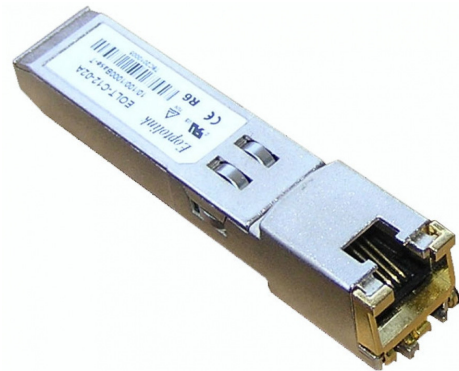# EOLT-C12-02-A

10/100/1000BASE-T Copper SFP Transceiver
RoHS6 Compliant

Features

◆ Support 10/100/1000BASE-T Operation in Host Systems

◆ For 100m Reach over Cat 5 UTP Cable

◆ Hot-Pluggable SFP Footprint

◆ Fully metallic enclosure for low EMI

◆ Low power dissipation (1.05 W typical)

◆ Compact RJ-45 connector assembly

◆ Access to physical layer IC via 2-wire serial bus

◆ Detailed product information in EEPROM

◆ Operating Case Temperature

　Standard：0℃~70℃

　Industrial：-40℃~85℃

◆ Compliant with SFP MSA

Applications

◆ LAN 10/100/1000Base-T

◆ Gigabit Ethernet over Cat 5 Cable

◆ Switch to Switch Interface

◆ Router/Server Interface

Order Information

Part No.	Data Rate	Link type	Distance	Connector	Temperature
EOLT-C12-02-A	10/100/1000M	Cat5	100m	RJ45	Standard
EOLT-C12-02-AI	10/100/1000M	Cat5	100m	RJ45	Industrial

Note1: Standard version

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compatible 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	Compatible with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards[*note3]

Note3: 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.

Product Description

EOLT-C12-02-A is a 10/100/1000BASE-T Copper Small Form Pluggable (SFP), which is based on the SFP Multi Source Agreement (MSA). It is compliant with the Gigabit Ethernet standard as specified in IEEE STD 802.3 and can fully satisfy the 10/100/1000BASE-T application.

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max
Maximum Supply Voltage	Vcc	-0.5		4.0
Storage Temperature	T$_S$	-40		85

Normal operating condition

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Operating Case Temperature	Top	0		70	℃	Standard
		-40		85		Industrial
Supply Voltage	Vcc	3.15	3.3	3.45	V	

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
+3.3 Volt Electrical Power Interface						
Supply Current	Icc		300	350	mA	
Input Voltage	Vcc	3.15	3.3	3.45	V	
Surge Current	Isurge			30	mA	
Low-Speed Signals, Electronic Characteristics						
SFP Output LOW	V$_{OL}$	0		0.5	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector
SFP Output HIGH	V$_{OH}$	host_Vcc-0.5		host_Vcc+0.3	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector
SFP Input LOW	V$_{IL}$	0		0.8	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector
SFP Input HIGH	V$_{IH}$	2		Vcc + 0.3	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector
High-Speed Electrical Interface, Transmission Line-SFP						
Line Baud Rates	f$_L$		1250		MHz	5-level encoding, per IEEE 802.3
TX Output impedance	Zout, TX		100		Ohm	Differential, for all frequencies between 1MHz and 1250MHz
RX Input Impedance	Zin, RX		100		Ohm	Differential, for all frequencies between 1MHz and 1250MHz
High-Speed Electrical Interface, Host-SFP						

Single ended data input swing	Vin	250		1200	mV	Single ended
Single ended data output swing	Vout	350		800	mV	Single ended
Rise/Fall Time	Tr, Tf		175		psec	20%-80%
TX Input Impedance	Zin		50		Ohm	Single ended
RX Output Impedance	Zout		50		Ohm	Single ended

General specifications

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Data rate		10		1000	Mbps	
Distance				100	m	Category 5 UTP. BER $<10^{-12}$

