INTERNATIONAL STANDARD

IEC 60191-6-8

First edition
2001-08

Mechanical standardization of semiconductor devices –

Part 6-8: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guide for glass sealed ceramic quad flatpack (G-QFP)

Normalisation mécanique des dispositifs à semiconducteurs

Partie 6-8:
Règles générales pour la préparation des dessins d'encombrement des dispositifs à semiconducteurs à montage en surface –
Guide de conception pour les boîtiers plats quadrangulaires en céramique, scellement verre

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 6-8: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guide for glass sealed ceramic quad flatpack (G-QFP)

FOREWORD

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2) The formal decisions or agreements of the 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 National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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International Standard IEC 60191-6-8 has been prepared by subcommittee 47D: Mechanical standardization of semiconductor devices, of IEC technical committee 47: Semiconductor devices.

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

FDIS	Report on voting
47D/438/FDIS	47D/456/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 3.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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- withdrawn;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

A bilingual version of this standard may be issued at a later date.

MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 6-8: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guide for glass sealed ceramic quad flatpack (G-QFP)

1 Scope and object

This part of IEC 60191 provides the common outline drawings and dimensions for all types of structures and composed materials of glass sealed ceramic quad flatpack (hereinafter called G-QFP).

The object of this design guide is to standardize outlines and obtain interchangeability of G-QFP.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60191. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60191 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

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

3 Definitions

For the purpose of this part of IEC 60191, the following definition, as well as those given in the other parts of this standard, apply.

3.1
G-QFP
glass sealed package with gull-wing formed terminals which are led out in four directions to mount on PCB surface

4 Numbering of the pins

The index area is positioned at the upper left corner of the package body when it is viewed from the seating plane. The terminal that is closest to the index corner is numbered 1, and continued terminals that count in counter-clockwise directions are numbered 2, 3.

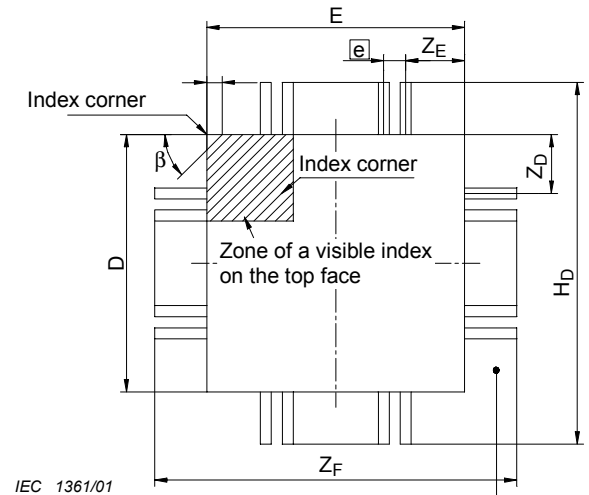


Figure 1a

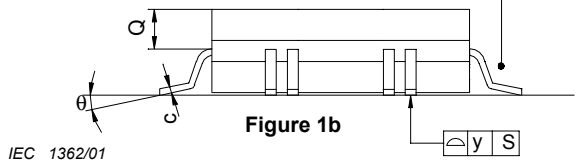


Figure 1b

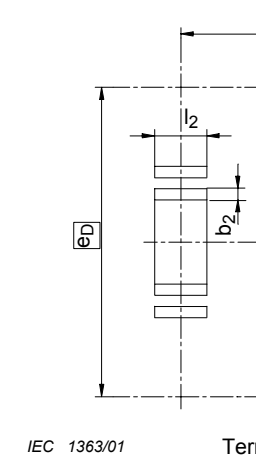
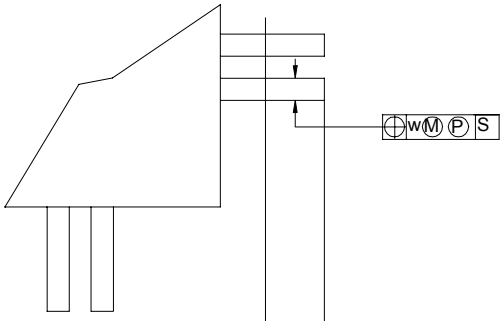


