



Designation: F1995 – 12

Standard Test Method for Determining the Shear Force of a Surface Mount Device (SMD) in a Membrane Switch¹

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1. Scope

1.1 This test method covers the determination of the shear integrity of materials and procedures used to attach surface mount devices (SMD) to a membrane switch circuit.

1.2 This test method is typically used to indicate the sufficient cure of conductive adhesive or underfill, or both. In general, this test method should be used prior to encapsulant. This test may also be used to demonstrate the Shear Force with encapsulation.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address all of 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. Terminology

2.1 Definitions:

2.1.1 *membrane switch*—A momentary switching device in which at least one contact is on (or made of) a flexible substrate.

2.1.2 *shear load*—A force applied parallel to the mounting surface sufficient to shear the SMD from its mounting.

2.1.3 *SMD*—Abbreviation for surface mount device (for example, light emitting diode (LED), resistor)

2.1.4 *attachment media*—A mounting adhesive used for electrical or mechanical bonding, or both, of the SMD to the substrate.

2.1.5 *plating*—A thin metallic coating (that is, gold, nickel) covering the leads of the SMD or circuit, or both, in the electrical interface area.

¹ This test method is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.18 Membrane Switches.

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3. Significance and Use

3.1 The different combinations of SMD types, attachment medias, circuit substrates, plating options, and process variation can account for significant variation in test outcome.

3.2 The SMD shear strength test is useful to manufacturers and users for determining the bond strength of the component to the membrane switch circuit.

4. Interferences

4.1 The following parameters may affect the results of this test:

4.1.1 Temperature and humidity, and

4.1.2 Substrate movement during test.

5. Apparatus

5.1 *Device*, shall consist of a load-applying instrument with an accuracy of $\pm 5\%$ of full scale capable of indicating peak hold.

5.2 *Mounting Fixture*, method to secure specimen to insure stability during test.

5.3 *SMD Contact Tool*, suitable to apply a uniform distribution of force to an edge of the SMD.

5.4 *Magnification Device*, suitable to facilitate visual observation of the SMD and contact tool interface during testing (optional).

6. Procedure

6.1 Pretest Setup:

6.1.1 Attach specimen to the test base to minimize movement of the substrate during test. Ensure that no damage occurs during attachment to the test base that could affect bond performance.

6.1.2 The direction of applied force shall be parallel with the plane of the circuit substrate.

6.1.3 The SMD contact tool shall load against an edge of the component, which most closely approximates a 90° angle with the base of the circuit substrate. Contact tool should make contact to SMD at a point equal to or less than $\frac{1}{2}$ the total SMD height, (see Fig. 1).

6.2 In-Process Test: