EOLS-PX-GEU-30 Series

Compliant with IEEE 802.3av™-2009 10/1GBASE-PRX-U3
Single fiber bi-directional Transceiver
1.25Gbps upstream and 10.3125Gbps downstream
RoHS6 Compliant

Features

- SFP+ Package with SC Receptacle
- Single +3.3V Power Supply
- 1.25 Gbps / 1310 nm Burst-Mode Transmitter with DFB laser
- 10.3125 Gbps / 1577.5nm High Sensitivity Continuous-Mode APD-TIA Receiver
- LVTTL Tx_Burst, Tx_SD, LOS
- LVTTL Sleep Mode for Power Consumption
- Operating Case Temperature
  Standard: 0℃~+70℃
  Industrial: -40℃~+85℃
- Compliant with Class 1 FDA and IEC60825-1 laser safety

Applications

- Compliant with SFF-8472 MSA
- Compliant with IEEE 802.3av
- Compliant with SFP+ MSA SFF-8431
- 10/1GBASE-PRX-U3 application

Ordering information

Part No.	Input	Output	Burst-mode	Fiber	Interface	Temp.
EOLS-PX-GEU-30-1*note1	AC	AC	LVTTL	SMF	SC	Standard
EOLS-PX-GEU-30-I1	AC	AC	LVTTL	SMF	SC	Industrial

Note1: Standard version

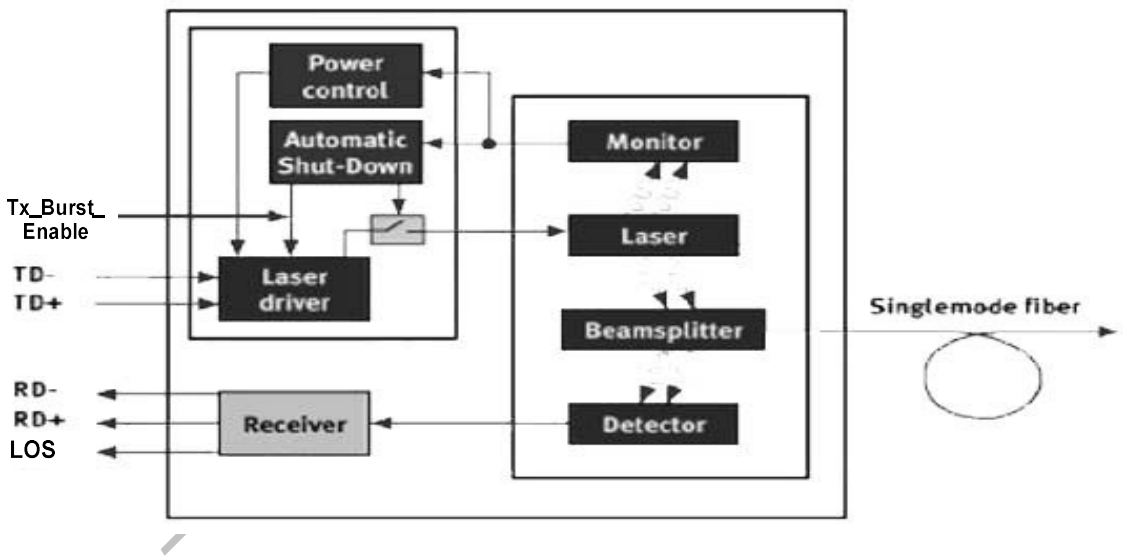
*The product image only for reference purpose.

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

Functional Diagram



Product Description

EOLS-PX-GEU-30 Series is a transceiver for the optical network unit (ONU) of 10GEPON with 10.3125Gbps in downstream and 1.25Gbps in upstream. EOLS-PX-GEU-30 series is high performance module for single fiber communications by using 1310nm burst-mode transmitter and 1577nm continuous-mode receiver.

