INTERNATIONAL STANDARD

IEC 60191-6-13

First edition
2007-06

Mechanical standardization of semiconductor devices –

Part 6-13: Design guideline of open-top-type sockets for Fine-pitch Ball Grid Array and Fine-pitch Land Grid Array (FBGA/FLGA)

Reference number
IEC 60191-6-13:2007(E)

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 6-13: Design guideline of open-top-type sockets for Fine-pitch Ball Grid Array and Fine-pitch Land Grid Array (FBGA/FLGA)

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

FDIS	Report on voting
47D/681/FDIS	47D/692/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 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 maintenance result 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- withdrawn,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
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A bilingual version of this publication may be issued at a later date.

MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 6-13: Design guideline of open-top-type sockets for Fine-pitch Ball Grid Array and Fine-pitch Land Grid Array (FBGA/FLGA)

1 Scope

This part of IEC 60191 gives a design guideline of open-top-type semiconductor sockets for Fine-pitch Ball Grid Array ("FBGA" hereafter) and Fine-pitch Land Grid Array ("FLGA" hereafter). This standard is intended to establish the outline drawings and dimensions of the open-top-type socket out of the test and burn-in sockets applied to FBGA and FLGA.

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 60191-2, *Mechanical standardization of semiconductor devices – Part 2: Dimensions*

IEC 60191-6:2004, *Mechanical standardization of semiconductor devices – Part 6: General rules for the preparation of outline drawings of surface mounted semiconductor device packages*

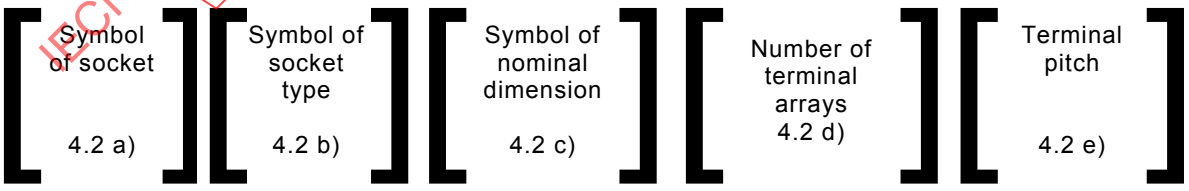
3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60191-6 apply.

4 Socket code

4.1 Construction of socket code

A socket code is constructed as follows.



Example **SFB** **TX** **2120AB** **1616** **080**

4.2 Symbols

a) Semiconductor sockets symbol

The symbol for socket shall be expressed in 3 characters. The first character, "**S**", refers to socket and the rest to the package code. FBGA shall be expressed as "**FB**", FLGA shall be expressed as "**FL**".

b) Socket type symbol

The symbol for socket type shall be expressed in 2 characters. The first character "**T**" refers to open top type and the rest remains option "**X**". Clamshell type socket is referred to as "**C**".

c) Socket nominal dimension symbol

The symbol for nominal dimension shall be expressed in 6 characters, which are 4 numeric characters and 2 alphabetical characters. The first 4 numeric characters comply with nominal dimension E x D which refers to applicable maximum width and length of FBGA/FLGA package.

The last 2 alphabetical characters refer to socket base matrix size either an even or an odd.

It refers to an odd contact row by "**A**" and an even contact row by "**B**" in order socket width direction and next socket length direction.

Namely, it refers to "**AA**" in case row number is an odd both for width and length direction, "**BB**" in case row number is an even both for width and length direction, "**AB**" in case row number is an odd at width direction and an even at length direction and "**BA**" in case row number is an even at width direction and an odd at length direction.

d) Number of terminal arrays

The symbol for number of terminal arrays shall be expressed by 4 numeric characters applying applicable package matrix size in E direction and D direction.

e) Terminal pitch

The symbol for terminal pitch of applicable package shall be expressed in 3 numeric characters. A decimal [.] is omitted.

5 Terminal number

The terminal number is provided in the following manner when the socket is viewed with the angle from topside. The horizontal row nearest to the index corner when the index is placed on the left topside is referred to as A.

As the row moves down, the number changes in the order of B, C, ……. AA, AB.

1 is defined for the vertical row nearest to the index corner. As the row moves rightward, the number is increased 2, 3, …… The terminal number is combined with these alphabets and numbers and expressed as A1 or B1. I, O, Q, S, X and Z are not used as symbols for a horizontal row.

6 Socket nominal dimension

The applicable package length and width which extend from 1,50 mm to 21,0 mm by 0,50 mm increments are divided into 4 package groups. The socket nominal dimension is defined by the largest value of the package length or width in each socket group.

