

FEATURES

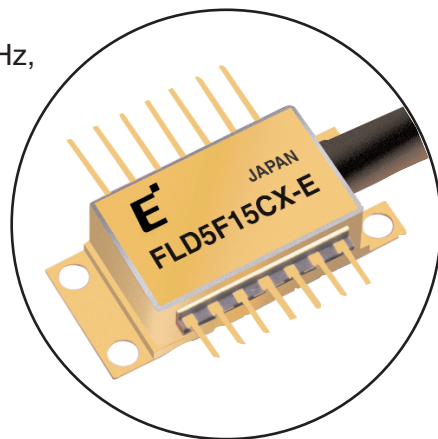
- Direct Modulation Laser for WDM systems
- Optimized for Long Distance Transmission (Dispersion 1800ps/nm)
- Peak wavelength 1527.99 to 1563.05nm (C-band: 191.8 to 196.2THz, 100GHz spacing)
- Output Power: 2mW
- 14-pin Butterfly type package
- Built-in Optical Isolator, Power Monitor PIN-PD, Thermistor, and Cooler
- Single Mode Fiber

APPLICATIONS

This laser is intended for the application of 2.5 Gb/s long haul Dense Wavelength Division Multiplexing (DWDM). Transmission spans of 100km (1800ps/nm) are possible.

DESCRIPTION

The laser is capable of 2.5 Gb/s transmission. It is packaged in a “butterfly” type module. The module employs a highly stable optical coupling system, coupling the laser output through a built-in optical isolator into a single mode fiber pigtail. The module also includes a monitor photodiode, a thermoelectric cooler (TEC), and thermistor. This device is designed for use in DWDM direct modulation transmission systems. Selected wavelengths specified to the ITU-T grid are available.



ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

Parameter	Symbol	Condition	Ratings		Unit
			Min.	Max.	
Storage Temperature	T _{stg}	-	-40	+85	°C
Operating Case Temperature	T _{op}	-	-20	+70	°C
Optical Output Power	P _f	CW	-	5	mW
LD Forward Current	I _F	CW	-	150	mA
LD Reverse Voltage	V _R	-	-	2	V
PD Reverse Voltage	V _{DR}	-	-	20	V
PD Forward Current	I _{PF}	-	-	10	mA
Cooler Voltage	V _C	Cooling	-	2.5	V
		Heating	-2.5	-	
Cooler Current	I _C	Cooling	-	1.4	A
		Heating	-0.9	-	
Thermistor Temperature	T _{th}	ATC Operation	-20	+70	°C
Lead Soldering Time	T _{sold}	260°C	-	10	sec
Environmental Operating Humidity	X _{op}	T _{op} <30°C	-	95	%
Environmental Storage Humidity	X _{st}	T _{stg} <30°C	-	95	%

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_L=T_{set}, T_C=25°C, BOL, unless otherwise specified)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Laser Set Temperature	T _{set}	-	20	-	35	°C
Threshold Current	I _{th}	CW	4	-	40	mA
Forward Voltage	V _{FDC}	CW, I _F =30 mA, pin 12, 13	-	1.6	1.75	V
Series Resistance	R _S	CW, pin 12, 13	22	25	28	Ω
Optical Output Power	P _f	CW	2.0	-	-	mW
Slope Efficiency	η	CW, P _f =2mW	0.03	0.04	-	mW/mA
Threshold Power	P _{th}	I _F =I _{th} , CW	-	-	150	μW
Tracking Error (Note 1)	TE	P _f =2mW, T _C =-20 to 70°C, I _m -APC	-0.5	-	+0.5	dB
Monitor Current	I _m	CW, P _f =2mW, V _{DR} =5V	0.25	-	2.0	mA
Photodiode Dark Current	I _D	V _{DR} =5V	-	2	100	nA
Photodiode Capacitance	C _t	V _{DR} =5V, f=1 MHz	-	-	10	pF
Photodiode Cutoff Frequency	f _{cm}	V _{DR} =5V, 50Ω load	100	-	-	MHz
Peak Wavelength	λ _p	Note (2)	Note (4)			nm
Wavelength Drift (after 20 yrs)	Δλ	Note (2)	-100	-	+100	pm
Wavelength Stability with Case Temperature	dλ/dT _C	T _C =-20 to 70°C	-1.0	-	+1.0	pm/°C
Side Mode Suppression	S _r	Note (2)	35	40	-	dB
Spectral Width (-20dB)	δλ	Note (2)	-	-	0.5	nm
Rise/Fall Time	T _r , T _f	20% to 80%	-	-	0.125	nsec
Cutoff Frequency	f _c	P _f =2mW, -3 dB	3.5	-	-	GHz
RF Return Loss	S ₁₁	f=50 MHz ~ 2 GHz	8	-	-	dB
		f=2 GHz ~ 3 GHz	6	-	-	dB
		f=3 GHz ~ 5 GHz	3	-	-	dB
Optical Isolation	I _s	T _C =-20 to 70°C	25	35	-	dB
Relative Intensity Noise	RIN	f=2.5 GHz P _f =2mW, ORL=24 dB	-	-	-140	dB/Hz
Kink	K _{ns}	up to 2.4mW	No Kink			-
Dispersion Penalty	dP	Note (3)	-	-	2.0	dB

