

EOLX-1696-14XXX series

**XFP Single-Mode for 10GbE/10GFC/SDH/SONET
Duplex DWDM XFP Transceiver
RoHS6 Compliant**



Features

- ◆ Supports 9.95Gb/s to 11.1Gb/s bit Rates
- ◆ Hot-Pluggable XFP Footprint
- ◆ 14dB power budget at least
- ◆ Temperature-Stabilized DWDM Rated EML Transmitter
- ◆ 50GHz ITU Grid
- ◆ Duplex LC Connector
- ◆ Built-in Digital Diagnostic Functions
- ◆ Operating Case Temperature:
 - Standard: 0°C to 70°C
 - Extended: -20°C to 75°C

Applications

- ◆ 10GBASE-ER/EW Ethernet
- ◆ 1200-SM-LL-L 10G Fiber Channel
- ◆ SONET OC-192 IR-2
- ◆ SDH STM S-64.2b
- ◆ SONET OC-192 IR-3
- ◆ SDH STM S-64.3b
- ◆ ITU-T G.709

Ordering Information

Part No.	Data Rate	Laser	Power budget	Temp.	Optical Interface
EOLX-1696-14XXX	10Gbps	EML EA	14dB	Standard	LC
EOLX-1696-14XXXE	10Gbps	EML EA	14dB	Extended	LC

Note1: Standard version.

*The product image only for reference purpose.

X- Channel refers to the following table:

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

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

*Note2: This channel is supported with limited availability; please contact Eoptolink for further details.

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 FCC, FDA and ROHS. For the latest certification information, please check with Eoptolink.

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit
Maximum Supply Voltage 1	Vcc3	-0.5		4.0	V
Maximum Supply Voltage 2	Vcc5	-0.5		6.0	V
Storage Temperature	T _s	-40		85	°C

Recommend Operating Condition

Parameter	Symbol	Min	Typ.	Max	Units
Operating Temperature	T _c	0		70	°C
		-20		75	°C
Supply Voltage 1	Vcc3	3.13	3.3	3.45	V
Supply Voltage 2	Vcc5	4.75	5	5.25	V

Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Main Supply Voltage	Vcc5	4.75		5.25	V	
Supply Voltage #2	Vcc3	3.13		3.45	V	
Supply Current – Vcc5 supply	Icc5			400	mA	
Supply Current – Vcc3 supply	Icc3			750	mA	
Transmitter						
Input Differential Impedance	R _{in}		100		Ω	1
Differential Data Input Swing	V _{in, pp}	120		820	mV	
Transmit Disable Voltage	V _D	2.0		Vcc	V	
Transmit Enable Voltage	V _{EN}	GND		GND+0.8	V	
Transmit Disable Assert Time				10	μs	

Receiver						
Differential Data Output Swing	Vout,pp	340	650	850	mV	
Data Output Rise Time	Tr			38	ps	2
Data Output Fall Time	Tf			38	ps	2
LOS Fault	V _{LOS Fault}	V _{CC} – 0.5		V _{CCHOST}	V	3
LOS Normal	V _{LOS Normal}	GND		GND+0.5	V	3
Power Supply Noise Rejection	PSNR	Compliant to Section 2.7.1 of XFP MSA				

Notes:

1. Internal AC coupling.
2. 20% – 80%
3. Los Of Signal is open collector to be pulled up with a 4.7k – 10kohm resistor to 3.15 – 3.6V.
Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Optical Characteristics (T_C = -5 to 70°C, V_{CC5} = 4.75 to 5.25 Volt)

Please note that the transmitter becomes operational within 60 seconds of power-up. This is due to the time required for the EML to reach its optimum operating temperature.

