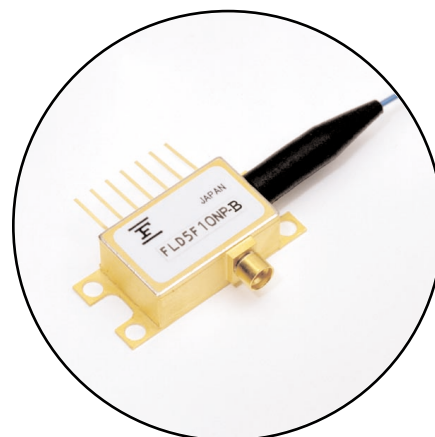


1,550nm MQW-DFB Modulator Integrated Laser

FLD5F10NP-B

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 SMP connection
- Built-in optical isolator, monitor photodiode, thermistor, and thermo-electric cooler
- $\lambda/4$ shifted MQW-DFB chip



APPLICATION

This MI laser is intended for intermediate short reach applications ($\geq 20\text{km}$) 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) $\lambda/4$ shifted Multi QuantumWell (MQW) 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 8.3 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 YAG welded optical coupling system. The module includes an optical isolator, monitor photodiode, thermistor and a thermo-electric cooler.

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

Parameter	Symbol	Condition	Ratings	Unit
Operating Case Temperature	T_{op}	-	-20 to +70	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-	-40 to +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 to +1	V
Photodiode Forward Current	I_{DF}	-	1	mA
Photodiode Reverse Voltage	V_{DR}	-	10	V
TEC Voltage	V_{c}	-	2.5	V
TEC Current	I_{c}	-	1.4	A
Lead Soldering Time	T_{sold}	260 $^{\circ}\text{C}$	10	sec

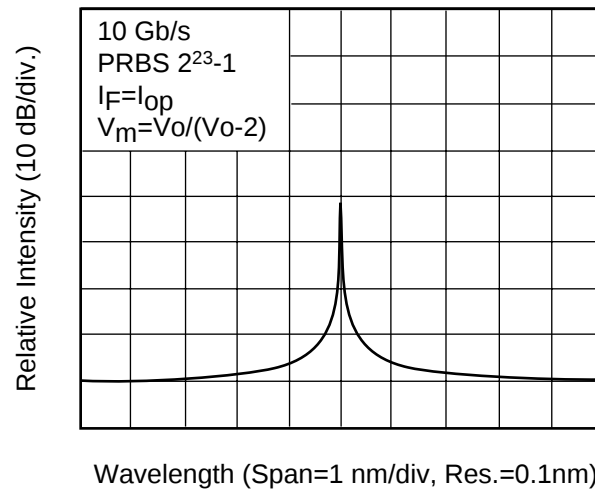
OPTICAL & ELECTRICAL CHARACTERISTICS ($T_L = T_{set}$, $T_C = 25^\circ\text{C}$, BOL, unless otherwise specified)

Parameter	Symbol	Test Condition	Limits			Unit
			Min.	Type	Max.	
Peak Wavelength	λ_p	Note (2)	1530	-	1565	nm
Sidemode Suppression Ratio	SSR		35	-	-	dB
On Level Modulation	V_O	-	0.7	-	0	V
Modulator Drive Voltage	V_{mod}	$(V_O - V_{mod}) \geq -3.3\text{V}$, $R_{ext} = 8.3\text{dB}$	-	-	2.6	V
Threshold Current	I_{th}	CW, $V_m = V_O$	-	-	30	mA
Operating Current	I_{op}	CW, $V_m = V_O$, $I_F = I_{th}$	50	-	100	mA
Dispersion Penalty	dP	Note (1)	-	-	2	dB
Optical Output Power (Avg. Power)	Pf		-2	-	-	dBm
Forward Voltage	V_F	CW, $I_F = I_{op}$	-	1.4	2.0	V
Extinction Ratio	R_{ext}	$f = 10\text{Gb/s}$, $I_F = I_{op}$, $V_m = V_O / V_O - V_{mod} $	8.3	-	-	dB
Rise Time	T_r	Note (2), 20 to 80%	-	20	40	ps
Fall Time	T_f		-	20	40	ps
RF Return Loss	S_{11}	$f = \text{DC} - 5\text{GHz}$, 50Ω Test Set, $V_m = V_O$, $I_F = I_{op}$	8	-	-	dB
RF Return Loss	S_{11}	$f = 5 - 10\text{GHz}$, 50Ω Test Set, $V_m = V_O$, $I_F = I_{op}$	3	-	-	dB
Cut-off Frequency	S_{21}	-3dB bandwidth, $V_m = V_O - 0.5 V_{mod} $, $I_F = I_{op}$	10	-	-	GHz
Monitor Current	I_m	Note (2)	0.04	-	1.1	mA
Relative Intensity Noise	RIN	$f = 10\text{ MHz} \sim 8.5\text{ GHz}$, $V_m = V_O$, $I_F = I_{op}$, 8% Reflection	-	-	-120	dB/Hz
Optical Isolation	I_s	$T_C = -20$ to $+65^\circ\text{C}$	25	35	-	dB
TEC Power Dissipation	P_{TEC}	$I_F = I_{op}$	-	-	2.4	W
Thermistor Resistance	R_{tr}	T_C , $T_L = +25^\circ\text{C}$	9.5	10.0	10.5	$\text{K}\Omega$
Thermistor B Constant	B		3270	3450	3630	K

