

ECCW Narrow Linewidth CW External Cavity Laser Diode



Features

- **Narrow linewidth, < 10 kHz available**
- **ITU wavelengths across the C-band**
- **100 GHz channel spacing**
- **10 mW minimum output power**
- **Industry standard, high reliability, hermetic 14-pin butterfly package**
- **Excellent long-term wavelength stability eliminates the need for a wavelength locker**
- **Back-facet monitor**
- **Designed to meet Telcordia GR-468 qualification standard**

Applications

- **Seismic sensor applications**
- **Interferometry**
- **Spectroscopy**
- **Lidar**
- **Optical test and instrumentation**
- **Microwave photonics**

The ECCW series external cavity laser is a cost effective solution for a coherent laser source. The laser is fabricated in a 14-pin hermetically sealed butterfly package that incorporates a bias tee circuit, an integrated thermoelectric cooler (TEC), a thermistor, and a back facet monitor photodiode. The ECCW provides substantially lower phase noise and a longer coherence length than other semiconductor lasers, including DFB lasers. The wavelength stability is assured by design, eliminating the need for wavelength lockers and complex feedback control circuits.

Performance Highlights

	Min	Typical	Max	Units
Minimum Optical Output Power, Version A	15	20	-	mW
Version B	10	12	-	
Optical Linewidth, CW, Version A	-	-	10	kHz
Version B	-	25	50	
Operating Case Temperature Range	-10	-	+70	°C
Center Wavelength (100 GHz ITU Grid)	1527	-	1570	nm
Optical Isolation	35	-	-	dB
Optical Return Loss	40	-	-	dB
Side Mode Suppression Ratio, CW	40	-	-	dB
Relative Intensity Noise	-	-155	-	dB/Hz

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	-20	75	°C
Forward Current	I_{OP}	CW	-	150	mA
Reverse Voltage	V_R	Continuous	-	2	V
Photodiode Forward Current	$I_{MPD,F}$	Continuous	-	2	mA
Photodiode Reverse Voltage	$V_{MPD,R}$	Continuous	-	10	V
TEC Current ²	I_{TEC}	-	-	1.8	A
TEC Voltage	V_{TEC}	Continuous	-	3.5	V
Fiber Bend Radius	R	Continuous	35	-	mm
Tensile Strength, Fiber to Case	F	Continuous	-	5	N
Lead Soldering Time ³	t_{sold}	< 260°C	-	10	sec
Package Mounting Screw Torque ⁴		-	-	0.12	m*N
Operating Humidity: Non-Condensing	X_{OP}	Continuous	5	95	%
Storage Humidity: Non-Condensing	X_{OP}	Continuous	5	95	%

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.
2. TEC current should not exceed 2.0 A during turn on, and case temperature under any conditions should not change faster than 10°C/min.
3. Soldering iron only; no reflow or dip soldering allowed.
4. See mounting recommendations below.

