

## Model 1933R, Coaxial 1310nm DFB Return Path Laser Diode



### Applications

- Return path transport in HFC and FTTx networks
- High linearity, low power fiber links

### Features

- Linear DFB laser design
- RoHS compliance
- Optical Isolator
- Low power consumption
- Monitor photodiode

Emcore's Model 1933R DFB lasers offer a low cost solution for linear return path fiberoptic links. 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 Ortel's long history of high performance, leading edge designs in CATV, 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

	Min	Typical	Max	Units
Operating Case Temperature Range	-40	-	80	°C
Optical Output Power	3	-	4.8	dBm
	5	-	5.8	
	6	-	8.0	
Frequency Range	5	-	200	MHz
Second Order Distortion				
Standard Linearity	-	-	-52	dBc
Enhanced Linearity	-	-	-58	
Third Order Distortion				
Standard Linearity	-	-	-63	dBc
Enhanced Linearity	-	-	-65	
Center Wavelength	1300	-	1320	nm
Optical Return Loss	35	-	-	dB
Side Mode Suppression Ratio, CW	30	-	-	dB

See following pages for complete specifications and conditions.

## 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 <sub>STG</sub>	Non-Operating	-40	85	°C
Operating Case Temperature	T <sub>OP</sub>	Continuous	-40	80	°C
Laser Diode Forward Current	I <sub>OP</sub>	CW	-	100	mA
Laser Diode Reverse Voltage	V <sub>R</sub>	Continuous	-	1.0	V
Photodiode Forward Current	I <sub>MPD</sub>	Continuous	-	2	mA
Photodiode Reverse Voltage	V <sub>MPD,R</sub>	Continuous	-	10	V
Average RF Input Power	PIN	60 Seconds	-	62	dBmV
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**

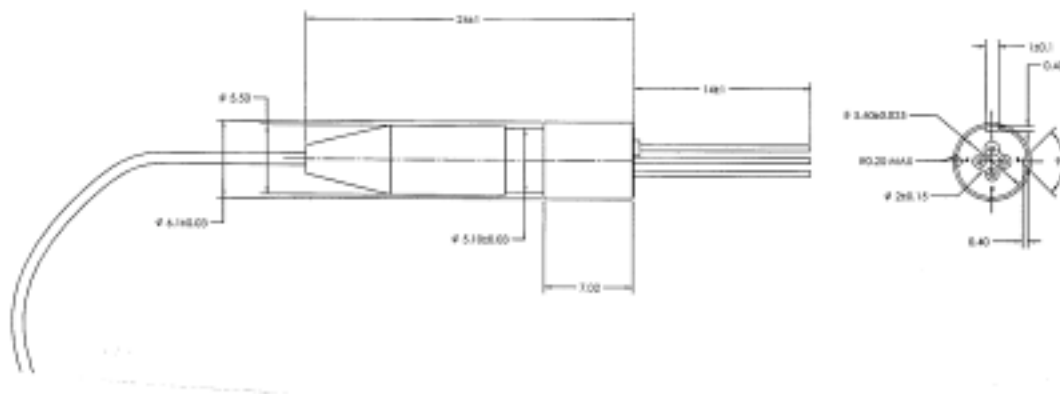
Parameters	Symbol	Conditions/Notes	Min	Typ	Max	Unit
Optical Output Power	$P_O$	3 dBm version 5 dBm version 6 dBm version	3 5 6	- - -	4.8 5.8 8.0	dBm
Threshold Current	$I_{TH}$	$T_{case} = 25^{\circ}C$ $T_{case} = 45^{\circ}C$	- -	8 13	15 20	mA
Laser Bias Current	$I_{OP}$	-	-	-	80	mA
Forward Voltage	$V_F$	$I_{op}$	-	1.0	1.8	V
Laser Input Impedance	$Z$	-	2	4	8	$\Omega$
MPD Current	$I_{MPD}$	$V_{MPD} = 5V, I_{op} = 40\text{ mA}$	200	-	1800	$\mu A$
MPD Dark Current	$I_D$	$V_{MPD} = 5V, I_{op} = 0$ $T_{case} = 25^{\circ}C$	-	-	50	nA
Center Wavelength	$\lambda_c$	$I_{op}$	1300	-	1320	nm
Relative Intensity Noise	RIN	CW, $I_{op}$ , $5\text{ MHz} < f < 200\text{ MHz}$	-	-155	-145	dB/Hz
Optical Isolation	ISO	$T_{case} = 25^{\circ}C$	30	-	-	dB
Spectral Width (-20 dB)	$\Delta\lambda$	$I_{op}$	-	0.1	1.0	nm
Side Mode Suppression Ratio	SMSR	$I_{op}$	30	45	-	dB
Optical Return Loss	ORL	$T_{case} = 25^{\circ}C$	35	-	-	dB

