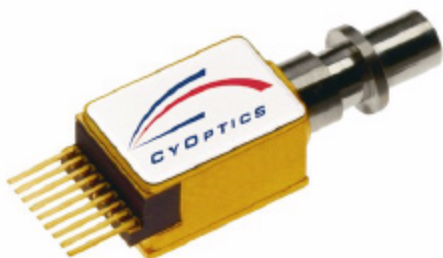


1610/11-Series MSA-compatible 2.5 Gb/s Cooled DFB TOSA



CyOptics' 1610 and 1611 type TOSA is available with LC receptacle (for use in DWDM SFP and other pluggable transceivers) or fiber pigtail (for use on line cards)

Features

- Ultra small form factor 9-pin MSA DFB TOSA
- Data rates up to 2.7Gb/s
- For use up to 200 km (4000 ps/nm) at 2.5 Gb/s
- +6 dBm typical optical output power (200km version)
- Wavelength selectable to ITU-T grid wavelengths, C band and L band* wavelengths
- Suitable for use in 100GHz channel spacing DWDM systems
- Temperature stabilized; can also be operated in partially cooled mode for CWDM applications
- Maximum power consumption less than 0.2W
- LC receptacle or pigtailed versions available
- 25Ω single-ended data input (15Ω option available)
- Operating case temperature range -5 to +75C

* LC Receptacle version. For other L-band versions, please contact your CyOptics Account Manager, or the contacts shown at the foot of this document.

Description

The 1610-Series 2.5 Gb/s transmitter optical sub-assembly (TOSA) integrates a high-speed laser, a monitor photodiode and a micro-TEC in a small form-factor metallized ceramic package. It is designed for use in small form-factor pluggable (SFP) transceivers and other types of optical modules for high-speed telecommunication and data applications including WDM SONET OC-48, SDH STM-16, Fiber Channel and Gigabit Ethernet.

The 1610-Series is available in the full range of C band ITU-T wavelengths operating at 2.5 Gb/s per channel. The device exhibits excellent wavelength stability, supporting operation at 100 GHz channel spacing over 15 years (assuming an end-of-life aging condition of $<\pm 90$ pm), with low hazard rates (~100FIT wearout over 20 yrs.).

Applications

- SFP Transceivers for DWDM, CWDM and SONET/SDH, GbE & Fibre Channel
- Line cards

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Conditions	Min	Max	Unit
Laser Diode Reverse Voltage	CW	—	2	V
Laser Diode Forward Current	CW	—	150	mA
Optical Output Power	CW	—	10	mW
Monitor Diode Reverse Voltage	—	—	10	V
Monitor Diode Forward Current	—	—	2	mA
Storage Temperature Range	—	–40	85	°C
TEC Current	—	—	1.3	A
TEC Current in Heating Mode	—	—	0.5	A
TEC Voltage	—	—	2	V

Electrostatic Discharge

CAUTION: This device is susceptible to damage as a result of electrostatic discharge. Take proper precautions during both handling and testing. Follow guidelines such as JEDEC Publication No. 108-A (Dec. 1988).

CyOptics employs a human-body model (HBM) for ESD-susceptibility testing and protection-design evaluation. ESD voltage thresholds are dependent on the critical parameters used to define the model. A standard HBM (resistance = 1.5 k Ω , capacitance = 100pF) is widely used and can be used for comparison purposes.

Electrical/Optical Characteristics

Table 1. Optical and Electrical Specifications (Chip operating temp. = 35 to 45C, except where noted. Nominal 50% duty cycle data signal, except where noted.)

