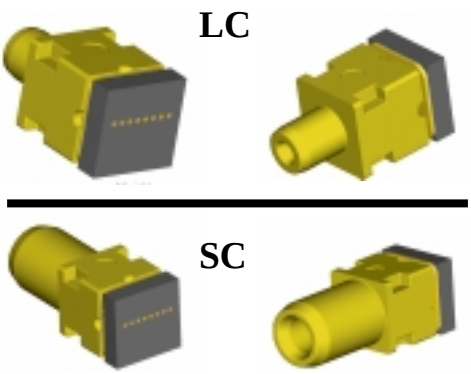
10Gbps 850nm VCSEL	Preliminary
TOSA Package	HFE6x9x-3x1

Key Features:

- LC TOSA HFE619x-321
- SC TOSA HFE639x-321
- High performance VCSEL
- Low electrical parasitic ceramic package
- Data rates from DC to 12.5Gbps
- Differential, Cathode or Anode driven versions available
- Complete isolation between the VCSEL and back monitor.



The HFE6x9x-321 uses a high-performance Vertical Cavity Surface Emitting Laser (VCSEL) designed to meet performance requirements for 10Gbps data communication over multimode optical fiber. Applications include Ethernet, Fibre Channel and ATM protocols. The optical assembly is designed to interface either 50µm or 62.5µm multimode fiber and ensure launch conditioning requirements compatibility with enhanced bandwidth fiber as specified by TIA 455-203.

The HFE6x9x-321 incorporates a power monitoring photodiode that can be used for temperature compensation, average power control, and for compliance with Class 1 eye safety limits.

The HFE6x9x is designed to be paired with the HFD6x80 detector plus preamplifier in transceiver/transponder applications.

ABSOLUTE MAXIMUM RATINGS

Parameter	Rating
Storage Temperature	-40 to +85°C
Case Operating Temperature	0 to +85°C
Lead Solder Temperature	260°C, 10 sec.
Reverse Power Supply Voltage	5V
Peak continuous forward current	12mA

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

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

VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Fiber coupled optical power	I_F=8mA Peak 50/125µm fiber	P_{OC}	400	600		µW	
Coupling Efficiency	I_F=10mA	PO_PCT	65			%	1
Threshold Current		I_{TH}		1	2	mA	
Threshold Current Temperature Variation	T_A=0 to 70ºC	ΔI_{TH}			1	mA	2
Slope Efficiency	P_{OC}=0.6mW	η	0.05	0.075	0.2	mW/mA	3
Slope Efficiency Temperature Variation	T_A=0 to 70ºC	$\Delta\eta/\Delta T$		-0.4		%/ºC	
Peak Wavelength	I_F=8mA	λ_P	840		860	nm	
λ_P Temperature Variation	T_A=0 to 70ºC	$\Delta\lambda_P/\Delta T$		0.06		nm/ºC	
RMS Spectral Bandwidth	I_F=8mA	$\Delta\lambda$			0.35	nm	
Laser Forward Voltage	I_F=8mA	V_F	1.6	1.8	2.2	V	
Laser Reverse Voltage	I_R=10µA	V_R	5	10		V	
Rise/Fall Time	Bias above threshold 20%-80%	T_R T_F			40 40	ps	4
Relative Intensity Noise	I_F=8mA	RIN_{12}			-130	dB/Hz	5
Series Resistance	I_F=8mA	R	45	60	75	Ohms	
Series Resistance Temperature Variation	I_F=8mA	$\Delta R/\Delta T$		-0.2		%/ºC	
Total Capacitance	I_F=8mA	C_T			0.5	pF	6
Encircled Flux Diameter	I_F=8mA	EF					7

Photodiode Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Monitor Current	P_{OC}=0.6mW	I_{PD}	20	50	200	µA	
Monitor Current Temperature Variation	P_{OC}=0.6mW T_A=0 to 70ºC	$\Delta I_{PD}/\Delta T$		0.0		%/ºC	
Dark Current	P_{OC}=0mW, V_R=3V	I_{DARK}			20	nA	
PD Reverse Voltage	P_{OC}=0mW, I_R=10µA	BVR_{PD}	30	115		V	8
PD Capacitance	V_R=0V, Freq=1MHz V_R=3V, Freq=1MHz	C_{PD}		75 40	100 55	pF	

