

1,550nm DFB DWDM Direct Modulation Laser

FLD5F6CX-J

FEATURES

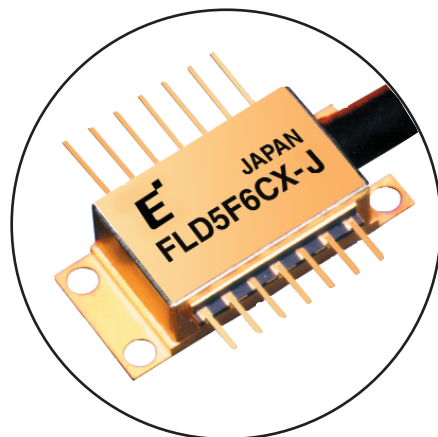
- Direct Modulated DFB Laser
- Built-in TEC, Thermistor and Monitor PD
- 14-Pin Butterfly Type Module
- 10mW Output Power
- Low Residual Chirp
- Optimized for 2.5 Gb/s Modulation Rates
- Selected wavelengths according to ITU-T grid available

APPLICATIONS

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

DESCRIPTION

The FLD5F6CX-J 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 module also includes a monitor photodiode, a thermoelectric cooler (TEC) and thermistor. This device is optimally designed for use in DWDM direct modulation transmission systems. Selected wavelengths are available to the specified ITU-T grid.



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

Parameter	Symbol	Condition	Rating		Unit
			Min.	Max.	
Storage Temperature	T _{stg}	-	-40	+70	°C
Operating Case Temperature	T _{op}	-	-20	+65	°C
Optical Output Power	P _f	CW	-	12	mW
Laser Forward Current	I _F	CW	-	150	mA
Laser Reverse Voltage	V _R	CW	-	2	V
Photodiode Forward Current	-	-	-	10	mA
Photodiode Reverse Voltage	V _{DR}	-	-	20	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	-20	+65	°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 ($T_L=T_{set}$, $T_C=25^{\circ}\text{C}$, BOL, unless otherwise specified)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Laser Set Temperature	T_{set}	-	20	-	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
Optical Output Power	P_f	CW	10.0	-	-	mW
Slope Efficiency	η	CW, $P_f=10\text{mW}$	0.14	-	-	mW/mA
Threshold Power	P_{th}	$I_F=I_{th}$, CW	-	-	150	μW
Tracking Error (Note 1)	TE	$P_f=10\text{mW}$, $T_C=-20\text{ to }65^{\circ}\text{C}$, APC	-0.5	-	+0.5	dB
Monitor Current	I_m	CW, $P_f=10\text{mW}$, $V_{DR}=5\text{V}$	0.25	-	2.5	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	$\Delta\lambda$	after 20 years	-200	-	+200	pm
Wavelength Stability with Case Temperature	$d\lambda/dT_C$	$T_C=-20\text{ to }65^{\circ}\text{C}$	-1	-	+1	pm/ $^{\circ}\text{C}$
Side Mode Suppression	S_r	Note (2)	33	35	-	dB
Spectral Width (-20dB)	$\delta\lambda$	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	$P_f=10\text{mW}$, -3 dB	4.0	-	-	GHz
In-Band Ripple (Window)	S_{21}	$f=50\text{ MHz to }3\text{ GHz}$	-1.5	-	+1.5	dB
RF Return Loss	S_{11}	$f=50\text{ MHz to }2\text{ GHz}$	8	-	-	dB
		$f=2\text{ GHz to }3\text{ GHz}$	6	-	-	dB
		$f=3\text{ GHz to }5\text{ GHz}$	3	-	-	dB
Optical Isolation	I_s	$T_C=-20\text{ to }65^{\circ}\text{C}$	25	35	-	dB
Relative Intensity Noise	RIN	$f=2.5\text{ GHz}$ $P_f=10\text{ mW}$, ORL=24 dB	-	-	-140	dB/Hz
Kinks	Kns	up to 12 mW	None			
Pulsation	-	-	None			
BER Performance	ER	Note (3)	No Floor			
Dispersion Penalty	dP	Note (3)	-	-	2.0	dB

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	$T_L = T_{set}$, $P_f = 10\text{mW}$, $T_C = 65^\circ\text{C}$	-	-	1.0	A
TEC Voltage	V_C	$T_L = T_{set}$, $P_f = 10\text{mW}$, $T_C = 65^\circ\text{C}$	-	-	2.4	V
Cooler Power	P_C	$T_L = T_{set}$, $P_f = 10\text{mW}$, $T_C = 65^\circ\text{C}$	-	-	2.4	W
TEC Resistance	R_C	$T_L = T_{set}$, $P_f = 10\text{mW}$, $T_C = 65^\circ\text{C}$	2.0	2.4	3.2	Ω
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

Note 1. $TE = 10 \cdot \log\{P_f(T_{case})/P_f(T_C = 25^\circ\text{C})\}$ dB

Note 2. 2.5 Gb/s NRZ, $P_{peak} = 2.0\text{mW}$, $R_{ext} = 8.2\text{dB}$, PRBS=2²³-1,

Note 3. Bit rate=2.48832 Gb/s, PRBS=2²³-1, Dispersion=1,800 ps/nm, $P_{peak} = 10\text{mW}$,
 $R_{ext} = 10\text{dB}$

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

Fig. 1 Forward Current vs Output Power

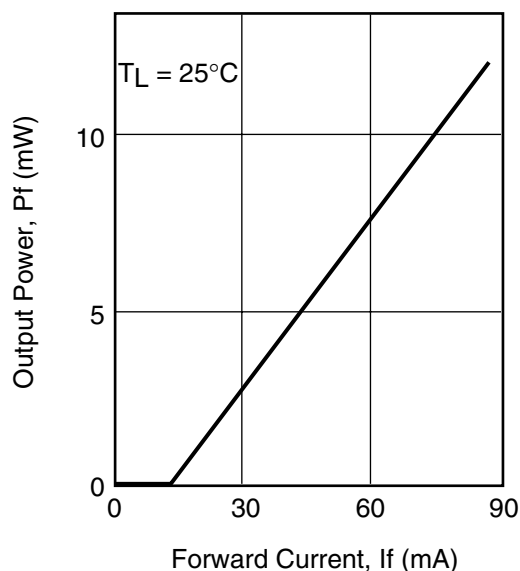


Fig. 2 Frequency Response

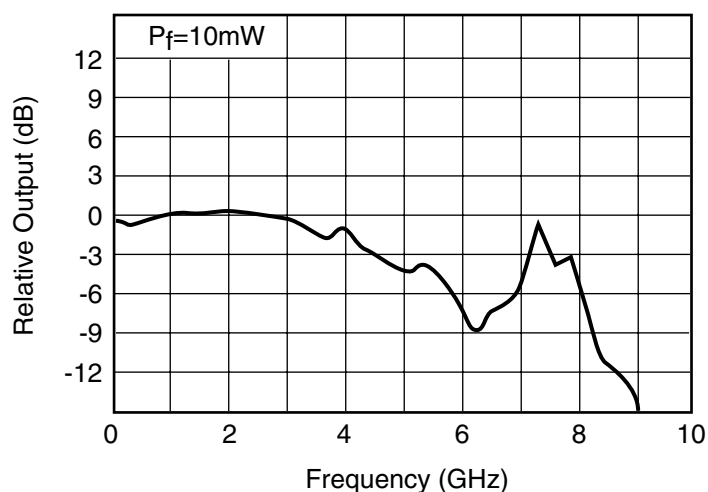


Fig. 3 RF Return Loss

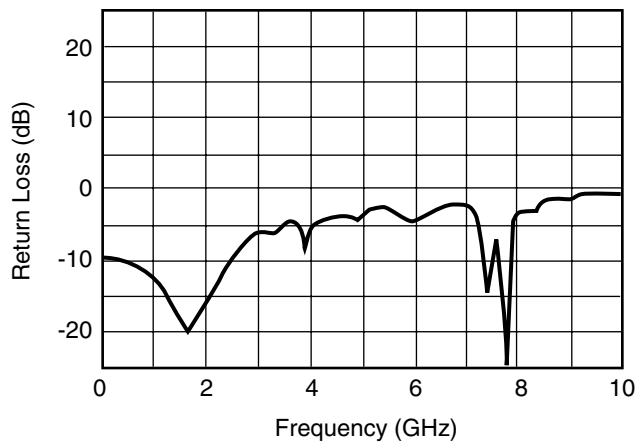


Fig. 4 Cooler Voltage -Current

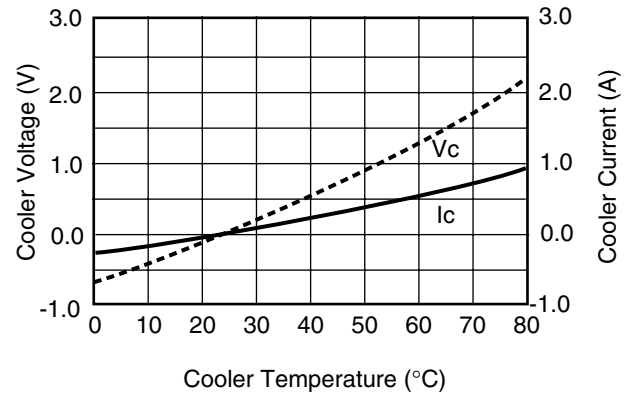


Fig. 5 Spectrum

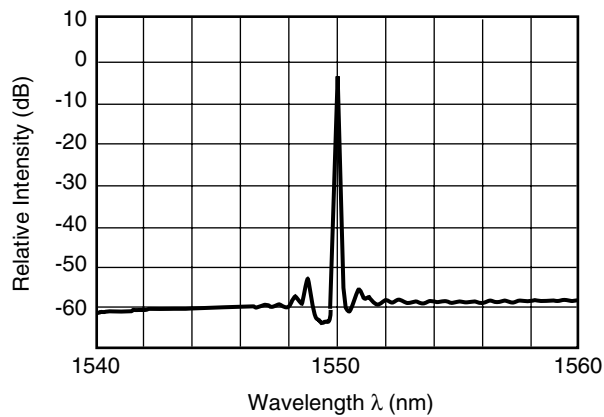


Fig. 6 Temperature Dependence of Wavelength(ACC Operation)

