IEC 60191-6-12

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Mechanical standardization of semiconductor devices –
Part 6-12: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guidelines for fine-pitch land grid array (FLGA)

Normalisation mécanique des dispositifs à semiconducteurs –
Partie 6-12: Règles générales pour la préparation des dessins d'encombrement des boîtiers des dispositifs à semiconducteurs à montage en surface – Lignes directrices de conception pour les boîtiers matriciels à plots et à pas fins (FLGA)

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International Standard IEC 60191-6-12 has been prepared by subcommittee 47D: Mechanical standardization of semiconductor devices, of IEC technical committee 47: Semiconductor devices.

This second edition of IEC 60191-6-12 cancels and replaces the first edition, published in 2002 and constitutes a technical revision. This edition includes the following significant changes with respect to the previous edition:

a) scope is expanded so that this standard include the square type FLGA. The title of this standard has been changed accordingly: "Rectangular type" has been deleted from the title.
b) ball pitch of 0,3 mm has been added;
c) datum is changed from the body datum to the ball datum;
d) combination lists of D, E, M_D, and M_E have been revised.

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

CDV	Report on voting
47D/784/CDV	47D/795/RVC

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 the parts in the IEC 60191 series, under the general title *Mechanical standardization of semiconductor devices*, can be found on the IEC website.

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- withdrawn,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.

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.

MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 6-12: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guidelines for fine-pitch land grid array (FLGA)

1 Scope

This part of IEC 60191 provides standard outline drawings, dimensions, and recommended variations for all fine-pitch land grid array packages (FLGA) with terminal pitch of 0,8 mm or less.

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 60191(all parts), *Mechanical standardization of semiconductor devices*

IEC 60191-6, *Mechanical standardization of semiconductor devices – Part 6: General rules for the preparation of outline drawings of surface mounted semiconductor device packages*

3 Terms and definitions

For the purposes of this document, the terms and definitions given IEC 60191 series and the following apply.

3.1
fine-pitch land grid array
FLGA
package with metal lands on one side of a substrate in a matrix of at least three rows and three columns on a pitch of 0,8 mm or less, wherein the maximum standoff height is 0,10 mm or less

NOTE Terminals may be missing from some row-column intersections.

3.2
flange-type FLGA
FLGA with a package outline (length, width) defined by a package flange part, mostly substrate, extending outward beyond the perimeter of a molded part or of a flip-chip-bonded part

NOTE Flange-type FLGA, shown in Figure 1, is generally cut by singulation press, thus resulting in larger dimensional errors than the singulation by dicing saw

IEC 1163/11

Figure 1 – Flange-type FLGA

3.3
rectangle-type FLGA
FLGA with a package outline (length, width) defined by a molded part with no extending flange part

NOTE Rectangle-type FLGA, shown in Figure 2, is generally cut by dicing, thus resulting in less dimensional errors than the singulation by press machine.

IEC 1164/11

Figure 2 – Rectangle-type FLGA

4 Terminal position numbering

When a package is viewed from the terminal side with the index corner in the bottom left corner position, terminal rows are lettered from bottom to top starting with A, then B, C,,,, AA, AB, *etc,,* whereas terminal columns are numbered from left to right starting with 1. Terminal positions are designated by a row-column grid system and shown as alphanumeric identification, e.g., A1, B1.

