

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Electronics assembly technology –
Part 4: Endurance test methods for solder joint of area array type package
surface mount devices**

**Technique d'assemblage des composants électroniques –
Partie 4: Méthodes d'essais d'endurance des joints brasés des composants
pour montage en surface à boîtiers de type matriciel**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 14 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 55 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Electronics assembly technology –
Part 4: Endurance test methods for solder joint of area array type package
surface mount devices

Technique d'assemblage des composants électroniques –
Partie 4: Méthodes d'essais d'endurance des joints brasés des composants
pour montage en surface à boîtiers de type matriciel

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 31.190

ISBN 978-2-8322-1873-0

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

CONTENTS

FOREWORD.....	6
1 Scope.....	8
2 Normative references	8
3 Terms definitions and abbreviations	9
3.1 Terms and definitions.....	9
3.2 Abbreviations.....	9
4 General	9
5 Test apparatus and materials	10
5.1 Specimen.....	10
5.2 Reflow soldering equipment.....	10
5.3 Temperature cycling chamber	10
5.4 Electrical resistance recorder.....	10
5.5 Test substrate.....	10
5.6 Solder paste	11
6 Specimen preparation.....	11
7 Temperature cycling test	13
7.1 Pre-conditioning.....	13
7.2 Initial measurement	13
7.3 Test procedure.....	13
7.4 End of test criteria.....	15
7.5 Recovery	15
7.6 Final measurement.....	15
8 Temperature cycling life	15
9 Items to be specified in the relevant product specification	15
Annex A (informative) Acceleration of the temperature cycling test for solder joints	17
A.1 General.....	17
A.2 Acceleration of the temperature cycling test for an Sn-Pb solder joint	17
A.3 Temperature cycling life prediction method for an Sn-Ag-Cu solder joint.....	18
A.4 Factor that affects the temperature cycling life of the solder joint	22
Annex B (informative) Electrical continuity test for solder joints of the package.....	23
B.1 General.....	23
B.2 Package and daisy chain circuit	23
B.3 Mounting condition and materials.....	23
B.4 Test method.....	23
B.5 Temperature cycling test using the continuous electric resistance monitoring system	23
Annex C (informative) Reflow solderability test method for package and test substrate land	25
C.1 General.....	25
C.2 Test equipment.....	25
C.2.1 Test substrate.....	25
C.2.2 Pre-conditioning oven	25
C.2.3 Solder paste	25
C.2.4 Metal mask for screen printing.....	25
C.2.5 Screen printing equipment	25

ITC STANDARD PREVIEW
 (standards.iteh.ai)
<http://standards.iteh.ai/catalog/standards/sist/8e52fe68-f6df-4126-9352-4573b2ffa181/iec-62137-4-2014>

C.2.6	Package mounting equipment.....	25
C.2.7	Reflow soldering equipment.....	25
C.2.8	X-ray inspection equipment	26
C.3	Standard mounting process	26
C.3.1	Initial measurement	26
C.3.2	Pre-conditioning	26
C.3.3	Package mounting on test substrate	26
C.3.4	Recovery	27
C.3.5	Final measurement	27
C.4	Examples of faulty soldering of area array type packages	27
C.4.1	Repelled solder by contamination on the ball surface of the BGA package.....	27
C.4.2	Defective solder ball wetting caused by a crack in the package	27
C.5	Items to be given in the product specification.....	28
Annex D (informative)	Test substrate design guideline.....	29
D.1	General.....	29
D.2	Design standard.....	29
D.2.1	General	29
D.2.2	Classification of substrate specifications.....	29
D.2.3	Material of the test substrate	31
D.2.4	Configuration of layers of the test substrate.....	31
D.2.5	Land shape of test substrate.....	31
D.2.6	Land dimensions of the test substrate.....	31
D.3	Items to be given in the product specification.....	32
Annex E (informative)	Heat resistance to reflow soldering for test substrate	33
E.1	General.....	33
E.2	Test apparatus.....	33
E.2.1	Pre-conditioning oven	33
E.2.2	Reflow soldering equipment.....	33
E.3	Test procedure.....	33
E.3.1	General	33
E.3.2	Pre-conditioning	33
E.3.3	Initial measurement	33
E.3.4	Moistening process (1)	34
E.3.5	Reflow heating (1)	34
E.3.6	Moistening process (2)	34
E.3.7	Reflow heating process (2)	34
E.3.8	Final measurement	34
E.4	Items to be given in the product specification.....	34
Annex F (informative)	Pull strength measurement method for the test substrate land.....	35
F.1	General.....	35
F.2	Test apparatus and materials.....	35
F.2.1	Pull strength measuring equipment.....	35
F.2.2	Reflow soldering equipment.....	35
F.2.3	Test substrate.....	35
F.2.4	Solder ball	35
F.2.5	Solder paste	35
F.2.6	Flux	35
F.3	Measurement procedure	36

