EOLS-1603-37XXD Series

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

Features

◆ Operating Data Rate up to 155Mbps

◆ Available in all C-Band Wavelengths on the 100GHz DWDM ITU Grid

◆ Single 3.3V Power Supply and TTL Logic Interface

◆ Hot-Pluggable SFP Footprint Duplex LC Connector Interface

◆ Compliant with Class 1 FDA and IEC60825-1 Laser Safety

◆ Compliant with SFP MSA

◆ Compliant with SFF-8472

◆ Operating Case Temperature:

Standard: 0℃ to 70℃
Extended: -5℃ to 70℃

Applications

◆ Amplified DWDM networks

◆ Ring topologies with fixed and reconfigurable OADMs

◆ Fast Ethernet, Giga Ethernet

◆ Fiber Channel

Ordering Information

Part No.	Data Rate	Laser	Power budget*(note2)	Interface	Temperature
EOLS-1603-37XX(note1)D	155Mbps	DWDM DFB	37dB	LC	Standard
EOLS-1603-37XX(note1)DI	155Mbps	DWDM DFB	37dB	LC	Extended

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

Note2: The power budget which is guaranteed.

*The product image only for reference purpose.

DWDM SFP Series

XX- Channel refers to the following table:

Channel (XX)	Part NO.	Frequency (THz)	Center Wavelength (nm)
15	EOLS-1603- 3715D EOLS-1603- 3715DI	191.5	1565.50
16	EOLS-1603- 3716D EOLS-1603- 3716DI	191.6	1564.68
17	EOLS-1603- 3717D EOLS-1603- 3717DI	191.7	1563.86
18	EOLS-1603- 3718D EOLS-1603- 3718DI	191.8	1563.05
19	EOLS-1603- 3719D EOLS-1603- 3719DI	191.9	1562.23
20	EOLS-1603- 3720D EOLS-1603- 3720DI	192.0	1561.42
21	EOLS-1603- 3721D EOLS-1603- 3721DI	192.1	1560.61
22	EOLS-1603- 3722D EOLS-1603- 3722DI	192.2	1559.79
23	EOLS-1603- 3723D EOLS-1603- 3723DI	192.3	1558.98
24	EOLS-1603- 3724D EOLS-1603- 3724DI	192.4	1558.17
25	EOLS-1603- 3725D EOLS-1603- 3725DI	192.5	1557.36
26	EOLS-1603- 3726D EOLS-1603- 3726DI	192.6	1556.55
27	EOLS-1603- 3727D EOLS-1603- 3727DI	192.7	1555.75
28	EOLS-1603- 3728D EOLS-1603- 3728DI	192.8	1554.94
29	EOLS-1603- 3729D EOLS-1603- 3729DI	192.9	1554.13
30	EOLS-1603- 3730D EOLS-1603- 3730DI	193.0	1553.33
31	EOLS-1603- 3731D EOLS-1603- 3731DI	193.1	1552.52
32	EOLS-1603- 3732D EOLS-1603- 3732DI	193.2	1551.72
33	EOLS-1603- 3733D EOLS-1603- 3733DI	193.3	1550.92
34	EOLS-1603- 3734D EOLS-1603- 3734DI	193.4	1550.12

35	EOLS-1603- 3735D EOLS-1603- 3735DI	193.5	1549.32
36	EOLS-1603- 3736D EOLS-1603- 3736DI	193.6	1548.51
37	EOLS-1603- 3737D EOLS-1603- 3737DI	193.7	1547.72
38	EOLS-1603- 3738D EOLS-1603- 3738DI	193.8	1546.92
39	EOLS-1603- 3739D EOLS-1603- 3739DI	193.9	1546.12
40	EOLS-1603- 3740D EOLS-1603- 3740DI	194.0	1545.32
41	EOLS-1603- 371D EOLS-1603- 371DI	194.1	1544.53
42	EOLS-1603- 3742D EOLS-1603- 3742DI	194.2	1543.73
43	EOLS-1603- 3743D EOLS-1603- 3743DI	194.3	1542.94
44	EOLS-1603- 3744D EOLS-1603- 3744DI	194.4	1542.14
45	EOLS-1603- 3745D EOLS-1603- 3745DI	194.5	1541.35
46	EOLS-1603- 3746D EOLS-1603- 3746DI	194.6	1540.56
47	EOLS-1603- 3747D EOLS-1603- 3747DI	194.7	1539.77
48	EOLS-1603- 3748D EOLS-1603- 3748DI	194.8	1538.98
49	EOLS-1603- 3749D EOLS-1603- 3749DI	194.9	1538.19
50	EOLS-1603- 3750D EOLS-1603- 3750DI	195.0	1537.40
51	EOLS-1603- 3751D EOLS-1603- 3751DI	195.1	1536.61
52	EOLS-1603- 3752D EOLS-1603- 3752DI	195.2	1535.82
53	EOLS-1603- 3753D EOLS-1603- 3753DI	195.3	1535.04
54	EOLS-1603- 3754D EOLS-1603- 3754DI	195.4	1534.25
55	EOLS-1603- 3755D EOLS-1603- 3755DI	195.5	1533.47
56	EOLS-1603- 3756D	195.6	1532.68