Parameter	Symbol	Min	Typ	Max	Unit
Transmitter					
Output Opt. Pwr: 9/125 SMF	Pout	-1		+4	dBm
Center Wavelength Spacing			50		GHz
			0.4		nm
Maximum dispersion tolerance		-800		800	ps/nm
Transmitter Center Wavelength –BOL	λ _C	X-25	X	X+25	pm
Optical Extinction Ratio	ER	8.2	9		dB
Transmitter and Dispersion Penalty	TDP			2	dB
Side Mode Suppression Ratio	SMSR	35			dB
TX Jitter Generation (peak-to-peak)	TXj			0.1	UI
TX Jitter Generation (RMS)	TXj _{RMS}			0.01	UI
Receiver					
Receiver Sensitivity @ 10.5Gb/s	Pmin			-15	dBm
Maximum Input Power	Pmax	+0.5			dBm
Optical Center Wavelength	λ _C	1270		1600	nm
Receiver Reflectance	Rrx			-27	dB
LOS De-Assert	LOSD			-17	dBm
LOS Assert	LOSA	-29			dBm
LOS Hysteresis		1			dB

Pin Descriptions

Pin	Logic	Symbol	Name/Description	Ref.
1		GND	Module Ground	1
2		VEE5	Optional -5.2 Power Supply – Not required	
3	LVTTTL-I	Mod-Desel	Module De-select; When held low allows the module to respond to 2-wire serial interface commands	
4	LVTTTL-O	Interrupt	Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface	2
5	LVTTTL-I	TX_DIS	Transmitter Disable; Transmitter laser source turned off	
6		VCC5	+5 Power Supply	
7		GND	Module Ground	1
8		VCC3	+3.3V Power Supply	
9		VCC3	+3.3V Power Supply	
10	LVTTTL-I	SCL	Serial 2-wire interface clock line	2
11	LVTTTL-I/O	SDA	Serial 2-wire interface data line	2
12	LVTTTL-O	Mod_Abs	Module Absent; Indicates module is not present. Grounded in the module.	2
13	LVTTTL-O	Mod_NR	Module Not Ready;	2
14	LVTTTL-O	RX_LOS	Receiver Loss of Signal indicator	2
15		GND	Module Ground	1
16		GND	Module Ground	1
17	CML-O	RD-	Receiver inverted data output	
18	CML-O	RD+	Receiver non-inverted data output	
19		GND	Module Ground	1
20		VCC2	+1.8V Power Supply – Not required	
21	LVTTTL-I	P_Down/RST	Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset	
			Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22		VCC2	+1.8V Power Supply – Not required	
23		GND	Module Ground	1
24	PECL-I	RefCLK+	Reference Clock non-inverted input, AC coupled on the host board – Not required	3
25	PECL-I	RefCLK-	Reference Clock inverted input, AC coupled on the host board – Not required	3
26		GND	Module Ground	1
27		GND	Module Ground	1

28	CML-I	TD-	Transmitter inverted data input	
29	CML-I	TD+	Transmitter non-inverted data input	
30		GND	Module Ground	1

Notes:

1. Module circuit ground is isolated from module chassis ground within the module.
2. Open collector; should be pulled up with 4.7k – 10k ohm on host board to a voltage between 3.15V and 3.6V.
3. A Reference Clock input is not required.

