

EOLP-1696-14XXXN series

SFP+ Single-Mode for DWDM Application
Duplex SFP+ Transceiver
Digital Diagnostic Function
0.6~10Gb/s CPRI/OBSAI
RoHS6 Compliant

Features

- ◆ Support data rate up to 11.3Gbps
- ◆ Available in all C-Band Wavelengths on the 50GHz DWDM ITU Grid
- ◆ Temperature-Stabilized DWDM EML Transmitter
- ◆ Duplex LC Connector
- ◆ Power Dissipation < 1.5W
- ◆ 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
 Extended: -20°C ~+75°C



Applications

- ◆ 10GBASE-ER/EW
- ◆ 10G FC
- ◆ OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- ◆ CPRI rates 10.138Gb/s, 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

Ordering Information

Part No.	Data Rate	Laser	Power budget	CDR	Case Temperature
EOLP-1696-14XXXN ^{*(note1)}	0.6Gbps to 11.3Gbps	DWDM EML	14dB	NO	Standard
EOLP-1696-14XXXEN ^{*(note1)}	0.6Gbps to 11.3Gbps	DWDM EML	14dB	NO	Extended

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

395	EOLP-1696-14395N	193.95	1545.72
400	EOLP-1696-14400N	194.00	1545.32
405	EOLP-1696-14405N	194.05	1544.92
410	EOLP-1696-14410N	194.10	1544.53
415	EOLP-1696-14415N	194.15	1544.13
420	EOLP-1696-14420N	194.20	1543.73
425	EOLP-1696-14425N	194.25	1543.33
430	EOLP-1696-14430N	194.30	1542.94
435	EOLP-1696-14435N	194.35	1542.54
440	EOLP-1696-14440N	194.40	1542.14
445	EOLP-1696-14445N	194.45	1541.75
450	EOLP-1696-14450N	194.50	1541.35
455	EOLP-1696-14455N	194.55	1540.95
460	EOLP-1696-14460N	194.60	1540.56
465	EOLP-1696-14465N	194.65	1540.16
470	EOLP-1696-14470N	194.70	1539.77
475	EOLP-1696-14475N	194.75	1539.37
480	EOLP-1696-14480N	194.80	1538.98
485	EOLP-1696-14485N	194.85	1538.58
490	EOLP-1696-14490N	194.90	1538.19
495	EOLP-1696-14495N	194.95	1537.79
500	EOLP-1696-14500N	195.00	1537.40
505	EOLP-1696-14505N	195.05	1537.00
510	EOLP-1696-14510N	195.10	1536.61
515	EOLP-1696-14515N	195.15	1536.22
520	EOLP-1696-14520N	195.20	1535.82
525	EOLP-1696-14525N	195.25	1535.43
530	EOLP-1696-14530N	195.30	1535.04
535	EOLP-1696-14535N	195.35	1534.64
540	EOLP-1696-14540N	195.40	1534.25
545	EOLP-1696-14545N	195.45	1533.86
550	EOLP-1696-14550N	195.50	1533.47
555	EOLP-1696-14555N	195.55	1533.07
560	EOLP-1696-14560N	195.60	1532.68
565	EOLP-1696-14565N	195.65	1532.29
570	EOLP-1696-14570N	195.70	1531.90
575	EOLP-1696-14575N	195.75	1531.51
580	EOLP-1696-14580N	195.80	1531.12
585	EOLP-1696-14585N	195.85	1530.72
590	EOLP-1696-14590N	195.90	1530.33
595	EOLP-1696-14595N	195.95	1529.94

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

Regulatory Compliance^{*Note3}

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

Note3: 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-1696-14XXXN series single mode transceiver is small form factor pluggable module for duplex optical data 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-1696-14XXXN series are designed to be compliant with SFP+ Multi-Source Agreement (MSA) Specification SFF-8431.

Absolute Maximum Ratings

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	%

*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
		Extended	-20	+75	°C
Power Supply Voltage	V _{cc}	3.15	3.3	3.45	V

Power Supply Current	I _{cc}		350	435	mA
Data Rate	DR	0.6		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 ^{*(note6)}
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 ^{*(note6)}
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		0.6		11.3	Gbps
Transmitter					
Center Wavelength Spacing			50		GHz
			0.4		nm
Spectral width(RMS)	Δλ		0.15	0.3	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power ^{*(note4)}	P _{out}	-1		4	dBm
Average Launch Power (Tx: OFF)	P _{off}			-30	dBm
Extinction Ratio	ER	3.5			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	TX _j	Per 802.3ae requirements			
Receiver					
Receiver Sensitivity ^{*(note5)}	P _{min}			-15	dBm
Receiver Overload	P _{max}	-1			dBm

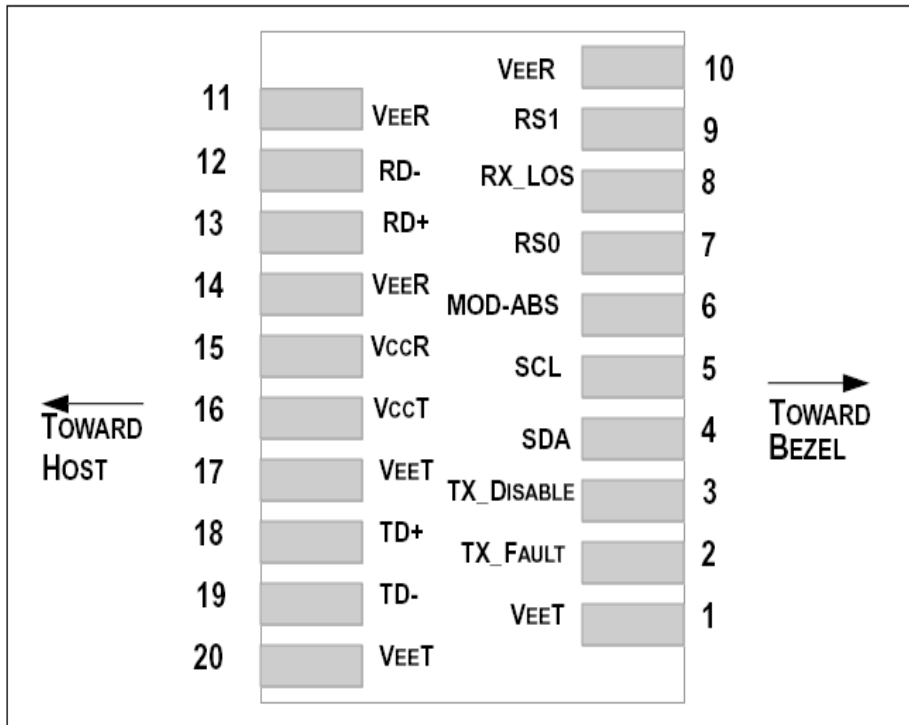
LOS De-Assert	LOSD			-17	dBm
LOS Assert	LOSA	-29			dBm
LOS Hysteresis		1			dB

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

Note5: Minimum average optical power measured at the BER less than 1E-12. The measure pattern is PRBS 2³¹-1.

Note6: CML logic, internally AC coupled.

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	No Function Implement.

8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTL).	1	No Function Implement.
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 435mA. 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.

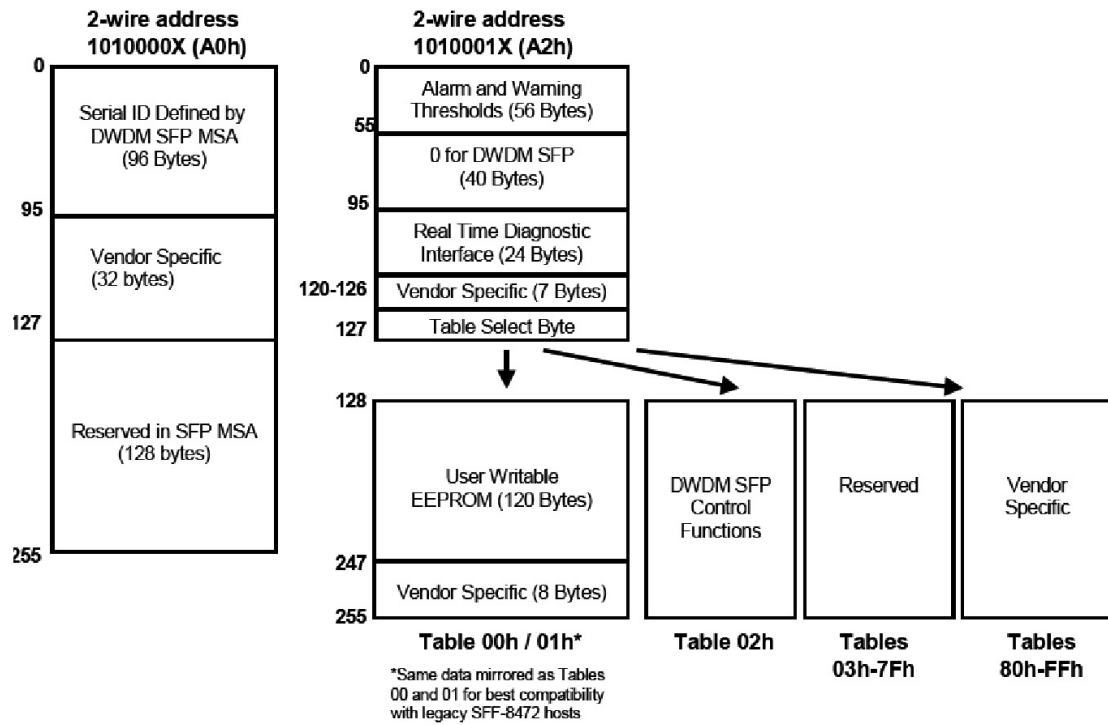
8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

