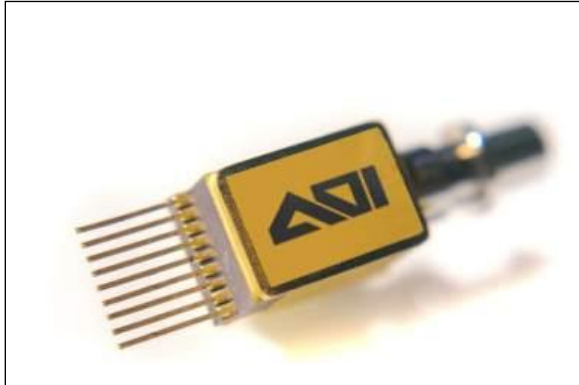


**DFB-xxx-BT-xx-2.5-x-xx-LC-476 TOSA Module**

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**Description**

The DFB-xxx-BT-xx-2.5-x-xx-LC-476 DFB transmitter optical subassembly (TOSA) module with integrated laser, monitor PD and micro-TEC in an 9-pin small form factor package. It is designed for direct modulation DWDM SONET OC-48, SDH STM-16, GbE, Fiber channel applications for use in transceivers or other transmit/transponder modules.

The TOSA will be available for up to 200km @1550nm (3600ps/nm) reaches. The device is available in the full range of C-band ITU-T wavelengths on a 100GHz channel spacing.

**Features**

- ❑ C-band wavelengths selectable on ITU-T 100GHz channel spacing
- ❑ Direct modulation up to 2.7 Gbps
- ❑ Compact MSA compliant 9-pin box TOSA package
- ❑ Meets GR 468 reliability specifications
- ❑ Available SC/APC and FC/APC or LC receptacle style

**Applications**

- ❑ SFP pluggable transceivers for DWDM, CWDM, SONET/SDH, GbE and fiber channel
- ❑ 1550-nm line cards
- ❑ Digital video transmission





**DFB-xxx-BT-xx-2.5-x-xx-LC-476 TOSA Module**

**Table 1. Absolute Maximum Ratings**

Parameter	Symbol	Condition	Min	Max	Unit
Operating Case Temperature	$T_c$	I=Iop	-40	85	°C
Storage Temperature	Tstg	--	-40	85	°C
Laser Forward Current	If	--	--	120	mA
Laser Reverse Bias	Vr	--	--	2	V
Photodiode Reverse Bias	Vrpd	--	--	10	V

**Table 2. Electrical and Optical Characteristics**

BOL, unless stated otherwise,  $T_i = 35\text{ °C}$  to  $45\text{ °C}$

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Laser Operating Temperature	$T_L$	$-40\text{ °C} \leq T_c \leq 85\text{ °C}$	35		45	°C
Laser Setpoint Temperature	$T_i$		35		45	°C
Slope Efficiency	SE	$P_o = 2\text{ mW, CW}$ $P_o = 6\text{ mW, CW}$	0.06 0.10		0.13 0.15	mW/mA mW/mA
Threshold Current (BOL)	$I_{th}$	$T_i = 35\text{--}45\text{ °C}$	--	18	30	mA
Forward Voltage	$V_f$	$P = P_o, \text{CW}, T_i = 35\text{--}45\text{ °C}$	--	1.2	1.9	V
Operating Current	$I_o$				80	mA
Optical Output Power	$P_o$	CW, $T_i = 35\text{--}45\text{ °C}$	1		6.0	mW
Center Wavelength (Specify ITU-T channels)	$\lambda_c$	CW, See Table 4	1528		1563	nm
Center wavelength tuning	$\Delta\lambda_c / \Delta T_i$	$35\text{ °C} \leq T_i \leq 45\text{ °C}$	--	0.09	0.12	nm/°C
Center Wavelength Tolerance	$\Delta\lambda_c$	@ $T_i$ , See Table 4 for $\lambda_c$	-0.1		+0.1	nm
Linewidth (3 dB)	FWHM	$P = P_o, \text{CW}$	--	--	10	MHz
Side-mode Suppression Ratio		$P = P_o, \text{CW}$	30	--	--	dB
Optical Isolation	$I_s$	$-40\text{ °C} \leq T_c \leq 85\text{ °C}$	30	--	--	dB
$\lambda_c$ Drift vs $T_c$	$\Delta\lambda_c / \Delta T_c$	$-40\text{ °C} \leq T_c \leq 85\text{ °C}$	--	--	-0.40	pm/°C
Monitor Current	$I_{mon}$	$V_{rpd} = 5\text{ V}$	10	--	150	µA/mW
Monitor Dark Current	$I_D$	$V_{rpd} = 5\text{ V}$	--	--	100	nA
Tracking Error	$\gamma$	$I_{mon} = \text{const}, \gamma = 10 \log(P_o/2\text{ mW})$ [dB]	-0.5	--	0.5	dB
Thermistor Resistance	$R_t$	$T_i = 25\text{ °C}$	9.5	--	10.5	KΩ
Thermistor Setpoint Resistance	$R_{Th}$	$T_i = 35\text{--}45\text{ °C}$	4.3		6.5	KΩ
Thermistor B Constant	B	$T_i = 25\text{ °C}$	--	3900	--	K
TEC Power Consumption (See ordering options)	$P_{TEC}$	$\Delta T = 50\text{ °C}, -20\text{ °C} \leq T_c \leq 85\text{ °C}$ $\Delta T = 50\text{ °C}, -40\text{ °C} \leq T_c \leq 85\text{ °C}$	--	--	0.40 0.45	W

