

10Gbps 850nm VCSEL
LC AND SC TOSA Packages

Preliminary
HFE6x9x-56x

Key Features:

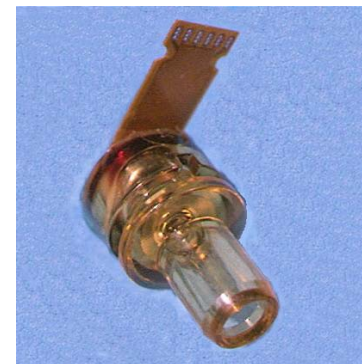
- LC TOSA HFE619x-56x
- SC TOSA HFE639x-56x
- High performance VCSEL
- Low electrical parasitic TO package with flexible interface
- Data rates from DC to 12.5Gbps
- Differential, Cathode or Anode driven versions available
- Complete isolation between the VCSEL, Monitor Photodiode and Case
- Mechanically compatible with all 10Gbps MSAs

The HFE6x9x-56x 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-56x incorporates a power monitoring photodiode that can be used for temperature compensation, average power control, and for compliance with Class 1 eye safety limits.



LC TOSA



SC TOSA

INVISIBLE LASER RADIATION
DO NOT VIEW DIRECTLY WITH
OPTICAL INSTRUMENTS
10mW at 820 - 860nm
CLASS 1M LASER PRODUCT

COMPLIES WITH IEC/EN 60825-1
Ed. 1.2:2001

COMPLIES WITH 21 CFR 1040.10
AND 1040.11 EXCEPT FOR
DEVIATION PURSUANT TO
LASER NOTICE NO. 50,
DATED 26 JULY 2001

Advanced Optical Products
Division of Finisar
830A East Arapaho Road
Richardson, TX 75081-2241



LASER RADIATION
AVOID EXPOSURE TO BEAM
CLASS 3B LASER PRODUCT

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 ($T_A=25^\circ\text{C}$ unless otherwise stated)

VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Fiber coupled optical power	$I_F=6.5\text{mA}$ Peak 50/125 μm fiber	P_{OC}	400	600		μW	
Coupling Efficiency	$I_F=6.5\text{mA}$	PO_PCT	70			%	1
Threshold Current		I_{TH}		1	2	mA	
Threshold Current Temperature Variation	$T_A=0$ to 70°C	ΔI_{TH}			1	mA	2
Slope Efficiency	$P_{OC}=0.6\text{mW}$	η	0.05	0.075	0.2	mW/mA	3
Slope Efficiency Temperature Variation	$T_A=0$ to 70°C	$\Delta\eta/\Delta T$		-0.4		%/ $^\circ\text{C}$	
Peak Wavelength	$I_F=6.5\text{mA}$	λ_p	840		860	nm	
λ_p Temperature Variation	$T_A=0$ to 70°C	$\Delta\lambda_p/\Delta T$		0.06		nm/ $^\circ\text{C}$	
RMS Spectral Bandwidth	$I_F=6.5\text{mA}$	$\Delta\lambda$			0.4	nm	
Laser Forward Voltage	$I_F=6.5\text{mA}$	V_F	1.6	1.8	2.4	V	
Laser Reverse Voltage	$I_R=10\mu\text{A}$	V_R	5	10		V	
Rise/Fall Time	Bias above threshold 20%-80%	T_R T_F			40 40	ps	4
Relative Intensity Noise	$I_F=6.5\text{mA}$	RIN_{12}			-130	dB/Hz	5
Series Resistance	$I_F=6.5\text{mA}$	R	45	60	75	Ohms	
Series Resistance Temperature Variation	$I_F=6.5\text{mA}$	$\Delta R/\Delta T$		-0.2		%/ $^\circ\text{C}$	
Total Capacitance	$I_F=6.5\text{mA}$	C_T			0.5	pF	6
Encircled Flux Diameter	$I_F(\text{avg})=6.5\text{mA}$	EF					7