Note 1. TE=10*log(pf(Tcase)/Pf(Tc=25°C))(dB)

Note 2. 2.5 Gb/s NRZ, P_{peak}=2mW, R_{ext}=8.2dB, PRBS=2²³-1,

Note 3. Bit rate=2.48832 Gb/s, PRBS=2²³-1, Dispersion=1,800 ps/nm, P_{peak}=2mW, R_{ext}=8.2dB

Decision point: Center of Back-to-Back at 10⁻⁹, No Floor,

Receiver: Eudyna Standard Receiver

Note 4. The selected wavelengths available are listed in Fig. 8

TEC AND THERMISTOR CHARACTERISTICS ($T_L=T_{set}$, $T_C=25^\circ\text{C}$, BOL, unless otherwise specified)

Parameter	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Cooler Current	I_C	$T_L=T_{set}$, $P_f=2\text{mW}$, $T_C=70^\circ\text{C}$	-	-	1.0	A
Cooler Voltage	V_C		-	-	2.4	V
Cooler Power	P_C		-	-	2.4	W
Thermistor Resistance	R_{tr}	$T_L=25^\circ\text{C}$	9.5	10.0	10.5	$k\Omega$
Thermistor B Constant	B		3,270	3,450	3,630	K

Fig. 1 Forward Current vs Output Power

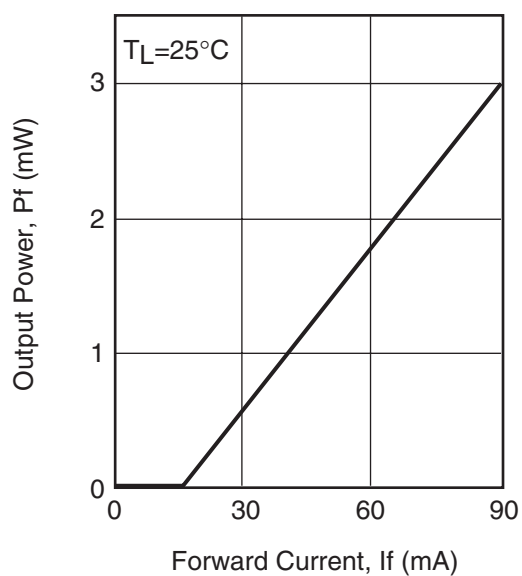


Fig. 2 Frequency Response

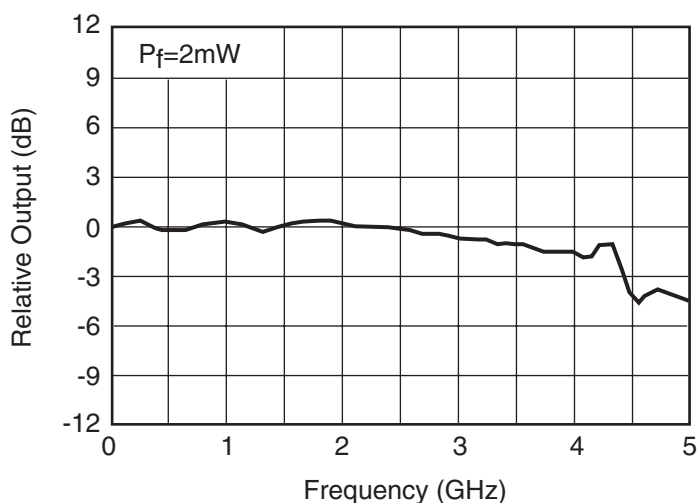


Fig. 3 RF Return Loss

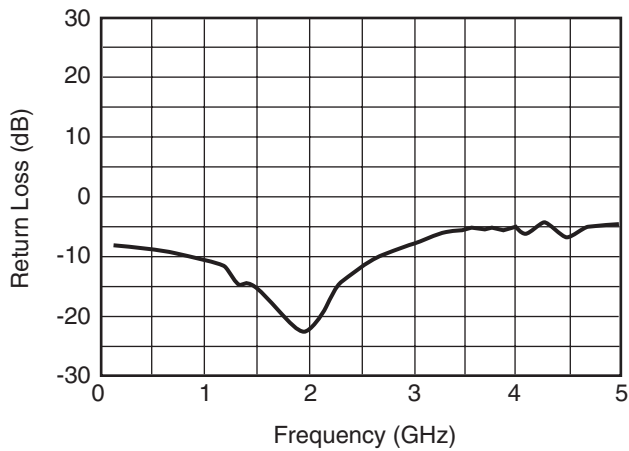


Fig. 4 Cooler Voltage -Current

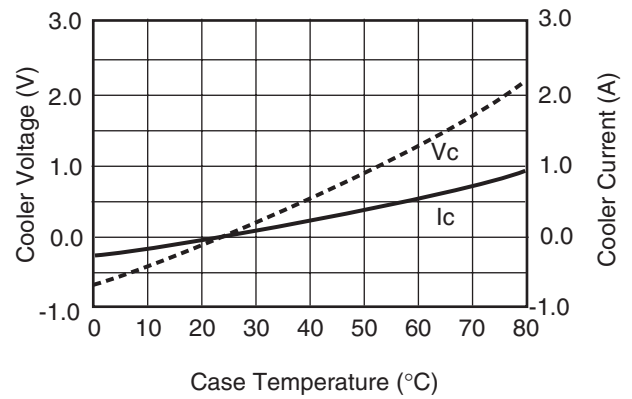


Fig. 5 Spectrum

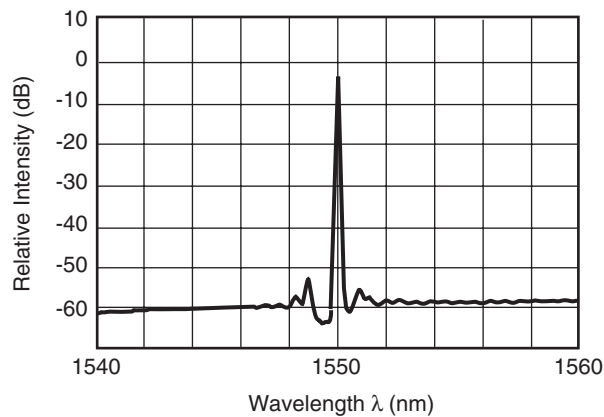


Fig. 6 Temperature Dependence of Wavelength (ACC Operation)

