

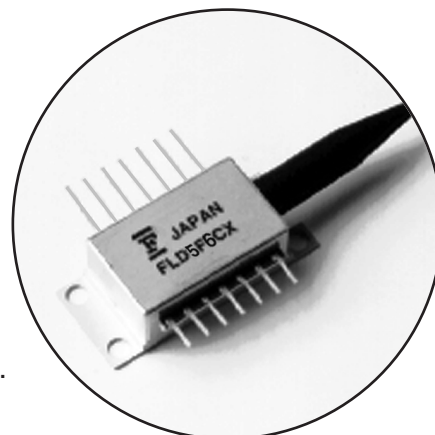
1,550nm MQW-DFB FLD5F6CX-E DWDM Direct Modulation Laser

FEATURES

- Direct Modulation MQW DFB Laser
- Built-in TEC, Thermistor and Monitor PD
- 14-Pin Butterfly Type Module
- Low Residual Chirp
- Optimized for 2.5 Gb/s Modulation Rates
- Selected wavelengths according to ITU-T grid available

APPLICATIONS

This MQW laser is intended for application in 2.5 Gb/s long haul Dense Wavelength Division Multiplexing (DWDM) systems. Transmission spans of 100 km are possible without amplification.



DESCRIPTION

The Multiple Quantum Well (MQW) Laser is a high power laser capable of 2.5 Gb/s transmission. It is packaged in a “butterfly” type module. The module employs a high efficiency optical coupling system, coupling the laser output through a built-in optical isolator into a single mode fiber pigtail. The modules also include 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)

Parameter	Symbol	Condition	Ratings	Unit
Storage Temperature	T _{stg}	-	-40 to +70	°C
Operating Case Temperature	T _{op}	-	-20 to +65	°C
Optical Output Power	P _f	CW	5.0	mW
Forward Current	I _F	CW	150	mA
Reverse Voltage	V _R	-	2	V
Photodiode Reverse Voltage	V _{DR}	-	20	V
Photodiode Forward Current	I _{DF}	-	10	mA
TEC Voltage	V _c	-	2.5	V
TEC Current	I _c	-	1.4	A
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 _{st} <30°C	95	%

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

Parameter	Symbol	Conditions	Limits			Unit
			Min.	Typ.	Max.	
Laser Set Temperature	T_{set}	-	15	-	35	$^\circ\text{C}$
Threshold Current	I_{th}	CW	3	-	40	mA
Forward Voltage	V_{FDC}	CW, $I_F=30\text{ mA}$, pin 12-13	-	1.6	1.75	V
Series Resistance	R_S	CW, pin 12-13	22	25	28	Ω
Reverse Voltage	V_R	CW, at $I_R<1500\mu\text{A}$	2	-	-	V
Optical Output Power	P_f	CW	2.0	-	-	mW
Slope Efficiency	η	CW, $P_f=2.0\text{mW}$	0.035	-	-	mW/mA
Threshold Power	P_{th}	$I_F=I_{th}$, CW	-	-	50	μW
Tracking Error (Note 1)	TE	$P_f=2.0\text{mW}$, $T_C=-20\text{ to }65^\circ\text{C}$	-0.5	-	+0.5	dB
Monitor Current	I_m	CW, $P_f=2.0\text{mW}$, $V_{DR}=5\text{V}$	0.10	-	1.0	mA
Photodiode Dark Current	I_D	$V_{DR}=5\text{V}$	-	2	100	nA
Photodiode Capacitance	C_t	$V_{DR}=5\text{V}$, $f=1\text{ MHz}$	-	-	10	pF
Photodiode Cutoff Frequency	f_{cm}	$V_{DR}=5\text{V}$, 50Ω load	100	-	-	MHz
Peak Wavelength	λ_p	Note (2)	Note (4)			nm
Wavelength Drift	-	after 20 years	-	-	0.2	nm
Wavelength Stability with Case Temperature	-	-	-	-	+/-2	pm/ $^\circ\text{C}$
Side Mode Suppression	S_r	Note (2)	33	35	-	dB
Spectral Width (-20dB)	-	Note (2)	-	-	0.5	nm
Rise Time (10%-90%)	t_r	Note (2)	-	0.1	0.125	nsec
Fall Time (10%-90%)	t_f	Note (2)	-	0.1	0.125	nsec
Cutoff Frequency	f_c	$P_f=2.0\text{mW}$, -3 dB	4.0	-	-	GHz
In-Band Ripple (Window)	S_{21}	$f=50\text{ MHz}\sim 3\text{ GHz}$	-	-	+/-1.5	dB
RF Return Loss	S_{11}	$f=50\text{ MHz}\sim 2\text{ GHz}$	8	-	-	dB
		$f=2\text{ GHz}\sim 3\text{ GHz}$	6	-	-	dB
		$f=3\text{ GHz}\sim 5\text{ GHz}$	3	-	-	dB
Optical Isolation	I_s	$T_C=-20\text{ to }65^\circ\text{C}$	25	35	-	dB
Relative Intensity Noise	RIN	$f=2.5\text{ GHz}$ $P_f=2.0\text{ mW}$, ORL=24 dB	-	-	-140	dB/Hz
Kinks (up to 2.4 mW)	K_{ns}	-	None			
Pulsation	-	-	None			
BER Performance	ER	Note (3)	No Floor			
Power Penalty	PP	Note (3)	-	-	1.5	dB