Photodiode Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Monitor Current	$P_{OC}=0.6\text{mW}$, $V_R=3\text{V}$	I_{PD}	50	200	500	μA	
Monitor Current Temperature Variation	$P_{OC}=0.6\text{mW}$ $T_A=0$ to 70°C	$\Delta I_{PD}/\Delta T$		0.0		%/ $^\circ\text{C}$	
Tracking Ratio Variation (Open Bore)	$P_{OB} = -2.5\text{dBm}$, $T_A=0$ to 70°C	ΔTR	-0.5		+0.5	dB	
Dark Current	$P_{OC}=0\text{mW}$, $V_R=3\text{V}$	I_{DARK}			20	nA	
PD Reverse Voltage	$P_{OC}=0\text{mW}$, $I_R=10\mu\text{A}$	BVR_{PD}	30	115		V	8
PD Capacitance	$V_R=0\text{V}$, Freq=1MHz $V_R=3\text{V}$, Freq=1MHz	C_{PD}		75 40	100 55	pF	

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 25°C 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 using a Network analyzer at 1GHz.
7. Encircled flux is measured per TIA-455-203.
8. To prevent VCSEL damage, short the VCSEL anode and cathode during BVR testing of the photodiode.

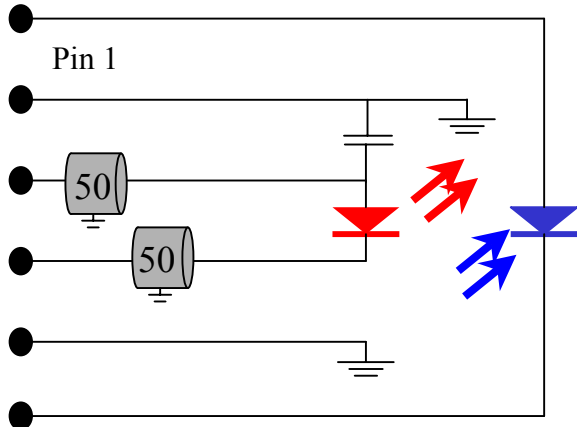
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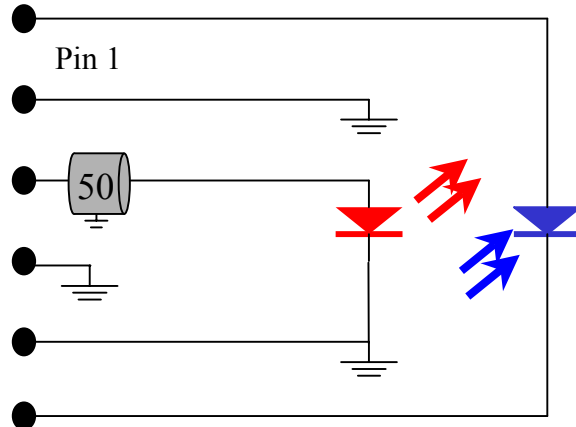
ORDER GUIDE:

Catalog Listing	Description
HFE6190-561	Cathode Driven, attenuated, LC TOSA, with 50Ω flex
HFE6191-561	Anode Driven, attenuated, LC TOSA, with 50Ω flex
HFE6192-561	Differentially Driven, attenuated, LC TOSA, with 25Ω flex
HFE6192-562	Differentially Driven, attenuated, LC TOSA, with 50Ω flex
HFE6390-561	Cathode Driven, attenuated, SC TOSA, with 50Ω flex
HFE6391-561	Anode Driven, attenuated, SC TOSA, with 50Ω flex
HFE6392-561	Differentially Driven, attenuated, SC TOSA, with 25Ω flex
HFE6392-562	Differentially Driven, attenuated, SC TOSA, with 50Ω flex

