EOLT-C12-02-GFM EOLT-C12-02-BFM

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

Features

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

◆ 100m transmission 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

◆ Compliant with IEEE Std 802.3

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*Note2	Link type	Distance	RX_LOS	Temp.
EOLT-C12-02-GFM* Note1	**Line side: 10/100/1000BASE-T** preferred Masters **Host side:** SGMII	Cat5	100m	NO	Standard

	Line side: 10/100/1000Mbps **Host side:** 10/100/1000Mbps enable the auto-negotiation, preferred Master					
EOLT-C12-02-GFIM		Cat5	100m	NO	Industrial
EOLT-C12-02-BFM* Note1	**Line side:** **10/100/1000BASE-T** preferred Masters **Host side:** SGMII	Cat5	100m	YES(only 1G)	Standard
EOLT-C12-02-BFIM	Line side: 10/100/1000Mbps **Host side:** 10/100/1000Mbps enable the auto-negotiation, preferred Master	Cat5	100m	YES(only 1G)	Industrial

Note1: Standard version

Note2: 10/100/1000Mbps enable the auto-negotiation, preferred Master.

 *The product image only for reference purpose.

Regulatory Compliance*Note2

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

Note2: 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

Eoptolink's EOLT-C12-02-GFM is 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

*Exceeding any one of these values may destroy the device immediately.

Normal operating condition

Parameter	Symbol	Min	Typ	Max	Units
Operating Case Temperature	EOLT-C12-02-GFM	0		70	°C
	EOLT-C12-02-GFM	-40		85	
Supply Voltage	Vcc	3.15	3.3	3.45	V
Date Rate*[Note4]		10		1000	Mbps

*Note4: 10/100/1000 BASE-T operation requires an SGMII interface with no clocks in the host system, and the module will operate as 1000BASE-T when the host system uses SERDES interface. It depends on the module PHY configuration.

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 frequency	f_L		125		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
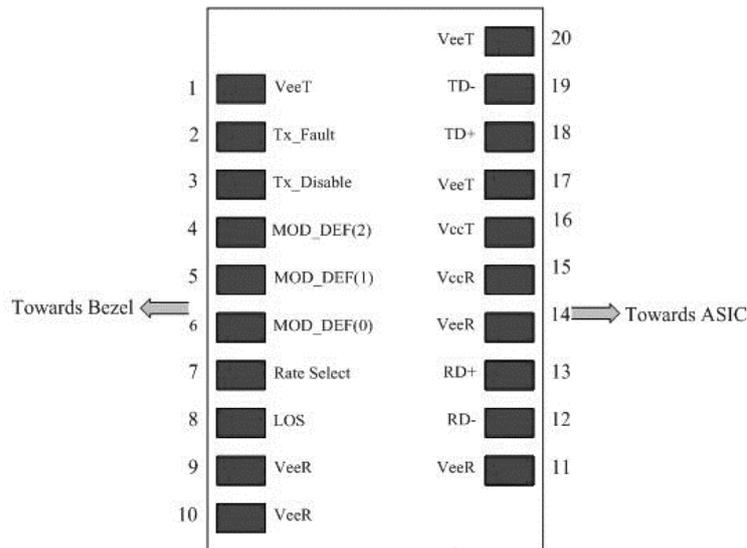
Serial Communication Protocol

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.

SGMII To Copper Modes
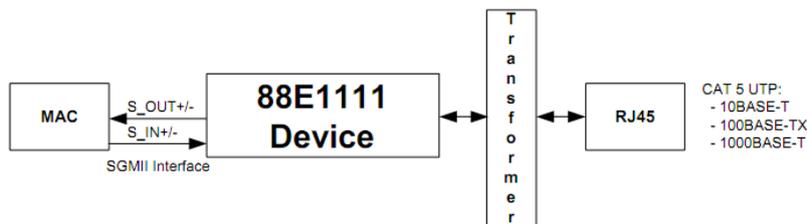
EEPROM Serial ID Memory Contents

