

Model 1955F/R/W Coaxial DFB Laser Diode

1550nm CWDM, 5 MHz – 4000 MHz



Emcore's Model 1955 DFB lasers offer a low cost solution for linear 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.

Applications

- Video signal distribution in HFC and FTTx nodes
- 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 5 - 4000 MHz
- Single and Double Optical Isolator
- High slope efficiency up to 0.3mW/mA
- Monitor photodiode
- RoHS

Performance Highlights

	Min	Typical	Max	Units				
Operating Case Temperature Range	-40	-	85	°C				
Optical Output Power ⁽¹⁾	3	-	4.9	dBm				
	5	-	5.9					
	6	-	8.9					
	9	-	9.0					
	10	-	11.9					
Frequency Range	5	-	4000	MHz				
Carrier-to-Noise Ratio (79 channels) ⁽¹⁾	51	-	-	dB				
Composite Second Order (79 channels) ⁽¹⁾				dBc				
					Standard Linearity	-	-	-55
					Enhanced Linearity	-	-	-57
Composite Triple Beat (79 channels) ⁽¹⁾	-	-	-65	dBc				
CWDM Wavelength ^(1,2)	1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610			nm				
Optical Return Loss ⁽¹⁾	45	-	-	dB				
Side Mode Suppression Ratio, CW ⁽¹⁾	30	-	-	dB				

(1) Performance at T_{case} = 25°C

(2) See available wavelength for order in Ordering Code Definitions

See following pages for complete specifications and conditions.

Absolute Maximum Ratings¹

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	85	°C
Laser Diode Forward Current	I _{OP}	CW	-	150	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
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	1955R opt model: 3 – 6dBm	3	-	4.9	dBm
			5	-	5.9	
		1955W opt model: 3 – 10dBm	6	-	8.9	
		1955F opt model: 3 – 10dBm	9	-	9.9	
			10	-	11.9	
Threshold Current	I _{TH}	T _{case} = 25°C T _{case} = 45°C	- -	8 13	15 20	mA
Slope Efficiency	SE	T _{case} = 25°C, I _{op}	0.07	-	0.3	mW/mA
Thermal Slope Efficiency	TSE	SE(T _c)/SE(25°C) T _{case} = -20°C to 85°C	0.4	-	1.2	-
Laser Bias Current	I _{OP}		-	-	80	mA
Forward Voltage	V _F	I _{op}	-	1.17	1.8	V
Laser Input Impedance	Z	-	2	4	8	Ω
MPD Current	I _{MPD}	V _{MPD} = 5V, I _{op}	50	-	2000	μA
MPD Dark Current	I _D	V _{MPD} = 5V, I _{op} = 0, T _{case} = 25°C	-	-	50	nA
CWDM Center Wavelength	λ _c	I _{op} T _{case} = 25°C	1468	1470	1472	nm
			1488	1490	1492	
			1508	1510	1512	
			1528	1530	1532	
			1548	1550	1552	
			1568	1570	1572	
			1588	1590	1592	
			1598	1610	1612	
Relative Intensity Noise	RIN	CW, I _{op} , 47 MHz - 1002 MHz	-	-	-150	dB/Hz
Optical Isolation	ISO	Double Isolators, T _{case} = 25°C	45	-	-	dB
		Single Isolators, T _{case} = 25°C	30	-	-	dB
Spectral Width (-20 dB)	Δλ	I _{op} , T _{case} = 25°C	-	0.1	1.0	nm
Side Mode Suppression Ratio	SMSR	I _{op} , T _{case} = 25°C	30	45	-	dB
Tracking Error	ΔPf	I _{MON} = const ER = 10log(P _O /2.0) [dB]	-1	-	+1	dB
Rise Time	tr	20-80% T _{case} = 25°C	-	0.05	0.10	ns
Fall Time	tf	80-20% T _{case} = 25°C	-	0.10	0.15	ns
Extinction Ratio	ER	10log (2.0mW/Pf (I _{th})) T _{case} = 25°C	10	-	-	dB
Optical Return Loss	ORL	T _{case} = 25°C	35	-	-	dB

