



BSI Standards Publication

Test methods for electrical materials, printed boards and other interconnection structures and assemblies

Part 5-601: General test methods for materials and assemblies — Reflow soldering ability test for solder joint, and reflow heat resistance test for printed boards

National foreword

This British Standard is the UK implementation of EN IEC 61189-5-601:2021. It is identical to IEC 61189-5-601:2021.

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 committee manager.

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© The British Standards Institution 2021
Published by BSI Standards Limited 2021

ISBN 978 0 580 96584 5

ICS 19.080; 31.180

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2021.

Amendments/corrigenda issued since publication

Date	Text affected
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English Version

Test methods for electrical materials, printed boards and other
interconnection structures and assemblies - Part 5-601: General
test methods for materials and assemblies - Reflow soldering
ability test for solder joint, and reflow heat resistance test for
printed boards
(IEC 61189-5-601:2021)

Méthodes d'essai pour les matériaux électriques, les cartes
imprimées et autres structures d'interconnexion et
ensembles - Partie 5-601: Méthodes d'essai générales pour
les matériaux et les assemblages - Essai d'aptitude au
brasage par refusion pour un joint brasé, et essai de
résistance à la chaleur de refusion pour les cartes
imprimées
(IEC 61189-5-601:2021)

Prüfverfahren für Elektromaterialien, Leiterplatten und
andere Verbindungsstrukturen und Baugruppen – Teil 5-
601: Allgemeine Prüfverfahren für Materialien und
Baugruppen – Prüfverfahren für die Aufschmelz-Lötfähigkeit
für Lötverbindungen und die Aufschmelz-
Lötwärmebeständigkeit von Leiterplatten
(IEC 61189-5-601:2021)

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 91/1601/CDV, future edition 1 of IEC 61189-5-601, prepared by IEC/TC 91 "Electronics assembly technology" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61189-5-601:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-12-10
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-03-10

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The text of the International Standard IEC 61189-5-601:2021 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 60068-2-58	NOTE	Harmonized as EN 60068-2-58
IEC 60068-2-78	NOTE	Harmonized as EN 60068-2-78
IEC 61188-5-8	NOTE	Harmonized as EN 61188-5-8
IEC 61189-5-3	NOTE	Harmonized as EN 61189-5-3
IEC 61190-1-1	NOTE	Harmonized as EN 61190-1-1
IEC 61190-1-2	NOTE	Harmonized as EN 61190-1-2
IEC 61249 (series)	NOTE	Harmonized as EN 61249 (series)
IEC 61249-2-7	NOTE	Harmonized as EN 61249-2-7
IEC 61249-2-8	NOTE	Harmonized as EN 61249-2-8
IEC 61760-1:2006	NOTE	Harmonized as EN 61760-1:2006 (not modified)
IEC 62137-1-1	NOTE	Harmonized as EN 62137-1-1
IEC 62137-4:2014	NOTE	Harmonized as EN 62137-4:2014 (not modified)

Annex ZA

(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2	series	Environmental testing	EN 60068-2	series
IEC 60068-2-14	-	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	-
IEC 60191-6-2	-	Mechanical standardization of semiconductor devices - Part 6-2: General rules for the preparation of outline drawings of surface mounted semiconductor devices packages - Design guide for 1,50 mm, 1,27 mm and 1,00 mm pitch ball and column terminal packages	EN 60191-6-2	-
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 60191-6-19	-	Mechanical standardization of semiconductor devices - Part 6-19: Measurement methods of the package warpage at elevated temperature and the maximum permissible warpage	EN 60191-6-19	-
IEC 60194-1 ¹	-	Printed boards design, manufacture and assembly - Vocabulary - Part 1: Common usage in printed board and electronic assembly technologies	-	-

¹ Under preparation. Stage at the time of publication: IEC/FDIS 60194-1:2020.

