The Institute for Interconnecting and Packaging Electronic Circuits
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IPC-TM-650
TEST METHODS MANUAL

Number	
2.6.13	
Subject	
Assessment of Susceptibility to Metallic Dendritic Growth: Uncoated Printed Wiring	
Date	Revision
10/85	
Originating Task Group	
N/A	

1.0 Scope This test method will demonstrate a relative degree to which uncoated printed wiring boards are susceptible to dendritic growth due to the presence of ionic residues and condensed moisture. This test method is particularly suitable for printed wiring board manufacturing process control.

2.0 Applicable Documents

IPC-TR-476 How to Avoid Metallic Growth Problems on Electronic Hardware

MIL-P-55110 Printed Wiring Boards

3.0 Test Specimens Test pattern is chosen from, but not restricted to e.g., MIL-P-55110 type ''Y'' pattern with a pair of conductors having typically 15-30 mils separation (See Figure 1). A pair of parallel conductors on an uncoated production printed wiring board, with spacing between conductors of approximately 15-30 mils is suitable as well.

4.0 Equipment/Apparatus

4.1 Power Supply A dc power supply capable of providing a metered 0-20 V dc, and 100 milliamps current.

4.2 Microscope 50-100 power microscope and means of providing direct and/or indirect lighting on specimen.

4.3 Miscellaneous Items DI water sample (2 oz.) kept in a plastic bottle, eye dropper, a 1/2 watt-10K ohm current limiting resistor and a stop watch.

5.0 Procedure

5.1 Preparation

5.1.1 Attach a wire to each of the conductors on the ''Y'' pattern test board, or to corresponding, parallel conductors on a production PWB.

5.1.2 Connect a 10K resistor in series to the power supply as shown in Figure 1. The resistor will limit the current to 1.5 milliamp maximum.

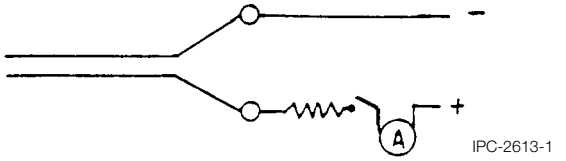

Figure 1

5.1.3 Place the board for viewing on the microscope, so that the parallel conductors are in view. Provide lighting that will illuminate the test board on top and/or underneath.

5.1.4 Using the eye dropper, place a drop of DI water across the conductors that are in view under the microscope, at least 0.5 inch away from the place where external wires are attached to parallel conductors. Adjust power supply to 15 V and turn the power supply on. Simultaneously start the stopwatch.

5.1.5 Carefully observe the action using the microscope. Adjust the power of the microscope so the entire water area is in view.

5.1.6 Bubbles may appear within about 5 seconds. This is hydrogen evolution-electrolysis of water.

5.1.7 Depending on PWB ionic cleanliness level and the characteristics of the PWB surface, there may be a dendritic (tree-like) growth from the negative to positive conductor, appearing within a typical (for a given board) but generally very broad time span of a few seconds to several minutes.

5.1.8 The condition of dendritic growth is much easier to observe with an artificial light source placed under the test board. A clear demonstration of the dendritic growth can be performed if tap water containing ionic contamination is used in place of DI water (see paragraph 5.1.4).

5.1.9 Once the dendritic growth has reached the positively charged conductor, most action will cease; turn off the stopwatch. The elapsed time is a relative measure of susceptibility of the PWB in question to undergo dendritic growth under high humidity (condensed moisture) environment. At least ten

separate measurements are needed to obtain a statistically meaningful result.

6.0 PWB Process Test/Sampling For testing of lot conformity at least ten different PWBs with parallel conductors as per Section 3 shall be tested.

7.0 Test Interpretation Test for susceptibility to metallic dendritic growth is a relative measure of localized ionic residue levels. As such, it does not have direct relationship with absolute PWB reliability measure. The results of this test are found useful in the PWB process control by testing board-to-board and lot-to-lot variations.