



How to test bonds » Lead integrity » MIL-STD-883 method 2004.7 lead integrity

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1. PURPOSE

This method provides various tests for determining the integrity of microelectronic device leads (terminals), welds, and seals. **Test condition A** provides for straight tensile loading. **Test condition A1** provides testing the solder or braze material lead attach on packages with brazed leads. **Test condition B1** provides for application of bending stresses to determine integrity of leads and seals. **Test condition B2** employs multiple application of bending stresses primarily to determine the resistance of the leads to metal fatigue under repeated bending. **Test conditions C1** and **C2** provide for application of torque or twisting stresses to device leads or studs, respectively, to determine integrity of leads and seals. **Test condition D** provides for application of peel and tensile stresses to determine integrity of terminal adhesion and plating of leadless packages. **Test condition E** provides for application of a bend test to determine integrity of plating for flexible and semi-flexible leads. It is recommended that test condition **A**, **B1**, **B2** and **C1** be followed by a seal test in accordance with method 1014 to determine any effect of the stresses applied on the seal as well as on the leads (terminals).

Note: This test method does not apply to ball grid array (BGA) or column grid array (CGA) devices.

2. APPARATUS

See applicable test condition.

3. DEFINITIONS

a. Arc

An arc is defined as the movement of the case, without torsion, to a position perpendicular to the pull axis and return to normal. All arcs on a single lead shall be made in the same direction and in the same plane without lead restriction.

b. Bending cycle

A bending cycle is one bend of a lead from a reference position (e.g. 0 Deg), to a defined arc and then back to the original reference to original position (e.g. 0 Deg).

c. Flexible lead

A rectangular lead is considered flexible if its section modulus is less than or equal

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Bond testers

- Condor *Sigma*
- Condor *Sigma Lite*
- Condor *Sigma W12*
- Condor *150HF*

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to that of an equivalent rectangular lead with a cross section of 0.15 x 0.51 mm (.006 x .020 inch). Round leads less than or equal to 0.51 mm (.020 inch) in diameter shall be considered flexible even if the lead is not intended to be bent as these leads may be subject to routine handling disturbances.

d. Rigid Lead or terminal

A rectangular lead or terminal shall be considered rigid if its section modulus is greater than that of an equivalent rectangular lead with a cross section of 0.15 x 0.51 mm (.006 x .020 inch) and is not intended to be bent or formed in its end use application. Round leads greater than 0.51 mm (.020 inch) diameter that are not intended to be bent or formed in their end use application shall be considered rigid.

e. Section modulus

Section modulus is defined as $bh^2/6$ (width x thickness $2/6$) for rectangular leads, and $0.098(\phi b^3)/3$ or $.098D^3$ for round leads (see MIL-STD-1835). A rectangular lead with a cross section of .006 x .020 has a section modulus of 1.2×10^{-7} . A round lead with a .020 inch diameter has a section modulus of 7.8×10^{-7} .

f. Semi-flexible Lead

A rectangular lead is considered semi-flexible if its section modulus is greater than that of an equivalent rectangular lead with a cross section of 0.15 x 0.51 mm (.006 x .020 inch) and is intended to be bent or formed in its end use application. Round leads greater than 0.51 mm (.020 inch) diameter that are intended to be bent or formed in their end use application shall be considered semi-flexible.

4. GENERAL PROCEDURE APPLICABLE TO ALL TEST CONDITIONS

The device shall be subjected to the stresses described in the specified test condition and the specified end-point measurements and inspections shall be made except for initial conditioning or unless otherwise specified. Unless otherwise specified, the sample size series sampling shall apply to the leads, terminals, studs or pads chosen from a minimum of 3 devices.

5. SUMMARY

The following details and those required by the specific test condition shall be specified in the applicable acquisition document:

- a. Test condition letter.
- b. Number and selection of leads (terminals), if different from above.

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XYZTEC designed a special work holder for lead integrity testing. It is available for the Condor Sigma and Condor Classic platforms. Shown here is the Condor Sigma version.

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