Host board Connector Pinout

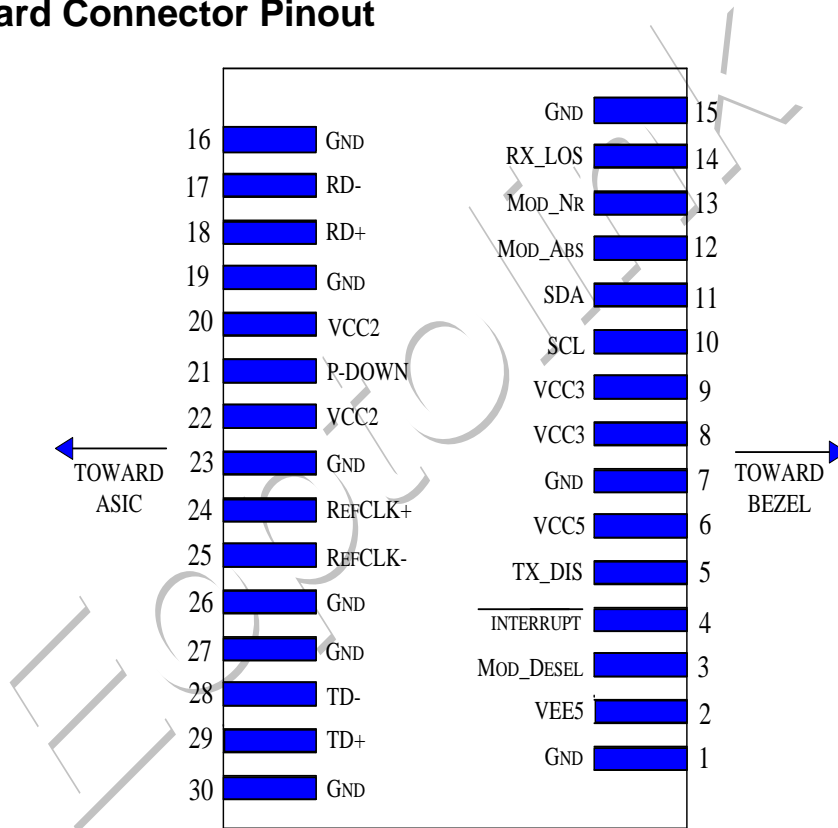


Diagram of Host Board Connector Block Pin Numbers and Name

General Specifications

Parameter	Symbol	Min	Typ.	Max	Units	Ref.
Bit Rate	BR	9.95		11.1	Gbps	1
Bit Error Ratio	BER			10 ⁻¹²		2

Notes:

1. SONET OC-192 IR-2, OC-192 IR-3, ITU-T G.709, 10GBASE-ER/EW with FEC, 10G Fiber Channel
2. Tested with a 2³¹ – 1 PRBS

Digital Diagnostic Functions

Eoptolink's EOLX-1696-14XXX Small Form Factor 10Gbps (XFP) transceivers are compliant with the current XFP Multi-Source Agreement (MSA) Specification Rev 4.5.

As defined by the XFP MSA, Eoptolink XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- ◆ Transceiver temperature
- ◆ Laser bias current
- ◆ Transmitted optical power
- ◆ Received optical power
- ◆ Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) 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 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory.

Table 1 Serial ID Memory Contents (Table 01h)

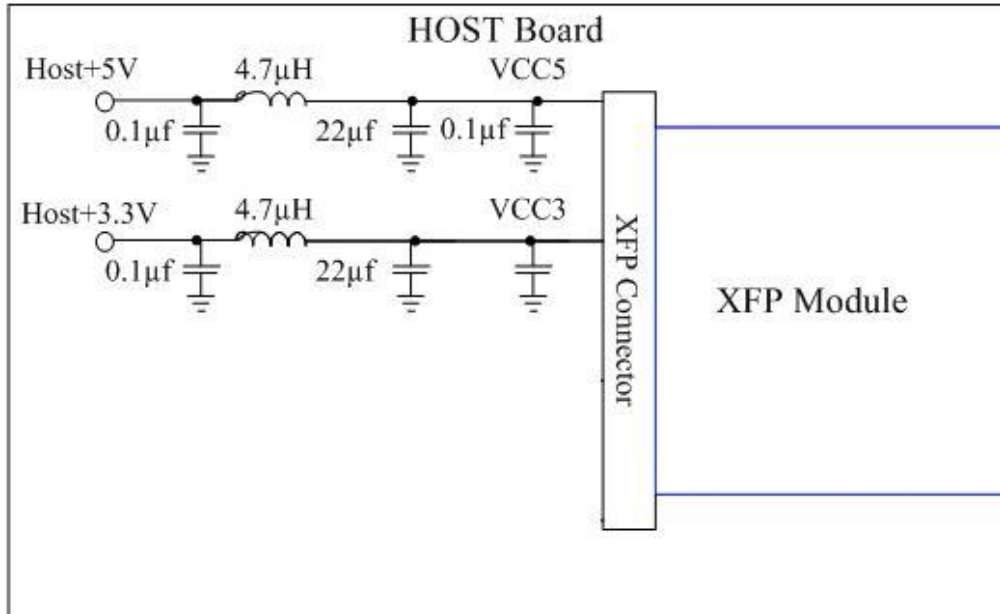
Addr.	Size (Bytes)	Name of Field	Hex	Description
128	1	Identifier	06	XFP
129	1	Ext. Identifier	90	power consumption < 3.5W, no Ref Colck required
130	1	Connector	07	LC Connector
131~138	8	Transceiver	22 00 00 00 00 10 24 00	Transmitter Code
139	1	Encoding	F0	64B/66B, 8B/10B,SONET Scrambled, NRZ

