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Lead integrity test method

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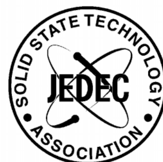

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EIA/JEDEC STANDARD

Test Method B105-B

Lead Integrity

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EIA/JESD22-B105-B

(Revision of Test Method B105-A)

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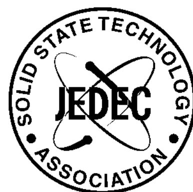

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LEAD INTEGRITY TEST METHOD

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IEC-PAS 62184 was submitted by JEDEC and has been processed by IEC technical committee 47: Semiconductor devices.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document:
Draft PAS	**Report on voting**
47/1457/PAS	47/1490/RVD

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TEST METHOD B105-B

LEAD INTEGRITY

(From JEDEC Council Ballot JCB-98-79 formulated under the cognizance of JC-14.1 Committee on Reliability Test Methods for Packaged Devices.)

1 Purpose

This test method provides various tests for determining the integrity lead/package interface and the lead itself when the lead(s) are bent due to faulty board assembly followed by rework of the part for reassembly. For hermetic packages, it is recommended that this test be followed by hermeticity tests in accordance with Test Method A109 to determine if there are any adverse effects from the stresses applied to the seals as well as to the leads. These tests, including each of its test conditions, is considered destructive and is only recommended for qualification testing. This test is applicable to all through-hole devices and surface-mount devices requiring lead forming by the user.

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1.1 Test Condition A - Tension

This test condition provides for the application of straight tensile loading.

1.2 Test Condition B - Bending Stress

This test condition provides for the application of bending stresses to determine the integrity of leads, seals and lead plating.

1.3 Test Condition C - Lead Fatigue

This test condition provides for the application of bending stresses primarily to determine the resistance of the leads to metal fatigue under repeated bending.

1.4 Test Condition D - Lead Torque

This test condition provides for the application of stresses to the leads to determine the resistance of seals and leads to twisting motions.

1.5 Test Condition E - Stud Torque

This test condition provides for the application of stresses on a threaded mounting stud caused by tightening the device during mounting.

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2 Apparatus

See applicable test condition.

3 General Procedure Applicable to all Test Conditions

The device shall be subjected to the stress described in the specified test condition and the specified end point measurements and inspections shall be made except for initial conditioning unless otherwise specified. When possible, the stress shall be applied to randomly selected leads from each device. The same leads shall not be used for more than one test condition.

4 General Summary

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

(a) Test Condition Letter

(b) Sample size (combinations of number of leads per device and number of devices) and quality level.

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5 Test Condition A - Tension

5.1 Purpose

This test is designed to check the capabilities of the device, leads, welds, and seals to withstand a straight pull.

5.2 Apparatus

The tension test requires suitable clamps and fixtures for securing the device and attaching the specified weight without lead restriction. Equivalent linear pull test equipment may be used.

5.3 Procedure

A tension of 8.0 $\pm$ 0.5 oz (227 $\pm$ 14 gram) shall be applied without shock to each lead to be tested in a direction parallel to the axis of the lead or terminal and the tension shall be maintained for 30 seconds minimum. The tension shall be applied as close to the end of the lead as practicable.

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5.3 Procedure (cont'd)

5.3.1 Measurements

Hermeticity test on hermetically sealed packages, visual examination and electrical measurements, that consist of parametric and functional tests, shall be taken, as specified in the applicable procurement document.

5.3.2 Failure Criteria

After the removal of the stress, examine the device using a magnification between 10X and 20X. Any evidence of breakage, loosening, or relative motion between the lead and the device body shall be considered a device failure. When hermeticity tests are conducted (in accordance with Test Method A109) as a post measurement, meniscus cracks shall not be a cause for rejection of the devices which have passed the tests. Failure of any specified post electrical measurement shall be considered a cause for failure.

5.4 Summary

The following details shall be specified in the applicable procurement documents:

(a) Weight to be attached to lead, if other than 8.0 $\pm$ 0.5 oz (227 $\pm$ 14 gram).

(b) Length of time weight is to be attached, if other than 30 seconds.

(c) Failure criteria, if other than specified.

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6 Test Condition B - Bending Stress

6.1 Purpose

This test is designed to check the capability of the leads, lead finish, lead welds and seals of the devices to withstand stresses to the leads and seals which might reasonably be expected to occur from actual handling and assembly of the devices in application.

6.2 Apparatus

The bending test requires attaching devices, clamps, supports or other suitable hardware, necessary to apply the bending stress through the specified bend angle.

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6 Test Condition B - Bending Stress (cont'd)

6.3 Procedure

Each lead of the sample shall be subjected to a force sufficient to bend the lead as specified in paragraphs 6.3.1 through 6.3.6, as applicable. Any number, or all of the leads of the test device, may be bent simultaneously. Rows of leads may be bent one row at a time. Each lead shall be bent through one cycle as follows:

Bend through the specified arc in one direction and return to the original position. All arcs shall be made in the same plane, without lead restriction.

6.3.1 Direction of Bends

Test leads shall be bent in the least rigid direction. If there is no least rigid direction, the leads may be bent in any direction. No lead shall be bent so as to interfere with another lead. If interference is unavoidable, the test lead shall be bent in the opposite direction to the angle specified and returned to its normal position.

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6.3.2 Procedure for Initial Conditioning for Environmental Test

When normally straight leads are supplied in a formed condition (including the staggered lead dual-in-line configuration), the lead forming operation shall be considered acceptable initial conditioning in place of that specified, providing the lead forming has been performed after lead plating and the forming is at least as severe in permanent lead deformation as the specified bending.

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6.3.3 Procedure for Flat-Packs and Axial Lead Metal-Can Devices (e.g., Flexible and Semi-Flexible Leads)

6.3.3.1 Flexible Leads

A lead shall be considered flexible if its section modulus (in the least rigid direction) is less than or equal to that of a rectangular lead with a cross section of 0.006 x 0.020 inch (0.15 x 0.51 mm). Round leads $\leq$ 0.020 inch (0.51 mm) in diameter shall be considered flexible. Flexible leads shall be bent through an arc of at least 45°, measured at a distance 0.12 $\pm$ 0.03 inch (3.05 $\pm$ 0.76 mm) along the lead from the seal unless otherwise specified.

6.3.3.2 Semi-Flexible Leads

Semi-flexible leads are those leads with a section modulus (in the least rigid direction) greater than that of a rectangular lead with a cross section of 0.006 x 0.020 inch (0.15 x 0.51 mm) which are intended to be bent during insertion or other application. Round leads greater than 0.020 inch (0.51 mm) in diameter shall be considered semi-flexible. Semi-flexible leads shall be bent through an arc of a least 30°, measured at the lead extremities, unless otherwise specified.