

1,550nm DFB DWDM Direct Modulation Laser

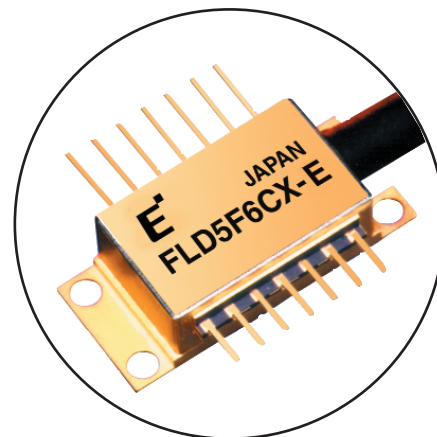
FLD5F6CX-E

FEATURES

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



DESCRIPTION

The FLD5FCX-E is capable of 2.5 Gb/s transmission. It is packaged in a “butterfly” type module. The module employs a highly stable 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	-	5	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}	Top<30°C	-	95	%
Environmental Storage Humidity	X _{st}	Tstg<30°C	-	95	%

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_L=T_{set}, T_C=25°C, BOL, unless otherwise specified)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Laser Set Temperature	T _{set}	-	15	-	35	°C
Threshold Current	I _{th}	CW	3	-	40	mA
Forward Voltage	V _{FDC}	CW, I _F =30 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	2.0	-	-	mW
Slope Efficiency	η	CW, P _f =2.0mW	0.035	-	-	mW/mA
Threshold Power	P _{th}	I _F =I _{th} , CW	-	-	50	μW
Tracking Error (Note 1)	TE	P _f =2.0mW, T _C = -20 to 65°C	-0.5	-	+0.5	dB
Monitor Current	I _m	CW, P _f =2.0mW, V _{DR} =5V	0.10	-	1.0	mA
Photodiode Dark Current	I _D	V _{DR} =5V	-	2	100	nA
Photodiode Capacitance	C _t	V _{DR} =5V, f=1 MHz	-	-	10	pF
Photodiode Cutoff Frequency	f _{cm}	V _{DR} =5V, 50Ω load	100	-	-	MHz
Peak Wavelength	λ _p	Note (2)	Note (4)			nm
Wavelength Drift	-	after 20 years	-200	-	+200	pm
Wavelength Stability with Case Temperature	dλ/dT _C	T _C = -20 to 65°C	-1	-	+1	pm/°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 =2.0mW, -3 dB	4.0	-	-	GHz
In-Band Ripple (Window)	S ₂₁	f=50 MHz~3 GHz	-1.5	-	+1.5	dB
RF Return Loss	S ₁₁	f=50 MHz~2 GHz	8	-	-	dB
		f=2 GHz~3 GHz	6	-	-	dB
		f=3 GHz~5 GHz	3	-	-	dB
Optical Isolation	I _S	T _C = -20 to 65°C	25	35	-	dB
Relative Intensity Noise	RIN	f=2.5 GHz P _f =2.0 mW, ORL=24 dB	-	-	-140	dB/Hz
Kinks	Kns	up to 2.4 mW	None			
Pulsation	-	-	None			
BER Performance	ER	Note (3)	No Floor			
Power Penalty	PP	Note (3)	-	-	1.5	dB

Note 1. TE=10*log(pf(Tcase)/Pf(Tc=25°C))dB, APC

Note 2. 2.5 Gb/s NRZ, pseudo-random, Pb=0.2mW, Ppeak=2.0mW

Note 3. Bit rate=2.48832 Gb/s, PRBS=2²³-1, Dispersion=1,800 ps/nm, Ppeak=2.0mW,

Pbias=0.2mW (Extinction ratio=10dB), B.E.R.=1x10⁻¹⁰

Decision point: Center of Back-to-Back at 10⁻⁹, Receiver: Eudyna Standard Receiver

Note 4. The selected wavelengths available are listed in Fig. 8

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_C	$T_L=T_{set}$, $P_f=2\text{mW}$, $T_C=65^\circ\text{C}$	-	-	2.4	W
TEC Resistance	R_C	$T_L=T_{set}$, $P_f=2\text{mW}$, $T_C=65^\circ\text{C}$	2.0	2.4	3.2	Ω
Thermistor Resistance	R_{tr}	$T_L=25^\circ\text{C}$	9.5	10.0	10.5	k Ω
Thermistor B Constant	B	-	3,270	3,450	3,630	K

