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Semiconductor devices - Mechanical and climatic test methods - Part 10: Mechanical shock - Device and subassembly (IEC 60749-10:2022)

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Halbleiterbauelemente - Mechanische und klimatische Prüfverfahren - Teil 10: Mechanischer Schock - Bauelemente und Unterbaugruppe (IEC 60749-10:2022)

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European foreword

The text of document 47/2752/FDIS, future edition 2 of IEC 60749-10, prepared by IEC/TC 47 "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60749-10:2022.

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)	2023-03-01
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2025-06-01

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**Semiconductor devices – Mechanical and climatic test methods –
Part 10: Mechanical shock – Device and subassembly**

**Dispositifs à semiconducteurs – Méthodes d'essais mécaniques et climatiques –
Partie 10: Chocs mécaniques – Dispositif et sous-ensemble**

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SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 10: Mechanical shock – Device and subassembly

FOREWORD

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This standard is based upon JEDEC document JESD22-B110. It is used with permission of the copyright holder, JEDEC Solid State Technology Association.

This edition cancels and replaces the first edition published in 2002. This edition includes the following significant technical changes with respect to the previous edition:

a) covers both unattached components and components attached to printed wiring boards;
b) tolerance limits modified for peak acceleration and pulse duration;
c) mathematical formulae added for velocity change and equivalent drop height.

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

Draft	Report on voting
47/2752/FDIS	47/2760/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.

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/standardsdev/publications.

A list of all the parts of the IEC 60749 series, 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 10: Mechanical shock – Device and subassembly

1 Scope

This part of IEC 60749 is intended to evaluate devices in the free state and assembled to printed wiring boards for use in electrical equipment. The method is intended to determine the compatibility of devices and subassemblies to withstand moderately severe shocks. The use of subassemblies is a means to test devices in usage conditions as assembled to printed wiring boards. Mechanical shock due to suddenly applied forces, or abrupt change in motion produced by handling, transportation or field operation can disturb operating characteristics, particularly if the shock pulses are repetitive. This is a destructive test intended for device qualification.

2 Normative references

There are no normative references in this document.

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3 Terms and definitions

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

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3.1
component
constituent part of device or subassembly

Note 1 to entry: Examples include source and drain regions as components of transistors, lead frames and dice as components of packaged integrated circuits, resistors and integrated circuits as components of printed circuit boards, motherboards as components of computers, LCD screens as components of monitors, ac and dc components of complex waveforms, and loops and algorithms as components of software programs.

Note 2 to entry: The classification of an item as a device or a component depends upon the intention of the owner at the time of classification.

3.2
dead-bug orientation
orientation of a package with the terminals facing upwards

3.3
device
piece of equipment, mechanism, or other entity designed to serve a special purpose or perform a special function

Note 1 to entry: The term device is often used as an abbreviated reference to the type or types of solid-state devices that are within the scope of those documents. Context could indicate otherwise; e.g., in the phrase ’the device used to hold the device under test‘, the first usage of the word ’device‘ refers to a mechanism; the second to a solid-state device.

Note 2 to entry: The classification of an item as a device or as a component depends upon the intention of the owner at the time of classification.

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3.4
equivalent drop height
free-fall drop height from which an object at rest must fall, in vacuum, under standard gravity, to attain a velocity equal to the velocity change stated in the test specification

Note 1 to entry: This is the theoretical height that will impart the specified velocity change if impact with zero rebound occurs. This height is provided for reference only in the various service conditions.

3.5
free state
state in which a device or subassembly is rigidly attached to the test apparatus so that the full specified shock level is transmitted to the device or subassembly body

3.6
live-bug orientation
orientation of a package when resting on its terminals

3.7
mounted state
state in which a subassembly is supported by a test fixture that allows flexure to simulate usage conditions and in a manner such that the full specified shock level is transmitted to the subassembly body

3.8
peak acceleration
maximum acceleration during the dynamic motion of the sample under test

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3.9
pulse duration
t_d
time interval between the instant when the acceleration first reaches 10 % of its specified peak level and the instant when the acceleration first returns to 10 % of the specified peak level after having reached that peak level

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Note 1 to entry: The basic frequency of the pulse is 1/2 × t_d.

3.10
service condition
designation for the severity of stress

3.11
subassembly
printed circuit board and the devices assembled thereon that form a unit or segment of electrical equipment

Note 1 to entry: Devices are preferably located near the centre of the printed circuit board.

3.12
velocity change
integral of the acceleration interval over the duration of the entire shock event including at least the pulse duration interval

3.13
vertical direction
direction that is parallel with gravity, i.e., normal to the normalized surface of the earth