Finisar

Product Specification

2.5Gbps, 850nm VCSEL, TO-46 Package

HFE4093-342

PRODUCT FEATURES

- 850nm multi-mode oxide isolated VCSEL
- Capable of modulation operation from DC to 2.5Gbps
- TO-46 flat window metal can component
- Designed for drive currents between 3-15mA average
- Packaged with a back monitor
- Un-Attenuated window can
- Attenuated versions also available

These products are high-performance 850nm VCSELs (Vertical Cavity Surface-Emitting Lasers) designed for high-speed data communications and packaged with a custom designed power monitor diode. The power monitor diode can be used with appropriate feedback control circuitry to set a maximum power level for the VCSEL. These combined features simplify design for high data rate communication and eye safety.

These products are high radiance VCSELs designed to convert electrical current into optical power that can be used in fiber optic communications and other applications. As the current varies above threshold, the light intensity increases proportionally.

These products are designed to be used with inexpensive silicon or gallium arsenide detectors, but excellent performance can also be achieved with some indium gallium arsenide detectors (see HFD3081-108 and HFD3081-203 product data sheets).

The low drive current requirement makes direct drive from PECL (Positive Emitter Coupled Logic) or ECL (Emitter Coupled Logic) gates possible and eases driver design.

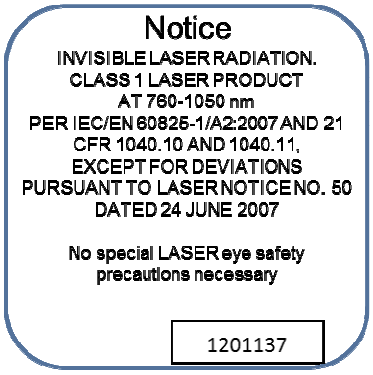
These are designed to interface with 50/125 and 62.5/125mm multi-mode fiber. They produce circularly symmetric, non-astigmatic, narrow divergence beams that, with appropriate lensing, fiber couple all of the emitter power

PRODUCT SELECTION

Part Number	Description
HFE4093-342	Un-Attenuated TO-46 component, VCSEL with Back Monitor Photodiode, Anode of VCSEL common with Photodiode Cathode

I. Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-40 to +100°C
Case Operating Temperature	-40* to +85°C
Lead Solder Temperature	260°C, 10 sec.
Laser continuous Forward Current	12mA
Laser peak forward current with pulse width less than 1ms	18mA
Laser Reverse voltage	5V
ESD Exposure (Human Body Model)	225V[1]



Notice

Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

Notice

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation to equipment, take normal ESD precautions when handling this product