Electrical/Optical Characteristics

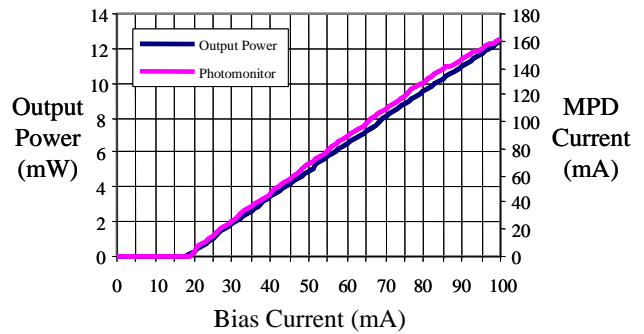
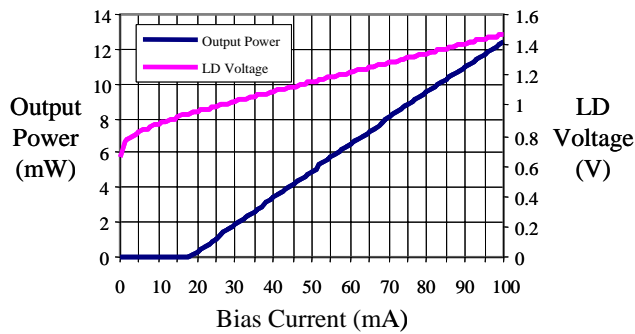
Parameters	Symbol	Conditions/Notes	MIN	Typ	MAX	Unit
Minimum Optical Output Power	P_O	Version A Version B	15 10	20 12	- -	mW
Optical Linewidth ¹		Version A ^{2,3} Version B	- -	- 25	10 50	kHz
Threshold Current	I_{TH}	-	-	-	30	mA
Laser Bias Current	T_{OP}	-	-	-	130	mA
Forward Voltage	V_F	CW, $P_O = 10$ mW	-	-	2.0	V
MPD Current	I_{MON}	CW, $P_O = 10$ mW	0.05	-	0.5	mA
MPD Tracking Error	TE	$-10^\circ\text{C} < T_C < 70^\circ\text{C}$	-	-	± 0.5	dB
TEC Set Temperature ⁴	T_s	Specified for every laser	16	-	35	$^\circ\text{C}$
Center Wavelength (100 GHz ITU Grid)	λ_c	See ITU Grid Channel Numbering Table				nm
Wavelength Drift with Case (-10 to 70 $^\circ\text{C}$) Temperature	$\Delta\lambda_{T_C}$	Relative to 25 $^\circ\text{C}$ Case Temperature	-	-	± 40	pm
Wavelength Offset from DWDM ITU Grid	$\Delta\lambda_{\text{offset}}$	TEC Temperature at T_s	-	-	± 80	pm
Frequency Temperature Coefficient	$\Delta f/\Delta T$	-	-	-	5	GHz/ $^\circ\text{C}$
Frequency Current Coefficient	$\Delta f/\Delta I$	-	-	-	250	MHz/mA
Optical Isolation	-	$-10^\circ\text{C} < T_C < 70^\circ\text{C}$	35	-	-	dB
Relative Intensity Noise	RIN	CW, at 200 MHz	-	-155	-	dB/Hz
Side Mode Suppression Ratio	SMSR	CW, $P_O > 1$ mW	40	-	-	dB
Optical Return Loss	ORL	-	40	-	-	dB
TEC Current	I_{TEC}	$T_C = 70^\circ\text{C}$, $T_{OP} = T_s$	-	-	1.5	A
TEC Voltage	V_{TEC}	$T_C = 70^\circ\text{C}$, $T_{OP} = T_s$	-	-	3.0	V
TEC Capacity	ΔT	$T_C = 70^\circ\text{C}$	55	-	-	$^\circ\text{C}$
Thermistor Resistance	R_{TH}	$T_{OP} = T_s$	9.5	10.0	10.5	k Ω
Thermistor Beta Constant	B	-	-	3891	-	K

1. CW, at rated power.
2. Lorentzian linewidth measured at -30 dB.
3. Gaussian linewidth measured at -10 dB.
4. TEC temperature at the recommended value.

