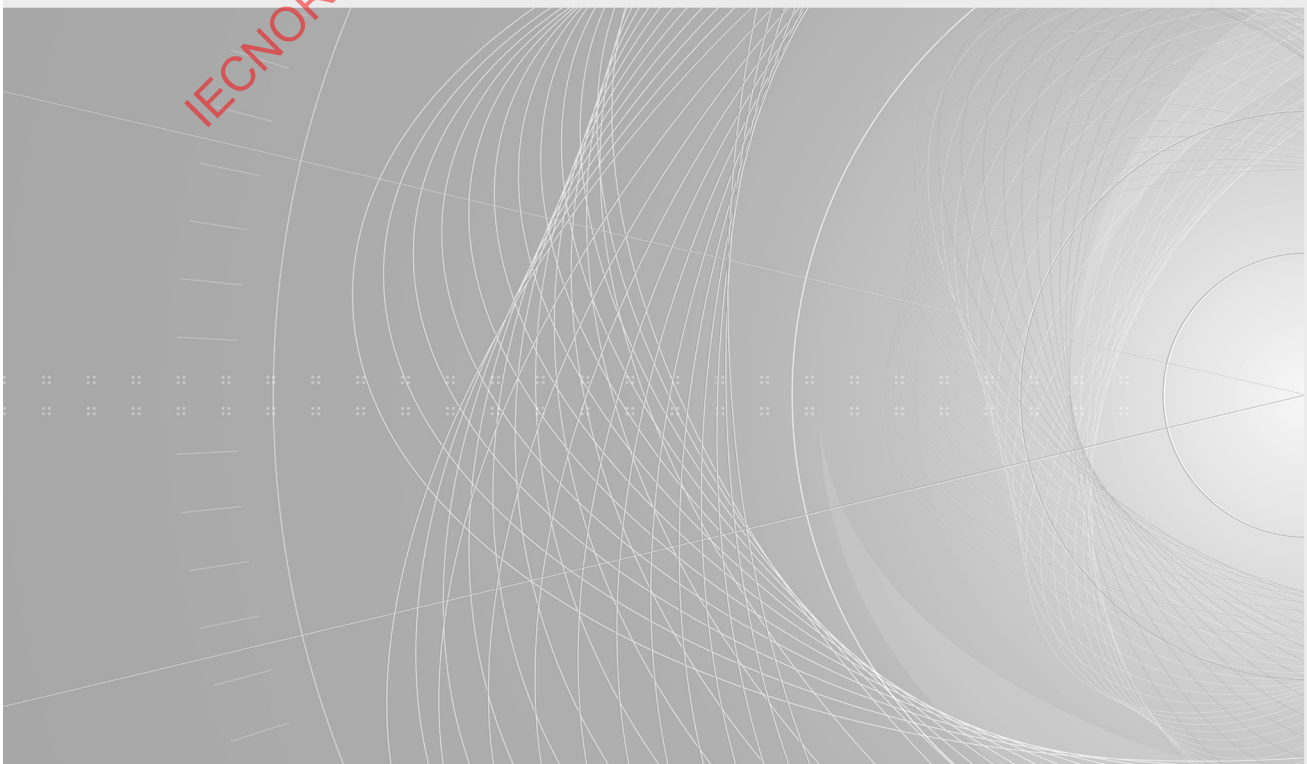
IEC 61240

Edition 3.0 2016-10

INTERNATIONAL STANDARD

Piezoelectric devices – Preparation of outline drawings of surface-mounted devices (SMD) for frequency control and selection – General rules



IEC 61240:2016-10(en)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

IEC 61240

Edition 3.0 2016-10

INTERNATIONAL STANDARD

Piezoelectric devices – Preparation of outline drawings of surface-mounted devices (SMD) for frequency control and selection – General rules

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.140

ISBN 978-2-8322-3692-5

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

PIEZOELECTRIC DEVICES – PREPARATION OF OUTLINE DRAWINGS OF SURFACE-MOUNTED DEVICES (SMD) FOR FREQUENCY CONTROL AND SELECTION – GENERAL RULES

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. 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 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 IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61240 has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

This third edition cancels and replaces the second edition published in 2012. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- outline drawings have been changed from three views (top, front and bottom) to that based on ISO layout in the third-angle projection, in which the view from the right has been added to the top, front and bottom views;
- reference line and geometrical dimensions of the package for enclosures have been changed for practical use;
- information on miniaturized leadless ceramic enclosures of piezoelectric devices (SMD) for frequency control and selection has been included in an annex.

