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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
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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:

<table>
<thead>
<tr>
<th>FDIS</th>
<th>Report on voting</th>
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<tbody>
<tr>
<td>91/826/FDIS</td>
<td>91/841/RVD</td>
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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

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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
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 61190-1-3, 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 61760-1, Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)