

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Mechanical standardization of semiconductor devices –  
Part 6-21: General rules for the preparation of outline drawings of surface  
mounted semiconductor device packages – Measuring methods for package  
dimensions of small outline packages (SOP)**

<https://standards.iteh.ai/catalog/standards/sist/1abf712e-b967-464f-bcef-1c5a49016110/iec-60191-6-21-2010>

**Normalisation mécanique des dispositifs à semiconducteurs –  
Partie 6-21: Règles générales pour la préparation des dessins d'encombrement  
des boîtiers pour dispositifs à semiconducteurs pour montage en surface –  
Méthodes de mesure pour les dimensions des boîtiers de faible encombrement  
(SOP)**



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**MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –**

**Part 6-21: General rules for the preparation of outline drawings  
of surface mounted semiconductor device packages –  
Measuring methods for package dimensions  
of small outline packages (SOP)**

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

FDIS	Report on voting
47D/772/FDIS	47D/776/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 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

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## MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

### Part 6-21: General rules for the preparation of outline drawings of surface mounted semiconductor device packages – Measuring methods for package dimensions of small outline packages (SOP)

#### 1 Scope

This part of IEC 60191 specifies methods to measure package dimensions of small outline packages (SOP), package outline form E in accordance to IEC 60191-4.

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

IEC 60191-6, *Mechanical standardization of semiconductor devices – Part 6: General rules for the preparation of outline drawings of surface mounted semiconductor device packages*  
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For the purposes of this document the terms and definitions given in IEC 60191-6 apply.

#### 4 Measuring methods

##### 4.1 Description of measuring method

The measuring methods described in this standard are for dimension values guaranteed to users on the basis of the following items.

- a) In general, measuring the dimensions shall be made with the semiconductor packages mounted on printed circuit-board as the guarantee is made to the user.
- b) In general, measurement may be made either by hand or automatically.
- c) The dimensions that cannot be measured unless the package is destroyed may be calculated from other dimensions or replaced by representative values. See 4.6.2.3.

4.2 Reference characters and drawing

Thin small outline package TSOP (1)

An outline drawing is given in Figure 1.

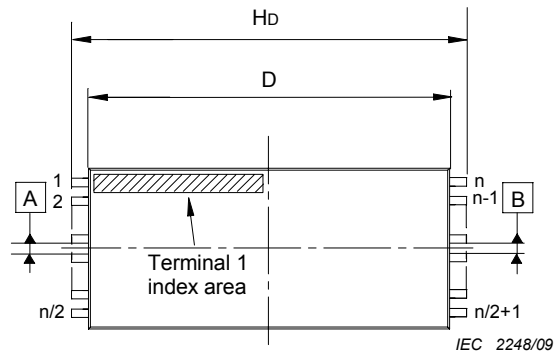


Figure 1a - Top view

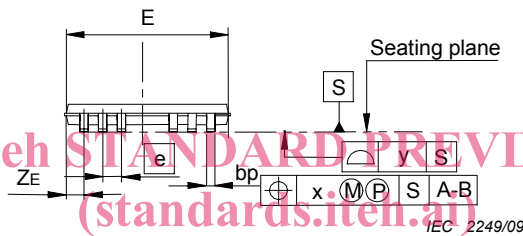


Figure 1b - Side view

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<https://standards.iteh.ai/catalog/standards/sist/1abf712e-b967-4641-beef-410aa18a475a/iec-60191-6-21-2010>

