

EOLP-1696-TDW-14XXXN MSA Series

SFP+ Single-Mode Tunable Transceiver
RoHS6 Compliant

Features

- ◆ Support data rate 0.614Gbps to 11.3Gbps
- ◆ 1550 nm ITU-T C-band 50 GHz spacing Tunable DWDM SFP+ Transceiver Temperature-Stabilized DWDM EML Transmitter
- ◆ Negative chirp transmitter with ILMZ (Integrated Laser Mach Zehnder) TOSA
- ◆ PIN receiver with limiting amplifier
- ◆ Low power consumption: <1.7 W at 70°C
- ◆ Positive power supply lines: 3.3 V
- ◆ Hot-Pluggable SFP+ Footprint
- ◆ Compliant with SFF-8431 MSA
- ◆ Compliant with SFF-8432 MSA
- ◆ Operating Case Temperature
- ◆ Standard: 0°C to 70°C



Applications

- ◆ 10GBASE-ER
- ◆ 10G FC
- ◆ CPRI rates 9.830 Gb/s, 7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s
- ◆ Other optical links

Ordering Information

Part No.	Data Rate	Laser	Power budget	CDR	Temp.
EOLP-1696-TDW-14XXXN ^{*(note1)}	0.614Gbps to 11.3Gbps	ILMZ	14dB	No	Standard

Note1: XXX refers to DWDM Wavelength channel as ITU-T specified.

DWDM Wavelength List:

*Channel (X)	Part NO.	Frequency (THz)	Center Wavelength (nm)
1	EOLP-1696-TDW-14115N	191.15	1568.36
2	EOLP-1696-TDW-14120N	191.20	1567.95
3	EOLP-1696-TDW-14125N	191.25	1567.54
4	EOLP-1696-TDW-14130N	191.30	1567.13
5	EOLP-1696-TDW-14135N	191.35	1566.72
6	EOLP-1696-TDW-14140N	191.40	1566.31
7	EOLP-1696-TDW-14145N	191.45	1565.90
8	EOLP-1696-TDW-14150N	191.50	1565.50
9	EOLP-1696-TDW-14155N	191.55	1565.09
10	EOLP-1696-TDW-14160N	191.60	1564.68
11	EOLP-1696-TDW-14165N	191.65	1564.27
12	EOLP-1696-TDW-14170N	191.70	1563.86
13	EOLP-1696-TDW-14175N	191.75	1563.45
14	EOLP-1696-TDW-14180N	191.80	1563.05
15	EOLP-1696-TDW-14185N	191.85	1562.64
16	EOLP-1696-TDW-14190N	191.90	1562.23
17	EOLP-1696-TDW-14195N	191.95	1561.83
18	EOLP-1696-TDW-14200N	192.00	1561.42
19	EOLP-1696-TDW-14205N	192.05	1561.01
20	EOLP-1696-TDW-14210N	192.10	1560.61
21	EOLP-1696-TDW-14215N	192.15	1560.20
22	EOLP-1696-TDW-14220N	192.20	1559.79
23	EOLP-1696-TDW-14225N	192.25	1559.39
24	EOLP-1696-TDW-14230N	192.30	1558.98
25	EOLP-1696-TDW-14235N	192.35	1558.58
26	EOLP-1696-TDW-14240N	192.40	1558.17
27	EOLP-1696-TDW-14245N	192.45	1557.77
28	EOLP-1696-TDW-14250N	192.50	1557.36
29	EOLP-1696-TDW-14255N	192.55	1556.96
30	EOLP-1696-TDW-14260N	192.60	1556.55
31	EOLP-1696-TDW-14265N	192.65	1556.15
32	EOLP-1696-TDW-14270N	192.70	1555.75
33	EOLP-1696-TDW-14275N	192.75	1555.34
34	EOLP-1696-TDW-14280N	192.80	1554.94
35	EOLP-1696-TDW-14285N	192.85	1554.54
36	EOLP-1696-TDW-14290N	192.90	1554.13
37	EOLP-1696-TDW-14295N	192.95	1553.73
38	EOLP-1696-TDW-14300N	193.00	1553.33

