

Semiconductor devices - Mechanical and climatic test
methods - Part 43: Guidelines for IC reliability
qualification plans

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English Version

**Semiconductor devices - Mechanical and climatic test methods -
Part 43: Guidelines for IC reliability qualification plans
(IEC 60749-43:2017)**

Dispositifs à semiconducteurs - Méthodes d'essais
mécaniques et climatiques - Partie 43: Lignes directrices
concernant les plans de qualification de la fiabilité des CI
(IEC 60749-43:2017)

Halbleiterbauelemente - Mechanische und klimatische
Prüfverfahren - Teil 43: Leitfaden Pläne zur
Zuverlässigkeitsqualifikation von integrierten Schaltungen
(IEC 60749-43:2017)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

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Endorsement notice

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2-1	NOTE	Harmonized as EN 60068-2-1.
IEC 60068-2-30	NOTE	Harmonized as EN 60068-2-30.
IEC 60749-11	NOTE	Harmonized as EN 60749-11.

Annexe ZA

(normative)

Références normatives à d'autres publications internationales avec les publications européennes correspondantes

Les documents suivants, en tout ou en partie, sont référencés normativement dans le présent document et sont indispensables pour son application. Pour les références datées, seule l'édition citée s'applique. Pour les références non-datées, la dernière édition du document référencé (y compris les amendements) s'applique.

NOTE 1 Dans le cas où une publication internationale est modifiée par des modifications communes, indiqué par (mod), l'EN/le HD correspondant(e) s'applique.

NOTE 2 Les informations les plus récentes concernant les dernières versions des Normes Européennes listées dans la présente annexe sont disponibles à l'adresse suivante: www.cenelec.eu.

<u>Publication</u>	<u>Année</u>	<u>Titre</u>	<u>EN/HD</u>	<u>Année</u>
IEC 60749-5	-	Semiconductor devices - Mechanical and climatic test methods - Part 5: Steady-state temperature humidity bias life test	EN 60749-5	-
IEC 60749-6	-	Semiconductor devices - Mechanical and climatic test methods - Part 6: Storage at high temperature	EN 60749-6	-
IEC 60749-15	-	Dispositifs à semiconducteurs - Méthodes d'essais mécaniques et climatiques -- Partie 15: Résistance à la température de soudage pour dispositifs par trous traversants	EN 60749-15	-
IEC 60749-20	-	Dispositifs à semiconducteurs - Méthodes d'essais mécaniques et climatiques -- Partie 20: Résistance des CMS à boîtiers plastique à l'effet combiné de l'humidité et de la chaleur de brasage	EN 60749-20	-
IEC 60749-21	-	Dispositifs à semiconducteurs - Méthodes d'essais mécaniques et climatiques -- Partie 21: Brasabilité	EN 60749-21	-
IEC 60749-23	-	Dispositifs à semiconducteurs - Méthodes d'essais mécaniques et climatiques -- Partie 23: Durée de vie en fonctionnement à haute température	EN 60749-23	-
IEC 60749-25	-	Dispositifs à semiconducteurs - Méthodes d'essais mécaniques et climatiques -- Partie 25: Cycles de température	EN 60749-25	-
IEC 60749-26	-	Dispositifs à semiconducteurs - Méthodes d'essais mécaniques et climatiques -- Partie 26: Essai de sensibilité aux décharges électrostatiques (DES) - Modèle du corps humain (HBM)	EN 60749-26	-
IEC 60749-28	-	Dispositifs à semiconducteurs - Méthodes d'essai mécaniques et climatiques - Partie 28: Essai de sensibilité aux décharges électrostatiques (DES) Modèle de dispositif chargé par contact direct (DC-CDM)	EN 60749-28	-
IEC 60749-29	-	Dispositifs à semiconducteurs - Méthodes d'essais mécaniques et climatiques -- Partie 29: Essai de verrouillage	EN 60749-29	-
IEC 60749-42	-	Semiconductor devices - Mechanical and climatic test methods -- Part 42: Temperature humidity storage	EN 60749-42	-

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
4 Product categories and applications	8
5 Failure.....	9
5.1 Failure distribution	9
5.2 Early failure	10
5.2.1 Description	10
5.2.2 Early failure rate	11
5.2.3 Screening.....	14
5.3 Random failure	17
5.3.1 Description	17
5.3.2 Mean failure rate	17
5.4 Wear-out failure	20
5.4.1 Description	20
5.4.2 Wear-out failure rate.....	20
6 Reliability test.....	23
6.1 Reliability test description	23
6.2 Reliability test plan	23
6.2.1 Procedures for creating a reliability test plan	23
6.2.2 Estimation of the test time required to confirm the TDDB from the number of test samples	26
6.2.3 Estimation of the number of samples required to confirm the TDDB from the test time.....	27
6.3 Reliability test methods	28
6.4 Acceleration models for reliability tests	31
6.4.1 Arrhenius model	31
6.4.2 V-model:.....	32
6.4.3 Absolute water vapor pressure model	32
6.4.4 Coffin-Manson model.....	32
7 Stress test methods.....	32
8 Supplementary tests	33
9 Summary table of assumptions	34
10 Summary.....	36
Bibliography.....	37
Figure 1 – Bathtub curve.....	10
Figure 2 – Failure process of IC manufacturing lots during the early failure period.....	11
Figure 3 – Weibull conceptual diagram of the early failure rate	12
Figure 4 – Example of a failure ratio: α (in hundreds) and the number of failures for CL of 60 %.....	14
Figure 5 – Screening and estimated early fail rate in Weibull diagram.....	15
Figure 6 – Bathtub curve setting the point immediately after production as the origin.....	16

Figure 7 – Bathtub curve setting the point after screening as the origin.....	17
Figure 8 – Conceptual diagram of calculation method for the mean failure rate from the exponential distribution	18
Figure 9 – Conceptual diagram of calculation method for the mean failure rate as an extension of early failure.....	19
Figure 10 – Conceptual diagram of the wear-out failure	21
Figure 11 – Conceptual diagram describing the concept of the acceleration test.....	21
Figure 12 – Concept of the reliability test in a Weibull diagram (based on sample size)	25
Figure 13 – Concept of the reliability test in a Weibull diagram (based on test time)	28
Figure 14 – Difference in sampling sizes according to the m value (image)	29
Table 1 – Examples of product categories.....	9
Table 2 – Cumulative failure probability 0,1 % over 10 years [$\times 10^{-6}$] for the third, fifth and seventh years	25
Table 3 – Major reliability (life) test methods and purposes	30
Table 4 – Examples of the number of test samples and the test time in typical reliability (life) test methods	31
Table 5 – LTPD sampling table for acceptance number $A_c = 0$	33
Table 6 – Major reliability (strength) test methods and purposes	33
Table 7 – Supplementary tests.....	34
Table 8 – Accelerating factors, calculation formulae and numerical values ^a	35

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 quality standards demanded in use conditions 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.

Note that 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 – MECHANICAL AND CLIMATIC TEST METHODS

Part 43: Guidelines for IC reliability qualification plans

1 Scope

This part of IEC 60749 gives guidelines for reliability qualification plans of semiconductor integrated circuit products (ICs). 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*