

EOLP-1696-14XXRN series

SFP+ Single-Mode for DWDM Application
Duplex SFP+ Transceiver
Digital Diagnostic Function
RoHS6 Compliant

Features

- ◆ Available in all C-Band Wavelengths on the 100GHz DWDM ITU Grid
- ◆ Temperature-Stabilized DWDM EML Transmitter
- ◆ Duplex LC Connector
- ◆ Power Dissipation < 1.5W
- ◆ With CDR function
- ◆ Dispersion tolerance from -300ps/nm to 800ps/nm
- ◆ Hot-Pluggable SFP+ Footprint
- ◆ Compliant with SFF-8431 MSA
- ◆ Compliant with SFF-8432 MSA
- ◆ Operating Case Temperature
Standard: 0°C to 70°C



Applications

- ◆ STM64/OC192
- ◆ Other optical links

Ordering Information

Part No.	Data Rate	Laser	Power budget	CDR	Case Temp.
EOLP-1696-14XXRN ^{*(note1)}	9.953~11.3Gbps	DWDM EML	14dB	YES	0°C to 70°C

Note1: XX refers to DWDM Wavelength channel as ITU-T specified, please refer the following table for detailed center wavelength information.

*The product image only for reference purpose.

XX- Channel refers to the following table:

Channel (X)*Note2	Part NO.	Frequency (THz)	Center Wavelength (nm)
15	EOLP-1696-1415RN	191.5	1565.50
16	EOLP-1696-1416RN	191.6	1564.68
17	EOLP-1696-1417RN	191.7	1563.86
18	EOLP-1696-1418RN	191.8	1563.05
19	EOLP-1696-1419RN	191.9	1562.23
20	EOLP-1696-1420RN	192.0	1561.42
21	EOLP-1696-1421RN	192.1	1560.61
22	EOLP-1696-1422RN	192.2	1559.79
23	EOLP-1696-1423RN	192.3	1558.98
24	EOLP-1696-1424RN	192.4	1558.17
25	EOLP-1696-1425RN	192.5	1557.36
26	EOLP-1696-1426RN	192.6	1556.55
27	EOLP-1696-1427RN	192.7	1555.75
28	EOLP-1696-1428RN	192.8	1554.94
29	EOLP-1696-1429RN	192.9	1554.13
30	EOLP-1696-1430RN	193.0	1553.33
31	EOLP-1696-1431RN	193.1	1552.52
32	EOLP-1696-1432RN	193.2	1551.72
33	EOLP-1696-1433RN	193.3	1550.92
34	EOLP-1696-1434RN	193.4	1550.12
35	EOLP-1696-1435RN	193.5	1549.32
36	EOLP-1696-1436RN	193.6	1548.51
37	EOLP-1696-1437RN	193.7	1547.72
38	EOLP-1696-1438RN	193.8	1546.92
39	EOLP-1696-1439RN	193.9	1546.12
40	EOLP-1696-1440RN	194.0	1545.32
41	EOLP-1696-1441RN	194.1	1544.53
42	EOLP-1696-1442RN	194.2	1543.73
43	EOLP-1696-1443RN	194.3	1542.94
44	EOLP-1696-1444RN	194.4	1542.14
45	EOLP-1696-1445RN	194.5	1541.35
46	EOLP-1696-1446RN	194.6	1540.56
47	EOLP-1696-1447RN	194.7	1539.77
48	EOLP-1696-1448RN	194.8	1538.98
49	EOLP-1696-1449RN	194.9	1538.19
50	EOLP-1696-1450RN	195.0	1537.40
51	EOLP-1696-1451RN	195.1	1536.61
52	EOLP-1696-1452RN	195.2	1535.82
53	EOLP-1696-1453RN	195.3	1535.04
54	EOLP-1696-1454RN	195.4	1534.25

55	EOLP-1696-1455RN	195.5	1533.47
56	EOLP-1696-1456RN	195.6	1532.68
57	EOLP-1696-1457RN	195.7	1531.90
58	EOLP-1696-1458RN	195.8	1531.12
59	EOLP-1696-1459RN	195.9	1530.33
60	EOLP-1696-1460RN	196.0	1529.55
61	EOLP-1696-1461RN	196.1	1528.77

*Note2: Please contact with EOPTOLINK for the channel availability.

Regulatory Compliance*

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

*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-1696-14XXRN series single mode transceiver is small form factor pluggable module for duplex optical communications. This module is designed for single mode fiber and operates at a nominal DWDM wavelength from 1528nm to 1566nm as specified by the ITU-T. It is designed to deploy in the DWDM networking equipment in metropolitan access and core networks.