Fiber Pigtail Specifications

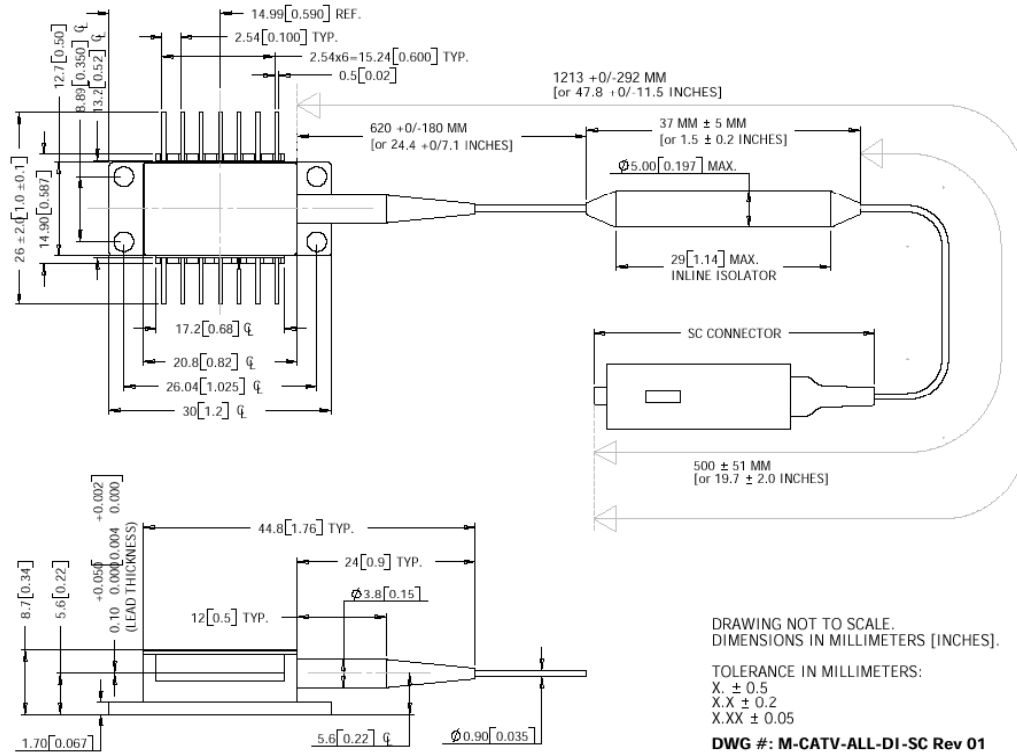
Parameters	Conditions/Notes	MIN	Typ	MAX	Unit
Fiber Type	Single Mode Fiber, Corning SMF-28™, or PMF				
Mode Field Diameter	-	9.0	10.4	11	μm
Cladding Diameter	-	123.5	125.0	126.5	μm
Outer Diameter of Buffer	-	-	900	-	μm
Length of Pigtail	-	-	2	-	m
Optical Connector	(See Ordering Information)				

Test Data



NOTE: The test data above assumes linewidth version B.

Outline Drawing



ITU Grid Channel Numbering

Channel	Wavelength (nm)	Channel	Wavelength (nm)	Channel	Wavelength (nm)
-	-	46	1540.56	30	1553.33
-	-	45	1541.35	29	1554.13
60	1529.55	44	1542.14	28	1554.94
59	1530.33	43	1542.94	27	1555.75
58	1531.12	42	1543.73	26	1556.56
57	1531.90	41	1544.53	25	1557.36
56	1532.68	40	1545.32	24	1558.17
55	1533.47	39	1546.12	23	1558.98
54	1534.25	38	1546.92	22	1559.79
53	1535.04	37	1547.72	21	1560.61
52	1535.82	36	1548.51	20	1561.42
51	1536.61	35	1549.32	-	-
50	1537.40	34	1550.12	-	-
49	1538.19	33	1550.92	-	-
48	1538.98	32	1551.72	-	-
47	1539.77	31	1552.52	-	-

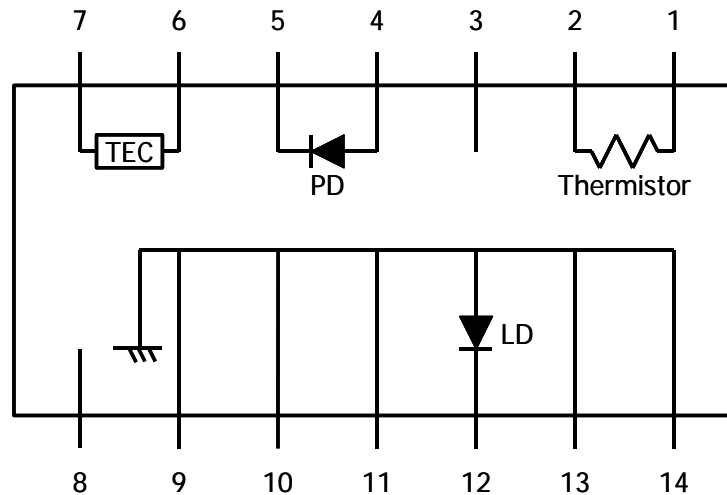
Reliability/Quality

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

Handling and Mounting

1. The Laser should be mounted on a heat sink at least 13 x 35 mm in size with surface finish better than 1 μm and flatness better than 25μm. It is recommended that the laser be mechanically mounted to the heat sink using M2-3 mm (#2-56) screws. Apply torque 0.1-0.11 m*N (0.8-1 lb*in). It is also recommended to use thermally conductive grease between the laser package and heat sink.
2. The fiber pigtail must not be subject to a bend radius below 35mm. The fiber is unable to withstand temperatures in excess of 120 °C without degradation. Avoid high temperature contact during soldering

Schematic



Pin Definitions

No.	description	No.	Description
1	Thermistor	8	NC
2	Thermistor	9	Case ground (LD anode)
3	NC	10	Case ground (LD anode)
4	PD anode (-)	11	Case ground (LN anode)
5	PD cathode (+)	12	LD cathode (-)
6	Cooler (+)	13	Case ground (LN anode)
7	Cooler (-)	14	Case ground (LD anode)

Laser Safety

Class IIIb Laser Product

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.

