

1.Features

- Single fiber bi-directional data links asymmetric TX 2488Mbps/RX1244Mbps application
- 1490nm continuous-mode DFB laser transmitter and 1310nm burst-mode APD-TIA receiver
- Small Form Factor Pluggable package with SC/UPC Connector
- Reset burst-mode receiver design support more than 15dB dynamic range
- Single +3.3V power supply
- Digital diagnostic monitoring interface
- Digital burst RSSI function to monitor the input optical power level
- LVPECL compatible data input/output interface
- LVTTTL transmitter disable control
- LVTTTL transmitter laser fault alarm
- LVTTTL receiver Signal Detect (SD) indication
- Low EMI and excellent ESD protection
- Class I laser safety standard IEC-60825 compliant
- Operating case temperature:
Standard: 0°C~+70°C
Industrial: -40°C~+85°C
- RoHS 2.0 compliance

2.Applications

- Gigabit-capable Passive Optical Networks (GPON) C++/C+++/C++++ 20Km application

3.General

The GPON OLT Transceiver module is designed for Gigabit Ethernet Passive Optical Network (GPON) 20km transmission. The module incorporates 1490nm continuous-mode transmitter and 1310nm burst-mode receiver. The transmitter section uses a 1490nm DFB laser and an integrated laser driver which is designed to be class-1 eye safe under any single fault. The laser driver includes APC and temperature compensation functions, which are used for keeping the launch optical power and extinction ratio constant over temperature and aging.

The receiver section uses an integrated APD and BM-preamplifier mounted together. The module has the function that indicates receiver burst-power-detect signal. The receiver includes digitalized burst mode optical power monitoring function, which converses any of a received ONU optical power directly in digital, with a Trigger input from system. When rising edge of Trigger detected, the DDM processor starts a burst optical power conversion, the digital result is available via DDM interface after Burst Optical Power Conversion Time. Trigger pulse width should be more than Burst Optical Power Conversion Holding Time. An integrated WDM coupler can distinguish 1310nm input light from 1490nm output light. The metallic package guarantees excellent EMI and EMC characteristics.

4. Order Information

Table-1-Order Information(Standard: 0°C~+70°C)

Part Number	Data Rate (TX/RX)	Index level	PO (dBm)	Sens (dBm)	Interface	Temp. ^{Note 1}
GGLS-4121-30CS	2.488Gbps/1.244Gbps	C++	+4.5~+10	≤-31	SC	0°C~+70°C
GGLS-4121-30ACS	2.488Gbps/1.244Gbps	C+++	+6~+10	≤-33	SC	0°C~+70°C
GGLS-4121-40CSC	2.488Gbps/1.244Gbps	C++++	+9~+13	≤-33	SC	0°C~+70°C

Table-1-Order Information (Industrial: -40°C~+85°C)

Part Number	Data Rate (TX/RX)	Index level	PO (dBm)	Sens (dBm)	Interface	Temp. ^{Note 1}
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SFP GPON OLT

GGLS-4121-30IS	2.488Gbps/ 1.244Gbps	C++	+4.5~+10	≤-31	SC	-40℃~+85℃
GGLS-4121-30AIS	2.488Gbps/ 1.244Gbps	C+++	+6~+10	≤-33	SC	-40℃~+85℃
GGLS-4121-40ISC	2.488Gbps/ 1.244Gbps	C++++	+9~+13	≤-33	SC	-40℃~+85℃

Note:

1.The Temp is Operating Case Temperature Range.

5. Absolute Maximum Ratings

Table 2-Absolute Maximum Ratings

Parameter	Condition	Unit	Min.	Typ.	Max.
Supply Voltage		V	-0.5	-	3.6
Storage Temperature	Case Temperature	℃	-45	-	+85
Relative Humidity, Storage	None Condensing	%	+5	-	+95
Rx Total Optical Power	Damage Threshold	dBm	-	-	-8

6. Operating Environment

Table 3-Operating Environment

Parameter	Condition	Unit	Min.	Typ.	Max.
Power Supply Voltage		V	3.13	3.3	3.47
Operating Case Temperature	Standard	℃	0	-	+70
	Industrial	℃	-40	-	+85