Note (1) FUJITSU Test System
 9.95328Gb/s, PRBS, $2^{23}-1$, $I_F = I_{op}$, $V_m = V_O$ and $(V_O - V_{mod})$
 Dispersion = 400ps/nm, Dispersion penalty at
 Bit Error Rate = $1.0\text{E}-10$

Note (2) FUJITSU Test System
 9.95328Gb/s, PRBS, $2^{23}-1$, $I_F = I_{op}$, $V_m = V_O$ and $(V_O - V_{mod})$

Fig. 1 Lasing Spectrum



**Fig. 2 Forward Current vs. Output Power and
Forward Current vs. Forward Voltage**

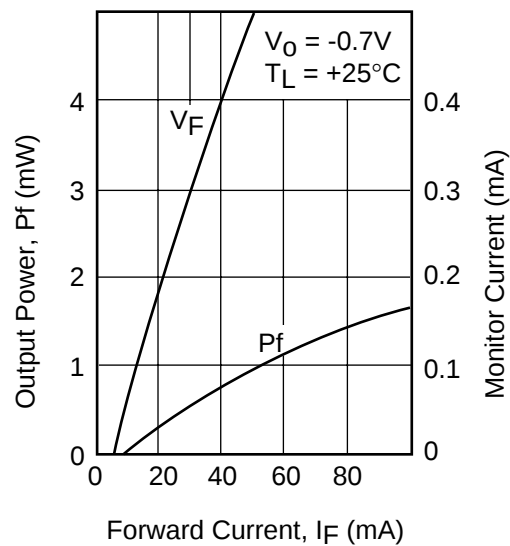


Fig. 3 Extinction Ratio
vs. Modulation Voltage

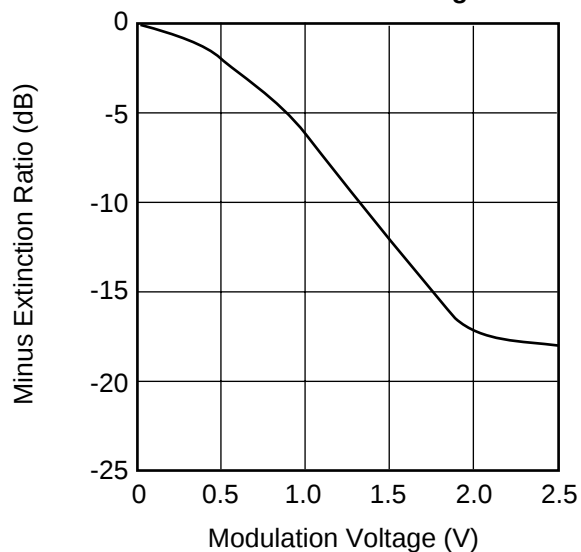


Fig. 4 Cut-off Frequency (S21)

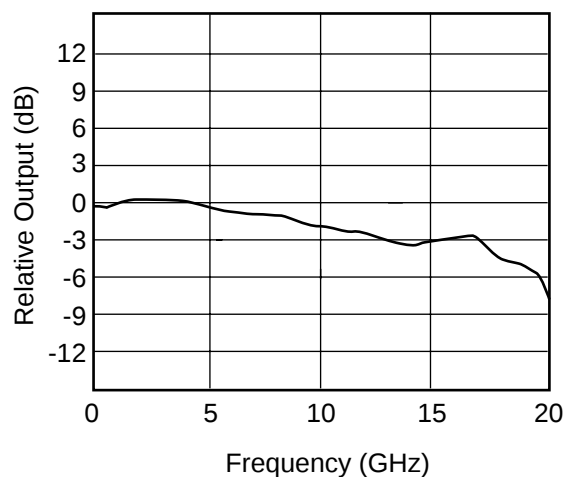


Fig. 5 RF Return Loss (S11)

