Datasheet 12 Gbps 940nm VCSEL

inneos

DESCRIPTION

Inneos' 940nm 12 Gbps VCSEL was designed specifically for wide temperature operating environments from -55°C to +85°C to meet the needs of automotive, industrial and aerospace applications. The device allows for wirebond to the n-contact on either side of the p-contact to support a variety of driver interfaces and packaging options. The Inneos 940nm VCSEL maintains superior performance in the harshest environments.

FEATURES

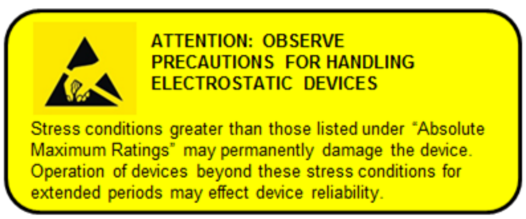
- Wide operating temperature from -55°C to +85°C
- Operation up to 12 Gbps
- Top-emitting
- Single channel

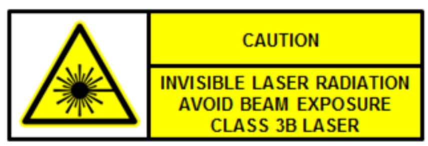
ORDERING INFORMATION

PART NUMBER	DESCRIPTION
V940-12GWA-1TGA	12 Gbps 940 nm VCSEL, Bare Die, -55°C to 85°C, Gel-Pak

APPLICATIONS

- Transmitter Optical Sub-Assemblies
- High-performance Transceivers
- Harsh Environment Sensors





ABSOLUTE MAXIMUM RATINGS

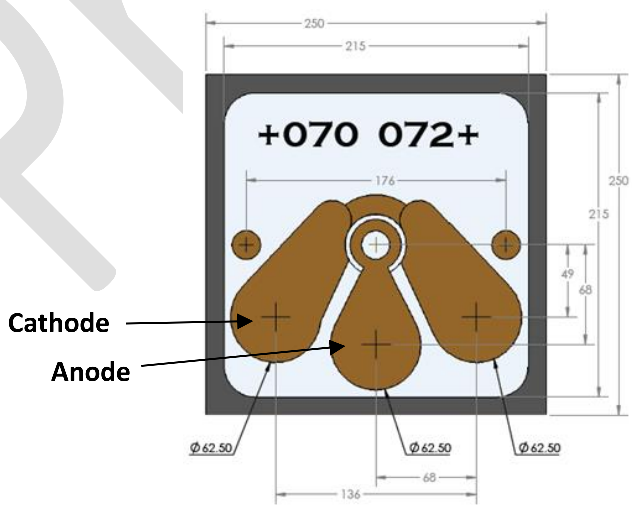
PARAMETER	SYMBOL	MIN	MAX	UNITS
Storage Temperature Range	T_S	-65	125	°C
Operating Temperature Range	T_o	-55	85	°C
Reverse Voltage	V_R		8	V
Continuous Forward Current	I_F		10	mA
ESD Protection (HBM)			200	V

OPTICAL/ELECTRICAL SPECIFICATIONS

PARAMETER	CONDITIONS	SYMBOL	UNITS	MIN	TYPICAL	MAX
Emission Wavelength	T_o=30°C @ 6mA	λ_c	nm	930	940	950
Variation of Wavelength with Temperature	-	$\frac{\Delta\lambda}{\Delta T}$	$nm/°C$	-	0.07	-
Spectral Width [a]	T_o=-55°C @ 6mA T_o=85°C @ 6mA	σ_λ	nm	-	-	1.00
Threshold Current [b]	T_o=-55°C, 85°C	I_{th}	mA	-	-	1.5
	T_o=30°C			-	0.75	-
Average Operating Current		I_{avg}	mA	-	6	-
Operating Voltage	T_o=-55°C @ 6mA	V_o	V	-	-	2.8
	T_o=85°C @ 6mA			-	2.2	-
Optical Output Power	T_o=-55°C, 85°C @ 6mA	P_o	mW	1.0	-	-
	T_o=30°C @ 6mA			-	2.5	-
Small Signal Bandwidth [c]	T_o=85°C @ 6mA	f_{3dB}	GHz	9.0	-	-
Relative Intensity Noise [d]	T_o=85°C @ 6mA	RIN_{12}	dB/Hz	-	-	-128
Beam Divergence Half Angle ($1/e^2$) [e]	T_o =30°C @ 6mA	$\theta_{1/2}$	deg	-	15	-
Slope Efficiency [f]	T_o =-55°C	SE	mW/mA	-	0.6	-
	T_o =85°C			-	0.3	-
Differential Resistance [g]	T_o =-55°C @ 6mA	R_{diff}	Ω	-	75	-
	T_o =85°C @ 6mA			-	60	-

MECHANICAL OUTLINE

Dimensions are in microns.



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PARAMETER CALCULATION METHODS USED

a. Spectral width is calculated based on FOTP-127 where the spectral level of the measured spectra below 20dB from maximum value are made zero and RMS spectral width is calculated based on formula

$$\Delta\lambda_{RMS} = \sqrt{\frac{\sum_{i=1}^{N} P_i\lambda_i^2}{\sum_{i=1}^{N} P_i} - \left(\frac{\sum_{i=1}^{N} P_i\lambda_i}{\sum_{i=1}^{N} P_i}\right)^2}$$

where 'λ_i' is the wavelength and 'P_i' is the optical power level of the i_{th} point in the spectra.

b. The threshold current is derived by a linear fit method using 10% and 20% of peak optical power points. Threshold current is the point at which the optical power is zero using the linear fit.

c. The small signal bandwidth is obtained from optical response measurements at set current and reading the cut off frequency at which the power level is 3dB down from the power level at DC.

d. Relative intensity noise: RIN_{12} is the DC-RIN measured with -12dB return. The DC-RIN is measured using an electrical spectrum analyzer with resolution bandwidth set to 1MHz, calibrated photodetector and broad-band amplifiers. The RIN per unit bandwidth is calculated using the formula,

$$RIN\left(\frac{dB}{Hz}\right) = RIN\,[dBm] - 10log_{10}\left(I_p^2 R_m\right)[dBm] - A\,[dB] - 10log_{10}(\Delta f\,[GHz])$$

where 'RIN' is the peak RIN on electrical spectrum analyzer with resolution bandwidth 'Δf', 'I_p' is the measured photocurrent, 'R_m' is the input resistance of measurement system, and 'A' is the amplification.

e. Beam divergence half-angle is derived from measurement of optical power in far-field at various angles. The half-angle is the angular deviation from center where the power reduces by '1/e'.

f. The slope efficiency is derived by linear fit method using 10% and 20% of peak optical power points. Slope efficiency is the slope of the lineal fit of optical power and drive current.

g. Differential resistance at point *'i'* of the measured LIV is calculated based on formula,

$$R_{diff} = \frac{V_i - V_{i-1}}{I_i - I_{i-1}}$$

where 'V_i', 'V_{i-1}' are the measured voltages at set currents 'I_i' and 'I_{i-1}' respectively.