	EOLS-1603- 3756DI		
57	EOLS-1603- 3757D EOLS-1603- 3757DI	195.7	1531.90
58	EOLS-1603- 3758D EOLS-1603- 3758DI	195.8	1531.12
59	EOLS-1603- 3759D EOLS-1603- 3759DI	195.9	1530.33
60	EOLS-1603- 3760D EOLS-1603- 3760DI	196.0	1529.55
61	EOLS-1603- 3761D EOLS-1603- 3761DI	196.1	1528.77

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 EOLS-1603-37XXD 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 1528.77nm to 1565.50nm 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 multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825.

The EOLS-1603-37XXD series are designed to be compliant with SFF-8472 Multi-Source Agreement (MSA).

Absolute Maximum Ratings*[note3]

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	+85	°C
Operating Case Temperature	T_{case}	0	75	°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 permanently.

Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	T_c	EOLS-1603-37XXD	0	-	+70	°C
		EOLS-1603-37XXDI	-5	-	+70	
Power Supply Voltage	Vcc		3.15	3.3	3.45	V
Power Supply Current	Icc		-	-	450	mA
Date Rate					155M	bps

Performance Specifications - Electrical

Parameter		Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter							
LVPECL Inputs(Differential)		Vin	400		2000	mVpp	AC coupled inputs*[note4]
Input Impedance (Differential)		Zin	85	100	115	ohm	Rin > 100 kohm @ DC
TX_Dis	Disable		2		Vcc	V	
	Enable		0		0.8		
TX_FAULT	Fault		2		Vcc	V	
	Normal		0		0.8		
Receiver							
LVPECL Outputs (Differential)		Vout	370		2000	mVpp	AC coupled outputs*[note4]
Output Impedance (Differential)		Zout	85	100	115	ohm	
RX_LOS	LOS		2		Vcc	V	
	Normal		0		0.8	V	
MOD_DEF (0:2)		VoH	2.5			V	
		VoL	0		0.8	V	

Performance Specifications – Optical

(DWDM DFB and PIN/TIA, 37dB Power Budget at Least)

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			155M		bps
Transmitter					
Center Wavelength	λ	1528		1564	nm
Spectral Width (-20dB)	Δλ			0.3	nm
Side Mode Suppression Ratio	SMSR	30			dB
Channel Spacing	Δf		100		GHz
Deviation From Central Frequency@EOL		-12		12	GHz
Average Output Power*[note5]	Pout	2		5	dBm
Average Launch Power (Tx: OFF)	Poff			-45	dBm
Extinction Ratio*[note6]	ER	8.2			dB
Rise/Fall Time(20%～80%)	tr/tf			2	ns
Output Optical Eye*[note6]	Compatible with IEEE 802.3*[note8]				
TX_Disable Assert Time	t_off			10	us
P_{out}@TX Disable Asserted	Pout			-45	dBm
Relative Intensity Noise	RIN			-135	dB/Hz
Receiver					
Center Wavelength	λ	1528		1664	nm
Receiver Sensitivity*[note7]	Pmin			-35	dBm
Receiver Overload	Pmax	-10			dBm
LOS De-Assert	LOSD			-36	dBm
LOS Assert	LOSA	-45			dBm
LOS Hysteresis*[note9]			0.5		dB

