

XG-PON&GPON Combo OLT SFP-DD 1577nm-TX/1270nm-RX and 1490nm- TX/1310nm-RX Class C+ 20km DOM SC SMF Optical Transceiver Module

XGG-SDD-C+N-I



Application

- FTTx
- XG-PON&GPON Access network

Features

- Combination of XG-PON OLT and GPON OLT optical transceiver in a SFP-DD package
- Comply ITU-T G.984.5 (2014)/Amd.2 (10/2020) GPON & XG-PON OPL Class C+
- Single fiber bi-directional data links with:
Tx1: 9.953Gbps, Rx1: 2.488Gbps
Tx2: 2.488Gbps, Rx2: 1.244Gbps
- 1577nm continuous-mode transmitter with EML laser
- 1490nm continuous-mode transmitter with DFB laser
- 1270nm burst-mode receiver with APD-TIA
- 1310nm burst-mode receiver with APD-TIA
- +3.3V power supply
- 2-wire interface for integrated digital diagnostic Monitoring
- RoHS With Exemptions 7C(I)
- 20Km Reach
- Commercial Temp: 0~70° C
- Industry Temp: -40~85° C

Description

The 9.953G-TX/2.488G-RX & 2.488G-TX/1.244G-RX Transceiver is specifically designed for 10-Gigabit-capable Passive Optical Network (XGPON&GPON) system. It integrates bidirectional data transmission over one single-mode optical fiber. The XGPON Combo OLT Small Form-Factor Pluggable Double Density (SFP-DD) transceiver provides an asymmetric 2.488Gbps & 1.244Gbps upstream and 9.953Gbps & 2.488Gbps downstream data rate, reaching a link up to 20km via an SC/UPC connector. It can operate at temperatures between -40 to 85° C. Digital diagnostic monitoring (DOM) allows access to real-time operating parameters. It is fully compliant with ITU-T G.984.5, ITU-T G.987.2 , ITU-T G.984.2, SFP-DD MSA.

Product Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature Range	Ts	-40	-	85	°C	
Operating Case Temperature	Tc	0		70	°C	C-Temp
	Tc	-40	-	85	°C	I-Temp
Relative Humidity	RH	5	-	+85	%	
Supply Voltage	VCC3	0	-	3.6	V	

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	Tc	0		70	°C	C-Temp
	Tc	-40	-	85	°C	I-Temp
Power Supply Voltage	VCC3	3.14	3.3	3.47	V	
Power Consumption (C-temp)			3		W	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Power Consumption (I-temp)			3.5		W	
XG Rx Optical Isolation (From external 1290-1650nm)	ISO	-30			dB	
GPON Rx Optical Isolation (From external 1260-1280nm)	ISO	-30			dB	
GPON Rx Optical Isolation (From external 1342-1650nm)	ISO	-30			dB	
Differential Power Range				20	dB	1

Notes:
1. Power differential between sequential ONU bursts

III. Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter (9.953G)						
Centre Wavelength	λ_C	1575	1577	1580	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power	Aop	5		9	dBm	
Average Launch Power-OFF	POFF			-39	dBm	
Extinction Ratio	ER	8.2			dB	
Transmitter tolerance to Reflected Power		- 15			dB	
Eye Diagram		ITU-T G.987.2 Compliant				

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter (2.488G)						
Centre Wavelength	λ_C	1480	1490	1500	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power	Aop	3		7	dBm	
Average Launch Power-OFF	POFF			-40	dBm	
Extinction Ratio	ER	8.2			dB	
Transmitter tolerance to Reflected Power		-15			dB	
Eye Diagram	ITU-T G.984.2 Compliant					
Receiver (2.488G)						
Operating Wavelength	λ_C	1260	1270	1280	nm	
Sensitivity	PSEN			-30.5	dBm	1
Saturation	PSAT	- 13			dBm	1
Signal Detected De-assert Level	Psdd	-45			dBm	
Signal Detected Assert Level	Psda			-31	dBm	
Max Optical input	Pdamage			0	dBm	
Receiver (1.244G)						
Operating Wavelength	λ_C	1290	1310	1330	nm	
Sensitivity	PSEN			-32	dBm	2
Saturation	PSAT	- 12			dBm	2



Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Signal Detected De-assert Level	Psdd	-45			dBm	
Signal Detected Assert Level	Psda			-33	dBm	
Max Optical input	Pdamage			0	dBm	

