

STN	Elektronické súčiastky Dlhodobé skladovanie elektronických polovodičových súčiastok Časť 5: Čipy a doštičky	STN EN 62435-5 35 8760
------------	--	--

Electronic components - Long-term storage of electronic semiconductor devices - Part 5: Die and wafer devices

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 07/17

Obsahuje: EN 62435-5:2017, IEC 62435-5:2017

125090

Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2017
Podľa zákona č. 264/1999 Z. z. o technických požiadavkách na výrobky a o posudzovaní zhody a o zmene a doplnení niektorých zákonov v znení neskorších predpisov sa slovenská technická norma a časti slovenskej technickej normy môžu rozmnožovať alebo rozširovať len so súhlasom slovenského národného normalizačného orgánu.

EUROPEAN STANDARD

EN 62435-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2017

ICS 31.020

English Version

**Electronic components - Long-term storage of electronic semiconductor devices - Part 5: Die and wafer devices
(IEC 62435-5:2017)**

Composants électroniques - Stockage de longue durée des dispositifs électroniques à semiconducteurs -
Partie 5: Dispositifs de puces et plaquettes
(IEC 62435-5:2017)

Elektronische Bauteile - Langzeitlagerung elektronischer Halbleiterbauelemente - Teil 5: Chip- und Wafererzeugnisse
(IEC 62435-5:2017)

This European Standard was approved by CENELEC on 2017-02-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

EN 62435-5:2017**European foreword**

The text of document 47/2328/FDIS, future edition 1 of IEC 62435-5, prepared by IEC/TC 47 "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62435-5:2017.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-11-24
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2020-02-24

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62435-5:2017 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2-17	NOTE	Harmonized as EN 60068-2-17.
IEC 60068-2-20	NOTE	Harmonized as EN 60068-2-20.
IEC 60749-3	NOTE	Harmonized as EN 60749-3.
IEC 60749-20-1	NOTE	Harmonized as EN 60749-20-1.
IEC 60749-21	NOTE	Harmonized as EN 60749-21.
IEC 60749-22	NOTE	Harmonized as EN 60749-22.
IEC 61340-5-1	NOTE	Harmonized as EN 61340-5-1.
IEC 61340-2-1	NOTE	Harmonized as EN 61340-2-1.
IEC/TR 62258-3	NOTE	Harmonized as CLC/TR 62258-3.
IEC 62435-1	NOTE	Harmonized as EN 62435-1.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62435-2	-	Electronic components - Long-term storage of electronic semiconductor devices - Part 2: Deterioration mechanisms	EN 62435-2	-



INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electronic components – Long-term storage of electronic semiconductor devices –
Part 5: Die and wafer devices**

**Composants électroniques – Stockage de longue durée des dispositifs
électroniques à semiconducteurs –
Partie 5: Dispositifs de puces et plaquettes**





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2017 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 Central Office
 3, rue de Varembe
 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 16 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.

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.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

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 aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

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



INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electronic components – Long-term storage of electronic semiconductor devices –
Part 5: Die and wafer devices**

**Composants électroniques – Stockage de longue durée des dispositifs électroniques à semiconducteurs –
Partie 5: Dispositifs de puces et plaquettes**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.020

ISBN 978-2-8322-3837-0

**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.....	4
INTRODUCTION.....	6
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and abbreviated terms	8
3.1 Terms and definitions.....	8
3.2 Abbreviations	9
4 Storage requirements	9
4.1 General.....	9
4.2 Assembly data	9
4.3 Prerequisite for storage.....	9
4.4 Damage to die products during long-term storage	9
4.5 Mechanical storage conditions	10
4.6 Long-term storage environment	10
4.7 Recommended inert atmosphere purity	11
4.8 Chemical contamination	11
4.9 Vacuum packing	11
4.9.1 General	11
4.9.2 Vacuum dry pack.....	11
4.10 Positive pressure systems for packing	11
4.11 Use of packing material having sacrificial properties	11
4.12 Use of bio-degradable material	12
4.13 Plasma cleaning	12
4.14 Electrical effects	12
4.15 Protection from radiation.....	12
4.16 Periodic qualification of stored die products	12
5 Long-term storage failure mechanisms	13
6 LTS concerns, method, verification and limitations	13
6.1 General.....	13
6.2 Wafers	13
6.3 Bare dice	14
7 Deterioration mechanisms specific to bare die and wafers	15
7.1 Wire bondability	15
7.2 Staining	15
7.3 Topside delamination.....	16
8 Specific handling concerns	16
8.1 Die on wafer film frames	16
8.2 Devices and dice embossed or punched tape storage	16
8.3 Handling damage	16
Annex A (informative) Audit checklist.....	17
Bibliography.....	20

Table 1 – LTS exposure concerns for wafers	14
Table 2 – LTS exposure concerns for bare dice	15
Table A.1 – Planning checklist	17

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRONIC COMPONENTS – LONG-TERM STORAGE
OF ELECTRONIC SEMICONDUCTOR DEVICES –****Part 5: Die and wafer devices**

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 62435-5 has been prepared by IEC technical committee 47: Semiconductor devices.