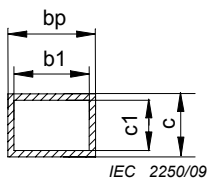


Figure 1c - Lead section

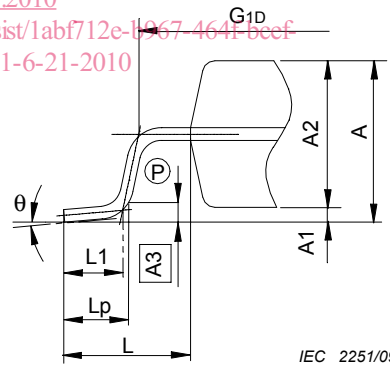


Figure 1d - Lead side view

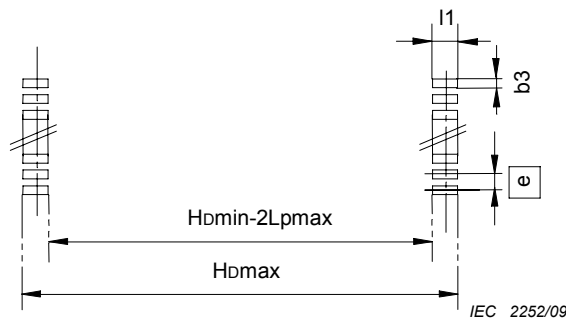
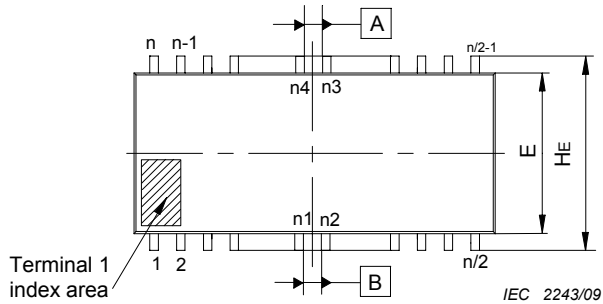


Figure 1e - Pattern of terminal position areas

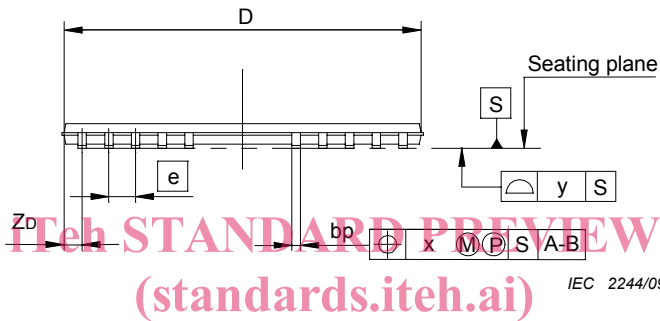
Figure 1 - TSOP(1) outline drawings

**Shrink small outline package SSOP, TSOP(2)**

An outline drawing is given in Figure 2.

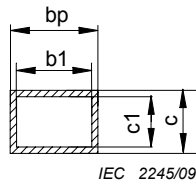


**Figure 2a - Top view**

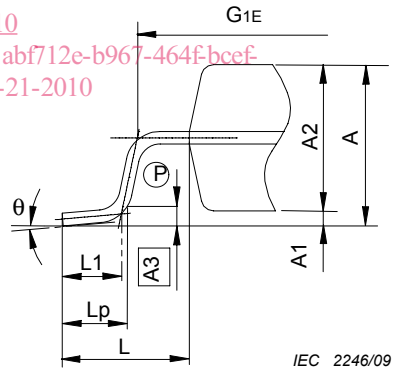


**Figure 2b - Side view**

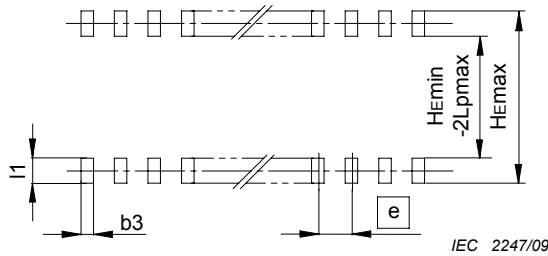
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**Figure 2c - Lead section**



