

#### FEATURES

- ◇ Single fiber bi-directional data links TX 9.953Gbps, Burst Mode RX 9.953G/2.488Gbps application
- ◇ Single fiber bi-directional data links TX 2.488Gbps, Burst Mode RX1.244Gbps application
- ◇ 0 to 70°C operating case temperature
- ◇ 3.3V power supply
- ◇ SFP+ package with SC Receptacle connector
- ◇ Hot-pluggable capability
- ◇ High power 1577nm EML LD and High power 1490nm DFB LD
- ◇ High sensitivity 1270nm/1310nm APD
- ◇ Support 20km transmission distance with SMF
- ◇ SD indication
- ◇ Low EMI and excellent ESD protection
- ◇ Digital diagnostic monitor interface
- ◇ RoHS compliance

#### APPLICATIONS

- ◇ XGS-PON N2 OLT
- ◇ GPON OLT C+ OLT

#### STANDARDS

- ◇ Complies with SFF-8472
- ◇ Complies with ITU-T G.9807.1 and ITU-T G.987.2
- ◇ Complies with FCC 47 CFR Part 15, Class B
- ◇ Complies with FDA 21 CFR 1040.10 and 1040.11
- ◇ Complies with EN55032 and EN55035
- ◇ Complies with UL60950-1 and CAN/CSA-22.2 No.60950-1
- ◇ Complies with EN 60825-1 and IEC 60950-1

ABSOLUTE MAXIMUM RATING					
Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Ambient Temperature	T <sub>STG</sub>	-40	85	°C	
Operating Case Temperature	T <sub>C</sub>	0	70	°C	
Operating Humidity	RoHS	5	85	%	
VCC3 Power Supply Voltage	VCC3	3.13	3.47	V	
Total Power			3.3	W	

RECOMMENDED OPERATING CONDITION						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Case Temperature	T <sub>c</sub>	0		70	°C	
Power Supply Voltage	V <sub>cc</sub>	3.13	3.3	3.47	V	
RX Data Rate			9.953		Gbps	
			2.488		Gbps	
			1.244		Gbps	
TX Data Rate			9.953		Gbps	
			2.488		Gbps	

XGS PON TRANSMITTER OPTICAL CHARACTERISTICS						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Optical Center Wavelength	$\lambda_c$	1575		1580	nm	
Optical Spectrum Width (-20dB)	$\Delta\lambda$	-	-	1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Optical Power	AOP	+4		+7	dBm	Launched into SMF
Power-OFF Transmitter Optical Power				-39	dBm	Launched into SMF
Extinction Ratio	ER	8.2			dB	PRBS2 <sup>31</sup> -1 @9.953Gbps
Optical Waveform Diagram	Compliant with ITU-T G.9807.1					Figure 1, Mask Margin>5%
Tolerance to Transmitter Incident		-15			dB	
Transmitter and Dispersion Penalty	TDP			1	dB	Transmit on 20km SMF

XGS PON TRANSMITTER ELECTRICAL CHARACTERISTICS						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Input Differential Swing		100		850	mV	CML input, AC coupled
Input Differential Impedance	Z <sub>in</sub>	90	100	110	$\Omega$	
TX Disable	Disable		2	VCC+0.3	V	
	Enable		-0.3	0.8	V	
TX Fault	Fault		2.4	VCC+0.3	V	
	Normal		-0.3	0.4	V	

