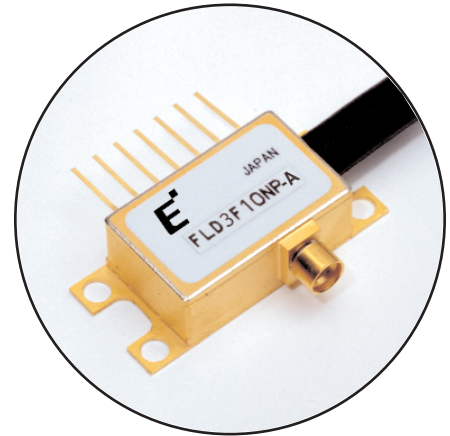


1,310nm Modulator Integrated DFB Laser

FLD3F10NP-A

FEATURES

- Modulator Integrated DFB Laser Diode Module
- CW operation of DFB laser section
- Modulation voltage applied only to modulator section
- High speed butterfly package with GPO connection
- Built-in optical isolator, monitor photodiode, thermistor, and thermo-electric cooler



APPLICATION

This MI laser is intended for intermediate reach applications ($\leq 24\text{km}$) at 10Gb/s.

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. Extinction ratios of more than 8.2 dB can be achieved with 2.6 Vp-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 thermoelectric cooler.

ABSOLUTE MAXIMUM RATINGS ($T_{op}=25^{\circ}\text{C}$, unless otherwise specified)

Parameter	Symbol	Condition	Rating		Unit
			Min.	Max.	
Operating Case Temperature	T_{op}	-	0	+70	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-	-40	+85	$^{\circ}\text{C}$
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	CW	-5	+1	V
Photodiode Forward Current	-	-	-	1	mA
Photodiode Reverse Voltage	V_{DR}	-	-	10	V
TEC Voltage	V_c	Cooling	-	+2.5	V
		Heating	-2.0	-	
TEC Current	I_c	Cooling	-	+1.4	A
		Heating	-0.7	-	
Thermistor Temperature	T_{th}	ATC Operation	0	+70	$^{\circ}\text{C}$
Lead Soldering Time	-	260 $^{\circ}\text{C}$	-	10	sec

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.	
Peak Wavelength	λ_p	Note (2)	1290	-	1320	nm
Threshold Current	I_{th}	CW, $V_m=V_o$	-	-	35	mA
Threshold Power	P_{th}	CW, $I_F=I_{th}$, $V_m=V_o$	-	-	75	μW
Operating Current	I_{op}	CW, $V_m=V_o$	50	-	100	mA
Forward Voltage	V_F	CW, $I_F=I_{op}$, $V_m=V_o$	-	-	2.2	V
Optical Output Power (Avg. Power)	P_f	Note (1)	0.0	-	2.0	dBm
Dispersion Penalty	dP	Note (1)	-	-	1.0	dB
Sidemode Suppression Ratio	SSR	Note (2)	30	-	-	dB
Optical Isolation	I_s	$T_c=0$ to $+70^\circ\text{C}$	23	35	-	dB
On Level Modulation	V_o	-	-1.0	-	0	V
Modulator Drive Voltage	V_{mod}	$(V_o-V_{mod}) \geq -3.3\text{V}$	-	-	2.6	Vpp
Extinction Ratio	R_{ext}	$f=10\text{Gb/s}$, $I_F=I_{op}$, $V_m=V_o/(V_o-V_{mod})$	8.2	-	-	dB
Rise Time	T_r	Note (2), 20 to 80%	-	-	25	ps
Fall Time	T_f	Note (2), 20 to 80%	-	-	25	ps
Cut-off Frequency	S_{21}	-3dB bandwidth, $V_m=-1\text{V}$, $I_F=I_{op}$	10	-	-	GHz
RF Return Loss	S_{11}	$f=\text{DC}-5\text{GHz}$, 50 Ω Test Set, $V_m=-1\text{V}$, $I_F=I_{op}$	8	-	-	dB
RF Return Loss	S_{11}	$f=5-10\text{GHz}$, 50 Ω Test Set, $V_m=-1\text{V}$, $I_F=I_{op}$	5	-	-	dB
Monitor Current	I_m	$V_{DR}=5\text{V}$, Note (2)	0.2	-	2.0	mA
TEC Capacity	ΔT	$P_{TEC}=2.4\text{W}$, $I_F=I_{op}$	45	-	-	$^\circ\text{C}$
TEC Current	I_c	$I_F=I_{op}$, $\Delta T=45^\circ\text{C}$	-	-	1.2	A
TEC Voltage	V_c	$I_F=I_{op}$, $\Delta T=45^\circ\text{C}$	-	-	2.4	V
TEC Power Dissipation	P_c	$I_F=I_{op}$	-	-	2.9	W
Thermal Resistance	R_{th}	$T_L=25^\circ\text{C}$	9.5	-	10.5	k Ω
Thermistor B Constant	B		3,270	3,450	3,630	K

