SIST

SLOVENSKI STANDARD
SIST EN 60747-5-3:2002

01-september-2002

Discrete semiconductor devices and integrated circuits - Optoelectronic devices - Measuring methods (IEC 60747-5-3:1997)

Discrete semiconductor devices and integrated circuits -- Part 5-3: Optoelectronic devices - Measuring methods

Einzel-Halbleiterbauelemente und integrierte Schaltungen -- Teil 5-3: Optoelektrische Bauelemente - Messverfahren

Dispositifs discrets à semiconducteurs et circuits intégrés -- Partie 5-3: Dispositifs optoélectroniques - Méthodes de mesure

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

Ta slovenski standard je istoveten z: EN 60747-5-3:2001

ICS:

31.080.01	Polprevodniški elementi (naprave) na splošno	Semiconductor devices in general
31.200	Integrirana vezja, mikroelektronika	Integrated circuits. Microelectronics
31.260	Optoelektronika, laserska oprema	Optoelectronics. Laser equipment

SIST EN 60747-5-3:2002 en

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60747-5-3

July 2001

ICS 31.260

English version

Discrete semiconductor devices and integrated circuits Part 5-3: Optoelectronic devices - Measuring methods (IEC 60747-5-3:1997)

Dispositifs discrets à semiconducteurs et circuits intégrés
Partie 5-3: Dispositifs optoélectroniques - Méthodes de mesure
(CEI 60747-5-3:1997)

Einzel-Halbleiterbauelemente und integrierte Schaltungen
Teil 5-3: Optoelektronische Bauelemente - Meßverfahren
(IEC 60747-5-3:1997)

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

This European Standard was approved by CENELEC on 2000-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

© 2001 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.

Ref. No. EN 60747-5-3:2001 E

Foreword

The text of the International Standard IEC 60747-5-3:1997, prepared by SC 47C, Flat panel display devices, of IEC TC 47, Semiconductor devices, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60747-5-3 on 2000-12-01 without any modification.

This standard should be read jointly with IEC 60747-1, EN 62007-1 and EN 62007-2.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-01-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-01-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annex A is informative.
Annex ZA has been added by CENELEC.

---

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Endorsement notice

The text of the International Standard IEC 60747-5-3:1997 was approved by CENELEC as a European Standard without any modification.

SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60068-1	1988	Environmental testing Part 1: General and guidance	EN 60068-1[1)]	1994
IEC 60270	1981	Partial discharge measurements	-	-

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

[1)] EN 60068-1 includes Corrigendum October 1988 + A1:1992 to IEC 60068-1:1988.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60747-5-3

Première édition
First edition
1997-08

Dispositifs discrets à semiconducteurs et circuits intégrés –

Partie 5-3: Dispositifs optoélectroniques – Méthodes de mesure

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Discrete semiconductor devices and integrated circuits –

SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

Part 5-3: Optoelectronic devices – Measuring methods

© IEC 1997 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'éditeur.

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission 3, rue de Varembé Geneva, Switzerland
Telefax: +41 22 919 0300 e-mail: inmail@iec.ch IEC web site http: //www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE V

Pour prix, voir catalogue en vigueur
For price, see current catalogue

CONTENTS

Page

FOREWORD 5

Clause

1 Scope 7

2 Normative references 7

3 Measuring methods for photoemitters 7

3.1 Luminous intensity of light-emitting diodes (I_v) 7

3.2 Radiant intensity of infrared-emitting diodes (I_e) 9

3.3 Peak-emission wavelength (λ_p), spectral radiation bandwidth ($\Delta\lambda$), and number of longitudinal modes (n_m) 11

3.4 Emission source length and width and astigmatism of a laser diode without pigtail 17

3.5 Half-intensity angle and misalignment angle of a photoemitter 19

4 Measuring methods for photosensitive devices 25

4.1 Reverse current under optical radiation of photodiodes including devices with or without pigtails ($I_{R(H)}$ or $I_{R(e)}$) and collector current under optical radiation of phototransistors ($I_{C(H)}$ or $I_{C(e)}$) 25