EN IEC 61189-5-601:2021 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60194-2	-	Printed boards design, manufacture and assembly - Vocabulary - Part 2: Common usage in electronic technologies as well as printed board and electronic assembly technologies	-	-
IEC 61190-1-3	-	Attachment materials for electronic assembly - Part 1-3: Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solder for electronic soldering applications	EN IEC 61190-1-3	-
IEC 62137-3	-	Electronics assembly technology - Part 3: Selection guidance of environmental and endurance test methods for solder joints	EN 62137-3	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TEST METHODS FOR ELECTRICAL MATERIALS, PRINTED BOARDS
AND OTHER INTERCONNECTION STRUCTURES AND ASSEMBLIES –****Part 5-601: General test methods for materials and assemblies –
Reflow soldering ability test for solder joint, and reflow heat
resistance test for printed boards**

FOREWORD

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IEC 61189-5-601 has been prepared by IEC technical committee 91: Electronics assembly technology. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
91/1601/CDV	91/1674/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 61189 series, published under the general title *Test methods for electrical materials, printed boards and other interconnection structures and assemblies*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

TEST METHODS FOR ELECTRICAL MATERIALS, PRINTED BOARDS AND OTHER INTERCONNECTION STRUCTURES AND ASSEMBLIES –

Part 5-601: General test methods for materials and assemblies – Reflow soldering ability test for solder joint, and reflow heat resistance test for printed boards

1 Scope

This part of IEC 61189 specifies the reflow soldering ability test method for components mounted on organic rigid printed boards, the reflow heat resistance test method for organic rigid printed boards, and the reflow soldering ability test method for the lands of organic rigid printed boards in applications using solder alloys, which are eutectic or near-eutectic tin-lead (Pb), or lead-free alloys.

The printed boards materials for this organic rigid printed boards are epoxide woven E-glass laminated sheets that are specified in IEC 61249-2 (all parts).

The objective of this document is to ensure the soldering ability of the solder joint and of the lands of the printed boards. In addition, test methods are provided to ensure that the printed boards can resist the heat load to which they are exposed during soldering.

This document covers tests Tg_1 , Tg_2 , Tg_3 , Tg_4 , Tg_5 , and Tg_6 listed in Table 1:

Table 1 – Test items defined in this document

Number of test method	Test	Method
Tg_1	Solder joint initial quality after reflow	Reflow
Tg_2	Warping of component and printed boards in reflow process	
Tg_3	Resistance to soldering heat of printed boards	
Tg_4	Wetting and dewetting of printed board land	
Tg_5	Resistance to dissolution of printed board land	
Tg_6	Pull strength of the test substrate land	

NOTE The test methods do not apply to the solder bath method.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2 (all parts), *Environmental testing*

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 devices 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 60191-6-19, *Mechanical standardization of semiconductor devices – Part 6-19: Measurement methods of the package warpage at elevated temperature and the maximum permissible warpage*

IEC 60194-1¹, *Printed boards design, manufacture and assembly – Vocabulary – Part 1: Common usage in printed board and electronic assembly technologies*

IEC 60194-2, *Printed boards design, manufacture and assembly – Vocabulary – Part 2: Common usage in electronic technologies as well as printed board and electronic assembly technologies*

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60191-6-2, IEC 60191-6-5, IEC 60194-1 and IEC 60194-2, as well as the following, apply.

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

solderability

ability of the lead or termination of a component or electrode of a component or printed board to be wetted by solder at the temperature of the lead, termination or electrode, which is assumed to be the lowest temperature in the soldering process, within the applicable temperature range of the solder alloy

Note 1 to entry: The term "solderability" is often used in combination with the term "test", indicating a specific method to evaluate the wettability or ability to be soldered of a surface under worst case conditions (soldering temperature and contact time with solder). It is not to be confused with the concepts "soldering ability" (see 3.3).

3.2

wettability

intrinsic property of the termination material to form an alloy with the solder

¹ Under preparation. Stage at the time of publication: IEC/FDIS 60194-1:2020.