ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES®

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IPC-TM-650
TEST METHODS MANUAL

Number	
2.6.3.4 (Supersedes 2.6.3.4 and 2.6.3.1C for Conformal Coating Test)	
Subject	
Moisture and Insulation Resistance – Conformal Coating	
Date	Revision
07/03	**A**
Originating Task Group	
Conformal Coating Task Group (5-33a)	

1 Scope This test method is used to determine the moisture and insulation resistance of applied conformal coating under prescribed conditions of temperature and humidity. Raw material qualification testing is performed on designated comb patterns.

2 Applicable Documents

IPC-CC-830 Qualification and Performance of Electrical Insulating Compound for Printed Board Assemblies

J-STD-004 Requirements for Soldering Fluxes

IPC-A-600 Acceptability of Printed Boards

3 Test Specimens

3.1 Class 1, 2 and 3 Five IPC-B-25A boards (See Figure 1) using the D comb patterns, one uncoated and four coated with conformal coating according to the coating suppliers recommendations.

4 Apparatus

4.1 Chamber A clean chamber capable of programming and recording an environment of 25 ± 5°C [77° ± 9°F] to at least 65 ± 2°C [149° ± 3.6°F] and 90-98% relative humidity. Power Supply Capable of producing a standing bias potential of 100 VDC with a tolerance of ± 10%.

4.3 Resistance Meter Capable of reading high resistance (10^{12} ohms or greater), with a test voltage of 100VDC.

4.4 Oven Capable of maintaining at least 120°C [248°F].

4.5 Timer

4.6 Solder Pot

4.7 Tongs

4.8 Soldering Iron

4.9 Flux Water white rosin (R or RMA) with halide content less than 0.5%, i.e., type Symbol A and B or ROL0 and ROL1 according to J-STD-004.

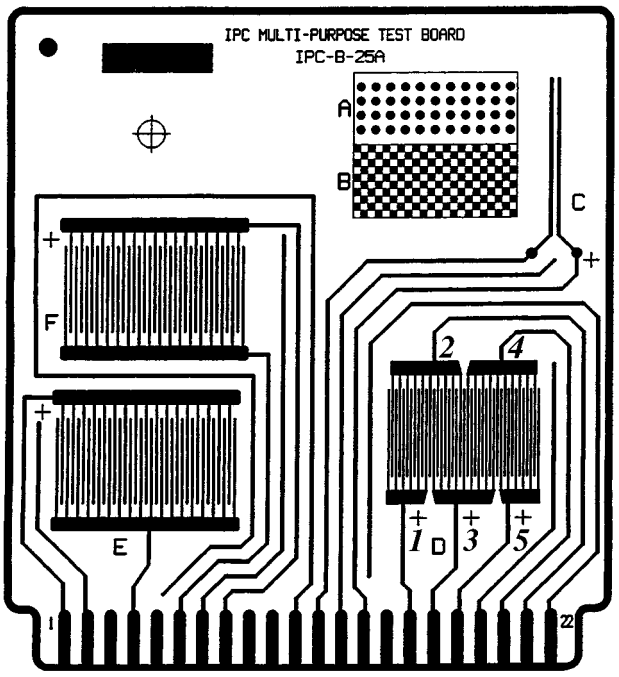

Figure 1 IPC-B-25A Test Board (Test Points on D Pattern Are Identified)

5 Test

5.1 Ambient Conditions 25°, +2°, -5°C [77°, +3.6°, -9°F]. 40-50% relative humidity.

5.2 Test Conditions 25° to 65° ± 2°C [77° to 149° ± 3.6°F], with 90, -5, +3% relative humidity, 50VDC bias, cycling, 6⅔ days.

5.3 Specimen Preparation

5.3.1 Positive, permanent and noncontaminating identification of the test specimens is of paramount importance.

5.3.2 Visually inspect the test specimens for any obvious defects, as described in the IPC-A-600. If there is any doubt about the overall quality of any test specimen, the test specimen should be discarded.

5.3.3 One uncoated specimen subjected to the same processing (except coating) as the coated specimens shall be supplied with each lot of samples as a test control.

5.4 Electrical Connections

5.4.1 Solder a single strand PTFE insulated wire, using the flux specified in 4.9, to each pad of the D comb pattern. These wires will be used to connect each pad of the designated comb pattern to polarization and insulation resistance testing. When soldering the wires onto the pads care should be taken to ensure that the flux does not splatter onto the combs. A simple off-contact shield fixture should be used to protect the test patterns from the flux spitting during soldering.

Note: An alternate method is to use gold plated alligator clips.

5.5 Soldering Flux Removal The flux shall not be removed. If the flux has contaminated the comb pattern on the control, the sample shall be discarded and a new one used. It cannot be cleaned because it will not represent the cleaning process that was used prior to conformal coating application.

5.6 Specimen Handling For the remainder of the test, the surface of the test specimens either uncoated or coated with conformal coating should not be handled or exposed to any other contaminating influence.

5.7 Procedure

5.7.1 Condition the specimens at 50 ± 2°C [122 ± 3.6°F] with no added humidity, for a period of 24 hours.

5.7.2 Testing

5.7.2.1 Allow the specimens to cool. Measure and record the initial insulation resistance measurements at ambient laboratory conditions. Apply 100 VDC on the specimen's test points with the resistance meter and take the reading after one minute. On the D comb pattern, test points 1, 3 and 5 are connected to the positive terminal and test points 2 and 4 are connected to the negative terminal of the resistance meter.

5.7.2.2 Place specimens in a chamber, in the vertical position and under a condensation drip shield. Each chamber load shall contain at least one uncoated board that is representative of the cleaning process used prior to conformal coating application for each lot tested.

5.7.2.3 Close chambers door and apply a 50 VDC polarizing bias to all test patterns. Electrical connections to specimens shall be made so that electrical polarization voltage and the test voltage of the same polarity are connected to the same terminal.

5.7.2.4 Expose test specimens to 20 cycles of temperature and humidity. Polarizing voltage shall be maintained throughout the entire 20-cycle period. Humidity shall be maintained at 85% minimum through the cycles except that when going to low temperature in Step c below, the humidity may drop to 80% minimum.

One cycle is as follows:

a. Start test at 25°C [77°F] and raise the temperature to 65°C [149°F] over a time span of 1.75 ± 0.75 hours.
b. Maintain temperature at 65°C [149°F] for 3, +0.5, -0 hours
c. Lower the temperature from 65°C [149°F] to 25°C [77°F] over 1.75 ± 0.5 hours

Note: There shall be no delay between cycles.

5.7.3 Measurement/Evaluation

5.7.3.1 Disconnect 50 VDC polarizing voltage source before taking the insulation resistance measurements. Insulation resistance shall be read as specified in 5.7.2.1.

5.7.3.2 Measure and record the resistance at the first, fourth, seventh and tenth cycle, between the 2nd and 3rd hour of the high phase of each cycle. These measurements are to be conducted without opening the chamber.

5.7.3.3 Upon completion of the 20 cycles, the test comb patterns shall be maintained at 25° ± 2°C [77° ± 3.6°F] relative humidity of 50 ± 5% for 24 hours.

5.7.3.4 After the 24-hour stabilization, the insulation resistance shall be measurements as previously stated in section 5.7.2.1.

5.7.3.5 The comb patterns will be examined for appearance and dielectric withstanding voltage in accordance with IPC-CC-830.