

Discrete semiconductor devices and integrated circuits —

Part 5-2: Optoelectronic devices — Essential ratings and characteristics

The European Standard EN 60747-5-2:2001, with the incorporation of amendment A1:2002, has the status of a British Standard

ICS 31.260

National foreword

This British Standard is the official English language version of EN 60747-5-2:2001, including amendment A1:2002. It is identical with IEC 60747-5-2:1997, including amendment 1:2002.

The start and finish of text introduced or altered by IEC amendment 1 is indicated in the text by tags A1 A1.

The UK participation in its preparation was entrusted by Technical Committee EPL/47, Semiconductors, to Subcommittee EPL/47/3, Performance of optoelectronic semiconductor devices and liquid crystal displays, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Summary of pages

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Discrete semiconductor devices and integrated circuits — Part 5-2: Optoelectronic devices — Essential ratings and characteristics

(includes amendment A1:2002)

(IEC 60747-5-2:1997 + A1:2002)

Dispositifs discrets à semiconducteurs et circuits
intégrés —
Partie 5-2: Dispositifs optoélectroniques —
Valeurs limites et caractéristiques essentielles
(inclut l'amendement A1:2002)
(CEI 60747-5-2:1997 + A1:2002)

Einzel-Halbleiterbauelemente und integrierte
Schaltungen —
Teil 5-2: Optoelektronische Bauelemente —
Wesentliche Grenz- und Kennwerte
(enthält Änderung A1:2002)
(IEC 60747-5-2:1997 + A1:2002)

This European Standard was approved by CENELEC on 2000-12-01 and amendment A1 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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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of the International Standard IEC 60747-5-2:1997, 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 60747-5-2 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 B and Annex ZA are normative and Annex A is informative. Annex ZA has been added by CENELEC.

Foreword to amendment A1

The text of document 47E/209/FDIS, future amendment 1 to IEC 60747-5-2:1997, 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 A1 to EN 60747-5-2:2001 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

Annexes designated “normative” are part of the body of the standard.

In this standard, Annex B and Annex ZA are normative.

Annex ZA has been added by CENELEC.

**NORME
INTERNATIONALE
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STANDARD**

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60747-5-2

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2002-03

**Dispositifs discrets à semiconducteurs
et circuits intégrés –**

**Partie 5-2:
Dispositifs optoélectroniques –
Valeurs limites et caractéristiques essentielles**

**Discrete semiconductor devices
and integrated circuits –**

**Part 5-2:
Optoelectronic devices –
Essential ratings and characteristics**



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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.
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International Standard IEC 60747-5-2 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.

Annex B forms an integral part of this standard.

[A1] Introduction

This part of IEC 60747 provides basic information on semiconductors:

- terminology;
- letter symbols;
- essential ratings and characteristics;
- measuring methods;
- acceptance and reliability. **[A1]**

1 Scope

This part of IEC 60747 gives the essential ratings and characteristics of the following categories or subcategories of optoelectronic devices which are not intended to be used in the field of fibre optic systems or subsystems:

- Semiconductor photoemitters, including:
 - light-emitting diodes (LEDs);
 - infrared-emitting diodes (IREDs);
 - laser diodes.
- Semiconductor photoelectric detectors, including:
 - photodiodes;
 - phototransistors.
- Semiconductor photosensitive devices.
- Semiconductor devices utilizing the optical radiation for internal operation, including:
 - photocouplers, optocouplers.

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.

IEC 60065:1985, *Safety requirements for mains operated electronic and related apparatus for household and similar general use*.

IEC 60068-2-1:1990, *Environmental testing — Part 2: Tests — Tests A: Cold*.

IEC 60068-2-2:1974, *Environmental testing — Part 2: Tests — Tests B: Dry heat*.

IEC 60068-2-3:1969, *Environmental testing — Part 2: Tests — Test Ca: Damp heat, steady state*.

IEC 60068-2-6:1995, *Environmental testing — Part 2: Tests — Test Fc: Vibration (sinusoidal)*.

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

IEC 60068-2-17: 1994, *Environmental testing — Part 2: Tests — Test Q: Sealing*.

IEC 60068-2-27:1987, *Environmental testing — Part 2: Tests — Test Ea and guidance: Shock*.

IEC 60068-2-30:1980, *Environmental testing — Part 2: Tests — Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*.

[A1] IEC 60112:1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*.

