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Users Guide to IPC-9202 and the IPC-B-52 Standard Test Vehicle

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Table of Contents

1.0 INTRODUCTION	1	3.2.8 Other Board Features	14
1.1 Definitions	1	3.2.8.1 Fiducials	14
1.1.1 Process Characterization	1	3.2.8.2 Contact Fingers	14
1.1.2 Qualification	1	3.3 Board Design Modifications	14
1.1.3 Validation	1	3.4 Electronic Data	15
2.0 APPLICABLE DOCUMENTS	2	3.5 Formal Drawing	15
2.1 IPC	2	3.6 Additional Patterns	16
2.2 International Electrotechnical Commission (IEC)	2	3.7 Bill of Materials (BOM)	16
3.0 THE IPC-B-52 TEST VEHICLE	2	3.8 Known Variations on the IPC-B-52 Design	17
3.1 Revision History	2	3.8.1 Variant 1	17
3.1.1 Original IPC-B-52	2	3.8.2 Variant 2	18
3.1.2 Revision A to Revision B	3	3.9 How Much Change Is Allowed?	18
3.1.3 Summary of Changes – Revision A to B	4	4.0 IPC-9202 POINTS FOR CONSIDERATION	18
3.1.4 What Did Not Change – Revision A to B	4	4.1 Process Qualification	23
3.1.5 IPC-B-52 Revision B	4	4.2 Testing at 80°C	29
3.2 The Main SIR Test Board	5	4.2.1 Initial and Final Measurements	30
3.2.1 The Ion Chromatography (IC) Test Coupon	6	4.2.2 Test Duration	30
3.2.3 The SIR Mini Coupon	6	4.2.3 Test Rounding	31
3.2.4 The Test Patterns	7	4.2.4 Data Exclusion	32
3.2.5 Connector Patterns	8	OTHER USEFUL INFORMATION	33
3.2.5.1 Pattern 1 – Connector J2	8	5.1 Test Sample Surface Finish	33
3.2.5.2 Pattern 16 – Connector J1	9	5.2 Test Sample Identification	33
3.2.5.3 Pattern 4 – SM IEEE1386 Connector	9	5.3 Manufacturing Processes	33
3.2.5.4 Capacitor Patterns	9	5.4 Test Sample Review	34
3.2.5.5 Pattern 2 – 0402 Capacitor Field	9	5.5 Testing for Electrical Shorts	34
3.2.5.6 Patterns 5 and 8 – 0805 Capacitor Field	10	5.6 Handling During Review	34
3.2.5.7 Pattern 14 – 0603 Capacitor Field	10	5.7 Storage Until Testing	34
3.2.5.8 Pattern 15 – 1206 Capacitor Field	11	5.8 Packaging for Shipment	34
3.2.6 SMT Devices	11	5.9 When Test Runs Have Issues	35
3.2.6.1 Pattern 3 – PGI Pattern	12	5.10 Interrupted Tests	35
3.2.6.2 Patterns 6 and 7 – QFP160 Lead to Lead Pattern (6) and QFP160 Comb (7)	12	5.11 Premature Ending of the Test	35
3.2.6.3 Patterns 9 and 10 – QFP80 Comb Pattern (9) and QFP80 Lead to Lead	13	5.12 Handling Outliers	35
3.2.7 Open Areas (11 and 12) for Custom Patterns	13	6.0 FINAL THOUGHTS	35
		7.0 REFERENCES	36

Figures

Figure 3-1a	Original IPC-B-52 Board (Circa 2004), Top Side	2	Figure 3-17a, Top Side	11
Figure 3-1b	Original IPC-B-52 Board (Circa 2004), Bottom Side	3	Figure 3-17b, Bottom Side	11
Figure 3-2	IPC-B-52 Board Revision A	3	Figure 3-17c, Top Side	11
Figure 3-3	IPC-B-52 Revision B, Full Board – Top Side	4	Figure 3-17d, Bottom Side	11
Figure 3-4	IPC-B-52 Revision B, Full Board – Bottom Side	5	Figure 3-18a BGA Pattern	12
Figure 3-5a	IPC-B-52B, SIR Board	5	Figure 3-18b Soldered BGA Component	12
Figure 3-5b	IPC-B-52B, SIR Board	5	Figure 3-19a QFP 160 Patterns	12
Figure 3-6	IPC-B-52B, Assembled SIR Board	5	Figure 3-19b Soldered QFP 160 Component	12
Figure 3-7a	Ion Chromatography (IC) Coupon	6	Figure 3-20a QFP80 Patterns	13
Figure 3-7b	Ion Chromatography (IC) Coupon with Components	6	Figure 3-20b Soldered QFP80 Component	13
Figure 3-8	Solder Mask Adhesion Coupon	6	Figure 3-21a SOIC Pattern	13
Figure 3-9	SIR Mini Coupon	6	Figure 3-21b Soldered SOICs	13
Figure 3-10a	IPC-B-52 Patterns, Top Side	7	Figure 3-22a Open Area	13
Figure 3-10b	IPC-B-52 Pattern, Bottom Side	8	Figure 3-23 IPC-B-52 Revision B in Open Area	14
Figure 3-11a	J2 Connector Pattern	8	Figure 3-24 Fiducials	14
Figure 3-11b	J2 Connector Installed	8	Figure 3-25 Contact Fingers	14
Figure 3-12a	SMT Connector Pattern	9	Figure 3-26 IPC-B-52 Diagram for Bill of Materials (BOM)	16
Figure 3-12b	SMT Connector Installed	9	Figure 3-27 Effect of Capacitance	17
Figure 3-13a	0402 Capacitor Pattern	9	Figure 3-28 IPC-B-52 QFN Variant 1	17
Figure 3-13b	0402 Soldered Capacitors	9	Figure 4-1 Connector Check Card	24
Figure 3-14a	0805 Capacitor Pattern, Top Side	10	Figure 4-2 SIR Chart	31
Figure 3-14b	0805 Soldered Capacitors, Top Side	10	Figure 4-3 SIR Levels at Different Test Conditions	32
Figure 3-14c	0805 Capacitor Pattern, Bottom Side	10		
Figure 3-15a	0603 Capacitor Patterns	10		
Figure 3-15b	0603 Soldered Capacitors	10		
Figure 3-16a	1206 Capacitor Pattern	11		
Figure 3-16b	1206 Soldered Capacitors	11		