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Notes:

1. PO_PCT is defined as the ratio of the coupled power into a 50/125 micron fiber to the total power output from the optical front end as measured on a large area detector.
2. Operation outside of the specified range may result in the threshold current exceeding the maximums defined in the electro-optical characteristics table. ΔI_{TH} is the maximum deviation from the 25ºC value.
3. Slope efficiency is defined as $\Delta P_O/\Delta I_F$ at a total power output of 0.6mW. Slope efficiency is intentionally lowered to the value shown by attenuation.
4. Rise and fall times are sensitive to drive electronics. Rise and fall times are measured 20%-80% using a 1GHz square wave AC coupled to the VCSEL using a bias-T. The DC current is adjusted to achieve a minimum OMA of -4dBm. Corrections are made for finite detector bandwidth.
5. RIN_{12} is measured using the OMA technique with 12dB return.
6. Total capacitance is measured with the VCSEL forward biased at 8mA using a Network analyzer at 1GHz.
7. Encircled flux is measured per TIA-455-203 at 8mA average current.
8. To prevent VCSEL damage, short the VCSEL anode and cathode during BVR testing of the photodiode.

ORDER GUIDE:

Catalog Listing	Description
HFE6190-321	Cathode Driven, attenuated, LC TOSA
HFE6191-321	Anode Driven, attenuated, LC TOSA
HFE6192-321	Differentially Driven, attenuated, LC TOSA
HFE6390-321	Cathode Driven, attenuated, SC TOSA
HFE6391-321	Anode Driven, attenuated, SC TOSA
HFE6392-321	Differentially Driven, attenuated, SC TOSA
HFE6190-351	Cathode Driven, attenuated, LC TOSA, with flex
HFE6191-351	Anode Driven, attenuated, LC TOSA, with flex
HFE6192-351	Differentially Driven, attenuated, LC TOSA, with flex
HFE6390-351	Cathode Driven, attenuated, SC TOSA, with flex
HFE6391-351	Anode Driven, attenuated, SC TOSA, with flex
HFE6392-351	Differentially Driven, attenuated, SC TOSA, with flex

PINOUT

HFE6x90-3x1		HFE6x91-3x1		HFE6x92-3x1	
Number	**Function**	**Number**	**Function**	**Number**	**Function**
1	GND	1	GND	1	GND
2	PDA	2	PDA	2	PDK
3	GND	3	GND	3	GND
4	LDA	4	LDA	4	LDA
5	LDK	5	LDK	5	LDK
6	GND	6	GND	6	GND
7	PDK	7	PDK	7	PDA
8	GND	8	GND	8	GND

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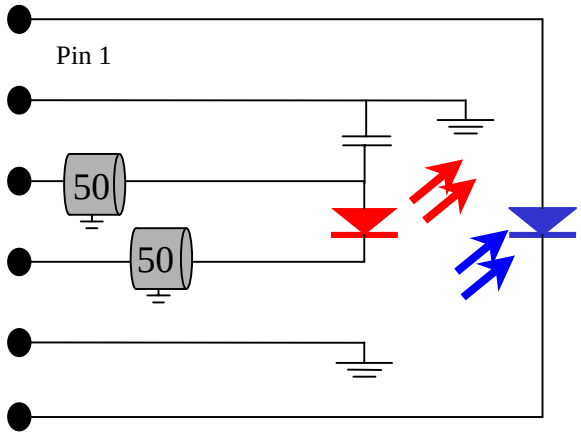
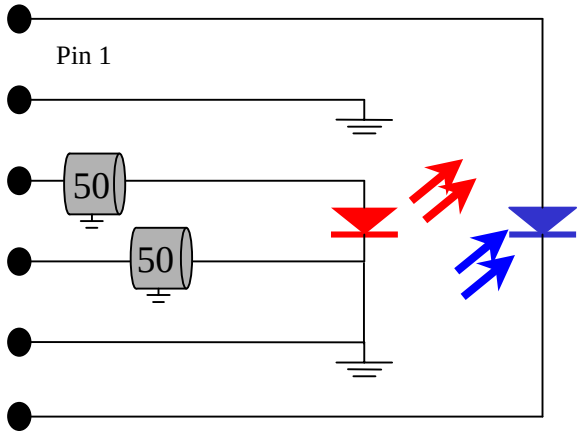
Schematics / Interface Configurations

