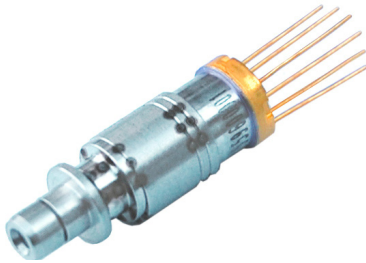


# Model 1995 1550 nm High Power CW Source DFB Laser for LiDAR

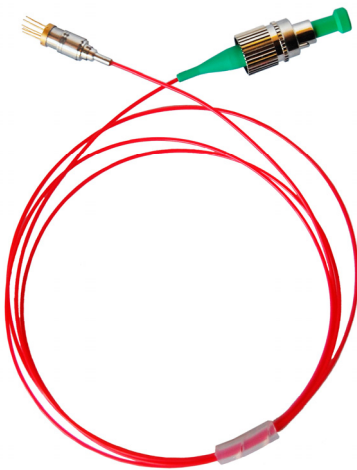


## Applications

- LiDAR
- Free Space Optics
- Frequency Modulated Continuous Wavelength Sensing

## Features

- 15 dBm Optical Output Power
- Monitor Photodiode
- Double Optical Isolator
- Telcordia Technologies® GR-468 Compliant
- RoHS



EMCORE's 1995 cooled TOSA laser module is characterized for use as a CW coherent optical source laser for LiDAR technology. The 1995 is DC-coupled with a built-in TEC, thermistor, and monitor photodiode. The device is in hermetic TO56 package with 6+1 pins. The 1995 incorporates a high-efficiency coupling scheme to deliver 15 dBm of CW optical power.

EMCORE's design provides a compact, robust solution for Frequency Modulation Continuous Wavelength (FMCW) sensing for autonomous vehicles and wide variety of other optical sensing applications. It is highly immune to mode or optical frequency hopping typically found with single isolator, external cavity designs. Mode or optical frequency hopping causes false readings in FMCW LiDAR, whereas EMCORE's laser technology maintains optical frequency stability over temperature suppressing false readings.

## Performance Highlights

Parameter	Min	Typ	Max	Units
Operating Case Temperature	-20		+70	°C
Wavelength	1550 +/- 10			nm
Optical Output Power	14	15	-	dBm
Threshold Current	-	-	40	mA
Operating Current	-	-	250	mA
Frequency Noise @ 100 kHz <sup>1</sup>	-		32	kHz <sup>2</sup> /Hz
Optical Isolation	40	50	-	dB
Maximum Laser Output Power (Eye Safety)	-	-	27	dBm
SMSR <sup>1</sup>	50		-	dB
Polarization Extinction Ratio (PMF pigtail)	17	-	-	dB
Optical Return Loss	40	-	-	dB

1. @ Operating current

## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Sym	Condition	Min	Max	Units
Operating Case Temperature	T <sub>C</sub>	continuous	-20	+70	°C
Storage Case Temperature	T <sub>STG</sub>	continuous	-40	+85	°C
Laser Forward dc Current	-	continuous	-	600	mA
Photodiode Reverse Voltage	V <sub>R,MPD</sub>	continuous	-	10	V
Laser Reverse Voltage	-	continuous	-	2	V
TEC Current	I <sub>TEC</sub>	continuous	-	1.7	A
Maximum Laser Output Power	P <sub>max</sub>	Continuous	-	27	dBm
ESD	-	HBM: R = 1500 Ω, C = 100 pF	-500	500	V
Relative Humidity	RH	Non-condensing			

Information contained herein is deemed reliable and accurate as of the issue date. EMCORE reserves the right to change the design or specification at any time without notice. EMCORE is a registered trademark of EMCORE Corporation in the U.S. and other countries.

