

EOLP-1696-TDW-23XXN 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
- ◆ APD 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-23XXN ^{*(note1)}	0.614 to 11.3Gbps	ILMZ	23dB	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-2312N	191.2	1567.95
2	EOLP-1696-TDW-2313N	191.3	1567.13
3	EOLP-1696-TDW-2314N	191.4	1566.31
4	EOLP-1696-TDW-2315N	191.5	1565.50
5	EOLP-1696-TDW-2316N	191.6	1564.68
6	EOLP-1696-TDW-2317N	191.7	1563.86
7	EOLP-1696-TDW-2318N	191.8	1563.05
8	EOLP-1696-TDW-2319N	191.9	1562.23
9	EOLP-1696-TDW-2320N	192.0	1561.42
10	EOLP-1696-TDW-2321N	192.1	1560.61
11	EOLP-1696-TDW-2322N	192.2	1559.79
12	EOLP-1696-TDW-2323N	192.3	1558.98
13	EOLP-1696-TDW-2324N	192.4	1558.17
14	EOLP-1696-TDW-2325N	192.5	1557.36
15	EOLP-1696-TDW-2326N	192.6	1556.55
16	EOLP-1696-TDW-2327N	192.7	1555.75
17	EOLP-1696-TDW-2328N	192.8	1554.94
18	EOLP-1696-TDW-2329N	192.9	1554.13
19	EOLP-1696-TDW-2330N	193.0	1553.33
20	EOLP-1696-TDW-2331N	193.1	1552.52
21	EOLP-1696-TDW-2332N	193.2	1551.72
22	EOLP-1696-TDW-2333N	193.3	1550.92
23	EOLP-1696-TDW-2334N	193.4	1550.12
24	EOLP-1696-TDW-2335N	193.5	1549.32
25	EOLP-1696-TDW-2336N	193.6	1548.51
26	EOLP-1696-TDW-2337N	193.7	1547.72
27	EOLP-1696-TDW-2338N	193.8	1546.92
28	EOLP-1696-TDW-2339N	193.9	1546.12
29	EOLP-1696-TDW-2340N	194.0	1545.32
30	EOLP-1696-TDW-2341N	194.1	1544.53
31	EOLP-1696-TDW-2342N	194.2	1543.73
32	EOLP-1696-TDW-2343N	194.3	1542.94
33	EOLP-1696-TDW-2344N	194.4	1542.14
34	EOLP-1696-TDW-2345N	194.5	1541.35
35	EOLP-1696-TDW-2346N	194.6	1540.56
36	EOLP-1696-TDW-2347N	194.7	1539.77
37	EOLP-1696-TDW-2348N	194.8	1538.98
38	EOLP-1696-TDW-2349N	194.9	1538.19

39	EOLP-1696-TDW-2350N	195.0	1537.40
40	EOLP-1696-TDW-2351N	195.1	1536.61
41	EOLP-1696-TDW-2352N	195.2	1535.82
42	EOLP-1696-TDW-2353N	195.3	1535.04
43	EOLP-1696-TDW-2354N	195.4	1534.25
44	EOLP-1696-TDW-2355N	195.5	1533.47
45	EOLP-1696-TDW-2356N	195.6	1532.68
46	EOLP-1696-TDW-2357N	195.7	1531.90
47	EOLP-1696-TDW-2358N	195.8	1531.12
48	EOLP-1696-TDW-2359N	195.9	1530.33
49	EOLP-1696-TDW-2360N	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-23XXN 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 an APD 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 -23XXN		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

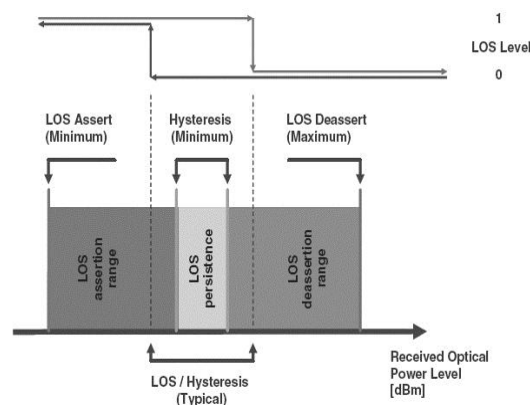
Extinction Ratio EOLP-1696-TDW-23XXN	ER	9			dB
Eye diagram compliance	GR-253, ITU-T G.691				
Pout@TX Disable Asserted	Pout			-45	dBm
Mask margin		10			%
Tuning speed (From one channel to another channel)				10	Sec
Receiver					
Input operating wavelength		1525		1575	nm
Receiver Sensitivity (B2B) ^{*(note5)}	Pmin			-24	dBm
Receiver Overload	Pmax	-7			dBm
Receiver Reflectance	RL			-27	dB
LOS De-Assert ^{*(note6)}	LOSD			-25	dBm
LOS Assert ^{*(note6)}	LOSA	-42		-26	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.