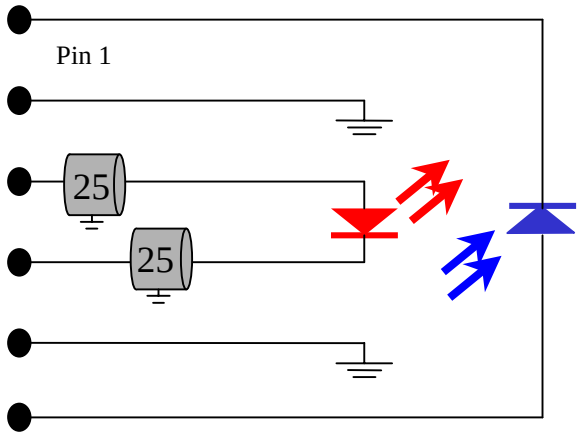
Cathode Driven: HFE6x90-3x1



Anode Driven: HFE6x91-3x1



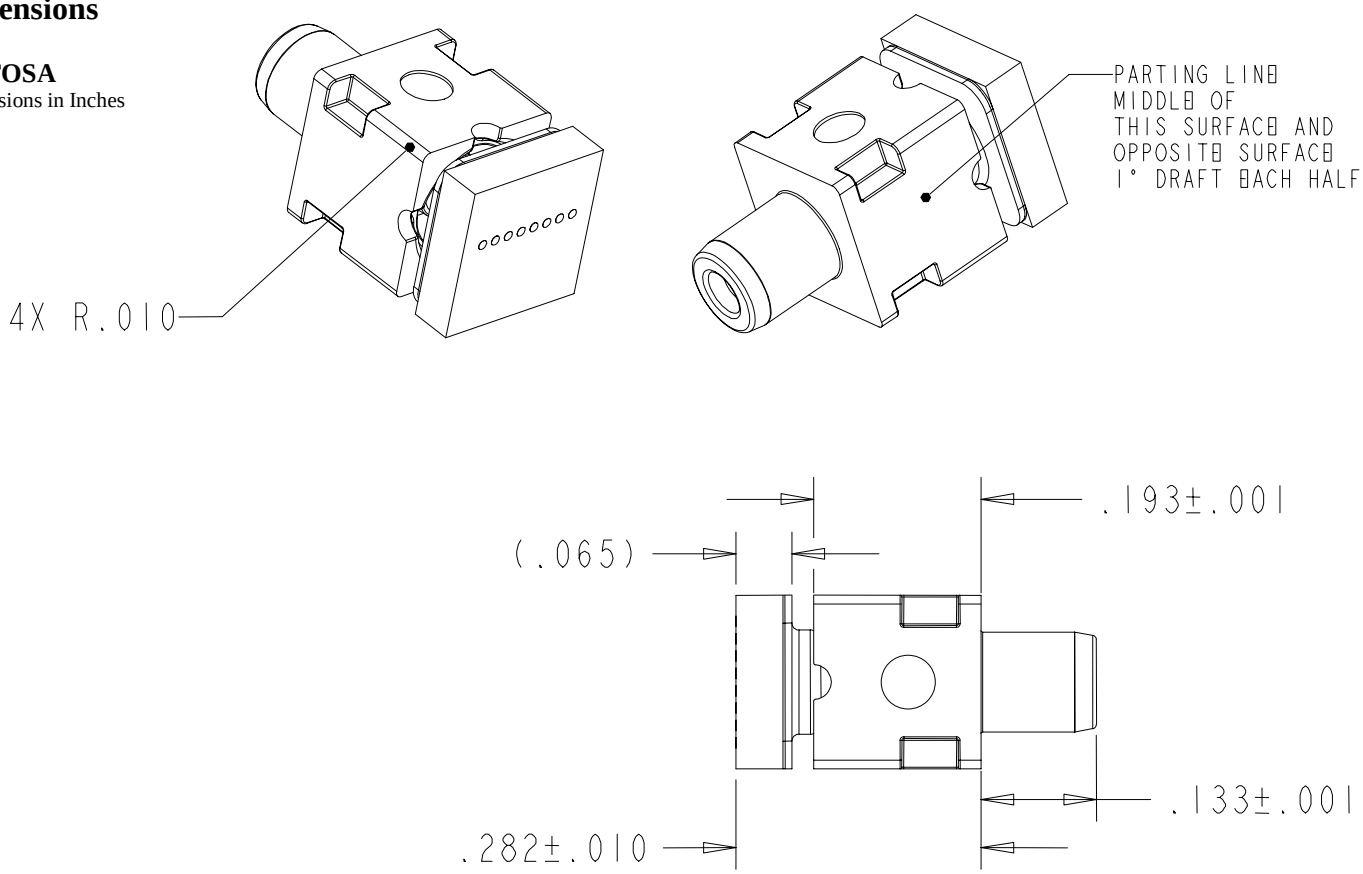
Differentially Driven: HFE6x92-3x1



10Gbps 850nm VCSEL	Preliminary