F.3.1	Pre-conditioning	36
F.3.2	Solder paste printing.....	36
F.3.3	Solder ball placement	36
F.3.4	Reflow heating process	36
F.3.5	Pull strength measurement	36
F.3.6	Final measurement	37
F.4	Items to be given in the product specification.....	37
Annex G (informative)	Standard mounting process for the packages.....	38
G.1	General.....	38
G.2	Test apparatus and materials.....	38
G.2.1	Test substrate.....	38
G.2.2	Solder paste	38
G.2.3	Metal mask for screen printing	38
G.2.4	Screen printing equipment	38
G.2.5	Package mounting equipment.....	38
G.2.6	Reflow soldering equipment.....	38
G.3	Standard mounting process	39
G.3.1	Initial measurement	39
G.3.2	Solder paste printing.....	39
G.3.3	Package mounting	39
G.3.4	Reflow heating process	39
G.3.5	Recovery	40
G.3.6	Final measurement	40
G.4	Items to be given in the product specification.....	40
Annex H (informative)	Mechanical stresses to the packages.....	41
H.1	General.....	41
H.2	Mechanical stresses	41
Bibliography	42
Figure 1	– Region for evaluation of the endurance test	10
Figure 2	– Typical reflow soldering profile for Sn63Pb37 solder alloy.....	12
Figure 3	– Typical reflow soldering profile for Sn96,5Ag3Cu,5 solder alloy.....	13
Figure 4	– Test conditions of temperature cycling test.....	14
Figure A.1	– FBGA package device and FEA model for calculation of acceleration factors AF	20
Figure A.2	– Example of acceleration factors AF with an FBGA package device using Sn96,5Ag3Cu,5 solder alloy.....	21
Figure A.3	– Fatigue characteristics of Sn96,5Ag3Cu,5 an alloy micro solder joint ($N_f = 20$ % load drop from initial load)	22
Figure B.1	– Example of a test circuit for the electrical continuity test of a solder joint	23
Figure B.2	– Measurement example of continuously monitored resistance in the temperature cycling test.....	24
Figure C.1	– Temperature measurement of specimen using thermocouples	26
Figure C.2	– Repelled solder caused by contamination on the solder ball surface	27
Figure C.3	– Defective soldering as a result of a solder ball drop	28
Figure D.1	– Standard land shapes of the test substrate	31
Figure F.1	– Measuring methods for pull strength	36

Figure G.1 – Example of printed conditions of solder paste.....	39
Figure G.2 – Temperature measurement of the specimen using thermocouples	40
Table 1 – Test conditions of temperature cycling test.....	14
Table A.1 – Example of test results of the acceleration factor (Sn63Pb37 solder alloy)	18
Table A.2 – Example test results of the acceleration factor (Sn96,5Ag3Cu,5 solder alloy)	20
Table A.3 – Material constant and inelastic strain range calculated by FEA for FBGA package devices as shown in Figure A.1 (Sn96,5Ag3Cu,5 solder alloy)	21
Table D.1 – Types classification of the test substrate.....	30
Table D.2 – Standard layers' configuration of test substrates	31
Table G.1 – Stencil design standard for packages	38
Table H.1 – Mechanical stresses to mounted area array type packages.....	41

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[IEC 62137-4:2014](https://standards.iteh.ai/catalog/standards/sist/8e52fe68-f6df-4126-9352-4573b2ffa181/iec-62137-4-2014)

<https://standards.iteh.ai/catalog/standards/sist/8e52fe68-f6df-4126-9352-4573b2ffa181/iec-62137-4-2014>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRONICS ASSEMBLY TECHNOLOGY –**Part 4: Endurance test methods for solder joint
of area array type package surface mount devices**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
<https://standards.iteh.ai/catalog/standards/sist/8e52fe68-f6df-4126-9352->
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62137-4 has been prepared by IEC technical committee 91: Electronics assembly technology.