Parameter	Symbol	Conditions	Min	Max	Unit
Laser Operating Temperature	T_{OP}	$T_{case} = -5$ to $+75C$	35	45	C
Slope efficiency	η	1610-version 1611-version	0.06 0.10	0.13 0.15	mW/mA mW/mA
Threshold Current (BOL)	I_{TH}	—	—	30	mA
Laser Forward Voltage	V_F	$I_F = I_{OP}$ @ T_{OP}	—	1.8	V
Operating Current	I_{OP}	—	—	80	mA
Threshold Power	P_{TH}	$I_F = I_{TH}$	—	80	μW
Fiber Output Power (average)	P_{AVG}	$I_F = I_{OP}$ @ T_{OP} 1610-version 1611-version	0 +4	+4 +7	dBm dBm
Center Wavelength (Wavelength can be specified to the ITU wavelength channels.)	λ_c	CW, $T_{LASER} = 35-45C$ C band versions L band versions	1528.7 1564.7	1563.9 1610.1	nm nm
Center Wavelength tuning coefficient	—	—	—	0.13	nm/C
Linewidth (3 dB FWHM)	$\Delta\lambda_{3dB}$	CW, $I_{bias} = I_{OP}$	—	10	MHz
Side-mode Suppression Ratio	SMSR	CW, $I_{bias} = I_{OP}$	35	—	dB
Center wavelength stability	$\Delta\lambda_D$	20 year system life $T_{case} = -5$ to $+75C$	-90	90	pm
Dispersion Penalty BER = 1×10^{-10}	DP	2.488 Gb/s, $I_F = I_{OP}$ @ 9.2dB RF extinction ratio 1610 - 2400 ps/nm 1611 - 4000 ps/nm	— —	2.0 2.0	dB dB

RF Characteristics

Input Impedance	Z_{IN}	—	22	28	Ω
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Monitor Diode

Monitor Voltage	V_{rmon}	—	3	10	V
Monitor Current	I_{BD}	+2dBm average (1610x) +5.5dBm average (1611x)	0.2 0.2	2.0 2.0	mA mA
Dark Current	I_D	$I_F = 0$, $V_{rmon} = 5V$	—	5	nA

Thermistor

Resistance (standard 10k Ω @25C thermistor)	R_{THERM}	$T = 40C$	5.2	5.5	k Ω
B-constant	B	—	3800	4000	K
Thermistor Current	I_{TC}	—	10	100	μA

Thermoelectric Cooler (TEC)

TEC Current	I_{TEC}	$T_{CASE} = -5$ to $+75C$ $T_{LASER} = 35-45C$ $I_{LASER} = 40mA$	—	0.3	A
TEC Voltage	V_{TEC}		—	0.8	V
TEC Power (1610-version)	P_{TEC}		—	0.2	W
TEC Power (1611-version)	P_{TEC}		—	0.25	W
TEC Capacity	ΔT		-50	40	C

Optical Isolation

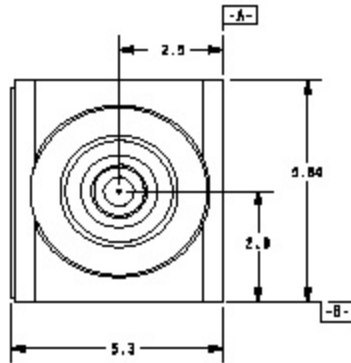
Optical Isolation	—	$T_{CASE} = 75C$	30	—	dB
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Package