TOSA Package	HFE6x9x-3x1

Dimensions

LC TOSA
Dimensions in Inches



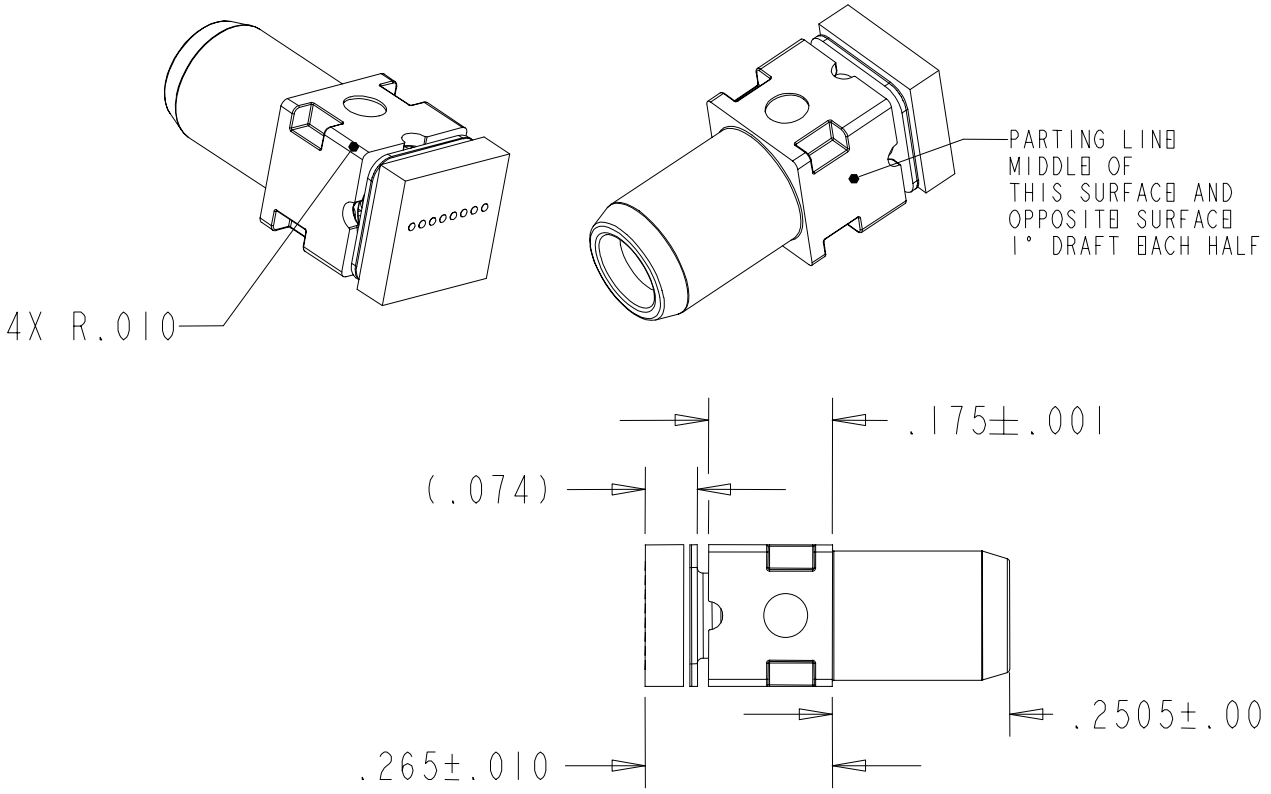
THE .212 DIMENSIONS SHOW THE MAXIMUM CERAMIC PACKAGE ENVELOPE (INCLUDING ALIGNMENT TOLERANCES) RELATIVE TO OSA.

