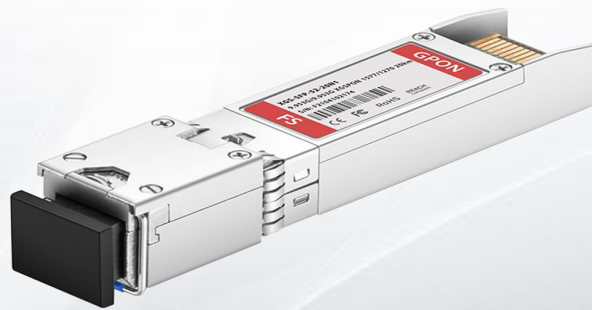


XGSPON OLT SFP+ 1577nm-TX/ 1270nm-RX 9.953G-TX/9.953G-RX Class N1 20km DOM SC SMF Optical Transceiver Module

XGS-SFP-52-20N1



Application

- Access Network

Features

- SFP+ package with SC receptacle optical interface compliant
- Single fiber bi-directional data links with 9.953Gbps downstream and 9.953Gbps/2.488Gbps upstream
- 1577nm continuous-mode transmitter with EML laser
- 1270nm burst-mode receiver with APD-TIA
- 2-wire interface for integrated digital diagnostic Monitoring
- Hot-Pluggable
- +3.3V power supplies
- Compliant with RoHS&WEEE, SFP MSA, SFF 8472, ITU-T G.9807.1
- 20Km Reach
- Excellent EMI and EMC characteristics

Description

XGS-PON OLT product is designed for OLT module based on XGSPON N1 technology. The product is an integrated module containing a micro-optic component and semiconductor material. The module could implement DDM function. It could be used at key locations in optical networks.

Product Specifications

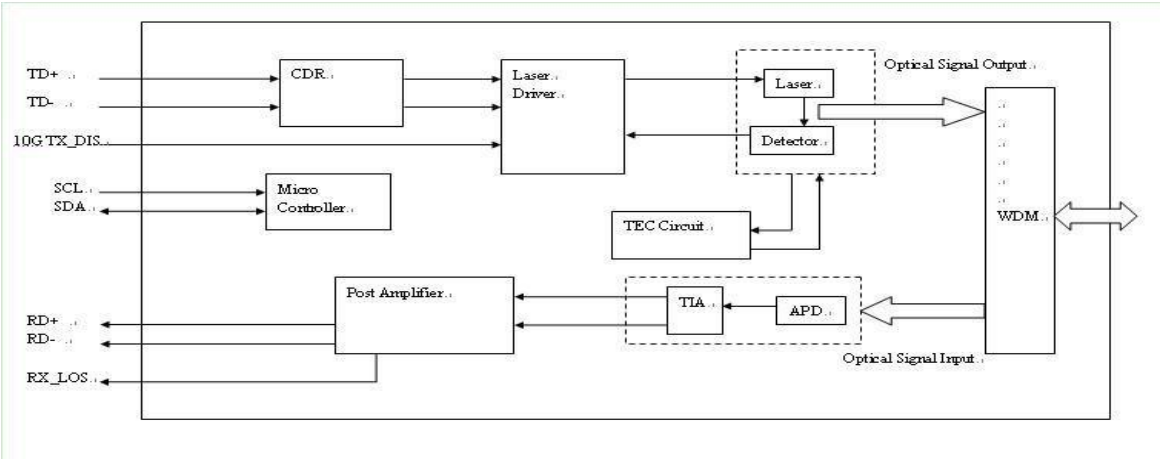
I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Temperature Range	Ts	-40	+85	°C	
Relative Humidity	RH	5	95	%	
Power Supply Voltage	Vcc	0	+3.6	V	
Receiver Damage Threshold		0	-	dBm	

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature Range	Tc	-5	-	75	°C	
Power Supply Voltage	Vcc	3.135	3.3	3.465	V	

