

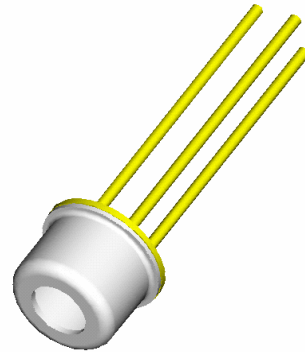
## Product Specification

### 1.25Gbps VCSEL Component, TO-46

#### HFE4082-321

#### PRODUCT FEATURES

- Designed for drive currents between 5 and 15 mA
- Optimized for low dependence of electrical properties over temperature
- High speed >1 GHz
- Two different laser/photodiode polarities
- Attenuating coating
- Packaged with a photo-detector



The HFE4082-321 is a high-performance 850 nm VCSEL (Vertical Cavity Surface-Emitting Laser) packaged for high-speed data communications. This product combines all the performance advantages of the VCSEL 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 each VCSEL. In addition, built-in power attenuation reduces the effective slope efficiency. These combined features simplify design for high data rate communication and eye safety. The HFE4082-321 is a high radiance VCSEL, designed to convert electrical current into optical power that can be used in fiber optic communications and other applications. As the current increases above threshold, the light intensity increases proportionally. The HFE4082-321 is designed to be used with inexpensive silicon or gallium arsenide detectors (see HFD3081-108), but excellent performance can also be achieved with some indium gallium arsenide detectors.

The low drive current requirement makes direct drive from PECL (Positive Emitter Coupled Logic) or EML (Emitter Coupled Logic) gates possible and eases driver design. The HFE4082-321 is designed to interface with 50/125 and 62.5/125  $\mu\text{m}$  multimode fiber. They produce circularly symmetric, non-astigmatic, narrow divergence beams that, with appropriate lensing, fiber couple all of the emitter power.

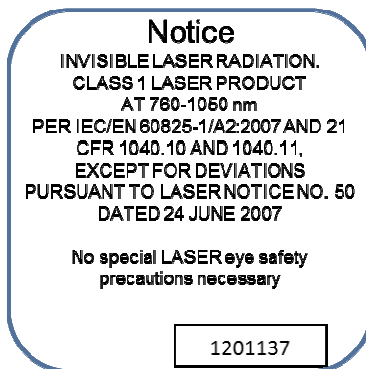
#### PRODUCT SELECTION

Part Number	Description
HFE4082-321	Attenuated VCSEL with Back Monitor Photodiode - VCSEL Anode Common

## I. Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-40 to +85°C
Case Operating Temperature	0 to +70°C
Lead Solder Temperature	260°C, 10 sec.
Laser continuous average current	15mA
Laser peak forward current with pulse width less than 1us	20mA
Laser reverse voltage	5V
ESD Exposure (Human Body Model)	225V <sup>1</sup>

<sup>1</sup>Heel and wrist straps must be used on a properly grounded workstation



### 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

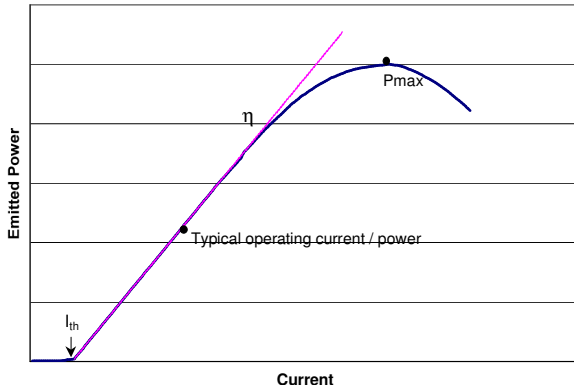
VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Peak Operating Current	Adjustable to establish operating power	$I_{peak}$		12	20	mA	2
Optical Power Output	$I_F=12mA$	$P_O$	0.3	0.6	1.2	mW	2,3
Threshold Current		$I_{TH}$	1.5	3.5	6	mA	
Threshold Current Temperature Variation	$T_A = 0^{\circ}C$ to $70^{\circ}C$	$\Delta I_{TH}$	-1.5		1.5	mA	4
Slope Efficiency	$P_O = 0.5mW$	$\eta$	0.04	0.1	0.16	mW/mA	5
Slope Efficiency Temperature variation	$T_A = 0^{\circ}C$ to $70^{\circ}C$	$\Delta\eta / \Delta T$		-0.5		%/ $^{\circ}C$	
Peak Wavelength	$I_F=12mA$	$\lambda_P$	830	850	860	nm	
$\lambda_P$ Temperature Variation	$I_F=12mA$	$\Delta\lambda_P/\Delta T$		0.06		nm/ $^{\circ}C$	
Spectral Bandwidth, RMS	$I_F=12mA$	$\Delta\lambda$			0.85	nm	
Laser Forward Voltage	$I_F=12 mA$	$V_F$	1.6	1.8	2.2	V	
Laser Reverse Voltage	$I_R=10 \mu A$	$BVR_{LD}$	5	10		V	
Rise and Fall Times	Prebias Above Threshold, 20%-80%	$t_r$ $t_f$		150 200	300 300	ps	6
Relative Intensity Noise	1 GHz BW, $I_F=12mA$	RIN		-128	-122	dB/Hz	
Series Resistance	$I_F=12 mA$	$R_S$	18	25	40	Ohms	
Beam Divergence	$I_F=12 mA$	$\theta$	5	15	20	Degrees	7
Photodiode Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Monitor Current	$P_O = 0.5mW$	$I_{PD}$	0.075		0.250	mA	
Monitor current Temperature Variation	$P_O = 0.5mW$	$\Delta I_{PD}/\Delta T$		0.2		%/ $^{\circ}C$	
Dark Current	$P_O = 0mW$ , $V_R=3V$	$I_D$			20	nA	
PD Reverse Voltage	$P_O = 0mW$ , $I_R=10 \mu A$	$BVR_{PD}$	30	115		V	8
PD Capacitance	$V_R=0V$ , Freq=1MHz $V_R=3V$ , Freq=1MHz	C		75 40	100 55	pF	