**RF Characteristics**

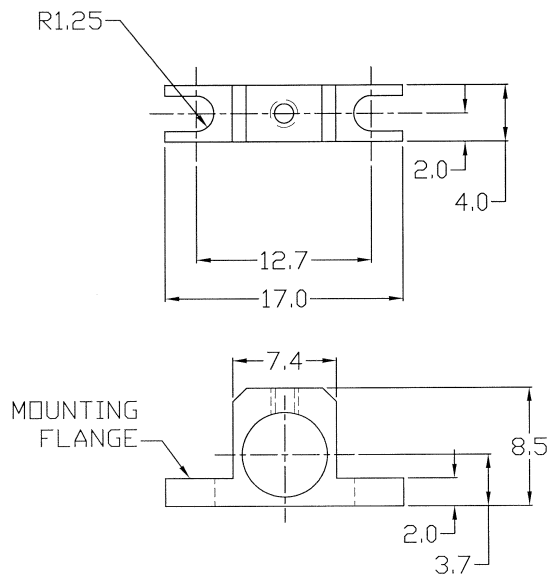
Parameters	Symbol	Conditions/Notes	Min	Typ	Max	Unit
Frequency Response Flatness <sup>1</sup>	$ S_{21} $	$5\text{ MHz} < f < 200\text{ MHz}$	-	-	1	dB <sub>p-p</sub>
Response Up-tilt <sup>1</sup>		$5\text{ MHz} < f < 200\text{ MHz}$	0		2	dB
Second Order Distortion <sup>2</sup> Standard Linearity Enhanced Linearity	DSO	$P_F = 3\text{ dBm}, OMI = 10\%$ each 2-tone test: $f_1=13\text{MHz}, f_2=19\text{MHz}$ 20 km of fiber (7.5 dB total loss with connector), $f_1 \pm f_2$	- -	- -	-52 -58	dBc
Third Order Distortion <sup>2</sup> Standard Linearity Enhanced Linearity	DTB	$P_F = 3\text{ dBm}, OMI = 10\%$ each 2-tone test: $f_1=13\text{MHz}, f_2=19\text{MHz}$ 20 km of fiber (7.5 dB total loss with connector), $2f_1 - f_2, 2f_2 - f_1$	- -	- -	-63 -65	dBc

- $I_{op}, T_{case} = 25^{\circ}C$ . Test with the laser Input pin matched to a 50 $\Omega$  system.
- $I_{op}, T_{case} = 25^{\circ}C$ . Test with laser input pin matched to a 75 $\Omega$  system.

**Package Outline Drawing**



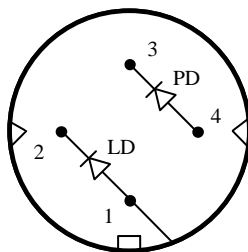
**Mounting Bracket**



## Reliability/Quality

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

## Schematic and Pinout



Pinout A

## Pin Definitions

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

## Laser Safety

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

Single-mode fiber pigtail with SC/APC connectors (standard).