Note (1) Eudyna Test System
9.95328Gb/s, PRBS=2²³-1, $I_F=I_{op}$, $V_m=V_o$ and (V_o-V_{mod})
Dispersion=82ps/nm, Dispersion penalty at
Bit Error Rate = 1.0E-10

Note (2) Eudyna Test System
9.95328Gb/s, PRBS=2²³-1, $I_F=I_{op}$, $V_m=V_o$ and (V_o-V_{mod})

Fig. 1 Lasing Spectrum

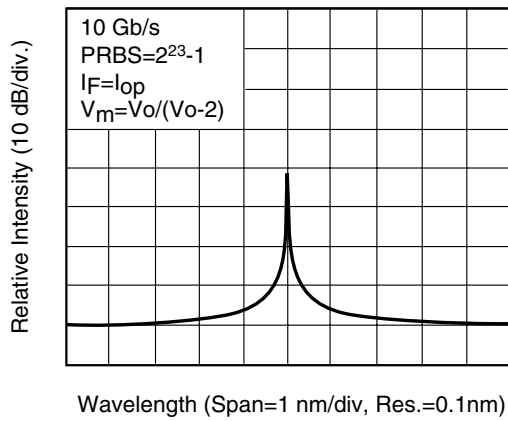


Fig. 2 Output Pwr & Monitor Current vs. Forward Current

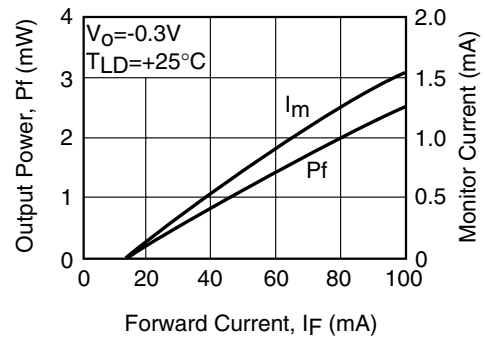


Fig. 3 Extinction Ratio vs. Modulation Voltage

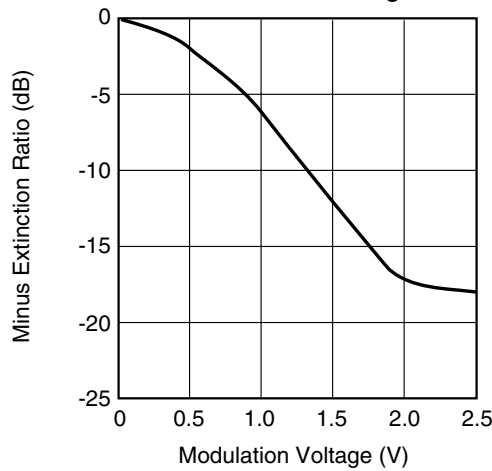


Fig. 4 Cut-off Frequency (S21)

