INTERNATIONAL STANDARD

IEC 60191-6-1

First edition
2001-10

Mechanical standardization of semiconductor devices –

Part 6-1:
General rules for the preparation of outline drawings of surface mounted semiconductor device packages –
Design guide for gull-wing lead terminals

Normalisation mécanique des dispositifs à semi-conducteurs –

Partie 6-1:
Règles générales pour la préparation des dessins d'encombrement des dispositifs à semiconducteurs pour montage en surface –
Guide de conception pour les boîtiers à broches en forme d'ailes de mouette

Reference number
IEC 60191-6-1:2001(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (www.iec.ch/catlg-e.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (www.iec.ch/JP.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 60191-6-1

First edition
2001-10

Mechanical standardization of semiconductor devices –

Part 6-1:
General rules for the preparation of outline drawings of surface mounted semiconductor device packages –
Design guide for gull-wing lead terminals

Normalisation mécanique des dispositifs à semi-conducteurs –

Partie 6-1:
Règles générales pour la préparation des dessins d'encombrement des dispositifs à semiconducteurs pour montage en surface –
Guide de conception pour les boîtiers à broches en forme d'ailes de mouette

International Electrotechnical Commission 3, rue de Varembé Geneva, Switzerland
Telefax: +41 22 919 0300 e-mail: inmail@iec.ch IEC web site http://www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE G

For price, see current catalogue

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 6-1: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guide for gull-wing lead terminals

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 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.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60191-6-1 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/459/FDIS	47D/470/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 2003. At this date, the publication will be

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

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

MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 6-1: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Design guide for gull-wing lead terminals

1 Scope

This part of IEC 60191 covers the requirements for the design rule of terminal shape plastic packages with gull-wing leads; e.g., QFP, SOP, SSOP, TSOP, etc. which are packages classified as Form E in IEC 60191-4 [1)]. This publication is intended to establish common rules on terminal shapes irrespective of package types.

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 60191-6:1990, *Mechanical standardization of semiconductor devices – Part 6: General rules for the preparation of outline drawings of surface mounted semiconductor device packages*

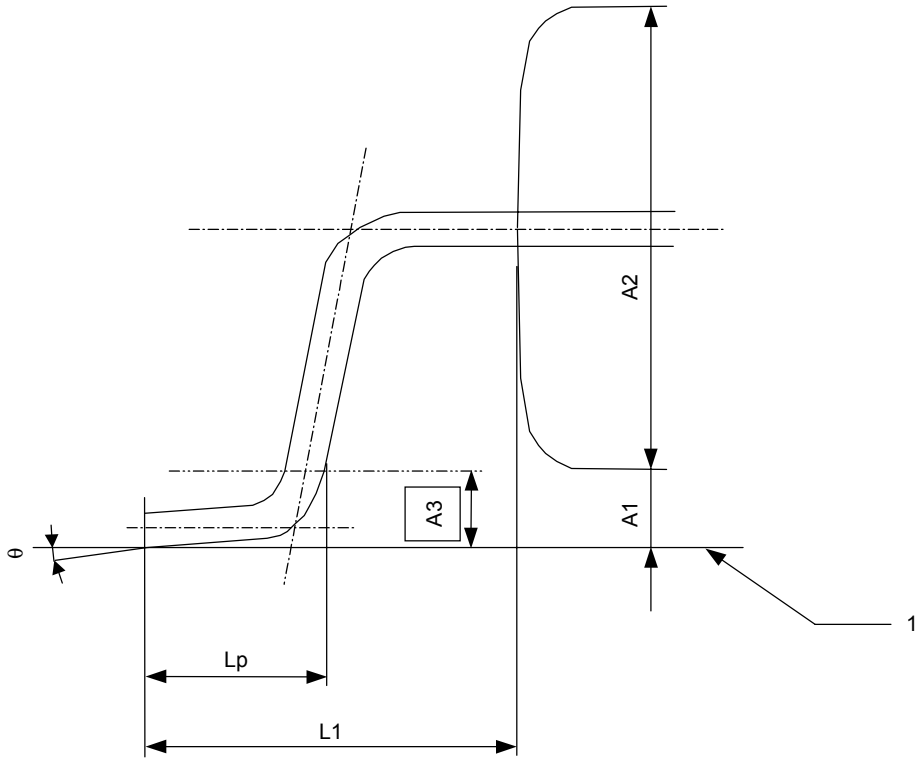
3 Definitions

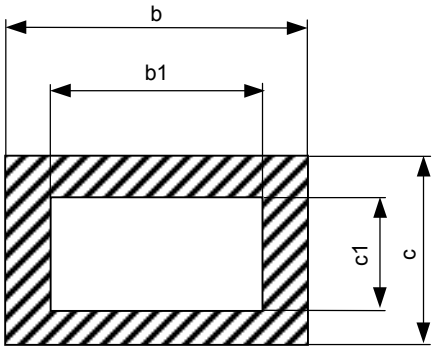
For the purpose of this part of IEC 60191, the definitions of IEC 60191-6 apply as well as the following definition:

3.1
gull-wing lead
compliant lead bent down from the body of the package with a foot at the end pointing away from the package

1) IEC 60191-4:1999, *Mechanical standardization of semiconductor devices – Part 4: Coding system and classification into forms of package outlines for semiconductor device packages*

4 References and drawings





Terminal cross-section [1)]

IEC 2161/01

1 Seating plane, with which a package is in contact

[1)] The dimensions of the terminal section apply to the ranges of 0,1 mm and 0,25 mm from the end of a terminal.

