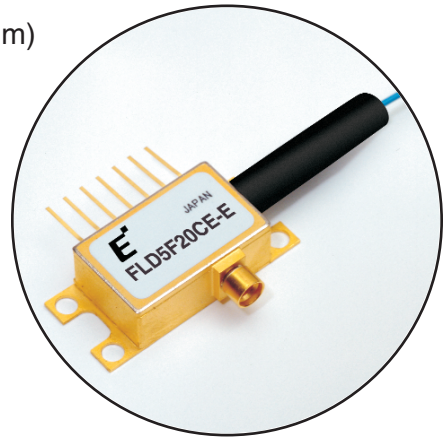
1,550nm MI DFB Laser with Integrated Wavelength Locker — FLD5F20CE-E

FEATURES

- 10Gb/s Modulator Integrated DFB Laser Diode Module
- Wavelength: ITU-T grid W9180 (1563.05nm) thru W9600 (1529.55nm)
- 1600 ps/nm Dispersion
- Compact package with GPO connector
- Built-in Optical Isolator, Ternary PIN-PD for monitor, thermistor and thermoelectric cooler
- Wavelength locker integrated MI-DFB



APPLICATION

This MI DFB laser is intended for long reach applications (80km) at 10Gb/s.

DESCRIPTION

The Modulator Integrated DFB Laser (MI DFB Laser) with Wavelength Locker 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 that 10dB can be achieved with 2.6 Vp-p modulation. The MI laser is installed in a butterfly type package. The tuned wavelength can be locked onto the desired ITU-T grid channel via use of the included fabry-perot etalon. The module incorporates a highly stable optical coupling system. The module includes an optical isolator, monitor photodiode, thermistor and a thermo-electric cooler.

ABSOLUTE MAXIMUM RATINGS (T_{op}=25°C, unless otherwise specified)

Parameter	Symbol	Condition	Rating		Unit
			Min.	Max.	
Operating Case Temperature	T_{op}	-	-20	+70	°C
Storage Temperature	T_{stg}	-	-40	+85	°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	-	+5	V
		Heating	-5	-	
TEC Current	I_c	Cooling	-	+2.5	A
		Heating	-0.6	-	
Thermistor Temperature	Tth	ATC Operation	-20	+70	°C
Lead Soldering Time	-	260°C	-	10	sec

OPTICAL & ELECTRICAL CHARACTERISTICS
(Laser Temperature $T_L = T_{set}$, T_{op} = 25°C, BOL, unless otherwise specified)

Parameter	Symbol	Test Condition	Limits			Unit
			Min.	Type	Max.	
Laser Set Temperature	T_{set}		15	-	35	°C
Peak Wavelength	W_p	Note (1)	Note (3)			nm
Wavelength Drift (After 20 Years)	-		-25	-	25	pm
Wavelength Stability with Case Temperature	-		-0.2	-	+0.2	pm/°C
Tunability	-		-	1	-	Channel
Threshold Current	I_{th}	CW, $V_m=V_o$	-	-	30	mA
Threshold Power	P_{th}	CW, $I_F=I_{th}$, $V_m=V_o$	-	-	75	μW
Operating Current	I_{op}		40	-	100	mA
Forward Voltage	V_F	CW, $I_F=I_{op}$	-	1.4	2.0	V
Output Power	P_f	Note (1)	-2.0	-	-	dBm
Tracking Error	TE	CW, $I_F=I_{op}$, $V_m=V_{op}$, Im-APC,Tc=-20 to +70°C	-0.5	-	+0.5	dB
Sidemode Suppression Ratio	SSR	Note (1)	35	-	-	dB
Spectral Width	ΔWp	Note (1), -3dB, FWHM	-	-	0.04	nm
		Note (1), -20dB, FWHM	-	-	0.30	
Relative Intensity Noise	RIN	10MHz to 8.5GHz, $V_m=V_o$, $I_F=I_{op}$, 8% Reflection	-	-	-120	dB/Hz
Kink	K	Ith+5mA to 1.5 x I_{op}	No Kink			-
Mode Hops	-	Ith+5mA to 1.5 x I_{op}	No Mode Hops			-
Optical Isolation	Is	Tc=-20 to +70°C	25	35	-	dB
On Level Modulation Voltage	V_o		-0.7	-	0	V
Modulator Drive Voltage	V_{mod}	(Vo-Vmod)>-3.3V, Rext=10dB	-	-	2.6	Vpp
RF Extinction Ratio	Rext	$I_F=I_{op}$, $V_m=V_o$ at On-Level $V_m=V_o-V_{mod}$ at Off-Level	10	-	-	dB
Transmission Penalty due to Dispersion	P_d	Note (2)	-	-	2.0	dB
Rise/Fall Time	T_r, T_f	$I_F=I_{op}$, $V_m=V_o$, 20% to 80%	-	20	25	ps
Cutoff Frequency	fc	-3dB, $I_F=I_{op}$, $V_m=V_o-0.5\|V_{mod}\|$	10	-	-	GHz
In Band Ripple	ΔG	$I_F=I_{op}$, 0.1 to 10GHz, $V_m=V_o-0.5\|V_{mod}\|$	-1.0	-	+1.0	dB

