

# INTERNATIONAL STANDARD

AMENDMENT 1

**Semiconductor devices –  
Part 5-4: Optoelectronic devices – Semiconductor lasers**

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**SEMICONDUCTOR DEVICES –**

**Part 5-4: Optoelectronic devices – Semiconductor lasers**

**AMENDMENT 1**

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Amendment 1 to IEC 60747-5-4:2022 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices.

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

Draft	Report on voting
47E/819/CDV	47E/841/RVC

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

The language used for the development of this Amendment is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications/](http://www.iec.ch/publications/).

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- reconfirmed,
- withdrawn, or
- revised.

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### 3.4.2 Output and current characteristics

#### 3.4.2.1

**output power**, <of a semiconductor laser>

*Delete the source.*

### 3.4.3 Noise characteristics (of a semiconductor laser)

#### 3.4.3.1

**relative intensity noise**

**RIN**

$R(f)$

*Replace the existing definition, formula and note with the following new definition, formula and note, and delete the source.*

ratio of the radiant power mean square fluctuation to the square of the mean radiant power, normalized to a frequency band of unit width

$$R(f) = \frac{\langle \Delta P(f)^2 \rangle}{\langle P \rangle^2} \cdot \frac{1}{\Delta f}$$

where  $\Delta f$  is the noise equivalent bandwidth

Note 1 to entry: The relative intensity noise as defined above is strictly "spectral relative intensity noise", but usually simplify referred to as RIN.

### Table 1 – Electrical and optical characteristics

*Replace, in Table 1, in the row for "Relative intensity noise", in the column of conditions for relative intensity noise, the existing text " $P, f_0, \Delta f_N$  specified" with the following new text " $P, f_0, \Delta f$  specified".*

Characteristics	Conditions at $T_{amb}$ or $T_{case} = 25\text{ °C}$ , unless otherwise stated	Symbol	Specifications		
			Required	Options <sup>a</sup>	Requirement
Forward voltage	$I_F$ or $P$ specified	$V_F$	×		max.
Threshold current		$I_{TH}$	×		min. and max.
Output power at threshold	$I_{TH}$	$P_{TH}$	×		max.
Forward current above threshold	$P$ specified	$\Delta I_F$	×		max.
Forward current above threshold at $T_{case\ max}$ or $T_{amb\ max}$	$P$ specified, $T = T_{case\ max}$ or $T_{amb\ max}$	$\Delta I_F$	×		max.
Differential output power efficiency	$P$ or $\Delta I_F$ specified	$\eta_d$	×		min. and max.
Peak emission wavelength	$\Delta I_F$ or $P$ specified	$\lambda_p$	×		min. and max.
Central wavelength	$\Delta I_F$ or $P$ specified	$\lambda_c$	×		min. and max.
Spectral bandwidth	$\Delta I_F$ or $P$ specified	$\Delta\lambda$	×		min. and max.
or: RMS spectral bandwidth	$\Delta I_F$ or $P$ specified	$\Delta\lambda_{rms}$	×		min. and max.
or: Number of longitudinal modes within a specified bandwidth and mode spacing in the wavelength domain	$\Delta I_F$ or $P$ specified Bandwidth specified	$n_m$ $s_m$	×		min. and max. min. and max.
Spectral linewidth	$\Delta I_F$ or $P$ specified	$\Delta\lambda_L$		×	max.
Side-mode suppression ratio	$\Delta I_F$ or $P$ specified	SMSR		×	min.
Divergence angles <sup>b, c</sup>	$\Delta I_F$ or $P$ specified	$\theta\ \sigma$		×	min.
or: Half-intensity angle in two specified planes <sup>c</sup>	$\Delta I_F$ or $P$ specified reference planes specified	$\theta_{1/2} (1)^d$ $\theta_{1/2} (2)^e$		×	max.
or: $1/e^2$ -intensity angle in two specified planes <sup>c</sup>	$\Delta I_F$ or $P$ specified reference planes specified	$\theta_{1/e^2} (1)^d$ $\theta_{1/e^2} (2)^e$		×	max.
Misalignment angle	$\Delta I_F$ or $P$ specified	$\Delta\theta$		×	max.
Half-intensity width at the facet of laser diode	$\Delta I_F$ or $P$ specified, reference axes specified	$D_{1/2} (x)^d$ $D_{1/2} (y)^e$		×	min. and max.
or: $1/e^2$ -intensity width at the facet of laser diode	$\Delta I_F$ or $P$ specified, reference axes specified	$D_{1/e^2} (x)^d$ $D_{1/e^2} (y)^e$		×	min. and max.
Astigmatic difference <sup>f</sup>	$\Delta I_F$ or $P$ specified, reference axes specified	$d_A$		×	max.
Rise time and fall time	Bias conditions ( $\Delta I_F$ or $\Delta P$ ) specified	$t_r, t_f$		×	max.
or: Turn-on time and turn-off time	Input pulse current, width and duty specified	$t_{on}, t_{off}$		×	max.
Small-signal cut-off frequency	$\Delta I_F$ or $P$ specified	$f_c$		×	min.
Relative intensity noise	$P, f_0, \Delta f$ specified	$R(f)$		×	max.
Carrier-to-noise ratio	$P, f_0, \Delta f, f_m$ specified, modulation format specified	$CIN$		×	max.

Characteristics	Conditions at $T_{amb}$ or $T_{case} = 25\text{ °C}$ , unless otherwise stated	Symbol	Specifications		
			Required	Options <sup>a</sup>	Requirement
Total capacitance	$\Delta I_F$ or $P$ , or $V_R$ specified frequency specified	$C_{tot}$		×	max.
Total inductance	$\Delta I_F$ or $P$ , or $V_R$ specified frequency specified	$L_{tot}$		×	max.
$S_{11}$ parameter	$\Delta I_F$ or $P$ specified frequency specified	$S_{11}$		×	max.
Annex A	<sup>a</sup> Options should be specified appropriate to applications.				
Annex B	<sup>b</sup> Only divergence angle according to ISO 11145 should be used. However, for the time being, data sheets may use both divergence angle and half-intensity angle. Manufacturers and users shall determine the parameter depending on applications.				
Annex C	<sup>c</sup> Care should be taken in confusing the divergence angle with the half-intensity angle, because they are defined based on the completely different concept.				
Annex D	<sup>d</sup> Parallel to the reference plane.				
Annex E	<sup>e</sup> Perpendicular to the reference plane.				
Annex F	<sup>f</sup> The astigmatic difference shall be derived based on ISO 11146-1.				

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