Note4: LVPECL logic, internally AC coupled.
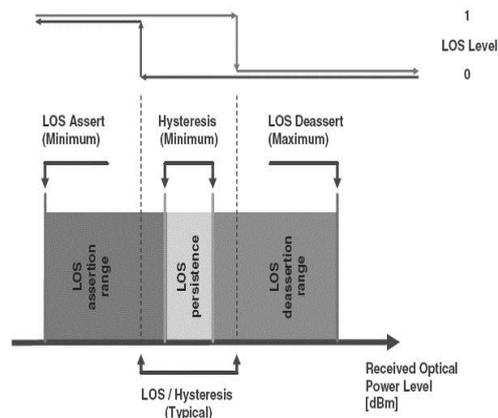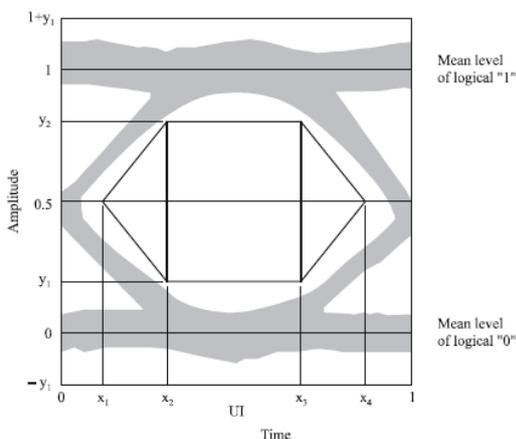
Note5: Output is coupled into a 9/125μm single-mode fiber.

Note6: Filtered, measured with a PRBS 2^{23}-1 test pattern @155Mbps
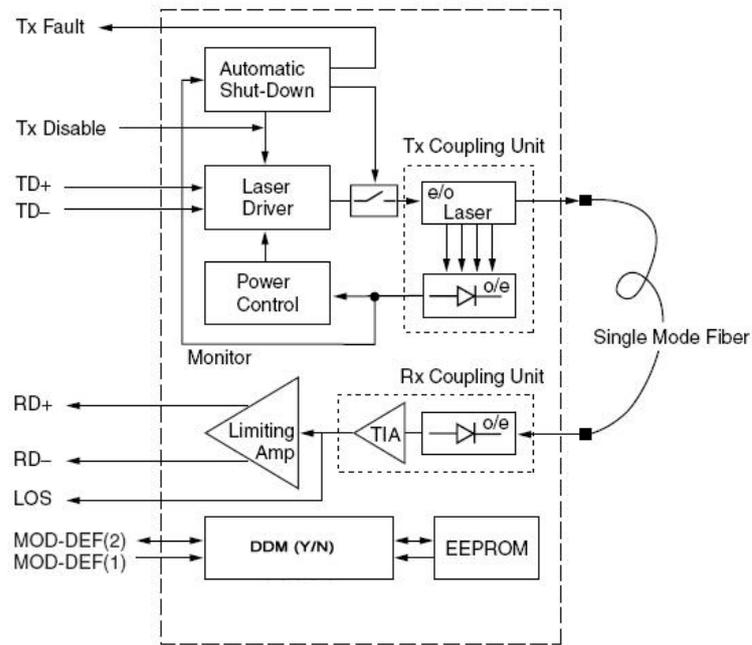
Note7: Minimum average optical power measured at BER less than 1E-10, with a 2^{23}-1 PRBS and ER=10dB.