OPTICAL & ELECTRICAL CHARACTERISTICS (Continued)
(Laser Temperature $T_L = T_{set}$, T_{op} = 25°C, BOL, unless otherwise specified)

Parameter	Symbol	Test Condition	Limits			Unit
			Min.	Type	Max.	
RF Return Loss	S11	DC to 5GHz, $V_m=V_o$, $I_F=I_{op}$, 50Ω Test Set	8	-	-	dB
		5 to 10GHz, $V_m=V_o$, $I_F=I_{op}$, 50Ω Test Set	5	-	-	dB
Power Monitor Current	Im1	CW, $I_F=I_{op}$, $V_m=V_o$, VDR=5V	0.04	-	1.5	mA
Power Monitor Dark Current	Id1	VDR=5V	-	2	100	nA
Power Monitor Diode Capacitance	Ct1	VDR=5V, f=10MHz	-	2	15	pF
Wavelength Monitor Current	Im2	CW, $I_F=I_{op}$, $V_m=V_o$, VDR=5V	0.04	-	1.5	mA
Wavelength Monitor Dark Current	Id2	VDR=5V	-	2	100	nA
Wavelength Monitor Diode Capacitance	Ct2	VDR=5V, f=10MHz	-	2	15	pF
Wavelength Difference between Lock Point and Im2 peak (Note 4)	Δλ		6.0	-	44.0	GHz
Im2 Peak-Bottom Ratio	Im2peak/ Im2bottom		2.0	-	4.0	dB
TEC Capacity	ΔT	PTEC=5.2W, $I_F=I_{op}$	70-Tset	-	-	°C
TEC Current	ITEC	$I_F=I_{op}$, ΔT=(70-Tset)[°C]	-	-	1.3	A
TEC Voltage	VTEC	$I_F=I_{op}$, ΔT=(70-Tset)[°C]	-	-	4.0	V
TEC Power Dissipation	PTEC	$I_F=I_{op}$	-	-	5.2	W
Thermistor Resistance	Rth	TL=25°C	9.5	-	10.5	kΩ
Thermistor B Constant	B		3270	3450	3630	K

Note 1. Eudyna Test System, 9.95328Gb/s, PRBS=2^{23}-1, $I_F=I_{op}$, $V_m=V_o$ and (V_o-V_{mod})
Note 2. Eudyna Test System, 9.95328Gb/s, PRBS=2^{23}-1, $I_F=I_{op}$, $V_m=V_o$ and (V_o-V_{mod}),
Dispersion=1600ps/nm
Dispersion Penalty at Bit-Error-Rate=1.0E-10
Note 3: See Table 1 Wavelength Table