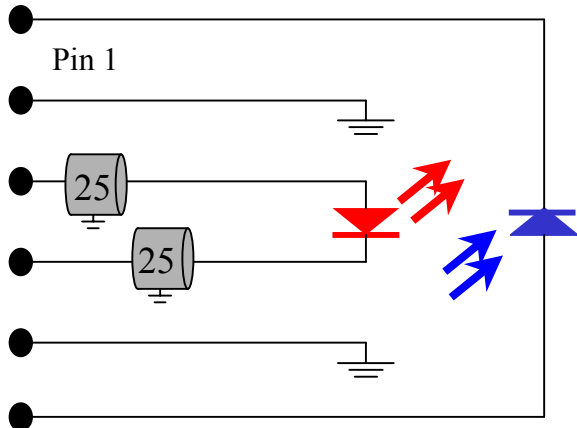
HFE 6x90-561



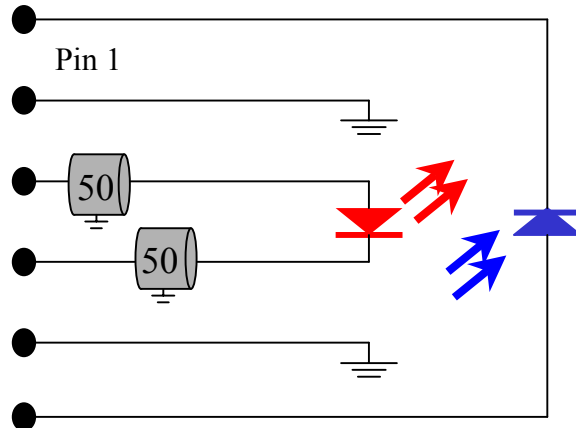
HFE 6x91-561



HFE 6x92-561