Fig. 1 Forward Current vs Output Power

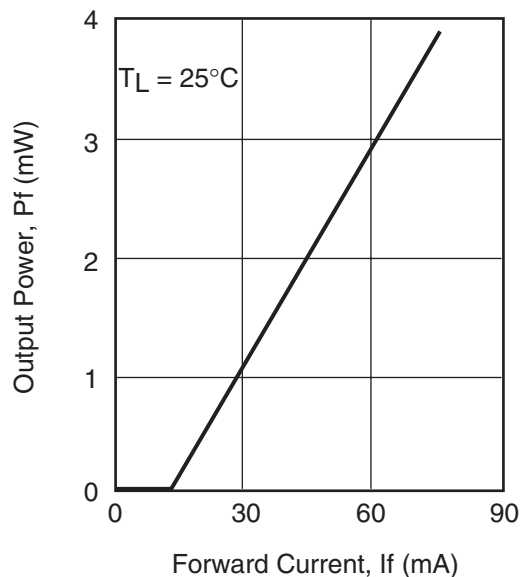


Fig. 2 Frequency Response

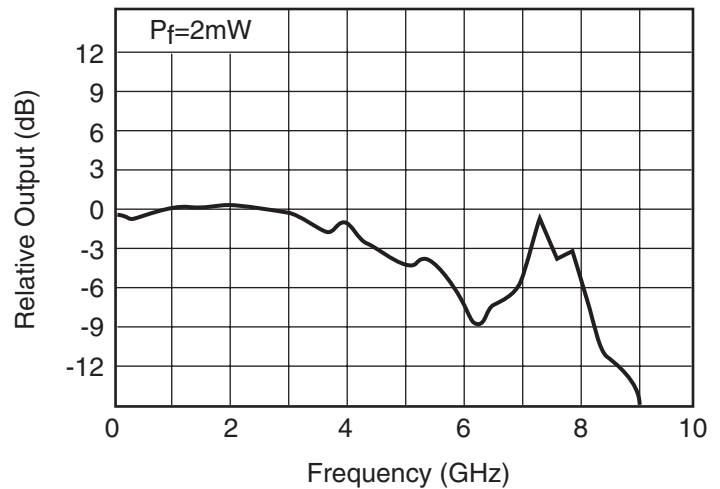


Fig. 3 RF Return Loss

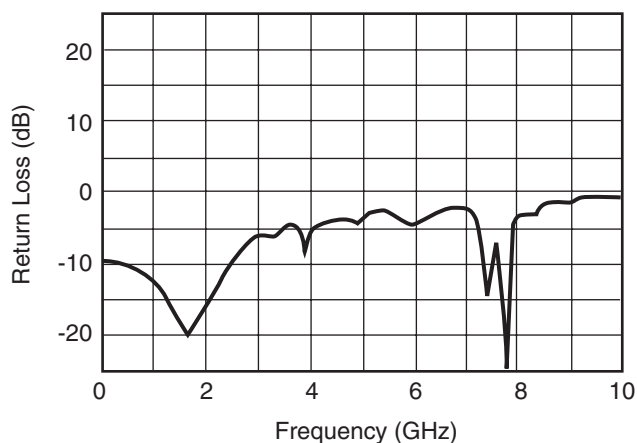


Fig. 4 Cooler Voltage -Current

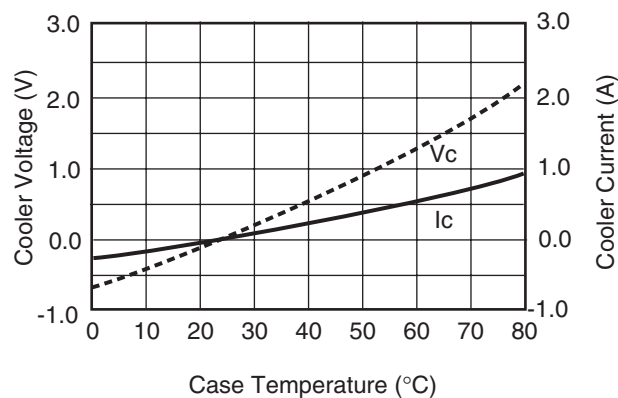


Fig. 5 Spectrum

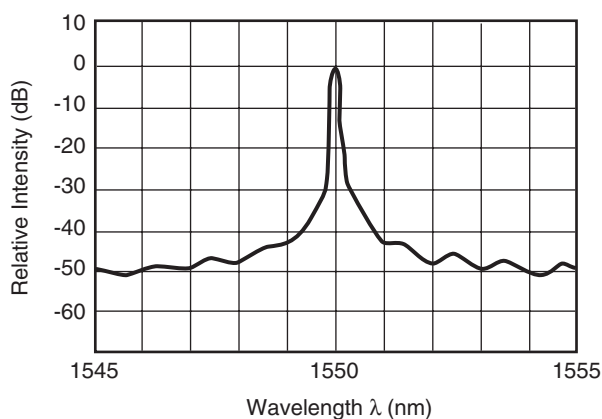


Fig. 6 Temperature Dependence of Wavelength(ACC Operation)