II. Electro-Optical Characteristics (T_{OP} = 25 °C unless otherwise stated)

VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Optical Power Output	I_F = 7mA	P_O		2.0		mW	2
Threshold Current		I_{TH}	0.5	1.8	2.5	mA	
Threshold Current maximum deviation from 25°C value	T_A = 0°C to 70°C	ΔI_{TH}	-0.5		1	mA	3
	T_A = 25°C to 85°C	ΔI_{TH}			1.7	mA	3
	T_A = -40°C to 25°C	ΔI_{TH}			2.5	mA	3
Temperature at minimum threshold current		T_O	-20		50	°C	3
Slope Efficiency	T_A = 25°C	η	0.225	0.4	0.6	mW/mA	4
	T_A = -40°C	η			0.75	mW/mA	
	T_A = 85°C	η	0.19			mW/mA	
Slope Efficiency Temperature variation	T_A = 0°C to 70°C	$\Delta\eta/\Delta T$		-6000		ppm/°C	5
Peak Wavelength	I_F = 7mA, T_A = 0°C to 85°C	λ_P	830	850	860	nm	
λ_P Temperature Variation	I_F = 7mA, T_A = -40°C to 85°C	$\Delta\lambda_P/\Delta T$		0.06		nm/°C	
Spectral Bandwidth, RMS	I_F = 7mA	$\Delta\lambda$			0.65	nm	
Laser Forward Voltage	I_F = 7mA	V_F		1.8	2.0	V	
Rollover		P_{max}	1.25			mW	6
Rise and Fall Times	Pavg = 2mW, Extinction Ratio = 10	t_r t_f			130 150	ps	7
Relative Intensity Noise	1 GHz BW, I_F = 7mA	RIN		-130	-122	dB/Hz	
Series Resistance	I_F = 7mA , T_A = 25°C	R_S	25	35	50	Ω	
	T_A = -40°C	R_S			60	Ω	
	T_A = 85°C	R_S	20			Ω	
Series Resistance Temperature Coefficient	I_F = 7mA, T_A = 0°C to 70°C	$\Delta R_s/\Delta T$		-3000		ppm/°C	8
Beam Divergence		θ	15		30	Degrees	9
Beam Divergence Current Variation		$\Delta\theta/\Delta I_F$		0.45		Degree/mA	
Photodiode Parameters	**Test Condition**	**Symbol**	**Min.**	**Typ.**	**Max.**	**Units**	**Notes**
Monitor Current	Po = 2mW, T_A = 25°C	I_{PD}	TBD	0.025	TBD	mA	10
	Po = 2mW, T_A = -40°C	I_{PD}	TBD		TBD		10
	Po = 2mW, T_A = +85°C	I_{PD}	TBD		TBD	mA	10
Monitor current Temperature Variation	Po = 2mW, 0°C to 70°C	$\Delta I_{PD}/\Delta T$		TBD		%/°C	10
Monitor Current Tracking		Deltrk		TBD			10, 11
Dark Current	Po = 0mW, V_R = 3V	I_D			20	nA	
PD Capacitance	V_R = 0V, Freq = 1MHz V_R = 3V, Freq = 1MHz	C		75 40	100 55	pF	

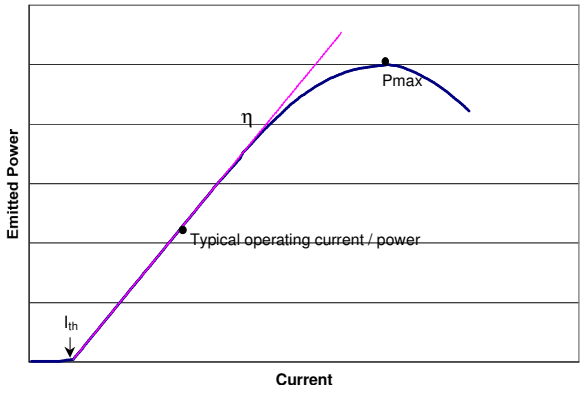
Notes:

1. Reliability is a function of temperature, see www.finisar.com for details.
2. For the purpose of these tests, I_F is DC current.
3. Threshold current varies as $(T_A - T_O)^2$. It may either increase or decrease with temperature, depending upon relationship of T_A to T_O. The magnitude of the change is proportional to the threshold at T_O.
4. Slope efficiency is defined as $\Delta P_O/\Delta I_F$.
5. To compute the value of Slope Efficiency at a temperature T, use the following equation:
   $\eta(T) \approx \eta(25^oC)*[1+(\Delta\eta/\Delta T)*(T-25)]$
6. Rollover is the power at which a further current increase does not result in a power increase.
7. Rise and fall times specifications are the 20% - 80%. Most of the devices will measure <135ps fall time. Rise and fall times are sensitive to drive electronics.
8. To compute the value of Series Resistance at a temperature T, use the following equation:
   $R_S(T) \approx R_S(25^oC)*[1+(\Delta R_S/\Delta T)*(T-25)]$
9. Beam divergence is defined as the total included angle between the $1/e^2$ intensity points.
10. These specifications are for the TO-46 component alone. Reflections introduced by any subsequent higher level assembly may affect these values.
11. Monitor current tracking is defined as follows:

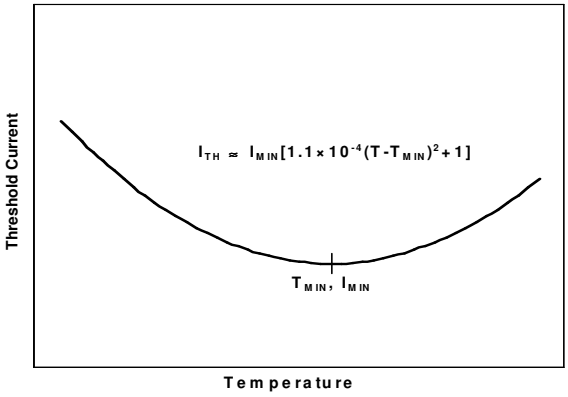
$$\text{Deltrk} = \frac{I_{PD}(P_O = 0.75\text{mW}) / 0.75\text{mW}}{I_{PD}(P_O = 0.45\text{mW}) / 0.45\text{mW}}$$

III. Typical Performance Curves

Emitted Power vs. Current: Power varies approximately linearly with current above threshold.



Threshold Current vs. Temperature: Threshold current varies parabolically with temperature; thus it can be nearly constant for a limited temperature range.



IV. Environmental Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T_{op}	-40		100	°C	
Storage Temperature	T_{sto}	-40		85	°C	

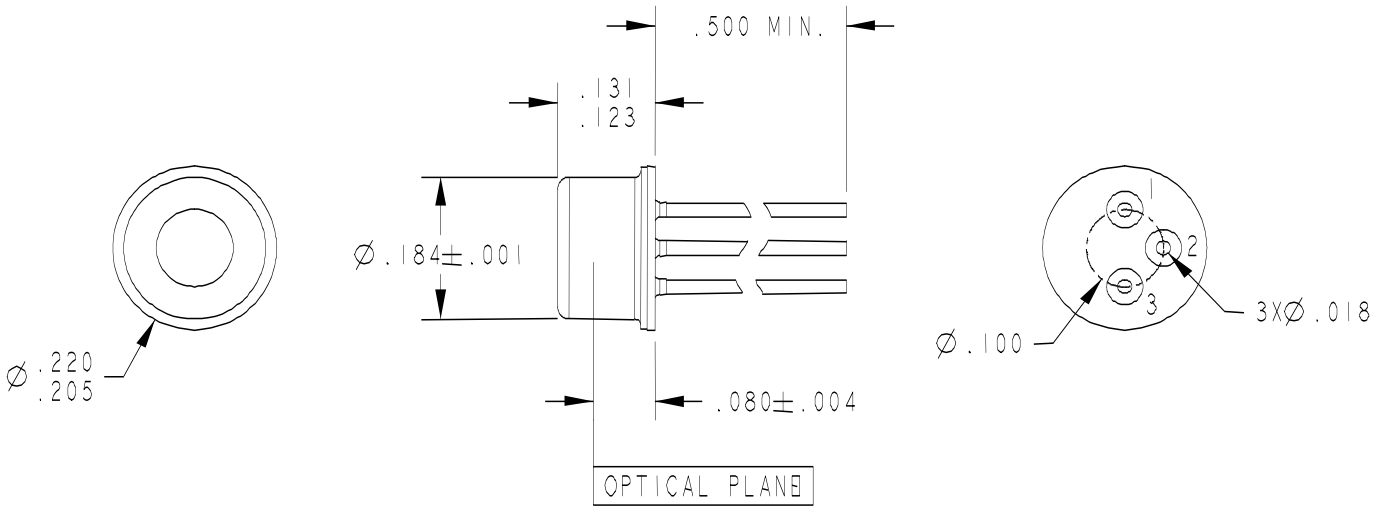
V. Regulatory Compliance

Feature	Agency	Standard	Certificate Number
Laser Eye Safety	FDA/CDRH	CDRH 21 CFR 1040 and Laser Notice 50	9521487

Copies of the referenced certificates are available at Finisar Corporation upon request.

VI. Mechanical Specifications

PIN	Description
1	K_{LD}
2	K_{PD}, A_{LD}
3	A_{PD}



(dimensions are in inches)

VII. Revision History

Revision	Date	Description
B00	8/14/2014	• Changed to Latest Finisar format.

VIII. For More Information

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