- Notes:
- 1. Measured with PRBS 2²³- 1 test pattern @2.488Gbps and ER=8.2dB, BER =10⁻⁴
 - 2. Measured with PRBS 2²³- 1 test pattern @1.244Gbps and ER=8.2dB, BER =10⁻⁴

IV. Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter (9.953G)						
Data Input Differential Swing	VIN	200		850	mVp-p	
Input Differential Impedance	ZIN		100		Q	
Tx_Disable Voltage	VIL	0		0.8	V	
	VIH	2		Vcc	V	
Transmitter Fault Voltage - Low	VTFI, L	0		0.4	V	
Transmitter Fault Voltage - High	VTFI, H	2.4		Vcc	V	
Transmitter (2.488G)						
Data Input Differential Swing	VIN	200		850	mVp-p	
Input Differential Impedance	ZIN		100		Q	
Tx_Disable Voltage	VIL	0		0.8	V	
	VIH	2		Vcc	V	
Transmitter Fault Voltage - Low	VTFI, L	0		0.4	V	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter Fault Voltage - High	VTFI, H	2.4		Vcc	V	
Receiver (2.488G)						
Data Output Differential Swing	VOUT	300		800	mVP-P	
Signal Detected Voltage_low	VSD, L	0		0.4	V	
Signal Detected Voltage_high	VSD, H	2.4		Vcc	V	
Receiver (1.244G)						
Data Output Differential Swing	VOUT	600		1600	mVP-P	
Signal Detected Voltage_low	VSD, L	0		0.4	V	
Signal Detected Voltage_high	VSD, H	2.4		Vcc	V	

V. RSSI Timing

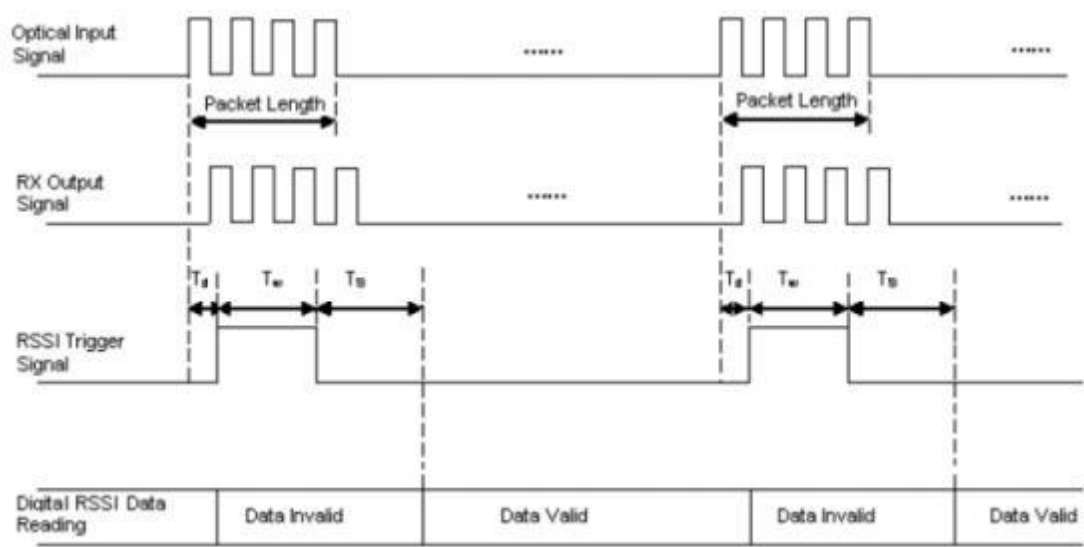


Figure 1, RSSI Timing Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Packet Length		575			ns	
RSSI Trigger Delay	Td	100			ns	
RSSI Trigger Width	Tw	500			ns	
RSSI Sampling Time	TSAMPLE	500			ns	
Delay Before Read	Ts	500			us	

