

STN	Polovodičové súčiastky Mechanické a klimatické skúšobné metódy Časť 18: Ionizujúce vyžarovanie (celková dávka)	STN EN IEC 60749-18 35 8799
------------	---	---

Semiconductor devices - Mechanical and climatic test methods - Part 18: Ionizing radiation (total dose)

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. 09/19

Obsahuje: EN IEC 60749-18:2019, IEC 60749-18:2019

Oznámením tejto normy sa od 15.05.2022 ruší
STN EN 60749-18 (35 8799) z októbra 2003

129317

EUROPEAN STANDARD

EN IEC 60749-18

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2019

ICS 31.080.01

Supersedes EN 60749-18:2003

English Version

**Semiconductor devices - Mechanical and climatic test methods -
Part 18: Ionizing radiation (total dose)
(IEC 60749-18:2019)**

Dispositifs à semiconducteurs - Méthodes d'essais
mécaniques et climatiques - Partie 18: Rayonnements
ionisants (dose totale)
(IEC 60749-18:2019)

Halbleiterbauelemente - Mechanische und klimatische
Prüfverfahren - Teil 18: Ionisierende Strahlung
(Gesamtdosis)
(IEC 60749-18:2019)

This European Standard was approved by CENELEC on 2019-05-15. 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: Rue de la Science 23, B-1040 Brussels

EN IEC 60749-18:2019 (E)**European foreword**

The text of document 47/2539/FDIS, future edition 2 of IEC 60749-18, prepared by IEC/TC 47 "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60749-18:2019.

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) 2020-02-15
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-05-15

This document supersedes EN 60749-18:2003.

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

Endorsement notice

The text of the International Standard IEC 60749-18:2019 was approved by CENELEC as a European Standard without any modification.



IEC 60749-18

Edition 2.0 2019-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Semiconductor devices – Mechanical and climatic test methods –
Part 18: Ionizing radiation (total dose)**

**Dispositifs à semiconducteurs – Méthodes d’essais mécaniques et climatiques –
Partie 18: Rayonnements ionisants (dose totale)**



**THIS PUBLICATION IS COPYRIGHT PROTECTED****Copyright © 2019 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
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.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries 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

67 000 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.

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.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques 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

67 000 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.



IEC 60749-18

Edition 2.0 2019-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Semiconductor devices – Mechanical and climatic test methods –
Part 18: Ionizing radiation (total dose)**

**Dispositifs à semiconducteurs – Méthodes d’essais mécaniques et climatiques –
Partie 18: Rayonnements ionisants (dose totale)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.080.01

ISBN 978-2-8322-6755-4

**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
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Test apparatus	8
4.1 Choice of apparatus	8
4.2 Radiation source	8
4.3 Dosimetry system	8
4.4 Electrical test instruments	8
4.5 Test circuit board(s)	8
4.6 Cabling	9
4.7 Interconnect or switching system	9
4.8 Environmental chamber	9
4.9 Irradiation temperature chamber	9
5 Procedure	9
5.1 Test plan	9
5.2 Sample selection and handling	9
5.3 Burn-in	10
5.4 Dosimetry measurements	10
5.5 Lead/aluminium (Pb/Al) container	10
5.6 Radiation level(s)	10
5.7 Radiation dose rate	10
5.7.1 Radiation dose rate determination	10
5.7.2 Condition A	11
5.7.3 Condition B	11
5.7.4 Condition C	11
5.7.5 Condition D	11
5.7.6 Condition E	11
5.8 Temperature requirements	11
5.8.1 Room temperature radiation	11
5.8.2 Elevated temperature irradiation	11
5.8.3 Cryogenic temperature irradiation	12
5.9 Electrical performance measurements	12
5.10 Test conditions	12
5.10.1 Choice of test conditions	12
5.10.2 In-flux testing	12
5.10.3 Remote testing	12
5.10.4 Bias and loading conditions	13
5.11 Post-irradiation procedure	13
5.12 Extended room temperature annealing test	14
5.12.1 Choice of annealing test	14
5.12.2 Need to perform an extended room temperature annealing test	14
5.12.3 Extended room temperature annealing test procedure	14
5.13 MOS accelerated annealing test	15
5.13.1 Choice of MOS accelerated annealing test	15

5.13.2	Need to perform accelerated annealing test.....	15
5.13.3	Accelerated annealing test procedure	16
5.14	Test procedure for bipolar and BiCMOS linear or mixed signal devices with intended application dose rates less than 0,5 Gy(Si)/s	16
5.14.1	Need to perform ELDRS testing	16
5.14.2	Determination of whether a part exhibits ELDRS.....	17
5.14.3	Characterization of ELDRS parts to determine the irradiation conditions for production or lot acceptance testing	17
5.14.4	Low dose rate or elevated temperature irradiation test for bipolar or BiCMOS linear or mixed-signal devices	18
5.15	Test report	18
6	Summary	18
	Bibliography.....	21
	Figure 1 – Flow diagram for ionizing radiation test procedure for MOS and digital bipolar devices.....	19
	Figure 2 – Flow diagram for ionizing radiation test procedure for bipolar (or BiCMOS) linear or mixed-signal devices.....	20

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SEMICONDUCTOR DEVICES –
MECHANICAL AND CLIMATIC TEST METHODS –****Part 18: Ionizing radiation (total dose)**

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 60749-18 has been prepared by IEC technical committee 47: Semiconductor devices.

This second edition cancels and replaces the first edition published in 2002. This edition constitutes a technical revision.

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

- a) updates to subclauses to better align the test method with MIL-STD 883J, method 1019, including the use of enhanced low dose rate sensitivity (ELDRS) testing;
- b) addition of a Bibliography, which includes ASTM standards relevant to this test method.

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

FDIS	Report on voting
47/2539/FDIS	47/2554/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 60749 series, published under the general title *Semiconductor devices – Mechanical and climatic test methods*, 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.

SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 18: Ionizing radiation (total dose)

1 Scope

This part of IEC 60749 provides a test procedure for defining requirements for testing packaged semiconductor integrated circuits and discrete semiconductor devices for ionizing radiation (total dose) effects from a cobalt-60 (^{60}Co) gamma ray source. Other suitable radiation sources can be used.

There are four tests presented in this procedure:

- a) a standard room temperature irradiation test;
- b) an irradiation at elevated temperature/cryogenic temperature test;
- c) an accelerated annealing test;
- d) an enhanced low dose rate sensitivity (ELDRS) test.

The accelerated annealing test estimates how dose rate ionizing radiation effects on devices is important for low dose rate or certain other applications in which devices can exhibit significant time-dependent effects. The ELDRS test determines if devices with bipolar linear components exhibit sensitivity to enhanced radiation-induced damage at low dose rates.

This document addresses only steady-state irradiations, and is not applicable to pulse type irradiations.

It is intended for military- and aerospace-related applications.

This document can produce severe degradation of the electrical properties of irradiated devices and thus is considered a destructive test.

2 Normative references

There are no normative references in this document.

koniec náhľadu – text ďalej pokračuje v platenej verzii STN