Designation: D2739 – 97 (Reapproved 2010)

Standard Test Method for Volume Resistivity of Conductive Adhesives[1]

This standard is issued under the fixed designation D2739; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the volume resistivity of resin-based conductive adhesives in the cured condition. The test is made on a thin adhesive layer as prepared in a bonded specimen. This test method is used for conductive adhesives that are cured either at room temperature or at elevated temperatures.

1.2 The values stated in either SI or other units shall be regarded separately as standard. SI equivalents to screw threads are shown in the figures.

1.3 *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]
D618 Practice for Conditioning Plastics for Testing
D907 Terminology of Adhesives
2.2 *Federal Specification:*
QQ-B-626 Composition 22[3]
2.3 *ASTM Adjuncts:*
Assembly Jig[4]

3. Terminology

3.1 *Definitions*—Many terms in this test method are defined in Terminology D907.

3.1.1 *conductivity*, *n*—the ratio of the current density carried through a specimen to the potential gradient paralleling the current. This is numerically equal to the conductance between opposite faces of a unit cube of liquid. It is the reciprocal of resistivity. **D2864, D27**

3.1.2 *resistivity, volume*, *n*—the ratio of the electric potential gradient to the current density when the gradient is parallel to the current in the material. **D1566, D11**

4. Summary of Test Method

4.1 The volume resistivity of adhesive layers cured between metal adherends is measured on a resistance bridge. Tensile adhesion plugs (Fig. 1)[5] are described in this test method. Any other test specimens and materials can be used as long as similar precautions (see Section 7) are observed regarding preparation and tolerances.

5. Significance and Use

5.1 Accurate measurement of the volume resistivity of conductive adhesives is important, particularly with respect to applications in electronic packaging techniques. This method measures the resistance of conductive adhesives used in thin films as part of a bonded assembly. This does not imply that the measured results are applicable to different configurations with different metals. This method may be used for acceptance testing and for screening materials.

6. Apparatus

6.1 *Kelvin (Resistance) Bridge*, calibrated to 1 % accuracy.[6]

6.2 With the agreement of the interested parties, any metal tensile adhesion plugs (Fig. 1) can be used to prepare the tensile adhesion specimens.

NOTE 1—Different metals will inherently provide different resistance values. The measured resistance is dependent on resistance at the adhesive-adherend interface due to metal oxide formation. The extent of oxide formation varies with locality and laboratory conditions. Brass, conforming to Federal Specification QQ-B-626 Composition 22, is a convenient metal. However, in order to minimize oxide formation, especially where measurements are critical, as in referee measurements, it is recommended that the metal plugs be plated with either gold or silver to a thickness of not less than 1 μm (0.000040 in.). Any size plug up to 30

[1] This test method is under the jurisdiction of ASTM Committee D14 on Adhesives and is the direct responsibility of Subcommittee D14.80 on Metal Bonding Adhesives.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://dodssp.daps.dla.mil.

[4] Detailed drawings of the assembly jig are available from ASTM International Headquarters. Order Adjunct No. ADJD2739. Original adjunct produced in 1987.

[5] Plugs to accommodate banana plug—No. 192, Herman H. Smith, Inc., or equivalent.

[6] Satisfactory resistance bridges are made by: Leads and Northup Co. Bridge Catalog No. 4306, Minneapolis Honeywell Division Catalog No. 1622, and Biddle Instruments Catalog No. 603282.