VI. Recommended Host Board Power Supply Circuit

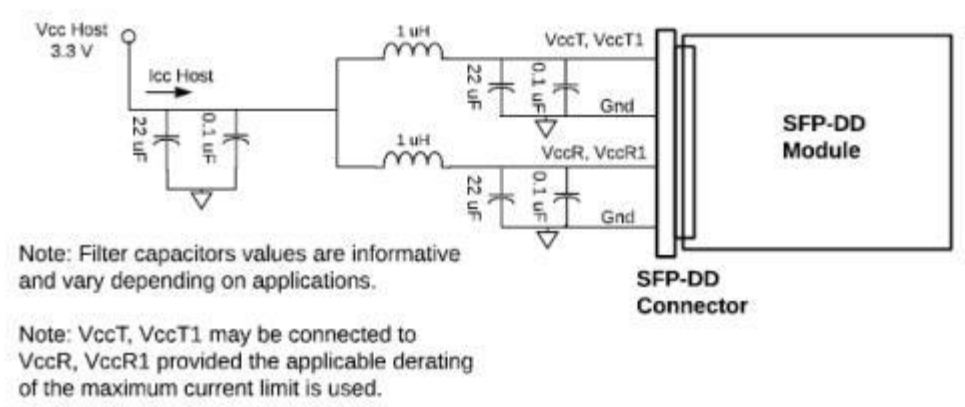


Figure 2, Recommended Host Board Power Supply Filtering

VII. XGPON Rx Burst Timing

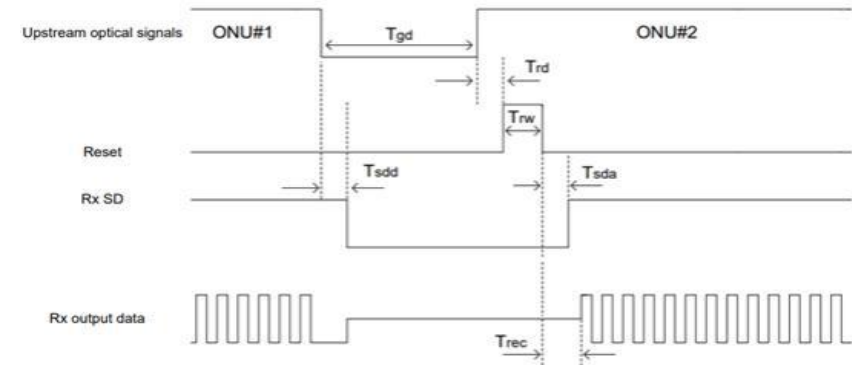


Figure 3, XGPON Rx Burst Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Guard Time	Tgd	51.2			ns	
Reset Delay	Trd	0			ns	1
Reset Width	Trw	25.6			ns	
SD Assert Time	Tsda	0		51.2	ns	
SD De-assert Time	Tsdd		100		ns	2
Data Recovery Time	Trec	0	25.6	100	ns	

- Notes:
- 1. Reset pulse is suggested to be fully inside the preamble.
 - 2. Signal detect auto reset function is applied. The signal detect de-assert time forced by auto reset is typically 100ns, and could short to about 12.8ns with additional reset pulse.