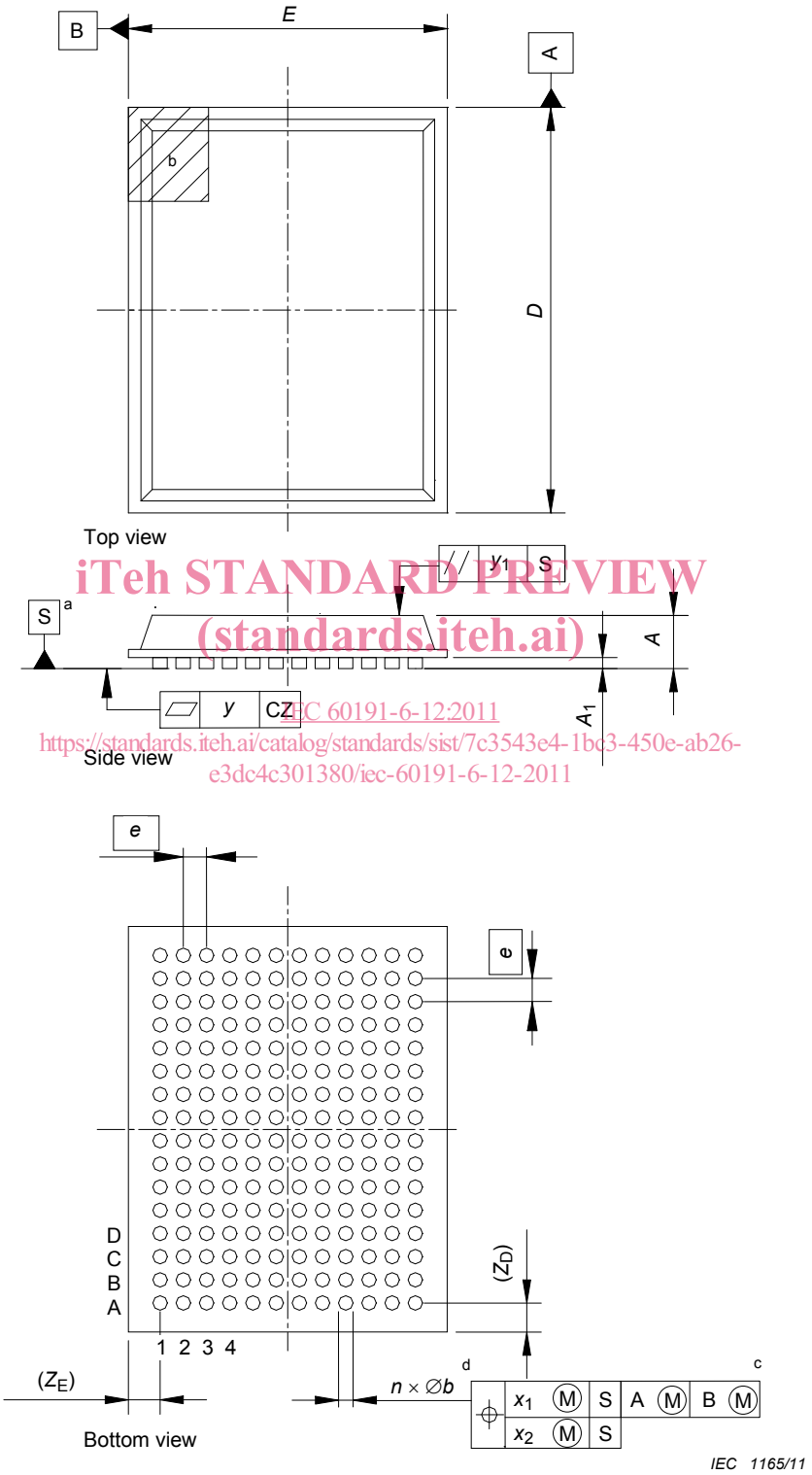
The letters I, O, Q, S, X and Z shall not be used for naming the terminal rows.

5 Nominal package dimension

A nominal package dimension is defined as “the package width (*E*) × length (*D*)”, which is expressed in the tenths place in millimeter.