39	EOLP-1696-TDW-14305N	193.05	1552.93
40	EOLP-1696-TDW-14310N	193.10	1552.52
41	EOLP-1696-TDW-14315N	193.15	1552.12
42	EOLP-1696-TDW-14320N	193.20	1551.72
43	EOLP-1696-TDW-14325N	193.25	1551.32
44	EOLP-1696-TDW-14330N	193.30	1550.92
45	EOLP-1696-TDW-14335N	193.35	1550.52
46	EOLP-1696-TDW-14340N	193.40	1550.12
47	EOLP-1696-TDW-14345N	193.45	1549.72
48	EOLP-1696-TDW-14350N	193.50	1549.32
49	EOLP-1696-TDW-14355N	193.55	1548.91
50	EOLP-1696-TDW-14360N	193.60	1548.51
51	EOLP-1696-TDW-14365N	193.65	1548.11
52	EOLP-1696-TDW-14370N	193.70	1547.72
53	EOLP-1696-TDW-14375N	193.75	1547.32
54	EOLP-1696-TDW-14380N	193.80	1546.92
55	EOLP-1696-TDW-14385N	193.85	1546.52
56	EOLP-1696-TDW-14390N	193.90	1546.12
57	EOLP-1696-TDW-14395N	193.95	1545.72
58	EOLP-1696-TDW-14400N	194.00	1545.32
59	EOLP-1696-TDW-14405N	194.05	1544.92
60	EOLP-1696-TDW-14410N	194.10	1544.53
61	EOLP-1696-TDW-14415N	194.15	1544.13
62	EOLP-1696-TDW-14420N	194.20	1543.73
63	EOLP-1696-TDW-14425N	194.25	1543.33
64	EOLP-1696-TDW-14430N	194.30	1542.94
65	EOLP-1696-TDW-14435N	194.35	1542.54
66	EOLP-1696-TDW-14440N	194.40	1542.14
67	EOLP-1696-TDW-14445N	194.45	1541.75
68	EOLP-1696-TDW-14450N	194.50	1541.35
69	EOLP-1696-TDW-14455N	194.55	1540.95
70	EOLP-1696-TDW-14460N	194.60	1540.56
71	EOLP-1696-TDW-14465N	194.65	1540.16
72	EOLP-1696-TDW-14470N	194.70	1539.77
73	EOLP-1696-TDW-14475N	194.75	1539.37
74	EOLP-1696-TDW-14480N	194.80	1538.98
75	EOLP-1696-TDW-14485N	194.85	1538.58
76	EOLP-1696-TDW-14490N	194.90	1538.19
77	EOLP-1696-TDW-14495N	194.95	1537.79
78	EOLP-1696-TDW-14500N	195.00	1537.40
79	EOLP-1696-TDW-14505N	195.05	1537.00
80	EOLP-1696-TDW-14510N	195.10	1536.61

81	EOLP-1696-TDW-14515N	195.15	1536.22
82	EOLP-1696-TDW-14520N	195.20	1535.82
83	EOLP-1696-TDW-14525N	195.25	1535.43
84	EOLP-1696-TDW-14530N	195.30	1535.04
85	EOLP-1696-TDW-14535N	195.35	1534.64
86	EOLP-1696-TDW-14540N	195.40	1534.25
87	EOLP-1696-TDW-14545N	195.45	1533.86
88	EOLP-1696-TDW-14550N	195.50	1533.47
89	EOLP-1696-TDW-14555N	195.55	1533.07
90	EOLP-1696-TDW-14560N	195.60	1532.68
91	EOLP-1696-TDW-14565N	195.65	1532.29
92	EOLP-1696-TDW-14570N	195.70	1531.90
93	EOLP-1696-TDW-14575N	195.75	1531.51
94	EOLP-1696-TDW-14580N	195.80	1531.12
95	EOLP-1696-TDW-14585N	195.85	1530.72
96	EOLP-1696-TDW-14590N	195.90	1530.33
97	EOLP-1696-TDW-14595N	195.95	1529.94
98	EOLP-1696-TDW-14600N	196.00	1529.55
99	EOLP-1696-TDW-14605N	196.05	1529.16

*: The wavelength is default while manufacture, please contact EOPOTLINK while ordering.