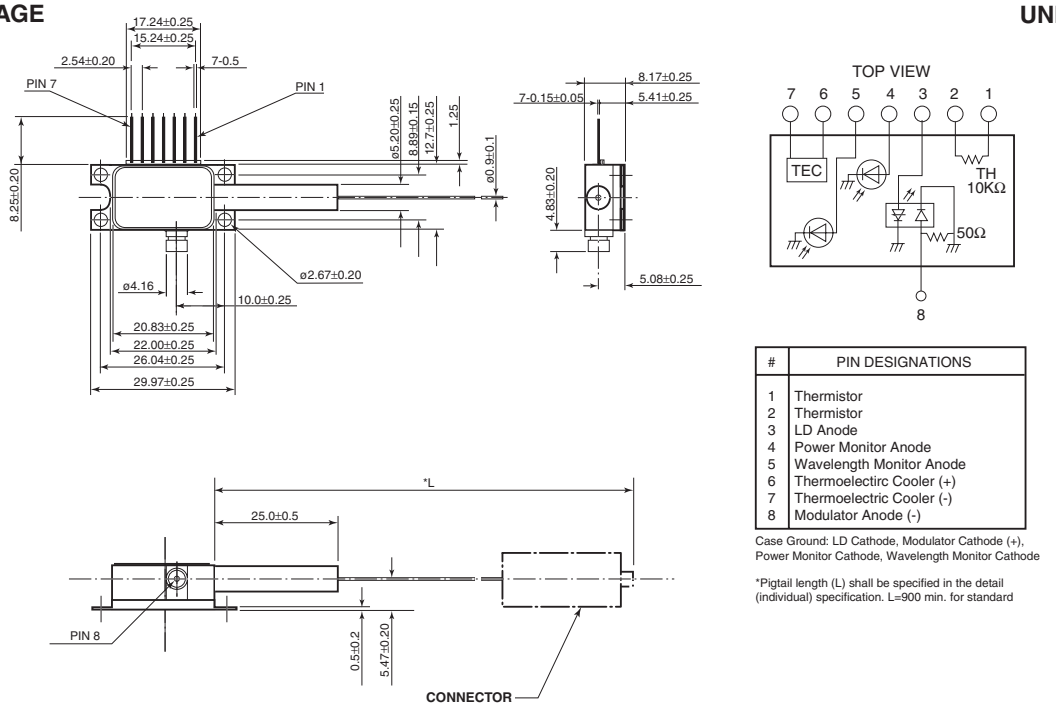
Figure 1 Wavelength Table

Part Number	Wavelength (nm) (TL=Tset) (in vacuum)	Frequency (THz)	Tolerance (nm)
FLD5F20CE-E9180	1563.05	191.80	±0.01
FLD5F20CE-E9185	1562.64	191.85	±0.01
FLD5F20CE-E9190	1562.23	191.90	±0.01
FLD5F20CE-E9195	1561.83	191.95	±0.01
FLD5F20CE-E9200	1561.42	192.00	±0.01
FLD5F20CE-E9205	1561.01	192.05	±0.01
FLD5F20CE-E9210	1560.61	192.10	±0.01
FLD5F20CE-E9215	1560.20	192.15	±0.01
FLD5F20CE-E9220	1559.79	192.20	±0.01
FLD5F20CE-E9225	1559.39	192.25	±0.01
FLD5F20CE-E9230	1558.98	192.30	±0.01
FLD5F20CE-E9235	1558.58	192.35	±0.01
FLD5F20CE-E9240	1558.17	192.40	±0.01
FLD5F20CE-E9245	1557.77	192.45	±0.01
FLD5F20CE-E9250	1557.36	192.50	±0.01
FLD5F20CE-E9255	1556.96	192.55	±0.01
FLD5F20CE-E9260	1556.55	192.60	±0.01
FLD5F20CE-E9265	1556.15	192.65	±0.01
FLD5F20CE-E9270	1555.75	192.70	±0.01
FLD5F20CE-E9275	1555.34	192.75	±0.01
FLD5F20CE-E9280	1554.94	192.80	±0.01
FLD5F20CE-E9285	1554.54	192.85	±0.01
FLD5F20CE-E9290	1554.13	192.90	±0.01
FLD5F20CE-E9295	1553.73	192.95	±0.01
FLD5F20CE-E9300	1553.33	193.00	±0.01
FLD5F20CE-E9305	1552.93	193.05	±0.01
FLD5F20CE-E9310	1552.52	193.10	±0.01
FLD5F20CE-E9315	1552.12	193.15	±0.01
FLD5F20CE-E9320	1551.72	193.20	±0.01
FLD5F20CE-E9325	1551.32	193.25	±0.01
FLD5F20CE-E9330	1550.92	193.30	±0.01
FLD5F20CE-E9335	1550.52	193.35	±0.01
FLD5F20CE-E9340	1550.12	193.40	±0.01
FLD5F20CE-E9345	1549.72	193.45	±0.01
FLD5F20CE-E9350	1549.32	193.50	±0.01
FLD5F20CE-E9355	1548.91	193.55	±0.01
FLD5F20CE-E9360	1548.51	193.60	±0.01
FLD5F20CE-E9365	1548.11	193.65	±0.01
FLD5F20CE-E9370	1547.72	193.70	±0.01
FLD5F20CE-E9375	1547.32	193.75	±0.01
FLD5F20CE-E9380	1546.92	193.80	±0.01
FLD5F20CE-E9385	1546.52	193.85	±0.01
FLD5F20CE-E9390	1546.12	193.90	±0.01

