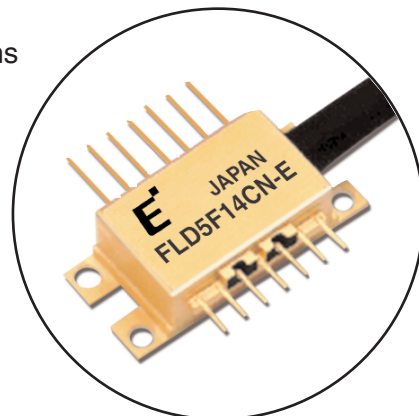


1,550nm Modulator Integrated DFB Laser

FLD5F14CN-E

FEATURES

- Long transmission capability of over 10,000ps/nm in 2.5 Gb/s systems
- Modulator Integrated DFB Laser Diode Module
- CW operation of DFB laser section
- Modulation voltage applied only to modulator section
- 1,550nm peak wavelength region and very low wavelength chirping
- 14-pin high speed butterfly package with fiber pigtail
- Built-in optical isolator, monitor photodiode, thermistor, and thermo-electric cooler
- Selected wavelength according to ITU-T grid available



APPLICATION

This MI laser is intended for application in 2.5 Gb/s long haul transmission links over 10,000ps/nm (with Erbium Doped Fiber Amplifiers (EDFA)).

DESCRIPTION

The Modulator Integrated DFB Laser (MI DFB Laser) has an electro-absorption modulator monolithically integrated with a conventional Distributed Feed-Back (DFB) laser. The modulation voltage is applied to the modulator section while the laser section operates CW allowing extremely low wavelength chirping. Transmission spans in excess of 10,000ps/nm are achievable. Extinction ratios of greater than 10 dB are achievable with 2Vp-p modulation. The MI laser is installed in a butterfly type package. The module incorporates a highly stable optical coupling system. The module includes an optical isolator, monitor photodiode, thermistor and a thermo-electric cooler. Selected wavelengths according to the ITU-T grid are available for Dense Wavelength Division Multiplexing (DWDM) applications.

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

Parameter	Symbol	Condition	Rating		Unit
			Min.	Max.	
Operating Case Temperature	T _{op}	-	0	+65	°C
Storage Temperature	T _{stg}	-	-40	+70	°C
Optical Output Power	P _f	CW	-	5	mW
Laser Forward Current	I _F	CW	-	150	mA
Laser Reverse Voltage	V _R	CW	-	2	V
Modulator Forward Voltage	V _m		-	1	V
Modulator Reverse Voltage	V _{ear}		-	5	V
Monitor Diode Reverse Voltage	V _{monr}	-	-	20	mA
Monitor Diode Forward Current	I _{mon}	-	-	1	V
TEC Voltage	V _c	Cooling	-	+2.5	V
		Heating	-2.5	-	
TEC Current	I _c	Cooling	-	+1.4	A
		Heating	-0.9	-	
Thermistor Temperature	T _{th}	ATC Operation	0	+65	°C

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

Parameter	Symbol	Test Condition	Limits			Unit
			Min.	Typ.	Max.	
Monitor Current	I_m	CW, $I_F = I_{op}$, $V_m = V_o$, $V_{DR} = 5\text{V}$	50	-	2,000	μA
Monitor Dark Current	I_d	$V_{DR} = 5\text{V}$	-	2	100	nA
Monitor Diode Capacitance	C_t	$V_{DR} = 5\text{V}$, $f = 1\text{ MHz}$	-	2	20	pF

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

Parameter	Symbol	Test Condition	Limits			Unit
			Min.	Typ.	Max.	
TEC Current	I_C	CW, $I_F = I_{op}$, $V_m = V_o$, $T_L = T_{set}$, $T_c = +65^\circ\text{C}$	-	-	1.0	A
TEC Voltage	V_C	CW, $I_F = I_{op}$, $V_m = V_o$, $T_L = T_{set}$, $T_c = +65^\circ\text{C}$	-	-	2.4	V
TEC Power Consumption	P_C	CW, $I_F = I_{op}$, $V_m = V_o$, $T_L = T_{set}$, $T_c = +65^\circ\text{C}$	-	-	2.4	W
TEC Resistance	R_{tec}	CW, $I_F = I_{op}$, $V_m = V_o$	2.0	2.3	3.2	Ω
Thermistor Resistance	R_{th}	$T_L = +15$ to $+35^\circ\text{C}$	6.3	-	15.4	k Ω
Thermistor B Constant	B	-	3,270	3,450	3,630	K
Tracking Error	TE	CW, $I_F = I_{op}$, $V_m = V_o$, $T_c = 0$ to $+65^\circ\text{C}$	-0.5	-	+0.5	dB