140	1	BR-Min	63	9.9Gbps
141	1	BR-Max	6F	11.1Gbps
142	1	Length (SMF)km	XX ^(note)	
143	1	Length (E-50µm)	00	
144	1	Length (50µm)	00	
145	1	Length(62.5µm)	00	
146	1	Length (Copper)	00	Not compliant
147	1	Device Tech	74	1550 EML, PIN detector
148~163	1 6	Vendor name	XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX ^(note)	Vendor name (ASCII)
164	1	CDR Support	F9	CDR supports 9.953G ~ 11.1G
165~167	3	Vendor OUI	XX XX XX ^(note)	
168~183	1 6	Vendor PN	XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX ^(note)	
184~185	2	Vendor rev	XX XX XX XX ^(note)	
186~187	2	Wavelength Tolerance	XX XX ^(note)	Centre Wavelength
188~189	2	Wavelength Tolerance	00 14	+/- 0.1 nm

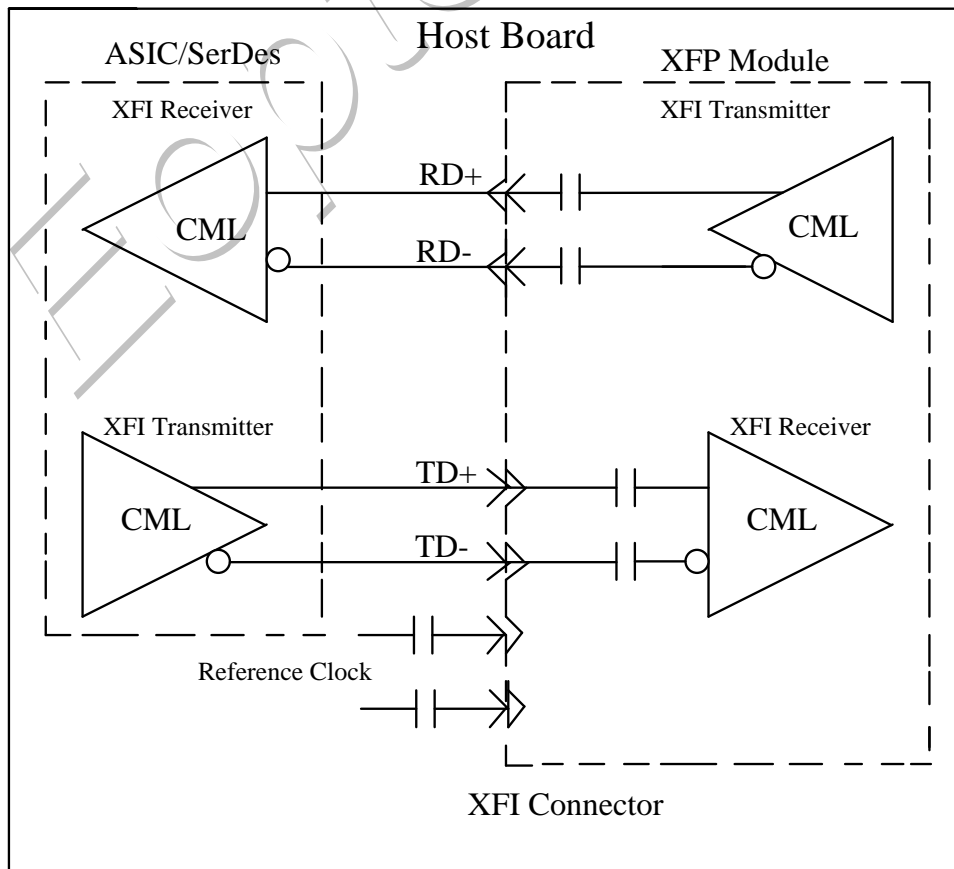
190	1	Max Case Temp	46	70deg
191	1	CC_BASE	XX ^(note)	Check sum of Byte 128 – 190
192~195	4	Power Supply	AF 96 77 00	3.5 Wmax, 1.5Wpd_max , 750Ma 3.3V, 300Ma 5V
196~211	1 6	Vendor SN	XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX ^(note)	
212~219	8	Date Code	XX XX XX XX XX XX XX XX (note)	
220	1	Diagnostic Monitoring Type	08	No BER Support, Average Power
221	1	Enhanced Options	60	Optional Soft TX_DISABLE implemented, Optional Soft P_down implemented
222	1	Aux Monitoring	46	AUX1: Laser Temperature AUX2: 5V Power Supply
223	1	CC_EXT	XX ^(note)	
224~255	3 2	Vendor Specific	Reserved	Check sum for Extended ID Field.

