

# 1997 Uncooled, Coaxial DFB Laser Diode

1270/1290/1310/1330/1350/1370/1530/1550 nm Wide Bandwidth 300 MHz – 6 GHz

emcore®

DATASHEET | DECEMBER 2020

WIRELESS



## Applications

- 5G Wireless
- Distributed Antenna Systems (DAS)
- Signal Distribution in L-Band and Wireless Remoting Links
- High Linearity, Low Power Fiber Links

## Features

- Linear DFB Laser Design
- Output Power Up to 10 dBm Available
- Bandwidth > 6 GHz
- RoHS Compliance
- Optical Isolator
- Low Power Consumption
- Monitor Photodiode

EMCORE's Model 1997 uncooled, coaxial DFB laser offers a low-cost solution for next-generation, wireless linear fiber optic links. The 1997 laser module features extended bandwidth to 6 GHz and is optimized for 5G, DAS (Distributed Antenna Systems) and small cells applications. It is designed to enhance bandwidth and signal integrity for delivery of consistent, reliable wireless signals in temperature-controlled indoor environments.

These components can be cooled with external thermo-electric coolers for high-stability or run without TEC's to reduce power consumption. The DFB laser builds upon EMCORE's long history of high-performance, leading-edge designs in wireless and high-speed digital applications. The laser diode devices are packaged in a compact hermetic assembly together with monitor photodiode and isolator, for flexible integration into various transmitter configurations.

## Performance Highlights

Parameters		Min	Typical	Max	Units
Operating Case Temperature Range		-40	-	70	°C
Optical Output Power <sup>(1)</sup>		-	7	-	mW
Frequency Range		300	-	6000	MHz
IIP3	F1=2660, F2=2670MHz, OMI 10%/tone <sup>(2)</sup>	35	-	-	dBm
	F1=3495, F2=3505MHz, OMI 10%/tone <sup>(2) (3)</sup>	35			
	F1=5790, F2=5800MHz, OMI 10%/tone <sup>(2) (3)</sup>	30			
IIP2	F1=1700, F2=2100MHz, OMI 10%/tone <sup>(2) (3)</sup>	45	-	-	dBm
	F1=2100, F2=3800MHz, OMI 10%/tone <sup>(2) (3)</sup>	40	-	-	
Tolerance from Center Wavelength		-4	-	+4	nm
Optical Return Loss <sup>(1)</sup>		35	-	-	dB
Side Mode Suppression Ratio, CW <sup>(1)</sup>		35	-	-	dB

1. Performance at Tcase = 25 °C
2. 2-tone tests. OMI 10%/tone, 0dBm input RF power, with eval board matched laser impedance to 50ohm.
3. Not production tested. Guarantee by design.



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## Absolute Maximum Ratings<sup>1</sup>

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.

Parameters	Symbol	Condition/Notes	Min	Max	Unit
Storage Temperature	$T_{STG}$	Non-Operating	-40	85	°C
Operating Case Temperature	$T_{OP}$	Continuous	-40	75	°C
Laser Diode Forward Current	$I_{OP}$	CW	-	100	mA
Laser Diode Reverse Voltage	$V_R$	Continuous	-	1.0	V
Photodiode Forward Current	$I_{MPD}$	Continuous	-	2	mA
Photodiode Reverse Voltage	$V_{MPD,R}$	Continuous	-	10	V
Maximum RF Input Power	$P_{in\_max}$	60 Seconds	-	25	dBm
Lead Soldering Temperature/Time	-	-	-	260/10	°C/sec
Relative Humidity	RH	Continuous	-	85	%
ESD	-	Human Body Model	-500	+500	V

1. Absolute maximum data are limited to system design only; proper device performance is not guaranteed over rating listed above. Operation beyond these maximum conditions may degrade device performance, lead to device failure, shorter lifetime, and will invalidate the device warranty.

## Electrical/Optical Characteristics

Parameters	Symbol	Conditions/Notes	Min	Typ	Max	Unit
Optical Output Power	$P_O$	$T_{case} = 25^{\circ}C$	-	7	-	mW
Threshold Current	$I_{TH}$	$T_{case} = 25^{\circ}C$	-	7	15	mA
Laser Bias Current	$I_{OP}$		-		80	mA
Forward Voltage	$V_F$	$I_{op}$	-	1.17	1.8	V
Slope Efficiency	SE	$T_{case} = 25^{\circ}C, I_{op}$	0.1	0.16	-	mW/mA
Thermal Slope Efficiency	TSE	$SE(T_c)/SE(25^{\circ}C)$ $T_{case} = -20^{\circ}C \text{ to } 85^{\circ}C$	0.4	-	1.2	-
Laser Input Impedance	Z	-	2	6	8	$\Omega$
MPD Current	$I_{MPD}$	$V_{MPD} = 5V, I_{op}$	50	-	1000	$\mu A$
MPD Dark Current	$I_D$	$V_{MPD} = 5V, I_{op} = 0$ $T_{case} = 25^{\circ}C$	-	-	50	nA
Center Wavelength	$\lambda_c$	$I_{op}$	1270	-	1550	nm
Relative Intensity Noise	RIN	$I_{op}, T_{case} = 25^{\circ}C, 3500MHz$	-	-	-150	dB/Hz

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## Electrical/Optical Characteristics (continued)

Parameters	Symbol	Conditions/Notes	Min	Typ	Max	Unit
Tracking Error	$\Delta P_i$	$I_{MON} = \text{const}$ $ER = 10\log(P_o/2.0)$ [dB]	-1.5	-	+1.5	dB
Optical Isolation, $T_{case} = 25^\circ\text{C}$	ISO	Single Isolator	25	-	-	dB
Spectral Width (-20 dB)	$\Delta\lambda$	$I_{op}$	-	0.1	1.0	nm
Side Mode Suppression Ratio	SMSR	$I_{op}$	35	45	-	dB
Optical Return Loss	ORL	$T_{case} = 25^\circ\text{C}$	35	-	-	dB

