This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F1995 – 13 (Reapproved 2021)

Standard Test Method for Determining the Shear Strength of the Bond between a Surface Mount Device (SMD) and Substrate in a Membrane Switch[1]

This standard is issued under the fixed designation F1995; 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 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Terminology

2.1 *Definitions:*

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

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

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

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

2.1.5 *SMD*—abbreviation for surface mount device (for example, light emitting diode (LED), resistor).

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 ±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.

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

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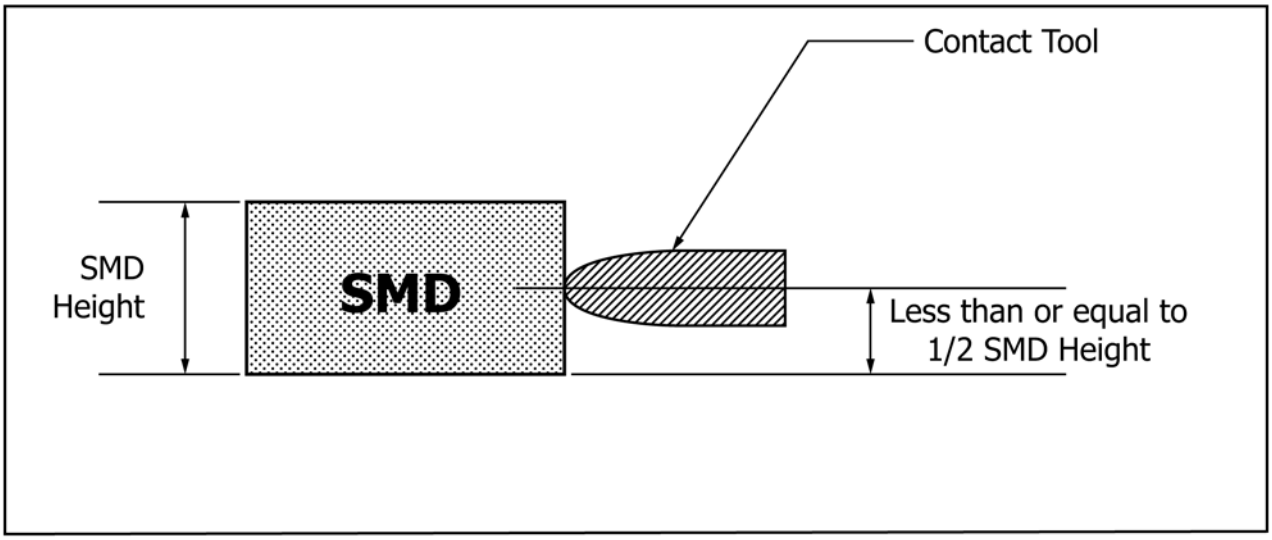

FIG. 1 SMD Contact

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 ½ the total SMD height, (see Fig. 1).

6.2 *In-Process Test:*

6.2.1 Bring contact tool into contact with SMD specimen.

6.2.2 Gradually increase force, not to exceed 225 g/s, until bond failure.

6.2.3 After initial contact with the SMD edge and during the application of force, the relative position of the contact tool shall not move such that contact is made with the circuit plane or SMD attachment media. If the tool rides over the SMD, a new specimen shall be substituted.

6.2.4 Record force measured to shear SMD.

7. Report

7.1 Report the following information:

7.1.1 Temperature.

7.1.2 Humidity.

7.1.3 Shape and size of contact tool.

7.1.4 Orientation of SMD to contact tool.

7.1.5 SMD information: SMD part number, plating type, etc.

7.1.6 Circuit or substrate type.

7.1.7 Attachment media type.

7.1.8 Force applied by contact tool when bond failure occured.

7.1.9 SMD size.

7.1.10 Type of encapsulant used.

8. Precision and Bias

8.1 *Precision*—It is not possible to specify the precision of the procedure in Test Method F1995 for measuring Shear Force because the test is destructive allowing only limited repeatability in comparison testing.

8.2 *Bias*—No information can be presented on the bias of the procedure in F1995 for measuring Shear Force because no standard sample is available for this industry.

9. Keywords

9.1 adhesion; bond strength; LED; membrane switch; shear force; SMD; surface mount

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