**Figure 2d - Lead side view**



**Figure 2e - Pattern of terminal position areas**

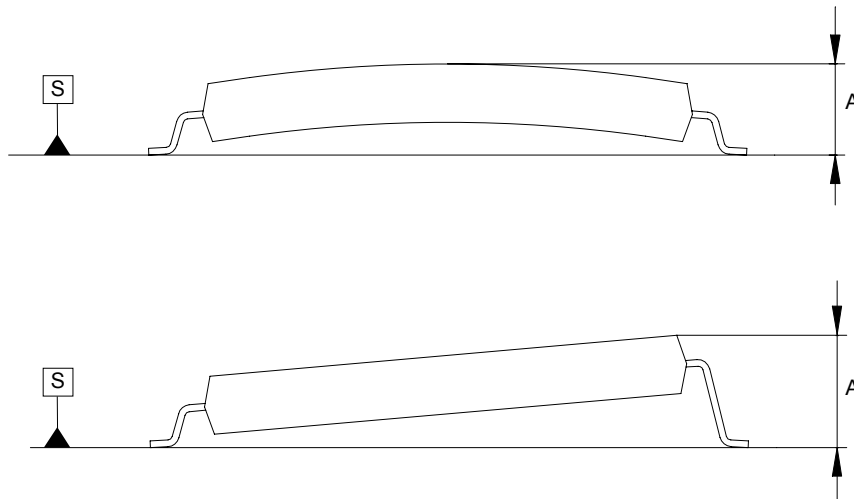
**Figure 2 - SSOP, TSOP(2) outline drawings**



### 4.3 Mounting height A

#### 4.3.1 Description

Let the height of a package from the seating plane to the top of the package be denoted as the mounting height. See Figure 3.



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Figure 3 – Mounting height

#### 4.3.2 Measuring method IEC 60191-6-21:2010

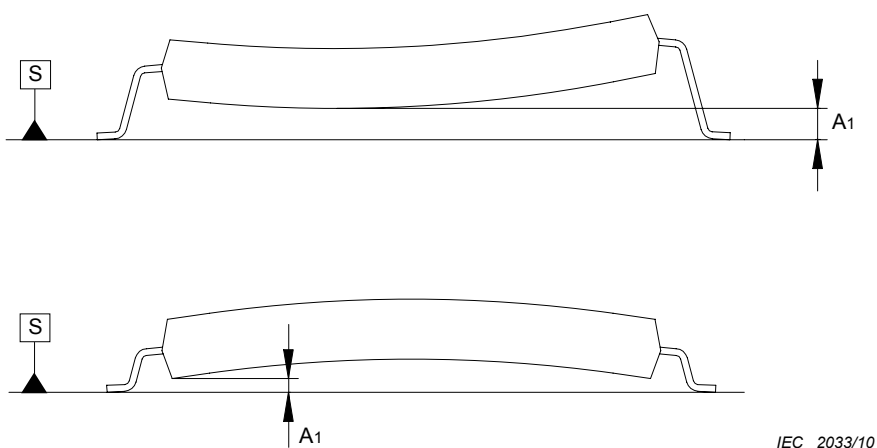
The measuring method shall be as follows <https://standards.iteh.ai/catalog/standards/sist/1abf712e-b967-464f-bcef-49021e475a/iec-60191-6-21-2010>

- Put the package on the surface plate to establish the seating plane.
- From the side or top, measure the distance to a highest point. Let the distance be denoted as the mounting height A.

### 4.4 Stand-off A1

#### 4.4.1 Description

Let a distance from the seating plane to the lowest point of a package be denoted as the stand-off. See Figure 4.



IEC 2033/10

Figure 4 – Stand-off

4.4.2 Measuring method

The measuring method shall be as follows.

- a) Put the package on the surface plate to establish the reference surface (seating plane).
- b) Measure a distance from the reference surface (surface plate) to the lowest point of the package.