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

7. Electrical Characteristics

Table 4-Electrical Characteristics

Parameter		Symbol	Min	Type	Max	Units	Notes
Transmitter							
Differential Data Input Swing		V _{in}	200	-	2400	mVpp	1
Input Differential Impedance		Z _{in}	90	100	110	ohm	
Tx_Disable	Disable	V _D	2.0	-	VCC	V	
	Enable	V _{EN}	GND	-	GND+0.8	V	
TX_Fault	Fault	V _F	2.0	-	VCC	V	
	Normal	V _{NO}	GND	-	GND+0.8	V	
Receiver							
Differential Date Output Swing		V _{out}	600	-	1500	mVpp	2
Output Differential Impedance		Z _{out}	90	100	110	ohm	
Signal Detect de-assert Time		T _{SDD}	ns	-	-	12.8	3
Signal Detect assert Time		T _{SDA}	ns	-	-	50	4
Signal Detect Voltage	High	V _{OH}	2.4	-	VCC	V	
	Low	V _{OL}	GND	-	GND+0.4	V	

Note:

1.Internally AC coupled, input termination may be required for LVPECL/CML applications.

2.Internally DC coupled, LVPECL/CML differential output stage.

3.Refer to the Reset signal rising edge

4.Refer to the Reset signal falling edge.

8. Specifications

Table 5-Optical Characteristics

Parameter	Symbol	Units	Min.	Typ.	Max.	Notes
Transmitter						
Data Rate	BR	Mbps	-	2488	-	

Optical Center Wavelength	λ_c	nm	1480	1490	1500	
Optical Spectrum Width (-20dB)	$\Delta\lambda$	nm	-	-	1	
Side Mode Suppression Ratio	SMSR	dB	30	-		
Power-OFF Transmitter Optical Power		dBm	-	-	-39	3
Extinction Ratio	ER	dB	8.2	-	-	4
Tolerance to Transmitter Incident Light		dB	-15	-	-	
Transmitter and Dispersion Penalty	TDP	dB	-	-	1	
Optical Waveform Diagram	ITU-T G.984.2					5
Parameter	Symbol	Unit	Min	Typ.	Max	Notes
Receiver						
Data Rate	BR	Mbps	-	1244	-	
Operating Wavelength	λ_c	nm	1260	1310	1360	
Saturation Optical Power	$P_{SAT}(C++)$	dBm	-12	-	-	6
	$P_{SAT}(C+++)$	dBm	-15	-	-	6
	$P_{SAT}(C++++)$	dBm	-15	-	-	6
Signal Detect Assert Level	SDA	dBm	-	-	-34	6
Signal Detect De-Assert Level	SDD	dBm	-45	-	-	6
Signal Detect Hysteresis		dBm	0.5	-	6	
Receiver Reflectance		dB	-	-	-12	
Receiver Burst Mode Dynamic Range		dB	15			7

Note:

- 1.BOL, Normal Temperature.
- 2.EOL, Over Temperature.
- 3.Launched into SMF
- 4.PRBS 2²³-1+72CID @2.488Gbit/s
5. Figure 1
- 6.PRBS 2²³-1+72CID@1244Mbps BER $\leq 1 \times 10^{-10}$.
7. Figure 2.