## Electrical/Optical Characteristics

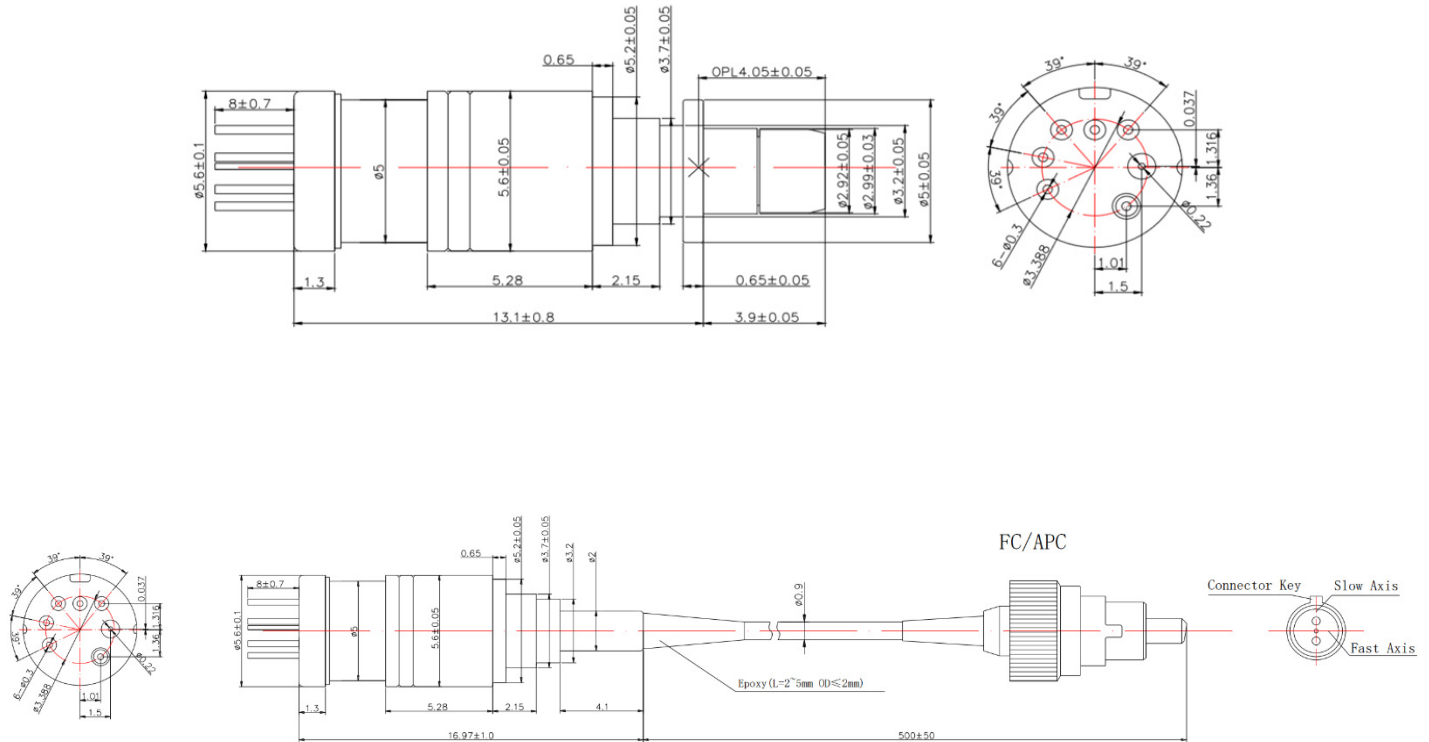
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating Case Temperature <sup>1</sup>	T <sub>C</sub>	Measured at the bottom of the package	-20		+70	°C
Optical Output Power	P <sub>O</sub>	T <sub>OP</sub> , I <sub>OP</sub> = 200 mA	14	15	-	dBm
Operating Current	I <sub>OP</sub>	-	-	200	250	mA
Operating Laser Temperature	T <sub>OP</sub>	Laser temperature setpoint (thermistor reading) to align λ <sub>OP</sub> with a designated wavelength channel, for I <sub>OP</sub> = 200 mA	37		53	°C
Laser Bias Forward Voltage	V <sub>OP</sub>	T <sub>OP</sub> , I <sub>OP</sub> = 250 mA	1.0	-	1.8	V
Wavelength	λ <sub>OP</sub>	T <sub>OP</sub> , I <sub>OP</sub> = 200 mA	1550 ± 10			nm
Wavelength change over life	Δλ <sub>L</sub>	T <sub>OP</sub> , I <sub>OP</sub> = 200 mA, 10,000 hours	-0.1		+0.1	nm
Frequency Noise @ 100 kHz	Δν	T = T <sub>OP</sub> , I <sub>F</sub> = I <sub>OP</sub>	-	-	32	kHz <sup>2</sup> /Hz
Optical Isolation	ISO	-	40	50	-	dB
Threshold Current	I <sub>TH</sub>	T <sub>OP</sub>	-		40	mA
Sidemode Suppression Ratio	SMSR	T <sub>OP</sub> , I <sub>OP</sub> = 200 mA	50	-	-	dB
Polarization Extinction Ratio	PER	T <sub>OP</sub> , I <sub>OP</sub> = 200 mA	17	-	-	dB
Wavelength Tuning with Bias Current	dv/dI	T <sub>OP</sub> , I <sub>OP</sub> = 200 mA, bias current modulation with a triangle wave @50KHz, for >1 GHz tuning	100	-	350	MHz/mA
Wavelength thermal tuning coefficient	dλ /dT			0.08		nm/°C
Monitor PD Current	I <sub>MPD</sub>	I <sub>OP</sub> = 200 mA, V <sub>MPD</sub> = -5 V	100	-	2500	μA
Monitor PD Dark Current	I <sub>D</sub>	I <sub>OP</sub> = 0 mA, V <sub>MPD</sub> = -5 V	-	-	0.2	μA
Thermistor Resistance <sup>2</sup>	R <sub>TH</sub>	T <sub>OP</sub> = 25 °C	9.0	10.0	11.0	KΩ
TEC Current <sup>3</sup>	I <sub>TEC</sub>	T <sub>OP</sub> , I <sub>OP</sub> = 200 mA	-1.0	-	+0.8	A
TEC Voltage <sup>3</sup>	V <sub>TEC</sub>	T <sub>OP</sub> , I <sub>OP</sub> = 200 mA	-2.5	-	+2.2	V

1. Effective heatsinking is required for safe operation of the product. Case temperature should be monitored as a part of the laser control loop, and it should never exceed 85 C. Laser shut-down mechanism should be implemented to avoid catastrophic damage.
2. Thermistor temperature-resistance formula:  $1/T = A + B \cdot \ln(R) + C \cdot (\ln(R))^2$  where T is temperature in Kelvin, R is resistance in Ohm, A=1.129x10<sup>-3</sup>, B=2.341x10<sup>-4</sup>, C=8.775x10<sup>-8</sup>.
3. Values for steady state operation.

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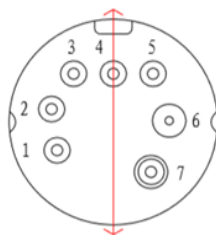


## Outline Drawings



## Pin Assignments

TOSA output polarization direction



Pin	Description
1	Laser Cathode (-)
2	Thermistor
3	MPD Cathode (+)
4	Thermo-electric Cooler (-)
5	Thermo-electric Cooler (+)
6	Laser Anode (+)
7	Case Ground/MPD Anode (-)/Thermistor