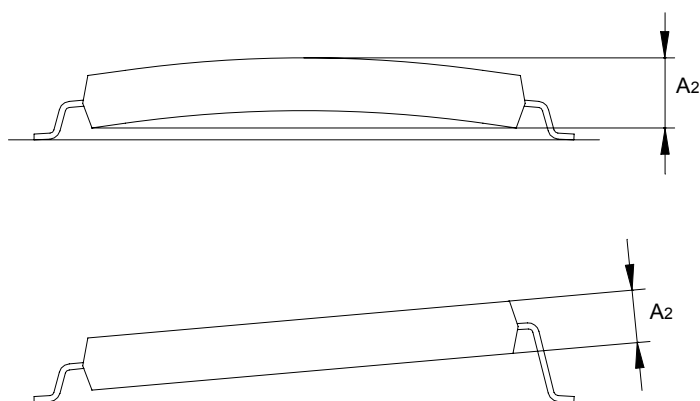
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4.5 Body thickness A2

4.5.1 Description

IEC 60191-6-21:2010

The body thickness is defined as a distance between planes, parallel to the reference surface, tangent to the highest and lowest points of the body. See Figure 5.



IEC 2034/10

Figure 5 – Body thickness A2

4.5.2 Measuring method

The measuring method shall be as follows.

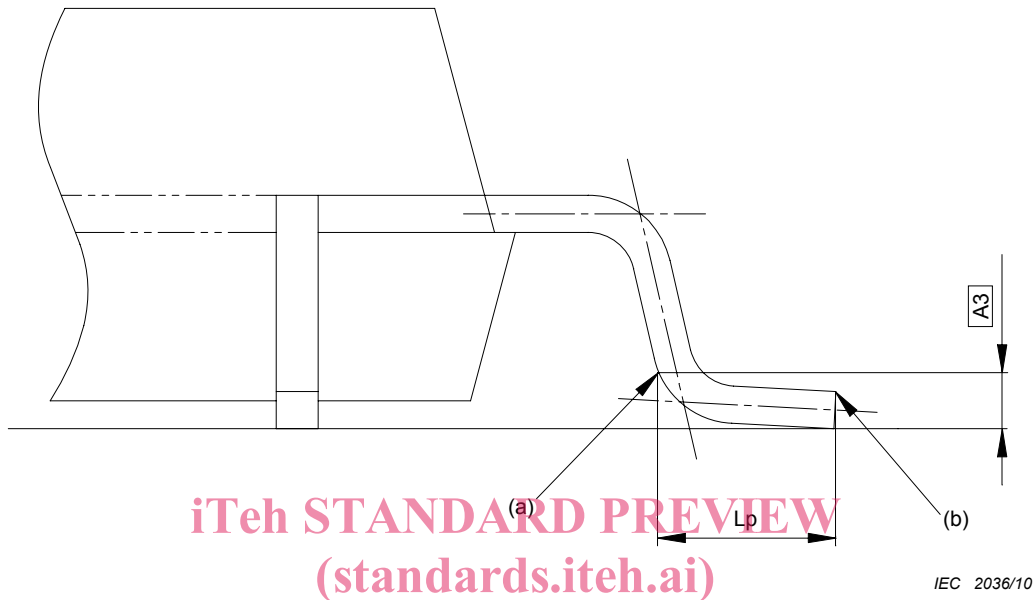
- a) Put the package which is accurately dimensioned between surface plates which are larger than the package vertically in parallel. Never touch the leads.



## 4.7 Soldered portion length $L_p$

### 4.7.1 Description

The distance in a mounting direction from a cross point (a) of a plane  $A_3$  from, and in parallel with, the seating plane with an inside surface of a descending portion of the lead to a tip (b) of the lead. See Figure 7.



**Figure 7 – Soldered portion length  $L_p$**   
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### 4.7.2 Measuring method

The measuring method shall be as follows.

- Put the package on the surface plate.
- Make the datum parallel with the measuring reference.
- Observe the lead toward the package side (in the seating plane direction). Measure positions of points (a) and (b) as the soldered portion length.

### 4.7.3 Remarks

As this measuring method can be done from the side, the values of the leads observable from the side are allowed as representative values.

## 4.8 Positional tolerance of terminal tips

### 4.8.1 Description

Let **S**, **A**, and **B** denote datum as shown in the above figures. Obtain positions of tips of leads at the points of 0,1 mm inside from the tips. Obtain differences from the theoretical positions. Acceptable differences are defined as the tolerance at centre positions of terminal tips. See Figures 8, 9 and 10.