**Table 3. RF Characteristics**

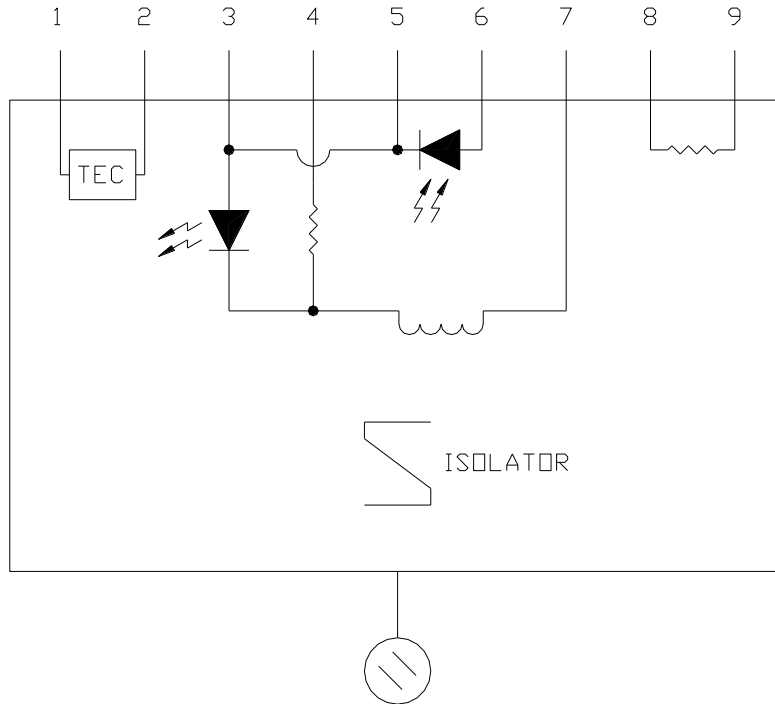
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Impedance	Zin		--	25	--	Ω
Modulation Current	I <sub>mod</sub>	$P = P_o$			50	mA
Extinction Ratio	ER	*Note 1	8.8	9.0	9.2	dB
Spectral Width	$\Delta\lambda$	*Note 1				
Full Width at -3 dB				0.1	0.3	nm
Full Width at -20 dB				0.3	1.0	nm
Dispersion Penalty	$\Delta S$	720 ps/nm 1800 ps/nm			2.0	dB
BER=1x10 <sup>-10</sup>					2.0	dB
2.488 Gbps, If=Iop, ER=9.2dB						dB

\*Note 1 – Modulated at 2.488Gbps,  $P = P_o$ , BER=1x10<sup>-10</sup>, NRZ code, PRBS 2<sup>23</sup>-1