DIM "A" MAY BE CHANGED, SUBJECT TO HIGH SPEED PERFORMANCE OF PRODUCT.

10Gbps 850nm VCSEL	Preliminary
TOSA Package	HFE6x9x-3x1

Mounting Dimensions

SC TOSA
Dimensions in Inches



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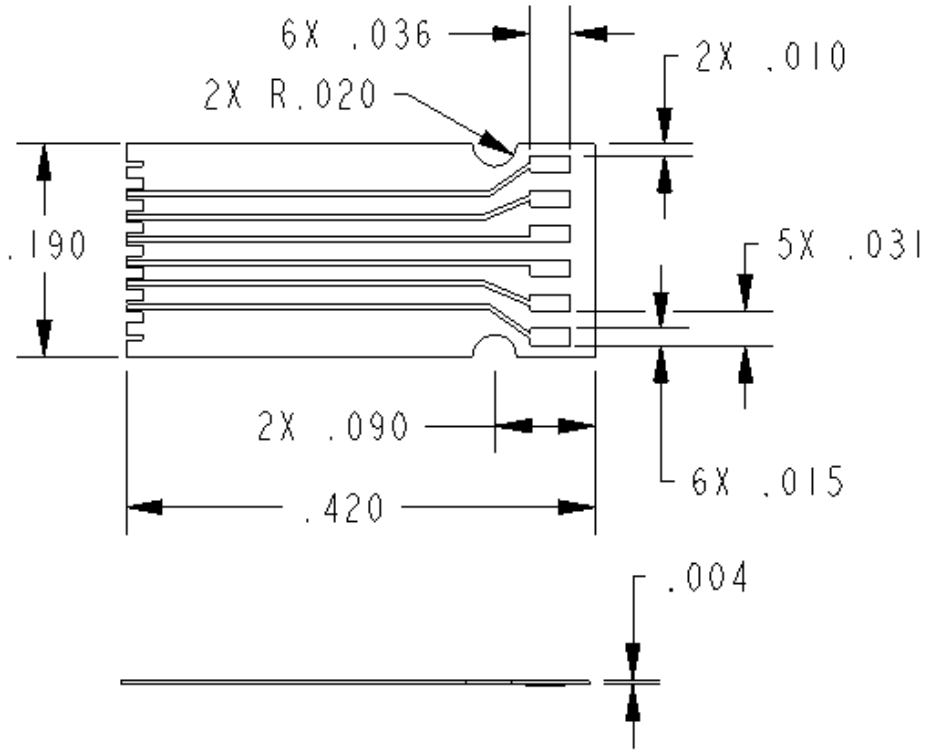
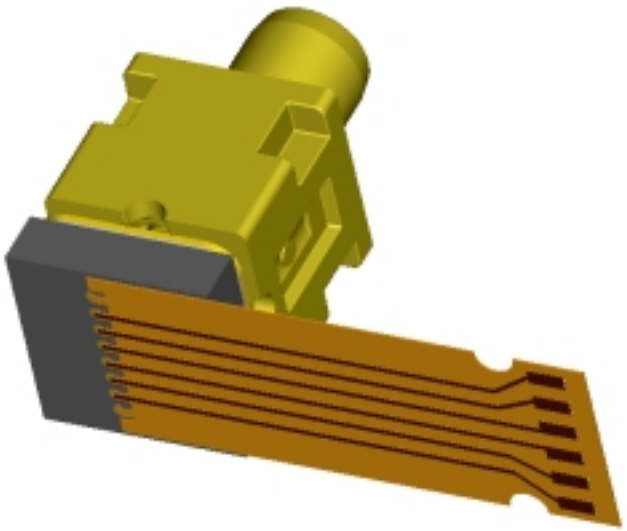
Flex electrical interface
Minimum bend radius = 0.010 inches





