

BS EN 62137-1-3:2009



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Surface mounting technology — Environmental and endurance test methods for surface mount solder joint —

Part 1-3: Cyclic drop test

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National foreword

This British Standard is the UK implementation of EN 62137-1-3:2009. It is identical to IEC 62137-1-3:2008.

The UK participation in its preparation was entrusted to Technical Committee EPL/501, Electronic assembly technology.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English version

**Surface mounting technology -
Environmental and endurance test methods
for surface mount solder joint -
Part 1-3: Cyclic drop test
(IEC 62137-1-3:2008)**

Technologie de montage en surface -
Méthodes d'essais d'environnement
et d'endurance des joints brasés
montés en surface -
Partie 1-3: Essai de chute cyclique
(CEI 62137-1-3:2008)

Oberflächenmontage-Technik -
Verfahren zur Prüfung
auf Umgebungseinflüsse
und zur Prüfung der Haltbarkeit
von Oberflächen-Lötverbindungen -
Teil 1-3: Zyklische Fallprüfung
(IEC 62137-1-3:2008)

This European Standard was approved by CENELEC on 2009-02-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: avenue Marnix 17, B - 1000 Brussels

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Foreword

The text of document 91/802/FDIS, future edition 1 of IEC 62137-1-3, prepared by IEC TC 91, Electronics assembly technology, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62137-1-3 on 2009-02-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2009-11-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-02-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62137-1-3:2008 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

- | | |
|----------------|---|
| IEC 60068-2-27 | NOTE Harmonized as EN 60068-2-27:200X ¹⁾ (not modified). |
| IEC 60068-2-31 | NOTE Harmonized as EN 60068-2-31:2008 (not modified). |

¹⁾ To be ratified.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-1	- ²⁾	Environmental testing - Part 1: General and guidance	EN 60068-1	1994 ³⁾
IEC 60194	- ²⁾	Printed board design, manufacture and assembly - Terms and definitions	EN 60194	2006 ³⁾
IEC 61188-5	Series	Printed boards and printed board assemblies - Design and use - Part 5: Attachment (land/joint) considerations	EN 61188-5	Series
IEC 61190-1-2	- ²⁾	Attachment materials for electronic assembly - Part 1-2: Requirements for soldering pastes for high-quality interconnects in electronics assembly	EN 61190-1-2	2007 ³⁾
IEC 61192-1	- ²⁾	Workmanship requirements for soldered electronic assemblies - Part 1: General	EN 61192-1	2003 ³⁾
IEC 61249-2-7	- ²⁾	Materials for printed boards and other interconnecting structures - Part 2-7: Reinforced base materials, clad and unclad - Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test), copper-clad	EN 61249-2-7 + corr. September	2002 ³⁾ 2005
IEC 61760-1	- ²⁾	Surface mounting technology - Part 1: Standard method for the specification of surface mounting components (SMDs)	EN 61760-1	2006 ³⁾

²⁾ Undated reference.

³⁾ Valid edition at date of issue.

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SURFACE MOUNTING TECHNOLOGY – ENVIRONMENTAL AND ENDURANCE TEST METHODS FOR SURFACE MOUNT SOLDER JOINT –

Part 1-3: Cyclic drop test

1 Scope

The test method described in this part of IEC 62137 applies to solder joints between terminals of surface mounting devices (SMDs) and land patterns on printed wiring boards (PWBs).

This test is intended to evaluate the strength of the solder joints of larger sized multi-terminal components and other components in devices (e.g. handheld mobile devices) in the event that the device is dropped. The properties of the solder joints (e.g. solder alloy, substrate, mounted device or design, etc.) are evaluated to assist in improving the strength of the solder joints.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60194, *Printed boards design, manufacture and assembly – Terms and definitions*

IEC 61249-2-7, *Materials for printed boards and other interconnecting structures – Part 2-7: Reinforced base materials clad and unclad – Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test), copper-clad*

IEC 61188-5 (all parts 5), *Printed boards and printed board assemblies – Design and use – Part 5: Attachment (land-joint) considerations*

IEC 61190-1-2, *Attachment materials for electronic assembly – Part 1-2: Requirements for soldering pastes for high-quality interconnects in electronics assembly*

IEC 61192-1, *Workmanship requirements for soldered electronic assemblies – Part 1: General*

IEC 61760-1, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60068-1 and IEC 60194, as well as the following definitions, apply.

3.1

drop impact strength

strength of the test substrate held by a jig that is dropped from a specified height, as represented by the number of cyclic drops that finally cause fracture at the intermetallic, the

surface plating, or within the joint between a surface mounting device (SMD) termination and a printed wiring board (PWB) copper land termination

3.2

strain

substrate surface strain

value indication measured by the strain gauge attached to the surface of the test substrate

NOTE It is a numeric dimensionless quantity representing the degree of stretching observed when the test substrate is distorted.