EEPROM

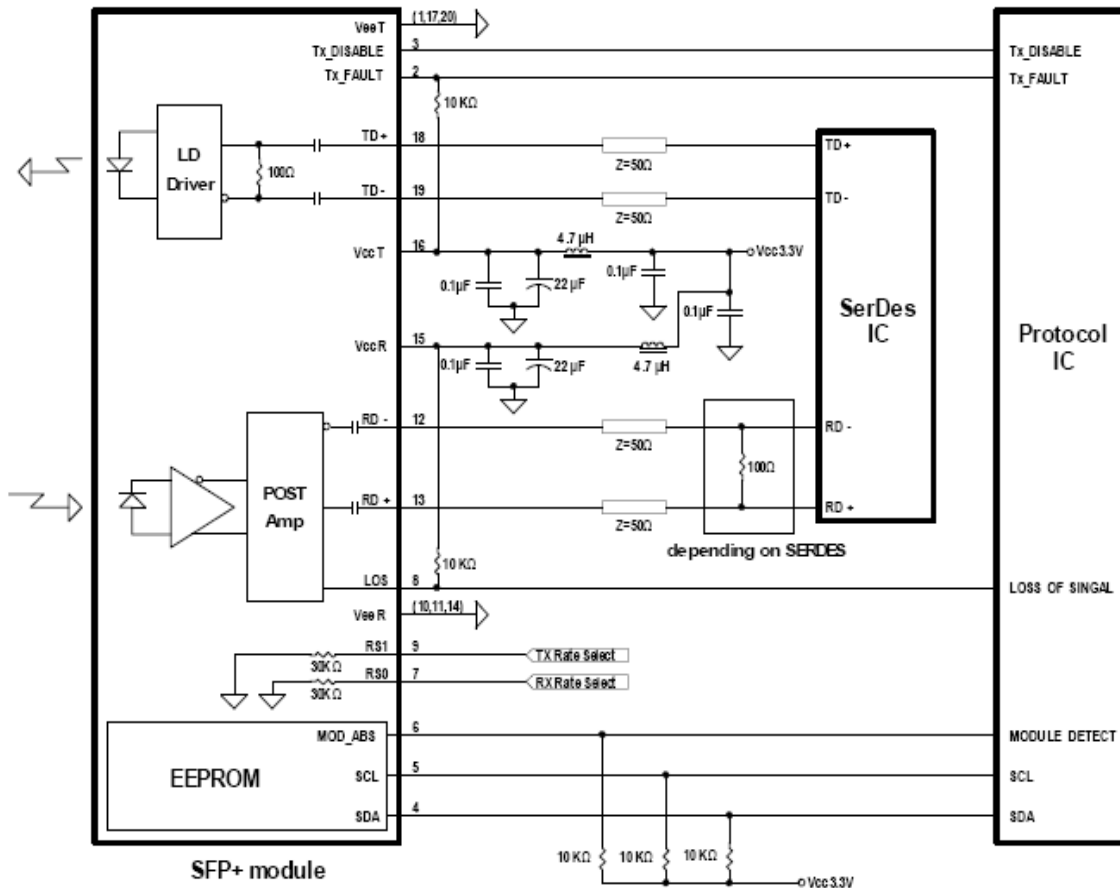
The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

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.