IEC 62137-4 (first edition) cancels and replaces IEC 62137:2004. This edition constitutes a technical revision.

IEC 62137-4 includes the following significant technical changes with respect to IEC 62137:2004:

- test conditions for use of lead-free solder are included;
- test conditions for lead-free solders are added;
- accelerations of the temperature cycling test for solder joints are added.

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

FDIS	Report on voting
91/1188/FDIS	91/1205/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 in the IEC 62137 series, published under the general title *Electronics assembly technology* can be found in the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

ITeH STANDARD PREVIEW
(standards.iteh.ai)

IEC 62137-4:2014

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

ELECTRONICS ASSEMBLY TECHNOLOGY –

Part 4: Endurance test methods for solder joint of area array type package surface mount devices

1 Scope

This part of IEC 62137 specifies the test method for the solder joints of area array type packages mounted on the printed wiring board to evaluate solder joint durability against thermo-mechanical stress.

This part of IEC 62137 applies to the surface mounting semiconductor devices with area array type packages (FBGA, BGA, FLGA and LGA) including peripheral termination type packages (SON and QFN) that are intended to be used in industrial and consumer electrical or electronic equipment.

An acceleration factor for the degradation of the solder joints of the packages by the temperature cycling test due to the thermal stress when mounted, is described Annex A.

Annex H provides some explanations concerning various types of mechanical stress when mounted.

The test method specified in this standard is not intended to evaluate semiconductor devices themselves.

IEC 62137-4:2014

NOTE 1 Mounting conditions, printed wiring boards, soldering materials, and so on, significantly affect the result of the test specified in this standard. Therefore, the test specified in this standard is not regarded as the one to be used to guarantee the mounting reliability of the packages.

NOTE 2 The test method is not necessary, if there is no stress (mechanical or other) to solder joints in field use and handling after mounting.

2 Normative references

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

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60191-6-2, *Mechanical standardization of semiconductor devices – Part 6-2: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guide for 1,50 mm, 1,27 mm and 1,00 mm pitch ball and column terminal packages*

IEC 60191-6-5, *Mechanical standardization of semiconductor devices – Part 6-5: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guide for fine-pitch ball grid array (FBGA)*

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 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 61249-2-8, *Materials for printed boards and other interconnecting structures – Part 2-8: Reinforced base materials clad and unclad – Modified brominated epoxide woven fibreglass reinforced laminated sheets of defined flammability (vertical burning test), copper-clad*

IEC 62137-3:2011, *Electronics assembly technology – Part 3: Selection guidance of environmental and endurance test methods for solder joints*

3 Terms definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60191-6-2, IEC 60191-6-5 and IEC 60194, as well as the following, apply.

3.1.1

temperature cycling life

period of time to reach a lost performance state, as agreed between the trading partners during the temperature cycling test

3.1.2

momentary interruption detector

instrument capable to detect an electrical discontinuity in the daisy chain circuits

Note 1 to entry: See Annex B for the electrical continuity test of solder joint.