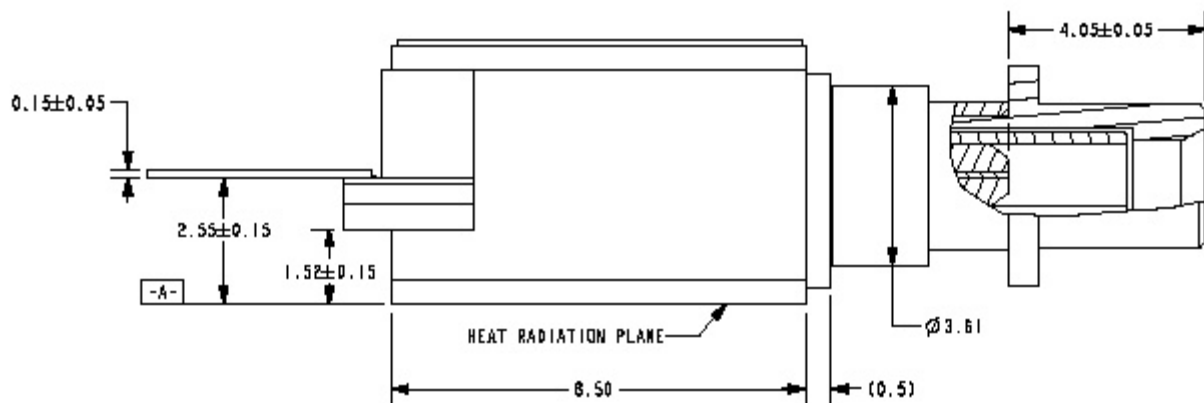
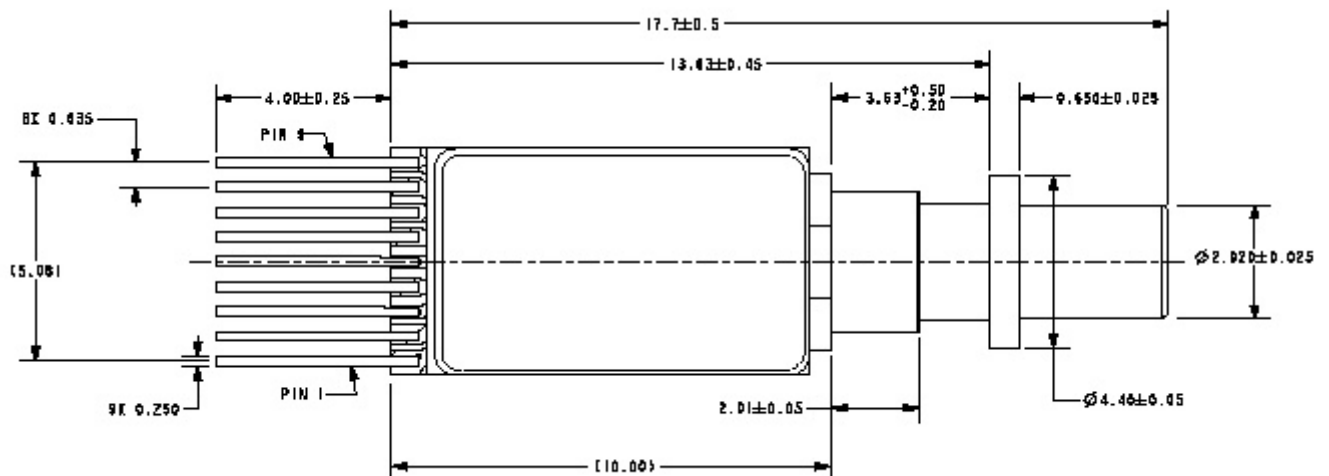
Center Wavelength Drift vs. Case Temperature	$\Delta\lambda_c/\Delta T_c$	$T_{CASE} = -5C$ to $+75C$	—	0.35	pm/C
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Outline Diagram

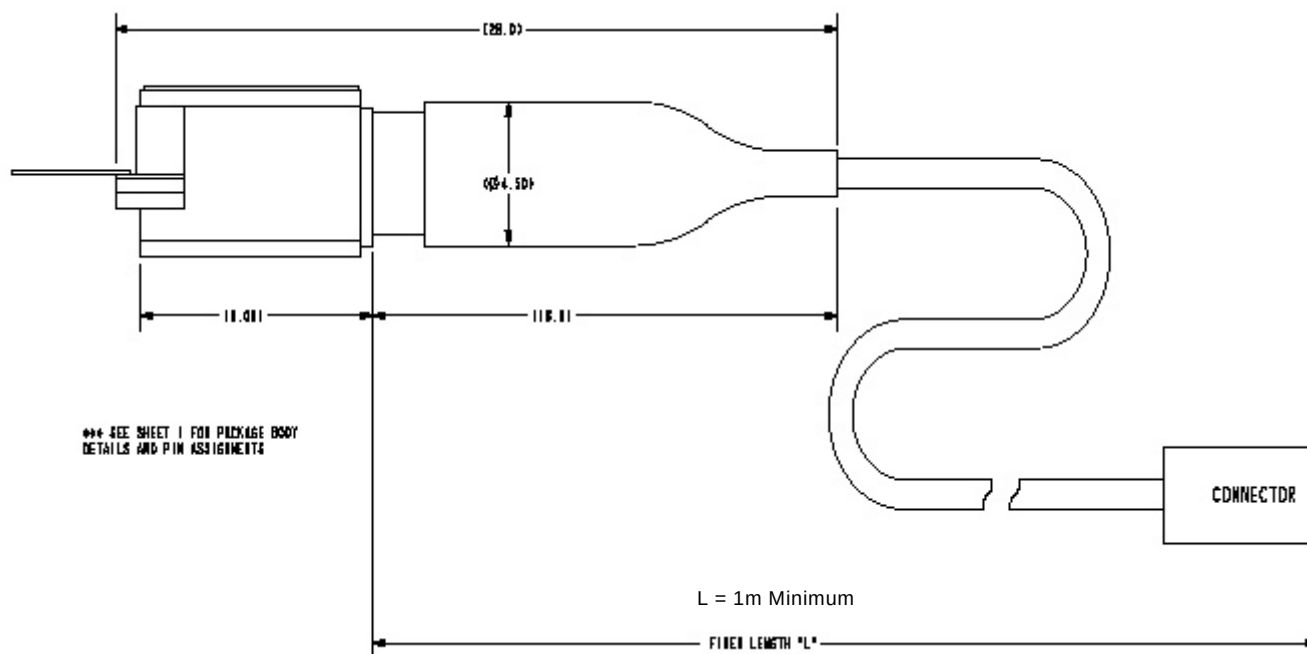
Dimensions are in millimeters.