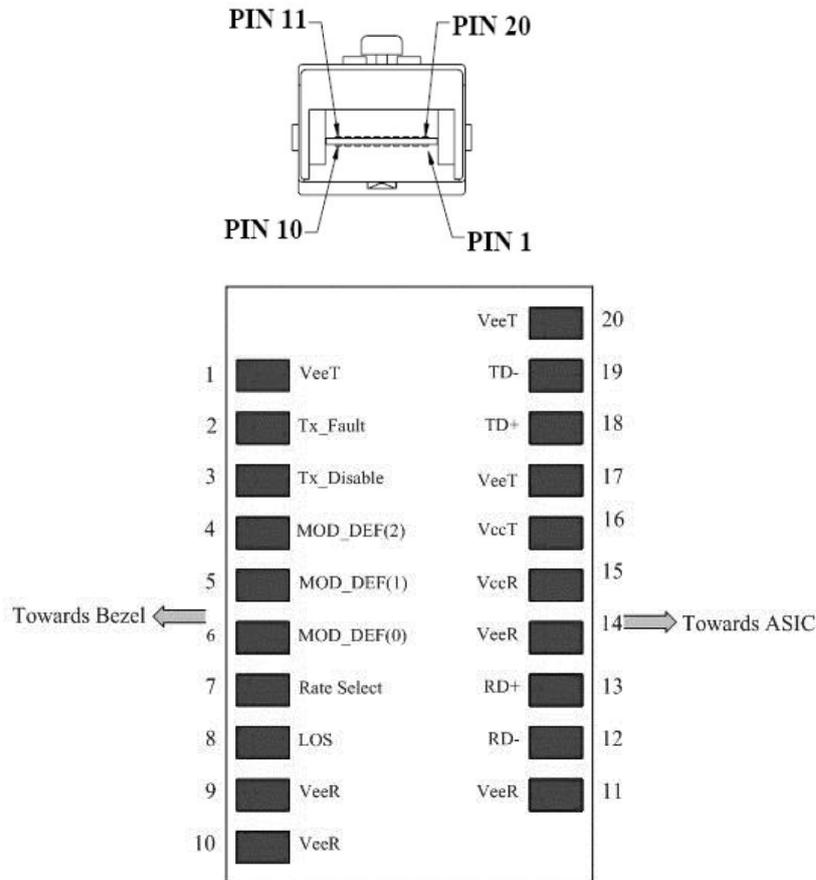Note8: Eye Pattern Mask   Note9: LOS Hysteresis

Functional Description of Transceiver


SFP Transceiver Electrical Pad Layout

Pin Function Definitions

Pin Num.	Name	Function Description
1	VeeT	Transmitter Ground
2	TX Fault	Transmitter Fault Indication, open collector/drain output
3	TX Disable	Transmitter Disable
4	MOD-DEF2	Module Definition 2, Data line for Serial ID.
5	MOD-DEF1	Module Definition 1, Clock line for Serial ID.
6	MOD-DEF0	Module Definition 0, Grounded within the module.
7	Rate Select	Not Connect, Function not available
8	LOS	Loss of Signal, open collector/drain output
9	VeeR	Receiver Ground
10	VeeR	Receiver Ground
11	VeeR	Receiver Ground
12	RD-	Inv. Received Data Out
13	RD+	Received Data Out
14	VeeR	Receiver Ground
15	VccR	Receiver Power, 3.3 ± 5%
16	VccT	Transmitter Power, 3.3 ± 5%
17	VeeT	Transmitter Ground
18	TD+	Transmit Data In
19	TD-	Inv. Transmit Data In
20	VeeT	Transmitter Ground

EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA) 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. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2H. The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 9.3.
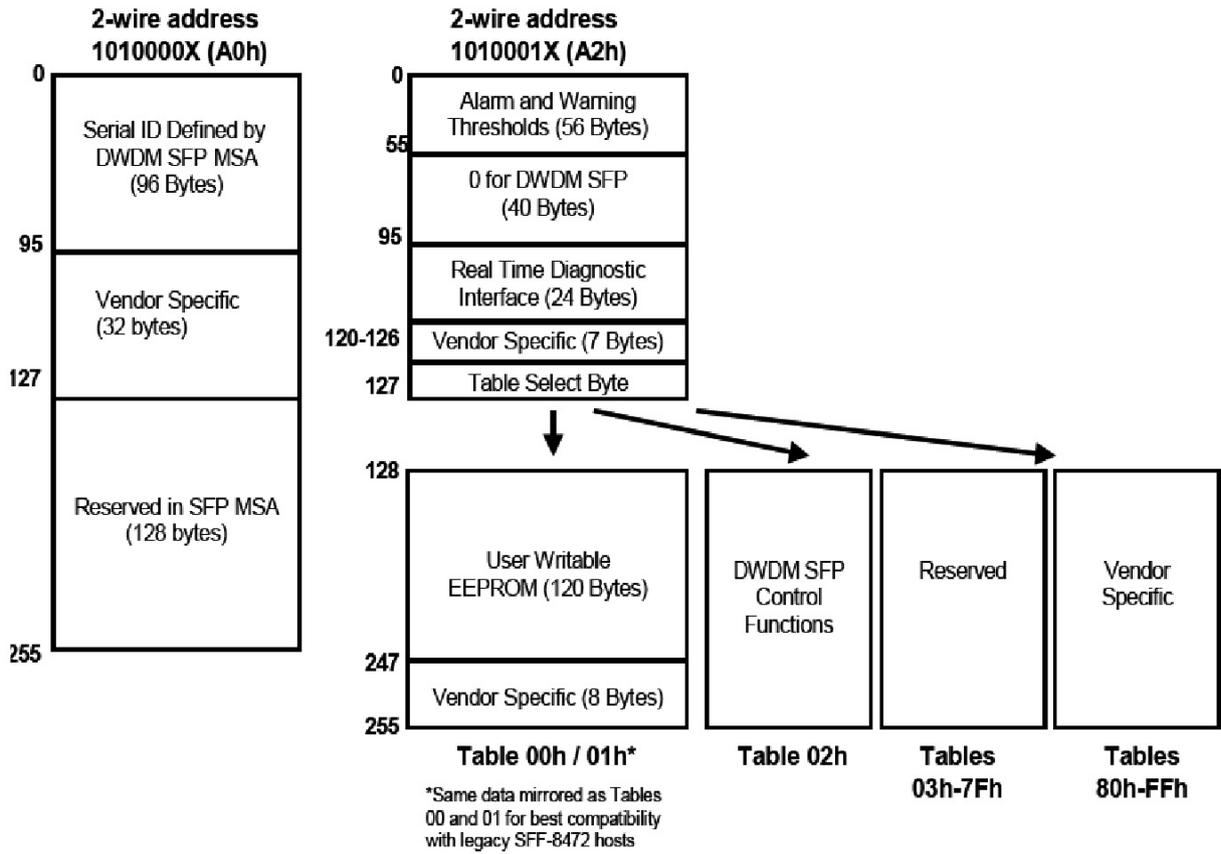
EEPROM Serial ID Memory Contents

Accessing Serial ID Memory uses the 2 wire address 1010000X(A0H). Memory Contents of Serial ID are shown in Table 1.

Table 1 Serial ID Memory Contents

Addr.	Size (bytes)	Name of field	Vaule(Hex)	Description
0	1	Identifier	0B	DWDM SFP
1	1	Ext. Identifier	XX	
2	1	Connector	07	LC connector
3-10	8	Transceiver Codes	00	Reserved
			00	-
			00	-
			XX	
			XX	
			XX	
			01	Single mode
			01	100Mbytes/sec compliant
11	1	Encoding	XX	
12	1	BR, Nominal	01	155Mbps
13	1	Reserved	00	-

14	1	Length (9µm)km	XX	
15	1	Length(9µm)100m	FF	
16	1	Length (50µm) 10m	00	
17	1	Length(62.5µm)10m	00	
18	1	Length (Copper)	00	Not compliant
19	1	Reserved	00	
20~35	16	Vendor Name	XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX(note10)	Vendor name
36	1	Implemented Optional DWDM Features	00	-
37-39	3	Vendor OUI	00 00 00	-
40-55	16	Vendor PN	XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX(note10)	PN
56-59	4	Vendor Rev	XX XX XX XX(note10)	
60-62	3	Wavelength	XX	Laser Wavelength
63	1	CC-BASE	XX	CC for Base ID fields implemented (addresses 0 to62)
64~65	2	Options	00	Reserved
			1A	1.TX_DISABLE is implemented and disables the serial output; 2.TX_FAULT signal implemented; 3.Loss of Signal implemented
66	1	BR, max	00	-
67	1	BR, max	00	-
68~83	16	Vendor SN	XX	Serial number of Transceiver (ASCII)
84~89	6	Date code	XX	The vendor's date code (ASCII)
90~91	2	Vendor specific lot code	XX XX	-
92	1	Diagnostic Monitoring Type	XX	1. Digital diagnostic monitoring implemented 2.Internally/Externally Calibrated; 3.Received power measurement type is Average Power
93	1	Enhanced Options	F0	1.Optional Alarm/warning flags implemented for all monitored quantities 2. Optional Soft TX_DISABLE control

|				
				and monitoring implemented 3. Optional Soft TX_FAULT monitoring Implemented 4. Optional Soft RX_LOS monitoring Implemented
94	1	SFF-8472 Compliance	01	Includes functionality described in Rev 9.3 of SFF-8472.
95	1	CC_EXT	XX	CC for the extended ID Fields (addresses 64 to 94) implemented.
96~127	32	Vendor Specific	XX	Read only memory
128-255	128	Reserved	Read only	

Note10: The "XX" byte should be filled in according to practical case. For more information, please refer to the related document of SFP Multi-Source Agreement (MSA).