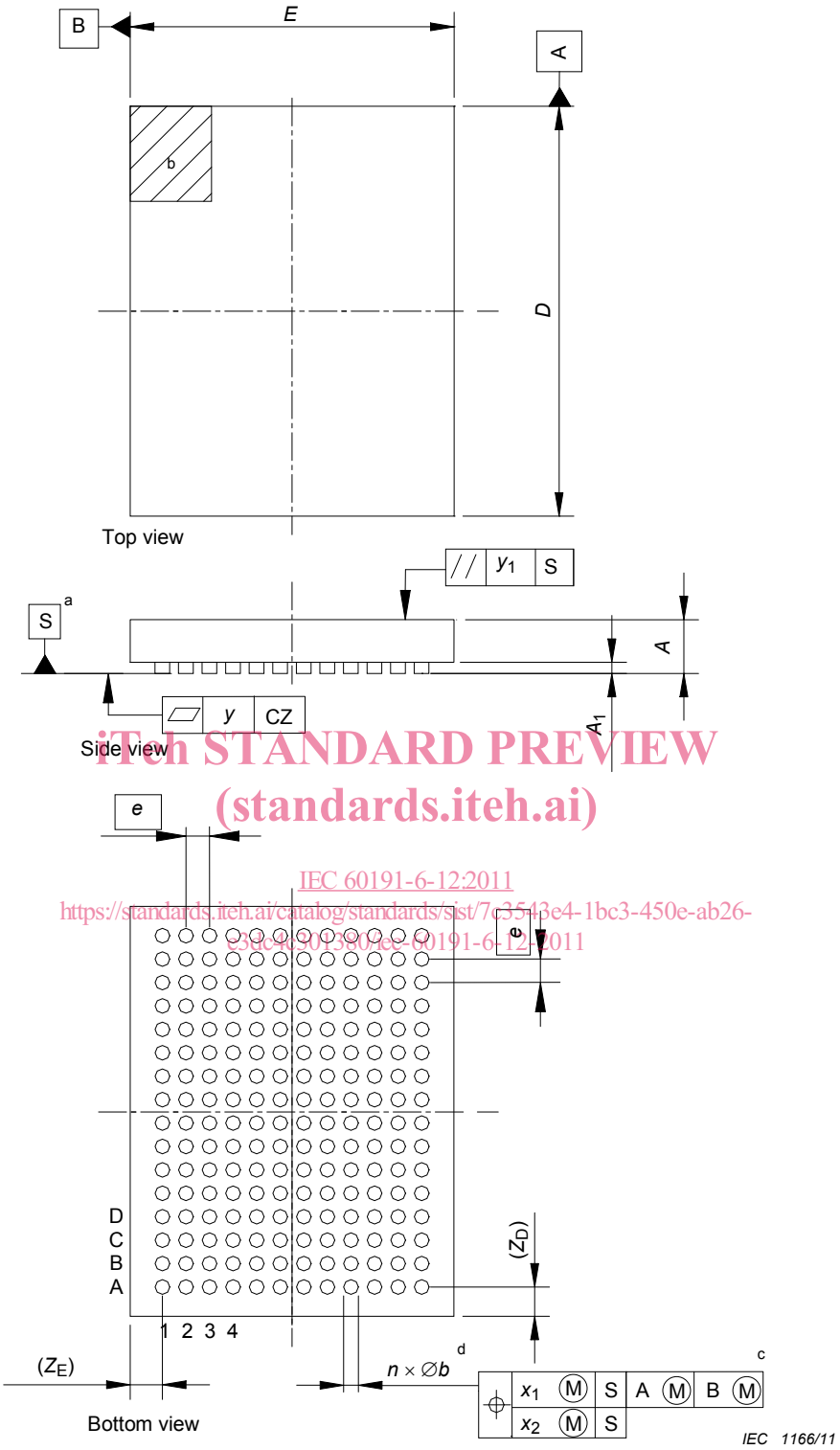
6 Outline drawings and principle dimensions

The FLGA outline is shown in Figures 3 and 4.



NOTE For footnotes relating to this figure, see Figure 4.

Figure 3 – Flange-type FLGA



NOTES relating to Figures 3 and 4:

[a] Datum S is defined as the seating plane on which a package free stands by contact of the balls.

[b] The hatched zone is an index-marking area, where whole index mark will be basically contained in 1/16 of the body size, In case it is physically difficult, index mark can extend more than 1/16 but no more than a quarter of the body size.