BOL: Beginning of Life

OPTICAL & ELECTRICAL CHARACTERISTICS ($T_L = T_{set}$, $T_c = 25^\circ\text{C}$, BOL, unless otherwise specified)

Parameter	Symbol	Test Condition	Limits			Unit
			Min.	Type	Max.	
Laser Set Temperature	T_{set}	-	+15	-	+35	$^\circ\text{C}$
On Level Modulation	V_o	-	-1	-	0	V
Threshold Current	I_{th}	CW, $V_m = V_o$	2	-	40	mA
Operating Current	I_{op}	CW	40	-	90	mA
Dispersion Penalty	dP	Note (1)	-	-	1.5	dB
Optical Output Power	P_f	CW, $I_F = I_{op}$, $V_m = V_o$	0	-	-	dBm
Forward Voltage	V_F	CW, $I_F = I_{op}$	-	1.4	2.0	V
Extinction Ratio	R_{ext}	CW, $I_F = I_{op}$, $V_m = V_o/(V_o - 2)$	10	12	-	dB
Peak Wavelength (Note 4)	λ_p	Note (2)	Note (4)			nm
Sidemode Suppression Ratio	SSR	Note (2)	33	38	-	dB
Spectral Width	$\Delta\lambda$	Note (3)	-	0.05	0.10	nm
Rise Time	T_r	Note (2), 20 to 80%	-	90	125	ps
Fall Time	T_f	Note (2), 20 to 80%	-	90	125	ps
Input Impedance	Z	CW, $V_m < 0$	-	50	-	Ω
RF Return Loss	S_{11}	$f = 2.5\text{ GHz}$, 50Ω Test Set, $V_m = V_o$, $I_F = I_{op}$	10	-	-	dB
Cut-off Frequency	S_{21}	-3dB bandwidth, 50Ω Test Set, $V_m = V_o - 0.5(V_{mod})$, $I_F = I_{op}$	3.5	-	-	GHz
Relative Intensity Noise	RIN	$f = 2.5\text{ GHz}$, $V_m = V_o$, $I_F = I_{op}$, ORL $\geq 24\text{ dB}$	-	-	-145	dB/Hz
Optical Isolation	I_s	$T_c = -20$ to $+65^\circ\text{C}$	25	35	-	dB

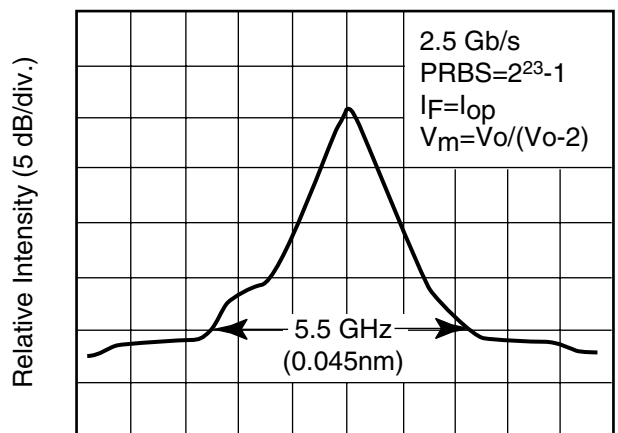
Note (1) Eudyna Test System
2.48832Gb/s, PRBS=2²³-1, $I_b = I_{op}$, $V_m = V_o/(V_o - 2)$
Dispersion = 10,000ps/nm
Dispersion penalty at bit - error - rate = 10⁻¹⁰

Note (2) Eudyna Test System
2.48832Gb/s, PRBS=2²³-1, $I_b = I_{op}$, $V_m = V_o/(V_o - 2)$

