MHz)	4.00	71.12								Tg=180C; Df=0.0170
2		Plane	GND	Conductive			35.56							
		Core		370HR ; 1-1080/1-3313 ; Rc=54% (1...	4.2	152.4								Tg=180C; Df=0.016
3		Signal	Inner 3	Conductive			35.56	304.8	304.8	0.69	41.58	74.89	77.59	
		Prepreg		370HR ; 1080 ; Rc= 64% (100 MHz)	4.00	71.12								Tg=180C; Df=0.0170
		Prepreg		370HR ; 7628 ; Rc= 45% (100 MHz)	4.36	180.34								Tg=180C; Df=0.0141
		Core		370HR ; 2-7628 ; Rc=42% (100 MHz)	4.4	355.6								Tg=180C; Df=0.014
		Prepreg		370HR ; 7628 ; Rc= 45% (100 MHz)	4.36	180.34								Tg=180C; Df=0.0141
		Prepreg		370HR ; 1080 ; Rc= 64% (100 MHz)	4.00	71.12								Tg=180C; Df=0.0170
4		Signal	Inner 4	Conductive			35.56	304.8	304.8	0.69	41.58	74.89	77.6	
		Core		370HR ; 1-1080/1-3313 ; Rc=54% (1...	4.2	152.4								Tg=180C; Df=0.016
5		Plane	VCC	Conductive			35.56							
		Prepreg		370HR ; 1080 ; Rc= 64% (100 MHz)	4.00	71.12								Tg=180C; Df=0.0170
		Prepreg		370HR ; 1080 ; Rc= 64% (100 MHz)	4.00	71.12								Tg=180C; Df=0.0170
6		Signal	Bottom	Conductive			35.56	122	157	0.43	63.34	98.18		
		Soldermask		Dielectric	3.3	12.7								

Zmetrix controlled impedance workstation

Controlled impedance measurement



Zmetrix controlled impedance software



Example of controlled impedance test protocol

Impedance Test Report

Company	KKE sro
Address 1	Vlkanovska 167
Address 2	97631 Vlkanova
Telephone	
Fax	
E-Mail	kke@bb.psg.sk
Web	

Test Summary

Customer	Test Customer
Board Type	Test Board
Part Number	v1
Revision Number	
Job Number	001
Work Order #	
Date	Wednesday, June 12, 2013 09:58:18
Data File	

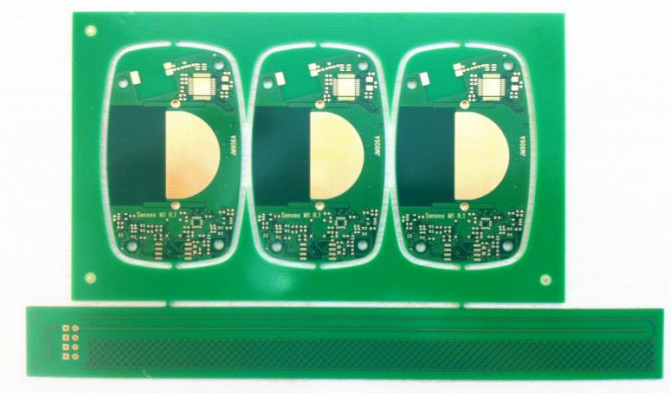
Results Summary

Boards Tested	6
Boards Passed	5
Boards Failed	1

Customer	Test Customer
Board Type	Test Board
Part Number	v1
Revision Number	
Job Number	001
Work Order #	
Date	Wednesday, June 12, 2013 09:58:18
Data File	

Name	Result	Average	Serial Num	Job Num	Layer	Time/Date	Min Value	Max Value	Std Dev	Operator
50Ohm_L4	Pass	49.20 Ohms	1	001	4	06/12/13 09:40:00	48.70 Ohms	52.08 Ohms	0.69 Ohms	
50Ohm_L4	Pass	51.06 Ohms	4	001	4	06/12/13 09:56:56	50.86 Ohms	51.81 Ohms	0.18 Ohms	
50Ohm_L4	Pass	47.97 Ohms	5	001	4	06/12/13 09:57:03	47.80 Ohms	48.96 Ohms	0.19 Ohms	
50Ohm_L4	Pass	48.41 Ohms	6	001	4	06/12/13 09:57:11	48.02 Ohms	50.34 Ohms	0.39 Ohms	
50Ohm_L4	Pass	47.41 Ohms	7	001	4	06/12/13 09:57:22	47.24 Ohms	48.73 Ohms	0.23 Ohms	
50Ohm_L4	Fail	44.24 Ohms	8	001	4	06/12/13 09:58:04	44.00 Ohms	46.12 Ohms	0.33 Ohms	

