

SEMI G63-1122

TEST METHOD FOR MEASUREMENT OF DIE SHEAR STRENGTH

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NOTICE: Paragraphs entitled 'NOTE:' are not an official part of this Standard or Safety Guideline and are not intended to modify or supersede the official Standard or Safety Guideline. These have been supplied by the global technical committee to enhance the usage of the Standard or Safety Guideline.

1 Purpose

1.1 The purpose of this Test Method is to determine procedures for die shear strength testing.

2 Scope

2.1 This Test Method shall be used for the measurement of the die shear strength when die attach paste/film is used to bond a die to a leadframe/substrate bond pad.

2.2 This Test Method shall be used for quality control and development at die attach paste/film suppliers and for incoming inspection and selection of the die attach paste/film at die attach paste/film users. Depending on adding die attach material (DAF), add the measurement conditions and several chip sizes for test vehicle.

2.3 This Test Method can be applicable to die attach material besides paste/film material and may be used to evaluate leadframe/substrate bond pad quality.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents 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 *United States Military Standard*¹

MIL-STD-883 — Method 2019, Die Shear Strength

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

4 Terminology

4.1 Definitions

4.1.1 *die* — semiconductor device or an imitation.

4.1.2 *die attach* — bond die and substrate such as leadframe/substrate pad.

4.1.3 *die contact tool* — tool for applying load to the die for shearing.

4.1.4 *dispense* — deal out paste/film.

4.1.5 *fillet* — height and shape of die attach paste in contact with or surrounding the die kerf.

4.1.6 *shear* — have forced completely in X-Y direction.

¹ United States Military Standards, available as freely downloadable PDF files from the ASSIST Quick Search website at <http://quicksearch.dla.mil>.

5 Summary of Method

5.1 This method is based on measuring the shear strength between die and leadframe/substrate pad bonded by die attach paste/film using die shear tester.

6 Equipment

6.1 *Die Shear Tester*

6.1.1 $\pm 5\%$ accuracy of full scale,

6.1.2 Die contact tool can be in contact with die edge from end-to-end.

6.2 *Hot Plate* — Optional.

6.3 *Microscope* — Optional.

7 Material

7.1 *Silicon Die* — 2 mm $\times$ 2 mm $\times$ 0.3 to 0.5 mm, 3 mm $\times$ 3 mm $\times$ 0.3 to 0.5 mm, 5 mm $\times$ 5 mm $\times$ 0.3 to 0.5 mm, 10 mm $\times$ 10 mm $\times$ 0.3 to 0.5 mm.

7.2 Leadframe/substrate.

7.3 Die attach paste/film.

8 Test Specimen

8.1 Dispense die attach paste by dispensing, stamping, or screen printing (when die attach paste) or prepare die attach film by stamping, or laminating (when die attach film).

8.2 Bond die and leadframe/substrate pad.

8.3 Cure the paste per recommendation and allow to cool to ambient.

NOTE 1: Height of fillet shall be less than half of the thickness of the die.

NOTE 2: Thickness of die attach paste/film shall be within the range of 5 to 30 μm before or after cure.

NOTE 3: Assembled parts shall not be exposed to a curing temperature higher than the peak recommended temperature for more than 30 seconds.

9 Sampling Plan

9.1 Number of specimens tested shall be 5 or more.

10 Procedure

10.1 Set a test specimen on the die shear tester.

10.2 Confirm that the die contact tool contacts the die side in half of the area or more and that the die contact tool does not touch the fillet.

10.3 Shear the specimen with the tester.

10.4 Record the strength.

10.5 Observe failed parts and classify in the following modes:

- Mode 1: Die breakage
- Mode 2: Adhesive failure between die and die attach paste/film
- Mode 3: Cohesive failure
- Mode 4: Adhesive failure between die attach paste/film and leadframe/substrate
- Mode 5: Leadframe/substrate deformation