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

FDIS	Report on voting
47/2328/FDIS	47/2351/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 62435 series, published under the general title *Electronic components – Long-term storage of electronic semiconductor devices*, 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.

INTRODUCTION

This document applies to the long-duration storage of electronic components.

This is a document for long-term storage (LTS) of electronic devices drawing on the best long-term storage practices currently known. For the purposes of this document, LTS is defined as any device storage whose duration may be more than 12 months for product scheduled for long duration storage. While intended to address the storage of unpackaged semiconductors and packaged electronic devices, nothing in this document precludes the storage of other items under the storage levels defined herein.

Although it has always existed to some extent, obsolescence of electronic components and particularly of integrated circuits, has become increasingly intense over the last few years.

Indeed, with the existing technological boom, the commercial life of a component has become very short compared with the life of industrial equipment such as that encountered in the aeronautical field, the railway industry or the energy sector.

The many solutions enabling obsolescence to be resolved are now identified. However, selecting one of these solutions should be preceded by a case-by-case technical and economic feasibility study, depending on whether storage is envisaged for field service or production, for example:

- remedial storage as soon as components are no longer marketed;
- preventive storage anticipating declaration of obsolescence.

Taking into account the expected life of some installations, sometimes covering several decades, the qualification times, and the unavailability costs, which can also be very high, the solution to be adopted to resolve obsolescence should often be rapidly implemented. This is why the solution retained in most cases consists in systematically storing components which are in the process of becoming obsolescent.

The technical risks of this solution are, a priori, fairly low. However, it requires perfect mastery of the implemented process and especially of the storage environment, although this mastery becomes critical when it comes to long-term storage.

All handling, protection, storage and test operations are recommended to be performed according to the state of the art.

The application of the approach proposed in this standard in no way guarantees that the stored components are in perfect operating condition at the end of this storage. It only comprises a means of minimizing potential and probable degradation factors.

Some electronic device users have the need to store electronic devices for long periods of time. Lifetime buys are commonly made to support production runs of assemblies that will exceed the production timeframe of its individual parts. This puts the user in a situation requiring careful and adequate storage of such parts to maintain the as-received solderability and minimize any degradation effects to the part over time. Major degradation concerns are moisture, electrostatic fields, ultra-violet light, large variations in temperature, air-borne contaminants, and outgassing.

Warranties and sparring also present a challenge for the user or repair agency as some systems have been designated to be used for long periods of time, in some cases for up to 40 years or more. Some of the devices needed for repair of these systems will not be available from the original supplier for the lifetime of the system or the spare assembly may be built with the original production run but then require long-term storage. This document was developed to provide a standard for storing electronic devices for long periods of time.

For storage of devices that are moisture sensitive but that do not need to be stored for long periods of time, refer to IEC TR 62258-3.

Long-term storage assumes that the device is going to be placed in uninterrupted storage for a number of years. It is essential that it is useable after storage. Particular attention should be paid to storage media surrounding the devices together with the local environment.

These guidelines do not imply any warranty of product or guarantee of operation beyond the storage time given by the original device manufacturer.

The IEC 62435 series is intended to ensure that adequate reliability is achieved for devices in user applications after long-term storage. Users are encouraged to request data from suppliers to these specifications to demonstrate a successful storage life as requested by the user. These standards are not intended to address built-in failure mechanisms that would take place regardless of storage conditions.

These standards are intended to give practical guide to methods of long-term storage of electronic components where this is intentional or planned storage of product for a number of years. Storage regimes for work-in-progress production are managed according to company internal process requirements and are not detailed in this series of standards.

The IEC 62345 series includes a number of parts. Parts 1 to 4 apply to any long-term storage and contain general requirements and guidance, whereas Parts 5 to 9¹ are specific to the type of product being stored. It is intended that the product specific part should be read alongside the general requirements of Parts 1 to 4.

Electronic components requiring different storage conditions are covered separately starting with Part 5.

The structure of the IEC 62435 series as currently conceived is as follows:

Part 1 – General

Part 2 – Deterioration mechanisms

Part 3 – Data

Part 4 – Storage

Part 5 – Die and wafer devices

Part 6 – Packaged or finished devices

Part 7 – MEMS

Part 8 – Passive electronic devices

Part 9 – Special cases

¹ Under preparation.

ELECTRONIC COMPONENTS – LONG-TERM STORAGE OF ELECTRONIC SEMICONDUCTOR DEVICES –

Part 5: Die and wafer devices

1 Scope

This part of IEC 62435, is applicable to long-term storage of die and wafer devices and establishes specific storage regimen and conditions for singulated bare die and partial or complete wafers of die including die with added structures such as redistribution layers and solder balls or bumps or other metallisation. This part also provides guidelines for special requirements and primary packaging that contain the die or wafers for handling purposes. Typically, this part is used in conjunction with IEC 62435-1 for long-term storage of devices whose duration can be more than 12 months for products scheduled for long duration storage.

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 62435-2, *Electronic components – long-term storage of electronic semiconductor devices – Part 2: Deterioration mechanisms*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN