

EOLP-1696-TDW-14XXN MSA Series

SFP+ Single-Mode Tunable Transceiver
RoHS6 Compliant

Features

- ◆ Support data rate 0.614 to 11.3Gbps
- ◆ 1550 nm ITU-T C-band 100 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: <1.8 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-ZR/ZW
- ◆ 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-14XXN ^{*(note1)}	0.614 to 11.3Gbps	ILMZ	14dB	No	Standard

Note1: XX refers to DWDM Wavelength channel as ITU-T specified at default status.

DWDM Wavelength List:

*Channel (X)	Part NO.	Frequency (THz)	Center Wavelength (nm)
1	EOLP-1696-TDW-1412N	191.2	1567.95
2	EOLP-1696-TDW-4113N	191.3	1567.13
3	EOLP-1696-TDW-4114N	191.4	1566.31
4	EOLP-1696-TDW-1415N	191.5	1565.50
5	EOLP-1696-TDW-1416N	191.6	1564.68
6	EOLP-1696-TDW-1417N	191.7	1563.86
7	EOLP-1696-TDW-1418N	191.8	1563.05
8	EOLP-1696-TDW-1419N	191.9	1562.23
9	EOLP-1696-TDW-1420N	192.0	1561.42
10	EOLP-1696-TDW-1421N	192.1	1560.61
11	EOLP-1696-TDW-1422N	192.2	1559.79
12	EOLP-1696-TDW-1423N	192.3	1558.98
13	EOLP-1696-TDW-1424N	192.4	1558.17
14	EOLP-1696-TDW-1425N	192.5	1557.36
15	EOLP-1696-TDW-1426N	192.6	1556.55
16	EOLP-1696-TDW-1427N	192.7	1555.75
17	EOLP-1696-TDW-1428N	192.8	1554.94
18	EOLP-1696-TDW-1429N	192.9	1554.13
19	EOLP-1696-TDW-1430N	193.0	1553.33
20	EOLP-1696-TDW-1431N	193.1	1552.52
21	EOLP-1696-TDW-1432N	193.2	1551.72
22	EOLP-1696-TDW-1433N	193.3	1550.92
23	EOLP-1696-TDW-1434N	193.4	1550.12
24	EOLP-1696-TDW-1435N	193.5	1549.32
25	EOLP-1696-TDW-1436N	193.6	1548.51
26	EOLP-1696-TDW-1437N	193.7	1547.72
27	EOLP-1696-TDW-1438N	193.8	1546.92
28	EOLP-1696-TDW-1439N	193.9	1546.12
29	EOLP-1696-TDW-1440N	194.0	1545.32
30	EOLP-1696-TDW-1441N	194.1	1544.53
31	EOLP-1696-TDW-1442N	194.2	1543.73
32	EOLP-1696-TDW-1443N	194.3	1542.94
33	EOLP-1696-TDW-1444N	194.4	1542.14
34	EOLP-1696-TDW-1445N	194.5	1541.35
35	EOLP-1696-TDW-1446N	194.6	1540.56
36	EOLP-1696-TDW-1447N	194.7	1539.77
37	EOLP-1696-TDW-1448N	194.8	1538.98
38	EOLP-1696-TDW-1449N	194.9	1538.19

39	EOLP-1696-TDW-1450N	195.0	1537.40
40	EOLP-1696-TDW-1451N	195.1	1536.61
41	EOLP-1696-TDW-1452N	195.2	1535.82
42	EOLP-1696-TDW-1453N	195.3	1535.04
43	EOLP-1696-TDW-1454N	195.4	1534.25
44	EOLP-1696-TDW-1455N	195.5	1533.47
45	EOLP-1696-TDW-1456N	195.6	1532.68
46	EOLP-1696-TDW-1457N	195.7	1531.90
47	EOLP-1696-TDW-1458N	195.8	1531.12
48	EOLP-1696-TDW-1459N	195.9	1530.33
49	EOLP-1696-TDW-1460N	196.0	1529.55

*: 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-14XXN 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 100 GHz grid across full C-band 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	V _{cc}	3.13	3.3	3.46	V
Power Supply Current	I _{cc}			550	mA
Date Rate	EOLP-1696-TDW -14XXN	0.614		11.3	Gbps

Performance Specifications – Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	V _{in}	250		1000	mVpp	AC coupled input*(note3)
Input Impedance (Differential)	Z _{in}	85	100	115	ohm	R _{in} > 100 kohm @ DC
TX_Dis	Disable	2		V _{cc} +0.3	V	
	Enable	0		0.8		
TX_FAULT	Fault	2.4		V _{cc} +0.3	V	
	Normal	0		0.4		
Receiver						
CML Outputs (Differential)	V _{out}	350		850	mVpp	AC coupled output*(note3)
Output Impedance (Differential)	Z _{out}	85	100	115	ohm	
RX_LOS	LOS	2.4		V _{cc} +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			100		GHz
			0.8		nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power(BOL)*(note4)	P _{out}	-1		+3	dBm
Average Launch Power (Tx: OFF)	P _{off}			-35	dBm