HFE 6x92-562

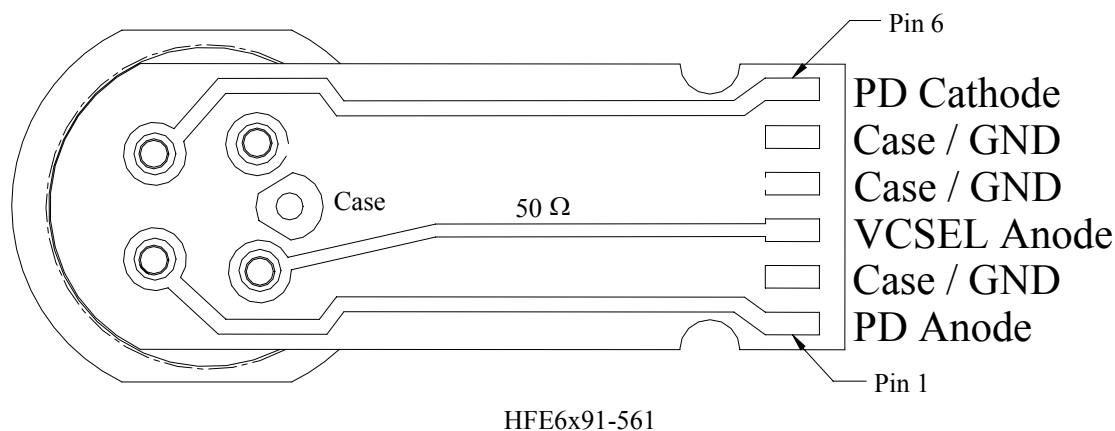
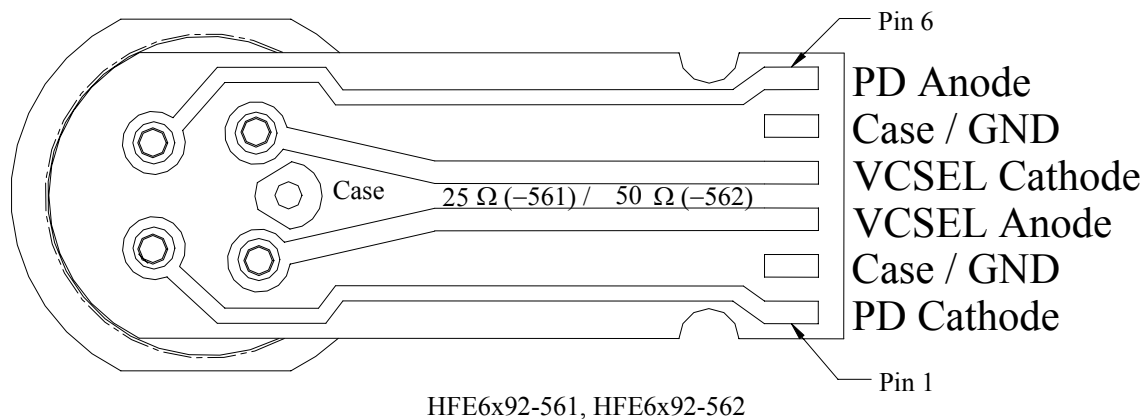
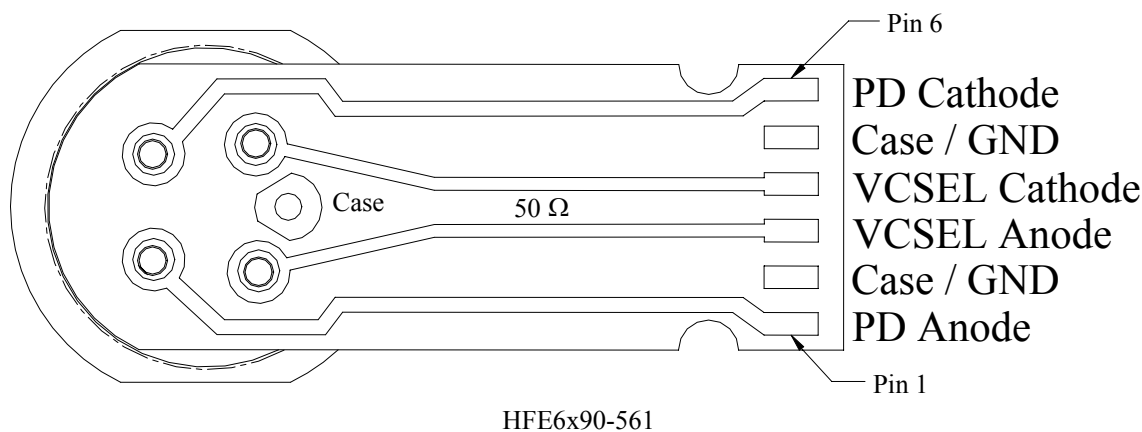