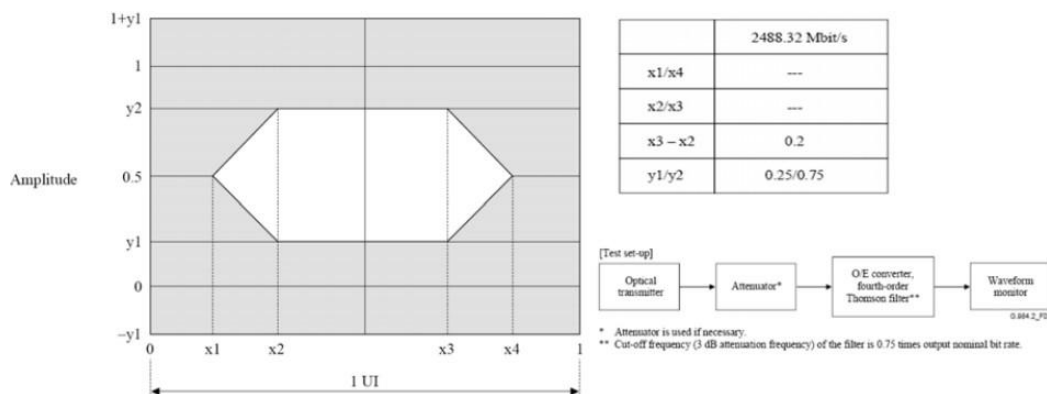


Figure 1, Transmitter Eye Mask Definitions and Test Procedure

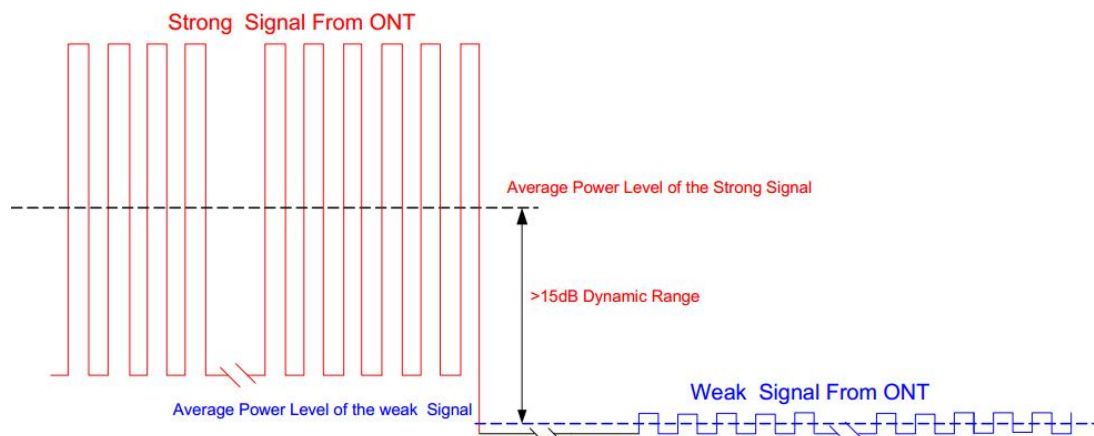


Figure 2, Burst Mode Receiver Dynamic Range in GPON System

Table 6-Digital RSSI Timing Specification

Parameter	Symbol	Unit	Min	Typ.	Max	Notes
Guard time	T _{GUARD}	bits	-	32		1
Reset width	T _{RESET}	bits	-	16		1
Optical Signal During Time	T _{ONTEN_DUR}	ns	500	-	-	2
RSSI Trigger Delay	TD	ns	30	-	3000	3,4
RSSI Trigger width	TW	ns	300	-	T _{ONTEN_DUR} -TD	4
I2C Access Prohibited Time		us	500	-		
Measurement Accuracy of received burst optical power, range from -10dBm to -30dBm		dB	-3	-	+3	

Note:

1. Figure 3.
2. For RSSI Measurement, Figure 4.
3. Refer to first bit of the preamble.
4. Figure 4.

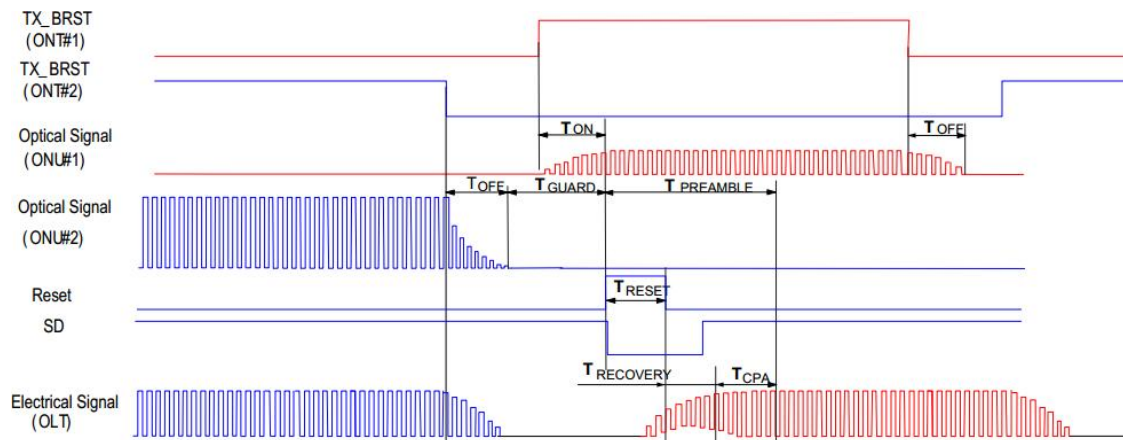


Figure 3, Burst Receiver Timing Sequence

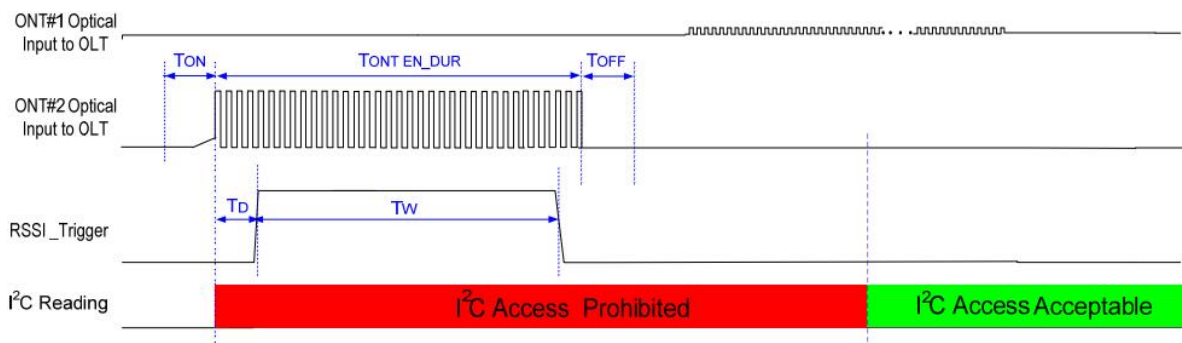


Figure 4, RSSI Timing Sequence

9. Digital Diagnostic Memory Map

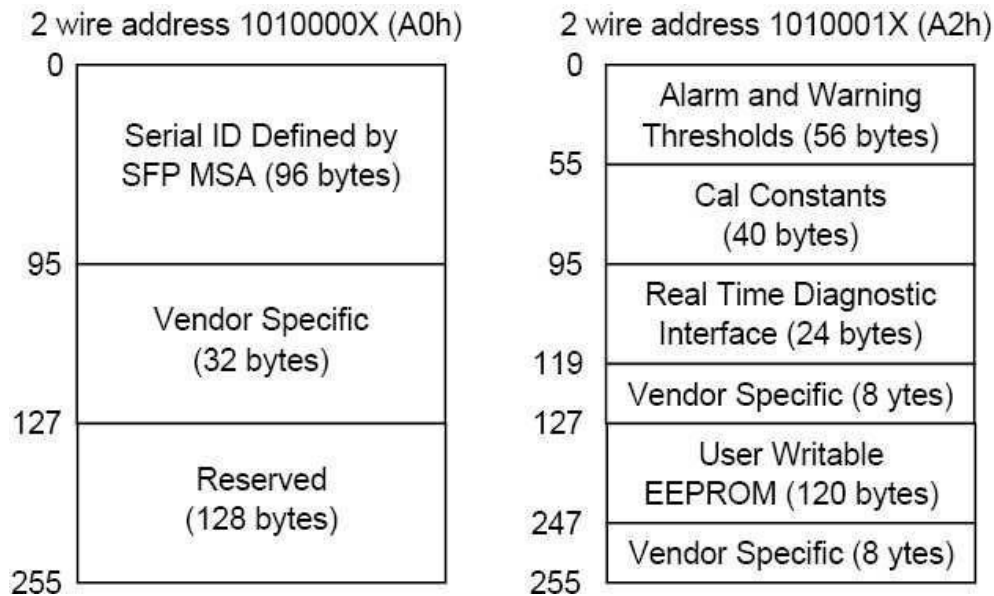


Figure 5, Memory map

10.Pin arrangement

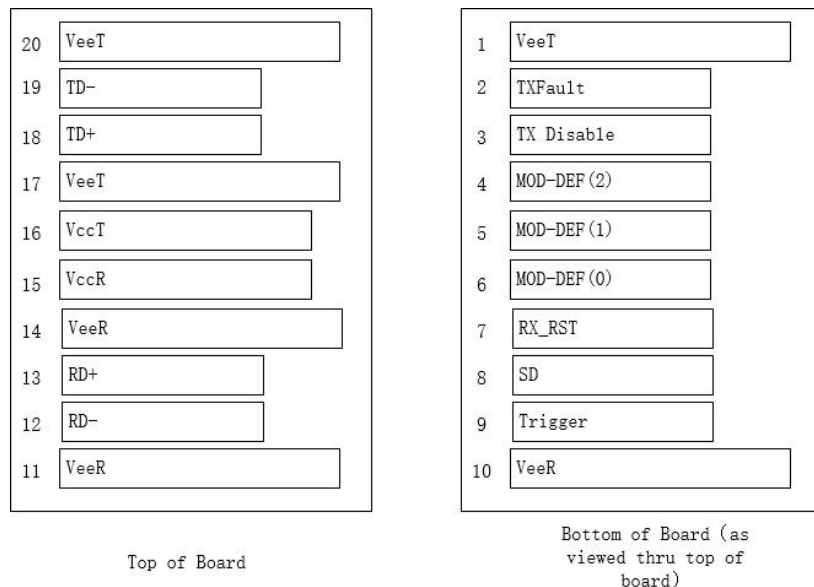


Figure 6, Pin Views

Table 7-Connector Pin Assignment

Pin	Name	Description	Notes
1	VeeT	Transmitter Ground	
2	TXFault	Transmitter Fault Indication	High: abnormal; Low: normal
3	TX Disable	Transmitter Disable	High: transmitter disable; Low: transmitter enable
4	MOD-DEF(2)	Module Definition 2	I2C data, SDA ,The data line of two wire serial interface
5	MOD-DEF(1)	Module Definition 1	I2C clock, SCL ,The clock line of two wire

			serial interface
6	MOD-DEF(0)	Module Definition 0	Connected to Ground in the transceiver
7	RX_RST	Receiver Reset	Active High
8	SD	Signal Detect	High: signal detected; Low: loss of signal
9	Trigger	RSSI Trigger for Transceiver A/D Conversion	High: enable RSSI A/D conversion
10	VeeR	Receiver Ground	
11	VeeR	Receiver Ground	
12	RD-	Inverse Received Data out	LVPECL logic output, DC coupled
13	RD+	Received Data out	LVPECL logic output, DC coupled
14	VeeR	Receiver Ground	
15	VccR	Receiver Power — +3.3V±5%	
16	VccT	Transmitter Power — +3.3 V±5%	
17	VeeT	Transmitter Ground	
18	TD+	Transmitter Data In	LVPECL logic input, AC coupled, internally 100 ohms differential termination
19	TD-	Inverse Transmitter Data In .	LVPECL logic input, AC coupled, internally 100 ohms differential termination
20	VeeT	Transmitter Ground	

