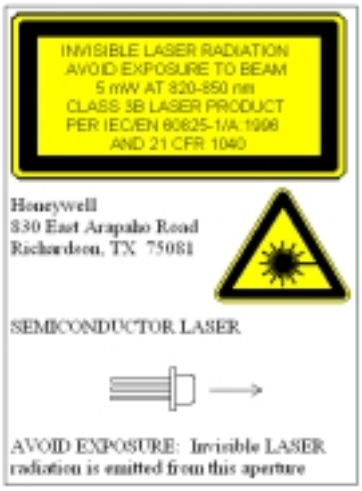
Fiber Optic LAN Components

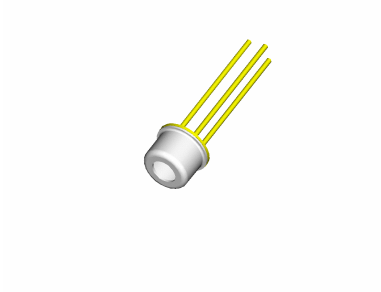
HFE408x-321

High Speed VCSEL 1.25Gbps

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 photodetector





The HFE408x-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 HFE408x-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 varies above threshold, the light intensity increases proportionally.

The HFE408x-321 is designed to be used with inexpensive silicon or gallium arsenide detectors, 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 HFE408x-321 is designed to interface with 50/125 and 62.5/125 µm multimode fiber. They product circularly symmetric, non-astigmatic, narrow divergence beams that, with appropriate lensing, fiber couple all of the emitter power.

ABSOLUTE MAXIMUM RATINGS

Parameter	Rating
Storage Temperature	-40 to +125°C
Operating Temperature	0 to +70°C
Lead Solder Temperature	260°C, 10 sec.
Continuous Optical Output Power (Any Current)	5 mW
Laser Diode Reverse Voltage (I_R=10 µA)	5 V
Laser Continuous Forward Current, Heat-Sinked	15 mA
PIN Photodiode Forward Current	10 mA

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.

ELECTRO-OPTICAL CHARACTERISTICS (T_A=25 °C unless otherwise stated)

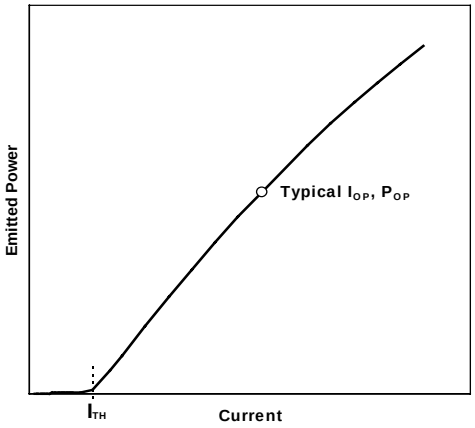
VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Peak Operating Current	Adjustable to establish operating power	I_{peak}		12	20	mA	1
Optical Power Output	I_F=12mA	Po	0.3	0.6	1.2	mW	1
Threshold Current		I_{TH}	1.5	3.5	6	mA	
Threshold Current Temperature Variation	T_A = 0°C to 70°C	ΔI_{TH}	-1.5		1.5	mA	2
Slope Efficiency	Po =0.5mW	η	0.04	0.1	0.16	mW/mA	3
Slope Efficiency Temperature variation	T_A = 0°C to 70°C	$\Delta\eta$ /ΔT		-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		150	300	ps	4
		t_f		200	300		
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	5
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	6
PD Capacitance	V_R=0V, Freq=1MHz	C		75	100	pF	
	V_R=3V, Freq=1MHz			40	55		

Notes:

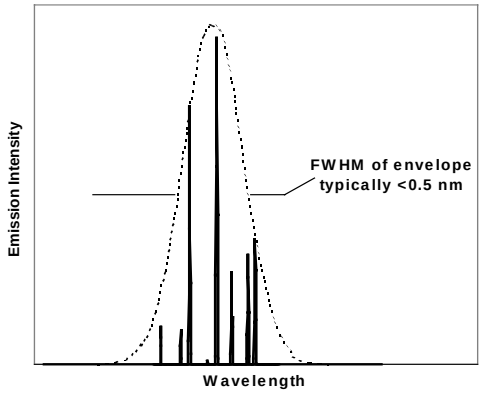
1. Operating power is set by the peak operating current $I_{PEAK}=I_{BIAS}+I_{MODULATION}$.
2. Operation at temperatures outside the specified range may result in the threshold current exceeding the maximums defined in the electro-optical characteristics table.
3. Slope efficiency is defined as ΔPo/ΔIF at a total power output of 0.5 mW. Slope efficiency is intentionally lowered to the values shown by optical attenuation.
4. Rise and fall times are sensitive to drive electronics, 200ps rise and fall times are achievable with Honeywell VCSELs.
5. Beam divergence is defined as the total included angle between the $1/e^2$ intensity points.
6. 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.

TYPICAL PERFORMANCE CURVES

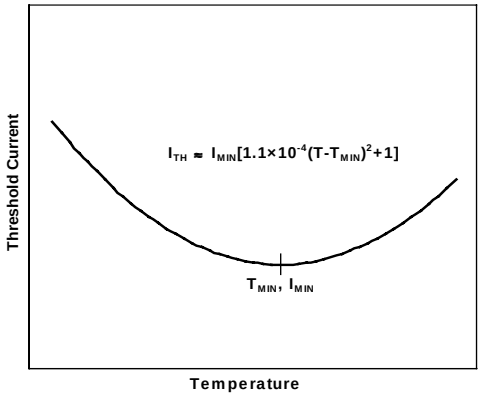
Emitted Power vs. Current: Power varies approximately linearly with current above threshold.



Emission Intensity vs. Wavelength: Typical 10 mA spectrum comprises multiple lines corresponding to multiple transverse modes.



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



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.

DANGER

The VCSEL is a class IIIb laser and should be treated as a potential eye hazard. Due to the size of the component, the applicable warning logotype, aperture label, and certification/ identification label cannot be placed on the component itself. These labels can be found on the individual envelope in which the VCSEL unit is packaged, or attached to the shipping package.

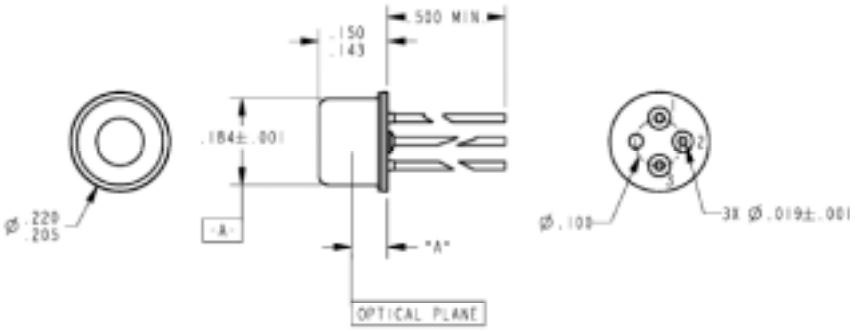
Fiber Optic LAN Components
High Speed VCSEL 1.25Gbps VCSEL

HFE408x-321

ORDER GUIDE

Catalog Listing	Description
HFE4081-321	Attenuated VCSEL with Back Monitor Photodiode - VCSEL Cathode Common
HFE4082-321	Attenuated VCSEL with Back Monitor Photodiode - VCSEL Anode Common

MOUNTING DIMENSIONS (for reference only): in./(mm)



DIMENSION A = 0.078±0.004

PINOUT

HFE4082-321		HFE4081-321	
Number	**Function**	**Number**	**Function**
1	K_{LD}	1	A_{LD}
2	K_{PD}, A_{LD}	2	K_{LD}, A_{PD}
3	A_{PD}	3	K_{PD}

PINOUT DEFINITIONS

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

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with the date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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