Tables

Table 3-1	IPC-B-52 Revision B, Bill of Materials (BOM)	16
Table 3-2	IPC-B-52 Variant - Components	18
Table 4-1	Voltage Gradients	29
Table 5-1	IPC-B-52 Pinout	34

Users Guide to IPC-9202 and the IPC-B-52 Standard Test Vehicle

FOREWARD

The electronics manufacturing process is often very complex, with dozens of variables that impact the quality and reliability of the manufactured assemblies in the end use environment. Of concern are the kinds of residues remaining on the electronic assembly and the effects that these residues have on the electro-chemical reliability of the end-product.

Surface Insulation Resistance testing measures changes to the surface insulation resistance. By its very nature, such testing must be conducted on a test coupon that should be representative of the intended end-product.

Apart from commonplace ionic residues, most modern process chemistries include non-ionic surfactant additives that are not detectable using ionic extract test methods such as Ion chromatography or Resistivity of Solvent Extracted (ROSE).

This document focuses on the IPC-B-52 standard test assembly and how it is used as a representative example of the intended end-product.

1.0 INTRODUCTION

In order to determine acceptable electro-chemical performance, the most suitable test is to run SIR using a test coupon that is representative of the intended end-product material set.

The advantage of this approach is that it does not differentiate between ionic nor non-ionic matter that may be deleterious to end-product performance. Other test methods, such as Ion Chromatography or ROSE are not able to detect or measure non-ionic contaminants.

There are many other test methods that are used to ascertain what is present as and when an SIR “failure” is detected.

The IPC-B-52 test vehicle is intended to be used to evaluate and optimize a manufacturing process, and to provide objective evidence that a chosen manufacturing material set, and manufacturing process is electro-chemically compatible. This latter use is often considered as a “process validation”, suitable for international specifications such as IPC J-STD-001 or IEC-61189-5-502. Such efforts are not trivial, and often an engineering analysis is required to determine the meaning of the resulting data set.

The predecessor to the IPC-B-52 was the IEC TB-57 test coupon. This was originally designed by the National Physical Laboratory in the United Kingdom and was created as part of a major EU funded research program to develop SIR testing for both material characterization (e.g., conformal coatings, solder masks, solder fluxes and pastes) as well as process material set evaluations.^a

Following this research effort, Rockwell Collins evolved the TB-57 to reflect certain industry needs prevalent at that time. This became the IPC-B-52 and adopted in the original IPC 9201 and IPC 9203 specifications. It is important to note that the original design was intended to be a “worst case” example of process residue entrapment. The intended goal was of having a World standard for process characterization and validation. In the test method IEC 61189-5-502 Surface Insulation Resistance Testing Assemblies now calls out the IPC-B-52 test coupon.

This document has been written as a companion document to IPC-9202.

In the event that the user wishes to design their own test coupon for the purpose of examining their material set, then it is recommended that reference be made to IPC 9201, SIR Test Handbook, Section 3.3.8 that outlines some important design rules.

The coupon **shall** be manufactured using the same manufacturing process and surface finish intended for the end-product. This is especially important in respect to the PTH sections that are intended to replicate the requirements of thru-hole headers, vias or perhaps press-fit connectors. The user should be aware that laminate choice may impact whether or not conductive anodic filament (CAF) failures (a sub-surface electrochemical migration failure) appear in SIR testing for the IPC-B-52 assemblies. Lower quality laminates have a higher risk of CAF failures.

1.1 Definitions Throughout IPC-9202 and IPC-9203 documents, the words “qualification”, “characterization”, and “validation” are used with respect to candidate manufacturing processes. These words mean different things to different people, and so a discussion of these terms is pertinent to these documents.

1.1.1 Process Characterization Process Characterization refers to any examination of the effects of a manufacturing process. This may include screening studies, small scale investigations of parameter effects, etc. The goal is to generate data characteristic of that process.

1.1.2 Qualification Qualification is a more formal term. For qualification, the goal of the data generation is to show that the process meets the criteria of a specification or standard, such as IPC-J-STD-001.

1.1.3 Validation Validation is work subsequent to the qualification. Validation is testing that shows the data generated in the qualification proved to be acceptable on actual product.