It is with the SFP+ 20-pin connector to allow hot plug capability. The transmitter section uses a DWDM EML laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses a PIN detector and a limiting post-amplifier IC.

The EOLP-1696-14XXRN series are designed to be compliant with SFP+ Multi-Source Agreement (MSA) Specification SFF-8431.

Absolute Maximum Ratings*^{Note3}

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	°C
Supply Voltage	Vcc	-0.5	3.6	V
Operating Relative Humidity		-	95	%

Note3: 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	0		+70	°C
Power Supply Voltage	V _{cc}	3.15	3.3	3.45	V
Power Supply Current	I _{cc}			434	mA
Data Rate		9.953		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 ^{*(Note4)}
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		V _{cc} +0.3	V	
	Normal	0		0.5		
Receiver						
CML Outputs (Differential)	V _{out}	350		700	mVpp	AC coupled output ^{*(Note4)}
Output Impedance (Differential)	Z _{out}	85	100	115	ohm	
RX_LOS	LOS	2		V _{cc} +0.3	V	
	Normal	0		0.8	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		9.953		11.3	Gbps
Transmitter					
Center Wavelength Spacing			100		GHz
			0.8		nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power ^{*(Note5)}	P _{out}	-1		4	dBm
Average Launch Power (Tx: OFF)	P _{off}			-30	dBm
Extinction Ratio	ER	8.2			dB
Transmitter Dispersion Penalty @800ps/nm	TDP			2	dB
P _{out} @TX Disable Asserted	P _{out}			-45	dBm
Relative Intensity Noise	RIN			-128	dB/Hz

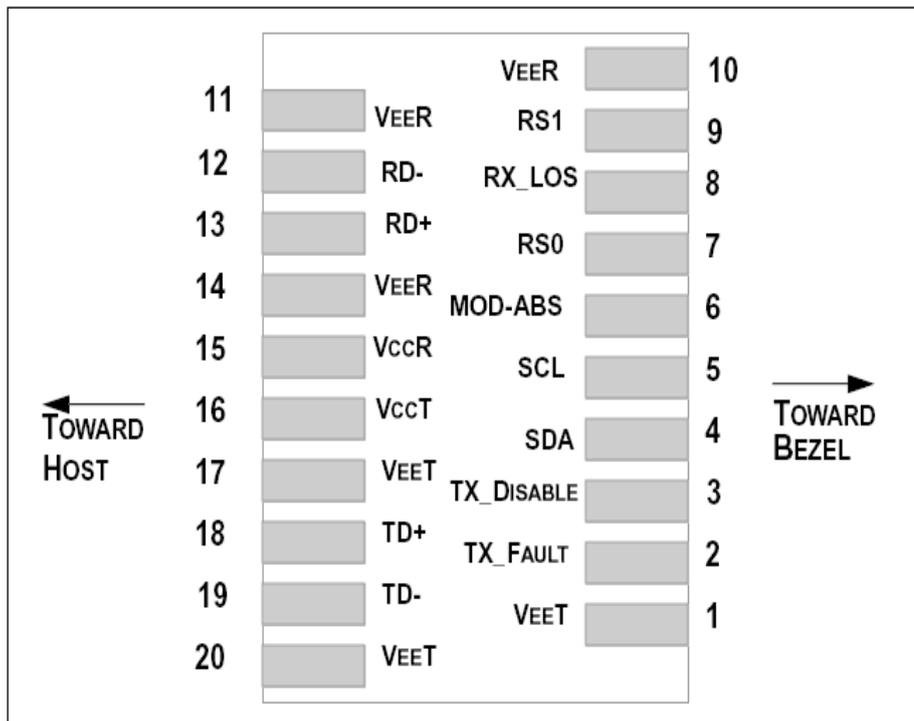
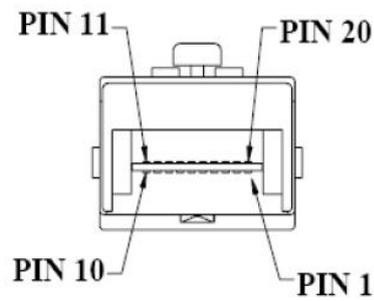
Tx Jitter 20kHz-80MHz	TXj			0.3	UI
Tx Jitter 4MHz – 80MHz	TXj			0.1	
Receiver					
Receiver Sensitivity*(Note6)	Pmin			-15	dBm
Receiver Overload	Pmax	-1			dBm
LOS De-Assert	LOSD			-17	dBm
LOS Assert	LOSA	-29			dBm
LOS Hysteresis		1			dB

Note4: CML logic, internally AC coupled.

Note5: Output is coupled into a 9/125µm single-mode fiber.

Note6: Minimum average optical power measured at the BER less than 1E-12. The measure pattern is PRBS 2³¹-1.