Pin Descriptions

Pin No.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Not used
3	TX Disable	Transmitter Disable	3	1
4	MOD-DEF2	Module Definition 2	3	2
5	MOD-DEF1	Module Definition 1	3	2
6	MOD-DEF0	Module Definition 0	3	2
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Not Used
9	VeeR	Receiver Ground	1	
10	VeeR	Receiver Ground	1	
11	VeeR	Receiver Ground	1	
12	RD-	Inv. Received Data Out	3	
13	RD+	Received Data Out	3	
14	VeeR	Receiver Ground	1	
15	VccR	Receiver Power	2	
16	VccT	Transmitter Power	2	
17	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	
19	TD-	Inv. Transmit Data In	3	
20	VeeT	Transmitter Ground	1	

Notes:

1. PHY disabled on $T_{DIS} > 2.0V$ or open, enabled on $T_{DIS} < 0.8V$, used to reset the module.

2. Should be pulled up with 4.7k – 10k ohm on host board to a voltage between 2.0 V and 3.6 V. MOD_DEF (0) pulls line low to indicate module is plugged in.

The following is the Diagram of host board connector pin numbers and names
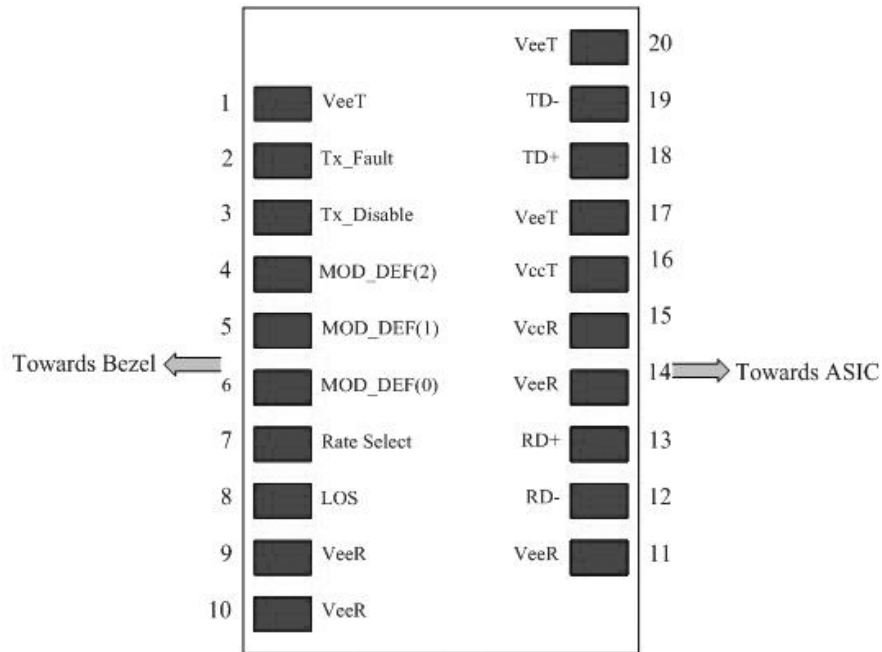
Serial Communication Protocol

Eoptolink Copper SFP support the 2-wire serial communication protocol defined in the SFP MSA. These SFP use a 128 byte EEPROM with an address of A0H. The 10/100/1000BASE-T physical layer IC can also be accessed via the 2-wire serial bus at address ACH.

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	Hex	Description
			BASE ID FIELDS	
0	1	Identifier	03	SFP
1	1	Ext. Identifier	04	SFP function is defined by serial ID only
2	1	Connector	22	RJ-45
3-10	8	Transceiver	00 00 00 08 00 00 00 00	Transceiver Code
11	1	Encoding	XX[note3]	
12	1	BR, Nominal	XX[note3]	
13	1	Reserved	00	
14	1	Length (9µm)km		Transceiver transmit distance