In consideration of a specific need for minimum socket outline size, the socket nominal dimension with 1,0 mm increments can be specified as an exception. Package length and width of 5,00 mm or less is unified in one socket nominal dimension.

7 Socket length and width

Socket length and width are categorized into 4 groups, from group 1 to group 4, to cover the difference of its terminal count and mechanism.

In socket group 1, 2 and 3, only square socket outline is allowed. Socket length and width are determined by the nominal dimension value plus 36,0 mm, 24,0 mm and 12,0 mm respectively.

In socket group 4, square and rectangular socket outlines are allowed. Socket length and width are determined by the nominal dimension value plus 8,0 mm independently in each sides.

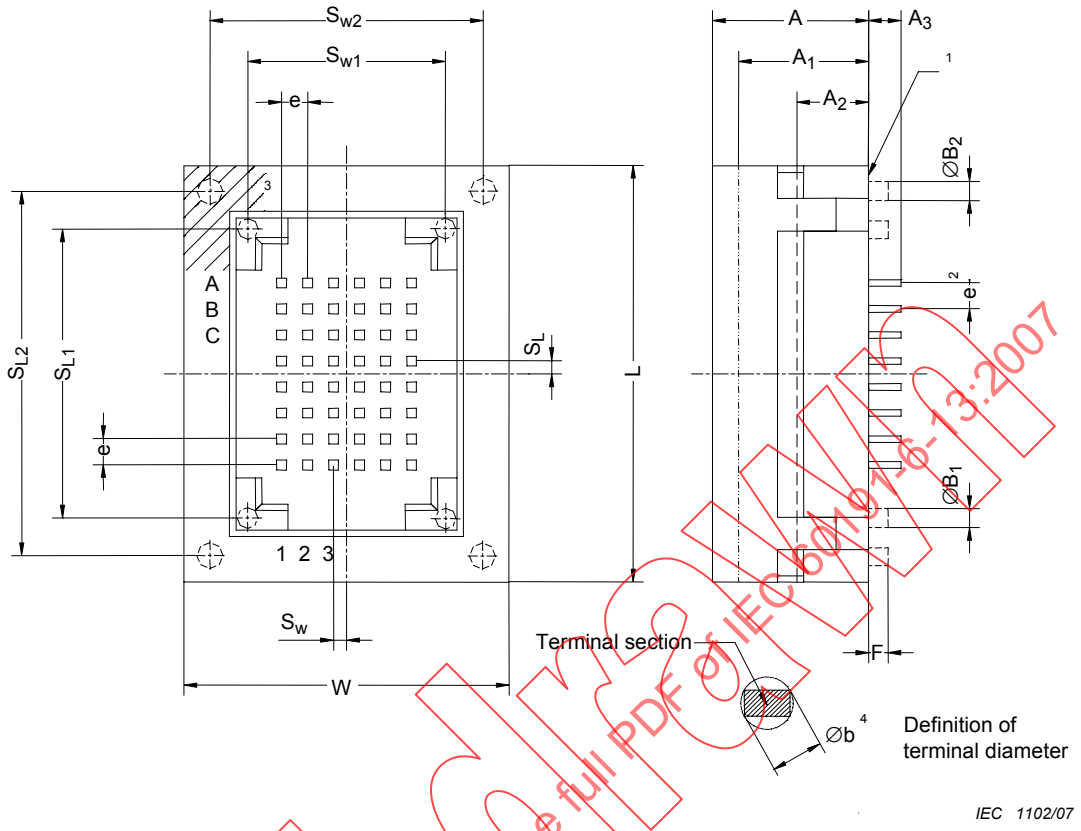
Socket group 1 aims for high terminal count package or FLGA socket which requires complicated socket structure. Socket group 2 and 3 are for the socket currently available. Socket group 4 is for the socket which is required to have the smallest possible outline such as for Memory IC.

Socket group number	Allowed socket outline	To determine socket length and width, the following values are added to the socket nominal dimension
Group 1	Square	36 mm
Group 2	Square	24 mm
Group 3	Square	12 mm
Group 4	Square or rectangular	8 mm

8 Reference symbols and schematics

8.1 Outline drawings

Outline drawings of the socket are shown in Figure 1 and the applicable package outline is in Figure 2. The overall dimensions are in Table 1. Socket dimensions are given in Table 2.



([1]) Indicates mounting plane. Mounting plane is defined by the plane where the socket contacts its mounting surface.

([2]) Stipulates true geometric position of the terminals.

([3]) Indicates positional tolerance of the index mark. Index mark should be completely within the shaded area.