\*Note 2 – consult factory for availability

DFB-xxx-BT-xx-2.5-x-xx-LC-476 TOSA Module

Electrical Schematics

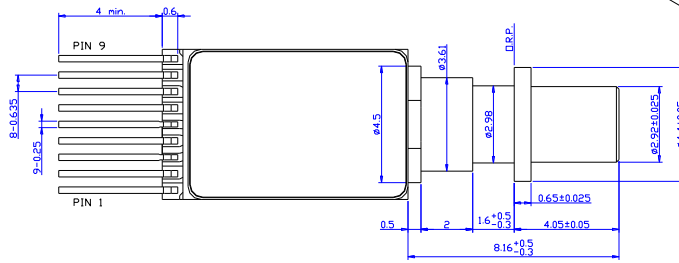
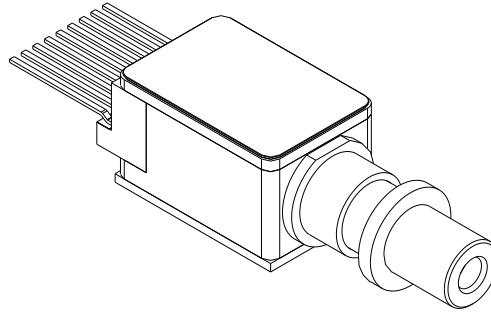


Pin Information

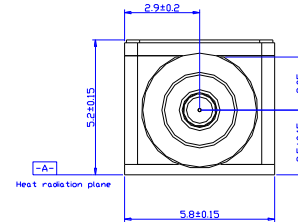
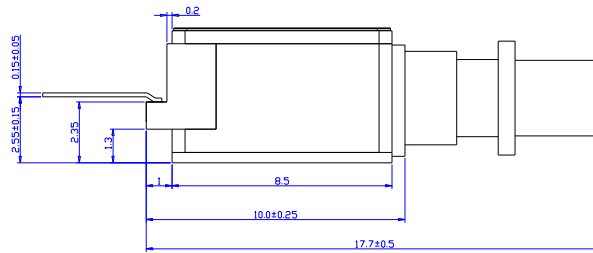
Pin No.	Description
1	Thermoelectric Cooler (-)
2	Thermoelectric Cooler (+)
3	RF Ground, LD anode, PD cathode
4	LD cathode (RF data)
5	RF GND, LD anode, PD cathode
6	PD Anode
7	LD cathode (Laser bias)
8	Thermistor
9	Thermistor

DFB-xxx-BT-xx-2.5-x-xx-LC-476 TOSA Module

**Outline Diagram**  
Dimensions are in millimeters



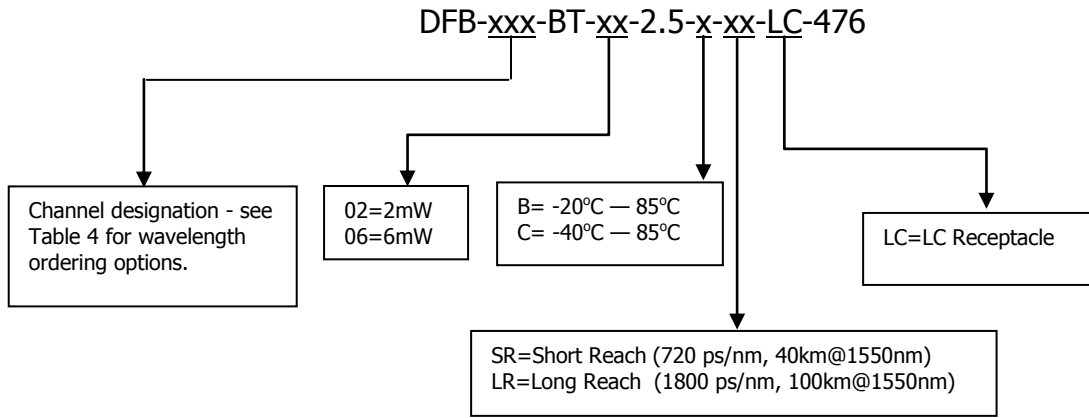
PIN ASSIGNMENT	
1	Thermoelectric Cooler (-)
2	Thermoelectric Cooler (+)
3	RF Ground, LD Anode, PD Cathode
4	LD Cathode (RF Bias)
5	RF Ground, LD Anode, PD Cathode
6	PD Anode
7	LD Cathode (Laser Bias)
8	Thermistor
9	Thermistor