1. Referenced to base of TO header.

Fiber Characteristics

Fiber Type: 900 micron buffer
Fiber Length: 1.0 – 1.4 meter

Forward Path RF Characteristics

1955F Performance Parameters	Symbol	Conditions/Notes	Min	Typ	Max	Unit
Frequency Response Flatness ¹	S ₂₁	47 MHz to 1002 MHz	-	-	1	dBp-p
		5 MHz to 4000 MHz	-	-	4	dBp-p
Response Up-tilt ¹		47 MHz to 1002 MHz	-1		3	dB
Carrier-to-Noise Ratio ^{2,3,4}	CNR	I _{op} , T _{case} = 25°C	51	-	-	dB
Composite Second Order ^{2,3,4}	CSO	I _{op} T _{case} = 25°C	-	-	-55	dBc
			-	-	-57	
Composite Triple Beat ^{2,3,4}	CTB	I _{op} T _{case} = 25°C	-	-	-65	dBc

1. I_{op}, T_{case} = 25°C. Test with the laser Input pin matched to a 50Ω system.
2. 3.7% OMI, 79 NTSC unmodulated carriers (50 MHz to 550 MHz). 0 km fiber.
3. Received power = 0 dBm.
4. I_{op}, T_{case} = 25°C. Test with the laser Input pin matched to a 75Ω system.

Return Path RF Characteristics

1955R Performance Parameters	Symbol	Conditions/Notes	Min	Typ	Max	Unit
Frequency Response Flatness ¹	S ₂₁	5 MHz - 200 MHz	-	-	1	dB _{p-p}
Discrete Second Order ²	DSO	P _F = 3 dBm, OMI = 10% each 2-tone: f1=13MHz, f2=19MHz 20 km of fiber (7.5 dB total loss with connector) DSO meas at 6MHz, 32MHz	-	-	-45	dBc
			-	-	-50	
Discrete Third Order ²	DTO	P _F = 3 dBm, OMI = 10% each 2-tone: f1=13MHz, f2=19MHz 20 km of fiber (7.5 dB total loss with connector) DTO meas at 7MHz, 25MHz	-	-	-63	dBc
			-	-	-65	

1. I_{op}, T_{case} = 25°C. Test with the laser Input pin matched to a 50Ω system.
2. I_{op}, T_{case} = 25°C. Test with laser input pin matched to a 75Ω system.