([4]) Terminal diameter is defined as the maximum diameter of a circle circumscribed about a vertical projection of the terminal from the mounting plane.

Figure 1 – Outline drawings of the socket

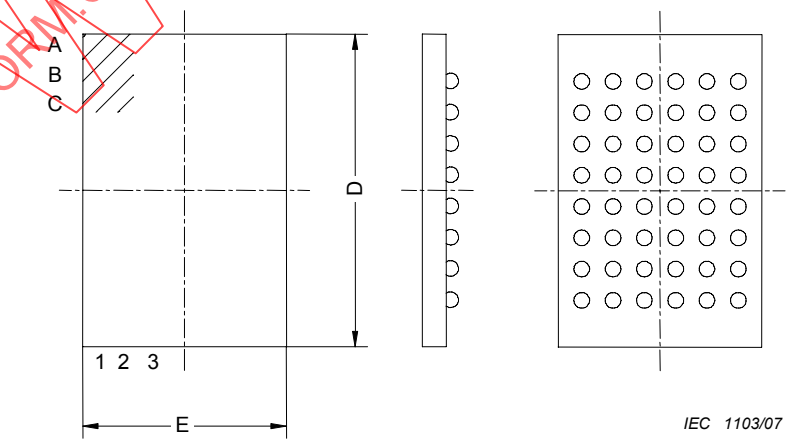


Figure 2 – Applicable package outline

8.2 Reference symbols and schematics of recommended socket mounting pattern on printed circuit board

The drawing of the recommended socket mounting pattern on a printed circuit board is shown in Figure 3 for reference in printed circuit board designing. See Table 3 for recommended dimensions.