Figure 2

See figure 3



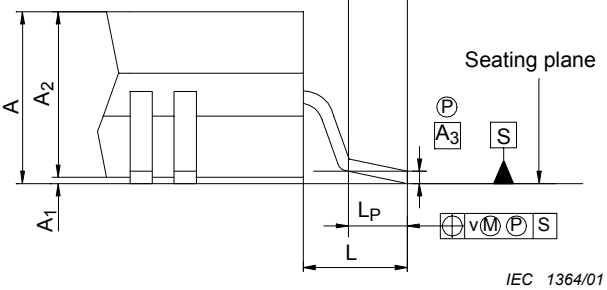


Figure 3

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

<table>
<tr><th rowspan="2">Ref.</th><th colspan="3">Limits to be observed</th><th rowspan="2">Recommended values for the dimensions
mm</th><th rowspan="2">Note [a]</th></tr>
<tr><th>Min.</th><th>Nom.</th><th>Max.</th></tr>
<tr><td>n</td><td></td><td>X</td><td></td><td></td><td>1</td></tr>
<tr><td>n_D</td><td></td><td>X</td><td></td><td></td><td>1</td></tr>
<tr><td>n_E</td><td></td><td>X</td><td></td><td></td><td>1</td></tr>
<tr><td>A</td><td></td><td></td><td>X</td><td>A max. = 0,5 × m
m = 3, 4, 5, 6, 7, 8, 9, 10, 11</td><td>2</td></tr>
<tr><td>A1</td><td>X</td><td>X</td><td>X</td><td>
<table>
<tr><td>A1 min</td><td>0,00</td><td>0,25</td></tr>
<tr><td>A1 nom</td><td>0,10</td><td>0,40</td></tr>
<tr><td>A1 max</td><td>0,25</td><td>0,50</td></tr>
</table>
</td><td></td></tr>
<tr><td>A2</td><td>X</td><td>X</td><td>X</td><td>
<table>
<tr><td>A2 min</td><td>0,51</td><td>1,01</td><td>1,51</td><td>2,01</td><td>2,51</td></tr>
<tr><td>A2 nom</td><td>0,76</td><td>1,26</td><td>1,76</td><td>2,26</td><td>2,76</td></tr>
<tr><td>A2 max</td><td>1,00</td><td>1,50</td><td>2,00</td><td>2,50</td><td>3,00</td></tr>
</table>
<table>
<tr><td>A2 min</td><td>3,01</td><td>3,51</td><td>4,01</td><td>4,51</td></tr>
<tr><td>A2 nom</td><td>3,26</td><td>3,76</td><td>4,26</td><td>4,76</td></tr>
<tr><td>A2 max</td><td>3,50</td><td>4,00</td><td>4,50</td><td>5,00</td></tr>
</table>
</td><td></td></tr>
<tr><td>$\boxed{A_3}$</td><td></td><td>X</td><td></td><td>$\boxed{A_3}$ = 0,25</td><td></td></tr>
<tr><td>b_p</td><td>X</td><td>X</td><td>X</td><td>
<table>
<tr><th>e</th><th>$b_{p\ min}$</th><th>$b_{p\ nom}$</th><th>$b_{p\ max}$</th></tr>
<tr><td>1,0</td><td>0,35</td><td>0,42</td><td>0,50</td></tr>
<tr><td>0,8</td><td>0,30</td><td>0,37</td><td>0,45</td></tr>
<tr><td>0,65</td><td>0,25</td><td>0,32</td><td>0,40</td></tr>
<tr><td>0,5</td><td>0,15</td><td>0,22</td><td>0,30</td></tr>
<tr><td>0,4</td><td>0,15</td><td>0,18</td><td>0,22</td></tr>
</table>
</td><td></td></tr>
<tr><td>D</td><td></td><td>X</td><td></td><td rowspan="2">
<table>
<tr><th></th><th>E_{nom}</th><th>D_{nom}</th></tr>
<tr><td rowspan="2">Regular square</td><td colspan="2">5 × K – 0,8
6 × K – 0,8
7 × K – 0,8
20 + 4m – 0,8</td></tr>
<tr><td>Rectangular</td><td>7 × K – 0,8</td><td>5 × 2K – 0,8</td></tr>
</table>
K = 2, 4
m = 3, 4, 5
<table>
<tr><th colspan="2">$E_{nom} \times D_{nom}$</th></tr>
<tr><th>Square</th><th>Rectangular</th></tr>
<tr><td>9,2 × 9,2
11,2 × 11,2
13,2 × 13,2
19,2 × 19,2
23,2 × 23,2
27,2 × 27,2
31,2 × 31,2
35,2 × 35,2
39,2 × 39,2</td><td>13,2 × 19,2
27,2 × 39,2</td></tr>
</table>
</td><td>4</td></tr>
<tr><td>E</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">[a] See notes on pages 9 and 10.</td></tr>
</table>