3.2 Abbreviations

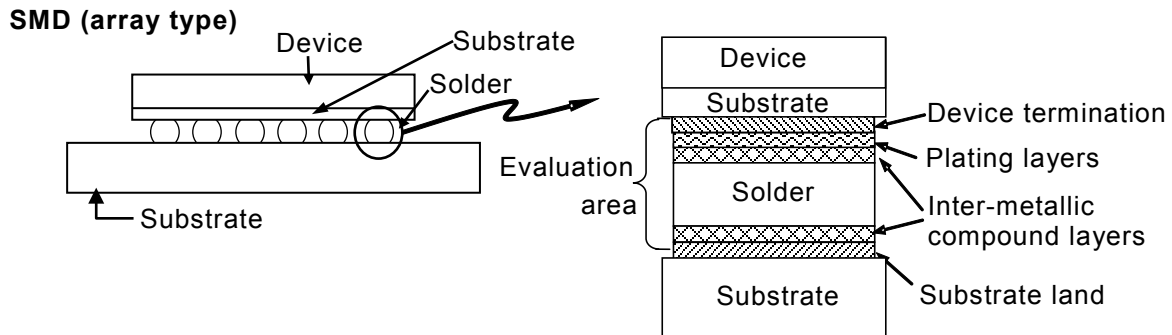
FBGA	Fine-pitch ball grid array
BGA	Ball grid array
FLGA	Fine-pitch land grid array
LGA	Land grid array
SON	Small outline non-leaded package
QFN	Quad flat-pack non-leaded package
SMD	Surface mounting device
OSP	Organic solderability preservative
FR-4	Flame retardant type 4
FEA	Finite element method analysis
CGA	Column grid array

4 General

The regions of the solder joints to be evaluated are shown in Figure 1. The test method in this standard is applicable to evaluate the durability of the solder joints against thermal stress to the package mounted on substrate but not to test the mechanical strength of the package itself.

Therefore, the conditions for accelerated stress conditioning by a temperature cycling test may exceed the maximum allowable temperature range for the package.

The test method specified in this standard is mainly applicable to the solder joint between substrates of printed wiring board and the package as an evaluation target. However, the test results depend on conditions such as the mounting method and the condition, materials and the printed wiring board, etc. See Annex C to Annex G.



IEC

Figure 1 – Region for evaluation of the endurance test

5 Test apparatus and materials

5.1 Specimen

Specimen is the package mounted on the test substrate (refer to Clause 6 for preparation).

5.2 Reflow soldering equipment

The reflow soldering equipment shall be able to realize the reflow soldering temperature profile specified in Clause 6. Examples of temperature profile are shown in Figure 2 and Figure 3.

NOTE A standard mounting process for the package is shown in Annex G.

5.3 Temperature cycling chamber

The temperature cycling chamber shall be able to realize the temperature cycling profile specified in Figure 4. The general requirements for the temperature cycling chamber are specified in IEC 60068-2-14.

5.4 Electrical resistance recorder

The electrical resistance recorder shall be able to detect electrical continuity interruption in the daisy chain circuit. If there is no doubt of the measuring result, an electrical resistance measuring instrument featured with a momentary interruption detector and/or a continuous electrical resistance data logger should be used.

The interruption detector should be sufficiently sensitive to detect a 100 μ s momentary interruption. Furthermore, the electrical resistance measuring instrument should be able to measure a resistance exceeding 1 000 Ω .

5.5 Test substrate

Unless otherwise specified in the product specification, the test substrate shall be as follows.

- a) Test substrate material

Test substrate material shall be a single sided printed wiring board for general use, for example, copper-clad epoxide woven fiberglass reinforced laminated sheets as specified in IEC 61249-2-7 or IEC 61249-2-8. The thickness shall be $(1,6 \pm 0,2)$ mm including copper foil. The copper foil thickness shall be (35 ± 10) μm .

NOTE 1 Heat resistance to reflow soldering for the test substrate is described in Annex E.

b) Test substrate dimensions

The test substrate dimensions depend on the mounted package size and shape. However, the test substrate dimensions shall be fixed on the pull strength test equipment.

c) Land shape and land dimensions

Land shape and land dimensions should be as specified in IEC 61188-5-8 or as recommended by the package manufacturer.

Moreover, the test substrate and the test package shall be designed in such a way that their land pattern forms a daisy chain circuit after mounting for the electrical continuity measurement.

NOTE 2 Annex D provides a test substrate design guide.