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PINOUT

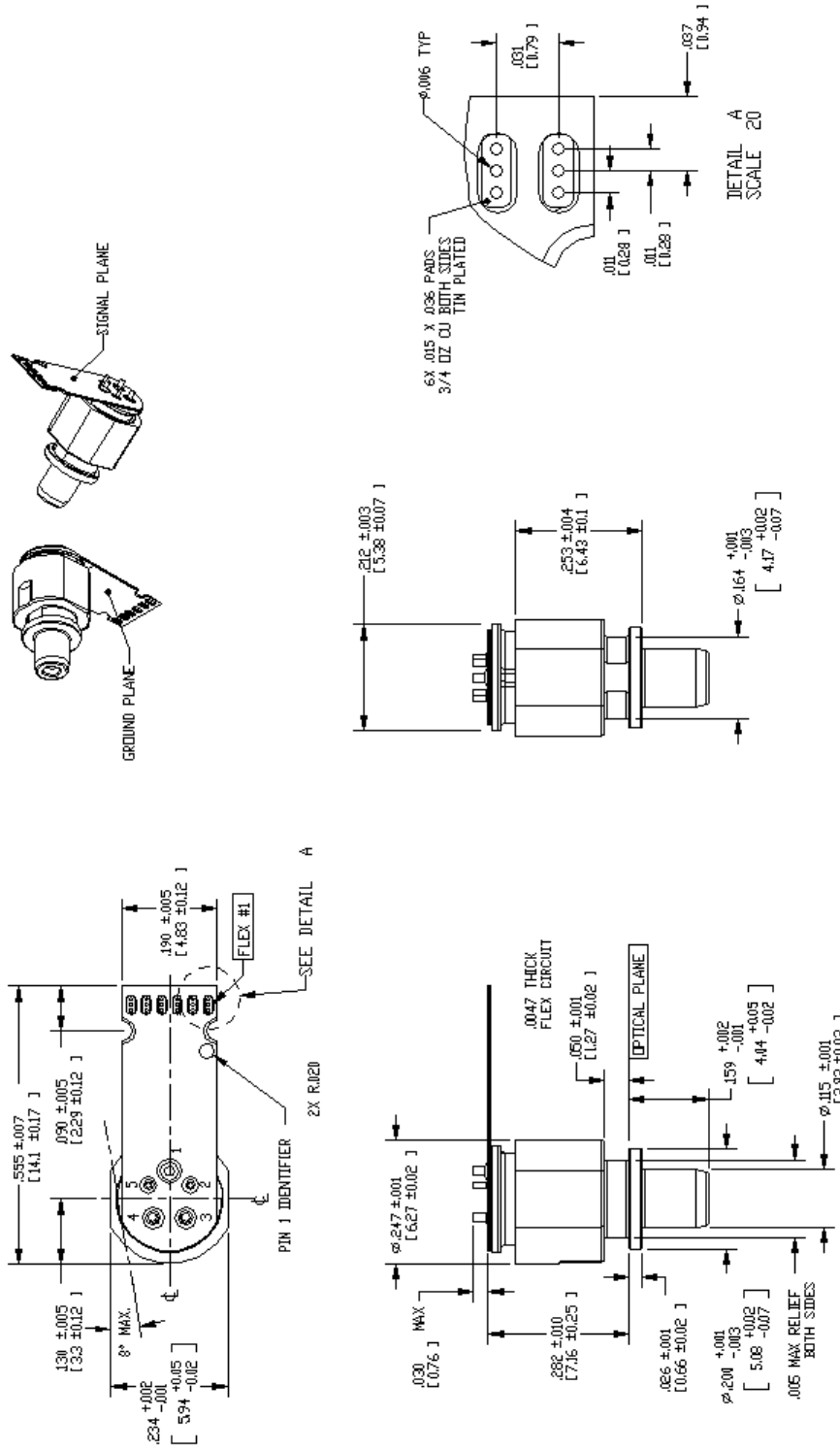
Pin Number	HFE6x90-561 Cathode Driven	HFE6x91-561 Anode Driven	HFE6x92-561 25Ω Differential Driven	HFE6x92-562 50Ω Differential Driven
1	PDA	PDA	PDK	PDK
2	GND	GND	GND	GND
3	LDA	LDA	LDA	LDA
4	LDK	GND	LDK	LDK
5	GND	GND	GND	GND
6	PDK	PDK	PDA	PDA



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Mounting Dimensions - LC TOSA with flex - dimensions in Inches