Note (3) Spectrum measurement equipment is "Monochrometer" or "Fabry-Perot Etalon".
Spectral width at -20dB under the modulation condition of Note (2)

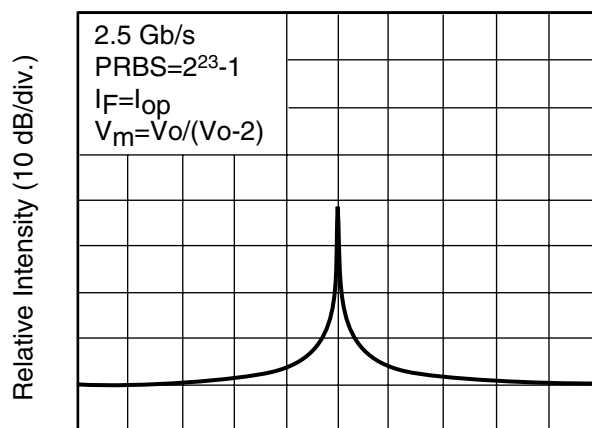
Note (4) The selected wavelengths available are listed in Fig. 9.

Fig. 1 Lasing Spectrum



Wavelength (Span=1 GHz/div, Res.=100 MHz)

Fig. 2 Lasing Spectrum



Wavelength (Span=1 nm/div, Res.=0.1nm)

Fig. 3 Temperature Dependence of Wavelength (ACC)

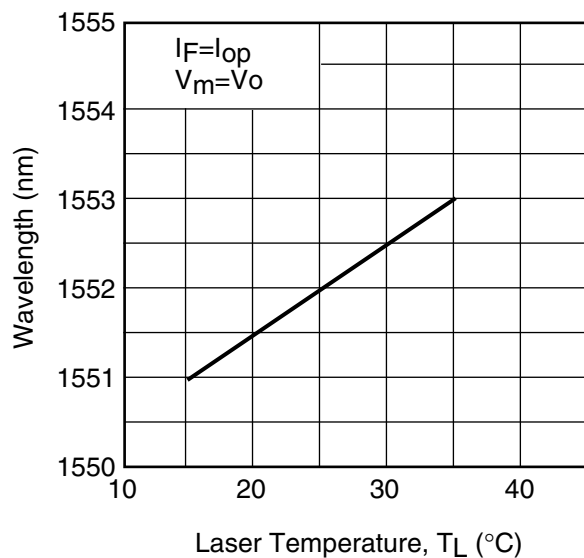
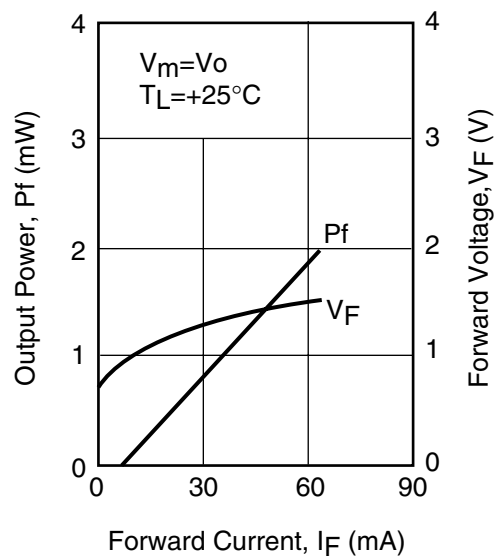


Fig. 4 Forward Current vs. Output Power and Forward Current vs. Forward Voltage



**Fig. 5 Extinction Ratio
vs. Modulation Voltage**

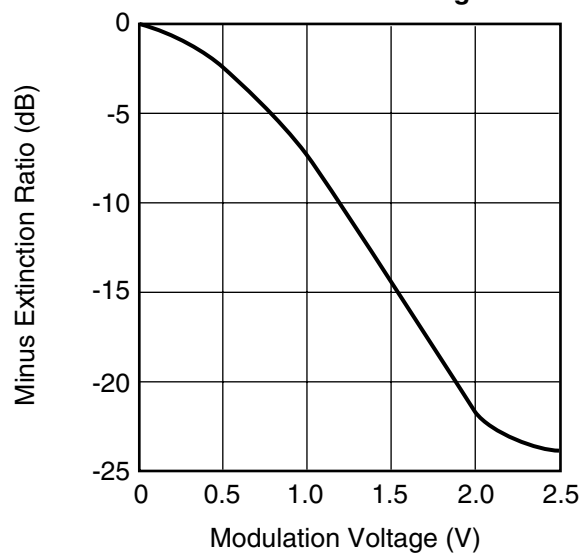


Fig. 6 Cut-off Frequency (S21)

