

INTERNATIONAL STANDARD

**Semiconductor devices - Generic semiconductor qualification guidelines -
Part 3: Guidelines for reliability qualification plans for power semiconductor
module**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Semiconductor devices -
Generic semiconductor qualification guidelines -
Part 3: Guidelines for reliability qualification plans
for power semiconductor module**

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IEC 63287-3 has been prepared by IEC technical committee 47: Semiconductor devices. It is an International Standard.

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

Draft	Report on voting
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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/publications.

A list of all parts in the IEC 63287 series, published under the general title *Semiconductor devices - Generic semiconductor qualification guidelines*, 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

When performing qualification tests, semiconductor device vendors prepare a specific reliability test plan upon consultation with semiconductor device users in order to efficiently carry out the reliability test.

This guideline presents examples of methods for preparing test plans to determine appropriate reliability test conditions, based on the level of quality required in the operating environments of various applications of power semiconductor modules. As a target of reliability, grades have been specified for each of the following applications: automotive, industrial and consumer electronics. Based on the number of annual operating hours, use period and other parameters assumed for each grade, this guideline defines verification methods for the wear-out failure, and proposes appropriate reliability tests. This guideline defines the concept of quality assurance from early failure to wear-out failure. It also presents approaches to appropriately ensure the reliability of power semiconductor modules.

The test conditions and the acceleration factor values presented in this guideline are only examples used for setting reliability test conditions to verify a required level of quality.

NOTE Qualification tests are tests performed by power semiconductor device vendors, taking into account the quality required by the users of their products.

1 Scope

This part of IEC 63287 specifies guidelines for a reliability qualification plan for power semiconductor modules to assure reliability targets over the entire product life.

Power semiconductor modules with incorporated control circuits are excluded. Clamped packages that need external pressure for being mounted in a system are excluded, e.g. disc-type pressure pack devices.

This document is not intended for medical, military, aeronautics and astronautics-related applications.

NOTE Throughout the document, the term power semiconductor module refers to multichip semiconductor power modules as defined in 3.3.

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 63287-1:2021, *Semiconductor devices - Generic semiconductor qualification guidelines - Part 1: Guidelines for IC reliability qualification*

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IEC 60068-2-27, *Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock*

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IEC 60191-2, *Mechanical standardization of semiconductor devices - Part 2: Dimensions*

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IEC 60721-3-3, *Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weatherprotected locations*

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IEC 60747-1, *Semiconductor devices - Part 1: General*

IEC 60747-2, *Semiconductor devices - Part 2: Discrete devices - Rectifier diodes*

IEC 60747-6, *Semiconductor devices - Part 6: Discrete devices - Thyristors*

IEC 60747-7, *Semiconductor devices - Discrete devices - Part 7: Bipolar transistors*

IEC 60747-8, *Semiconductor devices - Discrete devices - Part 8: Field-effect transistors*

IEC 60747-9, *Semiconductor devices - Part 9: Discrete devices - Insulated-gate bipolar transistors (IGBTs)*

IEC 60747-15, *Semiconductor devices - Discrete devices - Part 15: Isolated power semiconductor devices*

IEC 60749-1, *Semiconductor devices - Mechanical and climatic test methods - Part 1: General*

IEC 60749-5, *Semiconductor devices - Mechanical and climatic test methods - Part 5: Steady-state temperature humidity bias life test*

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IEC 60749-25, *Semiconductor devices - Mechanical and climatic test methods - Part 25: Temperature cycling*

IEC 60749-26, *Semiconductor devices - Mechanical and climatic test methods - Part 26: Electrostatic discharge ESD sensitivity testing - Human body model (HBM)*

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¹ JEITA EDR-4711A is the expanded version of IEC63287-1 which specifies for power semiconductor.