

EOLP-1696-14XXXRN series

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



Features

- ◆ Available in all C-Band Wavelengths on the 50GHz 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-1696-14XXXRN ^{*(note1)}	9.953~11.3Gbps	DWDM EML	14dB	YES	0°C to 70°C

Note1: XXX 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.

XXX- Channel refers to the following table:

Channel(X) ^{*note2}	Part NO.	Frequency (THz)	Center Wavelength (nm)
200	EOLP-1696-14200RN	192.00	1561.42
205	EOLP-1696-14205RN	192.05	1561.01
210	EOLP-1696-14210RN	192.10	1560.61
215	EOLP-1696-14215RN	192.15	1560.20
220	EOLP-1696-14220RN	192.20	1559.79
225	EOLP-1696-14225RN	192.25	1559.39
230	EOLP-1696-14230RN	192.30	1558.98
235	EOLP-1696-14235RN	192.35	1558.58
240	EOLP-1696-14240RN	192.40	1558.17
245	EOLP-1696-14245RN	192.45	1557.77
250	EOLP-1696-14250RN	192.50	1557.36
255	EOLP-1696-14255RN	192.55	1556.96
260	EOLP-1696-14260RN	192.60	1556.55
265	EOLP-1696-14265RN	192.65	1556.15
270	EOLP-1696-14270RN	192.70	1555.75
275	EOLP-1696-14275RN	192.75	1555.34
280	EOLP-1696-14280RN	192.80	1554.94
285	EOLP-1696-14285RN	192.85	1554.54
290	EOLP-1696-14290RN	192.90	1554.13
295	EOLP-1696-14295RN	192.95	1553.73
300	EOLP-1696-14300RN	193.00	1553.33
305	EOLP-1696-14305RN	193.05	1552.93
310	EOLP-1696-14310RN	193.10	1552.52
315	EOLP-1696-14315RN	193.15	1552.12
320	EOLP-1696-14320RN	193.20	1551.72
325	EOLP-1696-14325RN	193.25	1551.32
330	EOLP-1696-14330RN	193.30	1550.92
335	EOLP-1696-14335RN	193.35	1550.52
340	EOLP-1696-14340RN	193.40	1550.12
345	EOLP-1696-14345RN	193.45	1549.72
350	EOLP-1696-14350RN	193.50	1549.32
355	EOLP-1696-14355RN	193.55	1548.91
360	EOLP-1696-14360RN	193.60	1548.51
365	EOLP-1696-14365RN	193.65	1548.11
370	EOLP-1696-14370RN	193.70	1547.72
375	EOLP-1696-14375RN	193.75	1547.32
380	EOLP-1696-14380RN	193.80	1546.92
385	EOLP-1696-14385RN	193.85	1546.52
390	EOLP-1696-14390RN	193.90	1546.12
395	EOLP-1696-14395RN	193.95	1545.72

DWDM SFP+ Series

400	EOLP-1696-14400RN	194.00	1545.32
405	EOLP-1696-14405RN	194.05	1544.92
410	EOLP-1696-14410RN	194.10	1544.53
415	EOLP-1696-14415RN	194.15	1544.13
420	EOLP-1696-14420RN	194.20	1543.73
425	EOLP-1696-14425RN	194.25	1543.33
430	EOLP-1696-14430RN	194.30	1542.94
435	EOLP-1696-14435RN	194.35	1542.54
440	EOLP-1696-14440RN	194.40	1542.14
445	EOLP-1696-14445RN	194.45	1541.75
450	EOLP-1696-14450RN	194.50	1541.35
455	EOLP-1696-14455RN	194.55	1540.95
460	EOLP-1696-14460RN	194.60	1540.56
465	EOLP-1696-14465RN	194.65	1540.16
470	EOLP-1696-14470RN	194.70	1539.77
475	EOLP-1696-14475RN	194.75	1539.37
480	EOLP-1696-14480RN	194.80	1538.98
485	EOLP-1696-14485RN	194.85	1538.58
490	EOLP-1696-14490RN	194.90	1538.19
495	EOLP-1696-14495RN	194.95	1537.79
500	EOLP-1696-14500RN	195.00	1537.40
505	EOLP-1696-14505RN	195.05	1537.00
510	EOLP-1696-14510RN	195.10	1536.61
515	EOLP-1696-14515RN	195.15	1536.22
520	EOLP-1696-14520RN	195.20	1535.82
525	EOLP-1696-14525RN	195.25	1535.43
530	EOLP-1696-14530RN	195.30	1535.04
535	EOLP-1696-14535RN	195.35	1534.64
540	EOLP-1696-14540RN	195.40	1534.25
545	EOLP-1696-14545RN	195.45	1533.86
550	EOLP-1696-14550RN	195.50	1533.47
555	EOLP-1696-14555RN	195.55	1533.07
560	EOLP-1696-14560RN	195.60	1532.68
565	EOLP-1696-14565RN	195.65	1532.29
570	EOLP-1696-14570RN	195.70	1531.90
575	EOLP-1696-14575RN	195.75	1531.51
580	EOLP-1696-14580RN	195.80	1531.12
585	EOLP-1696-14585RN	195.85	1530.72
590	EOLP-1696-14590RN	195.90	1530.33
595	EOLP-1696-14595RN	195.95	1529.94
600	EOLP-1696-14600RN	196.00	1529.55
605	EOLP-1696-14605RN	196.05	1529.16