NOTE: "XX" is referred to be variable.

Recommended Host Board Power Supply Circuit

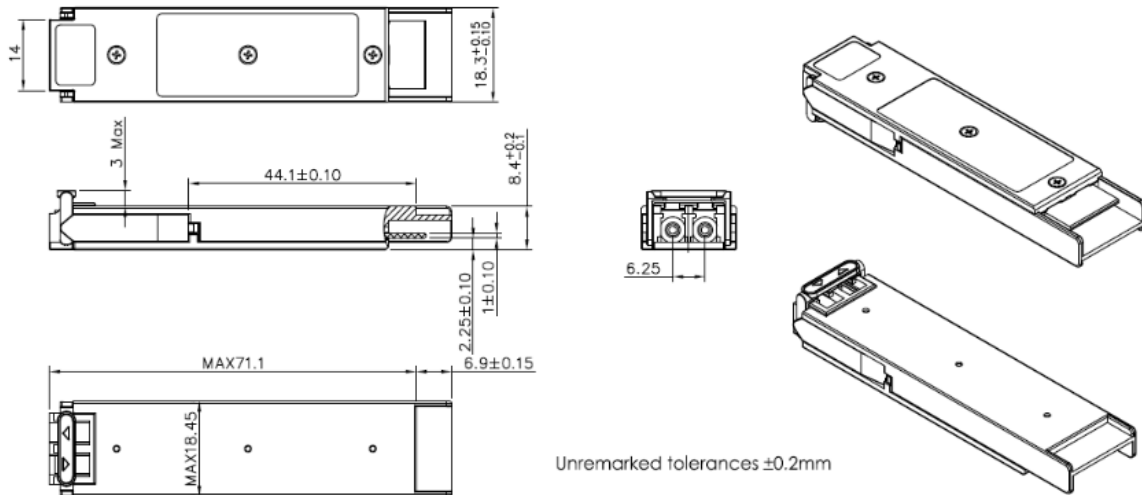


Recommended High-Speed Interface Circuit



Mechanical Specifications

Eoptolink's XFP transceivers are compliant with the dimensions defined by the XFP Multi-Sourcing Agreement (MSA).



*This 2D drawing only for reference, please check with Eoptolink before ordering.

Eye Safety

This single-mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

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
V3.a	Kelly			Update PN& sensitivity.	May 27, 2011
V4.0	Alex/Townie	Kelly		Update photo	Aug 10, 2011
V4.a	Kelly			Update supply circuit.	Sep 19, 2011
V4.b	Angela	Abby		Update LOS De-assert/Assert.	Sep 5, 2012
V4.c	Angela	Kelly/Fing		Update Pout and regulatory	Sep 15, 2014

				compliance,	
V4.d	Neal	Kelly/ Angela/Fing/ Elaine/ JP/Eason/Tor res/Chao.Wa ng		Update Temp, 2D Mechanical Specifications,the address and the contact information	Aug 25, 2017

Notice:

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