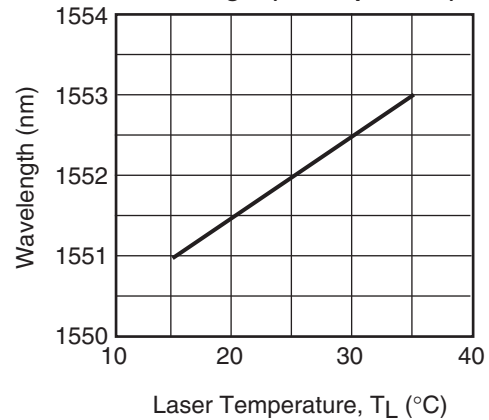


Fig. 7 Transmission Characteristics

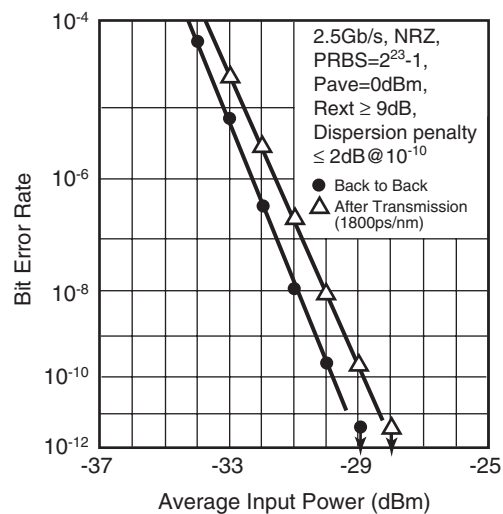


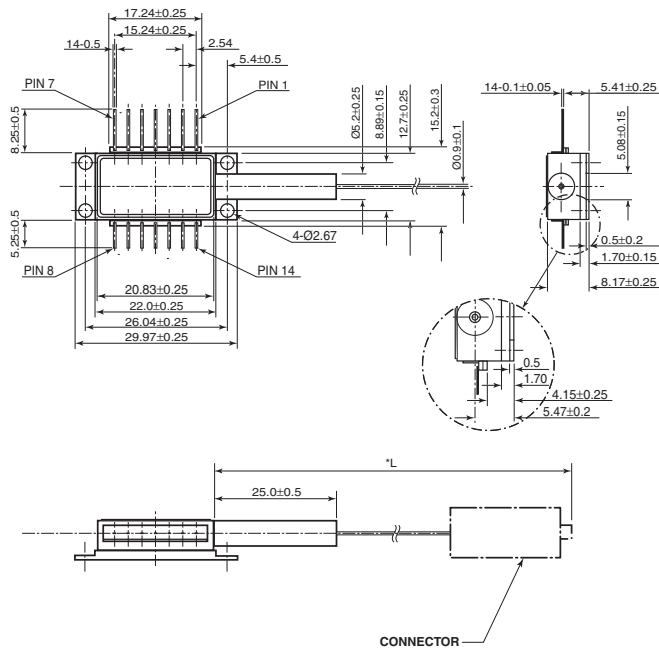
Fig. 8 Wavelength Table

Part Number	Wavelength (nm) (TL=Tset) (in vacuum)	Tolerance (nm)
FLD5F15CX-E9620	1527.99	±0.1
-E9610	1528.77	±0.1
-E9600	1529.55	±0.1
-E9590	1530.33	±0.1
-E9580	1531.12	±0.1
-E9570	1531.90	±0.1
-E9560	1532.68	±0.1
-E9550	1533.47	±0.1
-E9540	1534.25	±0.1
-E9530	1535.04	±0.1
-E9520	1535.82	±0.1
-E9510	1536.61	±0.1
-E9500	1537.40	±0.1
-E9490	1538.19	±0.1
-E9480	1538.98	±0.1
-E9470	1539.77	±0.1
-E9460	1540.56	±0.1
-E9450	1541.35	±0.1
-E9440	1542.14	±0.1
-E9430	1542.94	±0.1
-E9420	1543.73	±0.1

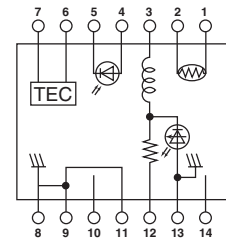
-E9410	1544.53	±0.1
-E9400	1545.32	±0.1
-E9390	1546.12	±0.1
-E9380	1546.92	±0.1
-E9370	1547.72	±0.1
-E9360	1548.51	±0.1
-E9350	1549.32	±0.1
-E9340	1550.12	±0.1
-E9330	1550.92	±0.1
-E9320	1551.72	±0.1
-E9310	1552.52	±0.1
-E9300	1553.33	±0.1
-E9290	1554.13	±0.1
-E9280	1554.94	±0.1
-E9270	1555.75	±0.1
-E9260	1556.55	±0.1
-E9250	1557.36	±0.1
-E9240	1558.17	±0.1
-E9230	1558.98	±0.1
-E9220	1559.79	±0.1
-E9210	1560.61	±0.1
-E9200	1561.42	±0.1
-E9190	1562.23	±0.1
-E9180	1563.05	±0.1

"CX" PACKAGE

UNIT: mm



Grounded Type	
PIN #	FUNCTION
1.	Thermistor
2.	Thermistor