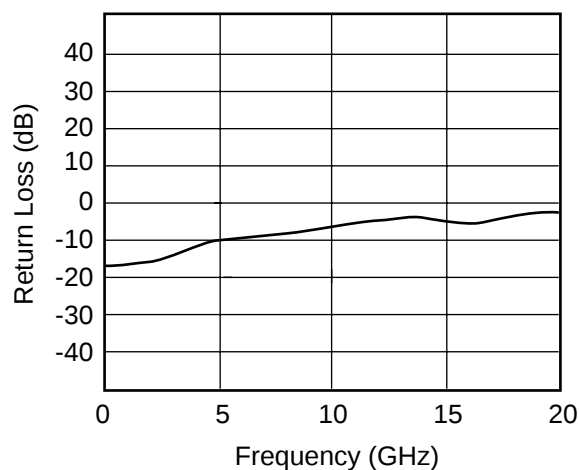
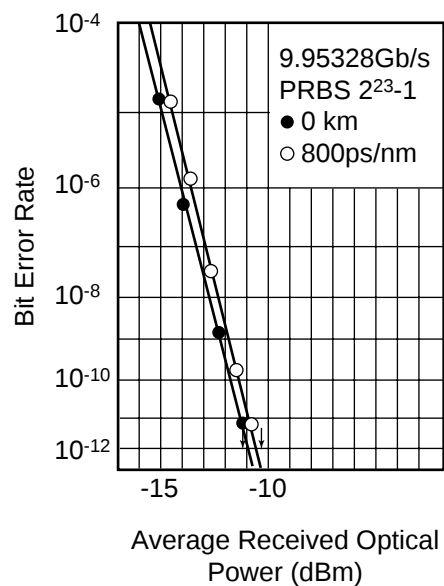
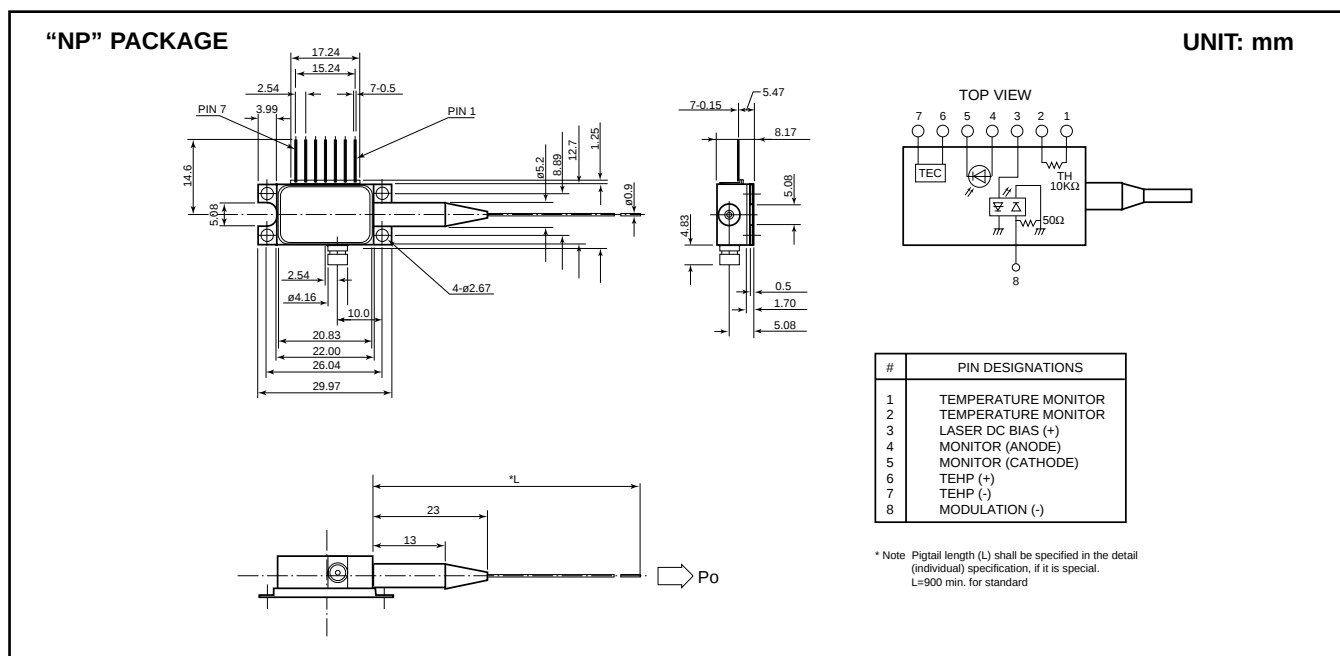


Fig. 6 Transmission Characteristics



1,550nm MQW-DFB _____ **FLD5F10NP-B**
Modulator Integrated Laser

Notes



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