III. Principle diagram





IV. Optical Characteristics

Parameter	Symbol	Unit	Min.	Typ.	Max.	Note
Transmitter (9.953G)						
Data Rate		Mbps	--	9953.28	-	
Center Wavelength Range	lc	nm	1575	-	1580	
Spectral Width(@-20dB)	DI	nm	-	-	1	
Launch Optical Power	Po	dBm	+2	-	+5	
Pout @TX-Disable Asserted	Poff	dBm			-39	
Extinction Ratio1	EX	dB	8.2	-	-	
Transmitter dispersion penalty 2	TDP	dB	-	-	1	
Eye Diagram	Compliant with ITU-TG.987.2					
Receiver (9.953G)						
Data Rate		Mbps	-	9953.28	-	
Center Wavelength Range	lc	nm	1260	1270	1280	
Receiver Sensitivity 3	S	dBm	-	-	-26	
Overload Input Optical Power	Pin	dBm	-5			
LOS Optical Dessert		dB	-	-	-27	
LOS Optical Assert			-45	-	-	
LOS Hysteresis		dB	0.5	-	6	
ReceIver (2.488G)						
Data Rate		Mbps	-	2488.32	-	
Center Wavelength Range	lc	nm	1260	1270	1280	



Receiver Sensitivity 3	-	-	-27.5	-	-	
Overload Input Optical Power	-7			-7		
LOS Optical Dessert	-	-	-28.5	-	-	
LOS Optical Assert	-45	-	-	-45	-	
LOS Hysteresis	0.5	-	6	0.5	-	

- Notes:
1. Measured with PRBS 2³¹-1 test pattern @9.95328Gbps .
 2. Transmit on 20km SMF.
 3. Measured with PRBS 2³¹-1 test pattern @9.953Gbps , BER=10⁻³.
 4. Measured with PRBS 2²³- 1 test pattern @2.48832Gbps, BER = 10⁻⁴.

V. Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Power Consumption		-	-	2.5	W	
CML Signal Differential Data Input Swing		100	-	800	mV	
CML Single Differential Data Output Swing		600		1000	mV	
Differential Data input impedance		-	100	-	Ω	
Signal Level (LVTTTL)	VOH	2.4	-	Vcc	V	
Signal Level (LVTTTL)	VOL	0	-	0.8	V	



VI. Electric Ports Definition

Pin	Name	Description
1	GND_T	Transmitter ground
2	TX_FAULT	LVTTTL Signal detect output internally pull up
3	TXDisable	Transmitter Disable (Note1)
4	SDA	I2C SerialData (LVTTTL)
5	SCL	I2C SerialClock (LVTTTL)
6	MOS_ABS	Internally connected GND
7	RESET	RXReset (LVTTTL)
8	RX_ SD	LVTTTL Signal detect output, internally pull up(Note2)
9	RSSI TRIG	RSSI TRIG Receiver RSSI trigger input (Note3)
10	GND_R	Receiver ground
11	10GND_R	Receiver ground
12	RD-	CML data output-(DC coupled and internal terminated)
13	RD+	8CML data output+(DC coupled and internal terminated)
14	GND_R	Receiver ground
15	VCC_R	Receiver power supply
16	VCC_T	Transmitter power supply
17	GND_T	Transmitter ground
18	TD+	LVPECL Data input+ (AC coupled and internal terminated)
19	TD-	LVPECL Data input- (AC coupled and internal terminated)
20	GND_T	Transmitter ground

Note 1: TX Disable input is used to shut down both the 10G laser and 1G laser (if module has 1G transmitter) output per the state table below. It is pulled up within the module with a 4.7 – 10K resistor.

