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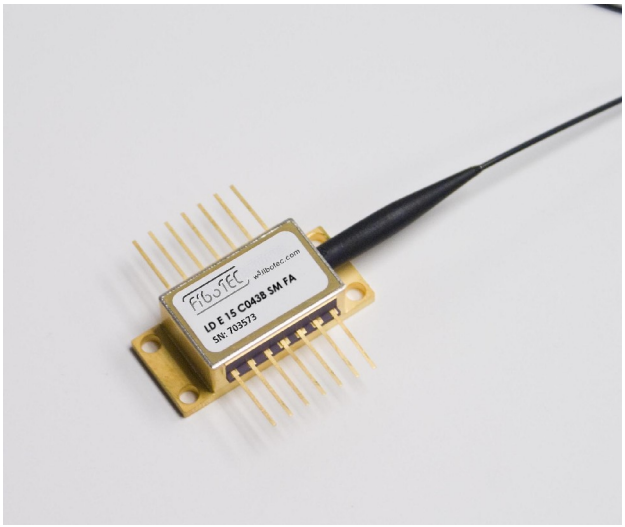
LD E
Single Frequency Laser Diodes



The LD E 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 LD E 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.

Caution: Invisible laser radiation is emitted! Never look directly in any optical output!

1. Electrical and Optical Specification

Parameters	Symbol	Conditions/Notes	MIN	Typ	MAX	Unit
Minimum Optical Output Power	P_O	Linewidth Version B	10 15	12 18	-	mW
Optical Linewidth [1,2,3,4] Version B		15 mW, SMF	-	25	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	-10ºC < T_C < 65ºC	-	-	±0.5	dB
TEC Set Temperature[5]	T_s	Specified for every laser	16	-	35	ºC
Center Wavelength (100 GHz ITU Grid)	?$_c$	See ITU Grid Channel Numbering Table				nm
Wavelength Drift with Case (-10 to 65 ºC) Temperature	?? T_C	Relative to 25ºC Case Temperature	-	-	±40	pm
Wavelength Offset from DWDM ITU Grid	?? $_{offset}$	TEC Temperature at T_S	-	-	±80	pm
Frequency Temperature Coeff.	?f/?T	-	-	3.5	5	GHz/ºC
Frequency Current Coefficient	?f/?I	-	-	200	250	MHz/mA
Optical Isolation	-	-10ºC < T_C < 65ºC	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 = 65ºC, T_{OP} = T_S	-	-	1.5	A
TEC Voltage	V_{TEC}	T_C = 65ºC, T_{OP} = T_S	-	-	3.0	V
TEC Capacity	?T	T_C = 65ºC	50	-	-	ºC
Thermistor Resistance	R_{TH}	T_{OP} = T_S	9.5	10.0	10.5	k?
Thermistor Beta Constant	?	-	-	3891	-	K

1. CW, at rated power.
2. Lorentzian linewidth measured at –30 dB.
3. Gaussian linewidth measured at –20 dB.
4. Linewidth measured with self-delayed heterodyne method at T_s, I_{op}
5. TEC temperature at the recommended value.

2. Fiber Pigtail Specification

Parameters	Conditions/Notes	MIN	Typ	MAX	Unit
Fiber Type	Single Mode Fiber, Corning SMF-28™				
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)				

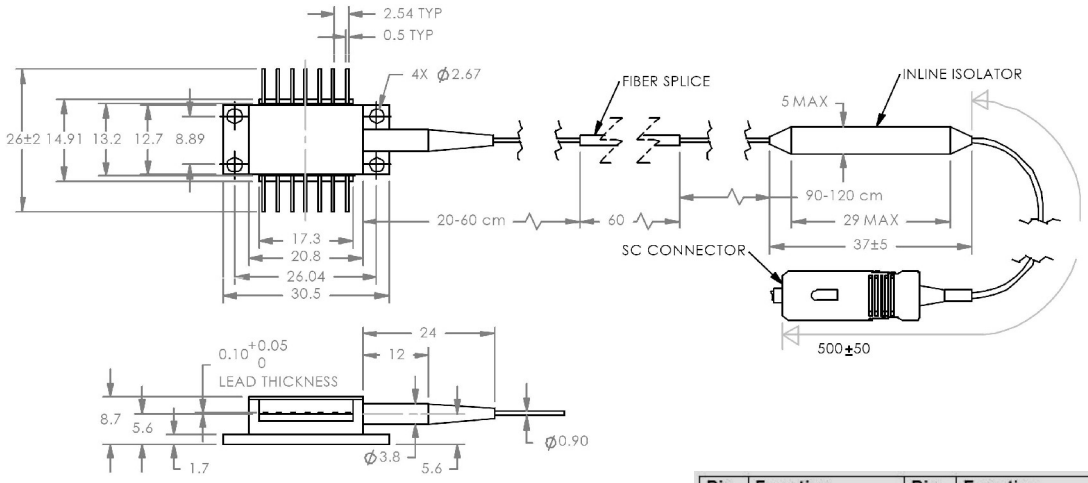
3. Absolute Maximum Ratings

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.

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	s
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.

4. Outline Drawing



DIMENSIONS ARE IN MILLIMETERS (UNLESS OTHERWISE SPECIFIED)
TOLERANCES (UNLESS OTHERWISE SPECIFIED):
X. ±.5
X.X ±.2
X.XX ±.05

Pin	Function	Pin	Function
1	Thermistor	8	Not Connected
2	Thermistor	9	Not Connected
3	LD Cathode	10	Not Connected
4	PD Anode	11	LD Anode (GND)
5	PD Cathode	12	LD RF (Modulation)
6	TE-Cooler +	13	LD Anode (GND)
7	TE-Cooler -	14	Not Connected

5. Handling and Mounting

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.

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

6. Ordering Information

LD E	-	10		C	nnn	B		SMF	zz

LD E	-	15		C	nnn	A		SMF	zz

(1) (2)

Minimum Optical Output Power (1)
10: 10 mW
15: 15 mW

Wavelength Channel (2)
020: ITU Channel 20, 1561.42 nm .....
060: ITU Channel 60, 1529.55 nm

Linewidth
B: Version B (50 kHz)

Fiber Pigtail
SMF: Single Mode Fiber

Connector
FA: FC/APC
SA: SC/APC

Wavelength channels (2)

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	-	-

7. Laser Safety

Class IIIb Laser Product

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.

8. Qualification

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