PIN	ASSIGNMENT
1	TEC (-)
2	TEC (+)
3	RF GROUND, LD ANODE, PD CATHODE
4	RF DATA, LD CATHODE
5	RF GROUND, LD ANODE, PD CATHODE
6	MONITOR PD ANODE
7	LASER BIAS, LD CATHODE
8	THERMISTOR
9	THERMISTOR



Pigtailed Version:



Ordering Information (LC receptacle versions, C-band)

120km Version	200km Version	ITU-T Frequency (THz)	Center Wavelength (nm)
1610L061	1611L061	196.1	1528.77
1610L060	1611L060	196.0	1529.55
1610L059	1611L059	195.9	1530.33
1610L058	1611L058	195.8	1531.12
1610L057	1611L057	195.7	1531.90
1610L056	1611L056	195.6	1532.68
1610L055	1611L055	195.5	1533.47
1610L054	1611L054	195.4	1534.25
1610L053	1611L053	195.3	1535.04
1610L052	1611L052	195.2	1535.82
1610L051	1611L051	195.1	1536.61
1610L050	1611L050	195.0	1537.40
1610L049	1611L049	194.9	1538.19
1610L048	1611L048	194.8	1538.98
1610L047	1611L047	194.7	1539.77
1610L046	1611L046	194.6	1540.56
1610L045	1611L045	194.5	1541.35
1610L044	1611L044	194.4	1542.14
1610L043	1611L043	194.3	1542.94
1610L042	1611L042	194.2	1543.73
1610L041	1611L041	194.1	1544.53
1610L040	1611L040	194.0	1545.32
1610L039	1611L039	193.9	1546.12
1610L038	1611L038	193.8	1546.92
1610L037	1611L037	193.7	1547.72
1610L036	1611L036	193.6	1548.51
1610L035	1611L035	193.5	1549.32
1610L034	1611L034	193.4	1550.12
1610L033	1611L033	193.3	1550.92
1610L032	1611L032	193.2	1551.72
1610L031	1611L031	193.1	1552.52
1610L030	1611L030	193.0	1553.33
1610L029	1611L029	192.9	1554.13
1610L028	1611L028	192.8	1554.94
1610L027	1611L027	192.7	1555.75
1610L026	1611L026	192.6	1556.56
1610L025	1611L025	192.5	1557.36
1610L024	1611L024	192.4	1558.17
1610L023	1611L023	192.3	1558.98
1610L022	1611L022	192.2	1559.79
1610L021	1611L021	192.1	1560.61
1610L020	1611L020	192.0	1561.42
1610L019	1611L019	191.9	1562.23
1610L018	1611L018	191.8	1563.05
1610L017	1611L017	191.7	1563.86

Ordering Information (LC receptacle versions, L-band)

