SLOVENSKI STANDARD
SIST EN 62007-1:2002

01-september-2002

Semiconductor optoelectronic devices for fibre optic system applications - Part 1: Essential ratings and characteristics (IEC 62007-1:1997 + A1:1998)

Semiconductor optoelectronic devices for fibre optic system applications -- Part 1: Essential ratings and characteristics

Optoelektronische Halbleiterbauelemente für faseroptische Systemanwendungen -- Teil 1: Wesentliche Grenz- und Kennwerte

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Dispositifs optoélectroniques à semiconducteurs pour application dans les systèmes à fibres optiques -- Partie 1: Valeurs limites et caractéristiques essentielles

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Ta slovenski standard je istoveten z: **EN 62007-1:2000**

ICS:

31.080.01	Polprevodniški elementi (naprave) na splošno	Semiconductor devices in general
31.260	Optoelektronika, laserska oprema	Optoelectronics. Laser equipment
33.180.01	Sistemi z optiļnimi vlakni na splońno	Fibre optic systems in general

SIST EN 62007-1:2002 **en**

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

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EUROPEAN STANDARD

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Semiconductor optoelectronic devices for fibre optic system applications Part 1: Essential ratings and characteristics

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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.

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CENELEC

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

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Foreword

The texts of the International Standard IEC 62007-1:1997 and its amendment 1, prepared by IEC TC 86, Fibre optics, were submitted to the formal vote and were approved by CENELEC as EN 62007-1 on 2000-04-01 without any modification.

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) 2001-04-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-04-01

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.

Endorsement notice

The texts of the International Standard IEC 62007-1:1997 and its amendment 1, were approved by CENELEC as a European Standard without any modification.

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https://standards.iteh.ai/catalog/standards/sist/515f4d97-ac27-4628-9cbf-1a3090e3f007/sist-en-62007-1-2002

SIST EN 62007-1:2002

CONTENTS

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SIST EN 62007-1:2002
https://standards.iteh.ai/catalog/standards/sist/515f4d97-ac27-4628-9cbf-1a3090e34007/sist-en-62007-1-2002

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SEMICONDUCTOR OPTOELECTRONIC DEVICES FOR FIBRE OPTIC SYSTEM APPLICATIONS –

Part 1: Essential ratings and characteristics

1 Scope

This part of IEC 62007 gives the essential ratings and characteristics of the following categories of semiconductor optoelectronic devices to be used in the field of fibre optic systems and subsystems:

– semiconductor photoemitters;
– semiconductor photoelectric detectors;
– monolithic or hybrid integrated optoelectronic devices and their modules.

2 Normative reference

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

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IEC 60825 (all parts), *Safety of laser products*

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3 Terms and definitions

The terminology concerning the *physical concepts*, the *types of devices*, the *general terms*, and those related to *ratings and characteristics* can be found in IEC 60747-5-1.

For the purpose of this International Standard, the following definitions are applicable.

3.1
avalanche photodiode (IEV 845-05-40, specialized):

a photodiode operating with a reverse bias such that the primary photocurrent undergoes amplification within the diode

3.2
relative intensity noise *RIN*:

the quotient of the radiant power mean square fluctuations $<\Delta\Phi_e^2>$ to the mean square radiant power $<\Delta\Phi_e>^2$, normalized to a frequency band of unit width

NOTE – *RIN* is usually expressed in dB/Hz.

$$RIN = 10 \log_{10} \left\{ <\Delta\Phi_e^2> \Big/ \left(<\Phi_e>^2 * \Delta f \right) \right\}$$

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3.3
spectral shift $\Delta\lambda_c$:
the deviation of the peak-emission wavelength at a particular case temperature or a particular forward current from its value at a specified reference case temperature or a specified reference forward current, respectively

NOTE – The specific reference temperature is usually 25 °C.

3.4
input reflection coefficient s_{11}:
the quotient of the high frequency reflected voltage to the high frequency incident voltage

3.5
tracking error E_R:
the deviation of the radiant power at a particular case temperature from its value at a specified reference case temperature

NOTE 1 – The specific reference temperature is usually 25 °C.