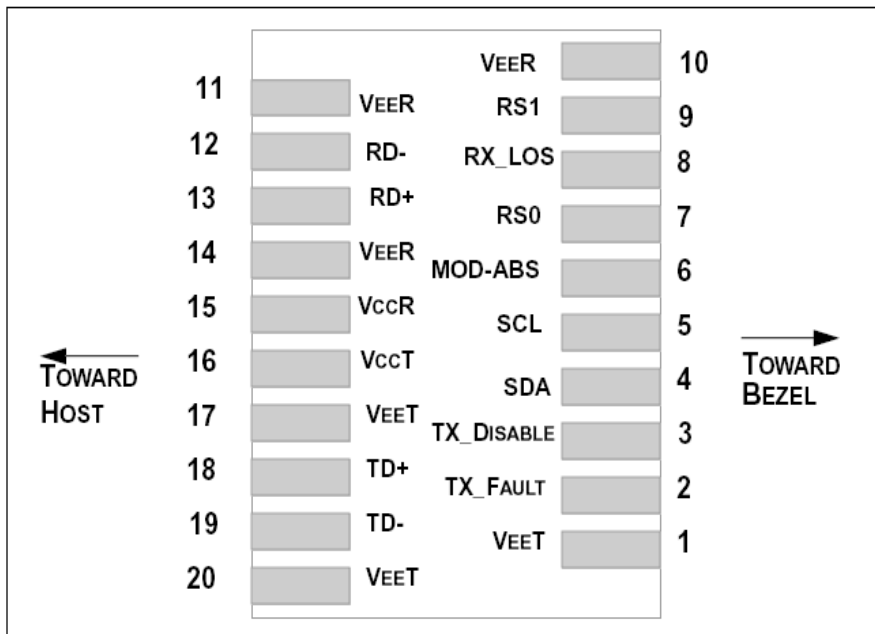
Time Specification

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.

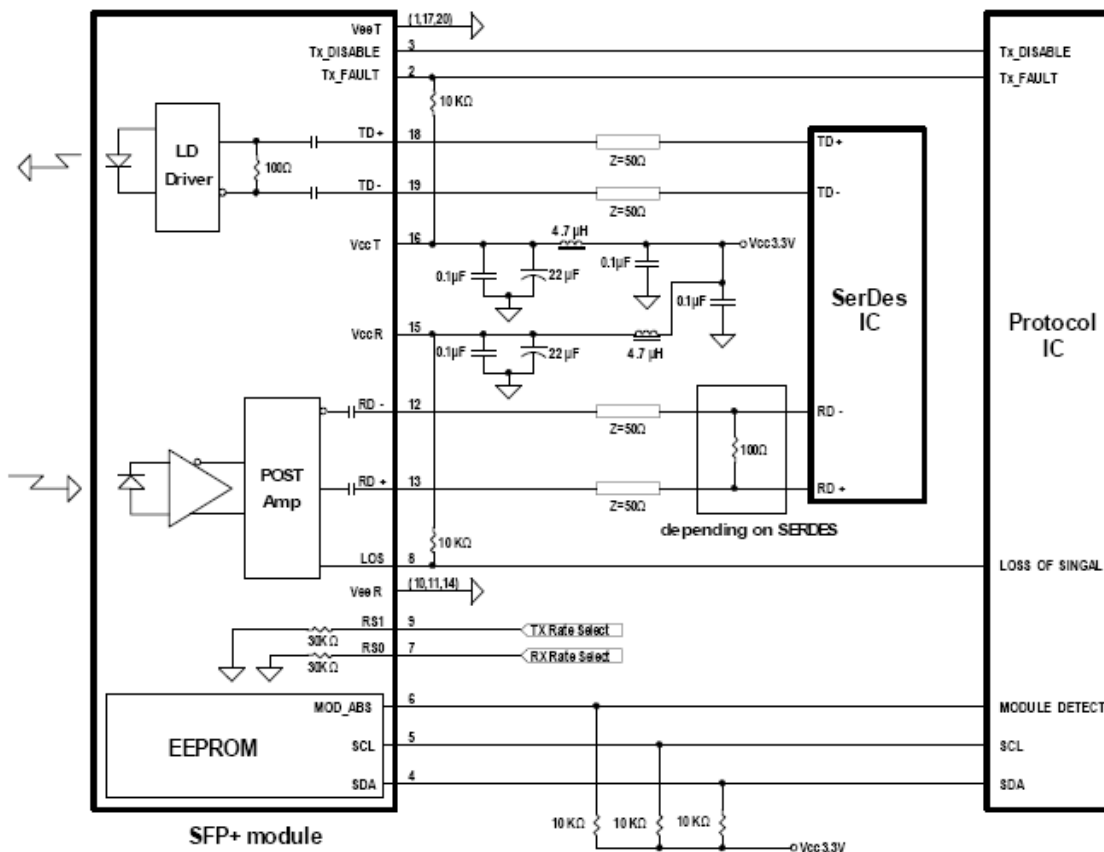
4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use).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

