

Discrete semiconductor devices and integrated circuits —

Part 5-1: Optoelectronic devices — General

The European Standard EN 60747-5-1:2001, and the incorporation of amendment A1:2002 and A2:2002, has the status of a British Standard

ICS 31.260

National foreword

This British Standard is the official English language version of EN 60747-5-1:2001, including amendments A1:2002 and A2:2002, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 60747-5-1:1997, including amendments 1:2001 and 2:2002, published by the International Electrotechnical Commission (IEC).

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 28, an inside back cover and a back cover.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 January 1998

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ISBN 0 580 29146 4

Amendments issued since publication

Amd. No.	Date	Comments
13341	24 December 2001	Implementation of the European Standard. Also, see national foreword.
13793 Corrigendum No. 1	17 July 2002	Implementation of CENELEC amendment A1
14097	16 January 2003	See national foreword

Discrete semiconductor devices and integrated circuits — Part 5-1: Optoelectronic devices — General

(includes amendments A1:2002 + A2:2002)

(IEC 60747-5-1:1997 + A1:2001 + A2:2002)

Dispositifs discrets à semiconducteurs et circuits
intégrés —

Partie 5-1: Dispositifs optoélectroniques —
Généralités

(inclut les amendements A1:2002 + A2:2002)
(CEI 60747-5-1:1997 + A1:2001 + A2:2002)

Einzel-Halbleiterbauelemente und integrierte
Schaltungen —

Teil 5-1: Optoelektronische Bauelemente —
Allgemeines

(enthält Änderungen A1:2002 + A2:2002)
(IEC 60747-5-1:1997 + A1:2001 + A2:2002)

This European Standard was approved by CENELEC on 2000-12-01. Amendment A1 was approved by CENELEC on 2002-02-01. Amendment A2 was approved by CENELEC on 2002-05-01. 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.

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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

Foreword

The text of the International Standard IEC 60747-5-1:1997, 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 60747-5-1 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.

Foreword to amendment A1

The text of amendment 1:2001 to the International Standard IEC 60747-5-1:1997, prepared by SC 47E, Discrete semiconductor devices, of IEC TC 47, Semiconductor devices, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A1 to EN 60747-5-1:2001 on 2002-02-01 without any modification.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-02-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2005-02-01

Foreword to amendment A2

The text of document 47E/208/FDIS, future amendment 2 to IEC 60747-5-1:1997, prepared by SC 47E, Discrete semiconductor devices, of IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60747-5-1:2001 on 2002-05-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-02-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2005-05-01

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Introduction

This part of IEC 60747 provides basic information on semiconductors:

- terminology;
- letter symbols;
- essential ratings and characteristics;
- measuring methods;
- acceptance and reliability. 

1 Scope

This Part of IEC 60747 deals with the terminology relating to the semiconductor optoelectronic devices.

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 747 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.

IEC 60050(731):1991, *International Electrotechnical Vocabulary (IEV) — Chapter 731: Optical fibre communication*.

IEC 60050(845):1987, *International Electrotechnical Vocabulary (IEV) — Chapter 845: Lighting*.

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests*.

3 Physical concepts

3.1 (Electromagnetic) radiation (IEV 845-01-01)

- 1) Emission or transfer of energy in the form of electromagnetic waves with the associated photons.
- 2) These electromagnetic waves or these photons.

3.2 Optical radiation (IEV 845-01-02)

Electromagnetic radiation of wavelengths lying between the region of transition to X-rays (≈ 1 nm) and the region of transition to radio waves (≈ 1 nm).

3.3 Visible radiation (IEV 845-01-03)

Any optical radiation capable of causing a visual sensation directly.

NOTE There are no precise limits for the spectral range of visible radiation since they depend upon the amount of radiant power available and the responsivity of the observer. The lower limit is generally taken between 360 nm and 400 nm and the upper limit between 760 nm and 830 nm.

3.4 Infrared radiation (IEV 845-01-04, specialized)

Optical radiation for which the wavelengths are longer than those for visible radiation.

3.5 Ultraviolet radiation (IEV 845-01-05, specialized)

Optical radiation for which the wavelengths are shorter than those for visible radiation.

3.6 Light (IEV 845-01-06, without note 2 which is not relevant)

3.6.1 Perceived light (see IEV 845-02-17)

3.6.2 Visible radiation (see IEV 845-01-03)

NOTE Concept 2 is sometimes used for optical radiation extending outside the visible range, but this usage is not recommended.

3.7 Photoelectric effect (from IEV 845-05-33: photoelectric detector)

Interaction between optical radiation and matter resulting in the absorption of photons and the consequent generation of mobile charge carriers, thereby generating an electric potential or current, or a change in electrical resistance, excluding electrical phenomena caused by temperature changes.

