

Full Band Tunable DFB Laser Module



Applications

- Long Haul or Metropolitan DWDM Transmission Systems
- Dynamic Wavelength Provisioning and Add/Drop Multiplexer

Descriptions

- FRL15TCWx-D66 series is full band tunable DFB laser module designed for long haul DWDM applications with external intensity modulator.
- The polarization maintaining fiber pigtail enables to directly connect a modulator without polarization control. The polarization state of output laser beam is maintained to a consistent orientation.
- Full band thermally tunable DFB laser diode chip is integrated with an optical isolator, thermo-electric coolers (TEC), thermistors, a power monitor photodiode, and a wavelength monitor photodiode in a hermetically sealed 26 pin butterfly package with same foot print as an industry standard 14 pin butterfly package.
- Full band thermally tunable DFB laser diode chip consists of DFB laser array and semiconductor optical amplifier (SOA). Each DFB laser is biased under constant current and output power is maintained by adjusting SOA current under automatic power control. By selecting an appropriate DFB laser and tuning the laser temperature, FRL15TCWx-D66 series can provide any ITU channel in 35 nm tuning range.
- This laser module complies with telecom requirements described in Telcordia™ GR-468 and is manufactured in an ISO™9001 certified production line.

Features

- 35nm tunability (88 ITU channels at 50GHz spacing) available in C or L band
- Stable wavelength with integrated wavelength monitor
- High optical output power up to 40mW for C band
- High side mode suppression ratio (SMSR) in entire tuning range
- 26 pin butterfly package
- Low TEC power consumption
- Polarization maintaining fiber pigtail
- RoHS compliant package

Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit	Conditions
Storage Temperature	T _{stg}	-40	85	°C	
Operating Case Temperature	T _c	-5	75	°C	
LD Operating Temperature	T _{LD}	8	57	°C	
Filter Operating Temperature	T _f	30	55	°C	
LD Forward Current	I _{fLD}	-	300	mA	
LD Reverse Voltage	V _{rLD}	-	2	V	
SOA Forward Current	I _{fSOA}	-	1050	mA	
SOA Reverse Voltage	V _{rSOA}	-	2	V	
PD Forward Current	I _{fPD}	-	10	mA	
PD Reverse Voltage	V _{rPD}	-	20	V	
TEC1 Current (LD)	I _{tec1}	-0.2	2.3	A	
TEC1 Voltage (LD)	V _{tec2}	-	4.9	V	
TEC2 Current (Filter)	I _{tec1}	-0.4	3.4	A	
TEC2 Voltage (Filter)	V _{tec2}	-	5.5	V	
Relative Humidity	RH	0	85	%	
Fiber Bend Radius	-	20	-	mm	
Fiber Axial Pull Force	-	-	10	N	
Lead Soldering Temperature	-	-	350	°C	
Lead Soldering Duration	-	-	10	sec	
Torque Force	-	-	0.1	Nm	Flatness : <20μm
Electrostatic Discharge (ESD)	-	-	500	V	HBM, C=100pF, R=1.5kΩ

Specifications ($T_c=25^\circ\text{C}$, BOL*¹ unless otherwise specified)

