Irish Standard
I.S. EN 62137-1-5:2009

Surface mounting technology - Environmental and endurance test methods for surface mount solder joints -- Part 1-5: Mechanical shear fatigue test (IEC 62137-1-5:2009 (EQV))

I.S. EN 62137-1-5:2009

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EUROPEAN STANDARD

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English version

Surface mounting technology - Environmental and endurance test methods for surface mount solder joints - Part 1-5: Mechanical shear fatigue test

(IEC 62137-1-5:2009)

Technologie du montage en surface - Méthodes d'essais d'environnement et d'endurance des joints brasés montés en surface - Partie 1-5: Essai de fatigue par cisaillement mécanique (CEI 62137-1-5:2009)

Oberflächenmontage-Technik - Verfahren zur Prüfung auf Umgebungseinflüsse und zur Prüfung der Haltbarkeit von Oberflächen-Lötverbindungen - Teil 1-5: Prüfung der Ermüdung durch mechanische Scherbeanspruchung (IEC 62137-1-5:2009)

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

Central Secretariat: avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 91/826/FDIS, future edition 1 of IEC 62137-1-5, prepared by IEC TC 91, Electronics assembly technology, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62137-1-5 on 2009-04-01.

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)	2010-01-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-04-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62137-1-5:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2-21	NOTE	Harmonized as EN 60068-2-21:2006 (not modified).
IEC 61188-5-8	NOTE	Harmonized as EN 61188-5-8:2008 (not modified).

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.

Publication	Year	Title	EN/HD	Year
IEC 60068-1	- [1)]	Environmental testing - Part 1: General and guidance	EN 60068-1	1994 [2)]
IEC 60194	- [1)]	Printed board design, manufacture and assembly - Terms and definitions	EN 60194	2006 [2)]
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	2007	Attachment materials for electronic assembly - Part 1-2: Requirements for soldering pastes for high-quality interconnects in electronics assembly	EN 61190-1-2	2007
IEC 61190-1-3	- [1)]	Attachment materials for electronic assembly - Part 1-3: Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solders for electronic soldering applications	EN 61190-1-3	2007 [2)]
IEC 61249-2-7	2002	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 2005
IEC 61760-1	- [1)]	Surface mounting technology - Part 1: Standard method for the specification of surface mounting components (SMDs)	EN 61760-1	2006 [2)]

[1)] Undated reference.

[2)] Valid edition at date of issue.

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I.S. EN 62137-1-5:2009

IEC 62137-1-5

Edition 1.0 2009-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Surface mounting technology – Environmental and endurance test methods for surface mount solder joints – Part 1-5: Mechanical shear fatigue test

Technologie du montage en surface – Méthodes d'essais d'environnement et d'endurance des joints brasés montés en surface – Partie 1-5: Essai de fatigue par cisaillement mécanique

IEC 62137-1-5:2009

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CONTENTS

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

Part 1-5: Mechanical shear fatigue test

FOREWORD

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International Standard IEC 62137-1-5 has been prepared by IEC technical committee 91: Electronics assembly technology.

The text of this standard is based on the following documents:

FDIS	Report on voting
91/826/FDIS	91/841/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 62137 series, under the general title *Surface mounting technology – Environmental and endurance test methods for surface mount solder joints*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The mechanical properties of lead-free solder joints between leads and lands on a printed wiring board are not the same with tin-lead-containing solder joints, due to their solder compositions. Thus, it becomes important to test the mechanical properties of solder joints of different alloys.