Regulatory Compliance^{*note2}

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12+A2
		EN 60825-1:2014
		EN 60825-2:2004+A1+A2
UL	E317337	UL 60950-1
		CSA C22.2 No. 60950-1-07
EMC CE	AE 50285865 0001	EN 55022:2010
		EN 55024:2010
FCC	WTF14F0514417E	47 CFR PART 15 OCT., 2013
FDA	/	CDRH 1040.10
ROHS	/	2011/65/EU

*Note2: The above certificate number updated to June 2014, because some certificate will be updated every year, such as FDA and ROHS. For the latest certification information, please check with Eoptolink.

Product Description

The EOLP-1696-TDW-14XXXN Tunable SFP+ module is a high performance tunable pluggable transceiver for use in the C-band window covering 1529 nm to 1568 nm. The module supports data rates from 0.614 Gb/s to 11.3 Gb/s and is provided in an SFP+, MSA compliant package. The optical transmitter utilizes the Tunable ILMZ chip to provide a high performance, low cost 10 Gb/s transceiver. Channel tuning is supported on the ITU-T 50 GHz grid across full C-band with ± 2.5 GHz stability. Wavelength and frequency tuning modes are supported in accordance with

SFF-8690.

The receive path comprises a PIN receiver with limiting amplifier.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	°C
Supply Voltage	Vcc	-0.5	3.6	V
ESD SFI pins	ESD1		1	kV
ESD except for SFI pins	ESD2		2	kV
Operating Relative Humidity		-	95	%

*Exceeding any one of these values may destroy the device immediately.

Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	T _c	Standard	0		+70	°C
Power Supply Voltage	Vcc		3.13	3.3	3.46	V
Power Supply Current	Icc				540	mA
Date Rate	EOLP-1696-TDW -14XXXN		0.614		11.3	Gbps

Performance Specifications – Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	Vin	250		1000	mVpp	AC coupled input*(note3)
Input Impedance (Differential)	Zin	85	100	115	ohm	Rin > 100 kohm @ DC
TX_Dis	Disable	2		Vcc+0.3	V	
	Enable	0		0.8		
TX_FAULT	Fault	2.4		Vcc+0.3	V	
	Normal	0		0.4		
Receiver						
CML Outputs (Differential)	Vout	350		850	mVpp	AC coupled output*(note3)
Output Impedance (Differential)	Zout	85	100	115	ohm	
RX_LOS	LOS	2.4		Vcc+0.3	V	
	Normal	0		0.4	V	
MOD_DEF (0:2)	VoH	2.5			V	With Serial ID
	VoL	0		0.5	V	