*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-1696-14XXXRN 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-1696-14XXXRN 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	T _s	-40	+85	°C
Supply Voltage	V _{cc}	-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
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Performance Specifications – Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	Vin	250		1000	mVpp	AC coupled input*(Note4)
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		Vcc+0.3	V	
	Normal	0		0.5		
Receiver						
CML Outputs (Differential)	Vout	350		700	mVpp	AC coupled output*(Note5)
Output Impedance (Differential)	Zout	85	100	115	ohm	
RX_LOS	LOS	2		Vcc+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			50		GHz
			0.4		nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power*(Note6)	Pout	-1		4	dBm
Average Launch Power (Tx: OFF)	Poff			-30	dBm
Extinction Ratio	ER	8.2			dB
Transmitter Dispersion Penalty @800ps/nm	TDP			2	dB
Pout@TX Disable Asserted	Pout			-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

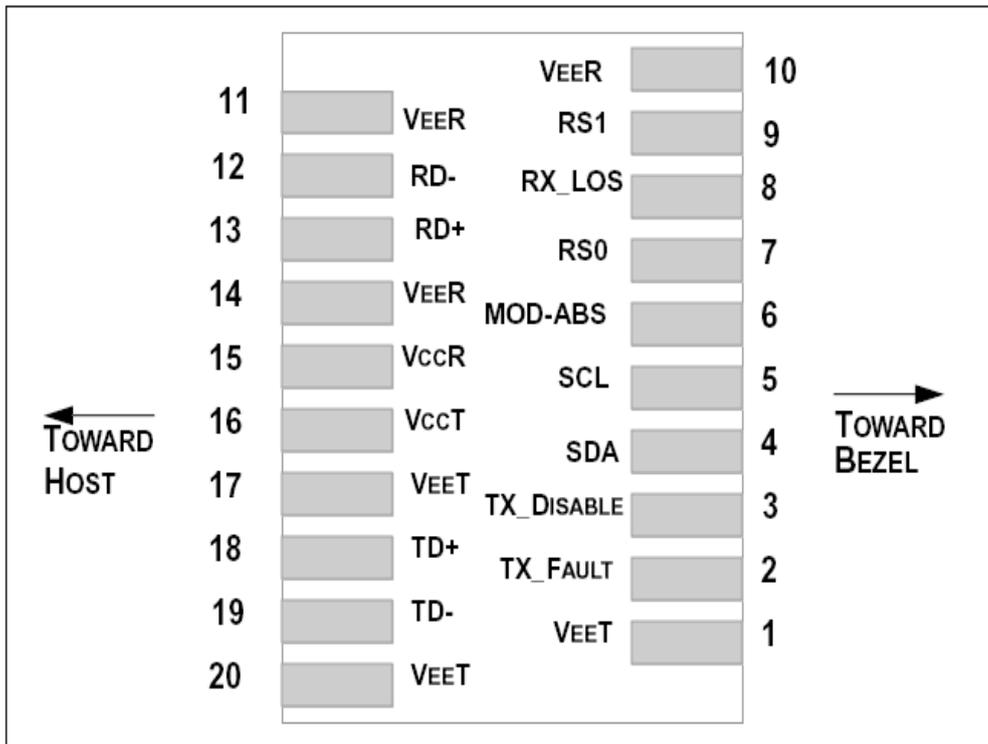
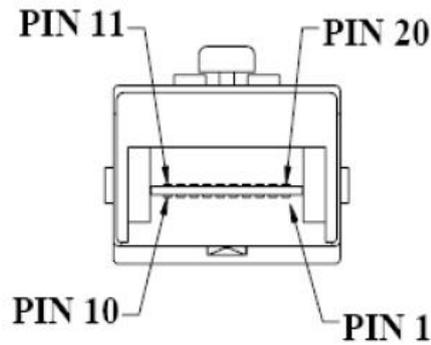
LOS Hysteresis		1			dB
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Note4: CML logic, internally AC coupled.