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

Part 1-5: Mechanical shear fatigue test

1 Scope

The test method described in this part of IEC 62137 applies to area array packages, such as BGA. This test method is designed to evaluate the fatigue life of the solder joints between component leads and lands on a substrate as shown in Figure 1. A temperature cyclic approach is generally used to evaluate the reliability of solder joints. Another method is to mechanically cycle the solder joints to shorten the testing time rather than to produce the strains by changing temperatures. The methodology is the imposition of shear deformation on the solder joints by mechanical displacement instead of relative displacement generated by CTE (coefficient of thermal expansion) mismatch, as shown in Figure 2. In place of the temperature cycle test, the mechanical shear fatigue predicts the reliability of the solder joints under repeated temperature change conditions by mechanically cycling the solder joints. In this test method, the evaluation requires first to mount the surface mount component on the substrate by reflow soldering, then cyclic mechanical shear deformation is applied to the solder joints until fracture of the solder joints occurs. The properties of the solder joints (for example solder alloy, substrate, mounted device or design, etc.) are evaluated to assist in improving the strength of the solder joints.

NOTE This test, however, does not measure the strength of the electronic components. The test method to evaluate the robustness of the joint to a board is described in IEC 60068-2-21.

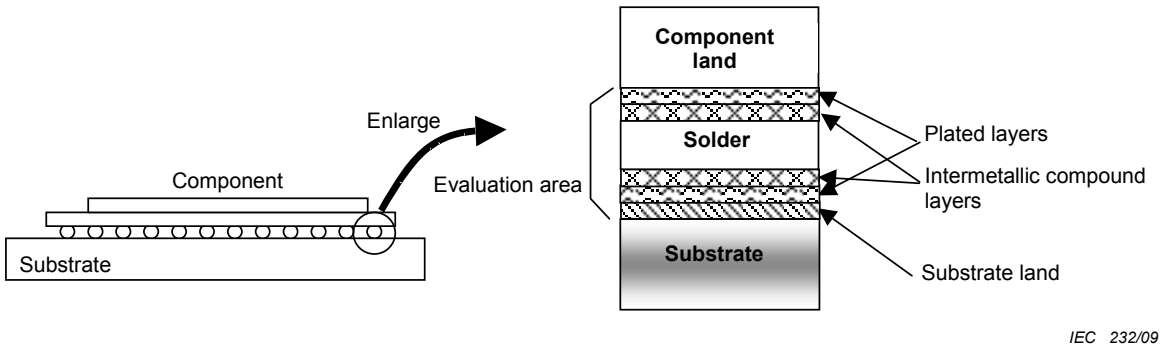
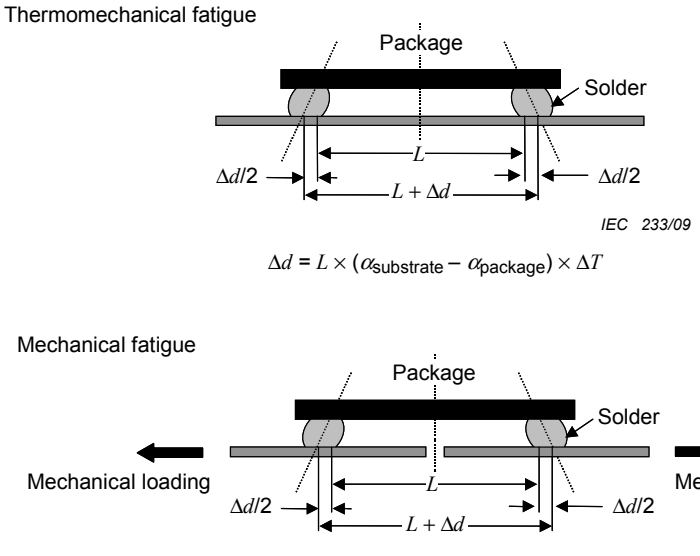


Figure 1 – Image drawing on evaluation area of joint strength



Key

Δd Relative displacement

ΔT Temperature range

α Coefficient of thermal expansion

Figure 2 – Schematic illustrations of thermomechanical and mechanical fatigue for 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 61188-5 (all parts), *Printed boards and printed board assemblies – Design and use*

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

IEC 61190-1-2:2007, *Attachment materials for electronic assembly – Part 1-2: Requirements for soldering pastes for high-quality interconnects in electronics assembly*

IEC 61190-1-3, *Attachment materials for electronic assembly – Part 1-3: Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solders for electronic soldering applications*

IEC 61249-2-7:2002, *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 61760-1, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)*