The transmitter section uses a DFB 1310nm laser and is a class 1 laser compliant according to International Safety Standard IEC-60825-1. The receiver section uses an integrated 1577 nm detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

CML interface is used for differential inputs and outputs. LVTTL logic control interface simplifies interface to external circuitry.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	+85	°C
Supply Voltage	V_{CC}	-0.5	4.0	V
Operating Relative Humidity	Hopr	5	95	%

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

Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	T_c	EOLS-PX-GEU-30-1	0		+70	°C
		EOLS-PX-GEU-30-I1	-40		+85	
Power Supply Voltage	V_{CC}		3.15	3.3	3.45	V
Power Supply Current	I_{CC}				450	mA
Data Rate	@ Tx side			1.25		Gbps
	@ Rx side			10.3125		

Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
LVCML and LVPECL Compatible Inputs (Differential)	Vin	200		1600	mVpp	AC coupled inputs
Input Impedance (Differential)	Zin	85	100	115	ohm	
Tx_Burst_Enable Input Voltage	H	2		Vcc	V	
	L	0		0.8	V	
Tx_FAULT Output Voltage	H	2		Vcc+0.3	V	Transmitter Fault Triggered
	L	0		0.5	V	
Tx_SD Output Voltage	H	2		Vcc+0.3	V	Laser on indicator
	L	0		0.5	V	Laser off indicator
TX Fault Assert Time	T_{fault_assert}	-		50	ms	
TX Fault Reset time	T_{fault_resert}	10			us	
Receiver						
CML Outputs (Differential)	Vout	340		900	mVpp	AC coupled outputs

Output Impedance (Differential)	Zout	80	100	120	ohm	
Rx_LOS Output Voltage	H	2		Vcc+0.3	V	
	L	0		0.8	V	
Rx_LOS Assert time	T_{assert}	-		100	us	
Rx_LOS De-Assert time	$T_{De-assert}$	-		100	us	

Performance Specifications - Optical

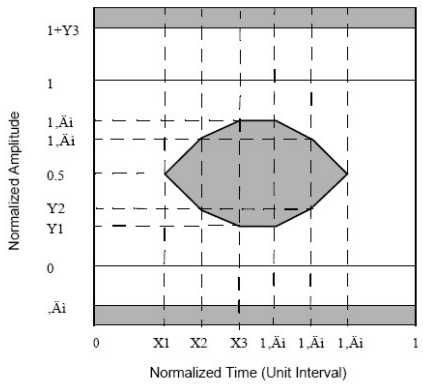
Parameter		Symbol	Min.	Typical	Max.	Unit
Data Rate		@Tx		1.25		Gbps
		@Rx		10.3125		
Transmitter						
Centre Wavelength		λ_C	1260	1310	1360	nm
Spectral Width (-20dB)		Δλ			1	nm
Side Mode Suppression Mode		SMSR	30			dB
Average Output Power*(note3)		Pout	0.62		5.62	dBm
Extinction Ratio*(note4)		ER	6	9		dB
Reflectance		Rt			-10	dB
Optical Return Loss Tolerance					15	dB
Rise/Fall Time(20%～80%)		tr/tf			260	ps
Total Jitter(PRBS2^7-1)		T_J			0.35	UI
Output Optical Eye*(note5)		IEEE Std 802.3av Compliant				
Optical Output Power with TX OFF*(note6)		P_off			-45	dBm
Path Penalty		Pp			1.5	dB
Receiver						
Centre Wavelength		λc	1575		1580	nm
Receiver Sensitivity*(note7)		Pmin			-28.5	dBm
Saturation Optical Power		Pmax	-8			dBm
Receiver Reflectance		CR			-12	dB
Optical Crosstalk					-47	dB
LOS De-Assert		LOSD			-29	dBm
LOS Assert		LOSA	-42			dBm
LOS Hysteresis*(note8)			0.5		6	dB
WDM Filter ISO	ISO(1560)		35			dB
	ISO(1600)		35			
RSSI resolution @ Full temperature range			-3		+3	dB

Note3: Output is coupled into a 9/125 um single-mode fiber.