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 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) 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.

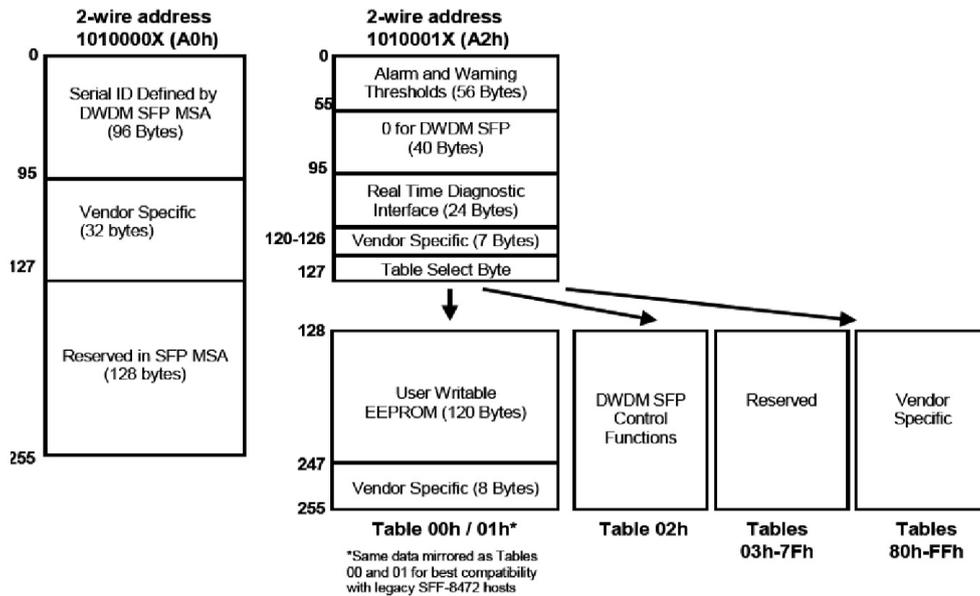
EEPROM

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.

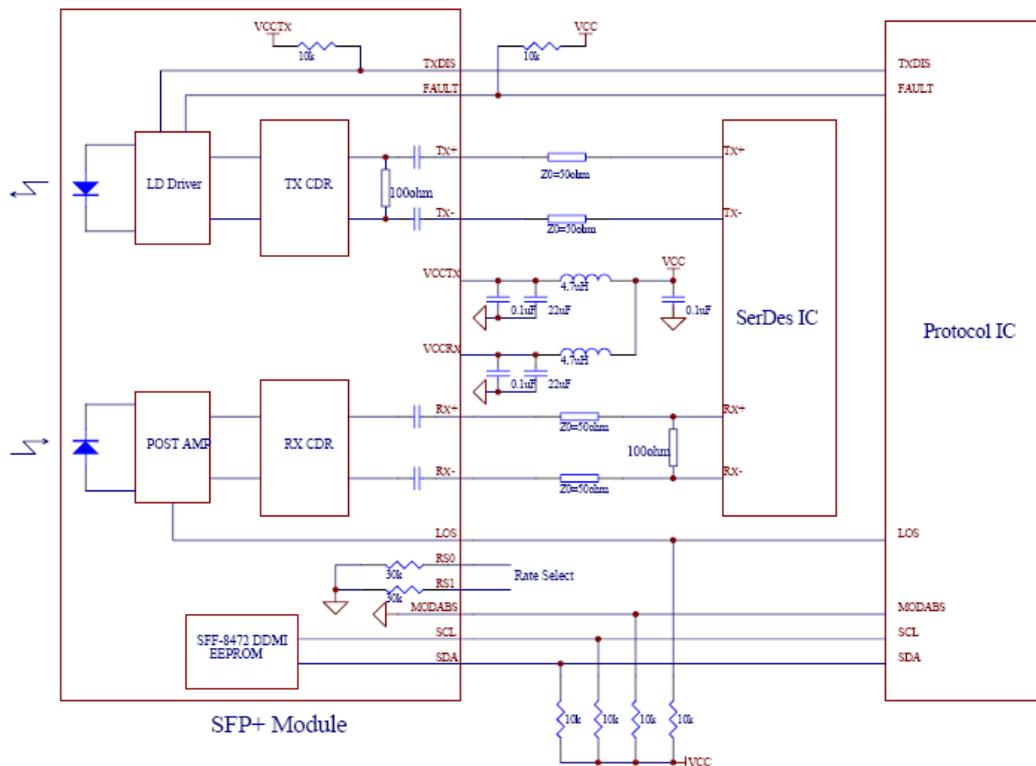
The serial interface uses the 2-wire serial CMOS EEPROM protocol. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP+ transceiver. The negative 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.