NOTE 2 – Specifications usually refer to the maximum deviation (absolute value) in two specified temperature ranges below and above the specified reference case temperature.

NOTE 3 – The tracking error is usually expressed as a percentage of the radiant power at the reference case temperature.

3.6
(diode) responsivity R_D, R (of a photodiode):
the quotient of the photocurrent I_p by the radiant power Φ_e at the optical port of the photodiode

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NOTE 1 – If no ambiguity is likely to occur, the shorter term and letter symbol may be used

NOTE 2 – "Photodiode" means a complete device such as:

- chip itself;
- packaged component with window or pigtail.

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3.7
excess noise factor F_e:
noise resulting from the spatial and timing fluctuations of the avalanche carrier multiplication: it is defined as the ratio of the noise power at a specified reverse bias to the amplified shot noise of the photocurrent at a reference reverse bias

NOTE – The reference reverse voltage should be sufficiently low that no carrier multiplication takes place but sufficiently large that the device is fully depleted and has achieved its rated speed and responsivity.

4 Light emitting diodes and infrared emitting diodes for fibre optic systems or subsystems

4.1 Type

Ambient-rated or case-rated light-emitting or infrared-emitting diode with or without optical fibre pigtail for fibre optic systems or subsystems.

4.2 Semiconductor material

GaAs, GaAlAs, InGaAs, InP, etc.

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4.3 Details of outline and encapsulation

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

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

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

4.3.4 Characteristics of the optical port: Orientation relative to mechanical axis, position relative to mechanical axis, area, numerical aperture.

4.3.5 For devices with pigtail: Information on the pigtail fibre, kind of protection, connector, length.

4.3.6 Information on the heat sink of the package.

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

Ref.	Characteristics	Letter symbol	Requirements	
			Min.	Max.
4.4.1	Storage temperature	T_{stg}	x	x
either 4.4.2.1	Ambient temperature	T_{amb}	x	x
or 4.4.2.2	Case temperature	T_{case}	x	x
4.4.3	Soldering temperature at maximum soldering time and minimum distance to case specified	T_{sld}		x
4.4.4	Reverse voltage	V_R		x
4.4.5	Continuous forward current Derating curve or derating factor	I_F		x
4.4.6	Repetitive peak forward current at specified pulse conditions (where appropriate) Derating curve or derating factor (where appropriate)	I_{FRM}		x
4.4.7	Power dissipation Derating curve or derating factor (where appropriate)	P_{tot}		x
4.4.8	For case-rated devices: Virtual junction temperature (where appropriate)	$T_{(vj)}$		x
4.4.9	For devices with pigtail: Bend radius of pigtail (at specified distance from the case)	r	x	
4.4.10	Shock			x
4.4.11	Vibration			x
4.4.12	Tensile force on devices with pigtail:			
4.4.12.1	Untight structure: – Tensile force on fibre along its axis – Tensile force on cladding along its axis	 F F		 x x
4.4.12.2	Tight structure: – Tensile force on pigtail along its axis	 F		 x

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SIST EN 62007-1:2002
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4.5 Electrical and optical characteristics

