



IPC-TM-650 TEST METHODS MANUAL

1 Scope This test method provides a standard method for evaluating the effect of established processing operations used in the manufacture of PWBs on materials that are considered for use in the manufacture of PWBs. Specific criteria for the acceptability are based on copper foil adhesion and visual surface condition of the base laminate.

2 Applicable Documents

IPC-TM-650 Test Methods Manual

2.4.8 Peel Strength of Metallic Clad Laminates

MIL-P-13949

3 Test Specimens

3.1 Copper-clad epoxy glass laminate materials ranging from 0.8 mm to 6.5 mm thick, clad on one or both sides.

3.2 Three specimens shall be tested from each material, except in the case where the material is clad on both sides, and then six specimens shall be processed for each material. Each specimen will have four readings for peel strength (see IPC-TM-650, Method 2.4.8).

4 Equipment/Apparatus

4.1 Etching Typical production printing, etching, and plating equipment and materials

4.2 Tester For peel strength equipment (see IPC-TM-650, Method 2.4.8)

5 Procedure

5.1 Print and Etch

5.1.1 Sand the edges of the test specimens to remove burrs, allowing close contact between the specimen, negative, and frame glass, resulting in a better defined etched pattern.

5.1.2 Scrub the copper surface(s) with FFF pumice and a brush to remove any contamination on the surface of the specimen until it passes a water break test.

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5.1.3 Dry the specimens using compressed filtered air.

5.1.4 Dip the specimens in the following photoresist solution at room temperature:

One part by volume KPR III
One part by volume toluene
One part by volume acetone

The specific gravity of the solution is 0.920.

5.1.5 Hold the specimen by one corner when dipping. Allow excess solution to drain until dripping stops.

5.1.6 Put the specimens on rack (after draining) into 80°C oven from three to five minutes to dry and harden KPR.

5.1.7 Remove the rack from the oven and allow the specimens to cool to room temperature.

5.1.8 Place the specimens upon the negative in the printing frame with the copper side against the negative.

5.1.9 Expose the mounted specimen 76 mm from the fluorescent black light for seven minutes.

5.1.10 Develop in trichlorethylene vapor for 15 seconds. It may require two to six cycles until the pattern is clear. Air-dry the specimen after developing.

Note: Use the test pattern in Method 2.4.8.

5.2 Etching Process and Etchant Removal

5.2.1 Method A

5.2.1.1 Etch the specimens with vigorous aeration for the minimum time (the time to produce a clean pattern with a minimum of undercutting is approximately seven minutes for 34 mm and 15 minutes for 69 mm copper, using fresh ferric chloride solution) in 42° Baume (be) ferric chloride solution maintained at 24°C to 38°C. The etching solution shall be renewed when the etching time exceeds 15 minutes for 34 mm copper or 30 minutes for 69 mm copper.

5.2.1.2 After removal of the copper, immediately wash the specimens with running tap water at 16°C to 32°C for two to five minutes. Thereafter, keep the specimens from drying until reaching step 5.2.1.7.

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5.2.1.3 Immerse the specimens in a 10% solution of oxalic acid in water at 16°C to 32°C for 15 to 20 minutes. Provide gentle circulation of the oxalic acid solution during this period. Flush the specimens with running tap water at 16°C to 32°C.

Caution: Oxalic acid is toxic.

5.2.1.4 Scrub the specimens with Grade FFF pumice to remove resist, or wipe off the resist with a lint-free cloth moistened with a suitable solvent (i.e., methylethyl ketone, trichlorethylene, or toluol). In cleaning the specimens, care must be exercised to avoid abrading the adhesive layer with the pumice or attacking the adhesive or laminate with the solvent. Specimens not involving the use of resist need not be scrubbed.

5.2.1.5 Scrub the specimens with a plastic-bristled brush under running tap water at 16°C to 32°C and rinse for 30 minutes.

5.2.1.6 Rinse the specimen in distilled water.

5.2.1.7 Dry the specimens for one hour in an oven at 80°C ± 3°C. If specimens are for electrical tests, handle only with rubber or polyethylene gloves.

5.2.2 Method B

5.2.2.1 Remove foil from the specimen using a solution containing 298 g ± 10 per liter of ammonium persulfate and 15.5 mL ± 1.0 per liter of sulfuric acid, specific gravity 1.836 (66°Be). The temperature shall be 43°C ± 3°C.

5.2.2.2 Rinse the specimens thoroughly in running water and dry with a clean air blast.

5.2.2.3 Dry the specimens in an oven at 80°C ± 3°C for one hour and allow the specimens to cool.

5.3 Petrolatum Evaluation

5.3.1 Drill 1.5 mm holes in the pads of the 3 mm lines with good fabricating practice.

5.3.2 Remove the developed KPR by rubbing the pattern lightly with cold trichlorethylene liquid. Rinse in water. Scrub the specimens with FFF pumice and water with a strong bristle brush.

5.3.3 Plate per MIL-P-13949. Deoxidize by dipping in 10% hydrochloric acid for two minutes and wash in running water for five minutes. Dry 30 minutes, minimum, at 105°C to 110°C.

5.3.4 Coat the etched copper surface with white petrolatum. Specimens shall be immersed horizontally in solder 6.5mm below the surface for 20 ± 1 seconds at 260°C +5°C/-0°C) measured 25 mm below the surface.

5.3.5 Remove the petrolatum from the surface of the specimen with a two minute scrub in cold trichlorethylene, followed by a one minute rinse in hot trichlorethylene.

5.3.6 Inspect the surface for weave exposure, measing, crazing, resin loss, delamination and blistering.

5.3.7 Test four 0.8 mm lines on the specimen for peel strength and report the average value for the four lines. This test shall be performed in accordance with Method 2.4.8.

5.4 Report

5.4.1 The results of the testing by this test method shall be reported in a written report, which contains the following as a minimum:

1. Certification that the test was performed in accordance with this test method
2. Identification of specimens tested
3. Test results for each of the specimens tested, including the results of the visual inspections and peel tests