3.	Laser DC Bias (-)
4.	Monitor (Anode)
5.	Monitor (Cathode)
6.	Thermoelectric Cooler (+)
7.	Thermoelectric Cooler (-)
8.	Case Ground
9.	Case Ground
10.	N.C.
11.	Case Ground
12.	Laser Modulation (-)
13.	Case Ground
14.	N.C.



For further information please contact:

Eudyna Devices USA Inc.

2355 Zanker Rd.
San Jose, CA 95131-1138, U.S.A.
TEL: (408) 232-9500
FAX: (408) 428-9111
www.us.eudyna.com

Eudyna Devices Europe Ltd.

Network House
Norreys Drive
Maidenhead, Berkshire SL6 4FJ
United Kingdom
TEL: +44 (0) 1628 504800
FAX: +44 (0) 1628 504888

Eudyna Devices Asia Pte Ltd.

Hong Kong Branch
Rm. 1101, Ocean Centre, 5 Canton Rd.
Tsim Sha Tsui, Kowloon, Hong Kong
TEL: +852-2377-0227
FAX: +852-2377-3921

Eudyna Devices Inc.

Sales Division
1, Kanai-cho, Sakae-ku
Yokohama, 244-0845, Japan
TEL: +81-45-853-8156
FAX: +81-45-853-8170

CAUTION

Eudyna Devices Inc. products contain **gallium arsenide (GaAs)** which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- Do not put this product into the mouth.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.

Eudyna Devices Inc. reserves the right to change products and specifications without notice. The information does not convey any license under rights of Eudyna Devices Inc. or others.

© 2004 Eudyna Devices USA Inc.
Printed in U.S.A.