Irish Standard
I.S. EN 60749-28:2017

Semiconductor devices - Mechanical and climatic test methods - Part 28: Electrostatic discharge (ESD) sensitivity testing - Charged device model (CDM) - device level

I.S. EN 60749-28:2017

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National Foreword

I.S. EN 60749-28:2017 is the adopted Irish version of the European Document EN 60749-28:2017, Semiconductor devices - Mechanical and climatic test methods - Part 28: Electrostatic discharge (ESD) sensitivity testing - Charged device model (CDM) - device level

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60749-28

June 2017

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English Version

Semiconductor devices - Mechanical and climatic test methods - Part 28: Electrostatic discharge (ESD) sensitivity testing - Charged device model (CDM) - device level (IEC 60749-28:2017)

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) (IEC 60749-28:2017)

Halbleiterbauelemente - Mechanische und klimatische Prüfverfahren - Teil 28: Prüfung der Empfindlichkeit gegen elektrostatische Entladungen (ESD) - Charged Device Model (CDM) - Device Level (IEC 60749-28:2017)

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 47/2362/FDIS, future edition 1 of IEC 60749-28, prepared by IEC/TC 47 "Semiconductor devices" in collaboration with IEC/TC 101 "Electrostatics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60749-28:2017.

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)	2018-02-02
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2020-05-02

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The text of the International Standard IEC 60749-28:2017 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60749-26	NOTE	Harmonized as EN 60749-26.

IEC 60749-28

Edition 1.0 2017-03

INTERNATIONAL STANDARD

colour inside

Semiconductor devices – Mechanical and climatic test methods – Part 28: Electrostatic discharge (ESD) sensitivity testing – Charged device model (CDM) – device level

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INTERNATIONAL STANDARD

colour inside

Semiconductor devices – Mechanical and climatic test methods – Part 28: Electrostatic discharge (ESD) sensitivity testing – Charged device model (CDM) – device level

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 28: Electrostatic discharge (ESD) sensitivity testing – Charged device model (CDM) – device level

FOREWORD

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International Standard IEC 60749-28 has been prepared by IEC technical committee 47: Semiconductor devices in collaboration with IEC technical committee 101: Electrostatics.

This standard is based on ESDA/JEDEC Joint Standard ANSI/ESDA/JEDEC JS-002 which resulted from the merging of JESD22-C101 and ANSI/ESD S5.3.1). It contains the essential elements from both standards. The co-operation of ANSI/ESDA/JEDEC is gratefully acknowledged.

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

FDIS	Report on voting
47/2362/FDIS	47/2379/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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INTRODUCTION

The earliest electrostatic discharge (ESD) test models and standards simulate a charged object approaching a device and discharging through the device. The most common example is IEC 60749-26, the human body model (HBM). However, with the increasing use of automated device handling systems, another potentially destructive discharge mechanism, the charged device model (CDM), becomes increasingly important. In the CDM, a device itself becomes charged (e.g. by sliding on a surface (tribocharging) or by electric field induction) and is rapidly discharged (by an ESD event) as it closely approaches a conductive object. A critical feature of the CDM is the metal-metal discharge, which results in a very rapid transfer of charge through an air breakdown arc. The CDM test method also simulates metal-metal discharges arising from other similar scenarios, such as the discharging of charged metal objects to devices at different potential.

Accurately quantifying and reproducing this fast metal-metal discharge event is very difficult, if not impossible, due to the limitations of the measuring equipment and its influence on the discharge event. The CDM discharge is generally completed in a few nanoseconds, and peak currents of tens of amperes have been observed. The peak current into the device will vary considerably depending on a large number of factors, including package type and parasitics. The typical failure mechanism observed in MOS devices for the CDM model is dielectric damage, although other damage has been noted.

The CDM charge voltage sensitivity of a given device is package dependent. For example, the same integrated circuit (IC) in a small area package can be less susceptible to CDM damage at a given voltage compared to that same IC in a package of the same type with a larger area. It has been shown that CDM damage susceptibility correlates better to peak current levels than charge voltage.

SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 28: Electrostatic discharge (ESD) sensitivity testing – Charged device model (CDM) – device level

1 Scope

This part of IEC 60749 establishes the procedure for testing, evaluating, and classifying devices and microcircuits according to their susceptibility (sensitivity) to damage or degradation by exposure to a defined field-induced charged device model (CDM) electrostatic discharge (ESD). All packaged semiconductor devices, thin film circuits, surface acoustic wave (SAW) devices, opto-electronic devices, hybrid integrated circuits (HICs), and multi-chip modules (MCMs) containing any of these devices are to be evaluated according to this document. To perform the tests, the devices are assembled into a package similar to that expected in the final application. This CDM document does not apply to socketed discharge model testers. This document describes the field-induced (FI) method. An alternative, the direct contact (DC) method, is described in Annex I.

The purpose of this document is to establish a test method that will replicate CDM failures and provide reliable, repeatable CDM ESD test results from tester to tester, regardless of device type. Repeatable data will allow accurate classifications and comparisons of CDM ESD sensitivity levels.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

3.1
CDM ESD
charged device model electrostatic discharge
electrostatic discharge (ESD) using the charged device model (CDM) to simulate the actual discharge event that occurs when a charged device is quickly discharged to another object at a lower electrostatic potential through a single pin or terminal

3.2
CDM ESD tester
charged device model electrostatic discharge tester
equipment that simulates the device level CDM ESD event using the non-socketed test method

Note 1 to entry: "Equipment" is referred to as "tester" in this document.