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	Note 3, Data line for Serial ID.
5	SCL	Module Definition 1	3	Note 3, Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	This pin has an internal 30k pull down to ground. A signal on This pin will not affect module performance.
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	1	This pin has an internal 30k pull down to ground. A signal on This pin will not affect module performance.
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 on1
(>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) VeeR and VeeT may be internally connected within the SFP+ module.

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. Maximum supply current is 434mA. 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. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.

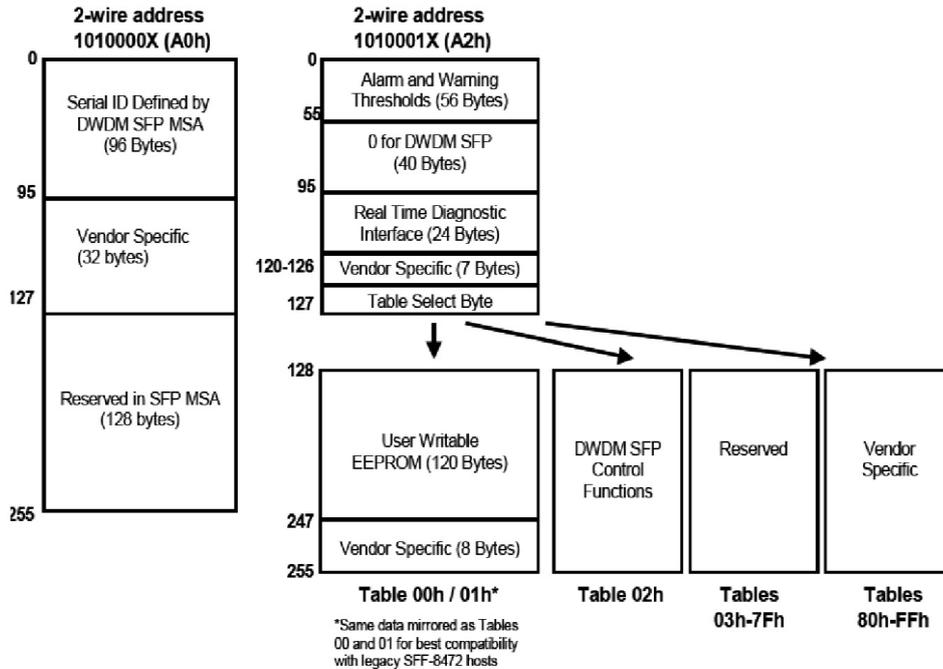
8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

EEPROM

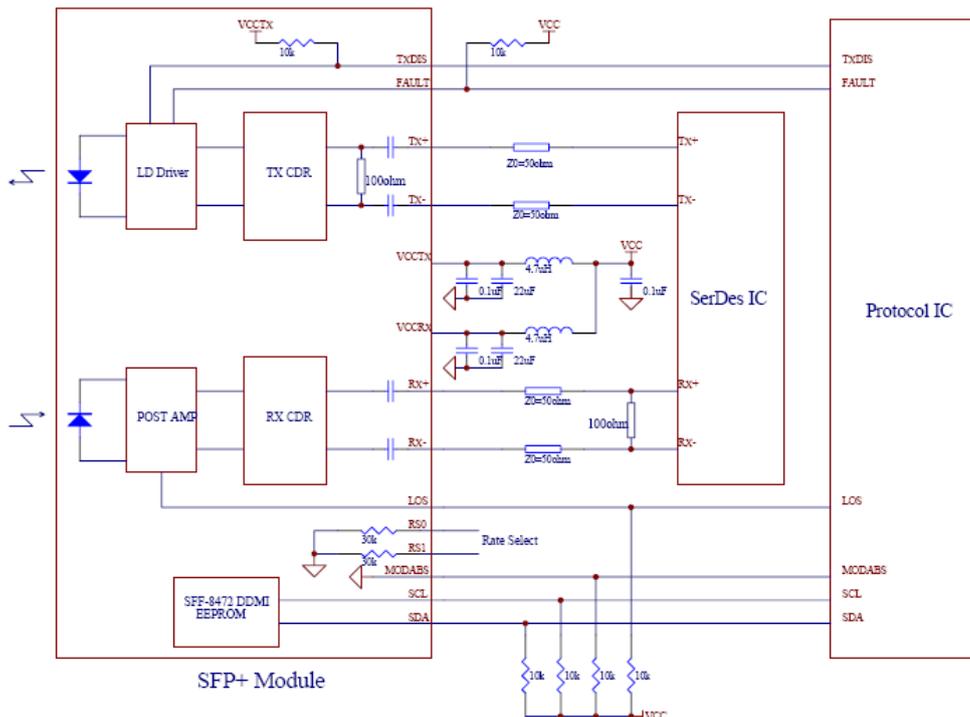
The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