Note 1. $TE=10\cdot\log(P_f(T_{case})/P_f(T_C=25^\circ\text{C}))\text{dB}$, APCNote 2. 2.5 Gb/s NRZ, pseudo-random, $P_b=0.2\text{mW}$, $P_{peak}=2.0\text{mW}$ Note 3. Bit rate=2.48832 Gb/s, PRBS=2²³-1, Dispersion=1,800 ps/nm (116km), $P_{peak}=2.0\text{mW}$, $P_{bias}=0.2\text{mW}$ (Extinction ratio=10dB), B.E.R.= 1×10^{-10} Decision point: Center of Back-to-Back at 10⁻⁹, Receiver: Fujitsu Standard Receiver

Note 4. The selected wavelength is available which is listed in Fig. 8

1,550nm MQW-DFB DWDM Direct Modulation Laser

FLD5F6CX-E

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.	
TEC Current	I_C	$T_L = T_{set}$, $P_f = 2\text{mW}$, $T_C = 65^\circ\text{C}$	-	-	1.0	A
TEC Voltage	V_C	$T_L = T_{set}$, $P_f = 2\text{mW}$, $T_C = 65^\circ\text{C}$	-	-	2.4	V
Cooler Power	P_{TEC}	$T_L = T_{set}$, $P_f = 2\text{mW}$, $T_C = 65^\circ\text{C}$	-	-	2.4	W
TEC Resistance	R_{TEC}	$T_L = T_{set}$, $P_f = 2\text{mW}$, $T_C = 65^\circ\text{C}$	2.0	2.4	3.2	Ω
Thermistor Resistance	R_{tr}	$T_L = 15 \text{ to } 35^\circ\text{C}$	6.3	-	15.4	$\text{k}\Omega$
Thermistor B Constant	B	-	3,270	3,450	3,630	K