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

CDV	Report on voting
49/1172/CDV	49/1188/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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.

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

INTRODUCTION

The enclosures of quartz crystal resonators and oscillators are unified in this third edition of IEC 61240.

Regarding the current situation of many quartz crystal device suppliers, many of them use their own enclosure layouts in their catalogues. For the convenience of consumers, general rules of enclosure layout and definition of size need to be unified.

The reasons prompting the revision of IEC 61240:2012 are as follows:

a) The height of packages should not be included in a drawing. Only the total height of enclosures should be expressed.

b) In small enclosure types, the size tolerance in smaller enclosures will not meet the conditions defined in Table A.3 (Annex A).

In newly proposed general rules of outline drawings, only the total height of enclosures should be expressed and the size tolerance in smaller enclosures is revised.

PIEZOELECTRIC DEVICES – PREPARATION OF OUTLINE DRAWINGS OF SURFACE-MOUNTED DEVICES (SMD) FOR FREQUENCY CONTROL AND SELECTION – GENERAL RULES

1 Scope

This International Standard sets out general rules for drawing all dimensional and geometrical characteristics of a surface-mounted piezoelectric device package (referred to in this document as SMD) in order to ensure mechanical inter-changeability of all outline drawings of the SMDs for frequency control and selection.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Mechanical standardization of semiconductor devices – Part 6: General rules for the preparation of outline drawings of surface mounted semiconductor device packages*

3 Classification of SMD

The SMD piezoelectric devices are classified into three types of packages depending on the structure of the terminal leads.

a) Leaded type: the folded ends of the terminal leads are turned away from the body.

NOTE 1 The package of the pin lead type is compatible with the socket. This is defined in the description of the leaded type.

b) Folded-leads type: the folded ends of the terminal lead are turned towards the body.

NOTE 2 The supporter with a board is defined in the description of this folded lead type.

c) Leadless type: terminal pads only are present on the body instead of terminal leads.

A proper combination of these options should be selected.

4 Title of the outline drawing

The title of the outline drawing shall imply the main package material (e.g. metal, plastic, glass, ceramic), the sealing procedure, number of terminals and the type of SMD, as shown in Examples 1, 2 and 3[1].

5 Composition of the outline drawing

5.1 Elements of outline drawings

The outline drawing of an SMD shall be composed of five elements: the drawings from four views in the third-angle projection, the table of detailed dimensions, the actual size sketch, the

[1] Examples 1, 2 and 3 refer to the sheets provided after Clause 9 of this document.

drawing of terminal land areas and the terminal lead details. These sample formats are shown in Examples 1, 2, and 3.

5.2 Outline drawing

The outline drawing with dimensional symbols shall be executed in the third-angle projection. Basically, one set of outline drawings consists of the view from above, the front view, the view from the right, and the view from below. In square type enclosure and cylindrical type enclosure, the view from the right can be omitted.

5.3 Table of detailed dimensions

The dimensions shall be given in millimetres and are required only where the letter X is shown in the table.

