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Polprevodniški elementi - 17. del: Magnetni in kapacitivni spojnik za osnovno in ojačeno izolacijo (IEC 60747-17:2020)

Semiconductor devices - Part 17: Magnetic and capacitive coupler for basic and reinforced insulation (IEC 60747-17:2020)

Halbleiterbauelemente - Teil 17: Magnetische und kapazitive Koppler für Basisisolierung und verstärkte Isolierung (IEC 60747-17:2020) PREVIEW

Dispositifs à semiconducteurs - Partie 17. Coupleur magnétique et capacitif pour l'isolation principale et renforcée (IEC 60747-17:2020)

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Semiconductor devices in

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general

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en

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November 2020

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English Version

Semiconductor devices - Part 17: Magnetic and capacitive coupler for basic and reinforced insulation (IEC 60747-17:2020)

Dispositifs à semiconducteurs - Partie 17: Coupleur magnétique et capacitif pour l'isolation principale et renforcée (IEC 60747-17:2020) Halbleiterbauelemente - Teil 17: Magnetische und kapazitive Koppler für Basisisolierung und verstärkte Isolierung (IEC 60747-17:2020)

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 60747-17:2020 (E)

European foreword

The text of document 47E/711/FDIS, future edition 1 of IEC 60747-17, prepared by SC 47E "Discrete semiconductor devices" of IEC/TC 47 "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60747-17:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2021-07-26 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-10-26

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In the official version, for Bibliographys the following notes: https://standards.iteh.ai/catalog/standards/sist/c114f176-9aab-4968-9223-

| | psysuman | 24a2764c33f1/sist-en-iec-60747-17-2021 |
|---------------------|----------|--|
| IEC 60060-1:2010 | NOTE | Harmonized as EN 60060-1:2010 (not modified) |
| IEC 60068-1:2013 | NOTE | Harmonized as EN 60068-1:2014 (not modified) |
| IEC 60068-2-6:2007 | NOTE | Harmonized as EN 60068-2-6:2008 (not modified) |
| IEC 60068-2-17:1994 | NOTE | Harmonized as EN 60068-2-17:1994 (not modified) |
| IEC 60068-2-27:2008 | NOTE | Harmonized as EN 60068-2-27:2009 (not modified) |
| IEC 60270:2000 | NOTE | Harmonized as EN 60270:2001 (not modified) |
| IEC 60664-4:2005 | NOTE | Harmonized as EN 60664-4:2006 (not modified) |
| IEC 60747-5-5:2007 | NOTE | Harmonized as EN 60747-5-5:2011 (not modified) |
| IEC 61000-4-5:2014 | NOTE | Harmonized as EN 61000-4-5:2014 (not modified) |
| IEC 61000-4-8:2009 | NOTE | Harmonized as EN 61000-4-8:2010 (not modified) |
| IEC 61000-4-9:2016 | NOTE | Harmonized as EN 61000-4-9:2016 (not modified) |
| IEC 61649:2008 | NOTE | Harmonized as EN 61649:2008 (not modified) |
| IEC 62368-1:2018 | NOTE | Harmonized as EN IEC 62368-1:2020 (not modified) |

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | EN/HD | <u>Year</u> |
|--------------------|-------------|--|---------------|-------------|
| IEC 60068-2-1 | 2007 | Environmental testing - Part 2-1: Tests - Test A: Cold | EN 60068-2-1 | 2007 |
| IEC 60068-2-2 | 2007 | Environmental testing - Part 2-2: Tests Test B: Dry heat | EN 60068-2-2 | 2007 |
| IEC 60068-2-14 | 2009 | Environmental testing Spart 2-14. Tests - Test N: Change of temperature | EN 60068-2-14 | 2009 |
| IEC 60068-2-20 | 2008/sta | SIST EN IEC 60747-17:2021 an Environmental testing at Rart 2:20:7Tests -49 Test 4:2Test methods for solderability and resistance to soldering heat of devices with leads | 6E№60068-2-20 | 2008 |
| IEC 60068-2-30 | 2005 | Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle) | EN 60068-2-30 | 2005 |
| IEC 60068-2-58 | 2015 | Environmental testing - Part 2-58: Tests - Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD) | EN 60068-2-58 | 2015 |
| IEC 60068-2-67 | 1995 | Environmental testing - Part 2-67: Tests - Test Cy: Damp heat, steady state, accelerated test primarily intended for components | EN 60068-2-67 | 1996 |
| IEC 60112 | 2003 | Method for the determination of the proof and the comparative tracking indices of solid insulating materials | EN 60112 | 2003 |
| IEC 60216-1 | 2013 | Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results | EN 60216-1 | 2013 |