4 Types of devices

4.1 Semiconductor optoelectronic device

- 1) A semiconductor device that emits or detects or that is responsive to coherent or non-coherent optical radiation.
- 2) A semiconductor device that utilizes such radiation for its internal purposes.

4.2 Semiconductor photoemitter

A semiconductor optoelectronic device that directly converts electric energy into optical radiant energy.

4.3 Semiconductor laser

4.3.1 (*Semiconductor*) laser diode

A semiconductor diode that emits coherent optical radiation through stimulated emission resulting from the recombination of free electrons and holes when excited by an electric current that exceeds the threshold current of the diode.

NOTE The laser diode is mounted on a submount or in a package with or without coupling means (e.g. lens, pigtail).

4.3.2 Laser-diode module

A module containing, together with the laser diode, means for an automatic optical and/or thermal stabilization of the radiant output power.

4.4 Light-emitting diode (LED)

A semiconductor diode, other than a semiconductor laser, capable of emitting visible radiation when excited by an electric current.

4.5 Infrared-emitting diode (IRED)

A semiconductor diode other than a semiconductor laser capable of emitting infrared radiation when excited by an electric current.

4.6 (*Semiconductor*) photosensitive device

A semiconductor device that utilizes the photoelectric effect for detection of optical radiation.

4.7 (*Semiconductor*) photoelectric detector

A semiconductor device that utilizes the photoelectric effect for detection of optical radiation.

4.8 (*Semiconductor*) photoresistor, photoconductive cell (IEV 845-05-37, specialized)

A semiconductor photoelectric detector that utilizes the change of electric conductivity produced by the absorption of optical radiation.

4.9 Photoelement, photovoltaic cell (IEV 845-05-38)

A photoelectric detector that utilizes the electromotive force produced by the absorption of optical radiation.

4.10 Photodiode (IEV 845-05-39)

A photoelectric detector in which a photocurrent is generated by absorption of optical radiation in the neighbourhood of a PN junction between the semiconductors, or of a junction between a semiconductor and a metal.

4.11 Phototransistor

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.

4.12 Photothyristor

A thyristor that is designed to be triggered by optical radiation.

4.13 Photocoupler, optocoupler

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

**4.13.1 DC input photocoupler/optocoupler**

photocoupler/optocoupler consisting at the input of an optoelectronic emitter to which d.c. current is applied.

4.13.2 AC input photocoupler/optocoupler

photocoupler/optocoupler consisting at the input of an antiparallel optoelectronic emitter to which a.c. current is applied.

4.13.3 phototransistor photocoupler/optocoupler

photocoupler/optocoupler whose photosensitive element is a phototransistor.

NOTE A base terminal may or may not be provided.

4.13.4 photodarlington photocoupler/optocoupler

photocoupler/optocoupler whose photosensitive element is a Darlington phototransistor.

NOTE A base terminal may or may not be provided.

4.13.5 photothyristor photocoupler/optocoupler

photocoupler/optocoupler whose photosensitive element is a photothyristor.

NOTE A gate terminal may or may not be provided.

4.13.6 phototriac photocoupler/optocoupler

photocoupler/optocoupler whose photosensitive element is a phototriac.

4.13.7 IC photocoupler/optocoupler

photocoupler/optocoupler whose photosensitive element is a photodiode/transistor and an integrated circuit.

4.13.8 FET photocoupler/optocoupler

photocoupler/optocoupler with one or more field-effect transistors (FETs) in its output stage.

NOTE A FET is activated by photo-elements or by direct optical radiation.

4.13.9 photodiode photocoupler/optocoupler

photocoupler/optocoupler whose photosensitive element is a photodiode.

4.13.10 IC input photocoupler/optocoupler

photocoupler/optocoupler whose input elements consist of an integrated circuit and an opto-electronic emitter.

5 General terms**5.1 Optical axis**

A line about which the principal radiation or sensitivity pattern is centered.

NOTE Unless otherwise stated, the optical axis coincides with the direction of maximum radiation or sensitivity.

5.2 Optical port (of a semiconductor optoelectronic device)

A geometrical configuration, referenced to an external plane or surface of the device, that is used to specify the optical radiation emitted from an emitting device or accepted by a detecting device.

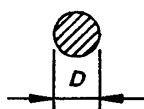
NOTE The geometrical configuration shall be specified by the manufacturer by means of geometrical information, e.g.:

- location, shape and size of the area of emission or acceptance;
- angle of emission or acceptance;
- other parameters, e.g. numerical aperture of optical fibre;
- orientation of optical axis.