3.3

maximum strain

maximum strain in the tensile side (+) on the measured strain waveform

3.4

momentary interruption detector

device that detects extremely short electrical discontinuity (momentary interruptions) in a daisy-chain circuit

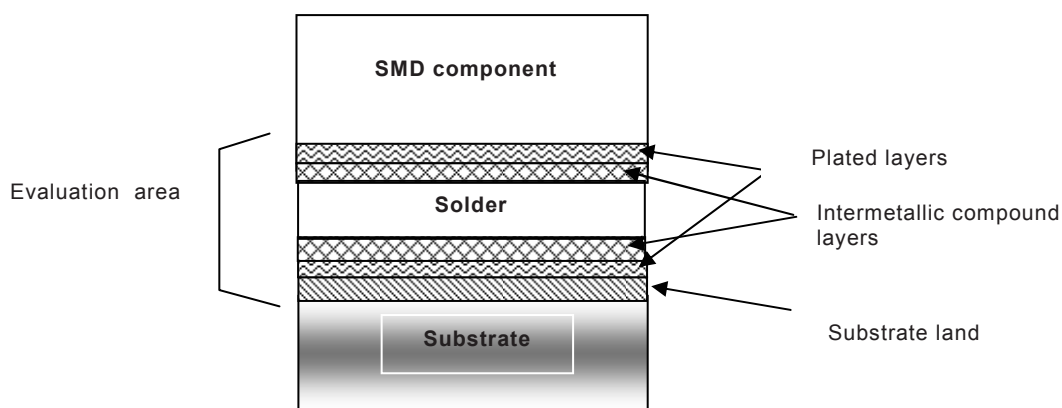
4 General remarks

The mechanical properties of the joint between a terminal to a land on a printed wiring board using lead-free solder are not the same for the joint using tin-lead solder due to the difference in composing elements of the solders. Thus it becomes important to test the mechanical properties of solder joints using different solder alloys.

This test is to evaluate the durability of joints that are formed by reflow soldering between SMD pins/electrodes and substrate lands in relation to drop heights. To evaluate the drop impact that the specimen joint receives, the strain can be used as an indicator of the impact, and it can quantitatively be measured using a strain gauge.

NOTE This drop impact test is not intended to be targeted at components themselves. Refer to IEC 60068-2-27 and IEC 60068-2-31 for test methods of the components.

Figure 1 is a conceptual illustration of the joint strength evaluation area of this test.



IEC 2095/08

Figure 1 – Area for evaluation in the cyclic drop test

5 Test equipment and materials

5.1 Reflow soldering oven

Unless otherwise specified, the reflow soldering oven shall be able to realize the temperature profile given in Figure 2.

5.2 Drop impact test equipment

This test equipment shall consist of a tester with a substrate securing jig and a measuring instrument. Unless otherwise specified, the following specifications apply.

- a) **Tester:** Use a tester that fulfills the requirements specified in Clause A.2.
- b) **Substrate securing jig:** Use a substrate securing jig that fulfills the requirements specified in A.2.2.
- c) **Measuring instrument:** Use a measurement instrument that fulfills the requirements specified in A.2.3.

5.3 Test substrate

Unless otherwise prescribed by the relevant specification, the test shall be conducted on a specimen (device) mounted by its normal means on the following substrate:

- a) **Material:** The substrate shall be a general double-sided board that is, as specified in IEC 61249-2-7.
- b) **Thickness:** The substrate thickness shall be either 1,0 mm or as specified in IEC 61249-2-7.
- c) **Size:** The substrate shall be of a size that allows testing using the jig specified in 5.2 b).
NOTE Since the substrate is supported at its margins, there should not be lands (e.g., check lands) at the margins of the substrate.
- d) **Land geometry:** The shape and size of a land shall comply with the IEC 61188-5 series or as specified by the component manufacturer.
- e) **Surface protection:** The solderable areas of the substrate (lands) shall be protected against oxidization by suitable means, e.g. by an organic or inorganic surface protection layer. This protective layer shall not adversely have an effect on the solderability of the lands under the soldering conditions described in Clause 6.

5.4 Solder alloy

Unless otherwise specified, the solder used in this test shall be Sn96,5Ag,30Cu0,5.

5.5 Solder paste

Unless otherwise specified, the solder paste used in this test shall comply with IEC 61190-1-2. The solder alloy specified in 5.4 shall be used for the solder paste.

5.6 Specimen components

Unless otherwise specified, specimen components shall be of a structure that allows continuity to be checked (e.g., daisy chain). They shall be designed based on the same specifications as the actually used components. The solder joints should be checked, as specified in IEC 61192-1, and the pattern design should be in accordance with the IEC 61188-5 series.

When using daisy-chain connections, care shall be taken not to cause any break in wiring patterns on the substrate. For example, the wiring patterns should be drawn not in the longitudinal direction on the test substrate, but in the crosswise direction.