Dielectric Constant Testing

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Comparison of Test Methods

IPC TM 650 2.5.5.5 is a test method that is used quite a bit in the microwave industry. This method is a stripline test where two 62 mil thick coupons are etched free of copper and placed on either side of a thin resonator card. The typical procedure is to place in the press a 62 mil thick control panel. After pressing, two coupons are removed from the panel and those coupons are used for material testing. The certified numbers for electrical and mechanical properties that are reported on the shipping documents and certificates of conformance are taken off the control panel coupons. It is assumed that since the control panels went through the same press cycle, temperatures and pressures as the rest of the press load that the values reported on the control panel represent the values of the rest of the panels in the press load regardless of thickness.

IPC TM 650 2.5.5.3 is a test method that is used in lieu of the test procedure above. There is good correlation between the values derived from either test method. This test method uses a two fluid cell to measure the permittivity or dielectric constant of a material. The measurement is not dependent on sample thickness. Thus any thickness from a thin film product up to ¼ inch material can be tested. Small coupons are removed from the manufactured panel and tested. The certified numbers for electrical and mechanical properties that are reported on the shipping documents and certificates of conformance are taken off the actual panel that is shipped to the customer.

While some manufacturers use the control panel approach, Taconic engineers believe that testing the electrical as well as mechanical properties of the material that the customer actually receives is a better approach. A press load can contain many different thicknesses of material. Rather than just testing a 62 mil coupon made from a 'controlled' panel, we remove coupons and test each and every thickness of material in the press load. i.e. if the press has 10, 20, 30, 31, 50, 60 and 125 mil materials in that press we test the 10, 20, 30, 31, 50, 60 and 125 mil thicknesses and report those individual numbers on the shipping documents. The method that Taconic uses does require a significant amount of additional testing. However, we feel that testing material that the customer actually receives is a much better approach than deriving the test data off a control panel.

IPC TM 650 2.5.5.5
Industry standard

62 mil (1.57 mm) test coupons for dielectric constant testing

- Substrate thickness in the press load can differ from this thickness
- DK value measured from these 2 test coupons **represents** the DK and DK tolerance of the entire press load of an actual substrate.

IPC TM 650 2.5.5.3
2 Fluid Cell Method - Taconic standard

Test coupons from actual substrate thickness(es) in a press load are used for dielectric constant testing

- AQL samples are measured from every actual substrate thickness(es) in the press load
- DK values are actually **measured**, not derived from representative 62 mil (1.57 mm) test coupons.
- DK tolerance of the actual substrate is calculated from the actual spread of measurements.