

# INTERNATIONAL STANDARD



**Packaging of components for automatic handling –  
Part 3: Packaging of surface mount components on continuous tapes**

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## Packaging of components for automatic handling – Part 3: Packaging of surface mount components on continuous tapes

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PACKAGING OF COMPONENTS FOR AUTOMATIC HANDLING –****Part 3: Packaging of surface mount components  
on continuous tapes**

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International Standard IEC 60286-3 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This sixth edition cancels and replaces the fifth edition published in 2013. This edition constitutes a technical revision.

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

- a) addition of a table of the classification to symbols concerning tape, reel and common symbols;
- b) additions of a figure of example of polarity and orientation and a figure of example of dot seal;
- c) revision of requirements for camber;
- d) addition of a definition of design value with regard to tilt.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
40/2643/FDIS	40/2649/RVD

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.

A list of all parts in the IEC 60286 series, published under the general title *Packaging of components for automatic handling*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
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## INTRODUCTION

Tape packaging meets the requirements of automatic component placement machines and also covers the use of tape packaging for components and singulated dies for test purposes and other operations.

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## PACKAGING OF COMPONENTS FOR AUTOMATIC HANDLING –

### Part 3: Packaging of surface mount components on continuous tapes

#### ~~1~~ **General**

##### **1 Scope**

This part of IEC 60286 is applicable to the tape packaging of electronic components without leads or with lead stumps, intended to be connected to electronic circuits. It includes only those dimensions that are essential for the taping of components intended for the above-mentioned purposes.

This document also includes requirements related to the packaging of singulated die products including bare die and bumped die (flip chips).

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

~~IEC 61340-5-1, *Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*~~

~~IEC/TR 61340-5-2, *Electrostatics – Part 5-2: Protection of electronic devices from electrostatic phenomena – User guide*~~

##### **3 Terms, definitions and symbols**

###### **3.1 Terms and definitions**

For the purposes of this document, the following terms and definitions apply. Definitions apply to all tape types, unless specifically mentioned.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

###### **3.1.1 components**

~~unless specifically mentioned otherwise, for all packaging types for bare die products, the term components refers to components as well as singulated die products~~

electronic part of a product that cannot be physically divided into smaller parts without losing its particular function

Note 1 to entry: This includes singulated die product.

Note 2 to entry: This is applied to all packaging-types for bare die products unless specifically mentioned otherwise.

### 3.1.2 component sizes

~~all component sizes~~ size of component that are identified with their metric size code

Note 1 to entry: This size code is followed by a capital M.

Note 2 to entry: To avoid possible confusion with inch-based size codes, an ~~equivalent~~ equivalency table is shown in Table 1.

**Table 1 – Component size codes**

Metric size code	Inch size code
0402M	01005
0603M	0201
1005M	0402
1608M	0603
2012M	0805

### 3.1.3 packaging

product made of any material of any nature to be used for the containment, protection, structured alignment for automatic assembly, handling and delivery

### 3.1.4 pressed carrier tape

<type 1b> carrier tape with concave cavities formed by compression of the base material

### 3.1.5 fluff

<type 1b> fibre from the base material attached inside the cavity

Note 1 to entry: See Figure 1.

### 3.1.6 burr

<type 1b> surface projection of tape unintentionally produced when cavity is formed

Note 1 to entry: See Figure 1.

### 3.1.7 deformation

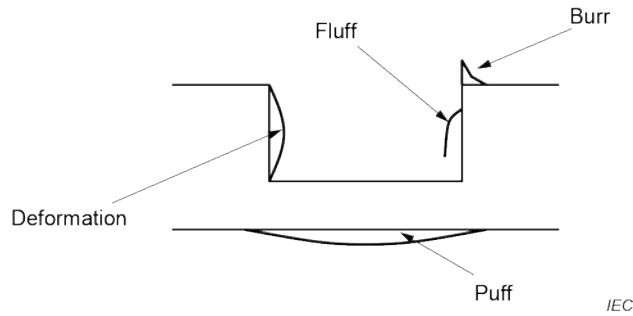
<type 1b> bulge on the inner wall of the cavity

Note 1 to entry: See Figure 1.