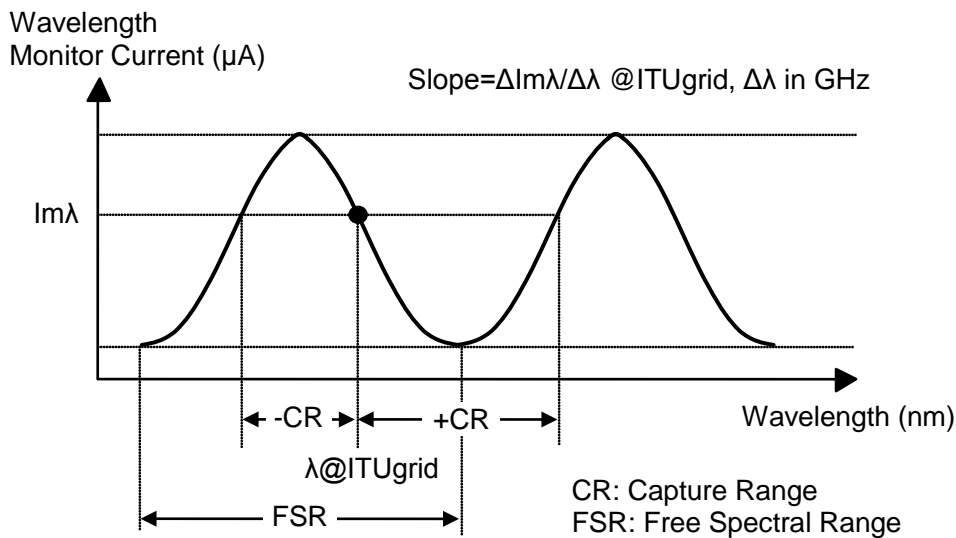
Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
Optical Output Power	Pf				dBm	CW
FRL15TCWA			10			
FRL15TCWB			13			
FRL15TCWC			15			
FRL15TCWD			16			
LD Operating Temperature	T_{LD}	15	-	55	$^\circ\text{C}$	Rated power, CW
LD Forward Current	I_{fLD}	-	-	300	mA	CW, fixed
LD Forward Voltage	V_{fLD}	-	-	2.7	V	CW
SOA Forward Current	$I_{fSOA,BOL}$	-	-	600	mA	Rated power, CW, BOL
SOA Forward Current	$I_{fSOA,EOL}$	-	-	840	mA	Rated power, CW, EOL, $I_{fSOA,EOL}=1.4 \times I_{fSOA,BOL}$
SOA Forward Voltage	V_{fSOA}	-	-	3.0	V	Rated power, CW, EOL
Wavelength	λ				nm	Rated power, CW 50GHz spacing, 88ch
-19610 (C band)		1528.773	-	1563.455		
-19090 (L band)		1570.416	-	1607.035		
Spectral Linewidth	$\Delta\lambda$	-	-	500	kHz	Rated Power, CW
Side Mode Suppression Ratio	SMSR	40	-	-	dB	Rated power, CW
Optical Isolation	Iso	25	-	-	dB	
Relative Intensity Noise	RIN	-	-	-135	dB/Hz	Rated power, CW $O_{PRL}<-25\text{dB}^{*2}$ $10\text{MHz}<f<10\text{GHz}$
Frequency Stability to ITU Grid	Δf_s	-2.5	-	2.5	GHz	Rated Power, $I_m=\text{const.}$, $I_m\lambda=\text{const.}$, EOL
Filter Operating Temperature	T_f	35	-	55	$^\circ\text{C}$	
Filter Temperature Coefficient	ΔT_f	-	15	-	pm/ $^\circ\text{C}$	
Free Spectral Range ^{*3}	FSR	-	50	-	GHz	
Capture Range ^{*3} (negative side)	-CR	14.0	-	22.5	GHz	
Capture Range ^{*3} (positive side)	+CR	27.5	-	36.0	GHz	
Power Monitor Current	Im				μA	Rated power, CW $V_{rPD}=5\text{V}$
FRL15TCWA		10	-	350		
FRL15TCWB		20	-	700		
FRL15TCWC		30	-	1000		
FRL15TCWD		40	-	1200		
Power Monitor Dark Current	I_d	-	-	100	nA	$V_{rPD}=5\text{V}$
Wavelength Monitor Current	$I_{m\lambda}$				μA	Rated power, CW $V_{rPD}=5\text{V}$
FRL15TCWA		4	-	350		
FRL15TCWB		8	-	700		
FRL15TCWC		12	-	1000		
FRL15TCWD		16	-	1200		
Wavelength Monitor Dark Current	$I_{d\lambda}$	-	-	100	nA	$V_{rPD}=5\text{V}$
Wavelength Monitor Current Slope ^{*3}	Slope	1	-	120	$\mu\text{A}/\text{GHz}$	$V_{rPD}=5\text{V}$
Tracking Error	TE	-0.5	-	0.5	dB	$I_m=\text{constant}$, $T_c=-5$ to 75°C

TEC1 Current (LD)	Itec1	-	-	0.9	A	Tc=75°C, Rated power, CW, EOL
TEC1 Voltage (LD)	Vtec1	-	-	1.7	V	Tc=75°C, Rated power, CW, EOL
TEC2 Current (Filter)	Itec2	-	-	1.7	A	Tc=75°C, Rated power, CW, EOL
TEC2 Voltage (Filter)	Vtec2	-	-	2.5	V	Tc=75°C, Rated power, CW, EOL
Total Power Consumption (P _{LD} +P _{SOA} +P _{TEC1} +P _{TEC2})	Ptotal	-	-	5.5	W	Tc=75°C, Rated power, CW, EOL
Thermistor B constant	B	-	3900	-	K	
Thermistor Resistance	R	9.5	-	10.5	kΩ	T _{LD} =25°C. Tf=25°C
Polarization Extinction Ratio	Er	20	-	-	dB	Rated power, CW