5.4 Actual size sketch

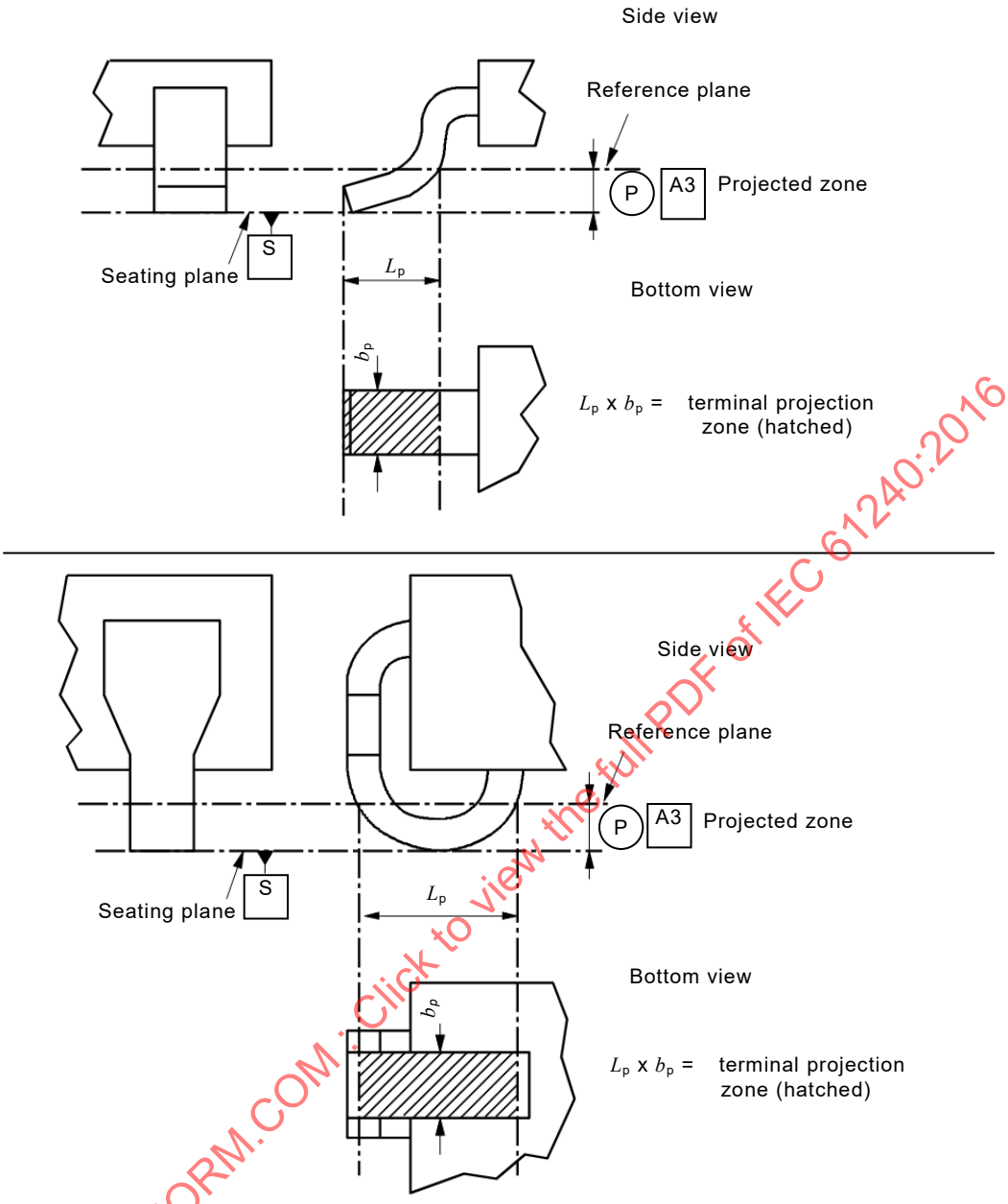
The actual size sketch means a drawing of the view from above with the real size outer dimensions.

5.5 Drawing of terminal land areas

The drawing of terminal land areas which is defined in Clause 7 shall be adapted to the connecting terminal leads on the printed circuit boards, alumina substrates, etc.

5.6 Terminal lead details

The terminal lead details shall be shown in accordance with IEC 60191-6 (see Figure 1).



Key for figure 1 and examples 1 to 3

(P) = projected tolerance zone (see ISO 1101, clause 11)

[A3] = reference plane distance

(*) means the true geometrical position

IEC

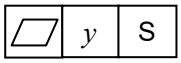
Figure 1 – Illustration of terminal projection zone

6 Requirements for terminal leads

6.1 The dimensions of terminal lead spacing shall be shown by the centre position of the terminal leads and its basic value e is 2,54 × n mm (n is an integer) and 1,27 × n mm for package dimensions smaller than 6 mm.

6.2 In the view from above of SMD, the lower lead from the left end shall be designated as terminal lead number 1. The subsequent lead numbers shall be designated as 2 to n, with the terminals following counter-clockwise.