**XGS PON TRANSMITTER EYE MASK DEFINITIONS AND TEST PROCEDURE**

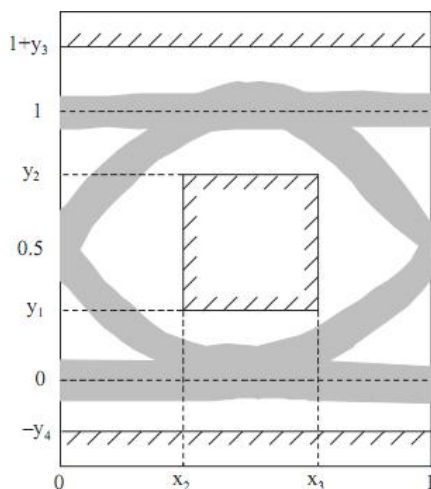


Figure 1 XGPON Transmitter Eye Mask Definitions

X3-X2	Y1	Y2	Y3	Y4	Unit
0.2	0.25	0.75	0.25	0.25	UI

**GPON TRANSMITTER OPTICAL CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Optical Center Wavelength	$\lambda_c$	1480		1500	nm	
Optical Spectrum Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Optical Power	AOP	+3		+7	dBm	Launched into SMF
Power-OFF Transmitter Optical				-39	dBm	Launched into SMF
Extinction Ratio	ER	8.2			dB	PRBS 2 <sup>23</sup> 1+72CID@2.488G
Optical Waveform Diagram	Compliant with ITU-T G.984.2					Figure 2, Mask Margin>5%
Tolerance to Transmitter Incident		-15			dB	

**GPON TRANSMITTER ELECTRICAL CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Input Differential Swing		100		850	mV	CML input, AC coupled
Input Differential Impedance	Zin	90	100	110	$\Omega$	
TX Disable	Disable	2		VCC+0.3	V	
	Enable	-0.3		0.8	V	
TX Fault	Fault	2.4		VCC+0.3	V	
	Normal	-0.3		0.4	V	

**GPON TRANSMITTER EYE MASK DEFINITIONS AND TEST PROCEDURE**

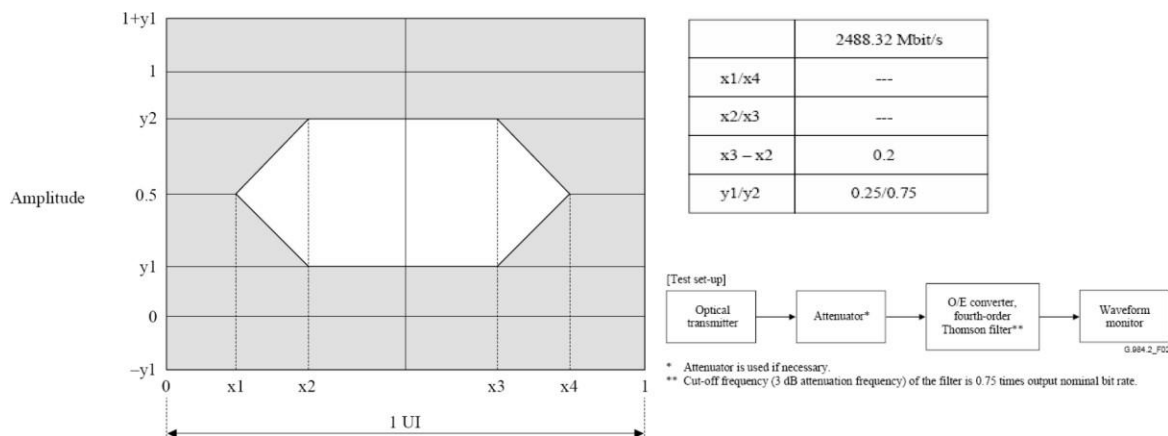


Figure 2 GPON Transmitter Eye Mask Definitions

**XGS PON RECEIVER OPTICAL CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Wavelength		1260		1280	nm	
Sensitivity	SEN			-28	dBm	ER ≥ 6dB
Saturation Optical Power	SAT	-8			dBm	PRBS2 <sup>31</sup> -1@9.953Gbps BER ≤ 1×10 <sup>-3</sup>
SD Assert Level				-29	dBm	
SD De-Assert Level		-45			dBm	
Hysteresis		0.5		6	dB	
Receiver Reflectance				-12	dB	

**XGPON RECEIVER OPTICAL CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Wavelength		1260		1280	nm	
Sensitivity	SEN			-29.5	dBm	ER ≥ 8.2dB
Saturation Optical Power	SAT	-10			dBm	PRBS2 <sup>23</sup> -1@2.488Gbps BER ≤ 1×10 <sup>-4</sup>
SD Assert Level				-30.5	dBm	
SD De-Assert Level		-45			dBm	
Hysteresis		0.5		6	dB	
Receiver Reflectance				-10	dB	