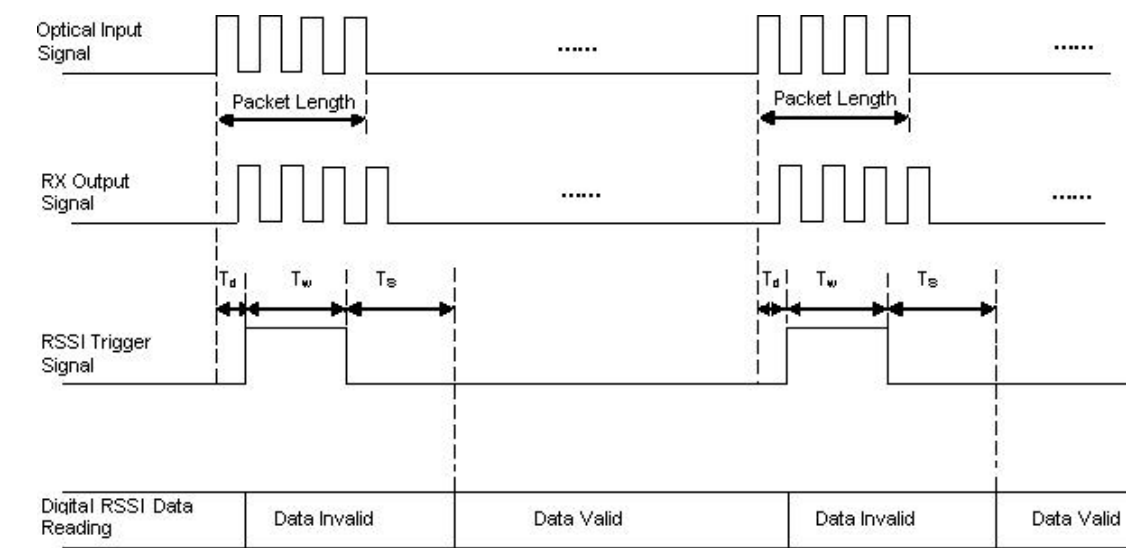
Low (<0.8V):Transmitter on

High (>2.0 V):Transmitter Disabled

Open :Transmitter Disabled

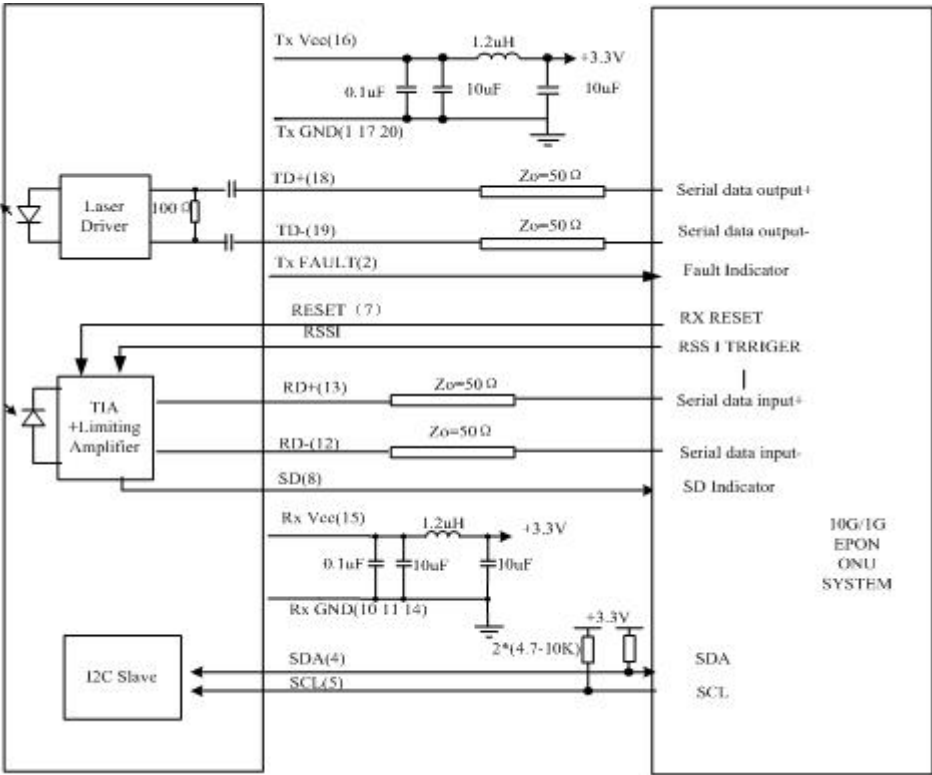
Note 2: SD (signal Detect) is an open collector/drain output which should be pulled up externally with a 4.7 – 10K resistor on the host board to supply <VccT+0.3V or VccR+0.3V. When low, this output indicates the received optical power is below the worst case receiver sensitivity. High indicates normal operation. In the low state, the output will be pulled to <0.8V.