Table 1 *(continued)*

<table>
<tr><th rowspan="2">Ref.</th><th colspan="3">Limits to be observed</th><th rowspan="2">Recommended values for the dimensions
mm</th><th rowspan="2">Note [a]</th></tr>
<tr><th>Min.</th><th>Nom.</th><th>Max.</th></tr>
<tr><td>e</td><td></td><td>X</td><td></td><td>e nom. = 1,0; 0,8; 0,65; 0,5; 0,4</td><td>5</td></tr>
<tr><td>H_D</td><td>X</td><td>X</td><td>X</td><td>$H_{D\ nom} = D_{\ nom} + 2L_{\ nom}$
$H_{D\ min} = D_{\ nom} - 0,2$
$H_{D\ max} = D_{\ nom} + 0,2$</td><td></td></tr>
<tr><td>H_E</td><td>X</td><td>X</td><td>X</td><td>$H_{E\ nom} = E_{\ nom} + 2L_{\ nom}$
$H_{E\ min} = H_{E\ nom} - 0,2$
$H_{E\ max} = H_{E\ nom} + 0,2$</td><td></td></tr>
<tr><td>L</td><td></td><td>X</td><td></td><td>$L_{\ nom}$ = 1,8; 2,1; 2,4</td><td></td></tr>
<tr><td>L_p</td><td>X</td><td>X</td><td>X</td><td><table><tr><th>$L_{\ nom}$</th><th>$L_{p\ min}$</th><th>$L_{p\ nom}$</th><th>$L_{p\ max}$</th></tr><tr><td>1,8, 2,1</td><td>0,45</td><td>0,60</td><td>0,75</td></tr><tr><td>2,4</td><td>0,73</td><td>0,88</td><td>1,03</td></tr></table></td><td></td></tr>
<tr><td>v</td><td></td><td></td><td>X</td><td>$v_{\ max} = 0,3$</td><td>6</td></tr>
<tr><td>w</td><td></td><td></td><td>X</td><td><table><tr><th>e</th><th>$w_{\ max}$</th><th>e</th><th>$w_{\ max}$</th></tr><tr><td>1,0</td><td>0,20</td><td>0,5</td><td>0,10</td></tr><tr><td>0,8</td><td>0,16</td><td>0,4</td><td>0,10</td></tr><tr><td>0,65</td><td>0,13</td><td></td><td></td></tr></table></td><td>6</td></tr>
<tr><td>y</td><td></td><td></td><td>X</td><td>$y_{\ max} = 0,10$</td><td></td></tr>
<tr><td>θ</td><td>X</td><td>X</td><td>X</td><td>$\theta_{\ min} = 0°$
$\theta_{\ nom} = 3°$
$\theta_{\ max} = 10°$</td><td></td></tr>
<tr><td colspan="6">[a] See notes on pages 9 and 10.</td></tr>
</table>