Ref.	Characteristics	Conditions at T_{amb} or T_{case} = 25 °C unless otherwise stated	Letter symbol	Requirements	
				Min.	Max.
4.5.1	Forward voltage	I_F or Φ_e specified	V_F		x
4.5.2	Reverse current	V_R specified	I_R		x
4.5.3	Differential resistance	I_F or Φ_e specified	rd		x
4.5.4	Total capacitance	V_R, f specified	C_{tot}		x
either 4.5.5.1	Relative intensity noise (where appropriate)	I_F or Φ_e , f_o, Δf_N specified	*RIN*		x
or 4.5.5.2	Carrier-to-noise ratio (where appropriate)	I_F or Φ_e , f_c, Δf_N, f_m, m specified	*C/N*		x
either 4.5.6.1	Radiant output power	I_F specified (d.c. or pulse, or both)	Φ_e	x	x [1]
or 4.5.6.2	Forward current	Φ_e specified	I_F	x [1]	x
4.5.7	For devices without pigtail: Half-intensity angle (where appropriate)	I_F or Φ_e, angle ϕ specified	$\theta_{1/2}$		x
4.5.8	For devices without pigtail: misalignment angle (where appropriate)	I_F or Φ_e, angle ϕ specified	$\Delta\theta$		x
4.5.9	Spectral radiation bandwidth	I_F or Φ_e specified	$\Delta\lambda$		x
either 4.5.10.1	Switching times: – rise time – fall time – delay times (where appropriate) – peak emission wavelengths	DC current, input pulse current pulse width and duty cycle specified	 t_r t_f $t_{d(on)}$/ $t_{d(off)}$		x x x x
or 4.5.10.2	Cut-off frequency	I_F or Φ_e specified	f_c	x	

[1] Where appropriate

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4.6 Supplementary information

Either

4.6.1.1 Typical curve or coefficient of radiant power versus temperature and typical curve of radiant output power versus forward current (d.c. or pulse, as specified).

or

4.6.1.2 Typical curve or coefficient of radiant intensity versus temperature and typical curve of radiant intensity versus forward current (d.c. or pulse, as specified).

4.6.2 Typical curve or coefficient of change in peak emission wavelength versus temperature.

4.6.3 Typical radiation diagram.

4.6.4 Thermal resistance, ambient-rated or case-rated.

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5 Laser module with pigtails

5.1 Type

The laser module consists of the following basic parts:

laser diode
pigtail
photodiodes
thermal sensor
Peltier element
} where appropriate

5.2 Semiconductor

5.2.1 Material

laser diode e.g. GaAs, GaAlAs, InGaAsP, InP
photodiode e.g. Ge, Si, GaInAs
thermal sensor
Peltier element
} where appropriate

5.2.2 Structure

Laser diode, e.g.: gain guided, index guided, distributed feedback, etc.

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5.3 Details of outline and encapsulation

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

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

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

5.3.4 Information on the pigtail fibre, e.g.: type of fibre, kind of protection, connector, length.

5.3.5 Information on the heatsinking of the package.

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

General conditions

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

5.4.2 Minimum and maximum operating case temperatures (T_{case}).

5.4.3 Minimum and maximum operating submount temperature (T_{sub}).

5.4.4 Maximum soldering temperature (soldering time and minimum distance to case) (T_{sld}).

5.4.5 Minimum bend radius of pigtail (at specified distance from the case) (r).

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5.4.6 Shock (maximum acceleration and pulse duration).

5.4.7 Vibration (maximum acceleration and frequency range).

5.4.8 Tensile force along cable axis:

5.4.8.1 Untight structure:

– Maximum tensile force on fibre (*F*).
– Maximum tensile force on cable (*F*).

5.4.8.2 Tight structure:

– Maximum tensile force on cable (*F*).

Laser diode

For laser module without Peltier cooler, derating curve or derating factor must be given for one of following parameters, 5.4.10 to 5.4.13. For laser module with Peltier cooler, T_{sub} equals to 25 °C.

5.4.9 Maximum reverse voltage (V_R).

5.4.10 Maximum continuous forward current (I_F).

5.4.11 Maximum continuous radiant power (ϕ_e).

5.4.12 Maximum pulsed forward current at stated frequency and pulse duration (I_{FP}).

5.4.13 Maximum pulsed radiant power at stated frequency and pulse duration (ϕ_{ep}).

Photodiode

5.4.14 Maximum reverse voltage (V_R).

5.4.15 Maximum forward current (I_F).

Thermal sensor (where appropriate)

5.4.16.1 Maximum power dissipation (*P*)

or

5.4.16.2 Maximum voltage supply (*V*).

Thermal electric cooler (where appropriate)

5.4.17 Maximum cooler current under cooling and heating (I_{PE}).

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