EOLS-1X03-2M-XG Series

100BASE-FX SGMII SFP Transceiver

(Without MCU Version)

Features

- 1310nm/1550nm Laser and PIN Photo-Detector
- 550m ~ 2km transmission with MMF
- Build-in PHY supporting SGMII Interface
- Support More Link Status Monitor, Such as CRC, Package Counter and Far End Fault Indication(FEFI)
- Single 3. 3V Power Supply and TTL Logic Interface
- Compliant with SFP MSA package with duplex LC Connector
- Standard Serial ID information Compliant with SFP MSA
- Operating Case Temperature
  Standard: 0℃~+70℃

Applications

- 100BASE-FX
- Switched Backplane Applications
- Switch to Switch Interface
- Other Optical Transmission Systems

Ordering Information

Part No.	Data Rate	Fiber	Distance*(note2)	Temperature	MCU
EOLS-1303-2M-G*(note1)	100Mbps/125Mbps	MMF	2km	Standard	No
EOLS-1503-2M-G*(note1)	100Mbps/125Mbps	MMF	2km	Standard	No

Note1: Standard version

Note2: 550m with 62.5/125μm MMF, 2km with 50/125μm MMF.

*The product image only for reference purpose.

Regulatory Compliance*[Note3]

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

Note3: 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-1X03-2M-XG series is small form factor pluggable module for single mode fiber 100BASE-FX and build-in PHY device supporting SGMII interface. It is with the SFP 20-pin connector to allow hot plug capability.

The transmitter section uses a multiple quantum well 1310nm or 1550nm laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	°C
Supply Voltage	Vcc	-0.5	3.6	V
Operating Relative Humidity	-	5	95	%

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T_c	0		+70	°C
Power Supply Voltage	Vcc	3.15	3.3	3.45	V
Power Supply Current	Icc			350	mA
Date Rate			125		Mbps

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+0.3	V	
	Enable		0		0.8		
TX_FAULT	Fault		2		Vcc+0.3	V	
	Normal		0		0.8		
Receiver							
LVPECL Outputs (Differential)		Vout	400		2000	mVpp	AC coupled outputs*(note4)
Output Impedance (Differential)		Zout	85	100	115	ohm	
RX_LOS	LOS		2		Vcc+0.3	V	
	Normal		0		0.8	V	
MOD_DEF (0:2)		VoH	2.5			V	With Serial ID
		VoL	0		0.5	V	

Performance Specifications – Optical

(1310nm FP and PIN/TIA)

Parameter	Symbol	Min.	Typical	Max.	Unit
MMF	L		2		km
Data Rate			125		Mbps
Transmitter					
Center Wavelength	λ_C	1260	1310	1360	nm
Spectral Width (RMS)	$\Delta\lambda$			4	nm
Average Output Power*(note5)	Pout	-20		-14	dBm
Extinction Ratio	ER	9			dB
Rise/Fall Time(20%～80%)	tr/tf			3	ns
Total Jitter	TJ			1.0	ns
Output Optical Eye*(note6)	Compliant with IEEE 802.3-2002				
TX_Disable Assert Time	t_off			10	us
TX Disable Asserted	Pout			-45	dBm
Receiver					
Center Wavelength	λ	1200		1600	nm
Receiver Sensitivity*(note7)	Pmin			-30	dBm
Return Loss		12			dB
LOS De-Assert	LOSD			-31	dBm

LOS Assert	LOSA	-45			dBm
LOS Hysteresis		1		3	dB
Overload*(note7)	Pmax	-8			dBm

(1550nm FP and PIN/TIA)

Parameter	Symbol	Min.	Typical	Max.	Unit
MMF	L		2		km
Data Rate			125		Mbps
Transmitter					
Center Wavelength	λC	1500	1550	1600	nm
Spectral Width (RMS)	Δλ			4	nm
Average Output Power*(note5)	Pout	-20		-14	dBm
Extinction Ratio	ER	9			dB
Rise/Fall Time(20%～80%)	tr/tf			3	ns
Total Jitter	TJ			1.0	ns
Output Optical Eye*(note6)	Compliant with IEEE 802.3-2002				
TX_Disable Assert Time	t_off			10	us
TX Disable Asserted	Pout			-45	dBm
Receiver					
Center Wavelength	λ	1200		1600	nm
Receiver Sensitivity*(note7)	Pmin			-30	dBm
Return Loss		12			dB
LOS De-Assert	LOSD			-31	dBm
LOS Assert	LOSA	-45			dBm
LOS Hysteresis		1		3	dB
Overload*(note7)	Pmax	-8			dBm

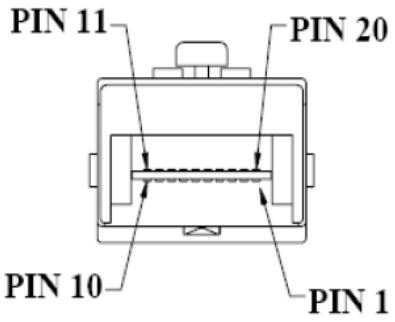
Note4: PECL logic, internally AC coupled.

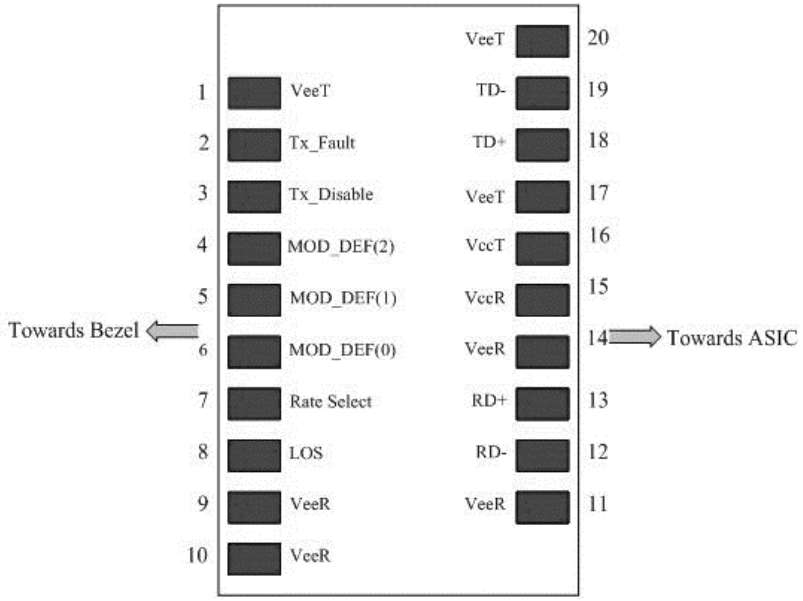
Note5: Output is coupled into a 62.5/125μm multi-mode fiber.

Note6: Measured with 4B/5B code for 125Mbps.

Note7: Measured with 4B/5B code for 125Mbps, worst-case extinction ratio, and BER 1E-12.

SFP Transceiver Electrical Pad Layout





Pin Function Definitions

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

20	VeeT	Transmitter Ground	1	5)

Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its states are:
Low (0 – 0.8V): Transmitter on
(>0.8, < 2.0V): Undefined
High (2.0 – 3.465V): Transmitter Disabled
Open: Transmitter Disabled

3) Modulation Absent, connected to VEET or VEER in the module.

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

5) VeeR and VeeT may be internally connected within the SFP module.

6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 350mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

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 writing 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.

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. The following information is according to EOLS-1303-2M-G.

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	07	LC Connector
3-10	8	Transceiver	00 00 00 20 00 00 00 00	Transmitter Code
11	1	Encoding	02	4B5B
12	1	BR, Nominal	01	100Mbps
13	1	Reserved	00	
14	1	Length (9μm)km	00	Transceiver transmit distance
15	1	Length(9μm)100m	00	
16	1	Length (50μm) 10m	C8	
17	1	Length(62.5μm)10m	37	
18	1	Length (Copper)	00	Not compliant
19	1	Reserved	00	
20-35	16	Vendor name	45 4F 50 54 4F 4C 49 4E 4B 20 49 4E 43 20 20 20	EOPTOLINK INC (ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN	45 4F 4C 53 2D 31 33 30 33 2D	EOLS-1303-2M-G

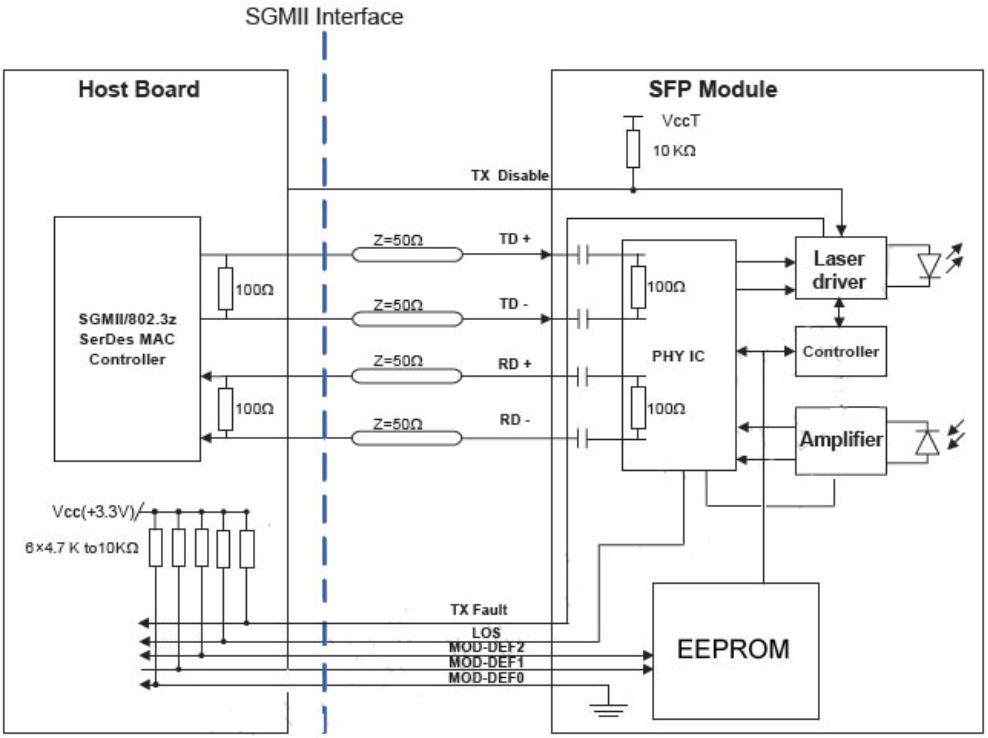
			32 4D 2D 47 20 20	
56-59	4	Vendor rev	31 2E 30 20	1.0
60-61	2	Wavelength	05 1E	1310nm
62	1	Reserved	00	
63	1	CC_BASE	Check Sum (Variable)	Check code for Base ID Fields
EXTENDED ID FIELDS				
64-65	2	Options	00 1A	TX_DISABLE, TX_FAULT and Loss of Signal implemented.
66	1	BR,max	00	
67	1	BR,min	00	
68-83	16	Vendor SN	XX XX XX XX XX XX XX XX 20 20 20 20 20 20 20 20	Serial Number of transceiver (ASCII). For example “B000822”.
84-91	8	Date code	XX XX XX XX XX XX XX XX	Manufactory date code. For example “080405”.
92	1	Diagnostic Monitoring Type	00	Digital diagnostic monitoring implemented
93	1	Enhanced Options	00	Optional flags
94	1	SFF_8472 Compliance	00	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	