Performance Specifications – Optical

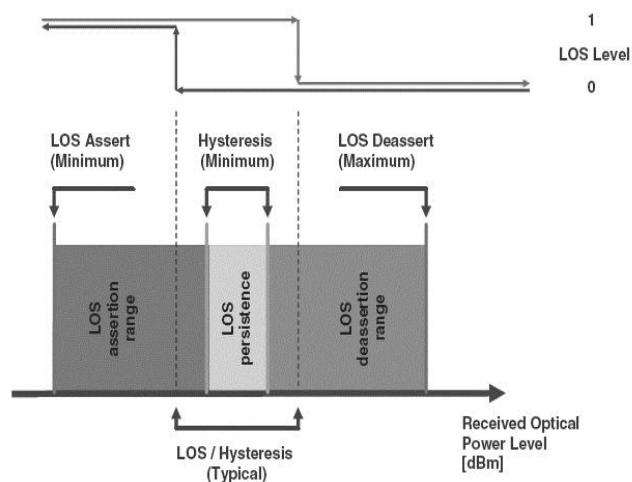
Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate		0.614		11.3	Gbps
Transmitter					
Center Wavelength Spacing			50		GHz
			0.3	0.5	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power(BOL) ^{*(note4)}	Pout	-1		+3	dBm
Average Launch Power (Tx: OFF)	Poff			-35	dBm
Extinction Ratio EOLP-1696-TDW-14XXN	ER	9			dB
Eye diagram compliance	GR-253, ITU-T G.691				
Pout@TX Disable Asserted	Pout			-45	dBm
Mask margin		10			%
Tuning speed (From one channel to another channel)				10	Sec
Receiver					
Input operating wavelength		1525		1575	nm
Receiver Sensitivity (B2B) ^{*(note5)}	Pmin			-15	dBm
Receiver Overload	Pmax	-3			dBm
LOS De-Assert ^{*(note6)}	LOSD			-16	dBm
LOS Assert ^{*(note6)}	LOSA	-35			dBm
LOS Hysteresis		0.5		4.0	dB

Note3: CML logic, internally AC coupled.

Note4: Output is coupled into a 9/125µm single-mode fiber.

Note5: Minimum average optical power measured at the 10.3125Gbps, ER>9dB, BER less than 1E-12, OSNR > 30dB, PRBS 2³¹-1.

Note6: Rx LOS Assert and De-Assert.



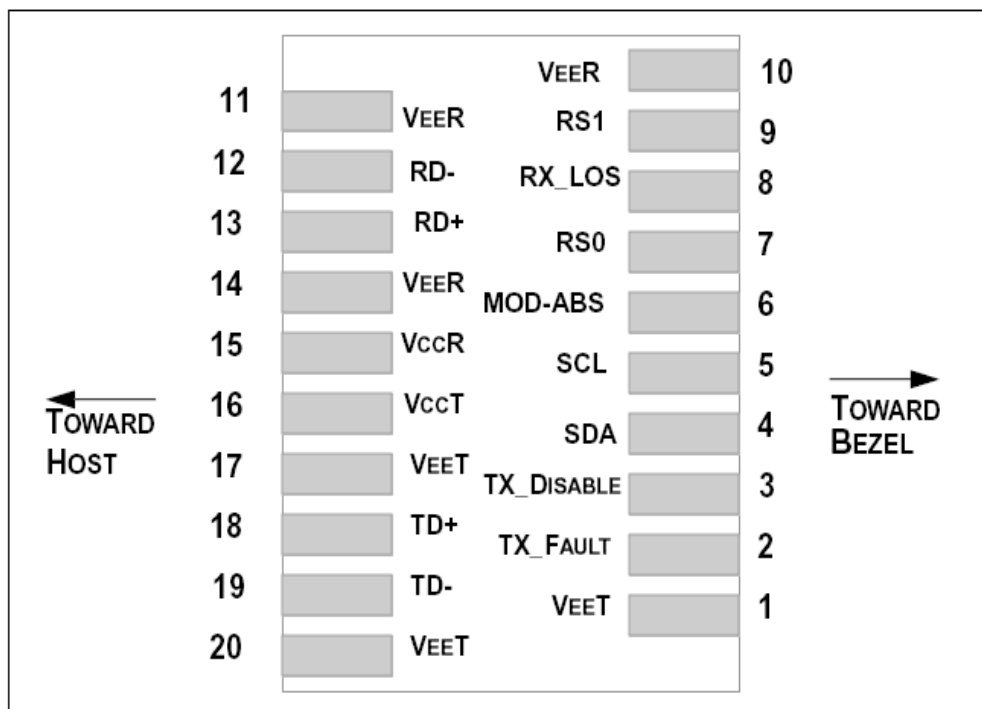
Time Specification

Parameter	Symbol	Min.	Typical	Max.	Unit
Tx_Disable assert time	t_off			100	us
Tx_Disable negate time	t_on			50	ms
Tx_Fault assert	t_fault_a			50	ms
Tx_Fault reset	t_fault_r	10			us
Loss Assert Delay	t_loss_a			100	us
Loss De-Assert Delay	t_loss_d			100	us
TEC Initiation time (Hot plug to TEC Cool)	t_tec_c			90	S
Time to I2C Ready	t_i2c_ini			300	ms

