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Semiconductor devices - Mechanical and climatic test methods - Part 17: Neutron irradiation (IEC 60749-17:2019)

Halbleiterbauelemente - Mechanische und klimatische Prüfverfahren - Teil 17: Neutronenbestrahlung (IEC 60749-17:2019)

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Dispositifs à semiconducteurs - Méthodes d'essais mécaniques et climatiques - Partie 17: Irradiation aux neutrons (IEC 60749-17:2019)

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

The text of document 47/2538/FDIS, future edition 2 of IEC 60749-17, prepared by IEC/TC 47 "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60749-17:2019.

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• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2022-05-02

This document supersedes EN 60749-17:2003.

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The text of the International Standard IEC 60749-17:2019 was approved by CENELEC as a European Standard without any modification.

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Part 17: Neutron irradiation

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SEMICONDUCTOR DEVICES –
MECHANICAL AND CLIMATIC TEST METHODS –

Part 17: Neutron irradiation

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International Standard IEC 60749-17 has been prepared by IEC technical committee 47: Semiconductor devices.

This second edition cancels and replaces the first edition published in 2003. This edition constitutes a technical revision.

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

a) updates to better align the test method with MIL-STD 883J, method 1017, including removal of restriction of use of the document, and a requirement to limit the total ionization dose;
b) addition of a Bibliography, including US MIL- and ASTM standards relevant to this test method.

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

FDIS	Report on voting
47/2538/FDIS	47/2553/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.

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SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 17: Neutron irradiation

1 Scope

The neutron irradiation test is performed to determine the susceptibility of semiconductor devices to non-ionizing energy loss (NIEL) degradation. The test described herein is applicable to integrated circuits and discrete semiconductor devices and is intended for military- and aerospace-related applications. It is a destructive test.

The objectives of the test are as follows:

a) to detect and measure the degradation of critical semiconductor device parameters as a function of neutron fluence, and

b) to determine if specified semiconductor device parameters are within specified limits after exposure to a specified level of neutron fluence (see Clause 6).

2 Normative references

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There are no normative references in this document.

3 Terms and definitions

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No terms and definitions are listed in this document.

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

4 Test apparatus

4.1 Test instruments

Test instrumentation to be used in the radiation test shall be standard laboratory electronic test instruments such as power supplies, digital voltmeters, and pico-ammeters, etc., capable of measuring the electrical parameters required.

4.2 Radiation source

The radiation source used in the test shall be a well characterized neutron source that produces either a broad neutron energy spectrum (such as a TRIGA®[1] reactor or a fast burst reactor) or a monoenergetic neutron spectrum such as available from deuterium-tritium or deuterium-deuterium accelerators) provided that the output can be converted to a 1 MeV equivalent spectrum.

[1] TRIGA is the trade name of a product supplied by General Atomics. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.