NOTE 3 Annex C provides a solderability test for the substrate land. And Annex F provides a strength test for the substrate land.

d) Surface finish of land pattern

If specified in the product specification, a solderable region (land pattern of the test substrate) shall be treated suitably against oxidization, for example, by means of an organic solderability preservative (OSP) layer. The surface protection shall not interfere with the solderability of the land pattern being soldered by using the reflow soldering equipment specified in 5.2. (standards.iteh.ai)

5.6 Solder paste

IEC 62137-4:2014

Solder paste is made of flux, finely divided particles of solder and additives to promote wetting and to control viscosity, tackiness, slumping, drying rate, etc. Unless otherwise specified in the product specification, one of the solder alloys listed below (as specified in IEC 61190-1-3) shall be used. The product specification shall specify details of the solder paste.

The major composition of the solder alloys are as follows:

- a) 63 % mass fraction of Sn (tin) and 37 % mass fraction on Pb (lead);
- b) from 3,0 % to 4,0 % mass fraction of Ag (silver), from 0,5 % to 1,0 % mass fraction of Cu (copper) and the remainder of Sn (tin).

Example: Sn-Ag-Cu ternary alloy such as Sn96,5Ag3Cu,5 alloy is used.

6 Specimen preparation

The package shall be mounted on the test substrate using the following reflow soldering process. The package for the specimen shall be modified as for test dummy package to form a daisy chain circuit with a land pattern of the test substrate after reflow soldering.

NOTE The solderability test to confirm the termination of the package and the test substrate land which affects the solder joint strength is described in Annex C.

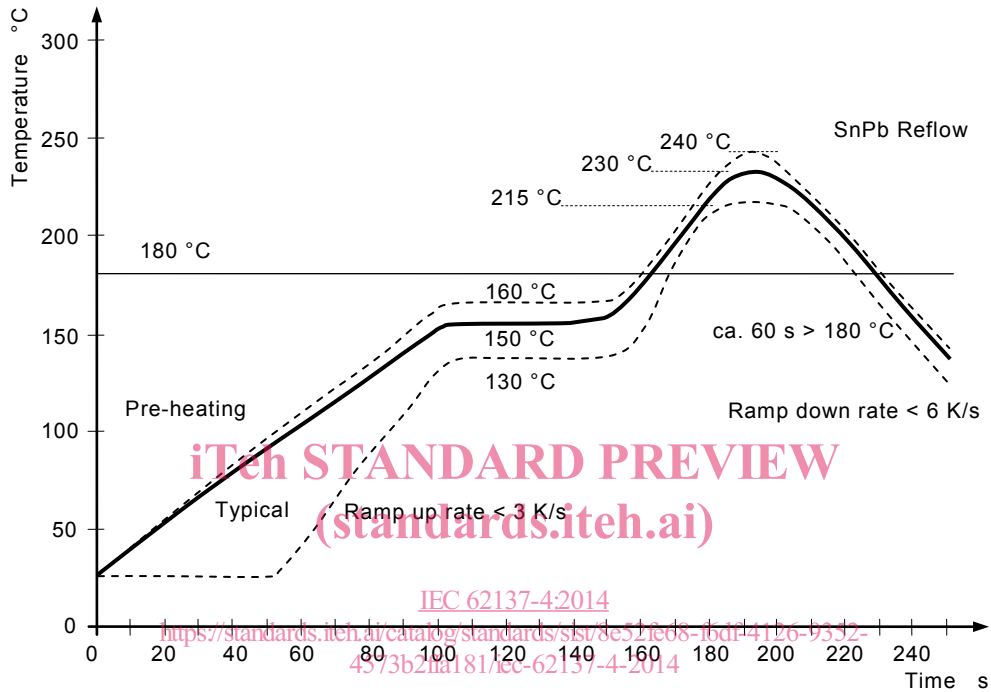
The specimen preparation process and the conditions are as follows.

- a) Unless otherwise specified in the product specification, the solder paste specified in 5.6 shall be printed on the test substrate land specified in 5.5, using a stencil made of stainless steel being $120 \mu\text{m}$ to $150 \mu\text{m}$ thick, and that have the same aperture dimensions as the dimensions, shape and arrangement of the test substrate land.
- b) The package shall be placed onto the printed solder paste.

c) The reflow soldering equipment specified in 5.2 shall be used for soldering the package terminals under the conditions shown in Figure 2 or Figure 3. The measuring point of the temperature shall be on the land portion.

Figure 2 shows an example of a typical reflow soldering profile using Sn63Pb37 solder alloy, as stated in IEC 61760-1:2006, Figure 13.

