

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Printed board assemblies –
Part 2: Sectional specification – Requirements for surface mount soldered
assemblies**

**Ensembles de cartes imprimées –
Partie 2: Spécification intermédiaire – Exigences relatives à l'assemblage par
brasage pour montage en surface**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2017 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
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.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 once a month by email.

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: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 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.

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.

Recherche de publications IEC - webstore.iec.ch/advsearchform

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 une fois par mois par email.

Service Clients - webstore.iec.ch/csc

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

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 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.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Printed board assemblies –
Part 2: Sectional specification – Requirements for surface mount soldered
assemblies**

**Ensembles de cartes imprimées –
Partie 2: Spécification intermédiaire - Exigences relatives à l'assemblage par
brasage pour montage en surface**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.190; 31.240

ISBN 978-2-8322-7400-2

**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

CONTENTS	2
FOREWORD	5
1 Scope	7
2 Normative references	7
3 Terms and definitions	7
4 General requirements	7
5 Surface mounting of components	7
5.1 General	7
5.2 Alignment requirements	7
5.3 Process control	8
5.4 Surface mounted component requirements	8
5.5 Flatpack lead forming	8
5.5.1 General	8
5.5.2 Surface mounted device lead bends	8
5.5.3 Surface mounted device lead deformation	9
5.5.4 Flattened leads	9
5.5.5 Dual-in-line packages (DIPs)	9
5.5.6 Parts not configured for surface mounting	9
5.6 Small devices with two terminations	9
5.6.1 General	9
5.6.2 Stack mounting	9
5.6.3 Devices with external deposited elements	9
5.7 Lead component body positioning	10
5.7.1 General	10
5.7.2 Axial-leaded components	10
5.7.3 Other components	10
5.8 Parts configured for butt lead mounting	10
5.9 Non-conductive adhesive coverage limits	10
6 Acceptance requirements	10
6.1 General	10
6.2 Control and corrective actions	10
6.3 Surface soldering of leads and terminations	11
6.3.1 General	11
6.3.2 Solder fillet height and heel fillets	11
6.3.3 Flat ribbon L and gull-wing leads	12
6.3.4 Round or flattened (coined) leads	13
6.3.5 J leads	14
6.3.6 Rectangular or square end component	15
6.3.7 Cylindrical end-cap terminations	16
6.3.8 Bottom only terminations	17
6.3.9 Castellated terminations	18
6.3.10 Butt joints	19
6.3.11 Inward L-shaped ribbon leads	20
6.3.12 Flat lug leads	21
6.3.13 Ball grid array	22
6.3.14 Column grid array	23

6.3.15	Bottom termination components.....	24
6.3.16	Components with bottom thermal plane terminations (D-Pak)	24
6.3.17	P-style terminations	26
6.4	General post-soldering requirements applicable to all surface-mounted assemblies.....	26
6.4.1	Dewetting	26
6.4.2	Leaching.....	26
6.4.3	Pits, voids, blowholes, and cavities.....	26
6.4.4	Solder wicking	27
6.4.5	Solder webs and skins	27
6.4.6	Bridging.....	27
6.4.7	Degradation of marking	27
6.4.8	Solder spikes.....	27
6.4.9	Disturbed joint	27
6.4.10	Component damage.....	27
6.4.11	Open circuit, non-wetting	27
6.4.12	Component tilting.....	27
6.4.13	Non-conducting adhesive encroachment.....	28
6.4.14	Open circuit, no solder available	28
6.4.15	Component on edge	28
7	Rework and repair	28
Annex A	(normative) Placement requirements for surface mounted devices	30
A.1	General.....	30
A.2	Component positioning	30
A.3	Small devices incorporating two terminations.....	30
A.3.1	Metallization coverage over the land (side-to-side)	30
A.3.2	Metallization coverage over the land (end).....	30
A.4	Mounting of cylindrical end-cap devices (MELFs).....	30
A.5	Registration of castellated chip carriers	30
A.6	Surface mounted device lead and land contact	30
A.7	Surface mounted device lead side overhang	30
A.8	Surface mounted device lead toe overhang.....	31
A.9	Surface mounted device lead height off land (prior to soldering)	31
A.10	Positioning of J lead devices.....	31
A.11	Positioning of gull-wing lead devices.....	31
A.12	External connections to packaging and interconnect structures.....	31
Bibliography	32
Figure 1	Lead formation for surface mounted device	8
Figure 2	– Fillet height	12
Figure 3	– Flat ribbon and gull-wing leads.....	13
Figure 4	– Round or flattened (coined) lead joint.....	14
Figure 5	– J lead joint	15
Figure 6	– Rectangular or square end components	16
Figure 7	– Cylindrical end-cap terminations	17
Figure 8	– Bottom only terminations	18
Figure 9	– Leadless chip carriers with castellated terminations	19

Figure 10 – Butt joints	20
Figure 11 – Inward L-shaped ribbon leads	21
Figure 12 – Flat lug leads	22
Figure 13 – BGA with collapsing balls	23
Figure 14 – Bottom termination components	24
Figure 15 – Bottom thermal plane terminations	25
Figure 16 – P-style terminations	26
Table 1 – BGA with non-collapsing balls	23
Table 2 – Column grid array.....	23
Table 3 – Reworkable defects.....	29

Currently in preview, click buy full version

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRINTED BOARD ASSEMBLIES –**Part 2: Sectional specification –
Requirements for surface mount soldered assemblies**

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.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, accept 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 61191-2 has been prepared by IEC technical committee 91: Electronics assembly technology.

This bilingual version (2019-09) corresponds to the monolingual English version, published in 2017-05.

This third edition cancels and replaces the second edition published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the requirements have been updated to be compliant with the acceptance criteria in IPC-A-610F;
- b) some of the terminology used in the document has been updated;

- c) references to IEC standards have been corrected;
- d) five termination styles have been added.

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

CDV	Report on voting
91/1386/CDV	91/1429/RVC

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

The French version of this standard has not been voted upon.

This document has been drafted in accordance with the ISO/IEC Directives, Part 1.

A list of all parts of IEC 61191 under the general title *Printed board assemblies* can be found in 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.

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 content. Users should therefore print this document using a colour printer.

PRINTED BOARD ASSEMBLIES –

Part 2: Sectional specification – Requirements for surface mount soldered assemblies

1 Scope

This part of IEC 61191 gives the requirements for surface mount solder connections. The requirements pertain to those assemblies that are totally surface mounted or to the surface mounted portions of those assemblies that include other related technologies (e.g. through-hole, chip mounting, terminal mounting, etc.).

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

IEC 61191-1, *Printed board assemblies – Part 1: Generic specification – Requirements for soldered electrical and electronic assemblies using surface mount and related assembly technologies*

IPC-A-610, *Acceptability of Electronic Assemblies*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60194 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>

4 General requirements

The requirements of IEC 61191-1 are a mandatory part of this specification.

Workmanship shall meet the requirements of IPC-A-610 in accordance with the classification requirements of this document.

5 Surface mounting of components

5.1 General

This clause covers assembly of components that are placed on the surface to be manually or machine soldered and includes components designed for surface mounting as well as through-hole components that have been adapted for surface mounting technology.