### 3.1.8 puff

<type 1b> bulge on the reverse side of the cavity

Note 1 to entry: See Figure 1.



**Figure 1 – Sectional view of component cavity (type 1b)**

**3.1.9 blister carrier tape**

~~tape types 2a, 2b and 3 are identified as blister carrier tapes~~ carrier tape which is identified as tape belonging to types 2a, 2b and 3

Note 1 to entry These types of carriers are also known as "embossed" carrier types.

**3.2 Symbols**

The symbols used in this document are listed in Table 2.

**Table 2 – Classification to symbols concerning tape, reel and common symbols**

Symbols	Definitions	Figure references
$A$	Reel diameter	Figure 26
$A_0$	Cavity's bottom dimension in direction of unreeling	Figures 2, 4, 5, 7, 8, 10, 11, 13, 14, 16 and 20
$B$	Reel hole key's groove width	Figure 27
$B_0$	Cavity's bottom dimension in direction of tape width	Figures 2, 4, 5, 7, 8, 10, 11, 13, 14, 16 and 20
$B_1$	Cavity's rim in direction of tape width	Figures 8, 11 and 14
$C$	Reel hole diameter	Figures 26 and 27
$C_T$	Distance of puff under cavity in direction of tape width	Figure 5
$d$	Difference of diameter between sprocket hole and round foramen	Figure 14
$D$	Reel slot diameter	Figure 27
$D_0$	Sprocket hole diameter	Figures 2, 5, 8, 11, 14 and 17
$D_1$	Cavity's bottom hole diameter	Figures 8 and 14
$E_1$	Shorter distance in direction of width between the origin point of round sprocket hole and the edge of a side of tape	Figures 2, 5, 8, 11, 14 and 17
$E_2$	Longer distance in direction of width between the origin point of round sprocket hole and the edge of a side of tape	Figures 2, 5, 8 and 11
$F$	Distance in direction of width between the origin point of round sprocket hole and the centre of cavity	Figures 2, 5, 8, 11 and 14
$F_A$	Distance in direction of width between the origin point of round sprocket hole and the centre of compartment	Figures 17, 19, 24 and 25
$G$	Shorter distance in direction of width between the cavity and the edge of a side of tape	Figures 2, 5, 8, 11 and 17
$K_0$	Cavity depth	Figures 2, 5, 8, 11, 14 and A.3
$N$	Hub diameter	Figure 26

Symbols	Definitions	Figure references
$P_0$	Pitch of the sprocket holes	Figures 2, 3, 5, 6, 8, 9, 11, 14 and 17
$P_1$	Cavity pitch	Figures 2, 3, 5, 6, 8, 9, 11, 14, 17 and 18
$P_2$	Pitch between the centre of a cavity on the same line with the origin point of round sprocket hole and the centre of the next cavity in direction of unreeling	Figures 2, 3, 5, 6, 8, 9, 11 and 14
$P_{2A}$	Pitch between the centre line of the origin point of round sprocket hole and the centre line of compartment in direction of unreeling	Figures 17, 18, 19, 24 and 25
$P_3$	Pitch between the centre of a cavity on the same line with the origin point of round sprocket hole and the centre of the second next cavity in direction of unreeling	Figures 3 and 6
$P_4$	Pitch between the centre of a cavity on the same line with the origin point of round sprocket hole and the centre of the third next cavity in direction of unreeling	Figures 3 and 6
$S$	Sprocket hole pitch in direction of width	Figure 14
$R$	Bending radius of carrier tape	Figure 21
$r$	Curvature radius of reel hole key's groove	Figure 27
$T$	Carrier tape thickness without cover tape	Figures 2, 5, 8, 11, 14, 17, 25 and A.1
$T_1$	Top cover tape thickness or bottom cover tape thickness	Figures 2, 5, 8, 11, 14 and 17
$T_2$	Sum of outer cavity height and top cover tape thickness	Figures 8, 11 and 14
$T_3$	Thickenss of pressed carrier tape including bulge	Figures 5 and A.1
$V_1$	Compartment dimension in direction of unreeling	Figures 17 and 18
$V_2$	Compartment dimension in direction of width	Figures 17 and 18
$W$	Carrier tape width	Figures 2, 5, 8, 11, 14 and 17
$W_P$	Distance between adhesive tapes	Figure 17
$W_1$	Reel inner width(measured at hub)	Figure 26
$W_2$	Reel overall width	Figure 26
$W_3$	Reel inner width in the rim	Figure 26
$Z$	Component thickness	Figure 25

#### 4 Structure of the specification

The various types of tapes are as follows.