IEC 60216-1:1990, *Guide for the determination of thermal endurance properties of electrical insulating materials — Part 1: General guidelines for ageing procedures and evaluation of test results*.

IEC 60216-2:1990, *Guide for the determination of thermal endurance properties of electrical insulating materials — Part 2: Choice of test criteria*. **[A1]**

IEC 60306-1:1969, *Measurement of photosensitive devices — Part 1: Basic recommendations*.

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

Ⓐ IEC 60672-2:1980, *Specification for ceramic and glass insulating materials — Part 2: Methods of test*. Ⓐ

IEC 60695-2-2:1991, *Fire hazard testing — Part 2: Test methods — Section 2: Needle-flame test*.

IEC 60747-5-1:1997, *Discrete semiconductor devices and integrated circuits — Part 5-1: Optoelectronic devices — General*.

IEC 60747-5-3:1997, *Discrete semiconductor devices and integrated circuits — Part 5-3: Optoelectronic devices — Measuring methods*.

3 Light-emitting diodes

(excluding devices for fibre optic systems or subsystems)

3.1 Type

Ambient-rated or case-rated light-emitting diode.

3.2 Semiconductor material

Gallium arsenide-phosphide, etc.

3.3 Colour

3.4 Details of outline and encapsulation

3.4.1 IEC and/or national reference number of the outline drawing.

3.4.2 Method of encapsulation: glass/metal/plastic/other.

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

3.5 Limiting values (absolute maximum system) over the operating temperature range, unless otherwise stated

3.5.1 Minimum and maximum storage temperatures (T_{stg}).

3.5.2 Minimum and maximum operating ambient or case temperature (T_{amb} or T_{case}).

3.5.3 Maximum reverse voltage (V_{R}).

NOTE Not applicable to dual-diode devices connected anode-to-cathode and cathode-to-anode.

3.5.4 Maximum continuous forward current (I_{F}) at an ambient or case temperature of 25 °C and derating curve or derating factor.

3.5.5 Where appropriate, maximum peak forward current (I_{FM}) at an ambient or case temperature of 25 °C, under specified pulse conditions.

3.6 Electrical characteristics

For multiple diodes, the characteristics should be given for each diode. For special applications, additional characteristics may be required.

Ref.	Characteristics	Conditions at T_{amb} or $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$, unless otherwise stated	Notes	Symbols	Requirements	
3.6.1	Forward voltage	I_F specified (d.c. or pulse)		V_F		Max.
3.6.2	Reverse current	V_R specified	1	I_R		Max.
3.6.3	Luminous intensity along the defined mechanical axis	I_F specified (d.c. or pulse)	2, 3	I_v	Min.	
3.6.4	Peak emission wavelength	I_F specified (d.c. or pulse)		λ_p	Min.	Max.
3.6.5	Spectral radiation bandwidth (where appropriate)	Half value of peak emission, with I_F as specified in 3.6.4		$\Delta\lambda$		Max.
3.6.6	Switching times (where appropriate)					Max.
3.6.7	Half-intensity angle (where appropriate)					Max.
NOTE 1 Not applicable to dual-diode devices connected anode-to-cathode and cathode-to-anode.						
NOTE 2 If the included solid angle over which the intensity is measured is not negligible, it should be specified.						
NOTE 3 For diodes intended for use in multi-diode arrays, maximum luminous intensity is also required.						

3.7 Supplementary information

3.7.1 Radiation diagram

A diagram graphically expressing typical luminous intensity versus viewing angle, and using either polar or rectangular co-ordinates.

3.7.2 Spectral diagram (where appropriate)

A diagram graphically expressing typical luminous intensity versus wavelength.

3.7.3 Mechanical information

Mounting and soldering conditions, where appropriate.

4 Infrared-emitting diodes

(excluding devices for fibre optic systems or subsystems)

4.1 Type

Ambient-rated or case-rated infrared-emitting diode.

4.2 Semiconductor material

Gallium arsenide, etc.

4.3 Details of outline and encapsulation

4.3.1 IEC and/or national reference number of the outline drawing.

4.3.2 Method of encapsulation: glass/metal/plastic/other.

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

4.4 Limiting values (absolute maximum system) over the operating temperature range, unless otherwise stated

4.4.1 Minimum and maximum storage temperature (T_{stg}).

4.4.2 Minimum and maximum operating ambient or case temperature (T_{amb} or T_{case}).

4.4.3 Maximum reverse voltage (V_R).