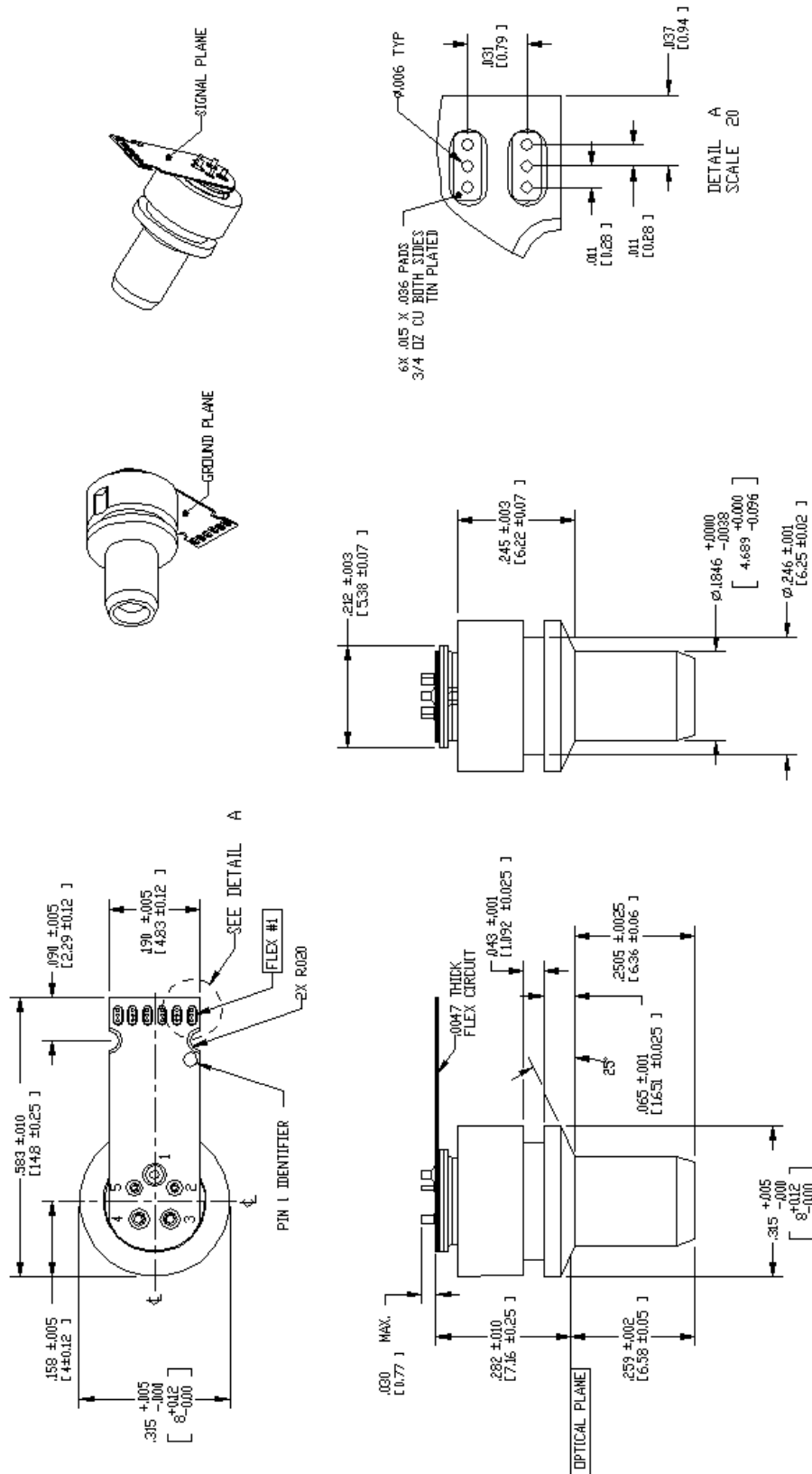


NOTE:
1. DIMENSIONS AND TOLERANCES SHOWN ASSUME ZERO ROTATIONAL ERROR BETWEEN LENS BARREL AND COMPONENT.

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Mounting Dimensions - SC TOSA with flex - dimensions in Inches



NOTE: 1. DIMENSIONS AND TOLERANCES SHOWN ASSUME ZERO ROTATIONAL ERROR BETWEEN LENS BARREL AND COMPONENT.