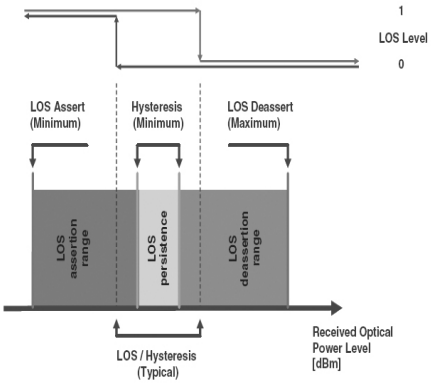
Note4: Filtered, Measured with PRBS2^7-1 test pattern @1.25Gbps.

Note 7: Measured with a PRBS 2^{31} -1 test pattern @10.3125Gbps and ER=8.2dB, BER is less than 1E-3.

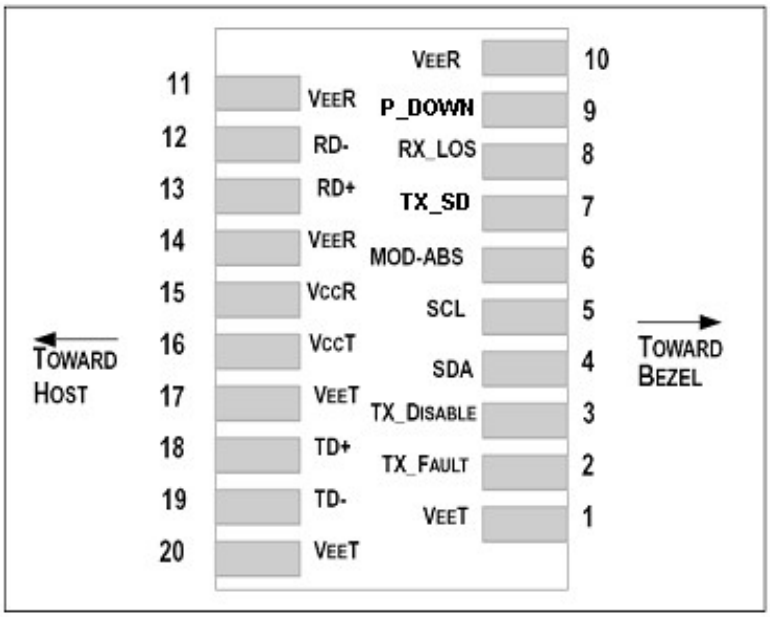
Note5: Eye pattern mask

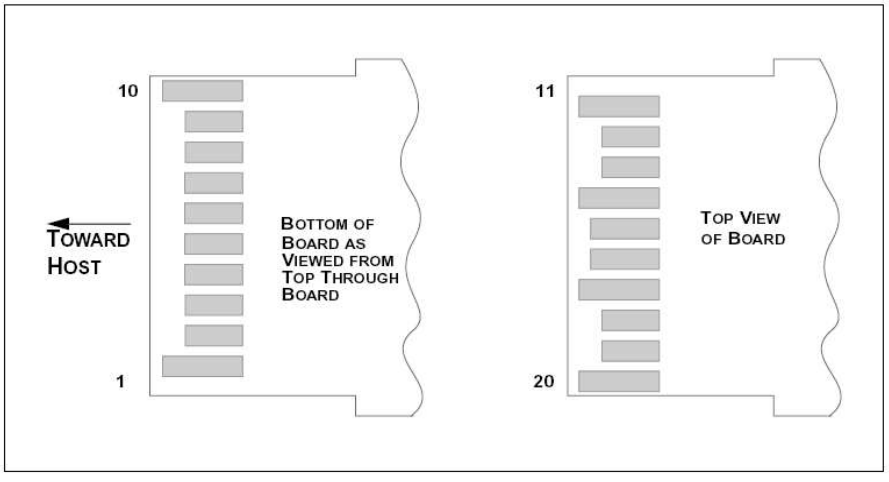


Note 8: LOS Hysteresis



SFP+ Transceiver Electrical Pad Layout





Pin Function Definitions

Pin Num.	Name	FUNCTION	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 15
2	TX Fault	Transmitter Fault Indication	3	Note 9
3	TX_Burst_Enable	Burst Enable	3	Note 10, Module disables on high or open
4	SDA	Module Definition 2	3	Note 11, Data line for Serial ID.
5	SCL	Module Definition 1	3	Note 11, Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 11
7	TX_SD	TX signal detector (LVTTL)	3	Note 12
8	RX_LOS	Loss of Signal	3	Note 13
9	P_Down	Power down (LVTTL)	3	Note 14
10	VeeR	Receiver Ground	1	Note 15
11	VeeR	Receiver Ground	1	Note 15
12	RD-	Inv. Received Data Out	3	Note 16
13	RD+	Received Data Out	3	Note 16
14	VeeR	Receiver Ground	1	Note 15
15	VccR	Receiver Power	2	3.3 ± 5%, Note 17
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 17
17	VeeT	Transmitter Ground	1	Note 15
18	TD+	Transmit Data In	3	Note 18
19	TD-	Inv. Transmit Data In	3	Note 18
20	VeeT	Transmitter Ground	1	Note 15

Notes:

Note9: 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.

Note10: TX_Burst_Enable is an input that is used to open the transmitter burst optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its states are:
Low (0 – 0.8V): Default Transmitter burst on
(>0.8, < 2.0V): Undefined
High (2.0 – 3.465V): Default Transmitter burst off

Note11: SDA/SCL is the 2 wire serial interface, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. MOD_ABS is GND internal, which should be pulled up with a 4.7K – 10KΩ resistor on the host board, high indicates module is absence.

Note12: TX_SD is the indicator of TX signal. High indicates laser on, low indicates laser off.

Note13: LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Assert high when the input optical power below the threshold..

Note14: Iinternal pulled up with a 4.7K – 10KΩ resistor internal. P_Down is a controller PIN for saving power consumption. If not use this feature, main board connection should be NC.

Low (0 – 0.8V): TX power saving is on and transmitter will be set to sleep mode.
(>0.8, < 2.0V): Undefined
High (2.0 – 3.465V) or NC: TX power saving off

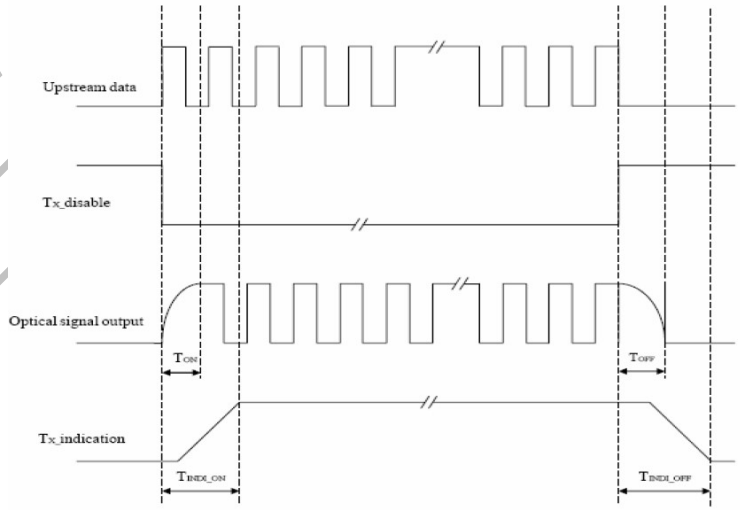
Note15: VeeR and VeeT may be internally connected within the SFP+ module.

Note16: RD-/+: These are the differential receiver outputs. They are AC coupled internal.

Note17: 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 600mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm 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.

Note18: TD-/+: These are the differential transmitter inputs. They are AC-coupled inside the module.