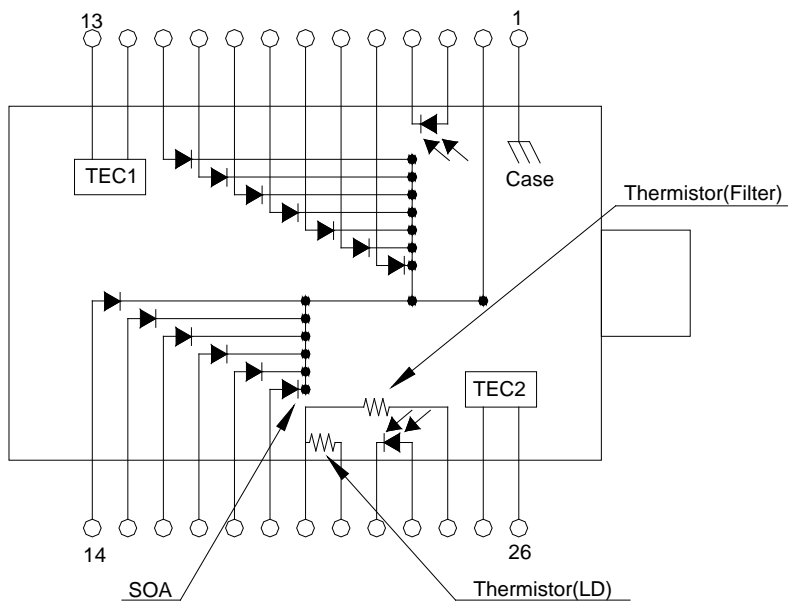
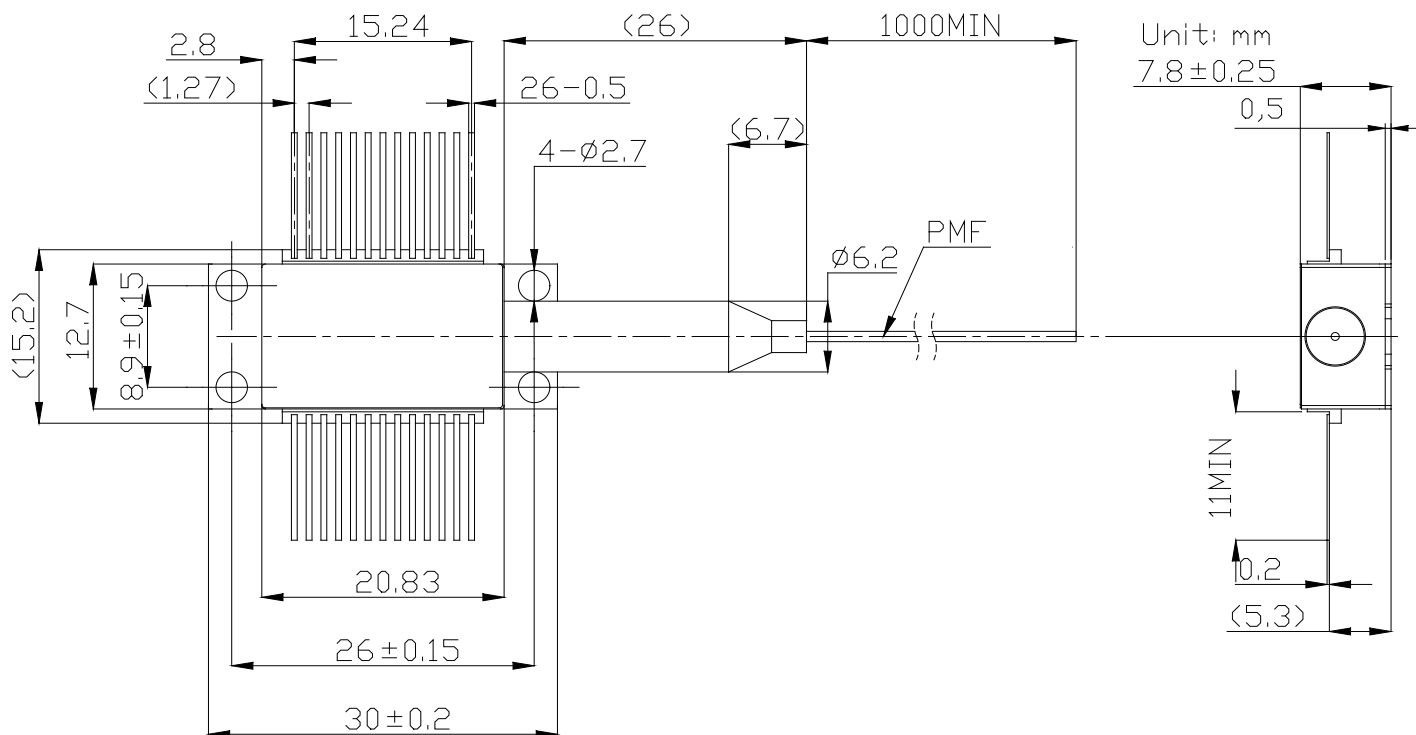
*1 BOL : Beginning of Life

