

EOLX-1696-24XXX Series

XFP DWDM Single-Mode for 10GbE/10GFC/SDH/SONET
 Duplex XFP 50GHz Transceiver
 RoHS6 Compliant



Features

- ◆ Available in all C-Band Wavelengths on the 50GHz DWDM ITU Grid
- ◆ Supports 9.95Gb/s to 11.1Gb/s Bit Rates
- ◆ Hot-pluggable XFP footprint
- ◆ Power budget 24dB
- ◆ Temperature-Stabilized DWDM Rated EML Transmitter
- ◆ Duplex LC connector
- ◆ Built-in Digital Diagnostic Functions
- ◆ Temperature Range -5°C to 70°C

Applications

- ◆ 10GBASE-ER/EW 10G 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	Fiber Type	Power Budget	Optical Interface
EOLX-1696-24XXX ¹	10G	EML EA	SMF	24dB	LC

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

DWDM Wavelength List:

*Channel (X)	Part NO.	Frequency (THz)	Center Wavelength (nm)
200	EOLX-1696-24200	192.00	1561.42
205	EOLX-1696-24205	192.05	1561.01

210	EOLX-1696-24210	192.10	1560.61
215	EOLX-1696-24215	192.15	1560.20
220	EOLX-1696-24220	192.20	1559.79
225	EOLX-1696-24225	192.25	1559.39
230	EOLX-1696-24230	192.30	1558.98
235	EOLX-1696-24235	192.35	1558.58
240	EOLX-1696-24240	192.40	1558.17
245	EOLX-1696-24245	192.45	1557.77
250	EOLX-1696-24250	192.50	1557.36
255	EOLX-1696-24255	192.55	1556.96
260	EOLX-1696-24260	192.60	1556.55
265	EOLX-1696-24265	192.65	1556.15
270	EOLX-1696-24270	192.70	1555.75
275	EOLX-1696-24275	192.75	1555.34
280	EOLX-1696-24280	192.80	1554.94
285	EOLX-1696-24285	192.85	1554.54
290	EOLX-1696-24290	192.90	1554.13
295	EOLX-1696-24295	192.95	1553.73
300	EOLX-1696-24300	193.00	1553.33
305	EOLX-1696-24305	193.05	1552.93
310	EOLX-1696-24310	193.10	1552.52
315	EOLX-1696-24310	193.15	1552.12
320	EOLX-1696-24320	193.20	1551.72
325	EOLX-1696-24325	193.25	1551.32
330	EOLX-1696-24330	193.30	1550.92
335	EOLX-1696-24335	193.35	1550.52
340	EOLX-1696-24340	193.40	1550.12
345	EOLX-1696-24345	193.45	1549.72
350	EOLX-1696-24350	193.50	1549.32
355	EOLX-1696-24355	193.55	1548.91
360	EOLX-1696-24360	193.60	1548.51
365	EOLX-1696-24365	193.65	1548.11
370	EOLX-1696-24370	193.70	1547.72
375	EOLX-1696-24375	193.75	1547.32
380	EOLX-1696-24380	193.80	1546.92
385	EOLX-1696-24385	193.85	1546.52
390	EOLX-1696-24390	193.90	1546.12
395	EOLX-1696-24395	193.95	1545.72
400	EOLX-1696-24400	194.00	1545.32
405	EOLX-1696-24405	194.05	1544.92
410	EOLX-1696-24410	194.10	1544.53
415	EOLX-1696-24415	194.15	1544.13

420	EOLX-1696-24420	194.20	1543.73
425	EOLX-1696-24425	194.25	1543.33
430	EOLX-1696-24430	194.30	1542.94
435	EOLX-1696-24435	194.35	1542.54
440	EOLX-1696-24440	194.40	1542.14
445	EOLX-1696-24445	194.45	1541.75
450	EOLX-1696-24450	194.50	1541.35
455	EOLX-1696-24455	194.55	1540.95
460	EOLX-1696-24460	194.60	1540.56
465	EOLX-1696-24465	194.65	1540.16
470	EOLX-1696-24470	194.70	1539.77
475	EOLX-1696-24475	194.75	1539.37
480	EOLX-1696-24480	194.80	1538.98
485	EOLX-1696-24485	194.85	1538.58
490	EOLX-1696-24490	194.90	1538.19
495	EOLX-1696-24495	194.95	1537.79
500	EOLX-1696-24500	195.00	1537.40
505	EOLX-1696-24505	195.05	1537.00
510	EOLX-1696-24510	195.10	1536.61
515	EOLX-1696-24515	195.15	1536.22
520	EOLX-1696-24520	195.20	1535.82
525	EOLX-1696-24525	195.25	1535.43
530	EOLX-1696-24530	195.30	1535.04
535	EOLX-1696-24535	195.35	1534.64
540	EOLX-1696-24540	195.40	1534.25
545	EOLX-1696-24545	195.45	1533.86
550	EOLX-1696-24550	195.50	1533.47
555	EOLX-1696-24555	195.55	1533.07
560	EOLX-1696-24560	195.60	1532.68
565	EOLX-1696-24565	195.65	1532.29
570	EOLX-1696-24570	195.70	1531.90
575	EOLX-1696-24575	195.75	1531.51
580	EOLX-1696-24580	195.80	1531.12
585	EOLX-1696-24585	195.85	1530.72
590	EOLX-1696-24590	195.90	1530.33
595	EOLX-1696-24595	195.95	1529.94

*:Please contact with EOPTOLINK the channel you need for the further detail.