Recommend Circuit Schematic
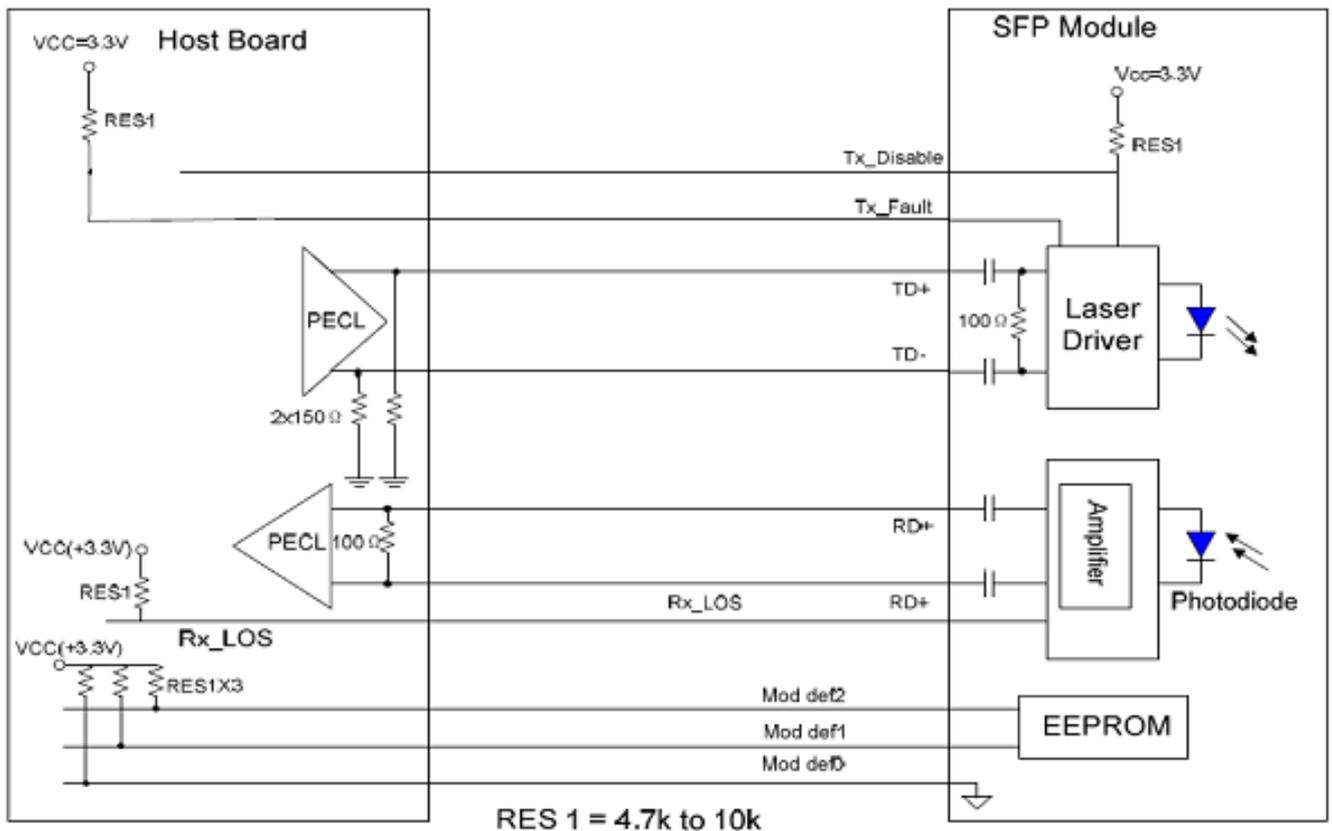
Mechanical Specifications
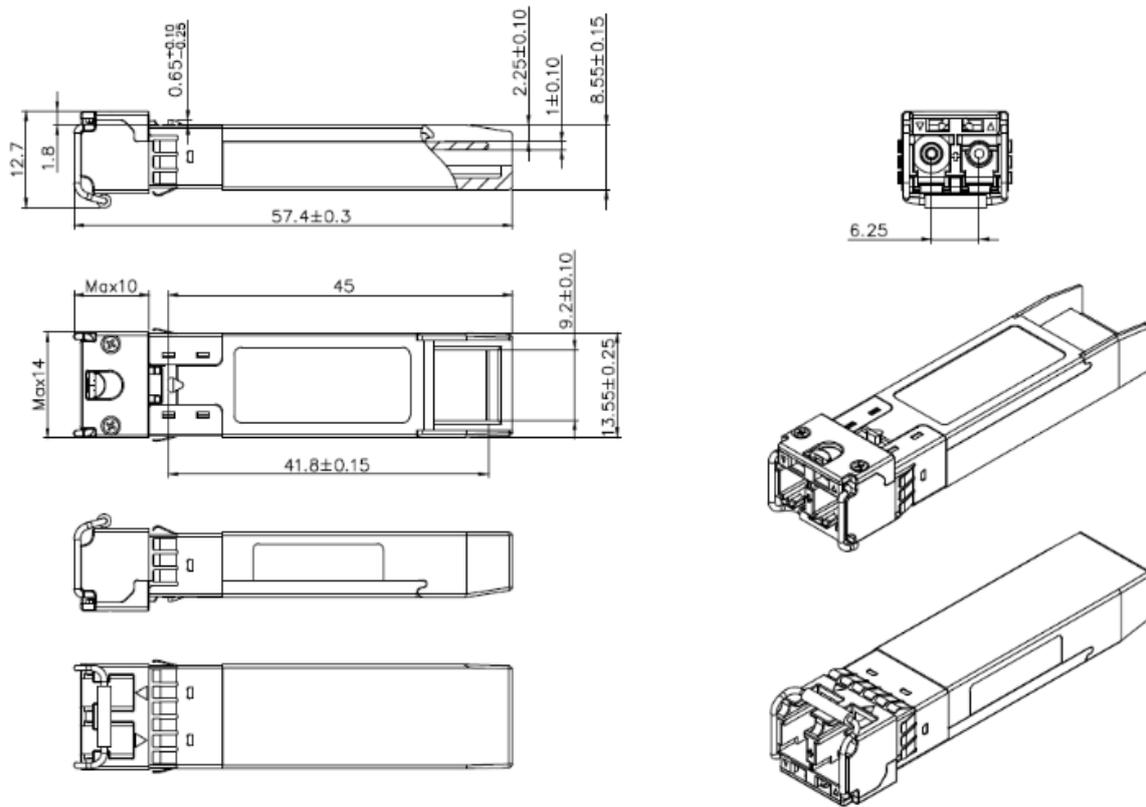
*This 2D drawing only for reference, please check with Eoptolink before ordering.