*2 O_{pRL} : Optical Return Loss

*3 These parameters are defined in following wavelength discriminator curve.



Dimensions and Pin Assignments



Pin No.	Function	Pin No.	Function
1	Case Ground	14	LD6 Anode(+)
2	LD, SOA Cathode Common(-)	15	LD5 Anode(+)
3	Power Monitor PD Anode(-)	16	LD4 Anode(+)
4	Power Monitor PD Cathode(+)	17	LD3 Anode(+)
5	LD1 Anode(+)	18	LD2 Anode(+)
6	LD12 Anode(+)	19	SOA Anode(+)
7	LD11 Anode(+)	20	Thermistor Common
8	LD10 Anode(+)	21	Thermistor(LD)
9	LD9 Anode(+)	22	Wavelength Monitor PD Cathode(+)
10	LD8 Anode(+)	23	Wavelength Monitor PD Anode(-)
11	LD7 Anode(+)	24	Thermistor(Filter)
12	TEC1(LD)(+)	25	TEC2(Filter)(+)
13	TEC1(LD)(-)	26	TEC2(Filter)(-)

Optical Fiber Pigtail Specifications

Parameters	Specification	Unit
Fiber Type	Polarization maintaining(PANDA) fiber(φ0.4mm)	-
Nominal Fiber Length	Min.1,000	mm
Connector Type	No Connector	-
Polarization Axis	Slow Axis	-

Ordering Information

FRL15TCW□ – D66 - □□□□□ - D

Optical Output Power
A: 10dBm
B: 13dBm
C: 15dBm
D: 16dBm (19610 only)

Wavelength code
19610: C band
19090: L band

Safety Information

This product complies with 21 CFR 1040.10 and 1040.11, Class 3b laser product. Invisible laser radiation is emitted from the end of the fiber or connector. Avoid direct exposure to the beam.

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Furukawa Electric reserves the right to improve, enhance and modify the features and specifications of FITEL products without prior notifications.

 **FURUKAWA ELECTRIC CO., LTD.**

Japan
Head Office
2-2-3, Marunouchi
Chiyoda-ku
Tokyo 100-8322,
JAPAN
Tel: +81-3-3286-3253
Fax: +81-3-3286-3978
<http://www.furukawa.co.jp>

North America
OFS
1 Brightwave Blvd.
Carrollton, GA 30117, USA
Tel: +1-770-798-5555
<http://www.ofsoptics.com>
E-mail: info@ofsoptics.com

Europe
Furukawa Electric Europe Ltd.
Furukawa House
77-85 Fulham Palace Road,
London W6 8JD, United Kingdom
Tel: +44-20-7313-5300
Fax: +44-20-7313-5310
<http://www.furukawa.co.uk>
<http://www.furukawa.co.uk/contactus.php>

ASIA
Furukawa Electric Hong Kong Ltd.
Suite 1810, 18/F, Tower 2,
33 Canton Road, China Hong Kong City
Tsim Sha Tsui, Kowloon, Hong Kong
Tel: 852-2512-8938
Fax: 852-2512-9717
<http://www.fehk.com.hk/>
E-mail: guest@fehk.cn