120km Version	200km Version	ITU-T Frequency (THz)	Center Wavelength (nm)
1610L0916	1611L0916	191.6	1564.68
1610L0915	1611L0915	191.5	1565.50
1610L0914	1611L0914	191.4	1566.31
1610L0913	1611L0913	191.3	1567.13
1610L0912	1611L0912	191.2	1567.95
1610L0911	1611L0911	191.1	1568.77
1610L0910	1611L0910	191.0	1569.59
1610L0909	1611L0909	190.9	1570.42
1610L0908	1611L0908	190.8	1571.24
1610L0907	1611L0907	190.7	1572.06
1610L0906	1611L0906	190.6	1572.89
1610L0905	1611L0905	190.5	1573.71
1610L0904	1611L0904	190.4	1574.54
1610L0903	1611L0903	190.3	1575.37
1610L0902	1611L0902	190.2	1576.20
1610L0901	1611L0901	190.1	1577.03
1610L0900	1611L0900	190.0	1577.86
1610L0899	1611L0899	189.9	1578.69
1610L0898	1611L0898	189.8	1579.52
1610L0897	1611L0897	189.7	1580.35
1610L0896	1611L0896	189.6	1581.18
1610L0895	1611L0895	189.5	1582.02
1610L0894	1611L0894	189.4	1582.85
1610L0893	1611L0893	189.3	1583.69
1610L0892	1611L0892	189.2	1584.53
1610L0891	1611L0891	189.1	1585.36
1610L0890	1611L0890	189.0	1586.20
1610L0889	1611L0889	188.9	1587.04
1610L0888	1611L0888	188.8	1587.88
1610L0887	1611L0887	188.7	1588.73
1610L0886	1611L0886	188.6	1589.57
1610L0885	1611L0885	188.5	1590.41
1610L0884	1611L0884	188.4	1591.26
1610L0883	1611L0883	188.3	1592.10
1610L0882	1611L0882	188.2	1592.95
1610L0881	1611L0881	188.1	1593.79
1610L0880	1611L0880	188.0	1594.64
1610L0879	1611L0879	187.9	1595.49
1610L0878	1611L0878	187.8	1596.34
1610L0877	1611L0877	187.7	1597.19
1610L0876	1611L0876	187.6	1598.04
1610L0875	1611L0875	187.5	1598.89
1610L0874	1611L0874	187.4	1599.75
1610L0873	1611L0873	187.3	1600.60
1610L0872	1611L0872	187.2	1601.46
1610L0871	1611L0871	187.1	1602.31
1610L0870	1611L0870	187.0	1603.17
1610L0869	1611L0869	186.9	1604.03

120km Version	200km Version	ITU-T Frequency (THz)	Center Wavelength (nm)
1610L0868	1611L0868	186.8	1604.88
1610L0867	1611L0867	186.7	1605.74
1610L0866	1611L0866	186.6	1606.60
1610L0865	1611L0865	186.5	1607.47
1610L0864	1611L0864	186.4	1608.33
1610L0863	1611L0863	186.3	1609.19
1610L0862	1611L0862	186.2	1610.06

Ordering Information (Pigtailed versions with FC/PC connector, C-band)

120km Version	200km Version	ITU-T Frequency (THz)	Center Wavelength (nm)
1610F061	1611F061	196.1	1528.77
1610F060	1611F060	196.0	1529.55
1610F059	1611F059	195.9	1530.33
1610F058	1611F058	195.8	1531.12
1610F057	1611F057	195.7	1531.90
1610F056	1611F056	195.6	1532.68
1610F055	1611F055	195.5	1533.47
1610F054	1611F054	195.4	1534.25
1610F053	1611F053	195.3	1535.04
1610F052	1611F052	195.2	1535.82
1610F051	1611F051	195.1	1536.61
1610F050	1611F050	195.0	1537.40
1610F049	1611F049	194.9	1538.19
1610F048	1611F048	194.8	1538.98
1610F047	1611F047	194.7	1539.77
1610F046	1611F046	194.6	1540.56
1610F045	1611F045	194.5	1541.35
1610F044	1611F044	194.4	1542.14
1610F043	1611F043	194.3	1542.94
1610F042	1611F042	194.2	1543.73
1610F041	1611F041	194.1	1544.53
1610F040	1611F040	194.0	1545.32
1610F039	1611F039	193.9	1546.12
1610F038	1611F038	193.8	1546.92
1610F037	1611F037	193.7	1547.72
1610F036	1611F036	193.6	1548.51
1610F035	1611F035	193.5	1549.32
1610F034	1611F034	193.4	1550.12
1610F033	1611F033	193.3	1550.92
1610F032	1611F032	193.2	1551.72
1610F031	1611F031	193.1	1552.52
1610F030	1611F030	193.0	1553.33
1610F029	1611F029	192.9	1554.13
1610F028	1611F028	192.8	1554.94
1610F027	1611F027	192.7	1555.75
1610F026	1611F026	192.6	1556.56
1610F025	1611F025	192.5	1557.36
1610F024	1611F024	192.4	1558.17
1610F023	1611F023	192.3	1558.98
1610F022	1611F022	192.2	1559.79
1610F021	1611F021	192.1	1560.61
1610F020	1611F020	192.0	1561.42
1610F019	1611F019	191.9	1562.23
1610F018	1611F018	191.8	1563.05
1610F017	1611F017	191.7	1563.86

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