6.3 The number 1 terminal lead shall be indicated by a corner notch or by a dotted expression on the top side. If there is a requirement to indicate the number 1 terminal on bottom side, the land area of the number 1 terminal can be designed in different size from others.

6.4 

means in this drawing that the distance from the seating plane to the nearest point of each terminal shall not exceed y mm.

7 Requirements for the terminal land area[2]

7.1 The positioning of land areas shall be adapted to the positions of the terminal leads.

The dimensions of the terminal land areas shall be specified with respect to the central line of the contacts of the SMD device.

7.2 The dimensions of terminal land areas shall be indicated as the maximum area which shall be added to the projection zone of the terminals for the parts to be connected to a printed circuit board and to its positional tolerances.

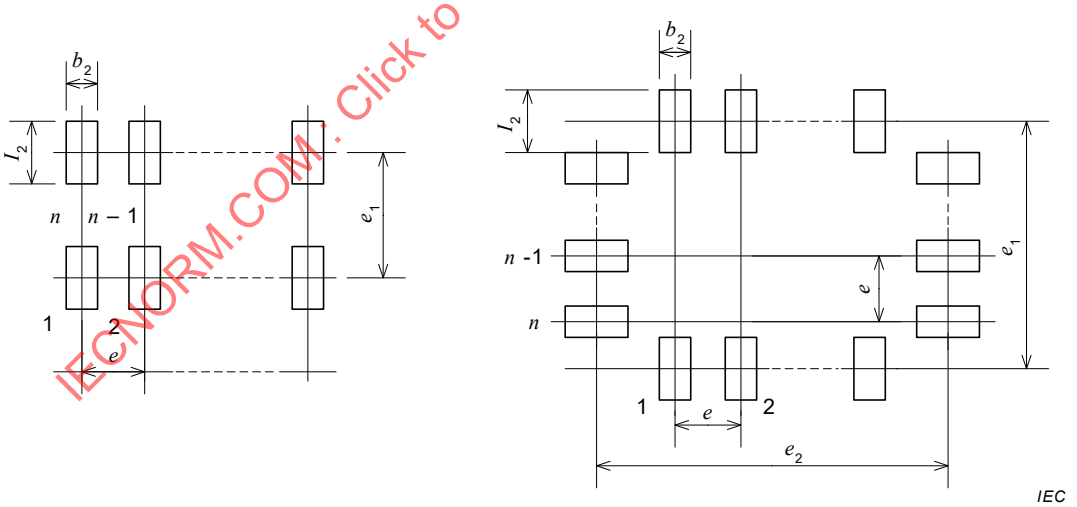


Figure 2 – Example of a terminal land area

8 Connections of terminal leads

The functions of the connections of terminal leads should not be defined on the outline drawing, but if necessary they may be indicated as shown in Annex B.