Note3: RX_RSSI_TRIG is used to start a RX Power Monitoring. It is pulled high to trigger a A/D sample start. The timing is shown as below:



Parameter	Symbol	Min.	Typ.	Max.	Unit
Packet Length	-	550	-	-	ns
Trigger delay	Td	25	-	-	ns
RSSI Trigger and Sample Time	Tw	500	-	-	ns
Internal delay	Ts	500	-	-	us

VII. Typical Application Circuit



VIII. Digital Diagnostic Memory Map

2 wire address 1010000X (A0)

2 wire address 1010001X(A2)

0	Serial ID Defined by SFP MSA(96bytes)
95	Vendor Specific(32bytes)
127	Reserved in SFP MSA(128bytes)
255	

0	Alarm and Warning Thresholds(56bytes)
55	Cal Constants(40bytes)
95	Real-Time Diagnostic Interface (24bytes)
119	Vendor Specific(8bytes)
127	User Writable EEPROM(120bytes)
247	Vendor Specific(8bytes)
255	



EEPROM Serial ID Memory Contents

Accessing Serial ID Memory uses the 2 wire address 1010000X (A0). Memory Contents of Serial ID are shown in the Table 1.

Table 1 Serial ID Memory Contents

Data Address	Size (Bytes)	Name of Field	Contents (Hex)	Description
BASE ID FIELDS				
0	1	Identifier	03	SFP-XGSPON
1	1	Extended. Identifier	04	
2	1	Connector	01	SC
3-10	8	Transceiver	0x00 0x00 0x00 0x000x00 0x00 0x00 0x00	
11	1	Encoding	03	NRZ
12	1	BR, Nominal	63	9.9Gbps
13	1	Reserved	00	
14	1	Length (9μm)km	14	Transceiver transmit distance (20Km)
15	1	Length(9μm)100m	C8	
16	1	Length(50μm)10m	00	
17	1	Length(62.5μm)10m	00	
18	1	Length(Copper)	00	Not compliant
19	1	Reserved	00	
20-35	16	Vendor name	20 20 20 20 20 20 20	(ASCII)



36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN	5254 58 4D32 36 36 2D	XGS-PON OLT
			37 30 38 20 20 20 20 20	
56-59	4	Vendor rev	31 2E30 20	1.0
60-61	2	Wavelength	06 29	Transceiver wavelength(1577nm)
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 1C	SD, TX_FAULT and TX_DISABLE implemented
66	1	BR, max	00	
67	1	BR, max	00	
68-83	16	Vendor SN	42 30 30 39 38 32 32 20 20 20 20 20 20 20 20 20	Serial Number of transceiver (ASCII). For example "B009822"
84-91	8	Date code	30 32 31 30 30 35 20 20	Manufactory date code. For example "021005".
92	1	Diagnostic Monitoring Type	68	Digital diagnostic monitoring implemented, "internally calibrated" is implemented, RX measurement type is "Average Power".

93	1	Enhanced Options	E0	Optional Alarm/warning implemented. Soft TX_DIS,TX_FAULT implemented
94	1	SFF_8472 Compliance	02	Includes functionality described in Rev9.5 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	Filled by zero

IX. Diagnostic Monitor Functions

Diagnostic Monitor Functions interface uses the 2 wire address 1010001X (A2). Memory contents of Diagnostic Monitor Functions are shown in Table 2

Table 2 Memory contents of Diagnostic Monitor Function

Data Address	Size (Bytes)	Name	Contents and Description
Alarm and Warning Thresholds			
00-01	2	Temperature High Alarm	Set to 85 °C
02-03	2	Temperature Low Alarm	Set to -10°C
04-05	2	Temperature HighWarning	Set to 78 °C
06-07	2	Temperature Low Warning	Set to -5°C
08-09	2	Vcc High Alarm	Set to 3.63 V
10-11	2	Vcc Low Alarm	Set to 2.97 V