## RF Characteristics

1997 Performance Parameter	Symbol	Conditions/Notes	Min	Typ	Max	Unit
Frequency Response Flatness <sup>1</sup>	S <sub>21</sub>	300 MHz - 6000 MHz	-	-	4	dB <sub>p-p</sub>
Input Third Order Interception Point	IIP3	F1=2660, F2=2670MHz, OMI 10%/tone <sup>2</sup>	35			dBm
		F1=3495, F2=3505MHz, OMI 10%/tone <sup>2 4</sup>	35			
		F1=5790, F2=5800MHz, OMI 10%/tone <sup>2 4</sup>	30			
Input Second Order Interception Point	IIP2	F1=1700, F2=2100MHz, OMI 10%/tone <sup>2 4</sup>	45			dBm
		F1=2100, F2=3800MHz, OMI 10%/tone <sup>2 4</sup>	40			

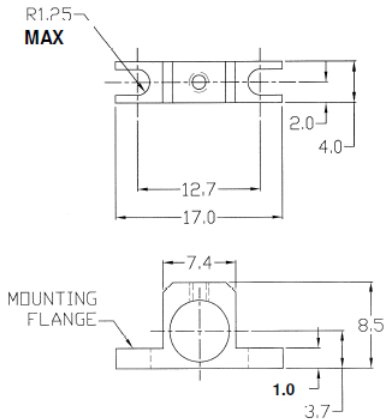
4. Not production tested. Guarantee by design.

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## Mounting Bracket



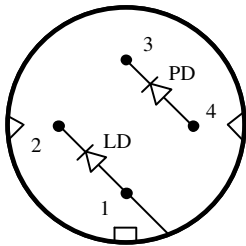
- NOTES:
- 1. UNIT: mm
  - 2. TOLERANCE: ±0.1mm UNLESS OTHERWISE SPECIFIED

## Reliability/Quality

Designed to meet qualification requirements of Telcordia™ (Bellcore) GR-468-CORE.

## Schematic and Pinout

### Schematic and Pinout A



Pinout A

### Pin Definitions for Pinout A

Pin	Description
1	LD Anode, Case Ground
2	LD Cathode
3	PD Cathode
4	PD Anode

Bottom

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.

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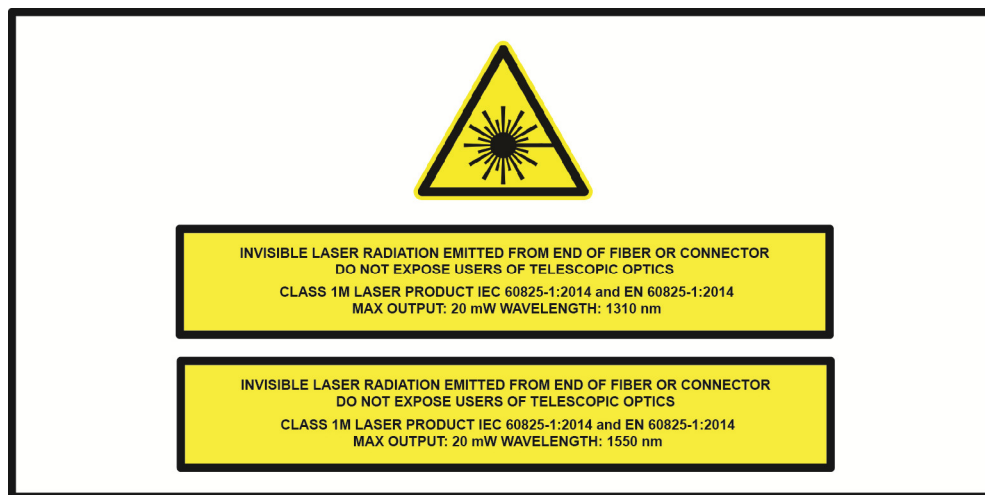
## Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191.

All versions of this laser are Class 1M laser product, tested according to IEC 60825-1:2014/EN 60825-1:2014

Because of size constraints, laser safety labeling (including an FDA class 1M label) is not affixed to the module, but attached to the outside of the shipping carton. Product is not shipped with power supply.

**Caution: Use of controls, adjustments and procedures other than those specified herein may result in hazardous laser radiation exposure.**



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## Ordering Code Definitions

1997 -dddd -xx -SA -zz - v

					<b>Family Name</b> 1997: 6GHz Uncooled, Coaxial Laser
					<b>Channel / Wavelength</b> dddd = 1270: 1270nm dddd = 1290: 1290nm dddd = 1310: 1310nm dddd = 1330: 1330nm dddd = 1350: 1350nm dddd = 1370: 1370nm dddd = 1530: 1530nm dddd = 1550: 1550nm
					<b>Isolator Type</b> xx = SI: Single Isolator xx = DI: Double Isolator
					<b>Optical Output Power</b> zz = 03: 3 dBm (2 mW) zz = 05: 5 dBm (3 mW) zz = 06: 6 dBm (4 mW) zz = 08: 8.5 dBm (7 mW) zz = 10: 10 dBm (10 mW)
					<b>Mounting Bracket</b> v = B: Mounting Bracket v = N: No Mounting Bracket

## Example

**1997-1310-SI-SA-08-N:** 6GHz Uncooled Coaxial Laser, 1310nm, single isolator, SC/APC optical connector, 7mW optical power, No Mounting Bracket