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

Rev.	Initiated	Reviewed	Approved	Revision History	Release Date
V2.a	Tim.Liang	Kelly.Cao		Released.	Oct 24, 2009
V2.b	Kelly			Revise the A2H.	Nov 24, 2009
V2.c	Kelly			Complete the DWDM wavelength.	Jan 18, 2010
V2.d	Kelly			Correct Rx λ range.	Apr 8, 2010
V3.a	Kelly			Update PN&LOGO.	July 18, 2011
V3.b	Jans	Kelly		Update EEPROM map, integrate 3 products.	Sep 20, 2011
V3.c	Angela	Lyn/Jason/ Walt/Nygai		Update regulatory compliance, Icc, Tr/Toff	Sep 25,2013

				and the Pout of 37dB and 45dB products.	
V3.d	Angela/ Daquan,D ong	Kelly		Change the LOSA of 34dB and 45dB products.	Nov 15,2013
V3.e	Angela	Lyn/Jason/ Nygai		Add 29dB series PN. Update the regulatory compliance and 2D drawing.	Aug 10,2015
V3.f	Oliver	Abby/Chao/Dow ney/Phlio /Picard/Marvin/K elly/Lyn/Elaine/Ni co/Jp/John/Flago n		Delete the 45dB link budget, update the regulatory compliance	Feb 9,2017
V3.g	Oliver/Elai ne	Kelly		Delete the 29dB 34dB link budget	Mar 24, 2017
V3.h	Elaine	Kelly/Daquan.Do ng		Update the note7 and 2D drawing.	Jul 28, 2017

Notice:

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