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the	MIL-STD-883G Method 3015.7	Class 1C (>1000V)

Electrical Pins		
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compliant with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	UL file E317337 TüV Certificate No. 50135086 (CB scheme)
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards ^{*note3}

Note2: For update of the equipments and strict control of raw materials, EOPTOLINK has the ability to supply the customized products since Jan 1, 2007, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Eoptolink's transceivers, because Eoptolink's transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

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
Case Operating Temperature	T _{OP}	-5		70	°C
Maximum Input Power	P _m			-8	dBm

Recommend operating condition

Parameter	Symbol	Min	Typ	Max	Units
Operating CaseTemperature	Top	-5		70	°C
Supply Voltage 1	Vcc3	3.13	3.3	3.45	V
Supply Voltage 2	Vcc5	4.75	5	5.25	V

Electrical Characteristics

(T_{OP} = -5 to 70°C, V_{CC5} = 4.75 to 5.25 Volts)

Parameter	Symbol	Min	Typ	Max	Unit
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
Module Total Power	P			4.5	W
Transmitter					
Input Differential Impedance	R _{in}		100		Ω
Differential Data Input Swing ^{*3}	V _{in} , pp	120		820	mV
Transmit Disable Voltage	VD	2.0		Vcc	V
Transmit Enable Voltage	VEN	GND		GND+ 0.8	V
Transmit Disable Assert Time				10	us
Receiver					
Differential Data Output Swing ^{*3}	V _{out} , pp	340	650	850	mV
Rise Time (20~80%)	t _r			38	ps
Fall Time (20~80%)	t _f			39	ps
LOS Fault ^{*4}	VLOS fault	Vcc – 0.5		VccHOST	V
LOS Normal ^{*4}	VLOS norm	GND		GND+0.5	V

Note3. After internal AC coupling.

Note4. Loss 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_{OP} = -5 to 70C, V_{CC5} = 4.75 to 5.25 Volts)

Parameter	Symbol	Min	Typ	Max	Unit
Transmitter					
Center Wavelength Spacing			50		GHz
			0.4		nm
Output Opt. Pwr: 9/125 SMF	Pout	0		+4	dBm
Transmitter Center Wavelength End Of Life	λ	X-100	X	X+100	pm
Transmitter Center Wavelength Beginning Of Life	λ	X-25	X	X+25	pm
Optical Extinction Ratio	ER	8.2	9		dB
Transmitter and Dispersion Penalty	TDP			2	dB
Average Launch Power of OFF transmitter	POFF	-30			dBm
TX Jitter Generation (Peak-to-Peak)	Txj			0.1	UI
TX Jitter Generation (RMS)	TxjRMS			0.01	UI
Receiver					
Receiver Sensitivity @ 10.5Gb/s	RSENS			-24	dBm
Overload Power	PMAX	-10			dBm
Optical Center Wavelength	λ_c	1520		1600	nm
Receiver Reflectance	Rrx			-27	dB
LOS De-Assert	LOSD			-25	dBm
LOS Assert	LOSA	-37			dBm
LOS Hysteresis		1			dB

Pin Descriptions

Pin	Symbol	Name/Description	Note
1	GND	Module Ground	5
2	VEE5	Optional -5.2 Power Supply – Not required	
3	Mod-Desel	Module De-select; When held low allows the module to respond to 2-wire serial interface commands	
4	Interrupt	Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface	6
5	TX_DIS	Transmitter Disable; Transmitter laser source turned off	
6	VCC5	+5 Power Supply	
7	GND	Module Ground	5
8	VCC3	+3.3V Power Supply	
9	VCC3	+3.3V Power Supply	