Figure 1 – Gull-wing lead terminal

5 Outline dimensions

The gull-wing lead design guides are shown in the tables below. The nominal value should be respected as the common value when developing packages with gull-wing leads thereby preventing proliferation of terminal shapes in the same package family. The range of values should be applied in usage on individual standards. The values are re-specified in the package design guide to reflect the specific requirement for each package type.

6 Package height and stand-off height

Table 1 below shows the relationship between the package height and the stand-off height.

Table 1 – Package height and stand-off height

Dimensions in millimetres

Package height A2 nom. (Range)		Stand-off height A1 nom. (Range)	
1,0 (0,95~1,05)		0,1 (0,00~0,15)	
1,4 (1,35~1,55)		0,1 (0,00~0,15)	
2,0 (1,80~2,20)	Low stand-off	0,1 (0,00~0,25)	
	High stand-off	0,4 (0,25~0,50)	
2,7 (2,50~2,90)	Low stand-off	0,1 (0,00~0,25)	
	High stand-off	0,4 (0,25~0,50)	
3,4 (3,20~3,60)	Low stand-off	0,1 (0,00~0,25)	
	High stand-off	0,4 (0,25~0,50)	
3,8 (3,60~4,00)	Low stand-off	0,1 (0,00~0,25)	
	High stand-off	0,4 (0,25~0,50)	

The package height and the stand-off height are defined regardless of the terminal pitch.

7 Terminal thickness and width

Table 2 – Terminal width b1 and b

Dimensions in millimetres

Terminal pitch e	Terminal width b1 nom. (Range)	Terminal width b (Range)	Note
1,27	0,40 (0,34~0,45)	(0,34~0,50)	
1,25	0,40 (0,34~0,45)	(0,34~0,50)	
1,0	0,40 (0,34~0,45)	(0,34~0,50)	
0,8	0,35 (0,29~0,41)	(0,29~0,45)	QFP only
	0,30 (0,25~0,35)	(0,25~0,40)	
0,65	0,30 (0,22~0,36)	(0,22~0,40)	QFP only
	0,22 (0,17~0,27)	(0,17~0,32)	
0,5	0,20 (0,17~0,23)	(0,17~0,27)	
0,4	0,16 (0,13~0,19)	(0,13~0,23)	
0,3	0,12 (0,09~0,15)	(0,09~0,18)	

Table 3 – Terminal thickness c1 and c

Dimensions in millimetres

Terminal pitch e	Terminal thickness c1 nom. (Range)	Terminal thickness c (Range)	Note
1,27	0,25 (0,23~0,27) 0,20 (0,19~0,21) 0,15 (0,14~0,16) 0,125 (0,115~0,135) 0,10 (0,09~0,11)	(0,23~0,32) (0,19~0,25) (0,14~0,20) (0,115~0,175) (0,09~0,15)	
1,25	0,15 (0,14~0,16) 0,125 (0,115~0,135) 0,10 (0,09~0,11)	(0,14~0,20) (0,115~0,175) (0,09~0,15)	
1,0			
0,8			
0,65			
0,5			
0,4			
0,3			

8 Terminal shape

Table 4 – Terminal shape

Dimensions in millimetres

Package height A2 nom.	Standard height of soldered part A3	Length of soldered part Lp nom. (Range)	Angle of terminal flat portions θ nom. (Range)	Terminal length L1 nom.	Notes
1,0	0,25	0,60 (0,45~0,75)	3° (0~8°)	1,0	
1,4		0,60 (0,45~0,75)		1,0	
2,0		0,60 (0,45~0,75)		1,0	e ≤0,50
		0,88 (0,73~1,03)		1,6	e ≤0,65
2,7		0,60 (0,45~0,75)		1,0	e ≤0,50
		0,88 (0,73~1,03)		1,6	e ≤0,65
3,4		0,60 (0,45~0,75)		1,3	e ≤0,50
		0,88 (0,73~1,03)		1,6	e ≤0,65
3,8		0,60 (0,45~0,75)		1,3	e ≤0,50
		0,88 (0,73~1,03)		1,6	e ≤0,65

9 Tolerance of terminal center position and coplanarity

Table 5 – Tolerance of terminal center position and coplanarity

Dimensions in millimetres

Terminal pitch e	Tolerance of terminal centre position X	Coplanarity y	Note
1,27	0,25	0,10	
1,25	0,35		
1,0	0,20		
0,8	0,20		QFP only
	0,16		
0,65	0,13		
0,5	0,08	0,08	
0,4	0,07		
0,3	0,06	0,05	

Standards Survey

The IEC would like to offer you the best quality standards possible. To make sure that we continue to meet your needs, your feedback is essential. Would you please take a minute to answer the questions overleaf and fax them to us at +41 22 919 03 00 or mail them to the address below. Thank you!

Customer Service Centre (CSC)

International Electrotechnical Commission
3, rue de Varembé
1211 Genève 20
Switzerland

or

Fax to: **IEC**/CSC at +41 22 919 03 00

Thank you for your contribution to the standards-making process.

Nicht frankieren
Ne pas affranchir

Non affrancare
No stamp required

A Prioritaire

RÉPONSE PAYÉE

SUISSE

Customer Service Centre (CSC)
International Electrotechnical Commission
3, rue de Varembé
1211 GENEVA 20
Switzerland

Q1 Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: *(e.g. 60601-1-1)*

.....

Q2 Please tell us in what capacity(ies) you bought the standard *(tick all that apply).* I am the/a:

purchasing agent ❑
librarian ❑
researcher ❑
design engineer ❑
safety engineer ❑
testing engineer ❑
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:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

ISBN 2-8318-6053-9

ICS 31.080.01

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND