

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**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**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2022 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.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 once a month by email.

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: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications preview. With a subscription you will always have access to up-to-date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**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

ICS 31.020; 31.240

ISBN 978-2-8322-5899-6

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD	6
INTRODUCTION	8
1 Scope	9
2 Normative references	9
3 Terms, definitions and symbols	9
3.1 Terms and definitions	9
3.2 Symbols	11
4 Structure of the specification	13
5 Dimensional requirements for taping	13
5.1 Component cavity positioning requirements	13
5.1.1 Requirements for type 1a, type 1b, type 2a, type 2b and type 3	13
5.1.2 Requirements for type 4	13
5.2 Component cavity dimension requirements (type 1a, type 1b, type 2a, type 2b and type 3)	14
5.3 Type 1a – Punched carrier tape, with top and bottom cover tape (tape widths: 8 mm and 12 mm)	14
5.4 Type 1b – Pressed carrier tape, with top cover tape (tape width: 8 mm)	17
5.5 Type 2a – Blister carrier tape, with single round sprocket holes and tape pitches down to 2 mm (tape widths: 8 mm, 12 mm, 16 mm and 24 mm)	19
5.6 Type 2b – Blister carrier tape, with single round sprocket holes and with 1mm tape pitch (tape widths: 4 mm)	21
5.7 Type 3 – Blister carrier tape, with double sprocket holes (32 mm to 200 mm)	23
5.8 Type 4 – Adhesive-backed punched plastic carrier tape for singled bare die and other surface mount components (8 mm, 12 mm, 16 mm and 24 mm)	26
6 Polarity and orientation requirements of components in the tape	28
6.1 Requirements for all types	28
6.2 Specific requirements for type 1a	29
6.3 Specific requirements for type 4	29
7 Carrier tape requirements	29
7.1 Taping materials	29
7.2 Minimum bending radius (for all types)	29
7.3 Camber	30
8 Cover tape requirements (for type 1a, type 1b, type 2a, type 2b and type 3)	31
9 Component taping and additional tape requirements	33
9.1 All types	33
9.2 Specific requirements for type 1b	33
9.3 Specific tape requirements for type 2b	33
9.4 Specific requirement for type 4	34
9.4.1 General	34
9.4.2 Coordinate system	34
9.4.3 Component positioning and lateral displacement	35
9.5 Specific requirements for tapes containing die products	36
9.5.1 General	36
9.5.2 Tape design for tapes containing die products	36
9.5.3 Cleanliness	36
9.5.4 Die lateral movement (type 1a, type 2a and type 2b)	37

10	Reel requirements	37
10.1	Dimensions	37
10.1.1	General	37
10.1.2	Reel dimensions	37
10.1.3	Reel hole dimensions	38
10.1.4	Drive hole dimensions (optional).....	39
10.2	Marking.....	40
11	Tape reeling requirements	41
11.1	All types.....	41
11.2	Specific requirements for type 1a.....	41
11.3	Specific requirements for type 4.....	41
11.4	Leader and trailer tape.....	41
11.4.1	General	41
11.4.2	Leader.....	42
11.4.3	Trailer.....	42
11.5	Recycling.....	42
11.6	Missing components	42
Annex A	(normative) Recommended measuring methods for type 1.....	43
A.1	Measurement method for carrier tape thickness (T_1 and T_3).....	43
A.2	Measurement method for cavity (A_0 and B_0).....	43
A.3	Measurement method for cavity depth (dimension K_1).....	44
Annex B	(informative) Measuring methods of electrostatic potential and charge decay performance while cover tape is peeled off from carrier tape containing surface mount devices.....	45
B.1	General.....	45
B.2	Method for measuring electrostatic potential and charge decay performance	46
B.2.1	General	46
B.2.2	Measurement instrument and device.....	48
B.2.3	Sample (test specimen).....	50
B.2.4	Pre-treatment conditions and measurement environment conditions	50
B.2.5	Measurement conditions.....	51
B.2.6	Method for measuring electrostatic potential.....	51
B.2.7	Method for measuring the electrostatic charge decay performance	52
B.3	Items to be described in the test report and items to be specified in the related standards.....	53
B.3.1	Items to be described in the test report.....	53
B.3.2	Items specified in related standards.....	54
Bibliography	55
Figure 1	– Sectional view of component cavity (type 1b).....	11
Figure 2	– 8 mm and 12 mm punched carrier-tape dimensions (4 mm cavity pitch)	14
Figure 3	– Illustration of 2 mm and 1 mm cavity pitch and maximum pocket offset	15
Figure 4	– Maximum component tilt, rotation and lateral movement	15
Figure 5	– Dimensions ($P_0 = 4 \text{ mm}/P_1 = 2 \text{ mm}$) and ($P_0 = 4 \text{ mm}/P_1 = 1 \text{ mm}$)	17
Figure 6	– Illustration of 2 mm and 1 mm cavity pitch and maximum pocket offset	18
Figure 7	– Maximum component tilt, rotation and lateral movement	18
Figure 8	– Blister carrier tape dimensions (8 mm, 12 mm, 16 mm and 24 mm).....	19