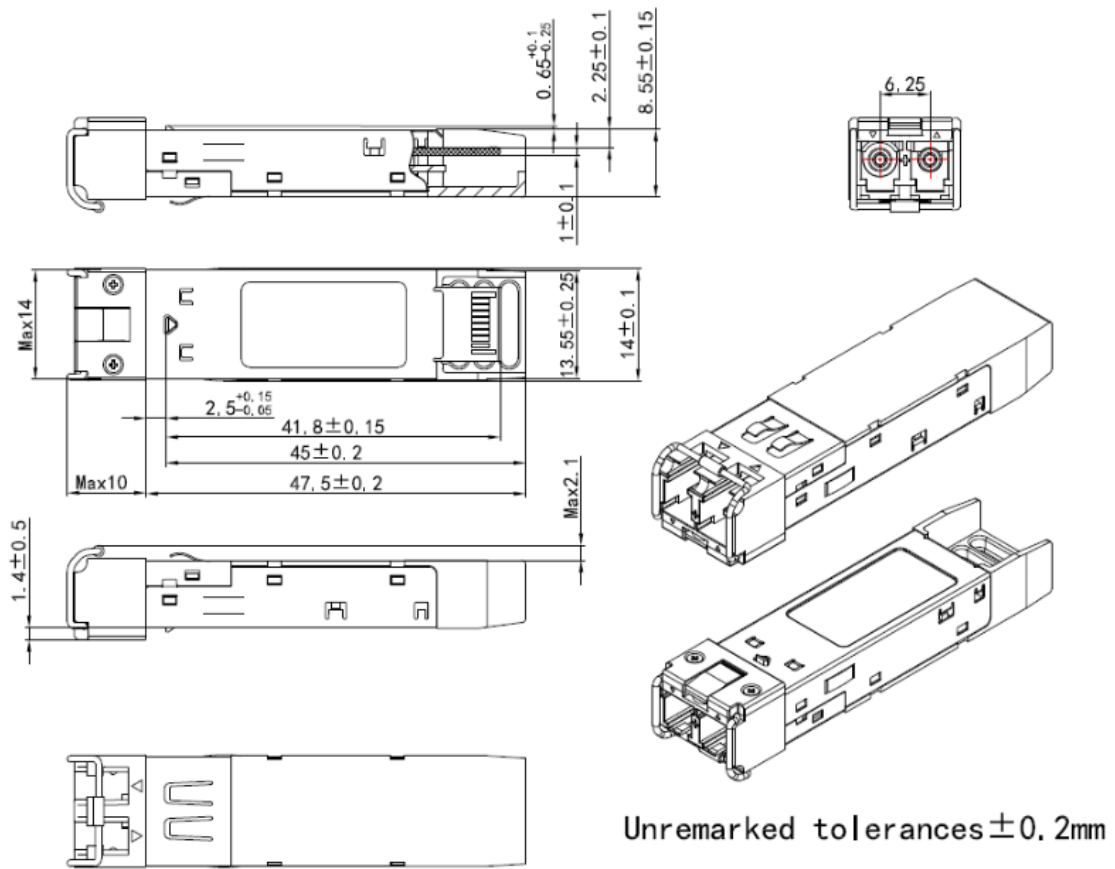
The module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Alarm/warning threshold data is written during device manufacture. TEC current monitoring, laser temperature monitoring, received 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

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<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	Kelly		New Released.	April 9, 2013

	JP.jiang	Fing			
V1.b	Abby	Kelly		Correct Center Wavelength Spacing	May 07, 2013
V1.c	Abby	Kelly/Vina		Update Regulatory Compliance and Mechanical Specifications	Feb 5, 2015
V1.d	Angela	Vina/Fing/Jp/Eason/Jason		Add CPRI&OBSAI application and industrial temperature range. Update max data rate and the tolerances of 2D drawing.	April 21,2015
V1.e	Angela	Kelly/Vina		Correct the 2D drawing.	July 8, 2015
V1.f	Angela	Kelly/Fing/JP/Eason		Update the max power dissipation and regulatory compliance.	Dec 17,2015
V1.g	Angela	Kelly/Fing/JP/Eason/Torres/Marvin/Picard/Arion/Erik/Tracy/Neal		Change the industrial temperature to extended temperature.	April 27,2016
V1.h	Angela	Fing/Eason/Phlio/Kelly/Vina/Dean		Add the spectral width and update 2D drawing.	July 19,2016
V1.i	Elaine	Kelly/Angela/Marvin/Torres/Sky/William/Chao.Wang		Update the extended PN, the CPRI data rate, the RS0/RS1 Pin function definition notes, picture, 2D drawing and the contact.	Mar 24, 2018

Notice:

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