---

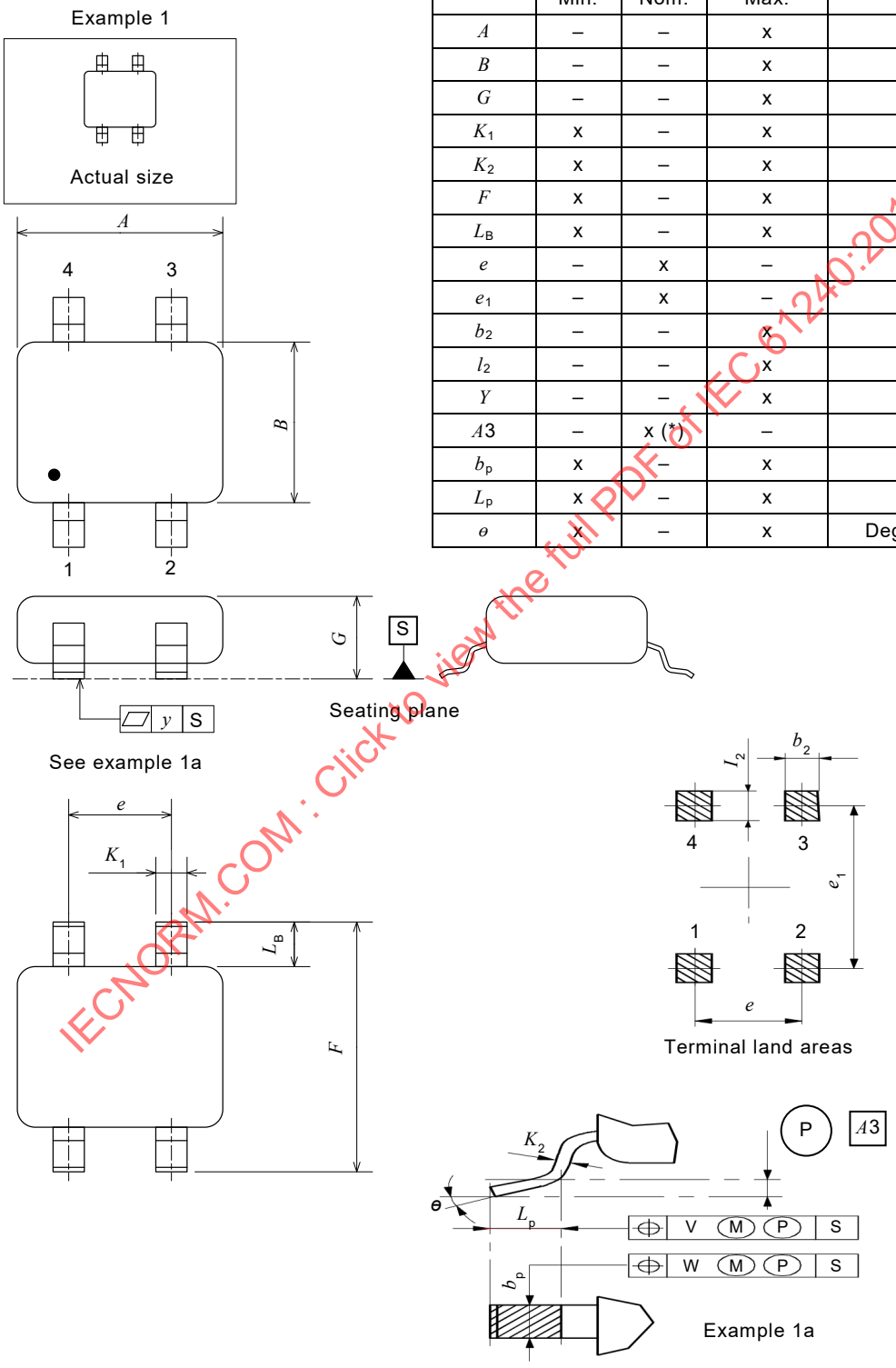
2 See Figure 2.

9 Descriptive notes

Descriptive notes may be used at the bottom of, or adjacent to the outline drawing if necessary.

Outline drawing

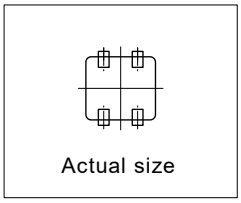
Ref.	Dimensions (mm)			Notes
	Min.	Nom.	Max.	
A	–	–	x	
B	–	–	x	
G	–	–	x	
K_1	x	–	x	
K_2	x	–	x	
F	x	–	x	
L_B	x	–	x	
e	–	x	–	
e_1	–	x	–	
b_2	–	–	x	
l_2	–	–	x	
Y	–	–	x	
$A3$	–	x (*)	–	
b_p	x	–	x	
L_p	x	–	x	
θ	x	–	x	Deg.



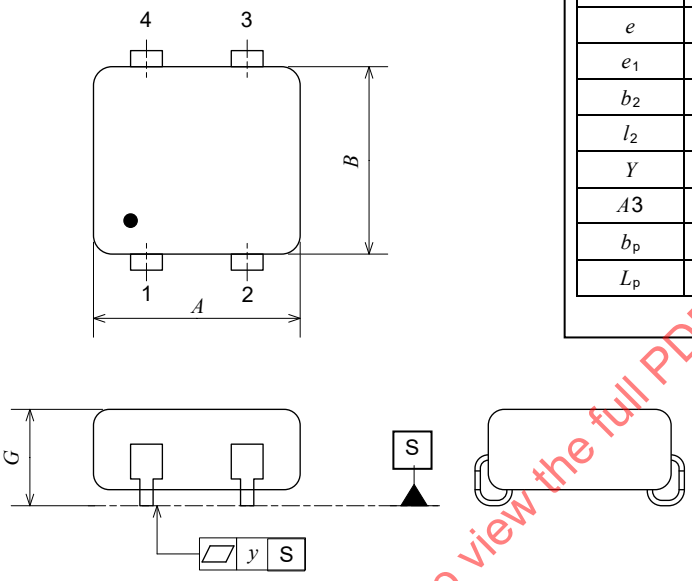
Glass or ceramic, solder-glass sealed four-leaded SMD outline, type- (example 1)	Scale 3: 1	
Sheet – number		