TX_SD Timing Sequence

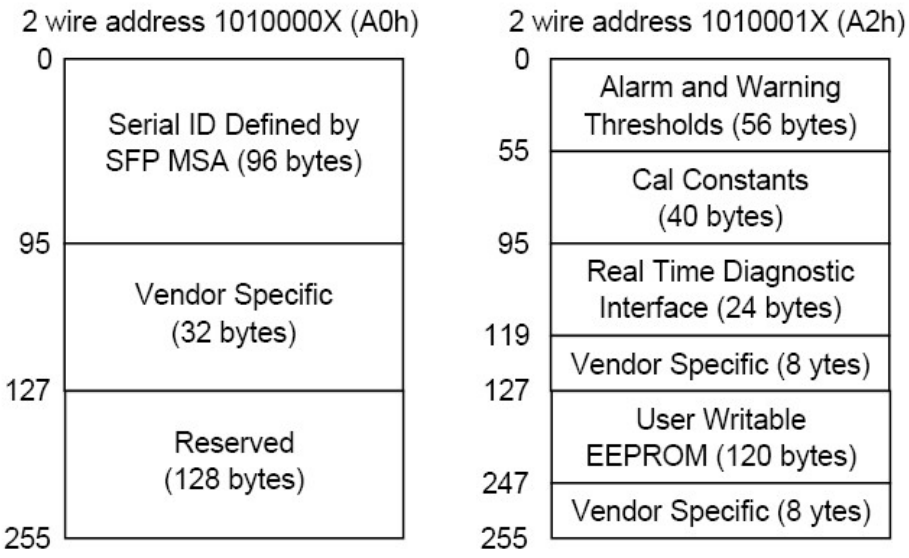


Parameter	Symbol	Min	Typ	Max	Unit
Tx_indication assert	Tindi-on			200	ns
Tx_indication deassert	Tindi-off			200	ns
Tx_burst on	Ton			30	ns
Tx_burst off	Toff			30	ns

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.

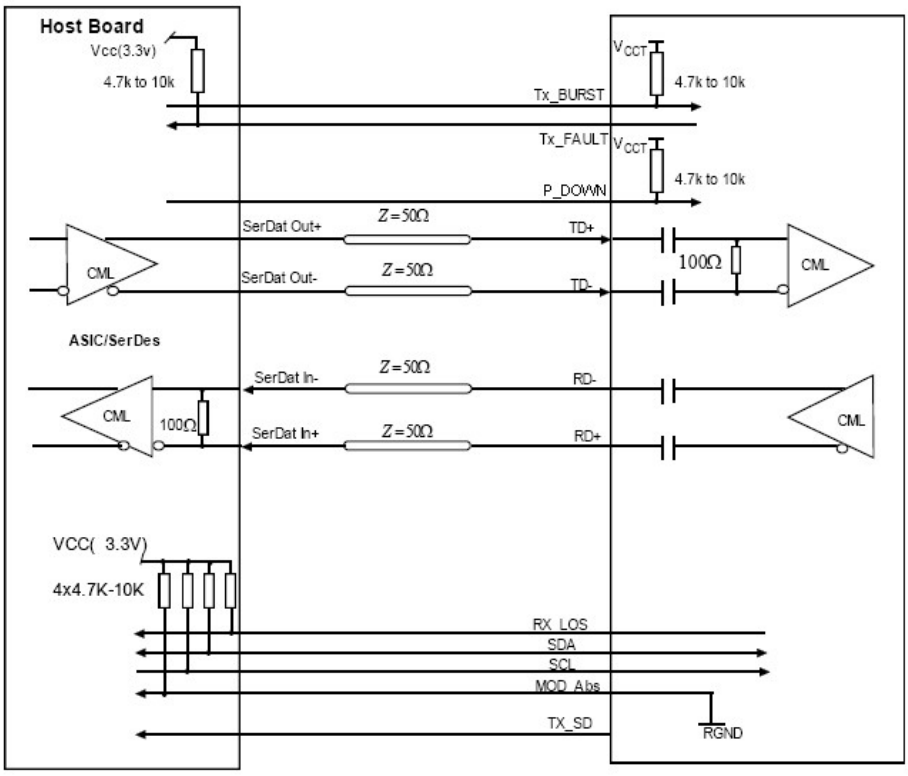
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 10.2.