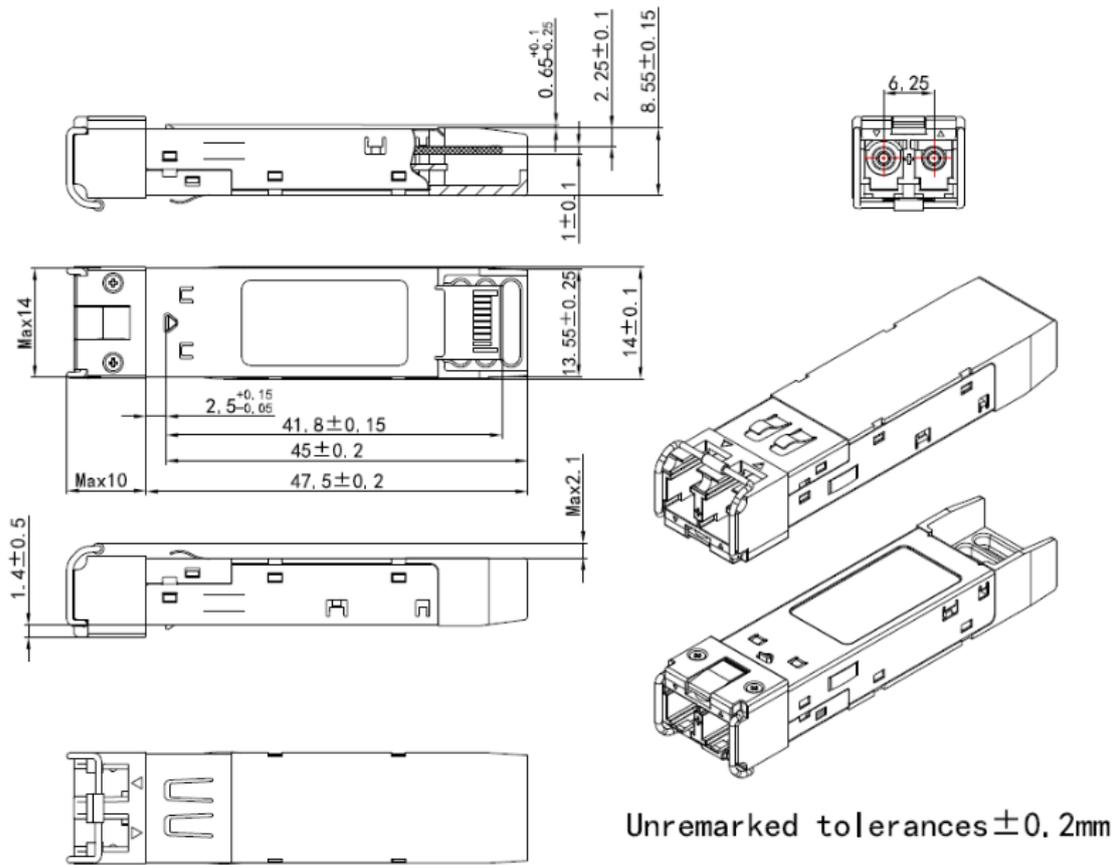
Alarm/warning threshold data is written during device manufacture. TEC current monitoring, laser temperature monitoring, received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and transceiver temperature monitoring all are implemented. The diagnostic 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	Abby JP.jiang	Kelly Fing		New Released.	April 9, 2013
V1.b	Abby	Kelly		Correct Center Wavelength Spacing	May 07, 2013
V1.c	Airon	Frank,Torres,Fing, Eason,JP		Update Power dissipation & Data rate & lcc	Dec 26, 2013
V1.d	Abby	Kelly/Vina		Update Mechanical Specifications	Feb 5, 2015
V1.e	Angela	Kelly/Vina/Arion/ Fing/JP/Eason		Update the regulatory compliance and the tolerances of 2D drawing.	Jan 27,2016
V1.f	Angela	Torres/Neal/Fing/ JP/Vina/Chao.Wang		Add the 600/605 channel. Update the 2D drawing and the contact.	Dec 28,2018
V1.g	Elaine	Kelly/Angela/Marvin/ Torres/Sky/William/ Chao.Wang		Update the picture and 2D drawing.	Mar 24, 2018

Notice:

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