Figure 3 shows an example of a typical reflow soldering profile using Sn96,5Ag3Cu,5 solder alloy, as stated in IEC 61760-1:2006, Figure 14.

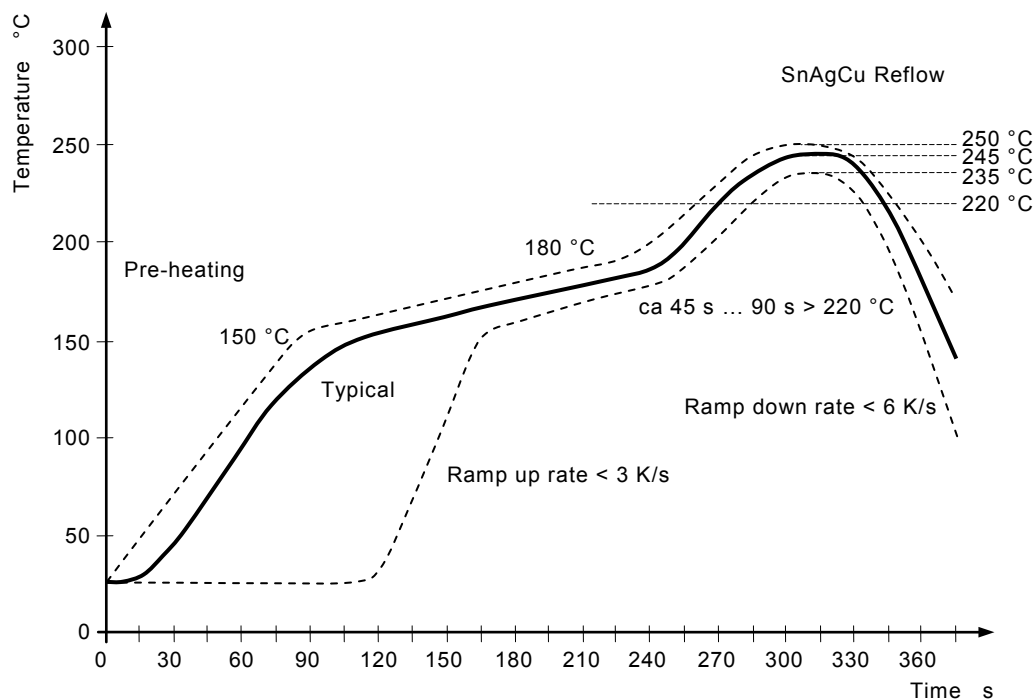


Continuous line: typical process (terminal temperature)

Dotted line: process limits. Bottom process limit (terminal temperature). Upper process limit (top surface temperature)

IEC

Figure 2 – Typical reflow soldering profile for Sn63Pb37 solder alloy



Continuous line: typical process (terminal temperature)

Dotted line: process limits: Bottom process limit (terminal temperature). Upper process limit (top surface temperature)

IEC

Figure 3 – Typical reflow soldering profile for Sn96,5Ag3Cu,5 solder alloy

7 Temperature cycling test

IEC 62137-4:2014

<https://standards.iteh.ai/catalog/standards/sist/8e52fe68-f6df-4126-9352-4573b2ffa181/iec-62137-4-2014>

7.1 Pre-conditioning

If the specimen needs to be cleaned, the product specification should specify the cleaning method.

7.2 Initial measurement

The specimen shall be subjected to visual examination. There shall be no defect, which may impair the validity of the test.

Electrical resistance as electrical continuity of the specimen (daisy chain circuit) shall be confirmed using the momentary interruption detector specified in 5.4.

7.3 Test procedure

The temperature cycling test is according to test Na (rapid change of temperature within the prescribed time of transfer) specified in IEC 60068-2-14 with the following details.

Place the specimen in the temperature cycling chamber where the best airflow is obtained and where there is sufficient airflow around the specimen.

The test condition shall be selected from Figure 4 and Table 1, and the test shall be performed to the specified cycles in the product specification.

The electrical resistance of the daisy chain circuit shall be monitored continuously during the test using the momentary interruption detector specified in 5.4.