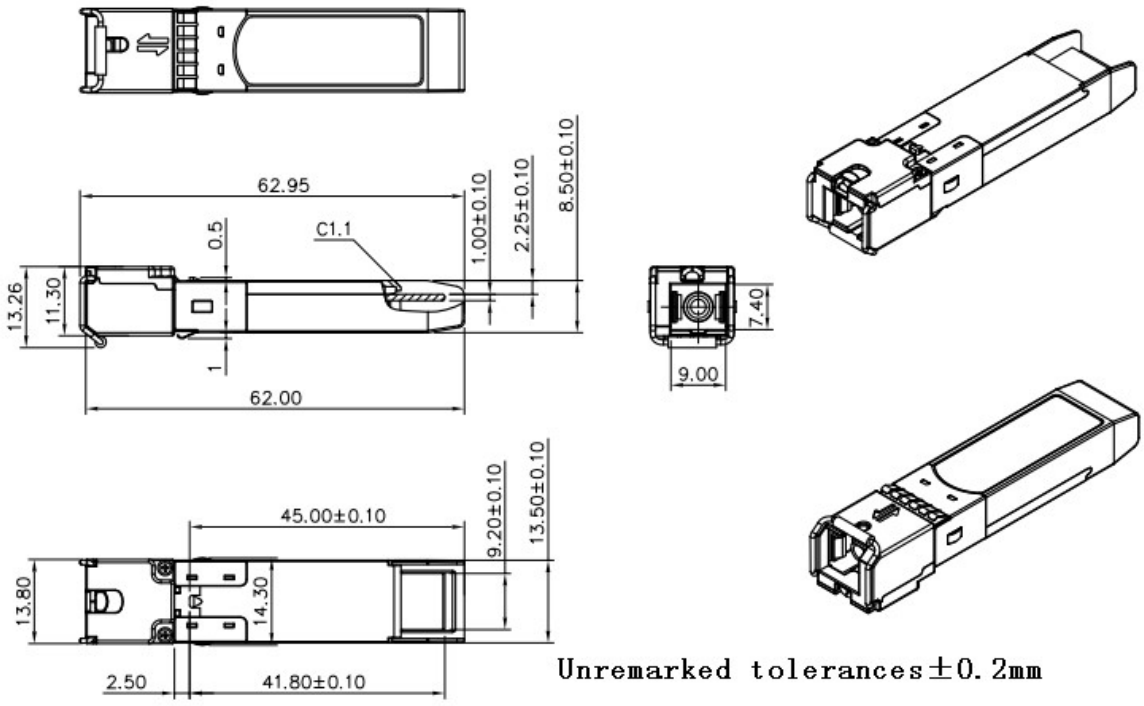
Digital Diagnostic Monitor Specification

Address	Parameter	Range	NOTES
96-97	Temperature	-40 to 125°C	Case temperature
98-99	Vcc Voltage	0V to 6.55V	
100-101	Bias Current	0 to 131mA	Unit 2uA
102-103	TX Power	-30 to 8.2 dBm	Unit 0.1uW
104-105	RX Power	-40 to 8.2 dBm	Unit 0.1uW

Recommend Circuit Schematic



Mechanical Specifications



*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 document.

Revision History

Revision	Initiated	Reviewed	Approved	DCN	Release Date
V1.a	Arvin/ Phlio			Preliminary Released.	Aug. 22, 2011
V1.b	Phlio	Kelly		Update PN to EOLS-PX-GEU-30.	Nov 28, 2011
V1.c	Angela	Kelly		Update LOSD&LOSA	Nov 16,2012
V1.d	Angela	Kelly	Phlio	Update the regulatory compliance and Max Icc.	Sep 18, 2015
V1.e	Phlio/ Yi wan/ Oliver	Kelly/Angela /Jason	Alex	Add BOL and EOL specification, update the regulatory compliance. Realse version	Feb 23, 2016
V1.f	Angela	Kelly/Vina/ Dean/Lyn/ Jason/Nygai	Phlio	Update the LOSA&LOSD and 2D drawing.	May 17,2016

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