Examples:

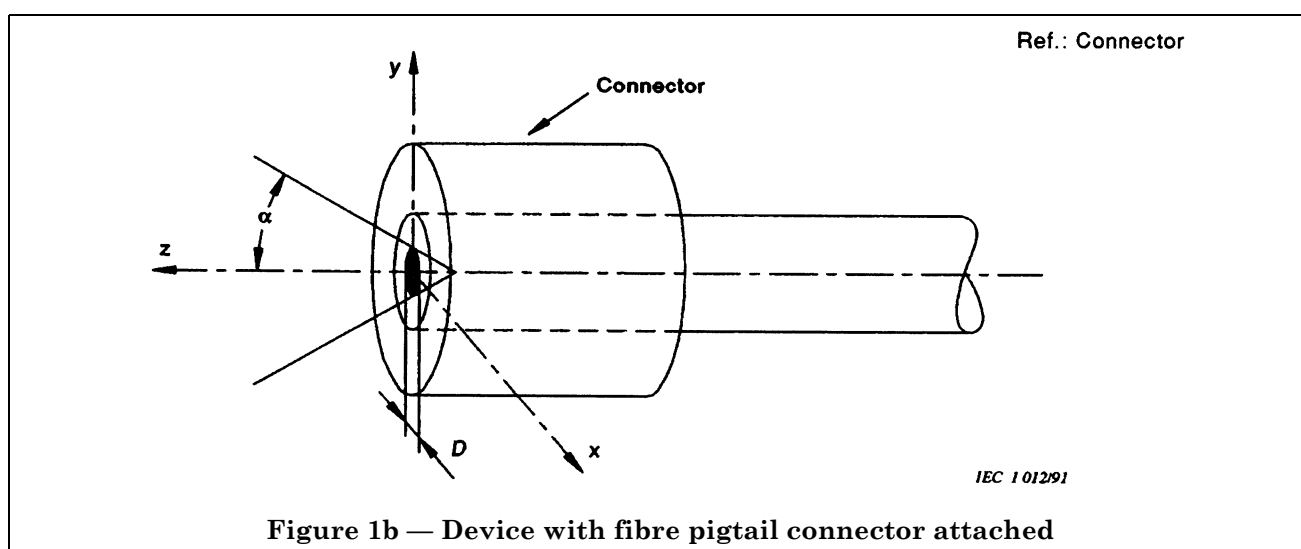
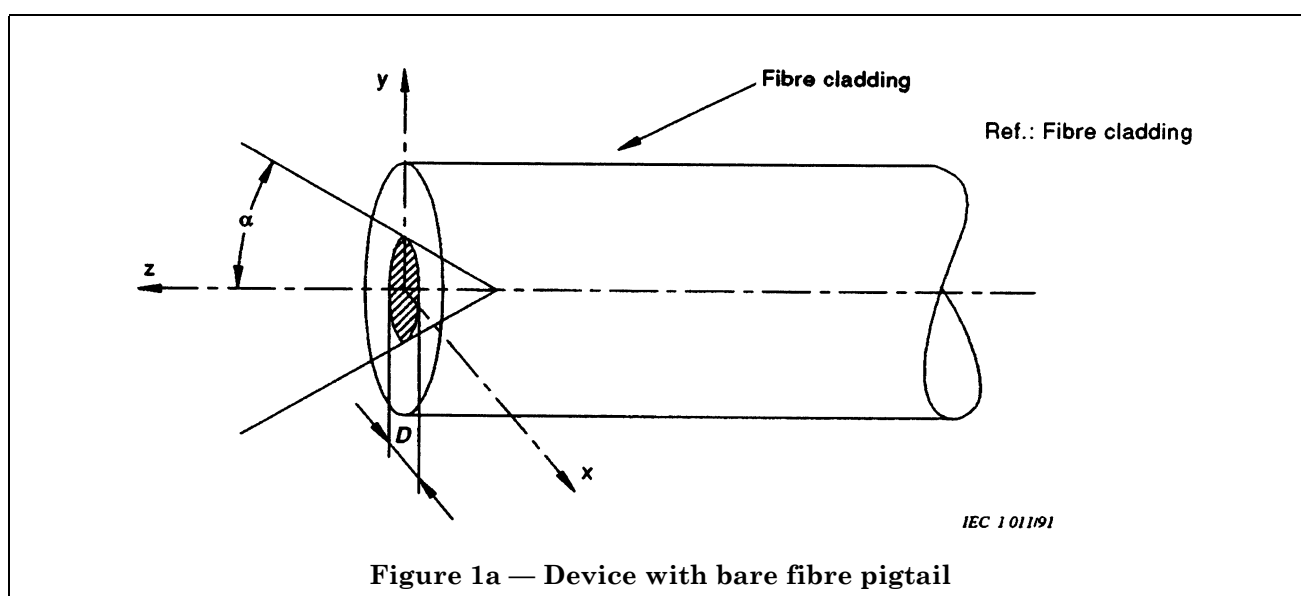
Signification of annotations in the figures:

α = emission of acceptance angle

 = optical port with diameter D

Ref. = reference locus for the definition of the optical port.

Example I: *Devices with pigtail (emitter or detector)*



Example II: *Packaged devices (emitter or detector), without pigtail*