Outline drawing

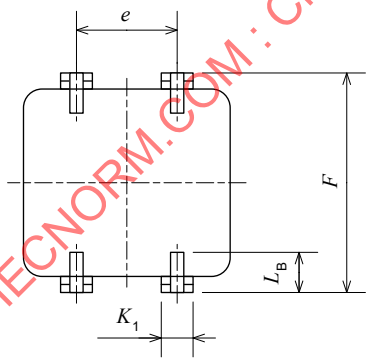
Example 2

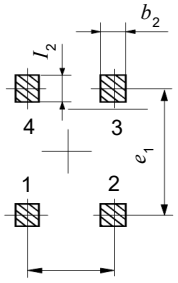


Ref.	Dimensions (mm)			Notes
	Min.	Nom.	Max.	
A	–	–	x	
B	–	–	x	
G	–	–	x	
K_1	x	–	x	
K_2	x	–	X	
F	x	–	x	
L_B	x	–	x	
e	–	x	–	
e_1	–	x	–	
b_2	–	–	x	
l_2	–	–	x	
Y	–	–	x	
$A3$	–	x (*)	–	
b_p	x	–	x	
L_p	x	–	x	

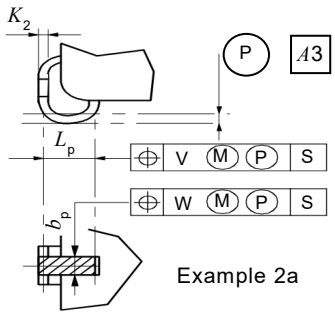


See example 2a





Terminal land areas



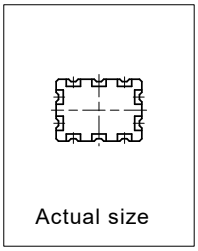
Example 2a

IEC

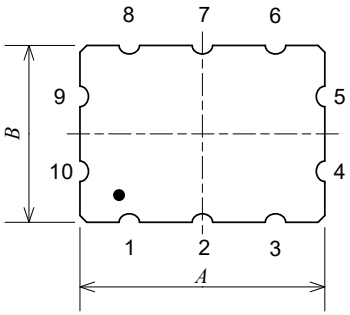
Glass or ceramic, solder-glass sealed four-folded lead SMD outline, type- (example 2)	Scale 3: 1	
Sheet – number		