System Performance

Parameter	Min.	Max.	OSNR Resolution BW 0.1nm	BER	Remark
Noise Loaded	-400ps/nm	1400 ps/nm	19dB	1E-04	10.709Gb/s, -10 to -20dBm, 0.25nm filter BW, Rx DTV optimized
Unamplified links	0 ps/nm	1400 ps/nm	>35dB	1E-12	10.709Gb/s, -20dBm, 0.25nm filter BW, Rx DTV optimized

SFP+ Transceiver Electrical Pad Layout



Pin Function Definition

Pin Num.	Name	FUNCTION	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	SDA	Module Definition 2	3	2-wire Serial Interface Data Line.
5	SCL	Module Definition 1	3	2-wire Serial Interface Clock.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTL).	3	Rate Select 0, optionally controls SFP+ module receiver. This pin is pulled low to VeeT with a >30K resistor
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTL).	1	Rate Select 1, optionally controls SFP+ module transmitter. This pin is pulled low to VeeT with a >30K resistor
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its states are:

Low (0 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

High (2.0 – 3.465V): Transmitter Disabled

Open: Transmitter Disabled

3) Module absent, connected to VEET or VEER in the module.

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, it indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

5) The module signal ground contacts, VeeR and VeeT, should be isolated from the module case

6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

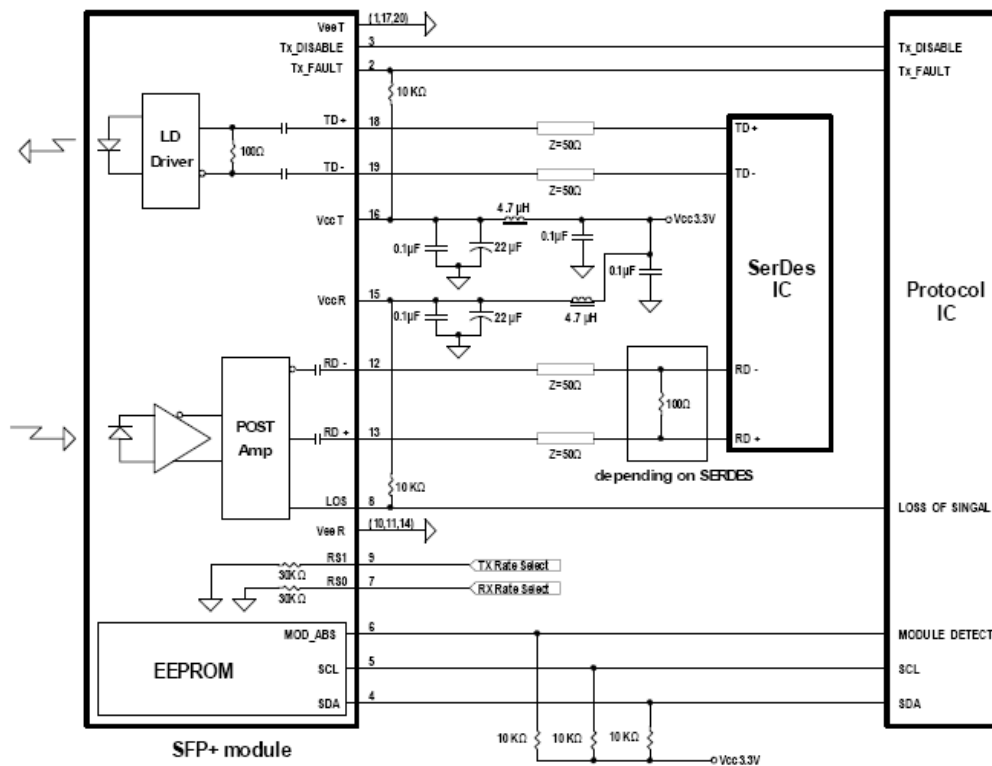
7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP+ connector pin. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. VccR and VccT may be internally connected within the SFP+ transceiver module.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