4.2 Dark current for photodiodes I_R and dark currents for phototransistors I_{CEO}, I_{ECO}, I_{EBO} 29

4.3 Collector-emitter saturation voltage $V_{CE(sat)}$ of phototransistors 31

5 Measuring methods for photocouplers 33

5.1 Current transfer ratio ($h_{F(ctr)}$) 33

5.2 Input-to-output capacitance (C_{io}) 35

5.3 Isolation resistance between input and output (r_{IO}) 37

5.4 Isolation test 39

5.5 Partial discharges of photocouplers 41

5.6 Collector-emitter saturation voltage $V_{CE(sat)}$ of a photocoupler 49

5.7 Switching times t_{on}, t_{off} of a photocoupler 53

Annex A (informative) – Cross references index 59

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

INTERNATIONAL ELECTROTECHNICAL COMMISSION

DISCRETE SEMICONDUCTOR DEVICES AND INTEGRATED CIRCUITS –

Part 5-3: Optoelectronic devices – Measuring methods

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4850a7df/sist-en-60747-5-3-2002

International Standard IEC 60747-5-3 has been prepared by subcommittee 47C: Optoelectronic, display and imaging devices, of IEC technical committee 47: Semiconductor devices.

This first edition replaces partially the second edition of IEC 60747-5 (1992) and constitutes a technical revision (see also annex A: Cross references index).

It should be read jointly with IEC 60747-1, IEC 62007-1 and IEC 62007-2.

The text of this standard is based partially on IEC 60747-5 (1992) and partially on the following documents:

FDIS	Report on voting
47C/173/FDIS	47C/186/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.

Annex A is for information only.

DISCRETE SEMICONDUCTOR DEVICES AND INTEGRATED CIRCUITS –

Part 5-3: Optoelectronic devices – Measuring methods

1 Scope

This part of IEC 60747 describes the measuring methods applicable to the optoelectronic devices which are not intended to be used in the fibre optic systems or subsystems.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60747. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60747 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

iTeh STANDARD PREVIEW

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

(standards.iteh.ai)

IEC 60270:1981, *Partial discharge measurements*

SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

3 Measuring methods for photoemitters

3.1 Luminous intensity of light-emitting diodes (I_v)

a) *Purpose*

To measure the luminous intensity of semiconductor light-emitting diodes.

The method can be applied to three possible measurement variants:

Variant 1

Rotation of the diode around its mechanical axis for an accurate location of the minimum and/or maximum value.

Variant 2

Alignment of the diode optical axis with that of the optical bench.

Variant 3

Positioning according to a reference corresponding to the type of the diode envelope and allowing a reproducible mechanical orientation.

b) *Circuit diagram*

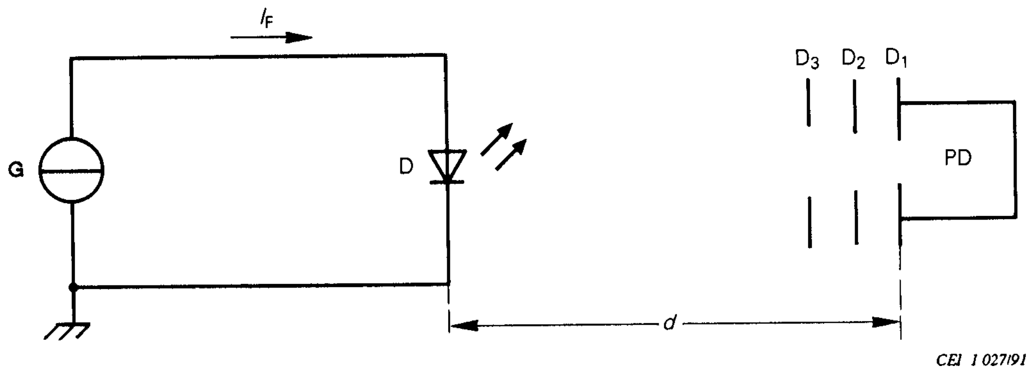

Figure 1

c) *Circuit description and requirements*

G = current source

D = light-emitting diode being measured

PD = photodetector including the diaphragm D_1 of area *A*

D_2, D_3 = Diaphragms intended to suppress parasitic radiations. D_2 and D_3 shall not limit the solid angle

d = distance between the diode being measured and D_1.