PCB with the controlled impedance test coupon



17. Terminology and detailed material specifications

T_g - Glass Transition Temperature

Temperature point at which a glassy solid changes to an amorfous resin / epoxy

- if temperature exceeds T_g:

1. expansion of the material is growing rapidly in the direction of Z axis
2. mechanical material properties degrade rapidly (strength, bonds in the material)

T_d - Decomposition Temperature

Temperature at which there is a 5% weight loss of resin / epoxy

- if temperature exceeds T_d:

1. irreversible destruction in material occurs due to breach of chemical bonds in resin / epoxy

T260/T288

Measures time to delamination at specific temperature (i.e. 260°C/288°C)

CTE – Coefficient of Thermal Expansion

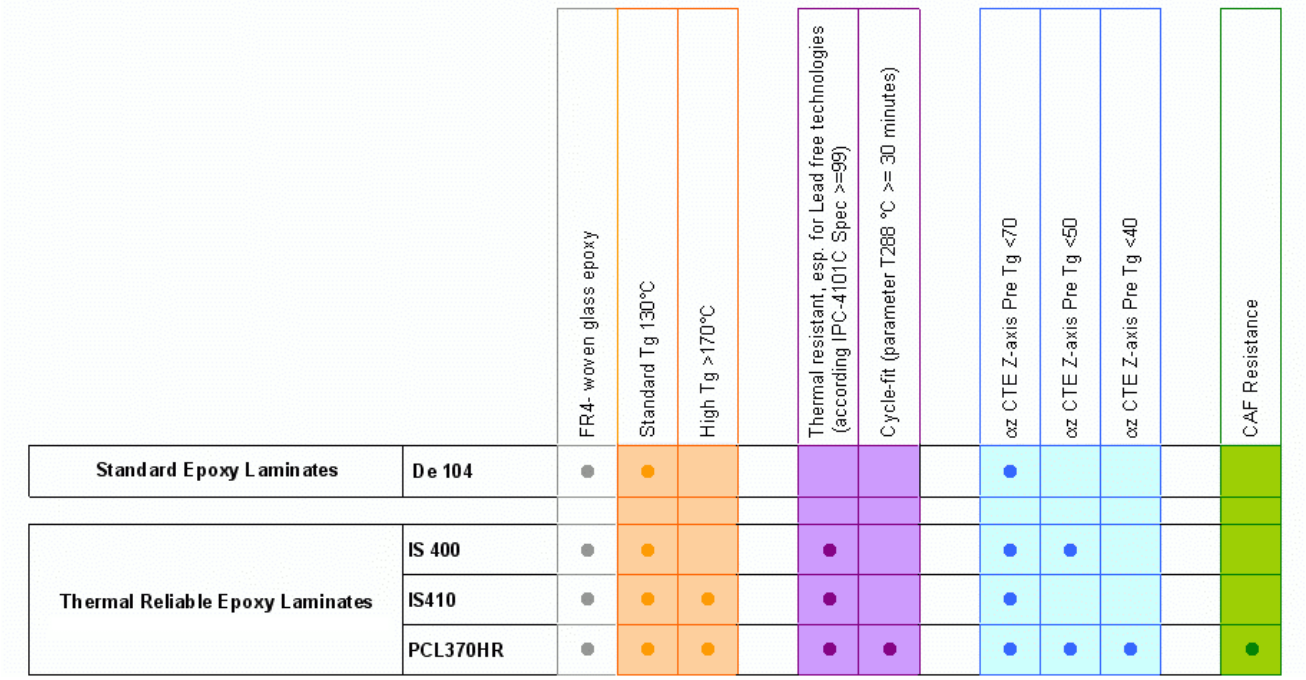
Dimensional increasing of the material in the X-, Y-and Z-axis by change of temperature at a constant pressure

CAF – Conductive Anodic Filament

Migration of copper ions through an enclosed moisture in the material, which can over time cause a short circuit