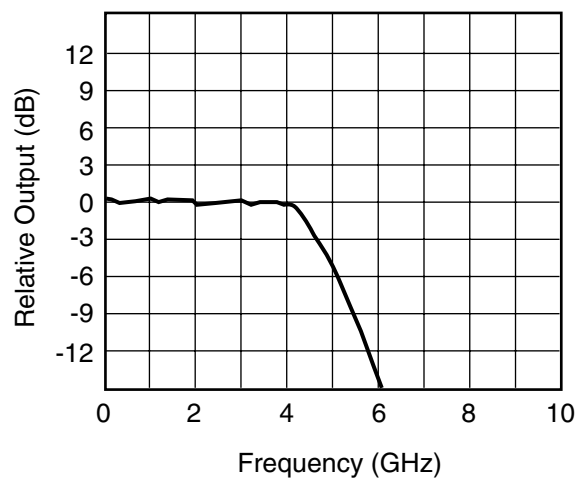


Fig. 7 RF Return Loss (S11)

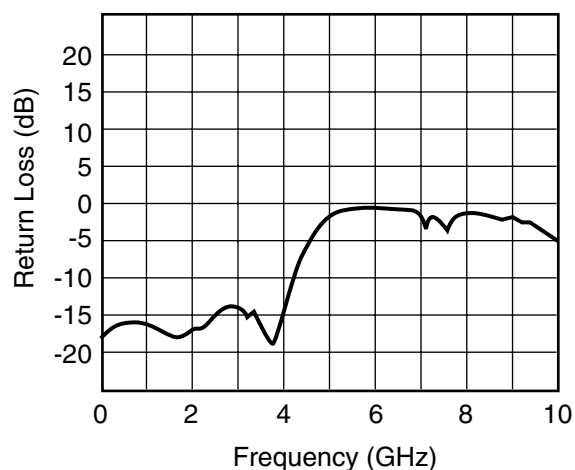


Fig. 8 Transmission Characteristics

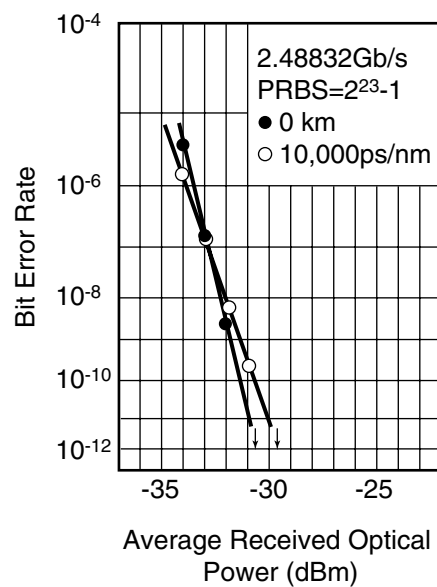
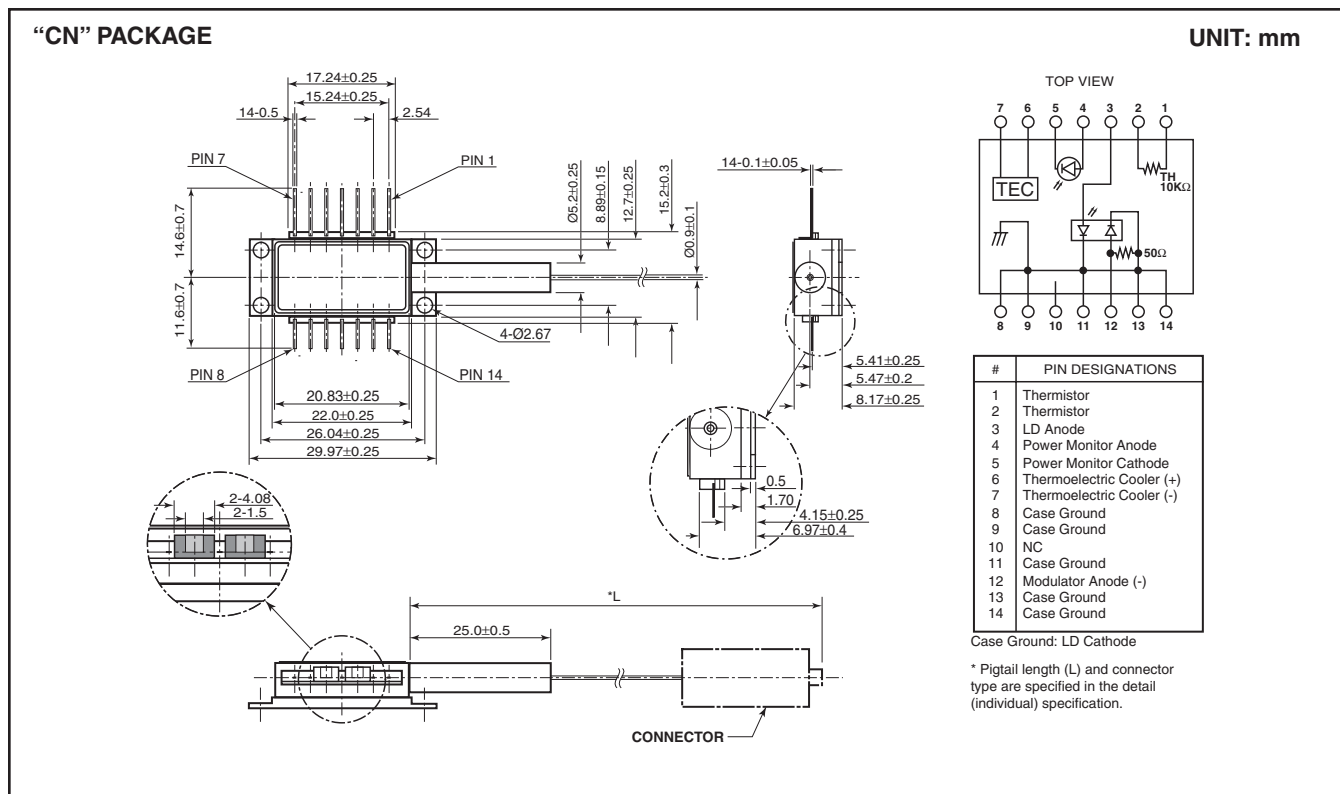


Fig. 9 Wavelength Table

Part Number	Wavelength (nm) (TL=Tset) (in vacuum)	Tolerance (nm)
FLD5F14CN-E59	1530.33	±0.1
-E58	1531.12	±0.1
-E57	1531.90	±0.1
-E56	1532.68	±0.1
-E55	1533.47	±0.1
-E54	1534.25	±0.1
-E53	1535.04	±0.1
-E52	1535.82	±0.1
-E51	1536.61	±0.1
-E50	1537.40	±0.1
-E49	1538.19	±0.1
-E48	1538.98	±0.1
-E47	1539.77	±0.1
-E46	1540.56	±0.1
-E45	1541.35	±0.1
-E44	1542.14	±0.1
-E43	1542.94	±0.1
-E42	1543.73	±0.1
-E41	1544.53	±0.1
-E40	1545.32	±0.1
-E39	1546.12	±0.1
-E38	1546.92	±0.1
-E37	1547.72	±0.1
-E36	1548.51	±0.1
-E35	1549.32	±0.1
-E34	1550.12	±0.1
-E33	1550.92	±0.1
-E32	1551.72	±0.1
-E31	1552.52	±0.1
-E30	1553.33	±0.1
-E29	1554.13	±0.1
-E28	1554.94	±0.1
-E27	1555.75	±0.1
-E26	1556.55	±0.1
-E25	1557.36	±0.1
-E24	1558.17	±0.1
-E23	1558.98	±0.1
-E22	1559.79	±0.1
-E21	1560.61	±0.1

1,550nm Modulator Integrated DFB Laser

FLD5F14CN-E



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.