EN IEC 60747-17:2020 (E)

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | EN/HD | <u>Year</u> |
|--------------------|-------------|---|---------------|-------------|
| IEC 60216-2 | 2005 | Electrical insulating materials - Thermal endurance properties - Part 2: Determination of thermal endurance properties of electrical insulating materials - Choice of test criteria | EN 60216-2 | 2005 |
| IEC 60664-1 | 2007 | Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests | EN 60664-1 | 2007 |
| IEC 60672-2 | 1999 | Ceramic and glass insulating materials - Part 2: Methods of test | EN 60672-2 | 2000 |
| IEC 60695-11-5 | 2016 | Fire hazard testing - Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance | EN 60695-11-5 | 2017 |
| IEC 62539 | 2007 | Guide for the statistical analysis of electrical insulation breakdown data | - | - |

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IEC 60747-17

Edition 1.0 2020-09

INTERNATIONAL STANDARD

Semiconductor devices - STANDARD PREVIEW

Part 17: Magnetic and capacitive coupler for basic and reinforced insulation

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SEMICONDUCTOR DEVICES -

Part 17: Magnetic and capacitive coupler for basic and reinforced insulation

FOREWORD

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International Standard IEC 60747-17 has been prepared by subcommittee SC 47E: Discrete semiconductor devices, of IEC technical committee TC 47: Semiconductor devices.

This first edition cancels and replaces IEC PAS 60747-17:2011. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC PAS 60747-17:2011:

- a) introduced lifetime safety factors for improved life time consideration, to comply with widely recognized aging mechanisms of silicone dioxide (TDDB) and thin film polymer isolation layers;
- b) significantly improved "end of life testing" paragraph and statistical life time consideration by adding detailed description on process, safety factors, methods of generating data points and respective lifetime interpolations as well as being specific on minimum amount of samples required;

- **-6-**
- c) introduced concept of certification by similarity, including Annex A, giving guidance on qualification considerations and required certification process;
- d) alternative pulse shape allowed for surge pulse testing, to avoid issues due to surge tester availability;
- e) various improvements throughout the standard: definitions, for example type of coupler have been improved, introduction of surge impulse $V_{\rm IMP}$ rating, usage of glass transition temperature, pre-conditioning have been redefined for improved usability and better compatibility with today's design and functionality of couplers, available mold compounds, etc.

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

| FDIS | Report on voting |
|--------------|------------------|
| 47E/711/FDIS | 47E/715/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 60747 series, published under the general title *Semiconductor devices*, 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, SIST EN IEC 60747-17:2021
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- withdrawn, 24a2764c33f1/sist-en-iec-60747-17-2021
- replaced by a revised edition, or
- amended.

SEMICONDUCTOR DEVICES -

Part 17: Magnetic and capacitive coupler for basic and reinforced insulation

1 Scope

This part of IEC 60747 specifies the terminology, essential ratings, characteristics, safety test and the measuring methods of magnetic coupler and capacitive coupler.

It specifies the principles and requirements of insulation and isolation characteristics for magnetic and capacitive couplers for basic insulation and reinforced insulation.

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.