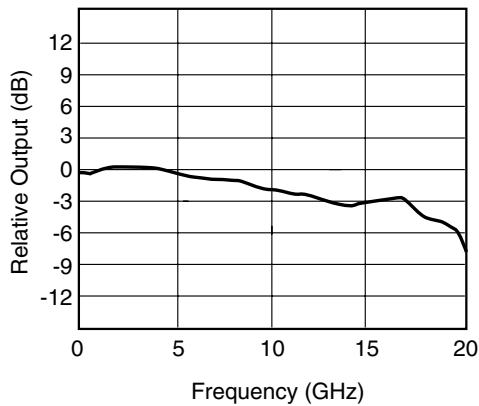
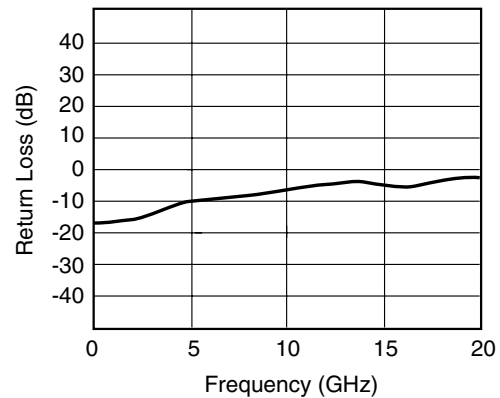
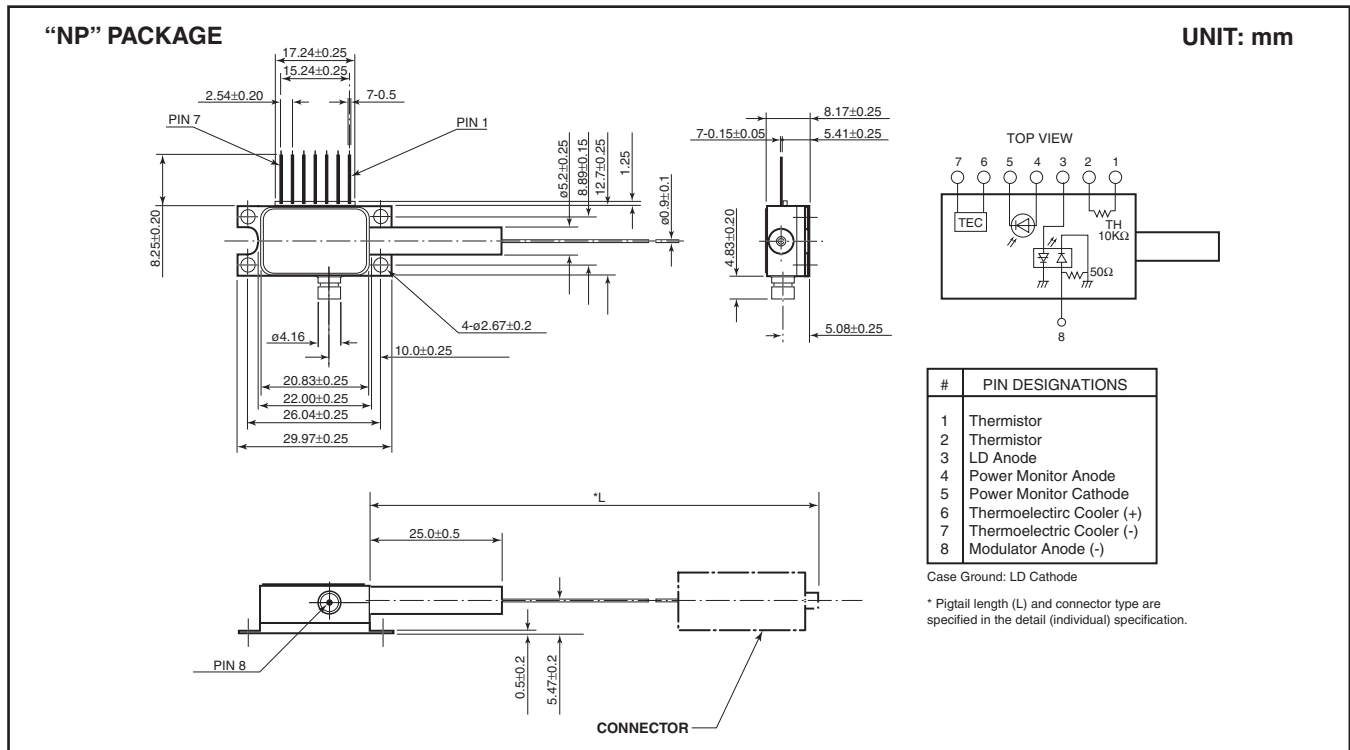


Fig. 5 RF Return Loss (S11)



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1,310nm Modulator Integrated DFB Laser



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