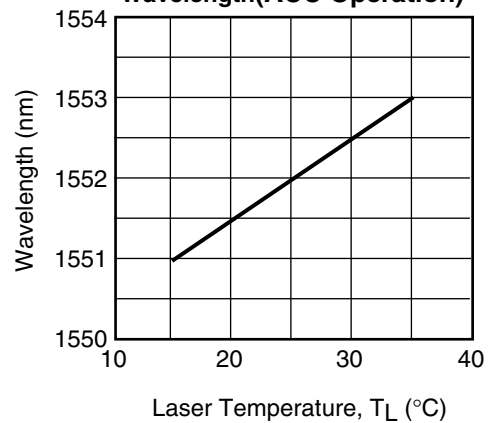


Fig. 7 Transmission Characteristics

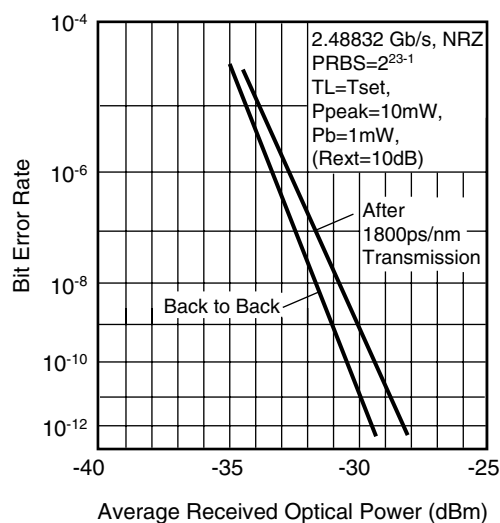


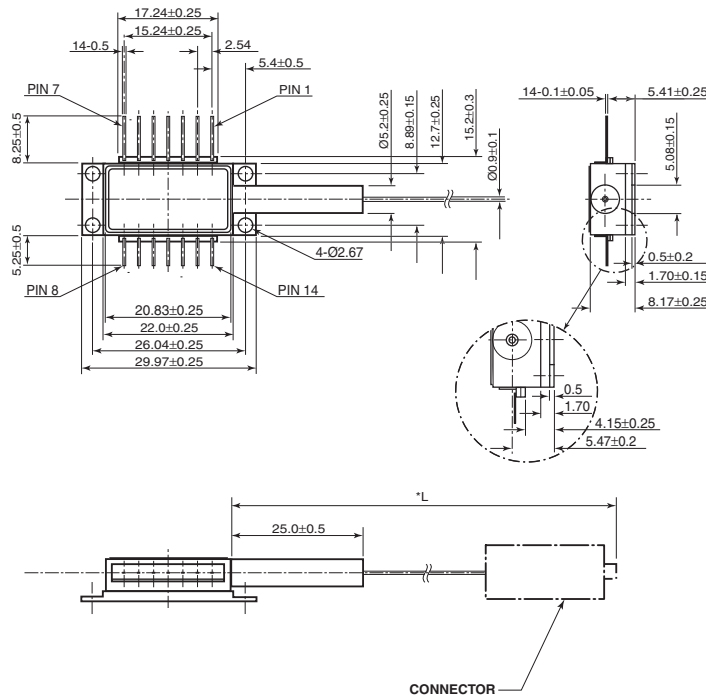
Fig. 8 Wavelength Table

Part Number	Wavelength (nm) (TL=Tset) (in vacuum)	Tolerance (nm)
FLD5F6CX-J62	1527.99	±0.1
-J61	1528.77	±0.1
-J60	1529.55	±0.1
-J59	1530.33	±0.1
-J58	1531.12	±0.1
-J57	1531.90	±0.1
-J56	1532.68	±0.1
-J55	1533.47	±0.1
-J54	1534.25	±0.1
-J53	1535.04	±0.1
-J52	1535.82	±0.1
-J51	1536.61	±0.1
-J50	1537.40	±0.1
-J49	1538.19	±0.1
-J48	1538.98	±0.1
-J47	1539.77	±0.1
-J46	1540.56	±0.1
-J45	1541.35	±0.1
-J44	1542.14	±0.1
-J43	1542.94	±0.1
-J42	1543.73	±0.1

-J41	1544.53	±0.1
-J40	1545.32	±0.1
-J39	1546.12	±0.1
-J38	1546.92	±0.1
-J37	1547.72	±0.1
-J36	1548.51	±0.1
-J35	1549.32	±0.1
-J34	1550.12	±0.1
-J33	1550.92	±0.1
-J32	1551.72	±0.1
-J31	1552.52	±0.1
-J30	1553.33	±0.1
-J29	1554.13	±0.1
-J28	1554.94	±0.1
-J27	1555.75	±0.1
-J26	1556.55	±0.1
-J25	1557.36	±0.1
-J24	1558.17	±0.1
-J23	1558.98	±0.1
-J22	1559.79	±0.1
-J21	1560.61	±0.1
-J20	1561.42	±0.1
-J19	1562.23	±0.1
-J18	1563.05	±0.1

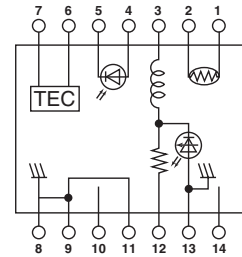
"CX" PACKAGE

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.



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