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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

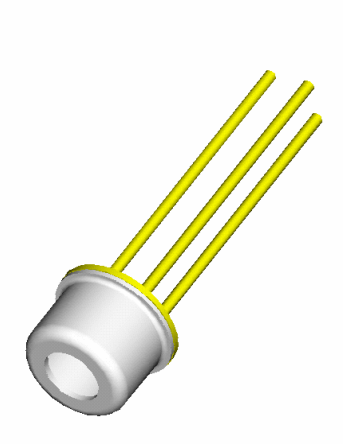
Finisar

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 um multimode fiber. They produce circularly symmetric, non-astigmatic, narrow divergence beams that, with appropriate lensing, fiber couple all of the emitter power.

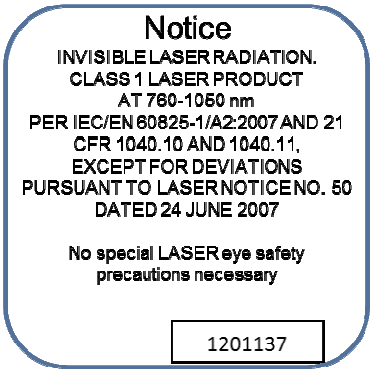
PRODUCT SELECTION

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[1]

[1]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

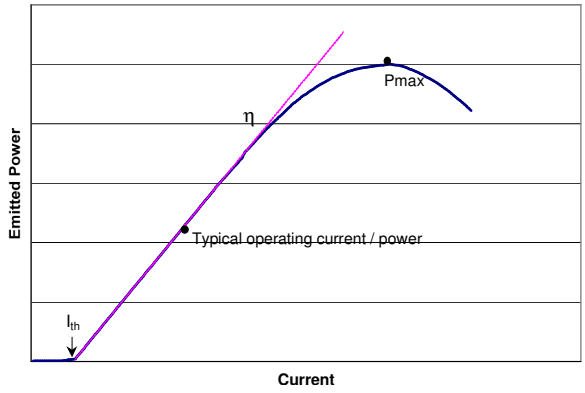
VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Peak Operating Current	Adjustable to establish operating power	I_{peak}		12	20	mA	2
Optical Power Output	I_F=12mA	Po	0.3	0.6	1.2	mW	2,3
Threshold Current		I_{TH}	1.5	3.5	6	mA	
Threshold Current Temperature Variation	T_A = 0°C to 70°C	ΔI_{TH}	-1.5		1.5	mA	4
Slope Efficiency	Po =0.5mW	η	0.04	0.1	0.16	mW/mA	5
Slope Efficiency Temperature variation	T_A = 0°C to 70°C	$\Delta\eta/\Delta T$		-0.5		%/°C	
Peak Wavelength	I_F=12mA	λ_P	830	850	860	nm	
λ_P Temperature Variation	I_F=12mA	$\Delta\lambda_P/\Delta T$		0.06		nm/°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 µA	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	θ	5	15	20	Degrees	7
Photodiode Parameters	**Test Condition**	**Symbol**	**Min.**	**Typ.**	**Max.**	**Units**	**Notes**
Monitor Current	Po =0.5mW	I_{PD}	0.075		0.250	mA	
Monitor current Temperature Variation	Po =0.5mW	$\Delta I_{PD}/\Delta T$		0.2		%/°C	
Dark Current	Po =0mW, V_R=3V	I_D			20	nA	
PD Reverse Voltage	Po =0mW, I_R=10 µA	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:

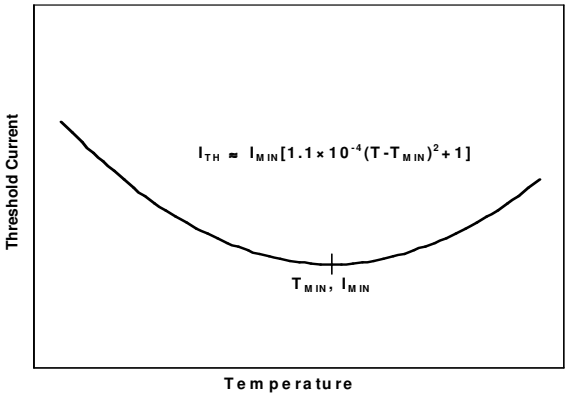
1. Reliability is a function of temperature, see www.finisar.com for details.
2. Operating power is set by the peak operating current $I_{PEAK}=I_{BIAS}+I_{MODULATION}$.
3. For the purpose of these tests, I_F is DC current.
4. Threshold current varies as $(T_A - T_O)^2$. It may either increase or decrease 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_{op}	0		70	°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

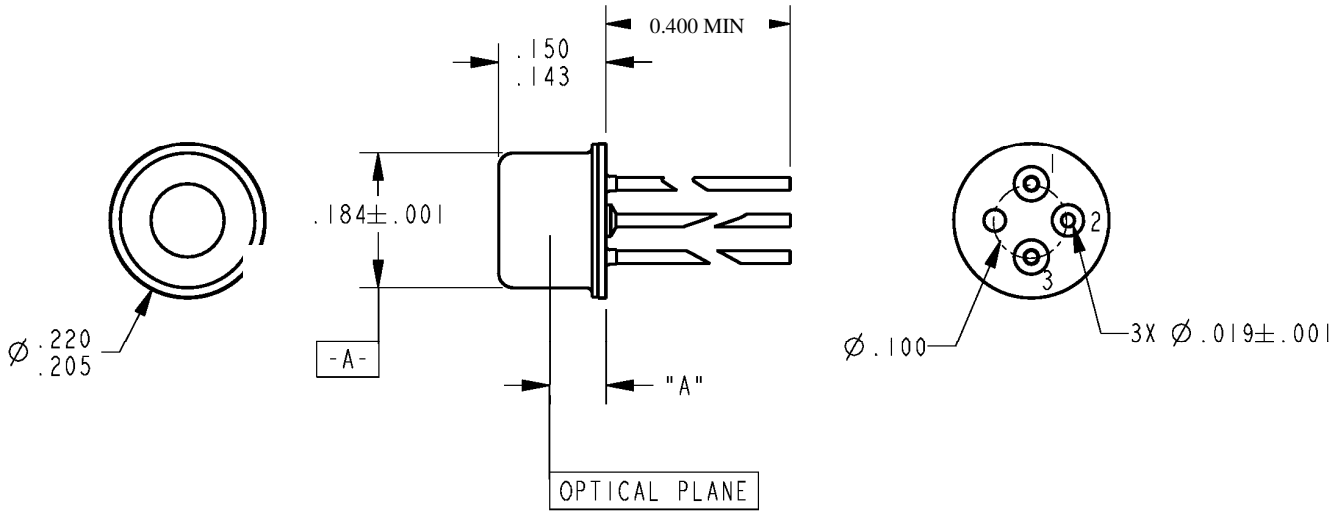
Copies of the referenced certificates are available at Finisar Corporation upon request.

VI. Mechanical Specifications

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

PINOUT DEFINITIONS

A_{LD}	VCSEL Anode	A_{PD}	Monitor Photodiode Anode
K_{LD}	VCSEL Cathode	K_{PD}	Monitor Photodiode Cathode



DIMENSION A = 0.078±0.004

(dimensions are in inches)

VII. Revision History

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

VIII. For More Information

Finisar Corporation
1389 Moffett Park Drive
Sunnyvale, CA 94089-1133
Tel. 1-408-548-1000
Fax 1-408-541-6138
sales@finisar.com
www.finisar.com