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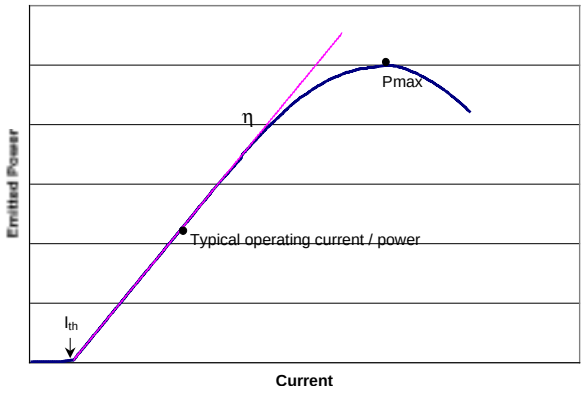
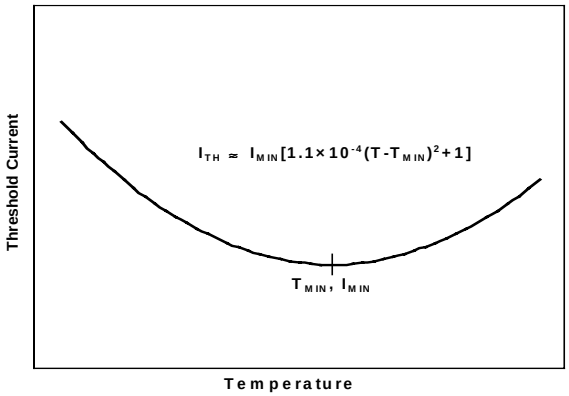
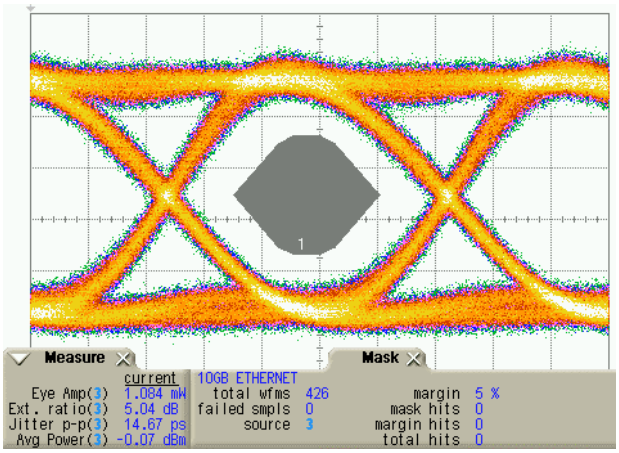
TYPICAL PERFORMANCE CURVES:

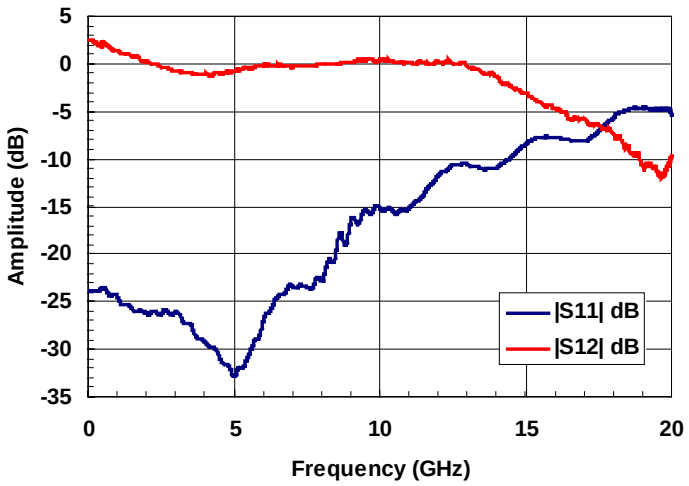
Emitted Power vs. Current: Power varies approximately linearly with current above threshold.