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IEC 60068-2-1:2007, Environmental testing – Part 2-1: Tests – Test A: Cold (Standards.iteh.ai)

IEC 60068-2-2:2007, Environmental testing – Part 2-2: Tests – Test B: Dry heat SIST EN IEC 60747-17:2021

IEC 60068-2-14:2009, Environmental testing ards/siptor 142-74. Part 142-74: N: Change of temperature

IEC 60068-2-20:2008, Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads

IEC 60068-2-30:2005, Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)

IEC 60068-2-58:2015, Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)

IEC 60068-2-67:1995, Environmental testing – Part 2: Tests – Test Cy: Damp heat, steady state, accelerated test primarily intended for components

IEC 60112:2003, Method for the determination of the proof and the comparative tracking indices of solid insulating materials

IEC 60216-1:2013, Electrical insulating materials – Thermal endurance properties – Part 1: Ageing procedures and evaluation of test results

IEC 60216-2:2005, Electrical insulating materials – Thermal endurance properties – Part 2: Determination of thermal endurance properties of electrical insulating materials – Choice of test criteria

IEC 60664-1:2007, Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests

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IEC 60672-2:1999, Ceramic and glass insulating materials – Part 2: Methods of test

IEC 60695-11-5:2016, Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance

- 8 -

IEC 62539:2007, Guide for the statistical analysis of electrical insulation breakdown data

3 Terms and definitions

3.1

details of outline and encapsulation

information related method of encapsulation and terminal connections within the coupler's isolation system

3.1.1

outline drawing

drawing or sketch restricted to line to describe the shape of objects or circuitry

3.1.2

method of encapsulation

encapsulating materials used forming part of the isolation system

3.1.3 terminal identification Teh STANDARD PREVIEW

terminal identification and indication of any connection between a terminal and the case

3.2

type of coupler

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internal constructions and insulation at an ethodor of six couple? to a achieve? basic or reinforced insulation 24a2764c33fl/sist-en-iec-60747-17-2021

3.2.1

SiO₂ isolator

isolator with an internal insulation construction utilizing silicon dioxide based material

3.2.2

thin film polymer isolator

isolator with an internal insulation construction, utilising a thin film polymer insulation

3.3

isolation

ability to reject electrical and magnetic interference or noise

3.4

insulation

part of an electromechanical product which galvanically separates the conducting parts at different electrical potentials

3.4.1

reinforced insulation

insulation of hazardous-live-parts which provides a degree of protection against electric shock equivalent to double insulation

Note 1 to entry: Reinforced insulation may comprise several layers which cannot be tested singly as basic insulation or supplementary insulation.

[SOURCE: IEC 60664-1:2007, 3.17.5]

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3.4.2

basic insulation

insulation providing a basic safeguard against electric shock

3.5

isolation side

all terminals of side 1 which are isolated from all terminals of side 2 by an isolation barrier, forming a two-terminal device

3.6

isolation capacitance

 C_{IC}

total capacitance between the terminals on side 1 of the isolation barrier connected together and the terminals on side 2 of the isolation barrier connected together forming a two-terminal device

Note 1 to entry: See IEC 60747-5-5:2007, 4.3.

3.7

isolation resistance

 R_{10}

resistance between the terminals on side 1 of the isolation barrier connected together and all the terminals on side 2 of the isolation barrier connected together forming a two-terminal device

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3.8

isolation resistance at safety (imiting temperature en.ai)

 $R_{\rm IO}$ s

resistance at safety limiting temperature \sqrt{g} between the terminals on side 1 of the isolation barrier connected together and fall the terminals on side 2 of the 9 solation barrier connected together forming a two-terminal devices which should be larger or equal to 1E9 Ω

3.9

isolation voltage

voltage between any specified terminals connected together on side 1 of the isolation barrier and any terminals connected together on side 2 of the isolation barrier

3.10

logic state match

condition in which an output logic state matches the associated input logic state

3.11

logic state transition match

condition in which an output logic state change follows the associated input logic state change

3 12

common mode transient immunity

CMTI

maximum tolerable rate-of-rise (or fall) of a common-mode voltage

Note 1 to entry: The common mode transient immunity is given in volts per second. CMTI should include the amplitude of the common-mode voltage that can be tolerated.

3 12 1

common mode transient immunity at logic high output

 $|CM_{\perp}|$

common mode transient immunity of the coupler with logic at high output