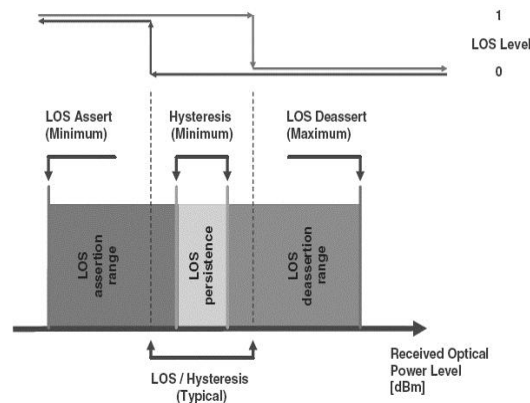
Extinction Ratio EOLP-1696-TDW-14XXN	ER	9			dB
Eye diagram compliance	GR-253, ITU-T G.691				
Pout@TX Disable Asserted	Pout			-45	dBm
Mask margin		10			%
Tuning speed (From one channel to another channel)				10	Sec
Receiver					
Input operating wavelength		1525		1575	nm
Receiver Sensitivity (B2B) ^{*(note5)}	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.



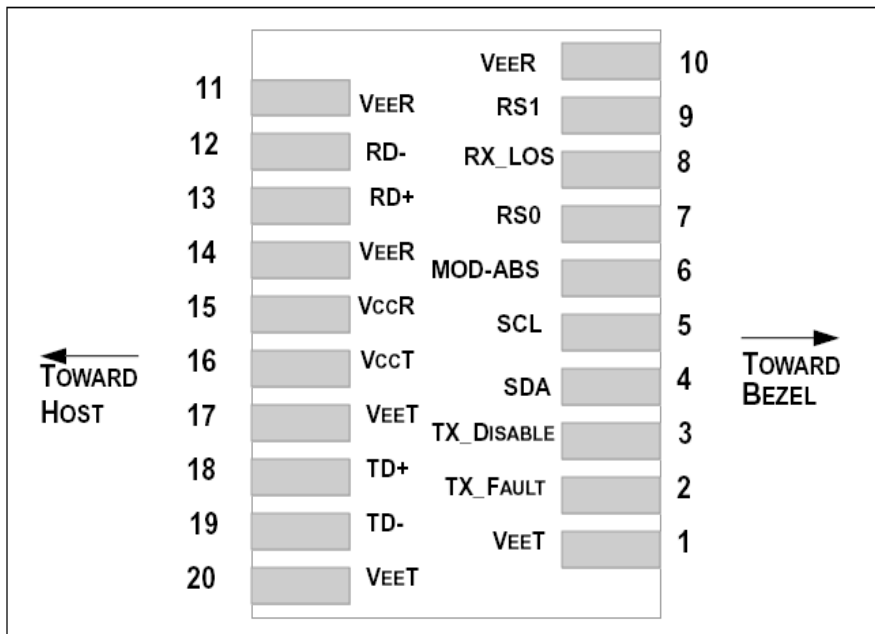
Time Specification

Parameter	Symbol	Min.	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 (LVTTTL).	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 (LVTTTL).	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.

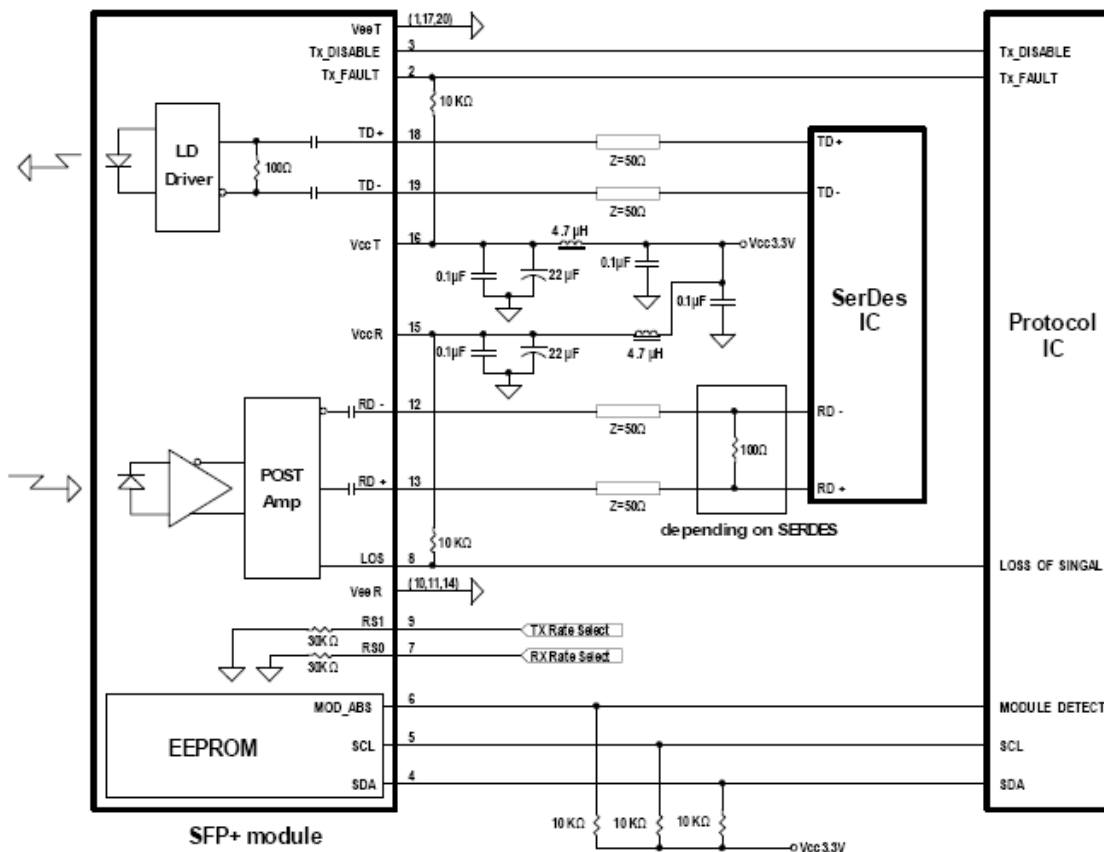
4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use).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