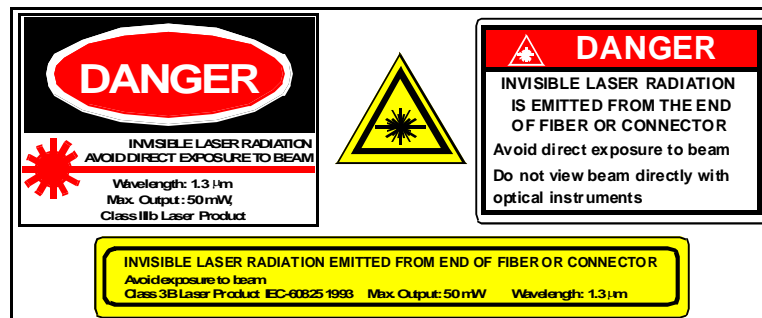
Wavelength = 1.3  $\mu\text{m}$ .

Maximum power = 50 mW.

Because of size constraints, laser safety labeling (including an FDA class IIIb label) is not affixed to the module, but attached to the outside of the shipping carton.

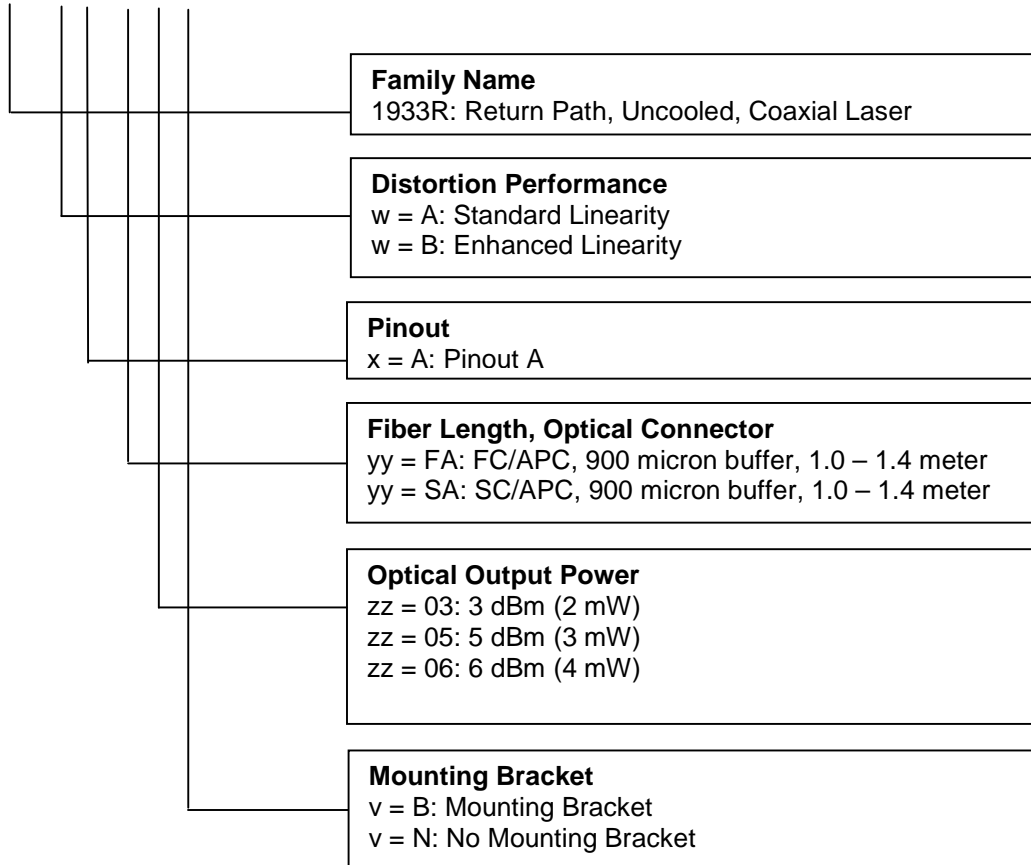
Product is not shipped with power supply.

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



## Ordering Code Definitions

1933R-w-x-yy-zz-v



## Example

**1933R-A-A-SA-06-N:** Return Path Uncooled Coaxial Laser, Standard Linearity, Pinout A, SC/APC optical connector, 6 dBm optical power, No Mounting Bracket.

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