The serial interface uses the 2-wire serial CMOS EEPROM protocol. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

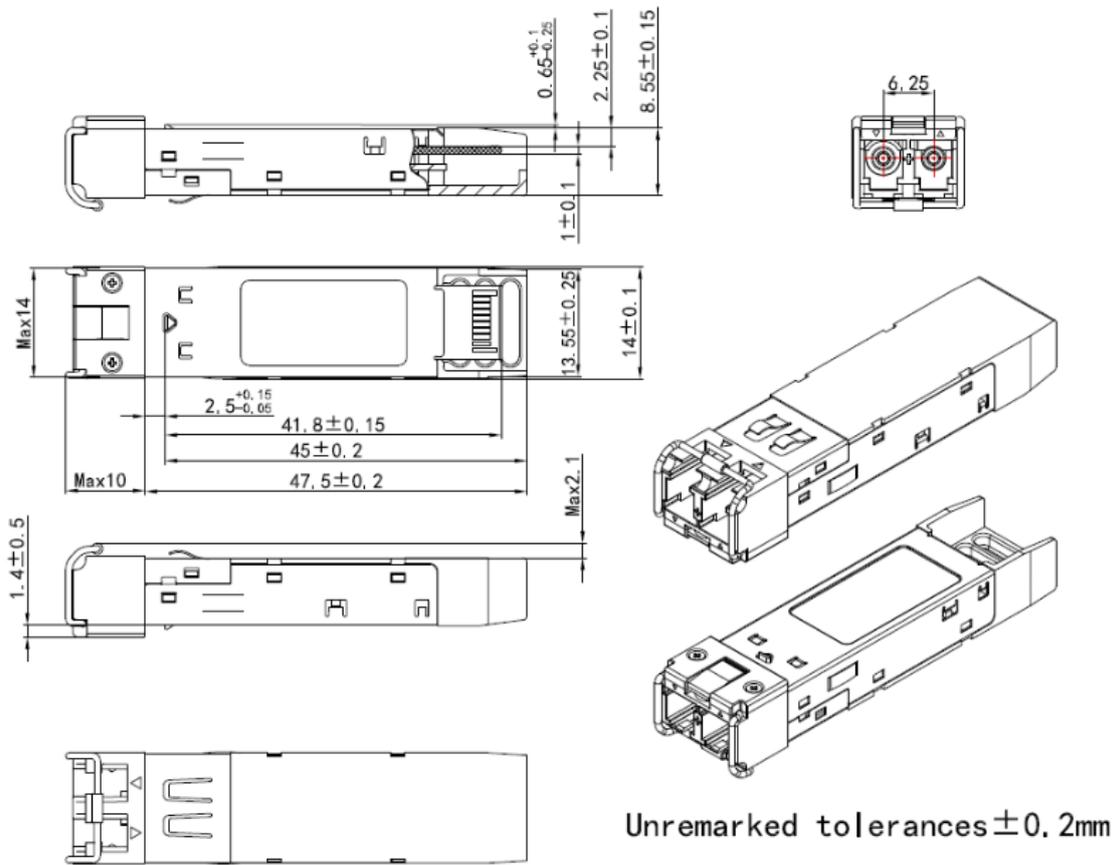
The module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Alarm/warning threshold data is written during device manufacture. TEC current monitoring, laser temperature monitoring, received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and transceiver temperature monitoring all are implemented. The diagnostic data are internal calibration and stored in memory locations 96 – 109 at wire serial bus address A2h. The transceiver memory map specific data field defines as following.



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	Alex	Kelly		New Released.	July 16,

					2012
V1.b	Angela	Kelly		Update mechanical spec. & power dissipation & Er & application.	July 24, 2012
V1.c	Angela	Kelly		Update photo, jitter & schematic spec.	July 27, 2012
V1.d	Angela	Kelly		Update lcc & Po & Sen.	Aug 1, 2012
V1.e	Frank	Kelly		Update lcc & LOSA & Sen & LOSD, correct PN on page2~3.	Mar 13, 2013
V1.f	Airon	Frank,Torres, Fing,Eason,JP		Update Power dissipation & Data rate & lcc	Dec 26, 2013
V1.i	Angela	Kelly/Vina/Arion /Fing/JP/Eason		Update the regulatory compliance and the tolerances of 2D drawing.	Jan 27,2016
V1.j	Elaine	Kelly/Angela/M arvin/ Torres/Sky/William/ Chao.Wang	Phlio	Update the picture, the 2D drawing and the contact.	Mar 23, 2018

Notice:

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