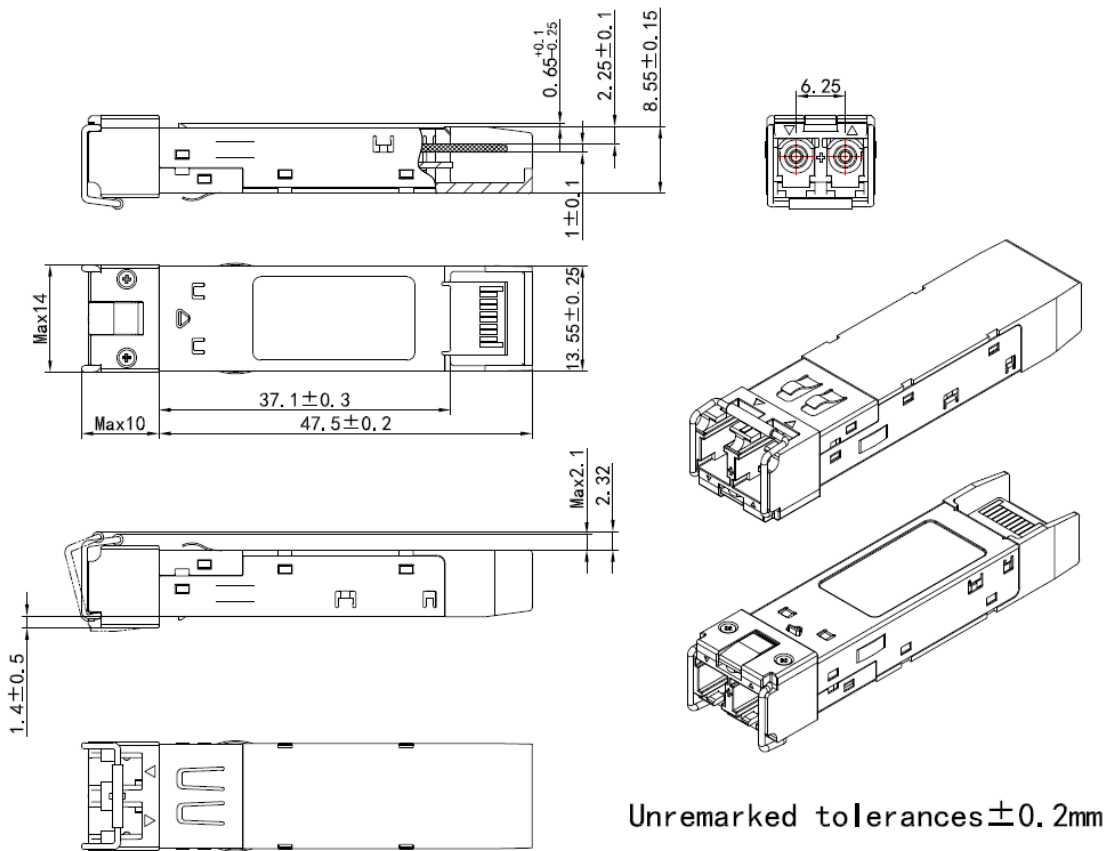
EEPROM

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

Recommend Circuit Schematic

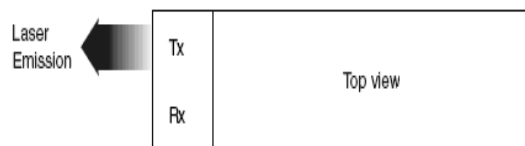


Mechanical Specifications



*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/Sky	Phlio	Initial.	Mar 20, 2017
V1.b	Oliver	Phlio/Bruce/Sky		Update the power consumption and add wavelength list	Jun 16, 2017
V1.c	Oliver	Kelly/Downey/Bruce	Phlio	Update the date rate	Jul 01, 2017

Notice:

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