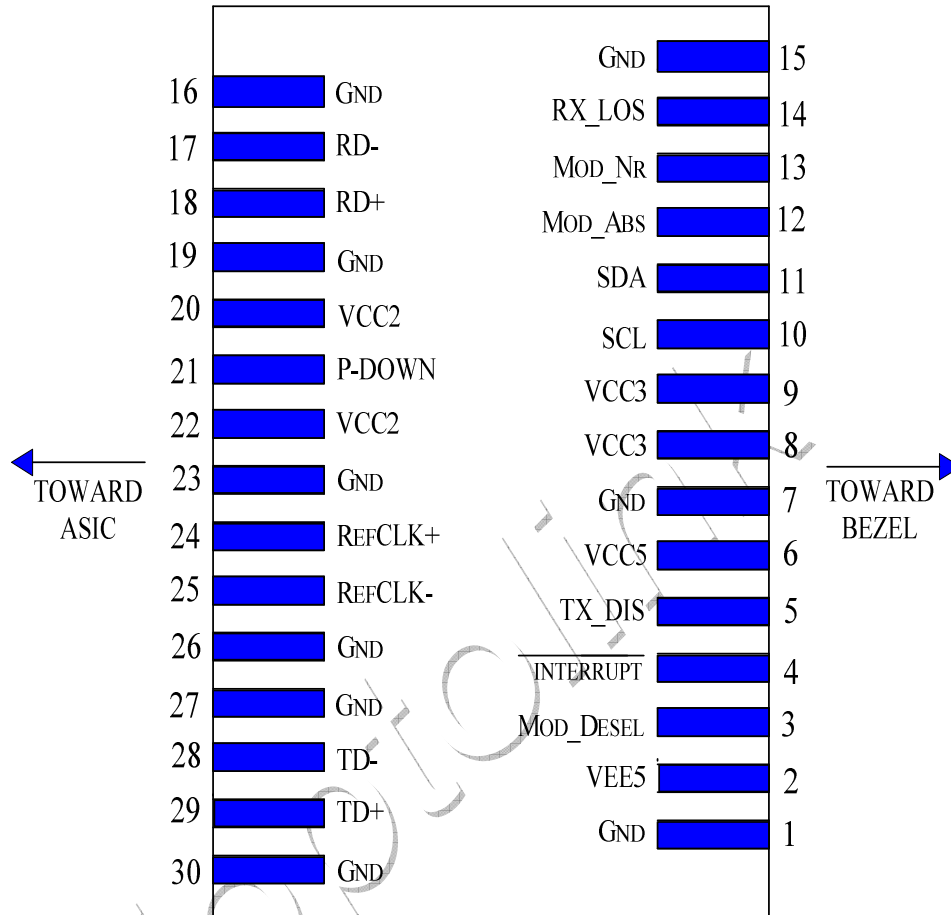
10	SCL	Serial 2-wire interface clock	6
11	SDA	Serial 2-wire interface data line	6
12	Mod_Abs	Module Absent; Indicates module is not present. Grounded in the module.	6
13	Mod_NR	Module Not Ready;	6
14	RX_LOS	Receiver Loss of Signal indicator	6
15	GND	Module Ground	5
16	GND	Module Ground	5
17	RD-	Receiver inverted data output	
18	RD+	Receiver non-inverted data output	
19	GND	Module Ground	5
20	VCC2	+1.8V Power Supply – Not required	
21	P_Down/RS T	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	5
24	RefCLK+	Reference Clock non-inverted input, AC coupled on the host board – Not required	7
25	RefCLK-	Reference Clock inverted input, AC coupled on the host board – Not required	7
26	GND	Module Ground	5
27	GND	Module Ground	5
28	TD-	Transmitter inverted data input	
29	TD+	Transmitter non-inverted data input	
30	GND	Module Ground	5

Note5. Module circuit ground is isolated from module chassis ground within the module.

Note6. Open collector; should be pulled up with 4.7k – 10k ohm on host board to a voltage between 3.15V and 3.6V.

Note7. A Reference Clock input is not required.

Pin arrangement



Pin Numbers and Name

General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Note
Bit Rate	BR	9.95		11.1	Gb/s	8
Bit Error Ratio	BER			10 ⁻¹²		9
Max. Supported Link Budget	LMAX		23		dB	8

Note8. SONET OC-192 IR-2, OC-192 IR-3, ITU-T G.709, 10GBASE-ER/EW + FEC, 10G Fiber Channel

Note9. Tested with a 2³¹ - 1 PRBS

Digital Diagnostic Functions

Eoptolink's EOLX-1696-24XXX Small Form Factor 10Gbps (XFP) transceivers are compliant with

the current XFP Multi-Source Agreement (MSA) Specification Rev 4.5.

