

SEMI G75.8-0698 (Reapproved 0615) TEST METHOD FOR MEASUREMENT OF THE COEFFICIENT OF THERMAL EXPANSION AND GLASS TRANSITION TEMPERATURE OF LEADFRAME TAPE

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NOTICE: This Standard or Safety Guideline has an Inactive Status because the conditions to maintain Current Status have not been met. Inactive Standards or Safety Guidelines are available from SEMI and continue to be valid for use.

1 Summary of Method

1.1 A thermal mechanical analyzer (TMA) is used to monitor the dimension of a tape sample with temperature increases to 400°C. It can be made to measure the base film, adhesive, and the leadframe tape. The results are obtained as a plot of expansion versus temperature, from which coefficient of thermal expansion (CTE) and glass transition temperature (T_g) may be obtained. CTE above the T_g cannot be measured because of softening and elongation of the sample.

2 Equipment

- 2.1 TMA with chart recorder.
- 2.2 Thermohygrostat.
- 2.3 Cutting die for sample preparation.
- 2.4 *Calipers* — 0.1 mm accuracy.

3 Sampling

- 3.1 The sampling is one sample per one lot. The vendor must report the definition of lot, if customer requires it.

4 Preparation of Specimens

- 4.1 Cut specimens out of the samples using the cutting die. The specimens shall be 20 ± 0.1 mm long and 5.0 ± 0.1 mm wide.
- 4.2 Allow the samples to be stabilized at $23 \pm 5^\circ\text{C}$ and $50 \pm 5\%$ RH for 16 hours minimum. This may be carried out in a climate controlled room or in a thermohygrostat.

5 Equipment Setup and Calibration

- 5.1 Refer to the TMA manufacturer's manual for setup and calibration procedures.

6 Procedure

- 6.1 Set the specimen to the chuck so that the length of the specimen under test is 10 ± 0.1 mm. Measure the specimen length using calipers.
- 6.2 Attach the chuck to the TMA.
- 6.3 Zero the recorder.
- 6.4 Set the Thermal Ramp to 10°C/minute, the maximum temperature to 400°C, and the load to 2 ± 0.2 grams.
- 6.5 Initiate the test sequence and obtain a chart record of Elongation of the specimen versus Temperature (see Figure 1).
- 6.6 Repeat for all specimens.

6.7 Calculation of Results

6.7.1 CTE (k) — Calculate the CTE using the following equation:

$$k = \frac{\Delta L}{L \times \Delta T}$$

where:

L = the length (mm) of the specimen at room temperature, and

ΔL = the elongation of the specimen (mm) for a given temperature difference, ΔT (°C).

These values are taken from the chart as shown in Figure 1.

6.7.2 Glass Transition Temperature (T_g)

6.7.2.1 On the chart, draw a best-fit tangent line to the curve between Point (A) and (B) and a second tangent between Point (C) and (D) (see Figure 1).

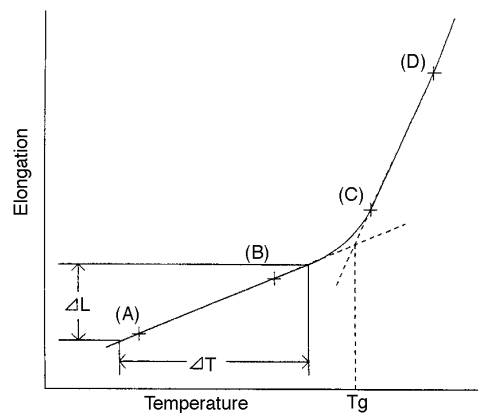


Figure 1
CTE

6.7.2.2 Extend the lower tangent line above its highest temperature and the higher tangent line below its lowest temperature until they intersect. The temperature at the intersection point is the glass transition temperature.

7 Related Documents

7.1 SEMI Standards and Safety Guidelines

SEMI G13 — Standard Test Method for Expansion Characteristics of Molding Compounds

7.2 ASTM Standards¹

ASTM D669 — Standard Test Method for Dissipation Factor and Permittivity Parallel with Laminations of Laminated Sheet and Plate Materials

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