XGS/XGPON RECEIVER ELECTRICAL CHARACTERISTICS						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Guard time	Tg	-	50	-	ns	
Reset Pulse Width	Tr	25.6	-	-	ns	
Receiver Threshold Settling Time	T <sub>SETTLIN<sub>G</sub></sub>			100	ns	Figure 3
Data Output Differential Swing		400		800	mV	DC Coupled, CML output
Output Differential Impedance	Zout	90	100	110	Ω	
SD Assert Level Time				100	ns	
SD De-Assert Level Time				100	ns	
SD Voltage - Low		-0.3		0.4	V	
SD Voltage - High		2.4		VCC+0.3	V	

GPON RECEIVER OPTICAL CHARACTERISTICS						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Wavelength		1290	1310	1330	nm	
Sensitivity (BOL)	SEN			-30	dBm	ER≥10dB
Saturation Optical Power	SAT	-12			dBm	PRBS 2 <sup>23</sup> -1@1.244Gbps BER ≤1×10 <sup>-4</sup>
SD Assert Level				-31	dBm	
SD De-Assert Level		-45			dBm	
Hysteresis		0.5		6	dB	
CID		72			Bit	

GPON RECEIVER ELECTRICAL CHARACTERISTICS						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Guard time	Tg	-	50	-	ns	
Reset Pulse Width	Tr	25.6	-	-	ns	
Receiver Threshold Settling Time	T <sub>SETTLE</sub>		25.6		ns	Figure 5
Data Output Differential Swing		600		1600	mV	LVPECL output, DC coupled
Output Differential Impedance	Zout	90	100	110	Ω	
SD Assert Level Time	Ta			24	ns	Figure 5
SD De-Assert Level Time				25.6	ns	
SD Voltage - Low		-0.3		0.4	V	
SD Voltage - High		2.4		VCC+0.3	V	