Table 2 – Group 2: Dimensions appropriate to mounting and gauging

<table>
<tr><th rowspan="2">Ref.</th><th colspan="3">Limits to be observed</th><th rowspan="2">Recommended values for the dimensions
mm</th><th rowspan="2">Note [a]</th></tr>
<tr><th>Min.</th><th>Nom.</th><th>Max.</th></tr>
<tr><td>b_2</td><td></td><td></td><td>X</td><td>$b_{2\ max} = b_{p\ max} + W_{\ max}$
<table><tr><th>e</th><th>$b_{2\ max}$</th></tr><tr><td>1,00</td><td>0,70</td></tr><tr><td>0,80</td><td>0,61</td></tr><tr><td>0,65</td><td>0,53</td></tr><tr><td>0,50</td><td>0,40</td></tr><tr><td>0,40</td><td>0,32</td></tr></table></td><td></td></tr>
<tr><td>e</td><td></td><td>X</td><td></td><td>$e_{\ nom}$ = 1,0; 0,8; 0,65; 0,5; 0,4</td><td>5</td></tr>
<tr><td>e_D</td><td></td><td>X</td><td></td><td>$e_D = H_{D\ nom} - L_{p\ nom}$</td><td></td></tr>
<tr><td>e_E</td><td></td><td>X</td><td></td><td>$e_E = H_{E\ nom} - L_{p\ nom}$</td><td></td></tr>
<tr><td>l_2</td><td></td><td></td><td>X</td><td>$l_{2\ max} = L_{p\ max} + V_{\ max}$
<table><tr><th>$L_{\ nom}$</th><th>$l_{2\ max}$</th></tr><tr><td>1,8; 2,1</td><td>1,05</td></tr><tr><td>2,4</td><td>1,33</td></tr></table></td><td></td></tr>
<tr><td colspan="6">[a] See notes on pages 9 and 10</td></tr>
</table>

Table 3 – Group 3: Dimensions appropriate to automated handling

Ref.	Limits to be observed			Recommended values for the dimensions mm	Note
	Min.	Nom.	Max.		
A_2	X	X	X	$A_{2\ min}$: 0,51 / 1,01 / 1,51 / 2,01 / 2,51 $A_{2\ nom}$: 0,76 / 1,26 / 1,76 / 2,26 / 2,76 $A_{2\ max}$: 1,00 / 1,50 / 2,00 / 2,50 / 3,00 $A_{2\ min}$: 3,01 / 3,51 / 4,01 / 4,51 $A_{2\ nom}$: 3,26 / 3,76 / 4,26 / 4,76 $A_{2\ max}$: 3,50 / 4,00 / 4,50 / 5,00	
D	X		X	$D_{\ min} = D_{\ nom} - 0,3$ $D_{\ max} = D_{\ nom} + 0,3$	
E	X		X	$E_{\ min} = E_{\ nom} - 0,3$ $E_{\ max} = E_{\ nom} + 0,3$	
k	X			No definition	
Q	X			No definition	
β		X		β = 45°	

Table 4 – Group 4: Dimensions for information only

Ref.	Limits to be observed			Recommended values for the dimensions mm	Note [a]
	Min.	Nom.	Max.		
c	X		X	$\boxed{e}$ / $c_{\ min}$ / $c_{\ max}$ $\boxed{e} \geq 0,65$: 0,12 / 0,23 $\boxed{e} \leq 0,50$: 0,10 / 0,20	7
Z_D		X	X	$Z_{D\ nom} = (D_{\ nom} - (n_D - 1)\ \boxed{e}\ ) / 2$ $Z_{D\ max} = (D_{\ max} - (n_D - 1)\ \boxed{e}\ ) / 2$	8
Z_E		X	X	$Z_{E\ nom} = (E_{\ nom} - (n_E - 1)\ \boxed{e}\ ) / 2$ $Z_{E\ max} = (E_{\ max} - (n_E - 1)\ \boxed{e}\ ) / 2$	8

[a] See notes on pages 9 and 10.

NOTE 1 The relation between the package body size and the maximum number of terminals will be as shown in the following table.

a) Regular square shape series

E × D*	**n_{nom} ($n_{D\ nom} = n_{E\ nom} = n_{nom} / 4$)**				
e	1,00	0,80	0,65	0,50	0,40
10 × 10	36	44	52	64	80
12 × 12		48	64	80	100
14 × 14	52	64	80	100	120
20 × 20	76	88	112	144	176
24 × 24				176	216
28 × 28		128	160	208	256
32 × 32			184	240	296
36 × 36				272	336
40 × 40			232	304	376

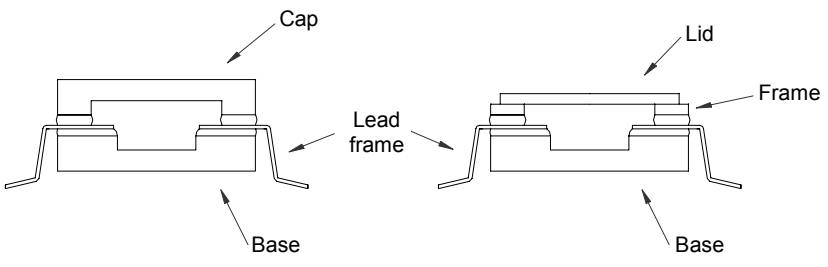
b) Rectangular shape series

E × D [a]	**n_{nom} ($n_{D\ nom}$, $n_{E\ nom}$)**				
e	1,00	0,80	0,65	0,50	0,40
14 × 20	64 (13, 19)	80 (16, 24)	100 (20,30)		
28 × 40				256 (52,76)	
[a] The E, D values shown in this table indicate integral numbers (as shown) minus 0,8 mm.					