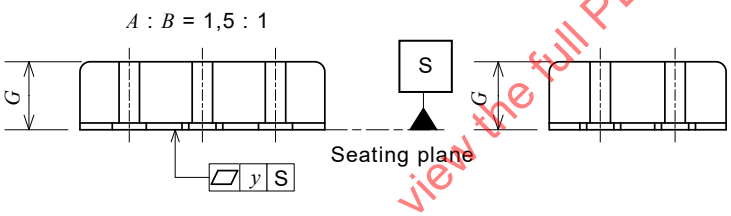
Outline drawing

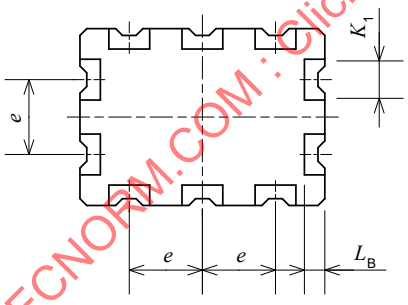
Example 3

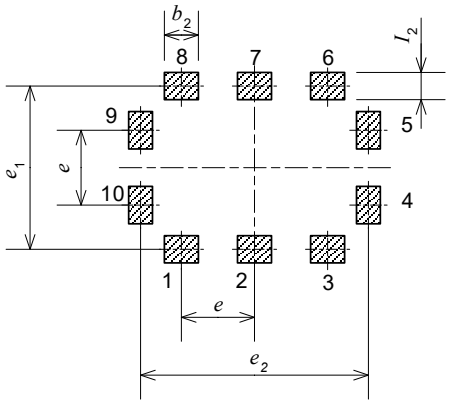


Ref.	Dimensions (mm)			Notes
	Min.	Nom.	Max.	
A	–	–	x	
B	–	–	x	
G	–	–	x	
K_1	x	–	x	
L_B	x	–	x	
e	–	x	–	
e_1	–	x	–	
e_2	–	x	–	
b_2	–	–	x	
l_2	–	–	x	
y	–	–	x	









Terminal land areas

IEC

Glass or ceramic, solder-glass sealed 10 leadless SMD outline, type- (example 3)	Scale 3: 1	
Sheet – number		

Annex A
(informative)

Miniaturized leadless ceramic enclosures of piezoelectric devices (SMD) for frequency control and selection

A.1 Precise drawing

For miniaturized packages, a precise drawing is virtually meaningless. For this reason, the following measures are taken.

a) Basically, a detailed structure is decided by mutual agreement between the maker and user. This document shows a simplified general drawing. Examples of standard drawing of outer dimensions are shown in Figures A.1 and A.2 below.

b) As for the drawing of outer dimensions, basically, the view from above, the front view, the view from the right, and the view from below should be described in the order of the upper, middle1, middle2 and bottom part in the same scale. Alphabetical characters should be used for the symbols of dimensions in the drawing.

c) Drawings of the same size should be described in the same scale. Basically, the scale should be decided based on the following criteria (see Table A.1).

Table A.1 – Scale of drawings

Nominal value of *A*	Scale
10 mm = < Nominal	3:1
5 mm =< Nominal < 10 mm	5:1
Nominal < 5 mm	10:1

d) Basically, the drawing should be in the horizontal orientation. As for square products, the sides having greater number of terminals should be described in the horizontal orientation.

e) As for the upper part of the view from above, the corner of the cap should be at the right angle, and there should be a notch on the corner of the main body. The distance between the cap and the main body or the notch should be 1,5 mm on the actual drawing, regardless of the scale (see Figure A.1).

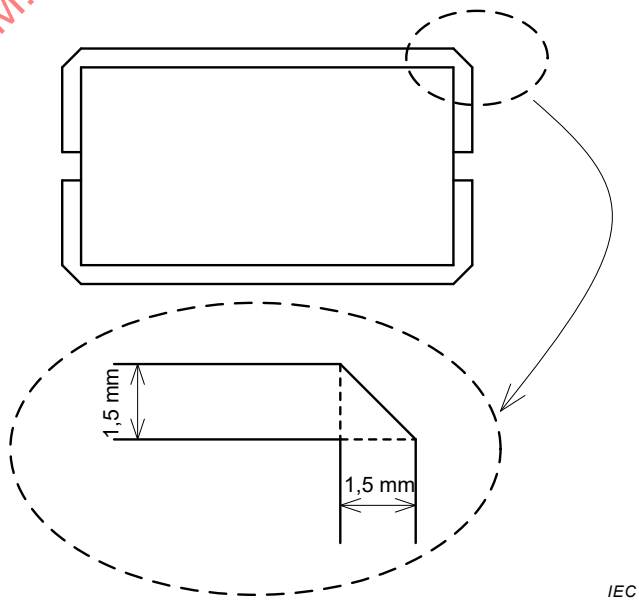


Figure A.1 – Upper part of the view from above

f) The thickness of the cap in the front view on the actual drawing should be 1,0 mm regardless of the scale. The height of the shaded part of the side electrode should be 1/3 G. (see Figure A.2).

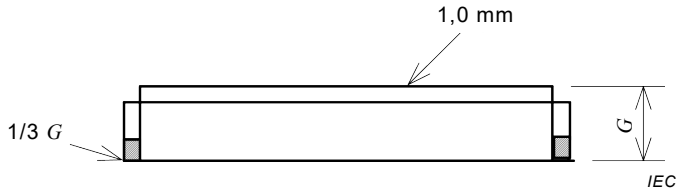


Figure A.2 – Front view (without a board)

g) As for enclosures with a board, the dimension of the board on the actual drawing should be 2,0 mm, regardless of the scale (see Figure A.3).