~~NOTE 1—The separation of the prior type 1 into two sub-types 1a and 1b is new in this edition of this standard. Any reference to type 1 not being specific to type 1a or type 1b is considered as referring to type 1a.~~

**Type 1** – Punched and pressed carrier tape

**Type 1a:** Punched carrier tape, with top and bottom cover tape (tape widths: 8 mm and 12 mm)

**Type 1b:** Pressed carrier tape, with top cover tape (tape width: 8 mm)

~~NOTE 2—The separation of the prior type 2 into two sub-types 2a and 2b is new in this edition of this standard. Any reference to type 2 not being specific to type 2a or type 2b is considered as referring to type 2a.~~

- Type 2** – Blister carrier tape, with single round sprocket holes
  - Type 2a:** Blister carrier tape, with single round sprocket holes, with top cover tape and tape pitches down to 2 mm (tape widths: 8 mm, 12 mm, 16 mm and 24 mm)
  - Type 2b:** Blister carrier tape, with single round sprocket holes, with top cover tape and with 1mm tape pitch (tape widths: 4 mm)
- Type 3** – Blister carrier tape, with double sprocket holes (tape widths: 32 mm to 200 mm)
- Type 4** – Adhesive-backed punched plastic carrier tape for singulated bare die and other surface mount components (tape widths: 8 mm, 12 mm, 16 mm, and 24 mm)

## 5 Dimensional requirements for taping

### 5.1 Component cavity positioning requirements

#### 5.1.1 Requirements for types 1a, 1b, 2a, 2b and 3

For defined component positioning, the cavity shall be defined to an origin point. The origin is the centre of the round sprocket hole, defined by the crosshair of the dimensions  $E_1$  and  $P_0$ . The centre of the compartment shall be defined by  $P_2$  and  $P$ , relative to the round sprocket hole (see Figures 2, 5, 8, 11 and 14). When dimension  $P_1$  is smaller or equal to 2 mm, the maximum allowed pocket offset, relative to the centre of the round sprocket hole, shall be applied (see Figures 3, 6, 9 and 12).

#### 5.1.2 Requirements for types 4

For defined component positioning, the component placement and location shall be defined to an origin. The origin is the centre of the sprocket hole, defined by the crosshair of the dimensions  $E_1$  and  $P_0$ . The centre of the component location shall be defined by  $P_{2A}$  and  $F_A$ , relative to the sprocket hole (see Figure 17). Type 4 does not have cavities that are used to position components, therefore all position measurements should be made according to the principle defined here and not to the compartments or 'pockets', which are virtual boundaries for component protection only. The term 'pocket offset' does not apply to type 4. The following applies to tape type 4:

- a) rotation and lateral movement of the component is defined by the accuracy to which it has been placed in the compartment, with reference to the target;
- b) the component shall not protrude above the top surface of the carrier tape (see Figure 25, sketch R);
- c) the components shall not change their orientation within the tape;
- d) the component shall be able to be removed from the cavity or compartment in a vertical direction, without mechanical restriction.

### 5.2 Component cavity dimension requirements (tape types 1a, 1b, 2a, 2b and 3)

The size of the component cavity, including applicable tolerances, is governed by the dimensions of the component for which the packaging applies, to ensure that the component is adequately protected and that tilt, rotation and lateral movement of the component complies with the requirements detailed for each type of tape. The following applies to tape types 1a, 1b, 2a, 2b and 3:

- a) dimensions  $A_0 \leq B_0$ , unless otherwise specified in the component detail specification;
- b) maximum and minimum dimensions of the component shall be taken from the component detail specification;