ASSOCIATION CONNECTING
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Number	
2.5.6.1	
Subject	
Solder Mask - Dielectric Strength	
Date	Revision
03/07	**B**
Originating Task Group	
Solder Mask Performance Task Group (5-33b)	

IPC-TM-650
TEST METHODS MANUAL

1 Scope The dielectric strength test (also called high-potential [Hi-Pot], over potential, or voltage breakdown) consists of the application of a test voltage for a specific time between mutually insulated portions of a printed board or between insulated portions and ground. This is used to prove that the printed board can operate safely at its rated voltage and withstand momentary overpotentials due to switching, surges, and other similar phenomena.

2 Applicable Documents

ASTM D 149 Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulation Materials at Commercial Power Frequencies

3 Test Specimen Three 102 mm x 102 mm [4.016 in x 4.016 in] squares of glass epoxy laminate materials having 1 ounce (0.0343 mm [0.00135 in] nominal) copper foil laminates on one side, and having the test specimen polymer film applied to the copper surface (see specimen preparation).

4 Apparatus

4.1 Any high voltage potential test equipment capable of providing voltage increases of 500 VDC per second, up to at least 10,000 VDC (see Section 6).

4.2 A standard Type 1 electrode per ASTM D 149, with a 51 mm [2.0 in] diameter, 25 mm [1.0 in] thick, with edges rounded to 6.4 mm [0.25 in.] radius to cover the test surface.

5 Procedure

5.1 Preparation of Test Specimen

5.1.1 Cut the laminate specimen to 102 mm x 102 mm [4.016 in x 4.016 in] and sand the edges lightly.

5.1.2 If double clad material is used, etch off all copper foil on one side.

5.1.3 Clean the copper foil surface thoroughly, per the polymer manufacturer's recommendations, prior to applying polymer coating.

5.1.4 Apply a film of the polymer test material on an area of 76.2 mm x 76.2 mm [3.0 in x 3.0 in] at the center of the copper clad surface. A pinhole free film is essential.

5.1.5 Cure the polymer coating per manufacturer's recommendations.

5.2 Test

5.2.1 Clip the ground terminal of the tester over the thickness of the copper foil and substrate, being careful not to let the clip extend inward to the polymer coating (see Figure 1).

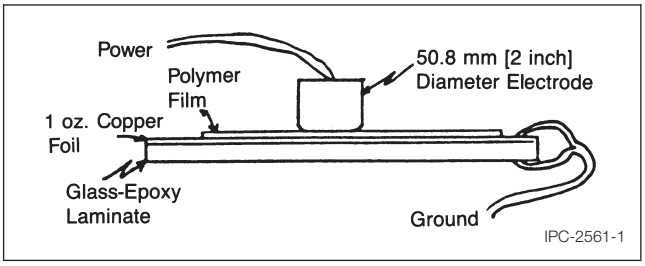

Figure 1

5.2.2 Place the positive electrode on top of test panel at the center. Make certain the electrode and clip are electrically isolated by the test polymer film.

5.2.3 Set up the potential voltage tester. Increase the voltage 500 VDC per second, until specimen exceeds requirement or breakdown occurs.

5.2.4 Measure the coating thickness of each of the test specimens to the nearest 0.0025 mm [0.0001 in] in at least four locations. Compute the average coating thickness and standard deviation.

5.3 Evaluation Determine the dielectric strength, E_D, using:

$$E_D = \frac{V_{BD}}{t}$$

where t is the thickness of the specimen, to the nearest 0.0025 mm [0.0001 in], measured in 5.2.4 and V_{BD} is the breakdown voltage measured in 5.2.3. Record results as ''V/mm'' or ''V/in.''

6 Notes

6.1 Suggested source for tester: Hipotronics Model HD-140 from Hipotronics, Inc. Brewster, NY 10509, or equivalent.

6.2 Safety must be exercised because of the potential danger of electrical shock.