VIII. GPON Rx Burst Timing

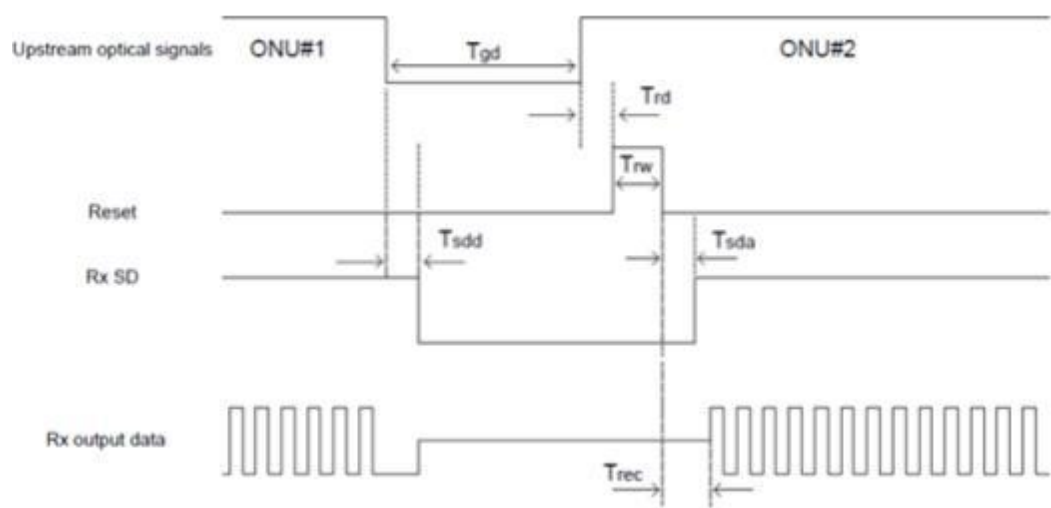


Figure 4, GPON Rx Burst Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Guard Time	Tgd	25.6			ns	
Reset Delay	Trd	0			ns	1
Reset Width	Trw	12.8			ns	
SD Assert Time	Tsda	0	25.6	51.2	ns	
SD De-assert Time	Tsdd		100		ns	2
Data Recovery Time	Trec	0	25.6	100	ns	

- Notes:
- 1. Reset pulse is suggested to be fully inside the preamble.
 - 2. Signal detect auto reset function is applied. The signal detect de-assert time forced by auto reset is typically 100ns, and could short to about 12.8ns with additional reset pulse.

IX. Recommended Interface Circuit

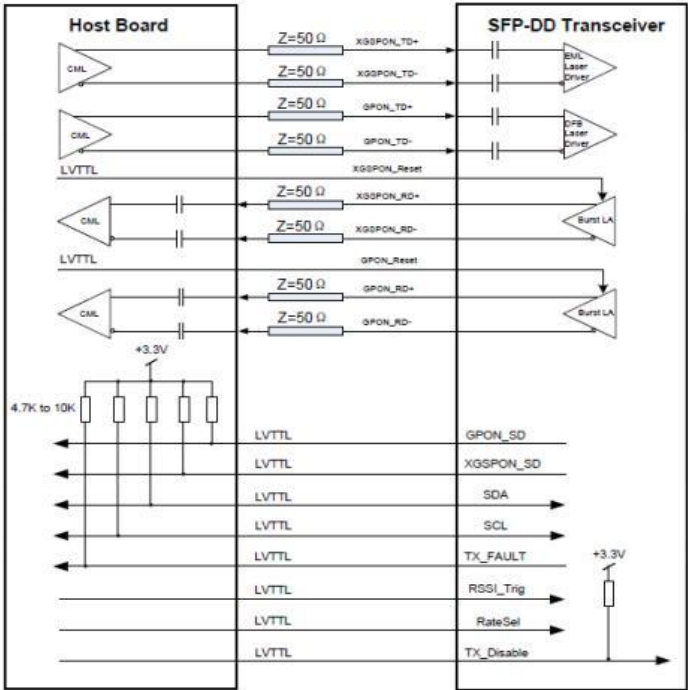


Figure 5, Recommended Interface Circuit

X. Diagnostics

Parameter	Range	Accuracy	Unit	Notes	Calibration
Temperature	0 to 70	± 3	$^{\circ}\text{C}$	LSB equal to 1/256c	Internal
Voltage	3.15 to 3.45	$\pm 3\%$	V	LSB equal to 100uV	Internal
Bias Current	0 to 130	$\pm 10\%$	mA	LSB equal to 4uA	Internal
Tx Power (9.953G)	5 to 9	$\pm 2\text{dB}$	dBm	LSB equal to 0.2uW	Internal
Tx Power (2.488G)	3 to 7	$\pm 2\text{dB}$	dBm	LSB equal to 0.2uW	Internal
Rx Power (2.488G)	-31 to -10	$\pm 3\text{dB}$	dBm	LSB equal to 0.1uW	Internal
Rx Power (1.244G)	-32 to -12	$\pm 3\text{dB}$	dBm	LSB equal to 0.1uW	Internal

XI. Pin Function Definitions

Pin	Logic	Name	Description
1		NC	Reserved
2	LVTTL-O	TX_Fault1	XGTransmitfault, activehigh
3	LVTTL-I	Tx_Disable1	ActivehightodisableXGPON
4	LVTTL-I/O	SDA	2-WireserialinterfaceSDA
5	LVTTL-I	SCL	2-WireserialinterfaceSCL
6		MOB_ABS	ModuleGround
7	LVTTL-I	RESET1	ResetforXGPONLA, activeHigh