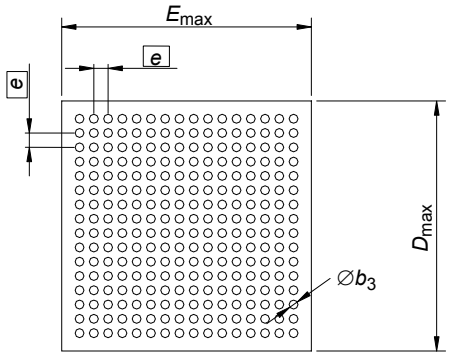
[c] True positional tolerances of terminals, x_1 and x_2, are applied to all terminals.

[d] The terminal diameter b is the maximum diameter of individual balls as measured in the plane parallel to the seating plane.

[e] An array of terminal-existence areas with regard to the datum S, A, and B is shown in the mechanical gauge drawing in Figure 5.

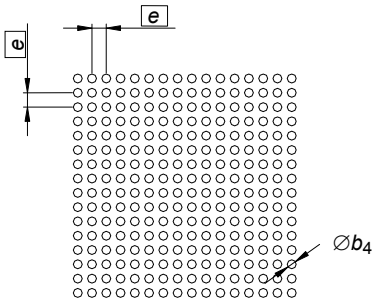
[f] The array of terminal-existence areas with regard to the datum S is shown in Figure 6.

Figure 4 – Rectangle-type FLGA



IEC 1167/11

Figure 5 – Mechanical gauge drawing [e]



IEC 1168/11

Figure 6 – Pattern of terminal position area [f]

NOTE The symbols in this figure are explained in IEC 60191-6.

7 Dimensions

Table 1 – Group 1: Dimensions appropriate to mounting and interchangeability

Dimensions in millimeters

Term	Symbol	Specification	Recommended value
Package nominal dimension	*E* x *D*	A package nominal dimension is defined as "the package width (*E*) x length (D), which is expressed in the tenths place in millimeter.	-
Package length	*D*	(1) Range of D_{nom}: from 1,5 to 21,0 (2) Interval of D_{nom} For square FLGA with $D_{nom} \geq 15,0$, D_{nom} is an integer. For other FLGA, the number in the tenths place of D_{nom} is either 0 or 5. (3) Tolerance of *D* For Flange-type: When $D_{nom} \leq 21,0$, $v_D = \pm 0,15$ When $D_{nom} > 21,0$, $v_D = \pm 0,20$ where v_D denotes a tolerance. For Rectangle-type: When $D_{nom} \leq 12,0$, $v_D = \pm 0,08$ When $12,0 < D_{nom} \leq 21,0$, $v_D = \pm 0,10$ When $D_{nom} > 21,0$, $v_D = \pm 0,15$ where v_D denotes a tolerance.	-

Table 1 *(continued)*

Dimensions in millimeters

Term	Symbol	Specification	Recommended value
Package width	*E*	(1) Range of E_{nom}: from 1,5 to 21,0 (2) Interval of E_{nom} For square FLGA with $E_{nom} \geq 15,0$, E_{nom} is an integer. For other FLGA, the number in the tenths place of E_{nom} is either 0 or 5. (3) Tolerance of "*E*" For flange-type: When $E_{nom} \leq 21,0$, $v_E = \pm 0,15$ When $E_{nom} > 21,0$, $v_E = \pm 0,20$ where v_E denotes a tolerance. For rectangle-type: When $E_{nom} \leq 12,0$, $v_E = \pm 0,08$ When $12,0 < E_{nom} \leq 21,0$, $v_E = \pm 0,10$ When $E_{nom} > 21,0$, $v_E = \pm 0,15$ where v_E denotes a tolerance.	-
Maximum profile height	*A*	*A* = 0,30 0,40 0,50 0,65 0,80 1,00 1,20 1,70 2,00 "*A*" includes heat slug thickness, package warpage, and tilt errors.	-
Stand-off height	A_1	$A_1 \text{max} \leq 0,10$	-
Terminal grid pitch	*e*	*e* = 0,80 0,65 0,50 0,40 0,30	-