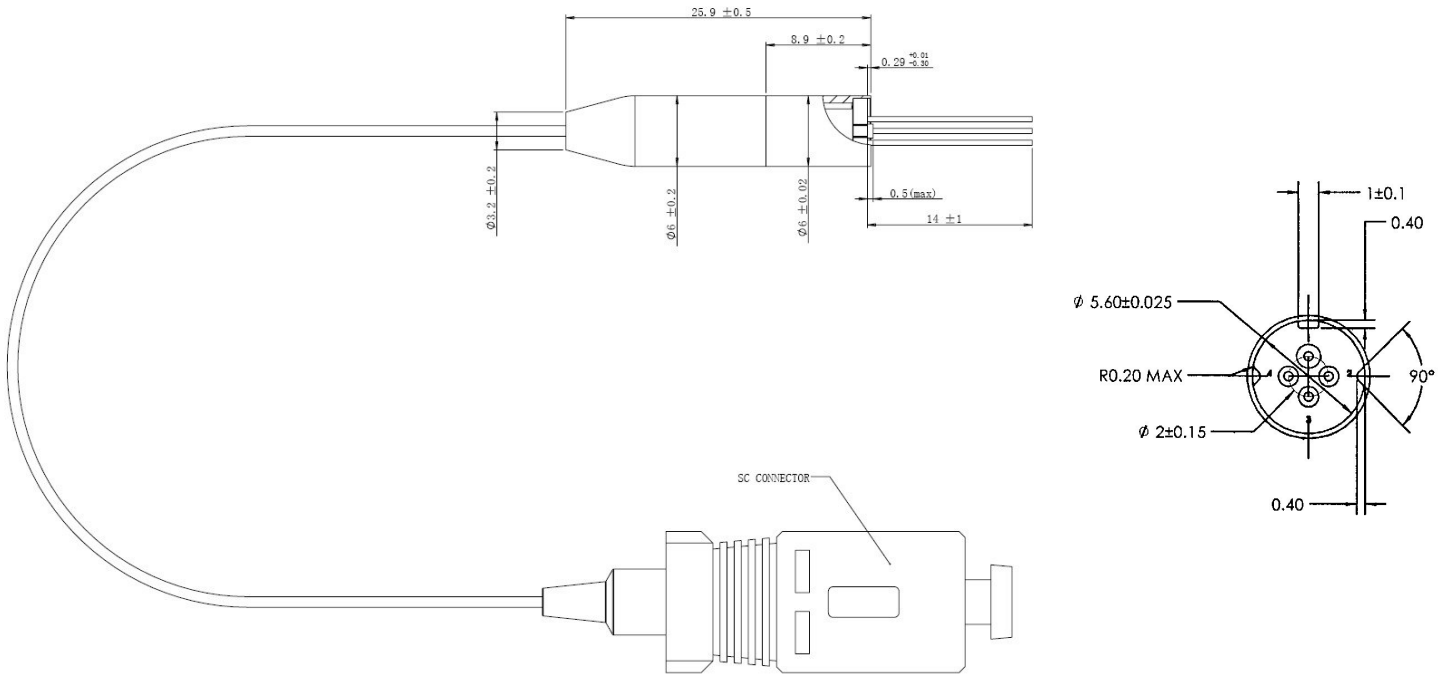
Wide Bandwidth Path RF Characteristics

1955W Performance Parameters	Symbol	Conditions/Notes	Min	Typ	Max	Unit
Frequency Response Flatness ¹	S ₂₁	900 MHz – 4000 MHz	-	-	4	dB _{p-p}
Input Third Order Intercept ²	IIP3	Standard Linearity, I _{bb}	30	-	-	dBm
1dB Compression Point ³	P _{1dB}	I _{bb}	16	-	-	dB

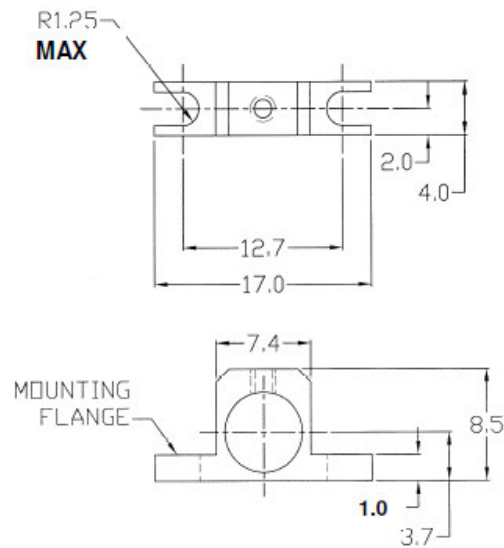
1. I_{op}, T_{case} = 25°C. Test with the laser Input pin matched to a 50Ω system.
2. IIP3 is measured at I_{bb} where I_{bb} is the bias point at which simultaneously the laser at its best linearity and the optical power is within specification. Test Frequency F1 = 2700MHz, F2 = 2703MHz, RF in = 0dBm/frequency. 0km fiber.
3. Test at 2700MHz. 0km fiber.

Package Outline Drawing

Note: Dimensions are in mm



Mounting Bracket



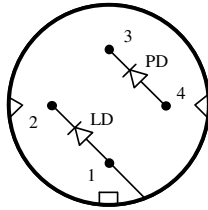
NOTES:

1. UNIT: mm
2. TOLERANCE: $\pm 0.1\text{mm}$ UNLESS OTHERWISE SPECIFIED

Reliability/Quality

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

Schematic and Pinout A

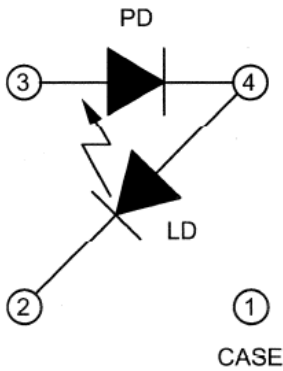


**Pinout A
Bottom View**

Pin Definitions for Pinout A

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

Schematic and Pinout C



Bottom View

Pin Definitions for Pinout C

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

Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1 laser product. This device has been classified with the FDA/CDRH under accession number 0220309. All Versions of this laser are Class 1 laser product, tested according to IEC 60825-1:2007/EN 60825-1:2007