Pin	Logic	Name	Description
8	LVTTL-O	Rx_SD1	XG Receiver signal detect, logic 1 indicates normal operation
9	LVTTL-I	RSSI_Trigger 1	XG RSSI trigger input, active high
10		GND	Module Ground
11		GND	Module Ground
12	CML-O	RD1-	Inverted XGPON received data output, DC coupling
13	CML-O	RD1+	XGPON received data output, DC coupling
14		GND	Module Ground
15		VCC	+3.3V Power supply
16		VCC	+3.3V Power supply
17		GND	ModuleGround
18	CML-I	TD1+	XG transmit data input, AC coupling
19	CML-I	TD1-	Inverted XG transmit data input, AC coupling
20		GND	ModuleGround
21		GND	ModuleGround
22	LVTTL-O	TX_Fault2	GPONTransmitfault, activehigh
23	LVTTL-I	Tx_Disable2	ActivehightodisableGPON
24		NC	Reserved
25		NC	Reserved

Pin	Logic	Name	Description
26		NC	Reserved
27	LVTTTL-I	RESET2	ResetforGPON, activeHigh
28	LVTTTL-O	Rx_SD2	GPONReceiversignaldetect, logic1 indicatesnormaloperation
29	LVTTTL-I	RSSI_Trigger2	GPONRSSItriggerinput, activehigh
30		GND	ModuleGround
31		GND	ModuleGround
32	CML-O	RD2-	InvertedGPONreceiveddataoutput, DCCoupling
33	CML-O	RD2+	GPONreceiveddataoutput, DCCoupling
34		GND	ModuleGround
35		VCC	+3.3VPowersupply
36		VCC	+3.3VPowersupply
37		GND	ModuleGround
38	CML-I	TD2+	GPONtransmitdatainput, ACCoupling
39	CML-I	TD2-	InvertedGPONtransmitdatainput, ACCoupling
40		GND	ModuleGround