### Notes:

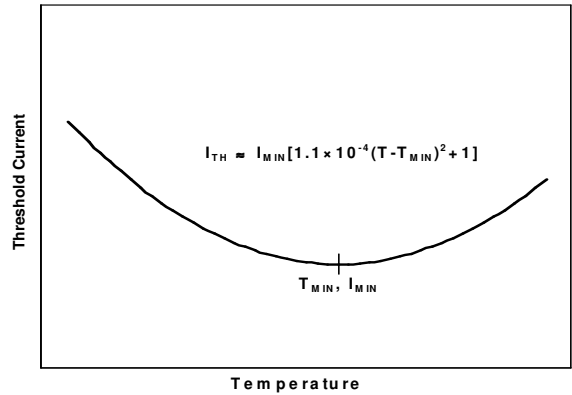
1. Reliability is a function of temperature, see [www.finisar.com](http://www.finisar.com) for details.
2. Operating power is set by the peak operating current  $I_{PEAK}=I_{BIAS}+I_{MODULATION}$ .
3. For the purpose of these tests,  $I_F$  is DC current.
4. Threshold current varies as  $(T_A - T_O)^2$ . 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  $T_O$ .
5. Slope efficiency is defined as  $\Delta P_O/\Delta I_F$ .
6. Rise and fall times specifications are the 20% - 80%. Most of the devices will measure <200ps fall time. Rise and fall times are sensitive to drive electronics.
7. Beam divergence is defined as the total included angle between the  $1/e^2$  intensity points.
8. To safeguard the VCSEL from current spike damage, short the VCSEL anode and cathode to each other during photodiode BVR verification testing. Additionally to safeguard the PIN photodiode, limit the photodiode reverse voltage in accordance with the absolute maximum rating.

### 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 <sub>op</sub>	0		70	°C	
Storage Temperature	T <sub>sto</sub>	-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

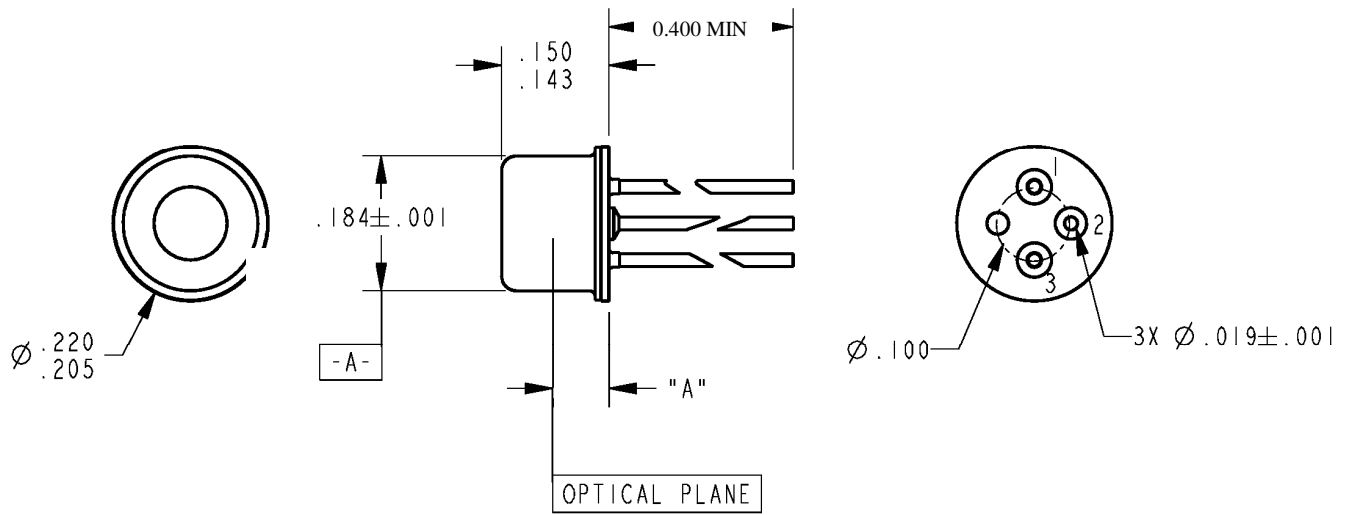
Copies of the referenced certificates are available at Finisar Corporation upon request.

**VI. Mechanical Specifications**

PIN	Description
1	K <sub>LD</sub>
2	K <sub>PD</sub> , A <sub>LD</sub>
3	A <sub>PD</sub>

**PINOUT DEFINITIONS**

A <sub>LD</sub>	VCSEL Anode	A <sub>PD</sub>	Monitor Photodiode Anode
K <sub>LD</sub>	VCSEL Cathode	K <sub>PD</sub>	Monitor Photodiode Cathode



DIMENSION A = 0.078±0.004

**(dimensions are in inches)**

**VII. Revision History**

<b>Revision</b>	<b>Date</b>	<b>Description</b>
A1	4/28/2013	• Document created.

**VIII. For More Information**

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