IPC

IPC-TM-650
TEST METHODS MANUAL

Number
2.4.50

Subject
Thermal Conductivity, Polymer Films

Date	Revision
7/95	

Originating Task Group
Deposited Dielectric Task Group (C-13a)

1.0 Scope This test method defines the procedure for determining the Thermal Conductivity of polymer coatings on inorganic substrates, such as polyimide on a silicon wafer.

2.0 Applicable Documents

ASTM D 2766 Standard Test Method for Specific Heat of Liquid and Solids

3.0 Test Specimen See Sample Preparation 5.1.

4.0 Apparatus

4.1 CO_2 Laser capable of 5 Joules per pulse.

4.2 Mercury/Cadmium/Tellurium (MCT) Infrared Detector or equivalent.

5.0 Procedure

5.1 Sample Preparation Samples are prepared by forming a structure on a silicon wafer consisting of 2 μm of sputtered carbon, 2 μm of sputtered Al metal, 25 μm of polymer dielectric, and 2 μm of sputtered Al on wafer according to manufacturer's recommendations.

5.2 Test Procedure Sample is placed between the laser and the detector according to Figure 1.

5.3 Test Analysis Heat rise is fit to the equation:

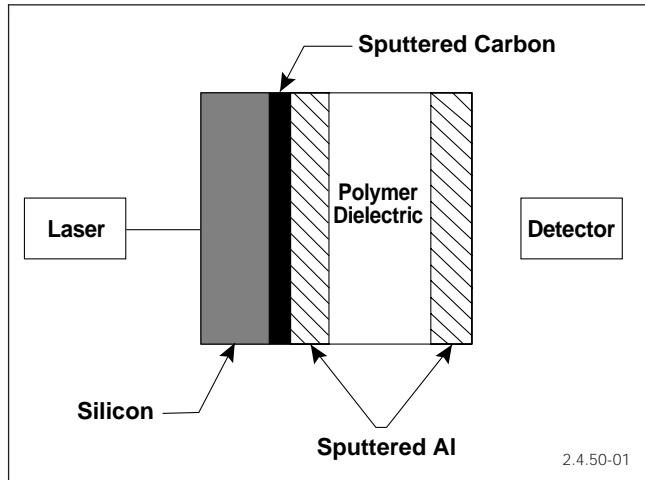$$T = 1 - \frac{4}{\pi} \sum_{n=0}^{\alpha} \frac{(-1)^n}{2n+1} e^{-\{(2n+1)^2 \pi^2 Lt/4\}}$$

where T is the normalized temperature rise and t is the time in seconds and L is the fitting parameter. The thermal divusivity k is given by:

$$k = (L)(l)^2$$

where l is the sample thickness. The thermal condutivity, K, is given by the equation:

$$K = k\, C_p\, P$$

where C_p is the heat capacity (as determined by ASTM D 2766) and p is the density.

Figure 1 Laser is flashed and the heat rise is measured on the back Al by the detector