Figure 9 – Illustration of 2 mm cavity pitch and pocket offset	20
Figure 10 – Maximum component tilt, rotation and lateral movement	20
Figure 11 – Type 2b carrier tape	22
Figure 12 – Maximum pocket offset.....	22
Figure 13 – Maximum component tilt, rotation and lateral movement	22
Figure 14 – Blister carrier tape.....	24
Figure 15 – Elongated sprocket hole skew	24
Figure 16 – Maximum component tilt, rotation and lateral movement	24
Figure 17 – Adhesive-backed punched carrier-tape dimensions (4 mm compartment pitch)	26
Figure 18 – Illustration of 2 mm compartment pitch	26
Figure 19 – Maximum component planar rotation and lateral displacement	27
Figure 20 – Example of polarity and orientation	29
Figure 21 – Bending radius	30
Figure 22 – Measuring method and camber	31
Figure 23 – Dot seals for thin components (as exceptions)	32
Figure 24 – Type 4 coordinate system	35
Figure 25 – Component clearance and positioning method	36
Figure 26 – Reel	37
Figure 27 – Reel hole presentation	39
Figure 28 – Drive hole layout	40
Figure 29 – Tape reeling and label area on the reel	41
Figure 30 – Leader and trailer.....	42
Figure A.1 – Carrier tape thickness measurement points	43
Figure A.2 – Cavity cross-section.....	44
Figure A.3 – Cavity depth dimension.....	44
Figure B.1 – Configuration of measurement method using electrostatic potential measuring system.....	46
Figure B.2 – Diagram of the site electrostatic potential when peeling cover tape.....	47
Figure B.3 – Configuration of electrostatic charge decay measurement method	47
Figure B.4 – Diagram of the measurement of electrostatic charge decay performance	48
Figure B.5 – Dimensions of the sample	50
Table 1 – Component size codes	10
Table 2 – Classification to symbols concerning tape, reel and common symbols.....	11
Table 3 – Constant dimensions of 8 mm and 12 mm punched carrier tape	16
Table 4 – Variable dimensions of 8 mm and 12 mm punched carrier tape	16
Table 5 – Component tilt, planar rotation and lateral movement	17
Table 6 – Constant dimensions of 8 mm pressed carrier tape	18
Table 7 – Variable dimensions of 8 mm pressed carrier tape	19
Table 8 – Component tilt, planar rotation and lateral movement	19
Table 9 – Constant dimensions of 8 mm to 24 mm blister carrier tape.....	20
Table 10 – Variable dimensions of 8 mm to 24 mm blister carrier tape	21
Table 11 – Component tilt, rotation and lateral movement.....	21

Table 12 – Constant dimensions of 4 mm carrier tape.....	23
Table 13 – Variable dimensions of 4 mm carrier tape.....	23
Table 14 – Component tilt, planar rotation and lateral movements	23
Table 15 – Constant dimensions of 32 mm to 200 mm blister carrier tape	25
Table 16 – Variable dimensions of 32 mm to 200 mm blister carrier tape	25
Table 17 – Component tilt, planar rotation and lateral movements	26
Table 18 – Dimensions of adhesive backed punched carrier tape	27
Table 19 – Variable dimensions of adhesive-backed punched carrier tape	28
Table 20 – Component planar rotation and lateral displacement	28
Table 21 – Minimum bending radius.....	30
Table 22 – Peel force.....	32
Table 23 – Absolute referencing data for component target position	34
Table 24 – Reel dimensions.....	38
Table 25 – Reel hole dimensions	39
Table 26 – Drive hole dimensions	40
Table B.1 – Conditions of the environment in which the samples are kept and the conditions of the measurement test environment before measurement.....	51

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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. For 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 Publications"). 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 far 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.

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

This seventh edition cancels and replaces the sixth edition published in 2019. This edition constitutes a technical revision.

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

- a) addition terms and definitions.
- b) addition of a table of the classification to symbols concerning drive hole diameter and distance between the reel hole centre and the drive hole centre;
- c) addition of drive hole to the reel (optional);
- d) revision of reel hole diameter tolerances;
- e) revision of 72 mm tape size carrier tape width dimension tolerances;

- f) addition of Annex B (informative);
- g) addition of component size 0201M.

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

Draft	Report on voting
40/2972/FDIS	40/2984/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

A list of all parts in the IEC 60268 series, published under the general title *Packaging of components for automatic handling*, can be found on the IEC website.

This document was drafted in accordance with ISO/IEC Directives, Part 2 and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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.

Currently in preview, click buy full version

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*

IEC 61340-4-5, *Electrostatics – Part 4-5: Standard test methods for specific applications – Methods for characterizing the electrostatic protection of footwear and flooring in combination with a person*

IEC 61340-4-6, *Electrostatics – Part 4-6: Standard test methods for specific applications – Wrist straps*

IEC 61340-4-7, *Electrostatics – Part 4-7: Standard test methods for specific applications – Ionization*

IEC 61340-4-9, *Electrostatics – Part 4-9: Standard test methods for specific applications – Garments*

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 terminology databases for use in standardization at the following addresses:

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