

SEMI G75-0698 (Reapproved 0706) STANDARD TEST METHOD OF THE PROPERTIES OF LEADFRAME TAPE

This standard was technically approved by the global Assembly & Packaging Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on May 16, 2006. It was available at www.semi.org in June 2006 and on CD-ROM in July 2006. Originally published June 1998.

1 Purpose

- 1.1 This standard describes procedures for measuring the mechanical, physical, chemical, thermal, and electrical properties of leadframe tape.
- 1.2 Equipment, sampling, and procedures are referred to in the individual test methods.
- 1.3 The test methods for the individual properties have been given in this standard.
 - 1.3.1 Ionic impurities (see SEMI G75.1).
 - 1.3.2 Adhesive strength (see SEMI G75.2).
 - 1.3.3 Peel strength of protective film from leadframe tape (see SEMI G75.3).
 - 1.3.4 Water absorption (see SEMI G75.4).
 - 1.3.5 Weight loss (see SEMI G75.5).
 - 1.3.6 Shrinkage factor (see SEMI G75.6).
 - 1.3.7 Thermal decomposition temperature (see SEMI G75.7).
 - 1.3.8 Coefficient of thermal expansion and glass transition temperature (see SEMI G75.8).
 - 1.3.9 Tensile strength, elongation, and tensile modulus (see SEMI G75.9).
 - 1.3.10 Volume and surface resistivity (see SEMI G75.10).
 - 1.3.11 Dielectric constant and dissipation factor (see SEMI G75.11).
 - 1.3.12 Breakdown strength (see SEMI G75.12).
 - 1.3.13 Leakage current (see SEMI G75.13).

2 Scope

2.1 The methods help tape manufacturers, leadframe manufacturers, and their customers in evaluating leadframe tapes.

2.2 Units

2.2.1 This standard test method uses SI (metric) units.

NOTICE: This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards and Documents

3.1 Referenced documents are listed in each test method.

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

4 Terminology

4.1 *breakdown strength* — under the specified test conditions, the quotient of the minimum r.m.s. voltage at the breakdown of the test piece (breakdown voltage) divided by the distance between the two electrodes (thickness of test piece).

4.2 *dielectric constant* — the amount of electrostatic energy stored in a unit volume of a substance in a unit electric field. It is called dielectric constant (ϵ_r) and expressed as the quotient of electrostatic capacity of a parallel condenser employing the test piece as the dielectric (C_x) divided by that of the same condenser when air (under the standard condition, the dielectric constant of air can be taken for that of vacuum) is used as the dielectric (C_o), measured under a specified frequency.

$$\text{i.e., } \varepsilon = C_x/C_o$$

4.3 *dielectric dissipation factor* — dielectric dissipation factor is the tangent of the complementary angle of dielectric phase angle (tand). The dielectric phase angle is the phase difference angle (q) between sine-wave voltage applied to the test piece and the current component having the same frequency as the applied voltage caused by the voltage application.

4.4 *HAST* — highly accelerated stress test: For example, 121°C/2 atm/100% RH.

4.5 *leadframe tape* — an adhesive coated tape. After removing protective film, laminated to the inner leads, which stops lead shift and/or lead lift during the assembly process.

4.6 *protective film* — a plastic film to cover the adhesive on leadframe tapes. This film prevents the adhesive from becoming contaminated and is removed from the leadframe tape just prior to taping the leadframe.

4.7 *strain* — the ratio of elongation of the sample length to the original length at the applied stress level.

4.8 *stress* — the applied force per unit cross-sectional area of the sample.

4.9 *surface resistivity* — the quotient of the voltage gradient parallel to the current along the surface of the test piece divided by the current per unit width of the surface.

4.10 *tensile break strength* — the tensile force per unit of original cross section of the sample at the point of breakage.

4.11 *tensile modulus* — the ratio of stress to strain of the sample below the yield point, in the elastic region of the stress/strain curve.

NOTE 1: Plastic materials may not have a true elastic region in the stress/strain curve or force/elongation curve. A tangent is drawn to the maximum slope of the curve in order to determine the modulus.

4.12 *thermal decomposition temperature (base film and adhesive)* — the thermal decomposition temperature is determined at 5% of the weight loss when the tape is set to the thermal ramp at 10°C/minute.

4.13 *volume resistivity* — the quotient of the voltage gradient parallel to the current within the test piece divided by the current density.

5 Significance

5.1 Ionic Impurities

5.1.1 Ionic contamination can adversely affect the reliability of semiconductor devices by causing leakage currents and aluminum corrosion.

5.2 Adhesive Strength

5.2.1 Low adhesive strength may result in inner leads movement of leadframe during the assembly and packaging process which may result in low yield or poor device reliability.

5.3 Peel Strength of Protective Film from Leadframe Tape

5.3.1 If the peeling strength of protective film from leadframe tape varies in peeling strength, the taping machines will not operate consistently.

5.4 Water Absorption

5.4.1 If the leadframe tapes absorb an excessive amount of water in storage, before or after packaging, then reliability of devices made by these leadframes may be affected. Current leakage and corrosion of device metallization may occur.

5.5 Weight Loss

5.5.1 Weight loss may indicate that devices manufactured with the leadframe tape may have reliability problems due to the tape outgassing.

5.6 Shrinkage Factor

5.6.1 Excessive shrinkage at thermal processing may cause the lead shift and wire bond problems for automatic bonders.

5.7 Thermal Decomposition Temperature

5.7.1 The devices manufactured with leadframe tape that decomposes at too low a temperature may have lower reliability.