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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Semiconductor devices – Generic semiconductor qualification guidelines – Part 1: Guidelines for IC reliability qualification

Dispositifs à semiconducteurs – Lignes directrices génériques concernant la qualification des semiconducteurs – Partie 1: Lignes directrices concernant la qualification de la fiabilité des circuits intégrés

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SEMICONDUCTOR DEVICES – GENERIC SEMICONDUCTOR QUALIFICATION GUIDELINES –

Part 1: Guidelines for IC reliability qualification

FOREWORD

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International Standard IEC 63287-1 has been prepared by IEC technical committee 47: Semiconductor devices.

This first edition of IEC 63287-1 cancels and replaces the first edition of IEC 60749-43 published in 2017. This edition constitutes a technical revision.

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

a) the document has been renamed and renumbered to distinguish it from the IEC 60749 (all parts);
b) a new section concerning the concept of "family" has been added with appropriate renumbering of the existing text.

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

DRAFT	Report on voting
47/2703/FDIS	47/2720/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 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- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This document provides guidelines for semiconductor IC vendors in the preparation of detailed reliability test plans for device qualification. Such plans are intended to be prepared before commencing qualification tests and after consultation with the user of their semiconductor integrated circuit product.

The guideline gives some examples for creating reliability qualification test plans to determine appropriate reliability test conditions based on the use conditions and requirements for each application of semiconductor integrated circuits. Categories are set for automotive applications and for general applications as a target of reliability. The grade for automotive use is further classified into two grades according to applications. The guideline assumes annual operating hours, useful life, etc. for each grade, and defines the verification methods for early failure rate and wear-out failure to propose appropriate reliability tests, and at the same time, presents concepts to properly ensure the quality of semiconductor integrated circuits using screening techniques which are designed to reduce the early failure rate.

The test conditions and the values of acceleration factors presented in this guideline are shown to provide examples of calculations for obtaining reliability test conditions in order to verify the required quality standards and are not designed to define the standards to ensure reliability of semiconductor integrated circuits.

NOTE Qualification tests are tests in which the semiconductor vendor takes account of the reliability required by its product users.

SEMICONDUCTOR DEVICES – GENERIC SEMICONDUCTOR QUALIFICATION GUIDELINES –

Part 1: Guidelines for IC reliability qualification

1 Scope

This part of IEC 63287 gives guidelines for reliability qualification plans of semiconductor integrated circuit products. This document is not intended for military- and space-related applications.

NOTE 1 The manufacturer can use flexible sample sizes to reduce cost and maintain reasonable reliability by this guideline adaptation based on EDR-4708, AEC Q100, JESD47 or other relevant document can also be applicable if it is specified.

NOTE 2 The Weibull distribution method used in this document is one of several methods to calculate the appropriate sample size and test conditions of a given reliability project.

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

IEC 60749-6, *Semiconductor devices – Mechanical and climatic test methods – Part 6: Storage at high temperature*

IEC 60749-15, *Semiconductor devices – Mechanical and climatic test methods – Part 15: Resistance to soldering temperature for through-hole mounted devices*

IEC 60749-20, *Semiconductor devices – Mechanical and climatic test methods – Part 20: Resistance of plastic encapsulated SMDs to the combined effect of moisture and soldering heat*

IEC 60749-21, *Semiconductor devices – Mechanical and climatic test methods – Part 21: Solderability*

IEC 60749-23, *Semiconductor devices – Mechanical and climatic test methods – Part 23: High temperature operating life*

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)*

IEC 60749-28, *Semiconductor devices – Mechanical and climatic test methods – Part 28: Electrostatic discharge (ESD) sensitivity testing – Charged device model (CDM) – Device level*