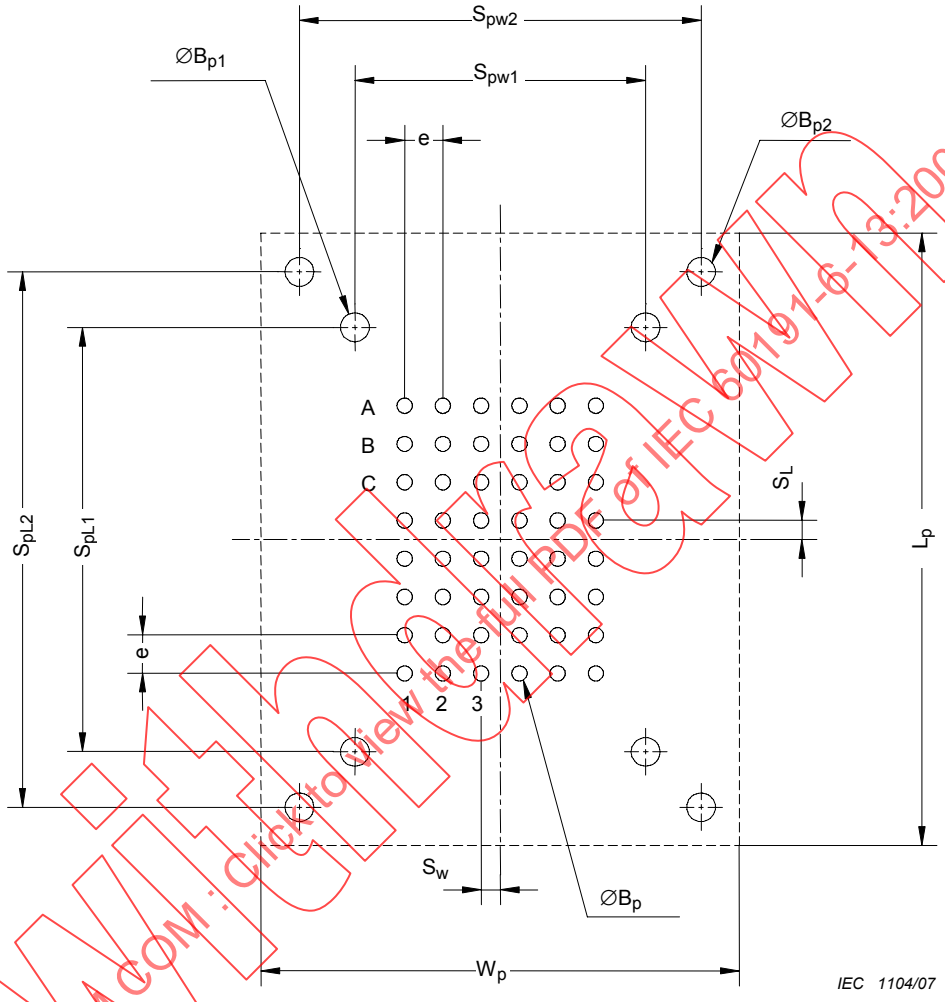


Figure 3 – Socket mounting pattern

8.3 Overall dimensions

Table 1 – Overall dimensions

Name	Reference symbol	Stipulations mm	Recommended value mm	Supplement
Socket nominal dimension	**E × D**	This value is based on the nominal dimensions of conformable FBGA and FLGA to the socket.	–	Table 2
Socket length	**L**	Socket length: L nominal defined. L = W (group 4 is exception.)	–	Table 2
Socket width	**W**	Socket width: W nominal defined W = L (group 4 is exception.)	–	Table 2
Socket height	**A**	A max = 22,0	–	
End stroke height	**A_1**	A_1 max = 16,0	14,0 13,5	
Seating plane Height	**A_2**	A_2 max = 14,0	9,7 8,2	
Terminal pitch	**e**	e = 0,80 e = 0,65 e = 0,50 e = 0,40	–	
Terminal length	**A_3**	A_3 = 0,7 to 6,3	–	
Terminal diameter	**Øb**	Maximum distance of the terminal cross-section e / Øb max 0,80 / 0,28 0,65 / 0,21 0,50 / 0,20 0,40 / 0,19	–	
Number of alignment pin (inside)	**n_1**	n_1= 0, 2, 3, 4 (either one to be selected)	–	
Number of alignment pin (outside)	**n_2**	n_2 = 0, 2, 3, 4 (either one to be selected)	–	
Alignment pin length	**F**	F_{min} = 1,0	–	
Distance between alignment pin in L-direction (inside)	**S_{L1}**	Group 1, 2, 3 = Socket nominal dimension plus 5,0 Group 4 = No pin exist	–	Table 2
Distance between alignment pin in W-direction (inside)	**S_{W1}**	Group 1, 2, 3 = Socket nominal dimension plus 5,0 Group 4 = No pin exist	–	Table 2

Table 1 *(continued)*

Name	Reference symbol	Stipulations mm	Recommended value mm	Supple-ment
Distance between alignment pin in L-direction (outside)	**S_{L2}**	Group 1 = Socket nominal dimension plus 30,0 Group 2 = Socket nominal dimension plus 18,0 Group 3 = Socket nominal dimension plus 9,0 Group 4 = Socket nominal dimension plus 5,0	–	Table 2
Distance between alignment pin in W-direction (outside)	**S_{W2}**	Group 1 = Socket nominal dimension plus 30,0 Group 2 = Socket nominal dimension plus 18,0 Group 3 = Socket nominal dimension plus 9,0 Group 4 = Socket nominal dimension plus 5,0	–	Table 2
Alignment pin diameter (inside)	**$ØB_1$**	$ØB_1$ max = 1,5	–	
Alignment pin diameter (outside)	**$ØB_2$**	Group 1 and 2 = $ØB_2$ max = 2,0 Group 3 and 4 = $ØB_2$ max = 1,5	–	Table 2
Centre terminal position in L-direction	**S_L**	When M_L is an odd number, S_L = 0 When M_L is an even number, S_L = e / 2	–	
Centre terminal position in W-direction	**S_W**	When M_W is an odd number, S_W = 0 When M_W is an even number, S_W = e / 2	–	
Number of terminals	**N**	Number of terminals and matrix sizes shall be equal to the applicable package's which is specified in IEC 60191-2. Matrix layout with partially depopulated terminal is accepted.	–	
Matrix size in L-direction	**M_L**			
Matrix size in W-direction	**M_W**			
Package setting direction		Direction of shifting for package insertion. This is to provide the direction of package shifting in order to ensure uniformity when fitting a package to a socket that has a larger terminal matrix than the package, when that package has an odd number of rows less than the socket. The direction of shifting shall be upper left.	–	

Table 2 – Socket dimensions

Table 2a – Socket dimensions for Group 1, 2 and 3 (square socket)

Longer side of package length or width mm	Socket nominal dimension E × D mm	Socket length and width mm		
		Group 1	Group 2	Group 3
		L = W	L = W	L = W
1,50 2,00 2,50 3,00 3,50 4,00 4,50 5,00 5,50 6,00 6,50 7,00 7,50 8,00 8,50 9,00	9 × 9	45,0	33,0	21,0
9,50 10,00 10,50 11,00 11,50 12,00 12,50 13,00	13 × 13	49,0	37,0	25,0
13,50 14,00 14,50 15,00 15,50 16,00 16,50 17,00	17 × 17	53,0	41,0	29,0
17,50 18,00 18,50 19,00 19,50 20,00 20,50 21,00	21 × 21	57,0	45,0	33,0