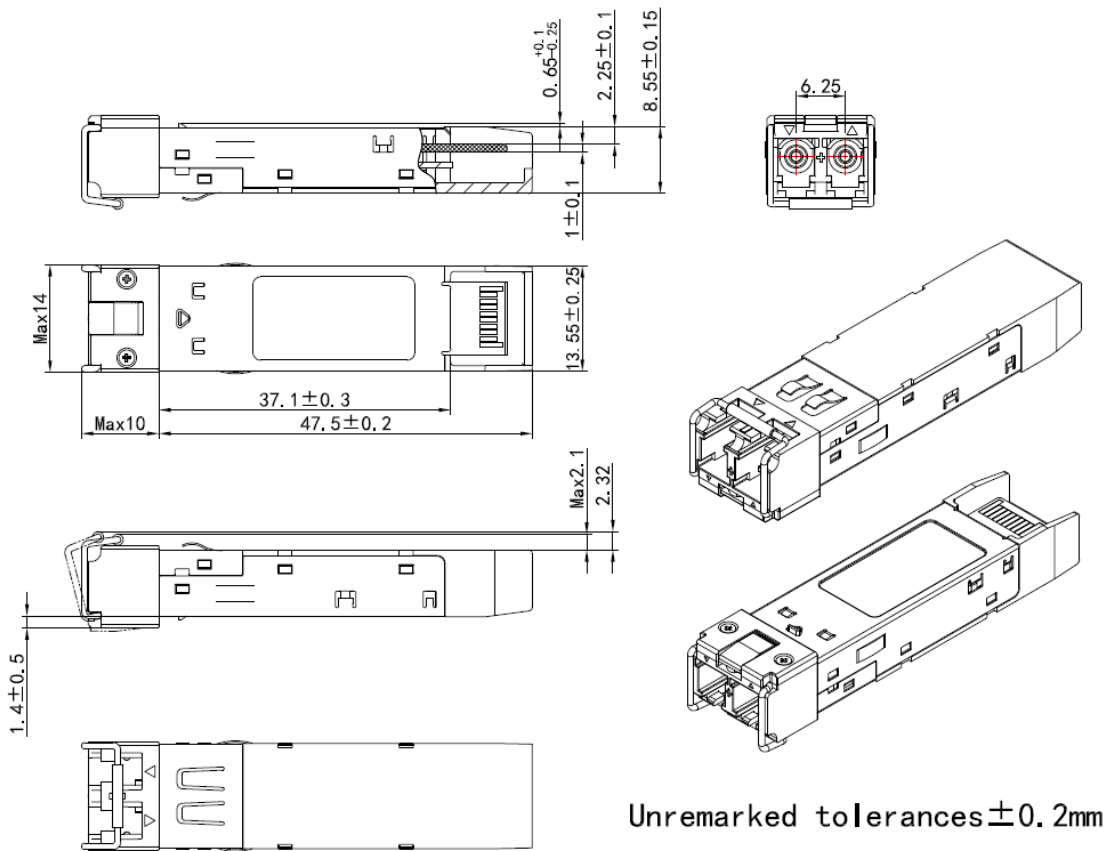
EEPROM

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

Recommend Circuit Schematic

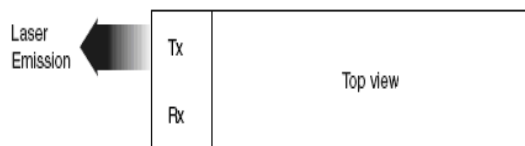


Mechanical Specifications



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

Laser Emission



Obtaining Document

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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/Downey/Bruce	Phlio	Initial.	Jul 01, 2017

Notice:

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