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

Copper SFP Series

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	01	8B10B
12	1	BR, Nominal	0D	1.25G
13	1	Reserved	00	
14	1	Length (9µm)km	00	Transceiver transmit distance
15	1	Length(9µm)100m	00	
16	1	Length (50µm) 10m	00	
17	1	Length(62.5µm)10m	00	
18	1	Length (Copper)	64	100m
19	1	Reserved	00	
20-35	16	Vendor name	XX XX XX XX XX XX XX XX(Note5) 20 20 20 20 20 20 20 20	Vendor name (ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	XX XX XX(Note5)	
40-55	16	Vendor PN	XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX(Note5)	Transceiver part number
56-59	4	Vendor rev	XX XX XX XX(Note5)	
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(Note5)	Serial Number of transceiver (ASCII). For example "B000822".
84-91	8	Date code	XX XX XX XX XX XX XX XX(Note5)	Manufacture date code. For example "080405".
92	1	Diagnostic Monitoring Type	XX(Note5)	Digital diagnostic monitoring implemented
93	1	Enhanced Options	XX(Note5)	Optional flags

94	1	SFF_8472 Compliance	XX[Note5]	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	

Note5: 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).

Recommended Software configuration

How to enable EOLS-C12-02-GFM work at 1000BASE-T

EOLS-C12-02-GFM supports 10/100/1000Mbps full duplex SGMII interface default. But it also can operate with 1000Mbps of SERDES operation. Please refer the following steps to configure:

Step 1: Access the PHY at 0xAC via two-wire serial interface.

Step 2: Configure 0xAC as below table

PHY Address: 0xAC		
Register Address	**Write data**	**Description**
0x16	0x0001	Select page 1
0x1B	0x9088	Enable SerDes mode
0x00	0x9140	Software reset to allow changes to take effect
0x16	0x0000	Select page 0

How to disable Auto-negotiation on EOLS-C12-02-GFM

EOLS-C12-02-GFM operates at mode of "Auto-negotiation enable" default. But it also can operate with "Auto-negotiation disable". Please refer the following steps to configure:

Step 1: Access the PHY at 0xAC via two-wire serial interface.

Step 2: Configure 0xAC as below table

PHY Address: 0xAC		
Register Address	**Write data**	**Description**
0x16h	0x0001h	Select page 1
0x00h	0x8140h	Disable Auto-negotiation
0x16h	0x0000h	Select page 0

Mechanical Specifications

Eoptolink's Copper SFP transceivers are compliant with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).
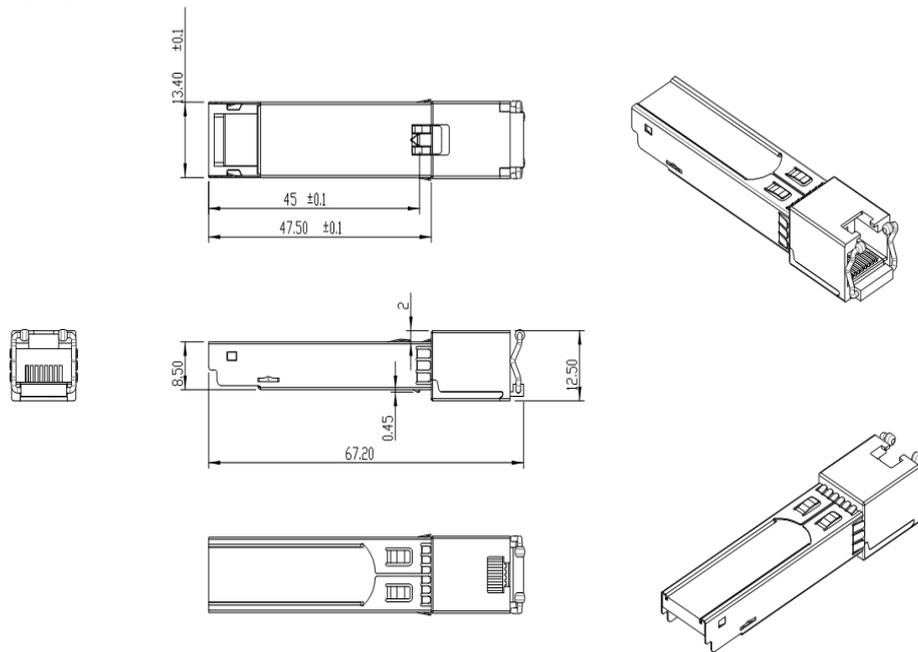
*This 2D drawing only for reference, please check with Eoptolink before ordering.

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

Revision	Initiated	Reviewed	Approved	DCN	Release Date
V1.a	Torres		Phlio	Released.	Apr 16, 2013
V1.b	Angela	Torres,Kelly	Alex	Add industrial temp. range	June 19,2013
V1.c	Xavi/ Angela	Torres		Modified the descripiton of line frequency. Update the regulatory compliance and contact.	May 10, 2018

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