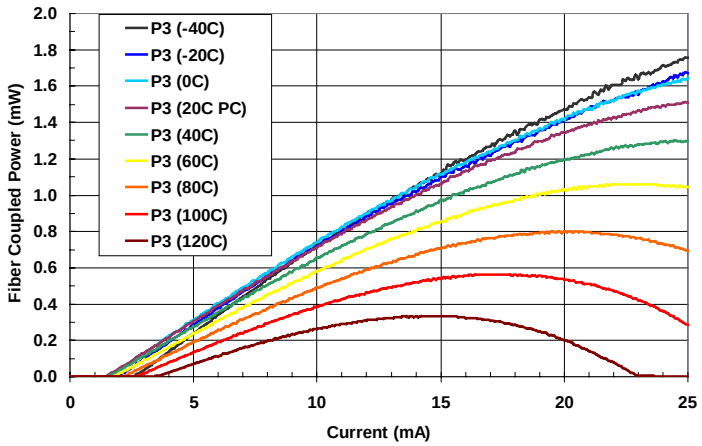


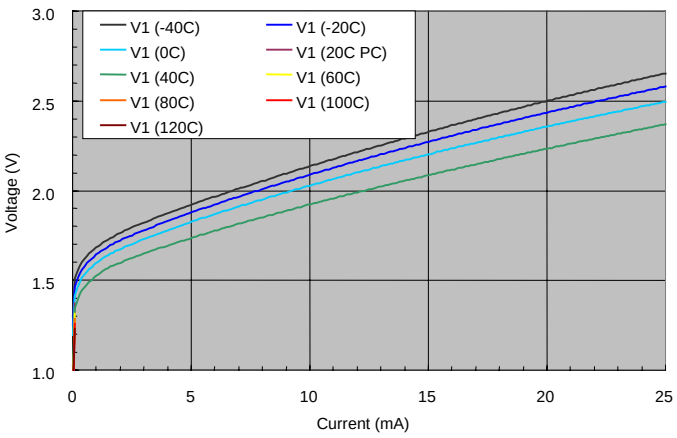
Threshold Current vs. Temperature: Threshold current varies parabolically with temperature; thus it can be nearly constant for a limited temperature range.











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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.

HONEYWELL CAPABILITIES

Honeywell VCSEL Optical Products has led the industry in high volume VCSEL technology since 1996. VCSELs (Vertical Cavity Surface Emitting Lasers) are semiconductor lasers which are impacting advances in optical communication, and sensor applications. VCSELs' superior reliability, low drive current, high coupled power, narrow and circularly symmetric beam and versatile packaging options (including arrays) are enabling solutions not possible with other optical technologies. Honeywell's advanced capabilities include

- 10Gbps serial VCSEL solutions
- Proton-implanted and oxide VCSELs
- 850nm is currently available. 780nm, 670nm and additional wavelengths are in development
- Packaging: surface mount, TO, SC, LC, MU, arrays, plastic packaging
- Assemblies: chip on board, chip on chip, plastic components and optical subassemblies
- All configurations (polarities and attenuation) are available
- VCSEL and detector arrays
- Long wavelength detectors
- Custom packaging options

LOCATIONS

Richardson, TX
- Business unit headquarters, wafer growth, wafer fabrication and TO package assembly

Juarez, Mexico
- SC, LC, MU, SMD, PSMD, PE

Minneapolis, MN
- Materials research

SALES AND SERVICE

Honeywell VCSEL Optical Products serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

TELEPHONE

1-866-MY-VCSEL USA (toll free)
1-972-470-4660 USA (Direct dial)
44 (0) 118 982 0266 Europe
03 5440-1425 Asia

FAX

1-972-470-4654 USA
44 (0) 979 445 2047 Europe
03 5440-1368 Asia