

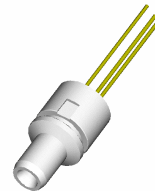
## Fiber Optic LAN Components

## HFE438x-521

### SC Connectorized 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  $\geq 1$  GHz
- Two different laser/photodiode polarities
- Attenuating coating
- Packaged with a photodetector



The HFE438x-521 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.

Packaged in a fiber receptacle sleeve, this high radiance VCSEL is 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 HFE438x-521 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 HFE438x-521 is a prealigned and focused fiber optic transmitter designed to interface with 50/125 and 62.5/125  $\mu\text{m}$  multimode fiber.



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### ABSOLUTE MAXIMUM RATINGS

Parameter	Rating
Storage Temperature	-40 to +85°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 ( $I_R=10 \mu A$ )	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 ( $T_A=25^\circ C$ unless otherwise stated)

VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Peak Fiber Coupled Optical Power (See threshold current and slope efficiency which control power output)	$I_F=12$ mA Peak 50/125 $\mu$ m fiber NA=0.20	$P_{OC}$		350 -4.5		$\mu$ W dBm	1
Threshold Current		$I_{TH}$		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	2
Slope Efficiency	$P_{OC}=0.35$ mW	$\eta$	0.02	0.04	0.1	mW/mA	3
Slope Efficiency Temperature Variation	$T_A = 0^\circ C$ to $70^\circ C$	$\Delta\eta/\Delta T$		-0.5		%/ $^\circ C$	
Peak Wavelength	$I_F=12$ mA	$\lambda_p$	830	850	860	nm	
$\lambda_p$ Temp Coefficient	$I_F=12$ mA	$\Delta\lambda_p/\Delta T$		0.06		nm/ $^\circ C$	
Spectral Bandwidth	$I_F=12$ mA, FWHM	$\Delta\lambda$			1.0	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 Time	Bias Above Threshold (20%-80%)	$t_R$ $t_F$		150 200	300 300	ps	4
Relative Intensity Noise	1 GHz BW	RIN		-128	-122	dB/Hz	
Series Resistance	$I_F=12$ mA	$R_S$	15	25	50	Ohms	

Photodiode Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Monitor Current	$P_{OC}=0.35$ mW	$I_{PD}$	0.09		0.58	mA	
Monitor Current Temperature Variation	$P_{OC}=0.35$ mW	$\Delta I_{PD}/\Delta T$		0.0		%/ $^\circ C$	
Dark Current	$P_o=0$ mW, $V_R=3$ V	$I_D$			20	nA	
PD Reverse Voltage	$P_o=0$ mW, $I_R=10 \mu A$	$BVR_{PD}$	30	115		V	5
PD Capacitance	$V_R=0$ V, Freq=1 MHz $V_R=3$ V, Freq=1 MHz	C		75 40	100 55	pF	

### Notes:

- Operating power is set by the peak operating current  
 $I_{PEAK}=I_{BIAS}+I_{MODULATION}$
- Operation at temperatures outside the specified range may result in the threshold current exceeding the maximums defined in the electro-optical characteristics table.
- Slope efficiency is defined as  $\Delta P_o/\Delta I_F$  at a total power output of 0.35 mW. Slope efficiency is intentionally lowered to the values shown by optical attenuation.

# Fiber Optic Components

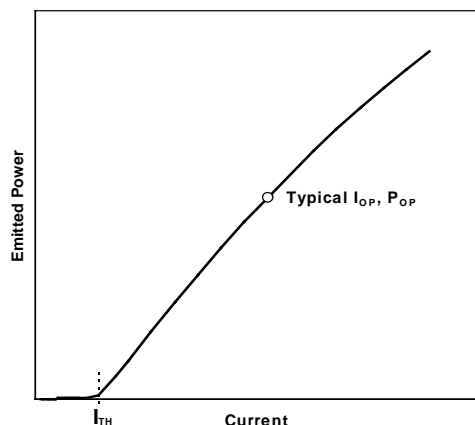
## SC Connectorized VCSEL 1.25Gbps

HFE438x-521

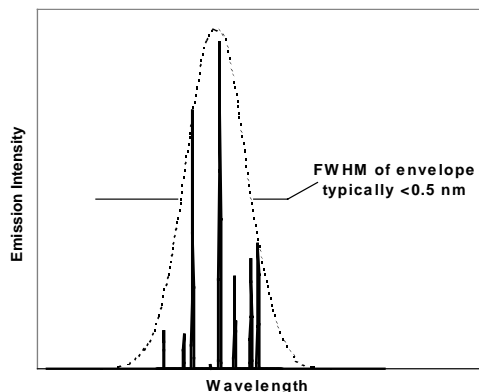
4. Rise and fall times are sensitive to drive electronics. 200 ps rise and fall times are achievable for all Honeywell VCSELs.
5. To safeguard the VCSEL from current spike damage, short the VCSEL anode and cathode to each other during photodiode BVR verification testing.

### TYPICAL PERFORMANCE CURVES

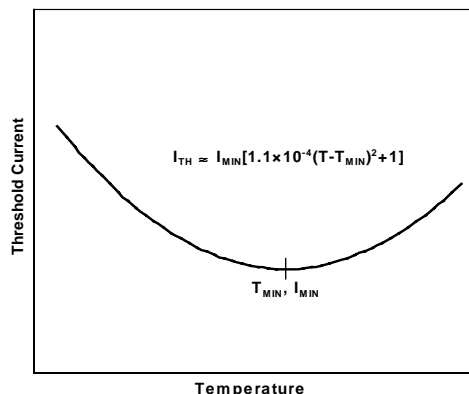
**Emitted Power vs. Current:** Power varies approximately linearly with current above threshold.



**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

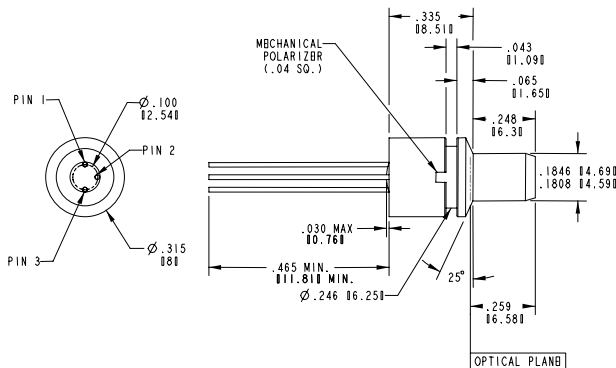
## SC Connectorized VCSEL 1.25Gbps

HFE438x-521

### ORDER GUIDE

Catalog Listing	Description
HFE4380-521	Attenuated VCSEL with Back Monitor Photodiode - VCSEL Anode Common
HFE4381-521	Attenuated VCSEL with Back Monitor Photodiode - VCSEL Cathode Common

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



### PINOUT

HFE4380-521		HFE4381-521	
Number	Function	Number	Function
1	K <sub>LD</sub>	1	A <sub>LD</sub>
2	K <sub>PD</sub> , A <sub>LD</sub>	2	K <sub>LD</sub> , A <sub>PD</sub>
3	A <sub>PD</sub>	3	K <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

### 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.

7/23/01

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.

### SALES AND SERVICE

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 +65-580-3312 (Singapore)  
 +44 (0) 118 981 9511 (UK)

### FAX

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 1-972-470-4549 (Fax on demand)  
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