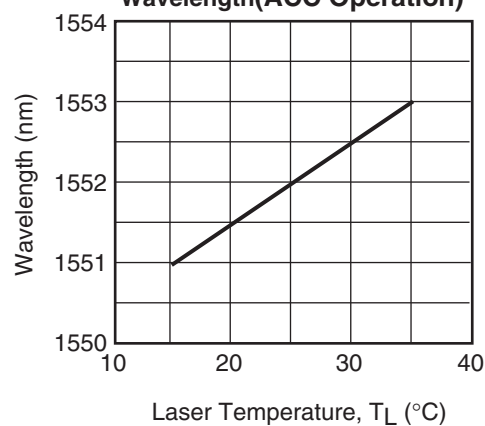


Fig. 7 Transmission Characteristics

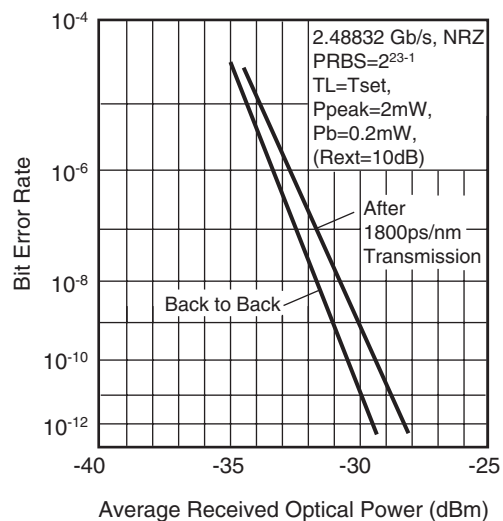


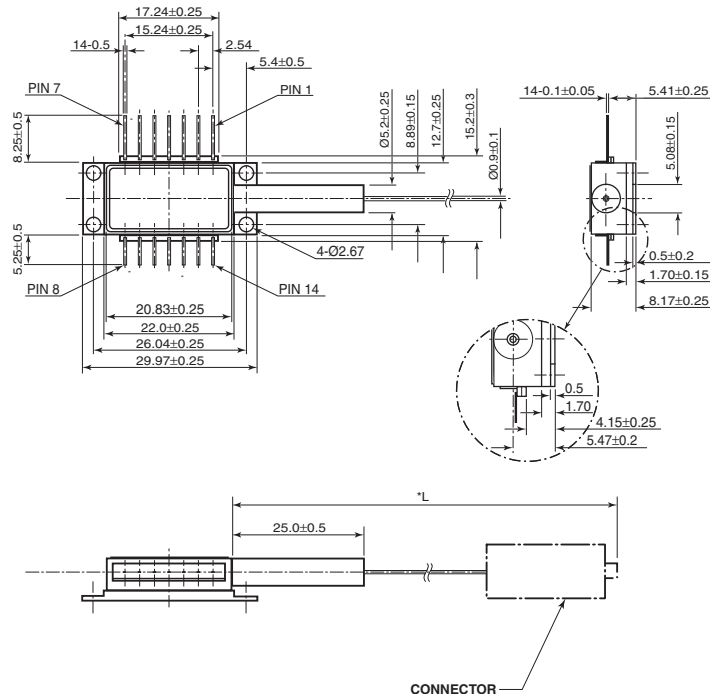
Fig. 8 Wavelength Table

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

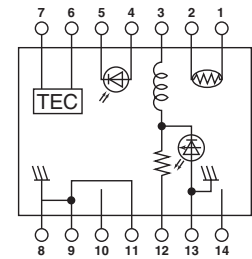
"CX" PACKAGE

UNIT: mm



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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