**TIMING PARAMETER DEFINITIONS IN BURST MODE SEQUENCE**

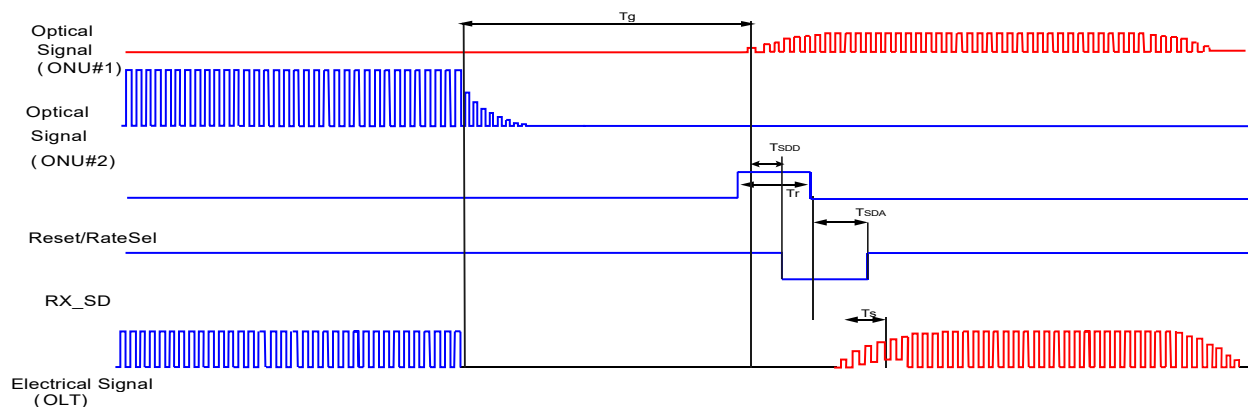


Figure 3 Timing Parameter Definitions in XGS PON Burst Mode Sequence

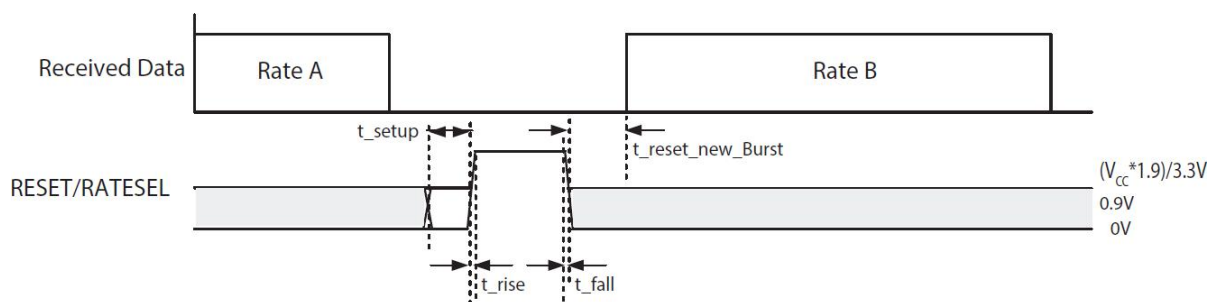


Figure 4 Reset/RateSel Timing Diagram

Reset/RateSel Function		
Reset/Ratesel	Voltage V	Function
High	1.9~3.3V	Reset
Middle	1.2~1.6V	Rate=2.488G
Low	0~0.9V	Rate=9.953G

Reset/RateSel Timing Diagram						
Parameter	Symbol	Min.	Typ.	Max.	Unit.	Notes
Setup Time	$T_{Setup}$	5			ns	
Reset Rise Time	$T_{Rise}$			3	ns	
Reset Fall Time	$T_{fall}$			3	ns	
Reset New Burst Time	$T_{Reset\ new\ burst}$			0	ns	

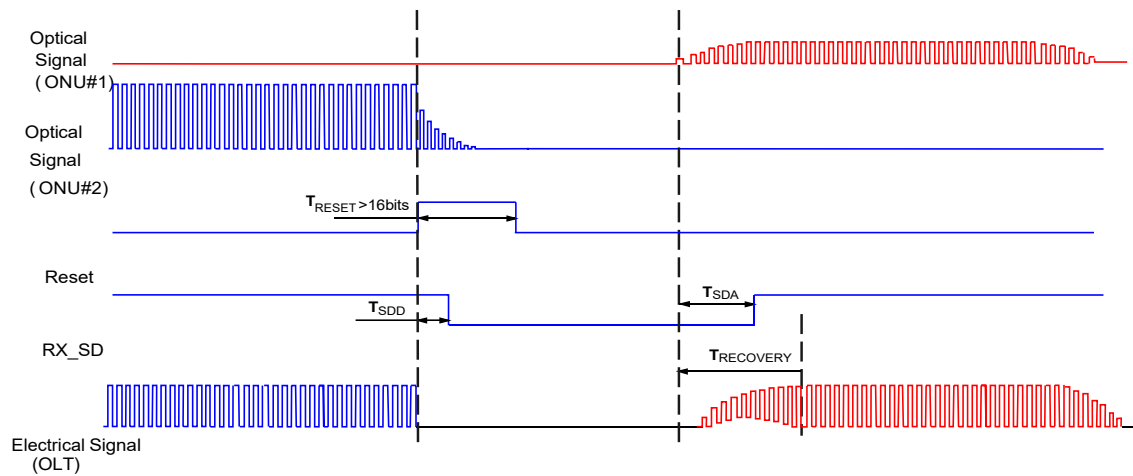


Figure 5 Timing Parameter Definitions in GPON Burst Mode Sequence

RSSI TIMING SEQUENCE						
Parameter	Symbol	Min.	Typ.	Max.	Unit.	Notes
Optical Signal Duration	$T_{opt}$	1200			ns	
RSSI Trigger width	$T_w$	500			ns	
RSSI Trigger Delay	$T_D$	150			ns	
I <sup>2</sup> C Access Prohibited Time	$T_s$			500	$\mu\text{s}$	
I <sup>2</sup> C Bus Frequency		0	100	200	KHz	
I <sup>2</sup> C - High		2.4		3.6	V	
I <sup>2</sup> C - Low		-0.3		1	V	