Wavelength = 1.5 μm .

Maximum power = 100 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.

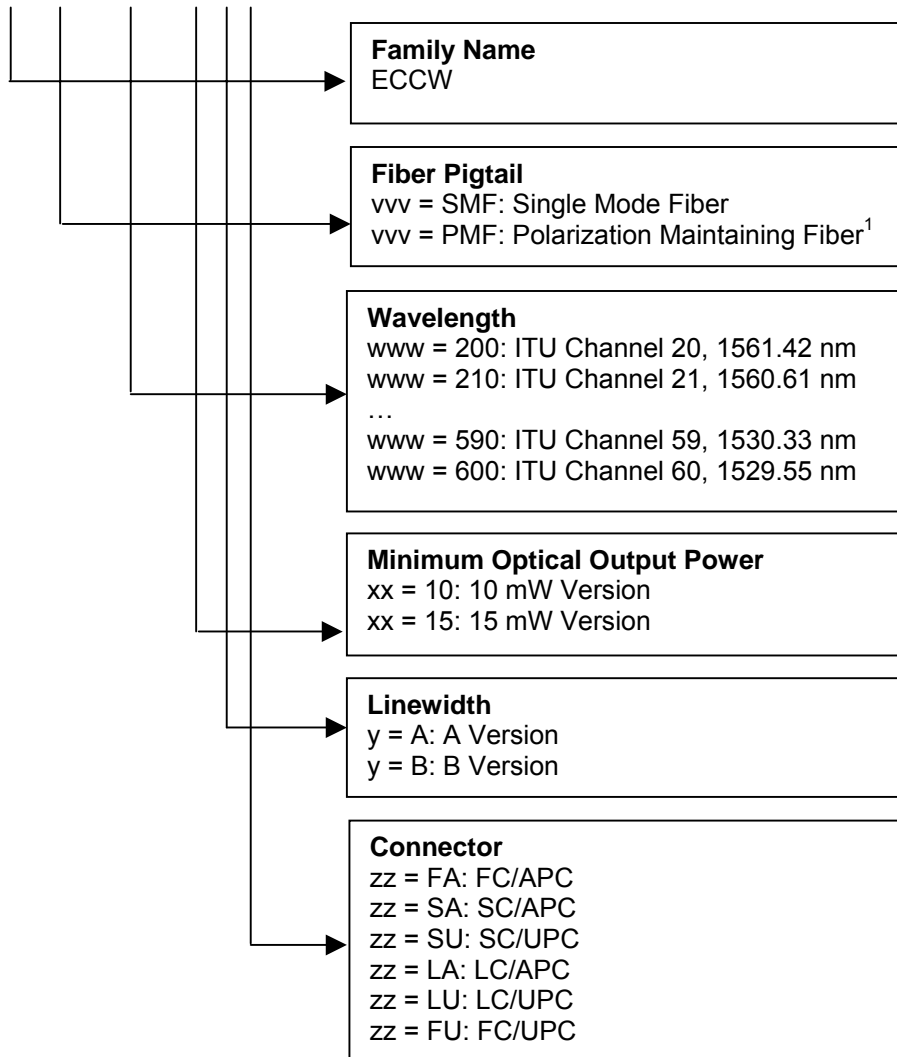
Product is not shipped with power supply.

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



Ordering Code Definitions

ECCW-*vvv-www-xx-y-zz*



1. NOTE: PMF fiber pigtail is not available for linewidth version A.

Example

ECCW-SMF-430-10-B-FA: ECCW, SMF fiber pigtail, ITU channel 43, 1542.94 nm, 10 mW minimum output power, linewidth option B, FC/APC optical connector

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Ortel, a division of EMCORE

2015 West Chestnut Street
Alhambra, California 91803-1542
Tel: 626-293-3400
Fax: 626-293-3428
www.emcore.com