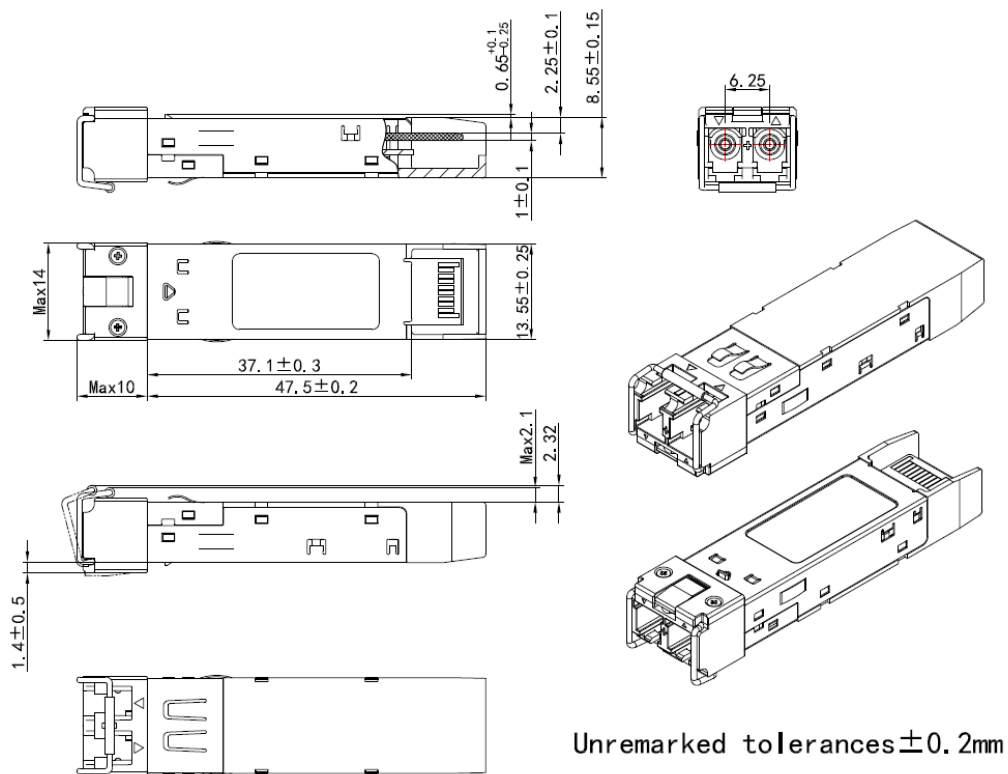
EEPROM

Please reference SFF-8690 – Tunable SFP+ Memory Map for ITU Frequencies

Recommend Circuit Schematic



Mechanical Specifications



*This 2D drawing only for reference, please check with Eoptolink before ordering.

Laser Emission



Obtaining Document

You can visit our website:

<http://www.eoptolink.com>

Or contact Eoptolink Technology Inc., Ltd. Listed at the end of the documentation to get the latest documents.

Revision History

Revision	Initiated	Reviewed	Approved	DCN	Release Date
V1.a	Oliver	Kelly/Sky	Phlio	Released.	May 11, 2017
V1.b	Oliver	Kelly/Sky/Bruce	Phlio	Update Wavelength channel	May 15, 2017
V1.c	Oliver	Kelly/Downey/Bruce	Phlio	Update some mistake	Jul 01, 2017

Notice:

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