**DFB-xxx-BT-xx-2.5-x-xx-LC-476 TOSA Module**

**Ordering Options**



**Table 4. Wavelength Ordering Options**

Channel Designation	Frequency (THz)	Wavelength (nm)*	Channel Designation	Frequency (THz)	Wavelength (nm)*
917	191.7	1563.86	940	194.0	1545.32
918	191.8	1563.05	941	194.1	1544.53
919	191.9	1562.23	942	194.2	1543.73
920	192.0	1561.42	943	194.3	1542.94
921	192.1	1560.61	944	194.4	1542.14
922	192.2	1559.79	945	194.5	1541.35
923	192.3	1558.98	946	194.6	1540.56
924	192.4	1558.17	947	194.7	1539.77
925	192.5	1557.36	948	194.8	1538.98
926	192.6	1556.55	949	194.9	1538.19
927	192.7	1555.75	950	195.0	1537.4
928	192.8	1554.94	951	195.1	1536.61
929	192.9	1554.13	952	195.2	1535.82
930	193.0	1553.33	953	195.3	1535.04
931	193.1	1552.52	954	195.4	1534.25
932	193.2	1551.72	955	195.5	1533.47
933	193.3	1550.92	956	195.6	1532.68
934	193.4	1550.12	957	195.7	1531.9
935	193.5	1549.32	958	195.8	1531.12
936	193.6	1548.51	959	195.9	1530.33
937	193.7	1547.72	960	196.0	1529.55
938	193.8	1546.92	961	196.1	1528.77
939	193.9	1546.12			

\* Please consult the factory for wavelength availability

## **DFB-xxx-BT-xx-2.5-x-xx-LC-476 TOSA Module**

### **Safety Information**

All versions of this laser are Class 1M laser products per IEC<sup>1</sup>/EN<sup>2</sup> 60825-1:2007. Users should observe safety precautions such as those recommended by ANSI<sup>3</sup> Z136.1-2000, ANSI Z36.2-1997 and IEC 60825-1:2007.

#### **Notes about Laser Safety Class:**

The Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) in the USA has decided to harmonize their requirements with 21 CFR 1040.10 and 1040.11 with the IEC/EN 60825-1 and IEC/EN 60601-2-22 standards. This process has not yet happened and in the interim, the CDRH agency has released '[Laser Notice No.50](#)' to reduce the regulatory burden. This notice allows IEC/EN classification and labeling of lasers within the USA.

#### **IEC<sup>1</sup>/EN<sup>2</sup> 60825-1 Laser Class**

**Class 1M:** laser is safe for all conditions of use except when passed through magnifying optics such as microscopes and telescopes. Class 1M lasers produce large-diameter beams, or beams that are divergent. The MPE for a Class 1M laser cannot normally be exceeded unless focusing or imaging optics are used to narrow the beam. If the beam is refocused, the hazard of Class 1M lasers may be increased and the product class may be changed. A laser can be classified as Class 1M if the total output power is below (IEC/EN) class 3B but the power that can pass through the pupil of the eye is within Class 1.

#### **FDA Laser Class**

**Class IIIB:** moderate power lasers (cw: 5-500 mW, pulsed: 10 J/cm<sup>2</sup> or the diffuse reflection limit, whichever is lower). In general Class IIIB lasers will not be a fire hazard, nor are they generally capable of producing a hazardous diffuse reflection. Specific controls are recommended.

This product does not conform to 21 CFR 1040.10 and 1040.11. Consequently, this laser module is only intended for use as a component by manufacturers of electronic products and equipment.

Wavelength = 1270 – 1610 nm  
 Maximum Power = 75mW  
 Single-mode fiber pigtail  
 Fiber Numerical Aperture = 0.14

Labeling is not affixed to the laser module due to size constraints; rather, labeling is placed on the outside of the shipping box.

This product is not shipped with a power supply.

**Caution: use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.**



classified in accordance with IEC 60825-1:2007

(1) IEC is a registered trademark of the International Electrotechnical Commission

(2) Within Europe the IEC standard has been adopted as a European Normative standard known as EN 60825, and each European country will have its own version of this standard, for example, the British Standards version known as BS EN 60825. There can be small differences between the different countries versions of EN 60825, and these are in part caused by the process of translating the standard into the native language of that country.

(3) ANSI is a registered trademark of the American National Standards Institute