The spectral sensitivity of the photometer shall be adjusted to the CIE (International Commission on Illumination) standard observers curve in the wavelength region of the light emitted by the diode. The photometer shall be calibrated in candelas at the distance *d*, with diaphragm D_1 in place.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-995f4830a7df/sist-en-60747-5-3-2002

The distance *d* shall be such that the solid angle viewed by the light source at the diaphragm D_1 (= A/d^2) is less than 0,01 sr.

For pulse measurements, the current generator should provide current pulses of the required amplitude, duration and repetition rate. The photodetector should have a rise time sufficiently small in comparison with the pulse duration; it should be a peak-reading instrument.

d) *Measurement procedure*

The diode being measured is positioned according to the variant chosen.

The specified current is applied and the luminous intensity is measured on the photodetector.

e) *Specified conditions*

– Ambient temperature and, where appropriate, the atmospheric conditions.

– Forward current in the diode and, where applicable, duration and repetition rate.

– Variant: 1, 2 or 3.

3.2 Radiant intensity of infrared-emitting diodes (I_e)

a) *Purpose*

To measure the radiant intensity of semiconductor infrared-emitting diodes.

The method can apply to three possible measurement variants:

Variant 1

Rotation of the diode around its mechanical axis for an accurate location of the minimum and/or maximum value.

Variant 2

Alignment of the diode optical axis with that of the optical bench.

Variant 3

Positioning according to a reference corresponding to the type of the diode envelope and allowing a reproducible mechanical orientation.

b) *Circuit diagram*

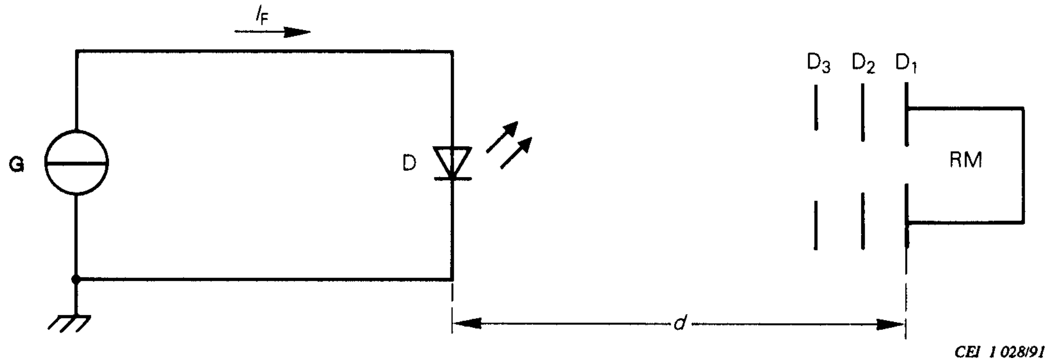

Figure 2

c) *Circuit description and requirements*

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 60747-5-3:2002
https://standards.iteh.ai/catalog/standards/sist/8cdf18d0-491d-49e3-8a1b-
995f4830a7df/sist-en-60747-5-3-2002

G	=	current source
D	=	infrared-emitting diode being measured
RM	=	radiometer including the diaphragm D_1 of area *A*
D_2, D_3	=	diaphragms intended to suppress parasitic radiations. D_2 and D_3 shall not limit the solid angle
d	=	distance between the diode being measured and D_1.

The radiant intensity I_e in the direction of the case axis should be measured by a wavelength-independent detector (for example, a thermocouple element) and the radiometer shall be calibrated in W/sr at the distance *d* with diaphragm D_1 in place.

The distance *d* shall be such that the solid angle viewed by the infrared source at the diaphragm D_1 (= A/d^2) is less than 0,01 sr.

For pulse measurements, the current generator shall provide current pulses of the required amplitude, duration and repetition rate. The radiometer shall have a rise time sufficiently small in comparison with the pulse duration; it shall be a peak-reading instrument.

d) *Measurement procedure*

The diode being measured is positioned according to the variant chosen.

The specified current is applied to the diode and the radiant intensity is measured on the radiometer.

e) *Specified conditions*

- Ambient temperature and, where appropriate, the atmospheric conditions.
- Forward current in the diode and, where applicable, duration and repetition rate.
- Variant: 1, 2 or 3.