Figure 1 Wavelength Table (Con't)

Part Number	Wavelength (nm) (TL=Tset) (in vacuum)	Frequency (THz)	Tolerance (nm)
FLD5F20CE-E9395	1545.72	193.95	±0.01
FLD5F20CE-E9400	1545.32	194.00	±0.01
FLD5F20CE-E9405	1544.92	194.05	±0.01
FLD5F20CE-E9410	1544.53	194.10	±0.01
FLD5F20CE-E9415	1544.13	194.15	±0.01
FLD5F20CE-E9420	1543.73	194.20	±0.01
FLD5F20CE-E9425	1543.33	194.25	±0.01
FLD5F20CE-E9430	1542.94	194.30	±0.01
FLD5F20CE-E9435	1542.54	194.35	±0.01
FLD5F20CE-E9440	1542.14	194.40	±0.01
FLD5F20CE-E9445	1541.75	194.45	±0.01
FLD5F20CE-E9450	1541.35	194.50	±0.01
FLD5F20CE-E9455	1540.95	194.55	±0.01
FLD5F20CE-E9460	1540.56	194.60	±0.01
FLD5F20CE-E9465	1540.16	194.65	±0.01
FLD5F20CE-E9470	1539.77	194.70	±0.01
FLD5F20CE-E9475	1539.37	194.75	±0.01
FLD5F20CE-E9480	1538.98	194.80	±0.01
FLD5F20CE-E9485	1538.58	194.85	±0.01
FLD5F20CE-E9490	1538.19	194.90	±0.01
FLD5F20CE-E9495	1537.79	194.95	±0.01
FLD5F20CE-E9500	1537.40	195.00	±0.01
FLD5F20CE-E9505	1537.00	195.05	±0.01
FLD5F20CE-E9510	1536.61	195.10	±0.01
FLD5F20CE-E9515	1536.22	195.15	±0.01
FLD5F20CE-E9520	1535.82	195.20	±0.01
FLD5F20CE-E9525	1535.43	195.25	±0.01
FLD5F20CE-E9530	1535.04	195.30	±0.01
FLD5F20CE-E9535	1534.64	195.35	±0.01
FLD5F20CE-E9540	1534.25	195.40	±0.01
FLD5F20CE-E9545	1533.86	195.45	±0.01
FLD5F20CE-E9550	1533.47	195.50	±0.01
FLD5F20CE-E9555	1533.07	195.55	±0.01
FLD5F20CE-E9560	1532.68	195.60	±0.01
FLD5F20CE-E9565	1532.29	195.65	±0.01
FLD5F20CE-E9570	1531.90	195.70	±0.01
FLD5F20CE-E9575	1531.51	195.75	±0.01
FLD5F20CE-E9580	1531.12	195.80	±0.01
FLD5F20CE-E9585	1530.72	195.85	±0.01
FLD5F20CE-E9590	1530.33	195.90	±0.01
FLD5F20CE-E9595	1529.94	195.95	±0.01
FLD5F20CE-E9600	1529.55	196.00	±0.01

"CE" PACKAGE **UNIT: mm**



#	PIN DESIGNATIONS
1	Thermistor
2	Thermistor
3	LD Anode
4	Power Monitor Anode
5	Wavelength Monitor Anode
6	Thermoelectirc Cooler (+)
7	Thermoelectric Cooler (-)
8	Modulator Anode (-)

Case Ground: LD Cathode, Modulator Cathode (+), Power Monitor Cathode, Wavelength Monitor Cathode

*Pigtail length (L) shall be specified in the detail (individual) specification. L=900 min. for standard

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