IEC 60286-3

Edition 6.0 2019-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

Emballage de composants pour opérations automatisées – Partie 3: Emballage des composants pour montage en surface en bandes continues

IEC 60286-3:2019-01(en-fr)

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

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

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

Emballage de composants pour opérations automatisées – Partie 3: Emballage des composants pour montage en surface en bandes continues

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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PACKAGING OF COMPONENTS FOR AUTOMATIC HANDLING –

Part 3: Packaging of surface mount components on continuous tapes

FOREWORD

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- withdrawn,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

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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.

PACKAGING OF COMPONENTS FOR AUTOMATIC HANDLING –

Part 3: Packaging of surface mount components on continuous tapes

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*

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
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
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 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.

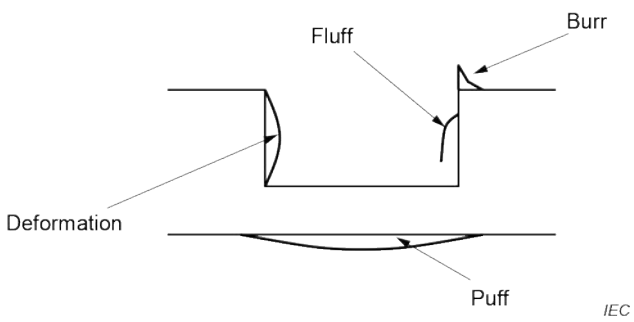

Figure 1 – Sectional view of component cavity (type 1b)

3.1.9
blister carrier tape
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
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

Symbols	Definitions	Figure references
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 direcion 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.

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)

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 F, 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;

c) the component shall not protrude above the top surface of the carrier tape, except for type 1a where the component shall not protrude beyond either surface of the carrier tape;

d) the components shall not change their orientation within the tape;

e) the component shall be able to be removed from the cavity or compartment in a vertical direction, without mechanical restriction, after the top cover has been removed, where a cover tape is used.

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

For respective dimensional codes, see Figures 2 to 4 and Tables 3 to 5.

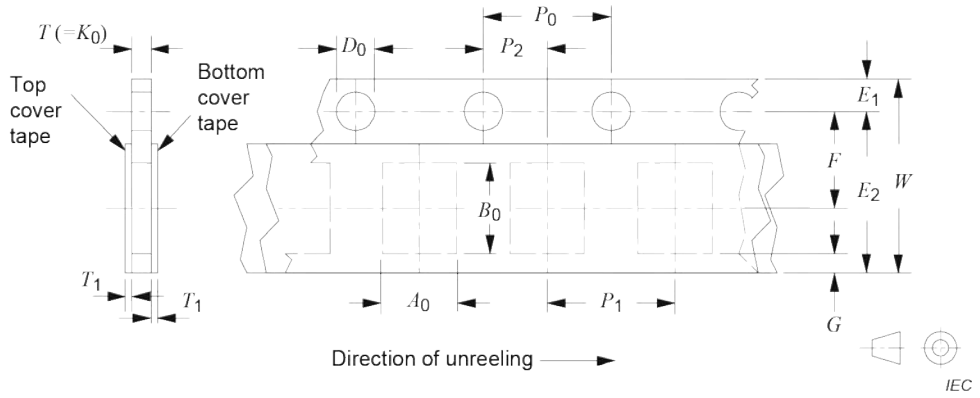

Figure 2 – 8 mm and 12 mm punched carrier-tape dimensions (4 mm cavity pitch)

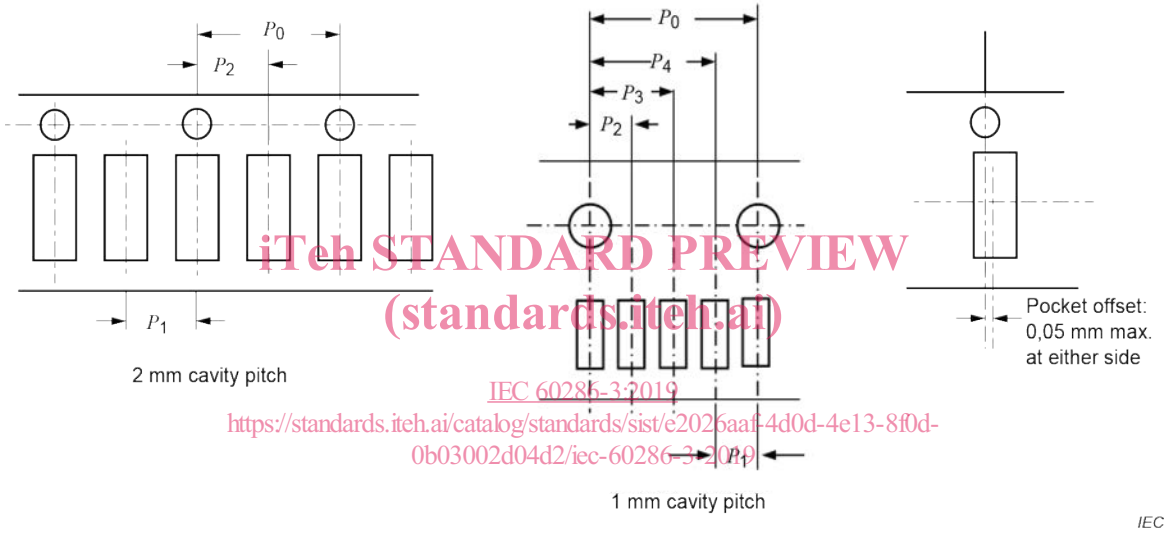

Figure 3 – Illustration of 2 mm and 1 mm cavity pitch and maximum pocket offset

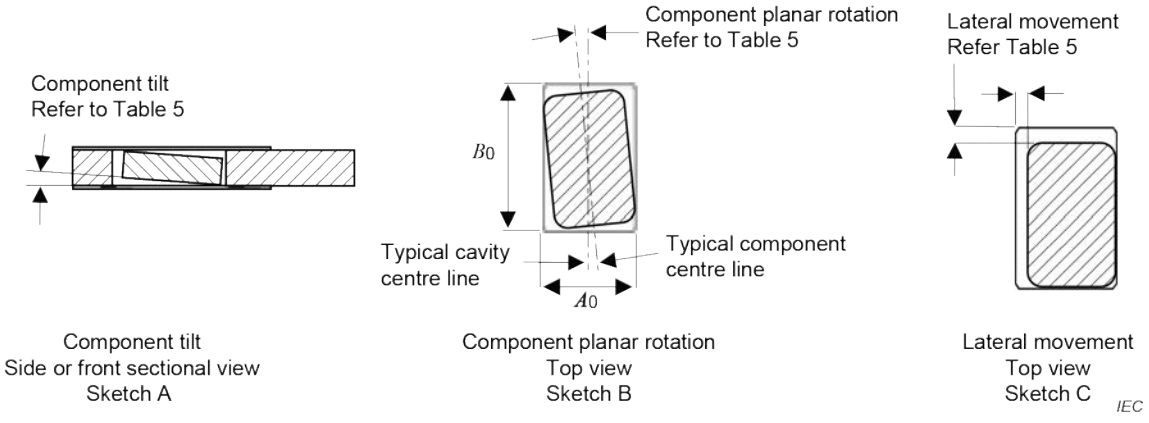

Figure 4 – Maximum component tilt, rotation and lateral movement