Digital RSSI Sample/Hold Timing Specification

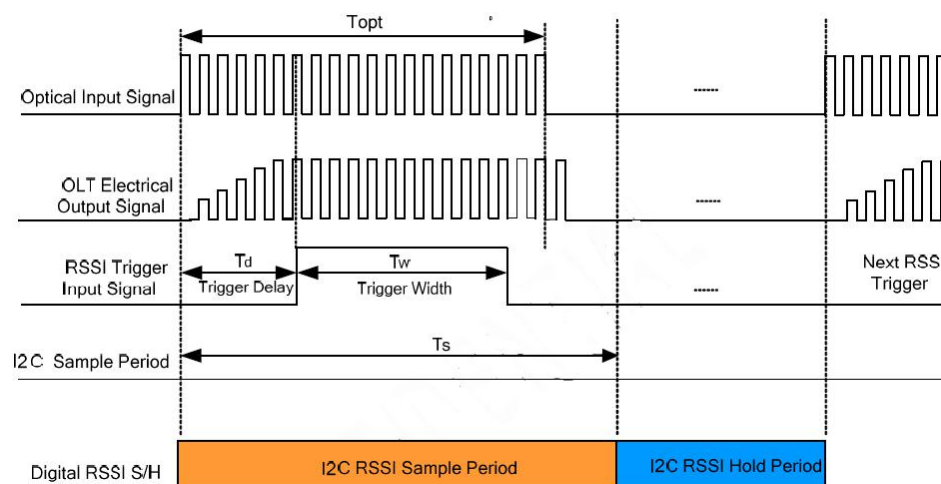


Figure 6 Timing Parameter Definitions in RSSI Trigger

**PIN OUT DRAWING**

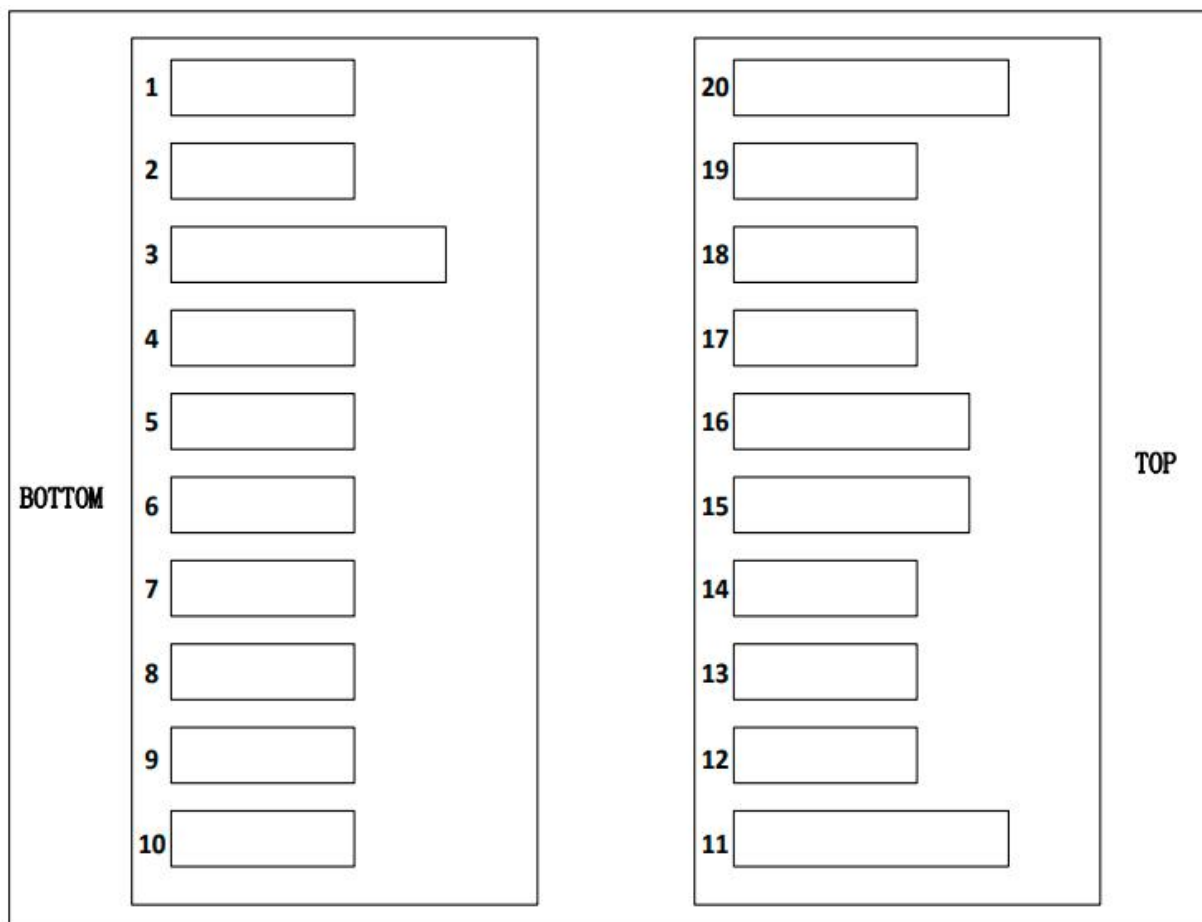


Figure 7 Pin Out Drawing

PIN DESCRIPTION			
PIN	Name	Description	Notes
1	GPON_TD+	2.5G Transmit Data In	AC coupled, CML input
2	GPON_TD-	Inv. 2.5G Transmit Data In	AC coupled, CML input
3	GND	Module Ground	
4	SDA	2-Wire Serial Interface Data	The data line of two wire serial interface <sup>[5]</sup>
5	SCL	2-Wire Serial Interface Clock	The clock line of two wire serial interface
6	GPON_RD-	Inv. Received 1G Data Out	DC coupled, LVPECL output <sup>[1]</sup>
7	Reset& Rate Select	XGSPON Reset& Rate Select	High: Reset, Middle:2.5G, Low:10G <sup>[2]</sup>
8	XGSPON SD	XGSPON SD Indicator	LOW: lost signal
9	Trig/Tx_Dis	Receiver RSSI trigger input /Transmitter	The Mode can be switched <sup>[3]</sup>
10	GPON_RD+	Received 1G Data Out	DC coupled, LVPECL output <sup>[1]</sup>
11	GND	Module Ground	
12	XGSPON_RD-	Inv. Received 10G Data Out	DC coupled, CML output