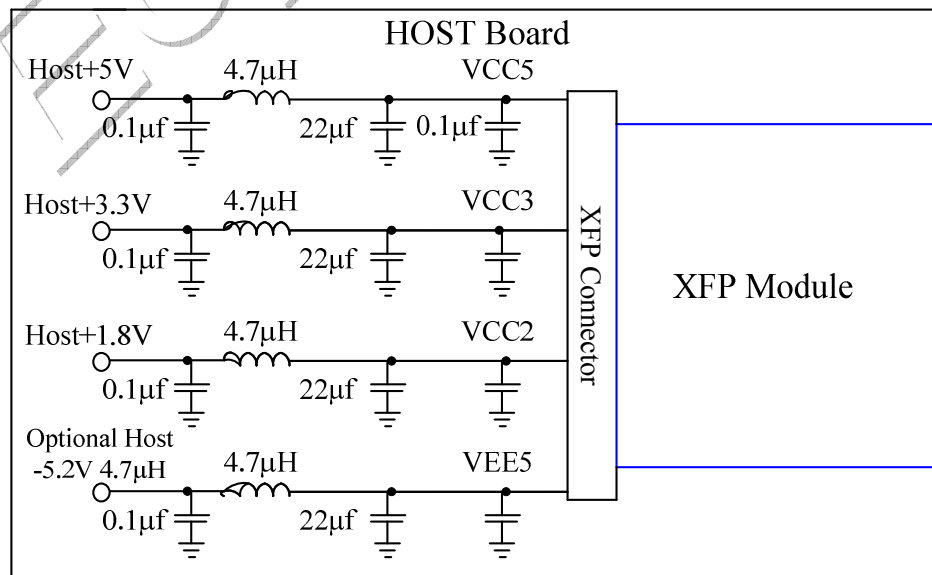
As defined by the XFP MSA, Eoptolink XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

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

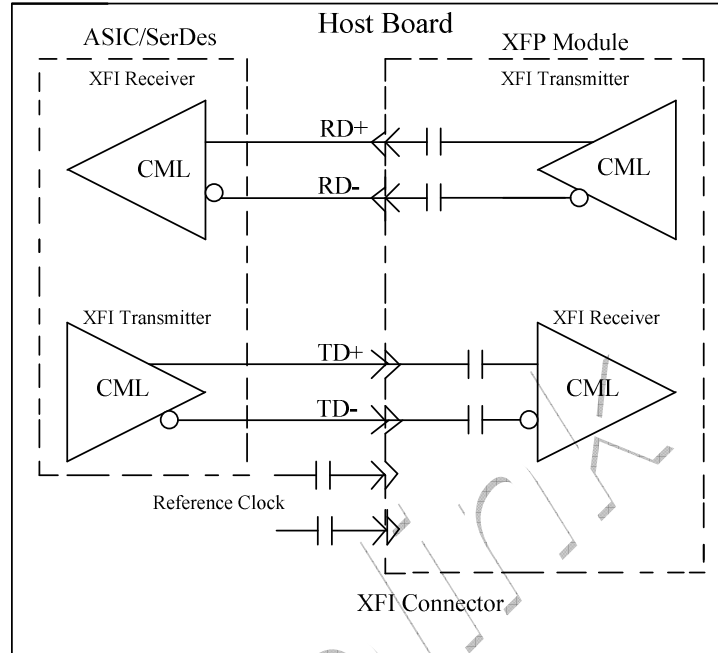
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

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.

Recommended Host Board Power Supply Circuit

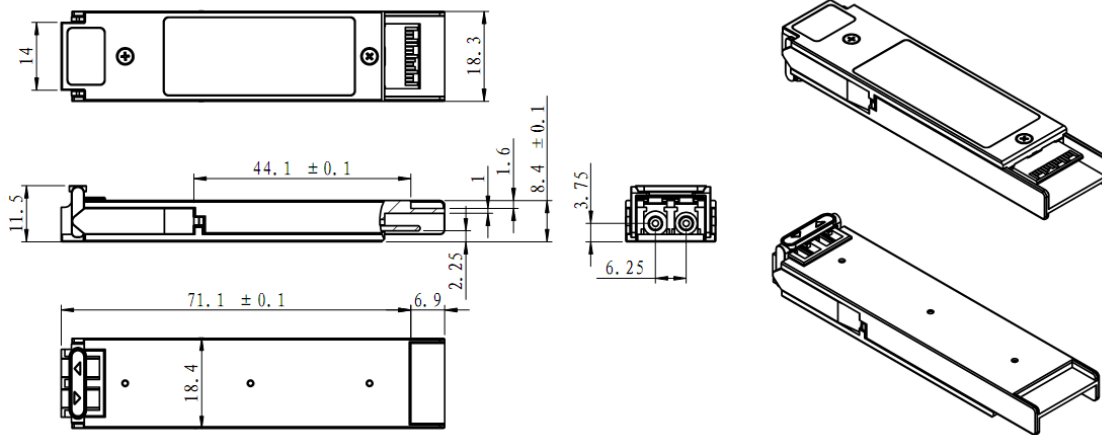


Recommended High-Speed Interface Circuit



Mechanical Specifications

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



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	Revision History	Release Date
V3.a	Kelly			Update PN&Pout, power budget.	May 27, 2011

Notice:

Eoptolink reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only. Eoptolink makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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