11. Block Diagram

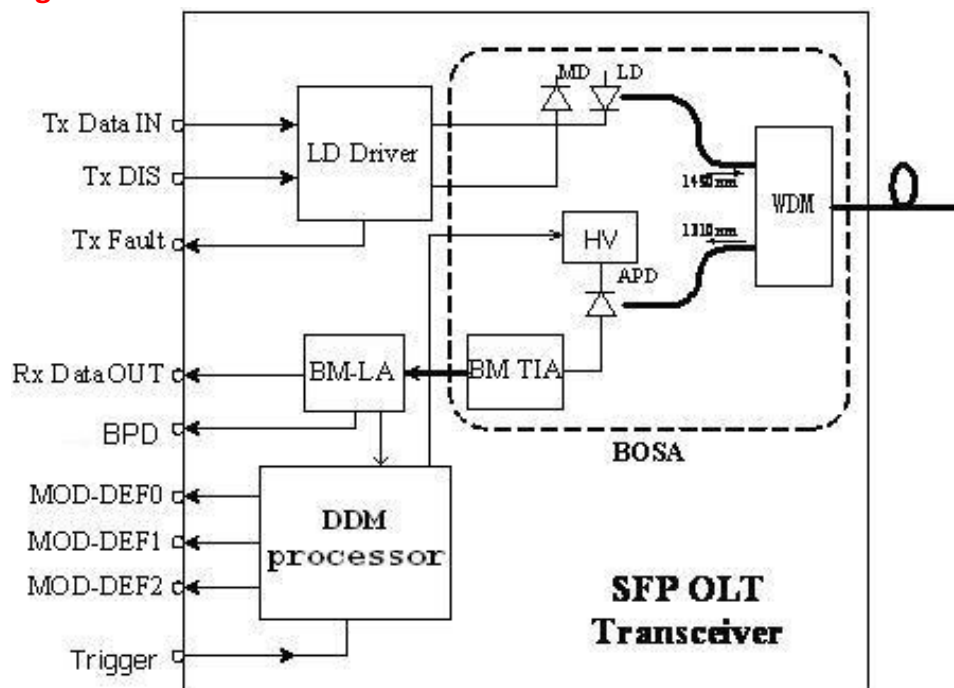


Figure 7, Block Diagram

12. Typical Application Circuit

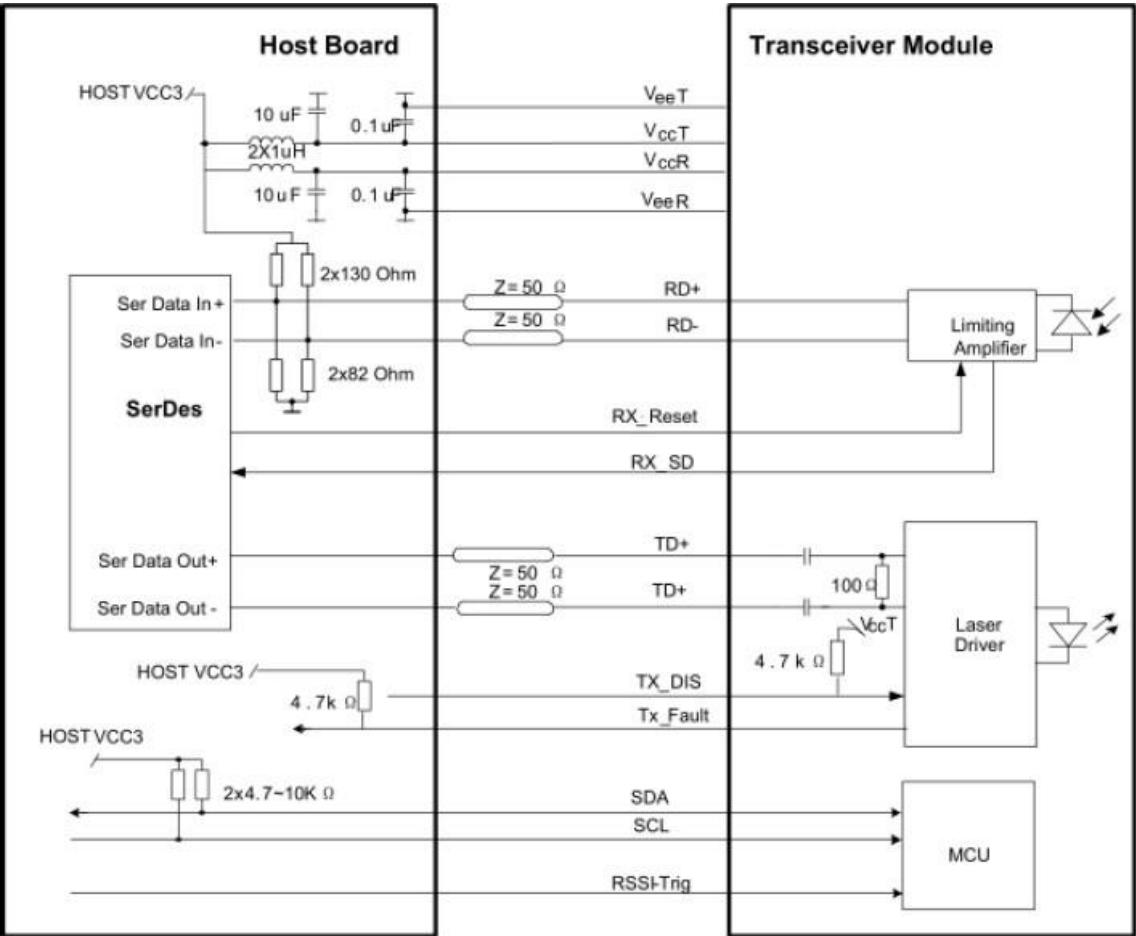


Figure 8, Typical Application Circuit

13. Mechanical Information

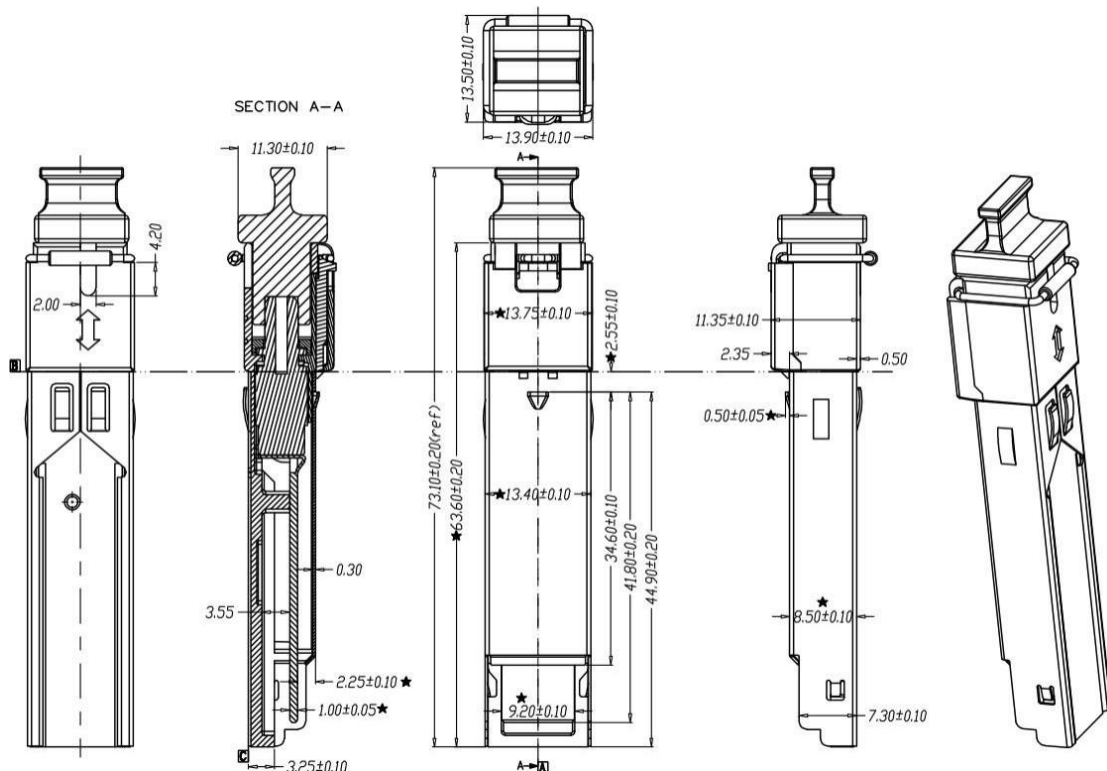


Figure 9, Mechanical Information

14. Regulatory Information

Table 8-List of Regulatory/Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883H Method 3015.8	Based on HBM
	IEC61000-4-2	8kV Contact Discharge 15kV Air Discharge
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.
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.
RoHS 2.0	2011/65/EU	Compliant with standards

15. Notice

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16.Revision History

Version	Initiated	Reviewed	Revision History	Release Date
A0	Fei.Han	Smith.Xu	Initialization	2018-07-16
A1	Fei.Han	Sean.Lin	PX30 Index level series Added	2022-09-01
A2	Fei.Han	Yucheng.Wang	Description Added	2022-11-24
A3	Yucheng.Wang			2023-03-20