13	XGSPON_RD+	Received 10G Data Out	DC coupled, CML output

**Shenzhen Opway Communication Co., Ltd.**



14	GPON SD	GPON SD Indicator	
15	VCCR	3.3V DC Power Input	
16	VCCT	3.3V DC Power Input	
17	GPON RESET	GPON RESET	
18	XGSPON_TD+	differential 10G Transmit Data In	AC coupled, CML input
19	XGSPON_TD-	Inv. differential 10G Transmit Data In	AC coupled, CML input
20	GND	Module Ground	

**Note 1:** This contact shall be pulled down with LVPECL output in the host;

**Note 2:** High voltage is greater than 1.9V, intermediate voltage is 1.2V ~ 1.6V, low voltage is lower than 0.9V;

**Note 3:** A2 RSSI/TXDIS SELECTION

Address	Bit	Name	Description
A2 BYTE118	7	RSSI Select	Writing "0" for XGS-PON RSSI Monitor; Writing "1" for GPON RSSI Monitor. Default power up value is "0".
	6	RSSI/ TXDIS Select	When set "0", PIN9 input as TXDIS input; When set "1", PIN9 as RSSI input. Default power up value is "0".
	5	XGSPON TXDIS Selection	When set "0", PIN9 as the XGS-PON TXDIS input. Default power-up value: "0". [4].
	4	GPON TXDIS Selection	When set "0", PIN9 as the GPON TXDIS input. Default power-up value: "0". [4].

