

**Printed board assemblies - Part 6: Evaluation criteria for  
voids in soldered joints of BGA and LGA and  
measurement method**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61191-6:2010 sisaldab Euroopa standardi EN 61191-6:2 ingliskeelset teksti.

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**Printed board assemblies -  
Part 6: Evaluation criteria for voids in soldered joints of BGA and LGA  
and measurement method  
(IEC 61191-6:2010)**

Ensembles de cartes imprimées -  
Partie 6: Critères d'évaluation des vides  
dans les joints brasés des boîtiers BGA  
et LGA et méthode de mesure  
(CEI 61191-6:2010)

Elektronikaufbauten auf Leiterplatten -  
Teil 6: Bewertungskriterien für Hohlräume  
in Lötverbindungen von BGA und LGA  
und Messmethode  
(IEC 61191-6:2010)

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## Foreword

The text of document 91/897/FDIS, future edition 1 of IEC 61191-6, prepared by IEC TC 91, Electronics assembly technology, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61191-6 on 2010-04-01.

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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) 2011-01-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2013-04-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 61191-6:2010 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 61190-1-3:2007 NOTE Harmonized as EN 61190-1-3:2007 (not modified).

IEC 61191-1 NOTE Harmonized as EN 61191-1

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## 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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-1	1988	Environmental testing -	EN 60068-1 <sup>1)</sup>	1994
+ A1	1992	Part 1: General and guidance	-	-
IEC 60194	2006	Printed board design, manufacture and assembly - Terms and definitions	EN 60194	2006

<sup>1)</sup> EN 60068-1 includes A1 to IEC 60068-1 + corr. October .

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## INTRODUCTION

The necessity for the evaluation of voids in soldered joints increases in the industry because the voids may affect the reliability of joints as the devices get smaller. As the number of interconnections increases the reliability per joint must also increase.

This subject has been discussed in some countries and trade organizations, and specific proposals have been made for classification or evaluation of voids to develop process guidelines. The same subject is also studied in academia to find correlation between voids and reliability of a joint. Appreciable findings are now available from the reliability study including relation between shapes of voids and degradation of life due to voids in a joint in thermal cycle stress.

Based on the information available, we developed evaluation criteria of voids in soldered joints for BGA (Ball Grid Array) and LGA (Land Grid Array) and a measurement method.



## PRINTED BOARD ASSEMBLIES –

### Part 6: Evaluation criteria for voids in soldered joints of BGA and LGA and measurement method

#### 1 Scope

This part of IEC 61191 specifies the evaluation criteria for voids on the scale of the thermal cycle life, and the measurement method of voids using X-ray observation. This part of IEC 61191 is applicable to the voids generated in the solder joints of BGA and LGA soldered on a board. This part of IEC 61191 is not applicable to the BGA package itself before it is assembled on a board.

This standard is applicable also to devices having joints made by melt and re-solidification, such as flip chip devices and multi-chip modules, in addition to BGA and LGA. This standard is not applicable to joints with under-fill between a device and a board, or to solder joints within a device package.

This standard is applicable to macrovoids of the sizes of from 10  $\mu\text{m}$  to several hundred micrometres generated in a soldered joint, but is not applicable to smaller voids (typically, planar microvoids) with a size of smaller than 10  $\mu\text{m}$  in diameter.

This standard is intended for evaluation purposes and is applicable to

- research studies,
- off-line production process control and
- reliability assessment of assembly

#### 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 60068-1:1998, *Environmental testing – Part 1: General and guidance*  
Amendment 1:1992

IEC 60194:2006, *Printed board design, manufacture and assembly – Terms and definitions*

#### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60194 and the following apply. The terms and definitions for BGA and LGA have been added for the benefit of the reader, see also IEC 60194.

##### 3.1

##### **ball grid array**

##### **BGA**

surface mount package wherein the bumps for terminations are formed in a grid on the bottom of a package

[IEC 60194, definition 34.1096]