Fig. 1 Forward Current vs Output Power

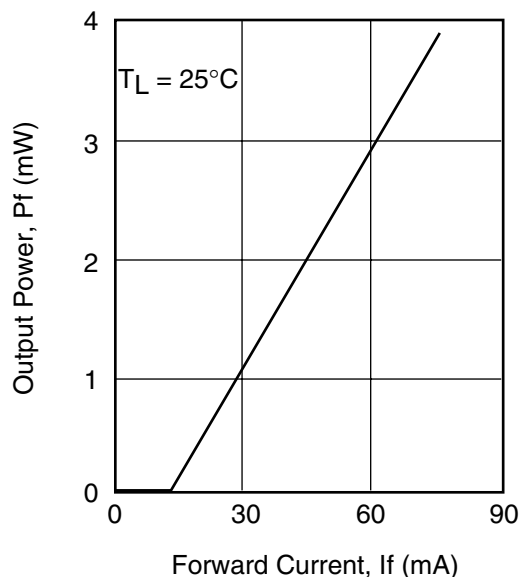


Fig. 2 Frequency Response

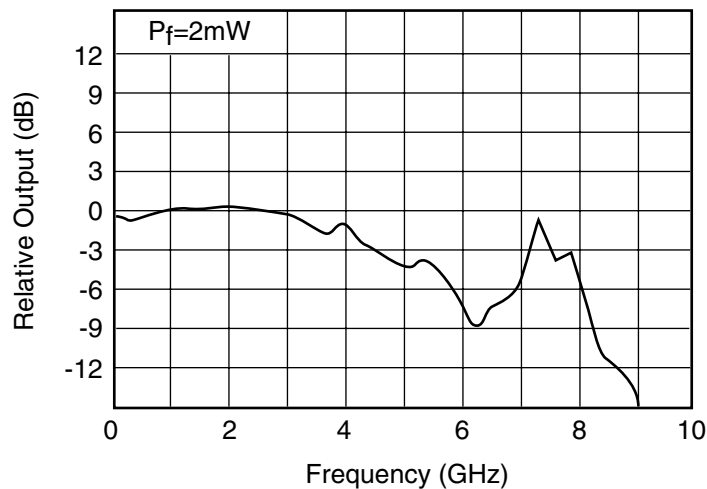


Fig. 3 RF Return Loss

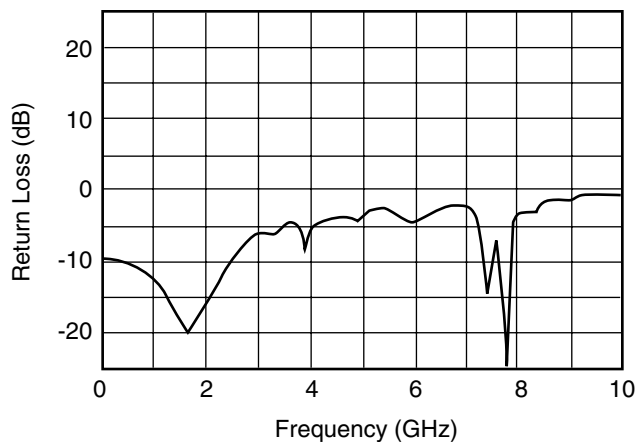


Fig. 4 Cooler Voltage -Current

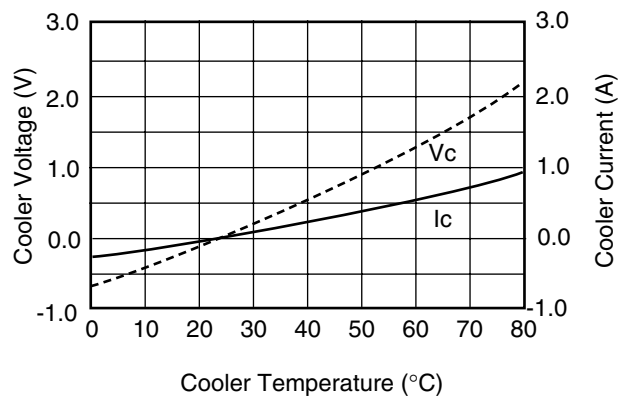


Fig. 5 Spectrum

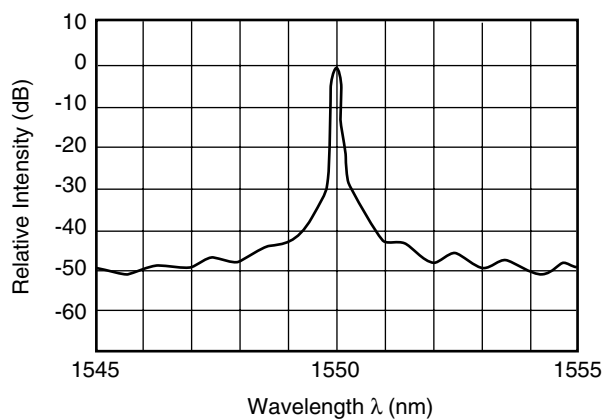


Fig. 6 Temperature Dependence of Wavelength

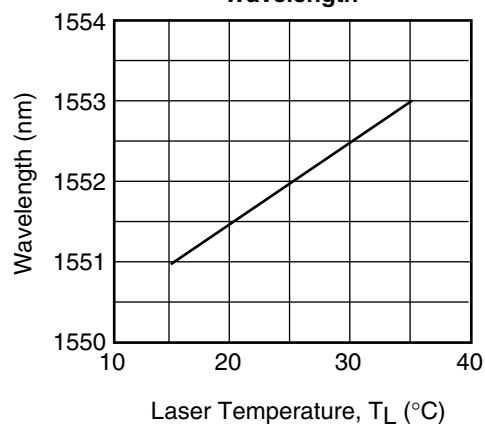


Fig. 7 Transmission Characteristics

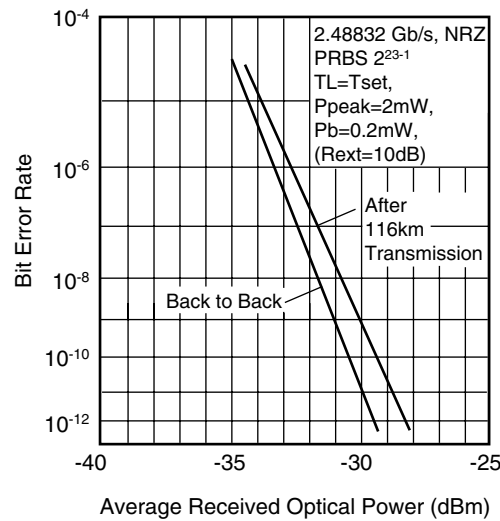


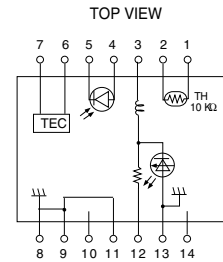
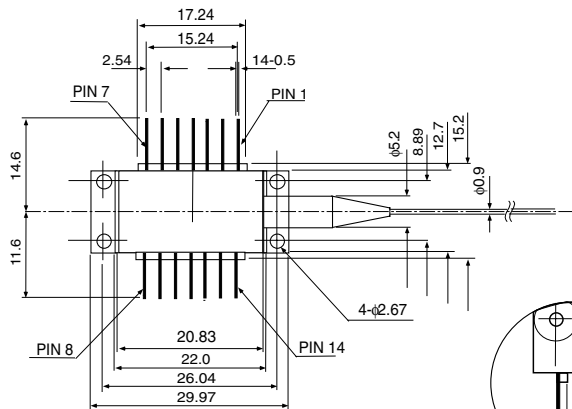
Fig. 8 Wavelength Table

Part Number	Wavelength (nm) (TL=Tset) (in vacuum)	Tolerance (nm)
FLD5F6CX-E62	1527.99	±0.1
-E61	1528.77	±0.1
-E60	1529.55	±0.1
-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
-E20	1561.42	±0.1
-E19	1562.23	±0.1
-E18	1563.05	±0.1

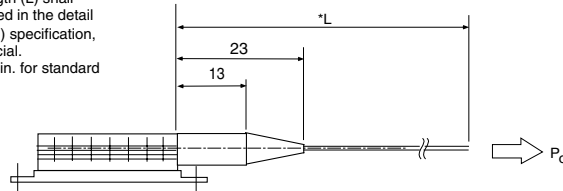
"CX" PACKAGE

UNIT: mm



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

* Pigtail length (L) shall be specified in the detail (individual) specification, if it is special.
L=1500 min. for standard



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