



IPC-TM-650 TEST METHODS MANUAL

1.0 Scope The purpose of this test is to determine the integrity of materials and procedures used to attach semiconductor die or surface mounted elements to package headers or other substrates. This determination is based on a measure of force applied to the die, the type of failure resulting from this application of force (if failure occurs) and the visual appearance of the residual die attach media and substrate/header metallization.

2.0 Applicable Documents None

3.0 Test Specimens Any die attach area on the finished mounting structure.

4.0 Apparatus or Material The test equipment shall consist of a load-applying instrument with an accuracy of ± 5 percent of full scale or 50 grams, whichever is the greater tolerance. A circular dynamometer with a lever arm or a linear motion force-applying instrument may be used to apply the force required for testing. The test equipment shall have the following capabilities:

- A die contact tool which applies a uniform distribution of the force to an edge of the die (see Figure 1).
- Provisions to assure that the die contact tool is perpendicular to the die mounting plane of the header or substrate.
- A rotational capability, relative to the header/substrate holding fixture and the die contact tool, to facilitate line contact on the edge of the die; i.e., the tool applying the force to the die shall contact the die edge from end-to-end (see Figure 2).
- A binocular microscope with magnification capabilities of 10X minimum and lighting which facilitates visual observation of the die and die contact tool interface during testing.

5.0 Procedure The test shall be conducted, as defined herein, or to the test conditions specified in the applicable specific acquisition document consistent with the particular part construction. All die strength tests shall be counted and the specific sampling, acceptance, and added sample provisions shall be observed, as applicable.

Number 2.4.42.2	
Subject Die Shear Strength	
Date 2/98	Revision
Originating Task Group MCM-L Substrate Performance Task Group (D-33e)	

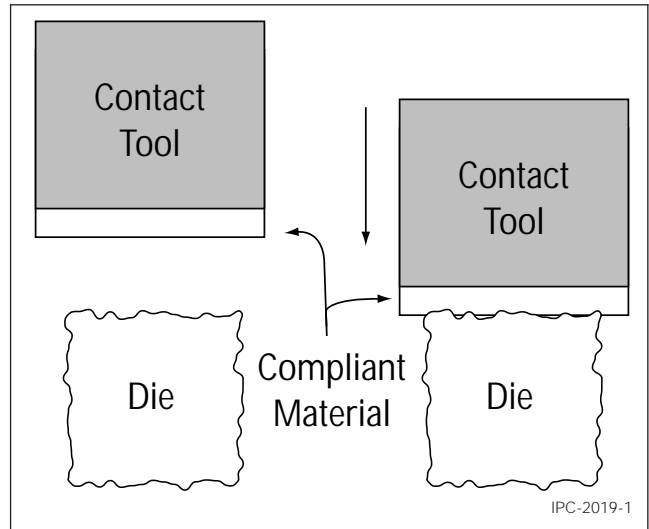


Figure 1 Compliant interface on contact tool distributes load to the irregular edge of the die.

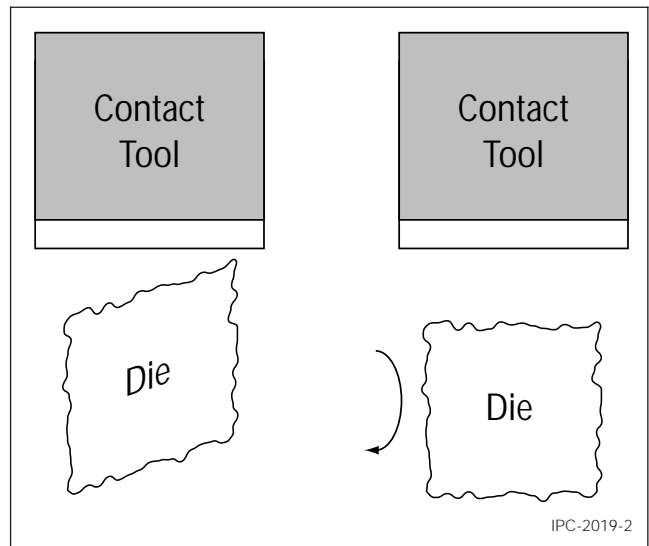


Figure 2 Rotate the die contact tool or the device for parallel alignment.

Number 2.4.42.2	Subject Die Shear Strength	Date 2/98
Revision		

5.1 Shear Strength A force sufficient to shear the die from its mounting or equal to twice the minimum specified shear strength, whichever occurs first, shall be applied to the die using apparatus of 4.0.

- When a linear motion force-applying instrument is used, the direction of the applied force shall be parallel with the plane of the header or substrate and perpendicular to the die being tested.
- When a circular dynamometer with a lever arm is employed to apply the force required for testing, it shall be pivoted about the lever arm axis and the motion shall be parallel with the plane of the header or substrate and perpendicular to the edge of the die being tested. The contact tooling attached to the lever arm shall be at a proper distance to assure an accurate value of applied force.
- The die contact tool shall load against an edge of the die which most closely approximates a 90° angle with the base of the header or substrate to which it is bonded (see Figure 3).

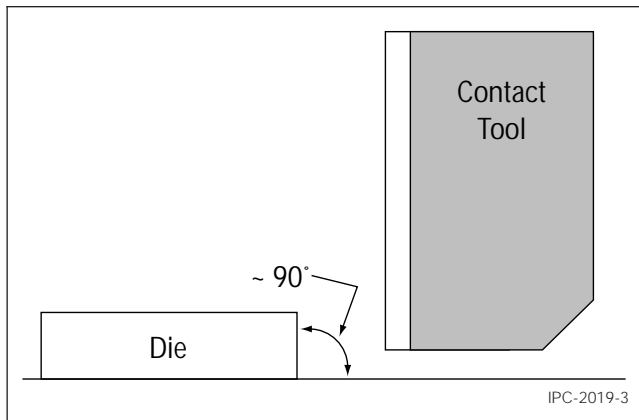


Figure 3 The contact tool shall load against that edge of the die which forms an angle $\sim 90^\circ$ with the header/substrate.

- After initial contact with the die edge and during the application of force, the relative position of the contact tool shall not move vertically such that contact is made with the header/substrate or die attach media. If the tool rides over the die, a new die may be substituted or the die may be repositioned, provided that the requirements of 5.1(c) are met.

5.2 Separation Categories When specified, the force required to achieve separation and the category of the separation shall be recorded. Examples are as follows:

- Shearing of die with residual silicon remaining
- Separation of die from die attach medium.
- Separation of die and die attach medium from package.

6.0 Notes The following details shall be specified in the procurement documentation.

- Number of devices to be tested and the acceptance criteria.
- Requirement for data recording, when applicable (see 5.2).