**Note 4:** The value is not "0", which represents keep the previous status.

**Note 5:** This contact shall be pulled up with 4.7~10k in the host;

**CONNECTOR CONNECTION DIAGRAM**

**Module**

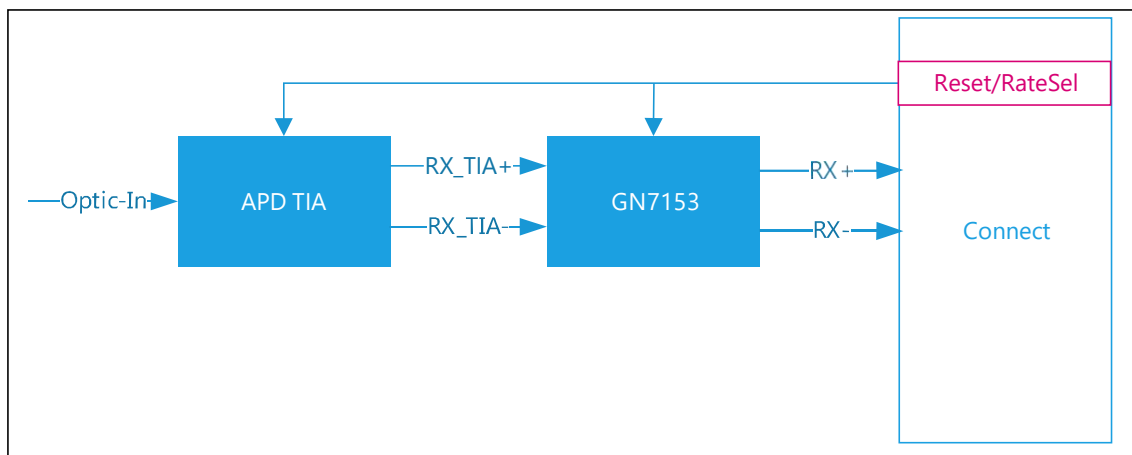


Figure 8 Connector connection diagram

**PACKAGE OUTLINE**

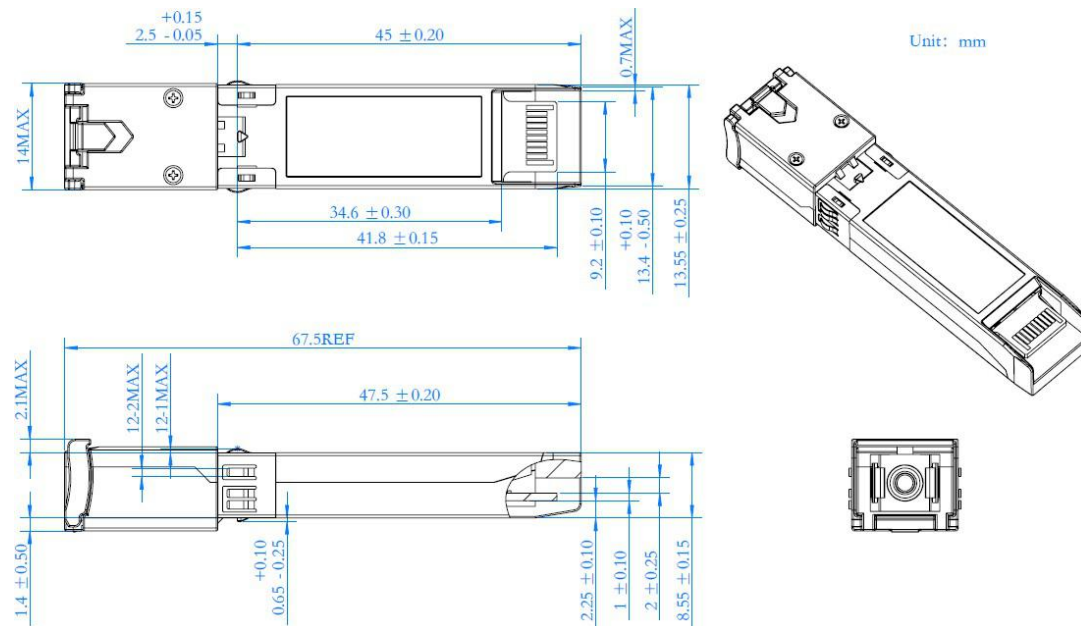


Figure 9 Package Outline

Note: The SFP+ 10G OLT package is preliminary version.