15	1	Length(9µm)100m		
16	1	Length (50µm) 10m		
17	1	Length(62.5µm)10 m		
18	1	Length (Copper)	64	100m
19	1	Reserved	00	
20-35	16	Vendor name	XX XX XX XX XX XX XX XX[note3] 20 20 20 20 20 20 20 20	Vendor name (ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	XX XX XX[note3]	
40-55	16	Vendor PN		Transceiver part number
56-59	4	Vendor rev	XX XX XX XX[note3]	
60-61	2	Wavelength	00	
62	1	Reserved	00	
63	1	CC_BASE	Check Sum (Variable)	Check code for Base ID Fields
EXTENDED ID FIELDS				
64-65	2	Options	00 00	TX_DISABLE, TX_FAULT and Loss of Signal implemented.
66	1	BR,max	00	
67	1	BR,min	00	
68-83	16	Vendor SN	XX XX XX XX XX XX XX XX 20 20 20 20 20 20 20 20[note3]	Serial Number of transceiver (ASCII). For example "B000822".
84-91	8	Date code	XX XX XX XX XX XX XX XX[note3]	Manufacture date code. For example "080405".
92	1	Diagnostic Monitoring Type	XX[note3]	Digital diagnostic monitoring implemented
93	1	Enhanced Options	XX[note3]	Optional flags
94	1	SFF_8472 Compliance	XX[note3]	01 for diagnostics (Rev9.3 SFF-8472).
95	1	CC_EXT	Check Sum (Variable)	Check sum for Extended ID Field.
VENDOR SPECIFIC ID FIELDS				
96-127	32	Vendor Specific	Read only	Depends on customer information
128-255	128	Reserved	Read only	

Note3: 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).

Mechanical Specifications

Eoptolink's Copper SFP transceivers are compliant with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).
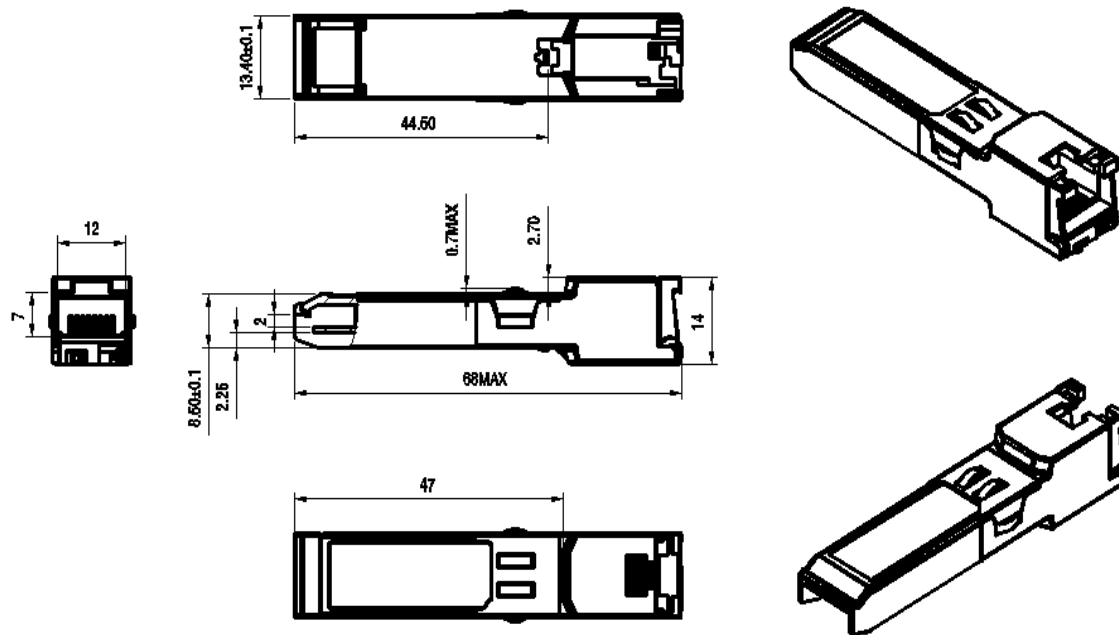
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http://www.eoptolink.com

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
V2.a	Tim.Liang	Florence.Dai Kelly.Cao		Released.	Apr 15, 2007
V2.b	Kelly.Cao			Change the logo.	Jan 6, 2010

V2.c	Cathy.Chen			Updated PN.	March 21, 2011
V2.d	Cathy			Updated EEPROM.	March 21, 2011
V2.e	Cathy			Add industrial temperature.	March 28, 2011

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