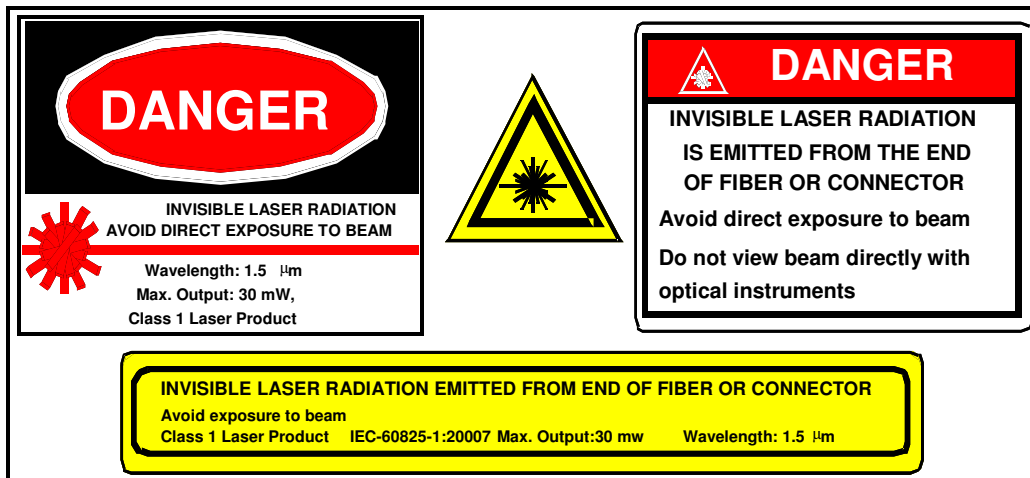
Wavelength = 1.5 μm .

Maximum power = 50 mW.

Because of size constraints, laser safety labeling (including an FDA class 1 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

1955x - a - bb - c - dddd - ww - yy - z

Family Name

1955F: Forward Path
1955R: Return Path
1955W: Wide Bandwidth

Distortion Performance

a = A: Standard
a = B: Enhanced (**not available for 1955W**)

Optical Isolator

bb = DI: Double Isolator (**only available for 3 – 6dBm optical power models**)
bb = SI: Single Isolator

Pinout Option

c = A: Pinout A
c = C: Pinout C

Wavelength

dddd = 1470: 1470 nm (not yet available, consult factory for more information)
dddd = 1490: 1490 nm (not yet available, consult factory for more information)
dddd = 1510: 1510 nm (not yet available, consult factory for more information)
dddd = 1530: 1530 nm (not yet available, consult factory for more information)
dddd = 1550: 1550 nm
dddd = 1570: 1570 nm (not yet available, consult factory for more information)
dddd = 1590: 1590 nm (not yet available, consult factory for more information)
dddd = 1610: 1610 nm (not yet available, consult factory for more information)

Optical Connector

ww = FA: FC/APC
ww = SA: SC/APC

Optical Output Power

yy = 03: 3 dBm (2 mW)
yy = 05: 5 dBm (3mW)
yy = 06: 6 dBm (4mW)
yy = 09: 9 dBm (8 mW) – (**only available for 1955F and 1955W**)
yy = 10: 10dBm (10 mW) – (**only available for 1955F and 1955W**)

Mounting Bracket

z = B: Mounting Bracket
z = N: No Mounting Bracket

Example

1955F-B-SI-A-1550-SA-10-N: Forward Path Uncooled 1550nm CWDM Coaxial Laser, Enhanced Linearity, Double Isolator, Pinout type A, 1550nm, SC/APC optical connector, 10 dBm optical power, no mounting bracket.

Information contained herein is deemed to be reliable and accurate as of issue date. EMCORE reserves the right to change the design or specifications of the product at any time without notice. EMCORE and the EMCORE logo are trademarks of EMCORE Corporation.

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