**EEPROM INFORMATION**

A0h(1010000X) and B0h(1011000X) are the Serial ID addresses for XGSPON/XGPON and GPON OLT, respectively.

A2h(1010001X) and B2h(1011001X) are the Digital Diagnostic addresses for XGSPON/XGPON and GPON OLT, respectively.

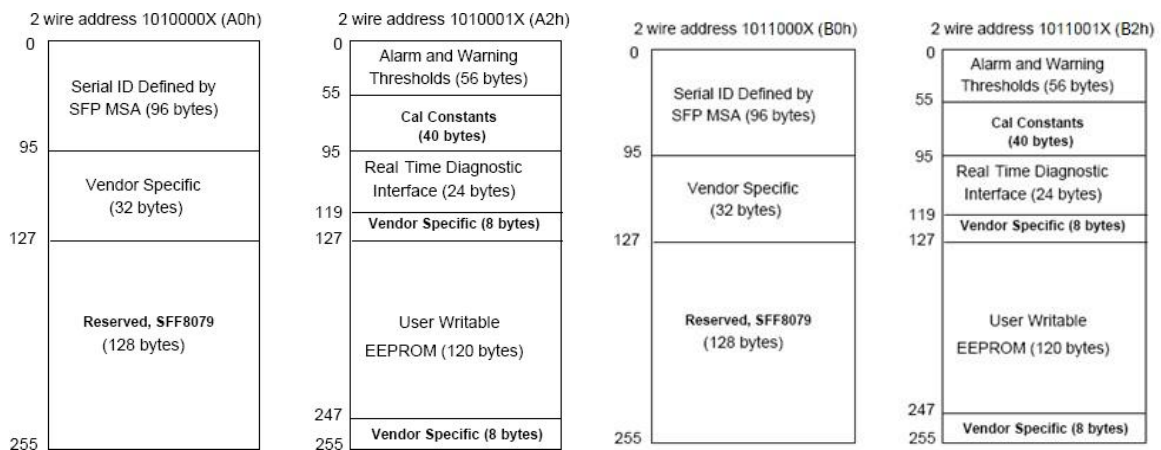


Figure 17 EEPROM Memory Map Specific Data Field Descriptions

XGS: DIGITAL DIAGNOSTIC MONITORING INTERFACE						
Parameter	Range	Accuracy	Calibration	Page	Address	NOTES
Temperature	0 to 70°C	±3°C	Internal	A2	Byte 96~97, Byte96 is MSB	LSB: 1/256C
Voltage	2.97 to 3.63V	±5%	Internal	A2	Byte 98~99, Byte98 is MSB	LSB: 0.1mV
Bias Current_XGS	0 to 262mA	±10%	Internal	A2	Byte 100~101, Byte100 is MSB	LSB: 4uA
TX Power_XGS	4 to 7dBm	±2dB	Internal	A2	Byte 102~103, Byte102 is MSB	LSB: 0.2uW
XGS-PON RX Power Monitor	-28 to -8dBm	±3dB	Internal	A2	Byte 104~105, Byte104 is MSB	LSB: 0.1uW

GPON: DIGITAL DIAGNOSTIC MONITORING INTERFACE						
Parameter	Range	Accuracy	Calibration	Page	Address	NOTES
Temperature	0 to 70°C	±3°C	Internal	B2	Byte 96~97, Byte96 is MSB	LSB: 1/256C
Voltage	2.97 to 3.63V	±5%	Internal	B2	Byte 98~99, Byte98 is MSB	LSB: 0.1mV
Bias Current_GPON	0 to 262mA	±10%	Internal	B2	Byte 100~101, Byte100 is MSB	LSB: 4uA
TX Power_GPON	3 to 7dBm	±2dB	Internal	B2	Byte 102~103, Byte102 is MSB	LSB: 0.2uW
GPON RX Power Monitor	-30 to -8dBm	±3dB	Internal	B2	Byte 104~105, Byte104 is MSB	LSB: 0.1uW