NOTE 2 The values stipulated by the mathematical expression must be applied to the individual overall dimensional standards.

NOTE 3 The following values are recommended for the thickness of the ceramic excluding the sealing glass.

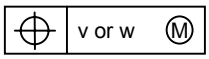
Base	1,27
Cap	1,27
Frame	0,76
Lid	0,76



IEC 1365/01

NOTE 4 Seal mismatching and glass protrusion are not included.

NOTE 5 Stipulates the true geometrical position.

NOTE 6 The values v, w are stipulated as 

without A, B as a datum line, and eliminate datum A and datum B from figure 1a.

The reasons are as follows.

a) Generally, in the case of ceramic packages, a tolerance of the outside dimensions is wider than that of plastic moulded package. Therefore, the lead true position based on ceramic body dimension is a rather large value like 0,6 mm, generally.

   These large values v and w are not useful for users.

b) E and D, the package outside dimension of G-QFP, do not include seal mismatching and glass protrusion according to note 4, so it is meaningless to specify E and D as datum planes.

c) In the semiconductor industry, QFP type packages are handled not by package body, but by the tip of the lead frame, in general.

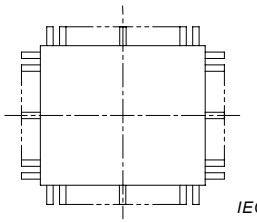
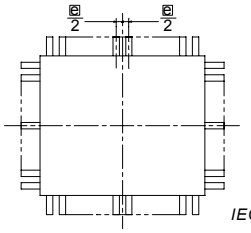
   For instance, QFP is handled in electrical tests or mounting onto printed circuit board by lead frame as a base point, not by package body, especially for a high-pin-count/fine-pitch QFP.

   Therefore, it is not so significant to stipulate package width/length as a datum line.

NOTE 7 These values include the thickness of finish plating.

NOTE 8 Since in the G-QFP the part corresponding to this dimension is not the outermost side of the package, the seal mismatching and the glass protrusion are not included, and only the standard values are stipulated.

NOTE 9 The pin layout is determined as follows.

<table>
<tr><th>E × D</th><th>e</th><th>Terminal layout</th></tr>
<tr><td>–
10 × 10
10 × 10
14 × 14
12 × 12</td><td>1,00
0,80
0,65
0,50
0,40</td><td> 
IEC 1366/01
The package centre coincides with the terminal centre.</td></tr>
<tr><td colspan="2">Other combinations of E × D and e besides the afore-mentioned ones</td><td> 

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The terminal centre is deviated by e /2 from the package centre.</td></tr>
</table>

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marketing specialist ❑
other.....

Q3 I work for/in/as a: *(tick all that apply)*

manufacturing ❑
consultant ❑
government ❑
test/certification facility ❑
public utility ❑
education ❑
military ❑
other.....

Q4 This standard will be used for: *(tick all that apply)*

general reference ❑
product research ❑
product design/development ❑
specifications ❑
tenders ❑
quality assessment ❑
certification ❑
technical documentation ❑
thesis ❑
manufacturing ❑
other.....

Q5 This standard meets my needs: *(tick one)*

not at all ❑
nearly ❑
fairly well ❑
exactly ❑

Q6 If you ticked NOT AT ALL in Question 5 the reason is: *(tick all that apply)*

standard is out of date ❑
standard is incomplete ❑
standard is too academic ❑
standard is too superficial ❑
title is misleading ❑
I made the wrong choice ❑
other .....

Q7 Please assess the standard in the following categories, using the numbers:
(1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
(6) not applicable

timeliness.....
quality of writing.....
technical contents.....
logic of arrangement of contents .....
tables, charts, graphs, figures.....
other .....

Q8 I read/use the: *(tick one)*

French text only ❑
English text only ❑
both English and French texts ❑

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

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