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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Semiconductor devices – Discrete devices – Part 5-5: Optoelectronic devices – Photocouplers

Dispositifs à semiconducteurs – Dispositifs discrets – Partie 5-5: Dispositifs optoélectroniques – Photocoupleurs

IEC 60747-5-5:2007

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

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Email: csc@iec.ch
Tél.: +41 22 919 02 11
Fax: +41 22 919 03 00

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SEMICONDUCTOR DEVICES – DISCRETE DEVICES –

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60747-5-5 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices.

This standard replaces the clauses for photocouplers (or optocouplers) described in IEC 60747-5-1, IEC 60747-5-2 and IEC 60747-5-3, including their amendments.

The contents for phototransistors and photothyristors in IEC 60747-5-1, IEC 60747-5-2 and IEC 60747-5-3, including their amendments, will be considered obsolete as of the effective date of publication of this standard.

NOTE Photocouplers that are certified to the previous version of the photocoupler standard, namely IEC 60747-5-1/2/3, are to be considered in compliance with the requirements and provisions of IEC 60747-5-5.

The text of this standard is based on the following documents:

FDIS	Report on voting
47E/332/FDIS	47E/340/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of the parts in the IEC 60747 series, under the general title *Semiconductor devices – Discrete devices*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

SEMICONDUCTOR DEVICES – DISCRETE DEVICES –

Part 5-5: Optoelectronic devices – Photocouplers

1 Scope

This part of IEC 60747 gives the terminology, essential ratings, characteristics, safety tests as well as the measuring methods for photocouplers (or optocouplers).

NOTE The word “optocoupler” can also be used instead of “photocoupler”.

2 Normative references

The following referenced documents are indispensable for the application 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 60065:2001, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1:2007, *Environmental testing – Part 2: Tests – Tests A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2: Tests – Tests B: Dry heat*

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60068-2-6:—, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*[1]

IEC 60068-2-14:1984, *Environmental testing – Part 2: Tests – Test N: Change of temperature*

IEC 60068-2-17:1994, *Basic environmental testing procedures – Part 2: Tests – Test Q: Sealing*

IEC 60068-2-27:—, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock and bump* [2]

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

IEC 60068-2-58:2005, *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 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

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1 To be published (replacing the sixth edition)

2 To be published (replacing the third edition)

IEC 60216-1:2001, *Electrical insulating materials – Properties of thermal endurance – 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*

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

IEC 60695-11-5:2004, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

3 Photocoupler

Optoelectronic device designed for the transfer of the electrical signals by utilizing optical radiation to provide coupling with electrical isolation between the input and the output

NOTE Different types of photocouplers include ambient-rated or case-rated photocouplers, for signal-isolation applications.

3.1 Semiconductor material

– Input diode: Gallium Arsenide, Gallium Aluminium Arsenide, etc.

– Output: Silicon, etc.

3.2 Details of outline and encapsulation

3.2.1 IEC and/or national reference number of the outline drawing

3.2.2 Method of encapsulation: glass/metal/plastic/other

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

3.3 Type of photocouplers

3.3.1 DC input photocoupler

Photocoupler consisting at the input of a photoemitter to which d.c. current is applied

3.3.2 AC input photocoupler

Photocoupler consisting at the input of antiparallel photoemitters to which a.c. current is applied

3.3.3 Phototransistor photocoupler

Photocoupler whose photo sensitive element is a phototransister

NOTE Phototransistor is a transistor in which the current produced by the photoelectric effect in the neighbourhood of the emitter-base junction acts as base current, which is amplified.

3.3.4 Photodarlington photocoupler

Photocoupler whose photo sensitive element is a Darlington phototransistor

NOTE A base terminal may or may not be provided.

3.3.5 Photothyristor photocoupler

Photocoupler whose photo sensitive element is a photothyristor

NOTE 1 Photothyrister is a thyrister that is designed to be triggered by optical radiation.

NOTE 2 Gate terminal may or may not be provided.

3.3.6 Phototriac photocoupler

Photocoupler whose photo sensitive element is a phototriac.

NOTE A phototriac is a triac that is designed to be triggered by optical radiation.

3.3.7 IC photocoupler

Photocoupler whose photo-sensitive element is a photodiode/phototransistor and an integrated circuit

3.3.8 FET photocoupler

Photocoupler with one or more field-effect transistors (FETs) in the output stage

NOTE A FET is activated by photo emitter by direct optical radiation.

3.3.9 Photodiode photocoupler

Photocoupler whose photosensitive element is a photodiode

3.3.10 IC input photocoupler

Photocoupler whose input element consists of an integrated circuit and an photoemitter.

3.3.11 Solid state opto relay

Photocoupler whose photo sensitive element is phototriac and output is triac.

4 Terms related to ratings and characteristics for photocouplers

4.1 Current transfer ratio

4.1.1 Static value of the (forward) current transfer ratio $h_{F(ctr)}$

The ratio of the d.c. output current to the d.c. input current, the output voltage being held constant.

NOTE The abbreviation CTR (d.c.) is sometimes used instead of a symbol.

4.1.2 Small-signal short-circuit (forward) current transfer ratio $h_{f(ctr)}$

The ratio of the a.c. output current to the a.c. input current, the output being short-circuited to a.c.

NOTE The abbreviation CTR (a.c.) is sometimes used instead of a symbol.

4.2 Cut-off frequency f_{co}

The frequency at which the modulus of the small-signal current transfer ratio has decreased to $1/\sqrt{2}$ of its low-frequency value.

4.3 Input-to-output capacitance C_{IO}

The total capacitance between all input terminals connected together and all output terminals connected together.

4.4 Isolation resistance R_{IO}

The resistance between all input terminals connected together and all output terminals connected together.

4.5 Isolation voltage

The voltage between any specified input terminal and any specified output terminal.