	Isola DE 104	Isola IS410	Isola 370HR
IPC-4101C Spec	21	21/24/26/28/121/124	21/24/26/98/99/101/126
Tg Glass Transition Temperature by DSC, spec minimum [°C]	130	175	175
Td Decomposition Temperature @ 5% wt loss [°C]	330	350	340
T260 Mins	60	50	60
T288 Mins	>5	>10	30
CTE, Z-axis Pre Tg	50	65	45
% Z-Axis Expansion (50-260C)	3	3.5	2.8
CTE, Z-axis Post Tg	250	250	230
CTE, Pre X, Y	13	13/14	13/14
CTE, Post Tg X, Y	14	15/17	14/17
Thermal Conductivity	0.4	0.5	0.4
Thermal Stress 10 Sec @ 288°C (550.4°F), spec min	pass	pass	pass
Permittivity (Dk) 100 MHz HP4285A	4	3.96	4.24
Permittivity (Dk) 1 GHz HP4291A	4	3.9	4.17
Permittivity (Dk) 2 GHz Bereskin Stripline	4	3.97	4.04
Permittivity (Dk) 5 GHz Bereskin Stripline	4	3.87	3.92
Permittivity (Dk) 10 GHz Bereskin Stripline	3.59	3.87	3.92
Loss Tangent (Df) 100 MHz HP4285A	0.02	0.0149	0.015
Loss Tangent (Df) 1 GHz HP4291A	0.02	0.0189	0.0161
Loss Tangent (Df) 2 GHz Bereskin Stripline	0.022	0.02	0.021
Loss Tangent (Df) 5 GHz Bereskin Stripline	0.02	0.023	0.025
Loss Tangent (Df) 10 GHz Bereskin Stripline	0.02	0.023	0.025
Volume Resistivity (After moisture resistance)	$1.3x10^{8}$	$5.0x10^{8}$	$3.0x10^{10}$
Volume Resistivity (At elevated temperature)	$3.4\ x10^{3}$	$3.6\ x10^{5}$	$7.0\ x10^{8}$
Surface Resistivity (After moisture resistance)	$1.0x10^{8}$	$8.0x10^{5}$	$3.0x10^{8}$

Surface Resistivity (At elevated temperature)	$7.0x10^8$	$4.5x10^8$	$2.0x10^8$
Dielectric Breakdown, spec minimum	>50	>50	>50
Arc Resistance, spec minimum	120	129	115
Electric Strength, spec minimum (Laminate & prepreg as laminated)	54 (1350)	44 (1100)	54 (1350)
Comparative Tracking Index (CTI)	2 [250 - 399]	3 [175 - 249]	3 [175 - 249]
Peel Strength Low profile Cu foil, very low profile u2013 all Cu >17um	6.5(1.14)	7 (1.23)	6 (1.05)
Peel Strength Standard profile copper - After thermal stress	7 (1.23)	7 (1.23)	9 (1.58)
Peel Strength Standard profile copper - At 125°C (257°F)	6.5(1.14)	6.5(1.14)	7 (1.23)
Peel Strength Standard profile copper - After process solutions	7 (1.23)	7 (1.23)	9 (1.58)
Flexural Strength Lengthwise direction	89.00	79.00	90.00
Flexural Strength Crosswise direction	70.00	68.00	77.00
Moisture Absorption, spec maximum	0.3	0.2	0.15
Flammability (Laminate & prepreg as laminated), spec min	V0	V0	V0
HWI	0		
Max Operating Temperature (MOT) [°C]	130	130 (150)	130 (150)
DSR	yes	yes	yes



		FR4- woven glass epoxy	Standard Tg 130°C	High Tg >170°C	Thermal resistant, esp. for Lead free technologies (according IPC-4101C Spec >=99)	Cycle-fit (parameter T288 °C >= 30 minutes)	αz CTE Z-axis Pre Tg <70	αz CTE Z-axis Pre Tg <50	αz CTE Z-axis Pre Tg <40	CAF Resistance
Standard Epoxy Laminates	De 104	●	●				●			
Thermal Reliable Epoxy Laminates	IS 400	●	●		●		●	●		
	IS410	●	●	●	●		●			
	PCL370HR	●	●	●	●	●	●	●	●	●