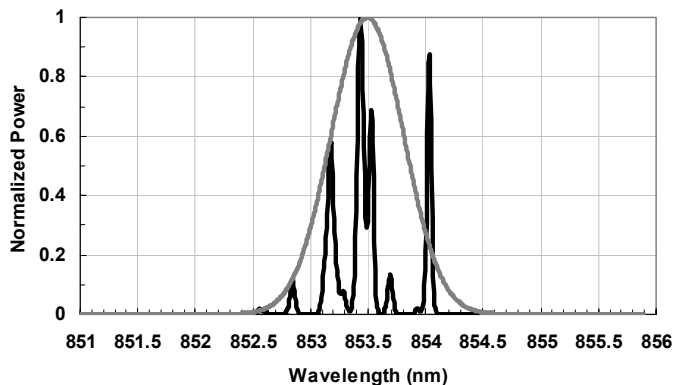
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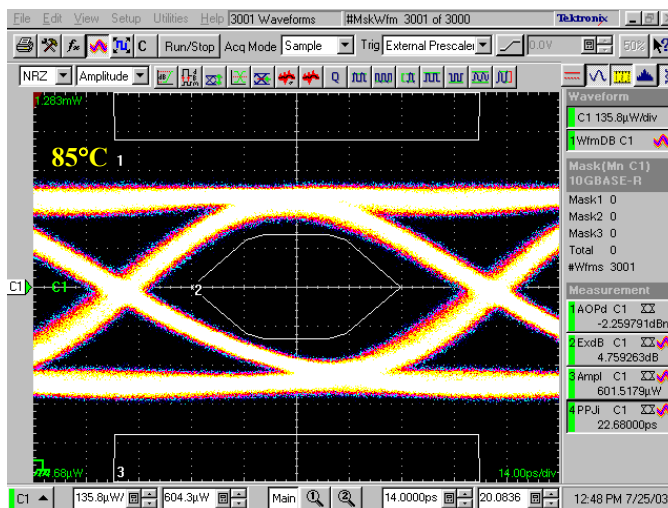
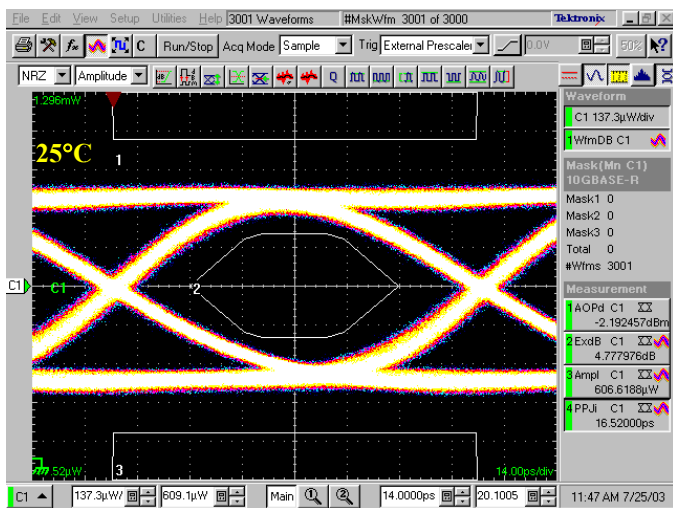
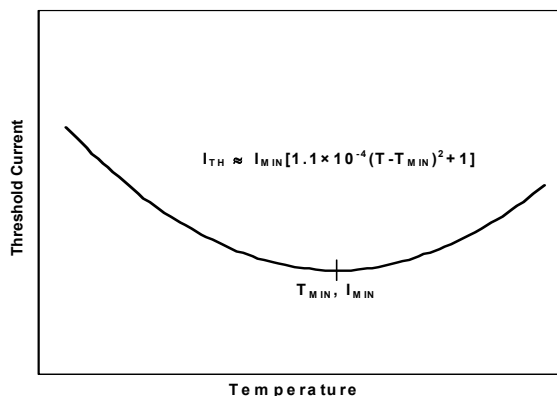
TYPICAL PERFORMANCE CURVES:

RMS Spectral Width is defined and measured using TIA-455-127

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



Fiber Coupled Power (mW)
HFE 6x90-561



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Warranty/Remedy

AOC warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with the date of shipment, AOC's warranty runs for 18 months. If warranted goods are returned to AOC during that period of coverage, AOC 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.

AOC CAPABILITIES

AOC 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 are enabling solutions not possible with other optical technologies. AOC'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

SALES AND SERVICE

AOC 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)

1-972-792-1800 USA (Direct dial)

44 (0) 118 982 0266 Europe

03 5440-1425 Asia

FAX

1-972-238-8670 USA

44 (0) 979 445 2047 Europe

03 5440-1368 Asia