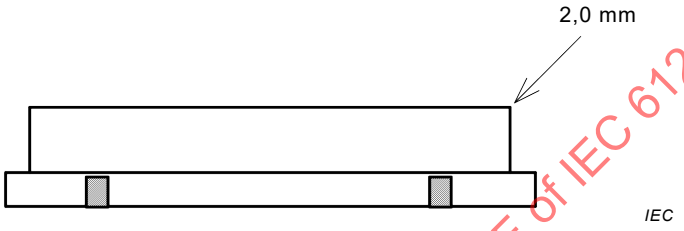


Figure A.3 – Front view (with a board)

h) In the dimension table, only the column with "X" should be filled in, while the columns with "-" should not be filled in. Dimension values corresponding to the symbols should be in millimetres (see Table A.2).

Table A.2 – Guideline for dimension table

Ref.	Dimension (mm)			Dimension (mm)
	Min.	Min.	Min.	
A	-	(X)	X	
B	-	(X)	X	
G	-	-	X	
K	X	-	X	
L_B	X	-	X	
e	-	X	-	
e_1	-	X	-	
e_2	-	X	-	
y	-	-	X	

i) Suffixes should be consecutive numbers starting from 1. Suffix should not be attached to the symbols consisting of only one character except "e".

j) Values in the Nominal Column of A, B should be the nominal dimension of the enclosure. Values should be rounded off to the first decimal place, and put in ( ). The maximum column of A and B should be filled in as follows (see Table A.3).

Table A.3 – Guideline for column "Max." of Table A.2 for A, B

Nominal value of A	Maximum value of A and B
Nominal < 7 mm	Nominal value + 0,20
Nominal = >7 mm	Nominal value + 0,30

k) As for the dimension of the symbols of G and y, only the standard maximum dimension should be filled in.

l) As for the definition of the symbols of K and L_B, K represents the width, and L_B represents the depth. (As for the electrode on the corner, $K < L_B$. The dimension of the electrode should be measured from the side.)

As for the allowance of K and L_B, the maximum and minimum dimensions are calculated by doubling the positive allowance of A and B specified in Table A.3.

NOTE The sum of centre values of K and L_B having the same vector as the distance between terminals (e, e_1, e_2, …) are equal to the nominal value of A and B.

m) The distance between terminals (e, e_1, e_2, …) should be the distance from the centre of one terminal to another.

n) The actual size sketch should be shown in a small box at the upper left corner of the sheet as in Examples 1 to 3.

o) In square type enclosure, the view from the right can be omitted.

p) In cylindrical type enclosure, the view from the right can be omitted.

A.2 Requirements for enclosures with 3 terminals

As for the arrangement of terminals, it is preferable to meet the following conditions.

a) The dimension between two adjacent terminals should be the distance from the centre of one terminal to another. The standard value "e" should be multiples of 2,54 mm. If the length of one side is less than 6 mm, it should be multiples of 1,27 mm.

b) As for the terminal number, when the SMD is looked down on from above, the terminal at the bottom left should be numbered as No.1. The other terminals are numbered in order counter-clockwise.

c) The terminal No.1 should be identified by the dot mark on the surface, or the notch on the terminals. In some cases, the length of other terminals is changed for identification.

d) y S means that the distance from the board to each terminal is not longer than y millimetres.

A.3 Naming rule for new type of enclosures

The designation of SMD defined in miniaturized leadless ceramic enclosures is as follows.

a) The dimension of the longer side should be indicated first, followed by the dimension of the shorter side.

b) When the dimension of the longer side and the shorter side has two digits and one digit respectively: the dimension of the longer side is rounded off to the first integral place to obtain a two digits integer. While, the dimension of the shorter side is rounded off to the first integral place to obtain a single digit integer, and secondly, 0 is put before the number.

c) When the dimension of both the longer side and the shorter side has one digit: the dimension of both the longer side and the shorter side is rounded off to the first decimal place, and expressed with one integral number and one decimal number.

Table A.4 shows the correspondence between the new and old enclosures.