XII. EEPROM Definitions

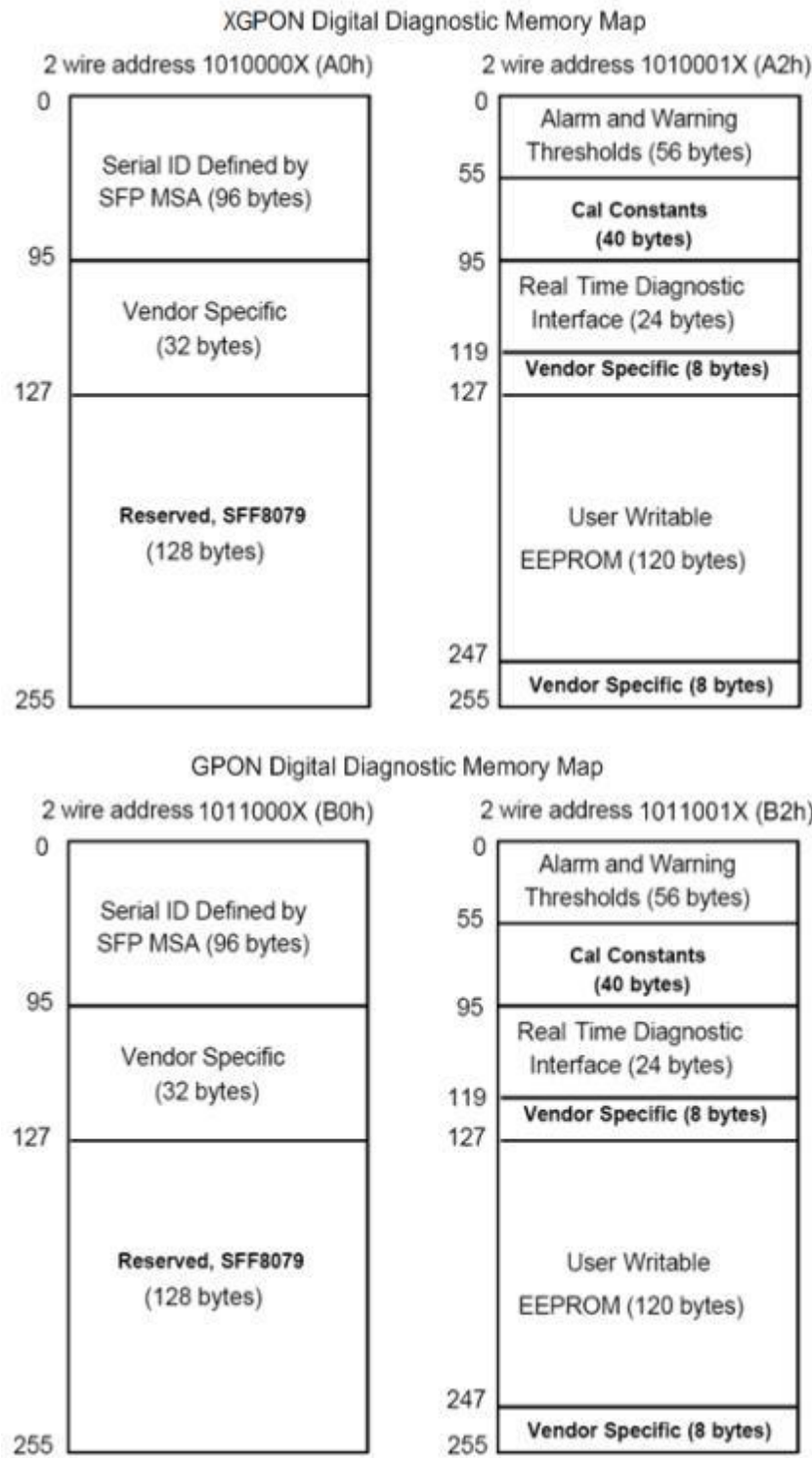


Figure 6, EEPROM Definitions

XIII. Outline Drawing

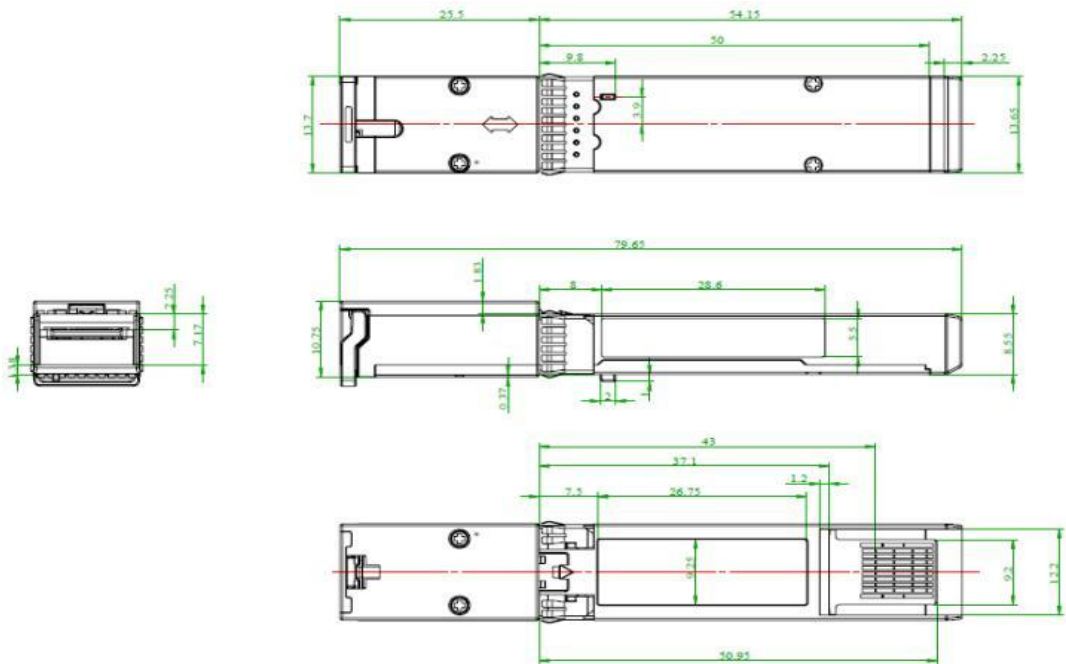


Figure 7, Outline Drawing

Order Information

Part Number	Description
XGG-SDD-C+N-I	XG-PON&GPON Combo OLT SFP-DD 1577nm-TX/1270nm-RX and 1490nm-TX/1310nm-RX Class C+ 20km DOM SC SMF Optical Transceiver Module (Industrial)
XGG-SFP-C+L-I	XG-PON&GPON Combo OLT SFP+ 1577nm-Tx/1270nm-Rx and 1490nm-Tx/1310nm-Rx Class C+ 20km DOM SC SMF Optical Transceiver Module (Industrial)