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).

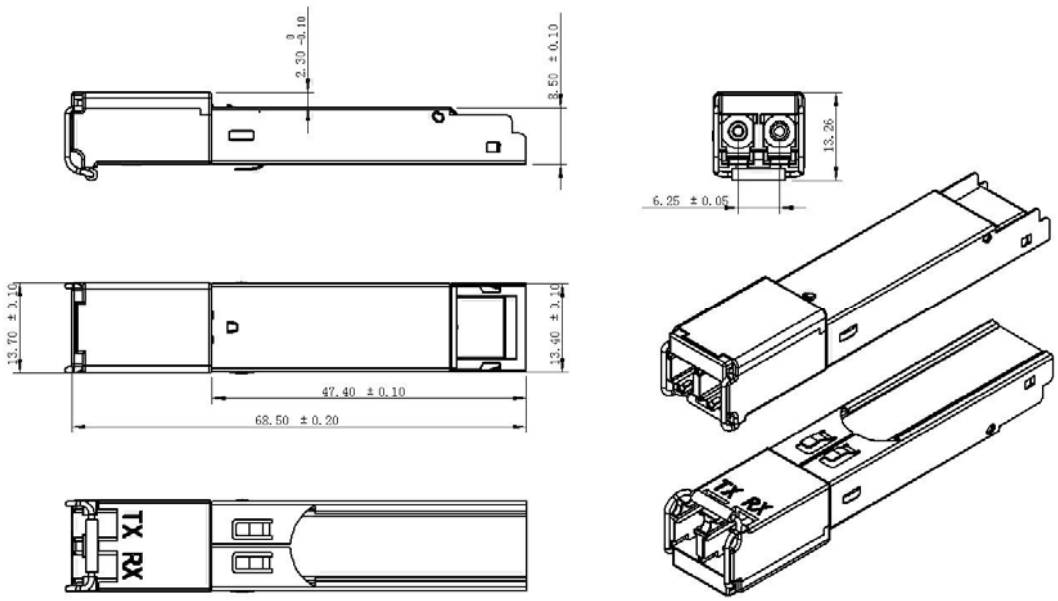
Easier Configuration

Designing-in a high performance PHY chip in EOLS-XX03-XX-G, host can configure Eoptolink’s SGMII series product easily. For EOLS-XX03-XX-G, host only need access few registers (device address is ACH) via I^2C serial interface to configure SGMII module, such as speed-selection, Auto-negotiation, LOS/Link detection, TX disable, FEFI/RFI and CRC counter function support. For more detailed information, please refer to application note of EOLS-XX03-XX-G.

Recommend Circuit Schematic

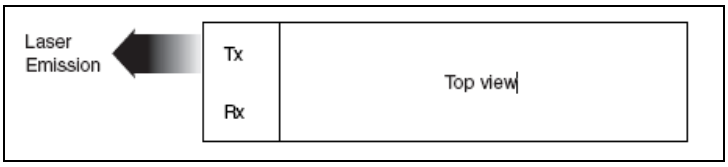


Mechanical Specifications



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

Laser Emission



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Revision History

Revision	Initiated	Reviewed	Approved	Revision History	Release Date
V1.a	Kelly.Cao			Released.	Sep 29, 2008
V1.b	Phlio	Kelly		Adding the 1550nm products.	July 13, 2009
V1.c	Kelly			Update PN&LOGO.	Sep 23, 2011
V1.d	Kelly			Correct spelling mistakes.	Dec 9, 2011
V1.e	Angela	Kelly		Update the regulatory compliance and delete class1 label.	Mar 16,2016
V1.f	Angela	Kelly/Oliver/Lyn	Alex	Delated the industrial temperature. Updated the Max Icc and contact.	June 4, 2018

Notice:

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