12-13	2	Vcc High Warning	Setto 3.47 V
14-15	2	Vcc Low Warning	Setto 3.13 V
16-17	2	Bias High Alarm	170mA
18-19	2	Bias Low Alarm	0mA
20-21	2	Bias High Warning	150mA
22-23	2	Bias Low Warning	0mA
24-25	2	TX Power High Alarm	6.0 dBm
26-27	2	TX Power Low Alarm	1.0 dBm
28-29	2	TX Power High Warning	5.0 dBm
30-31	2	TX PowerLow Warning	2.0 dBm
32-33	2	RX Power High Alarm	-4.0 dBm
34-35	2	RX Power Low Alarm	-28.5 dBm
36-37	2	RX Power High Warning	-5.0 dBm
38-39	2	RX Power Low Warning	-27.5 dBm
40-55	16	Reserved	
Calibration Constants			
56-59	4	RX Powe rCalibration Data4	
60-63	4	RX Power Calibration Data3	



64-67	4	RX Power Calibration Data2	
68-71	4	RX Power Calibration Data1	
72-75	4	RX Power Calibration Data0	
76-77	2	Bias Calibration Data1	0100(fixed)
78-79	2	Bias Calibration Data0	0000(fixed)
80-81	2	TXPower Calibration Data1	0100(fixed)
82-83	2	TX Power Calibration Data0	0000(fixed)
84-85	2	Temperature Calibration Data1	01 00 (fixed)
86-87	2	Temperature Calibration Data0	00 00 (fixed)
88-89	2	Vcc Calibration Data1	01 00 (fixed)
90-91	2	Vcc Calibration Data0	00 00 (fixed)
92-94	3	Reserved	00 00 00 (fixed)
95	1	Check Sum	Checksum of bytes 0-94
Real Time Diagnostic Monitor Interface1			
96-97	2	Measured Temperature	Internally measured module temperature
98-99	2	Measured Vcc	Internally measured supply voltage in module
100-101	2	Measured Bias	Internally measured Tx Bias current
102-103	2	Measured TX Power	Internally measured Tx Optical Power
104-105	2	Measured RX Power	Measured Rx input power
106-109	4	Reserved	



110	1	Logic Status	See Table 2.1
111	1	AD Conversion Updates	See Table 2.1
112-119	8	Alarm and Warning Flags	See Table 2.2
Vendor Specific			
120-127	8	Vendor Specific	Don't Access
128-247	120	User writable EEPROM	
248-255	8	Vendor Specific	Don't Access

Note1: Temperature (Signed twos complement value)

A2h Byte 96 (Temperature MSB) A2h Byte 97 (Temperature LSB)

Supply Voltage, Tx Bias Current, Tx Optical Power, Rx Received Power (Unsigned values)

A2h Byte 98 (Vcc MSB) A2h Byte 99 (Vcc LSB)

A2h Byte 98 (Vcc MSB) A2h Byte 99 (Vcc LSB)

A2h Byte 102 (TX Power MSB) A2h Byte 103 (TX Power LSB)

A2h Byte 104 (RX Power MSB) A2h Byte 105 (RX Power MSB)

All the measured values are "Internally Calibrated", Each measurement could be obtained by multiplying digital value by corresponding LSB value:
 Temperature = Temp (Digital Value) × (1/256); when Temperature<128 Temperature = [Temp (Digital Value) × (1/256)]-256; when Temperature≥ 128
 VCC=VCC(Digital Value) × 100μV
 TX Bias Current = TX Bias Current (Digital Value) × 4μA TX Power = TX Power (Digital Value) × 0.2μW
 RX Power = RX Power (Digital Value) × 0.1μW

Table 2.1 Logic Status and AD Conversion Updates

Byte	Bit	Name	Description
110	7	Reserved	Reserved
110	6	Soft Tx Disable Control	1=disable,0=enable.
110	5	Reserved	Reserved
110	4	Reserved	Reserved
110	3	Reserved	Reserved
110	2	TxFault	1=FAULT0=NORMAL
110	1	SD	1=SD,0=NORMAL
110	0	Reserved	Reserved
111	7-0	TempA/DValid	Setto 0.

Each of the measured values has a corresponding high alarm, low alarm, high warning and low warning threshold level at location 00-39(x0A2) written as the data format of a corresponding valued shown in Table 2.2.Alarm and warning flags at bytes 112-119(0xA2) are defined as follows.

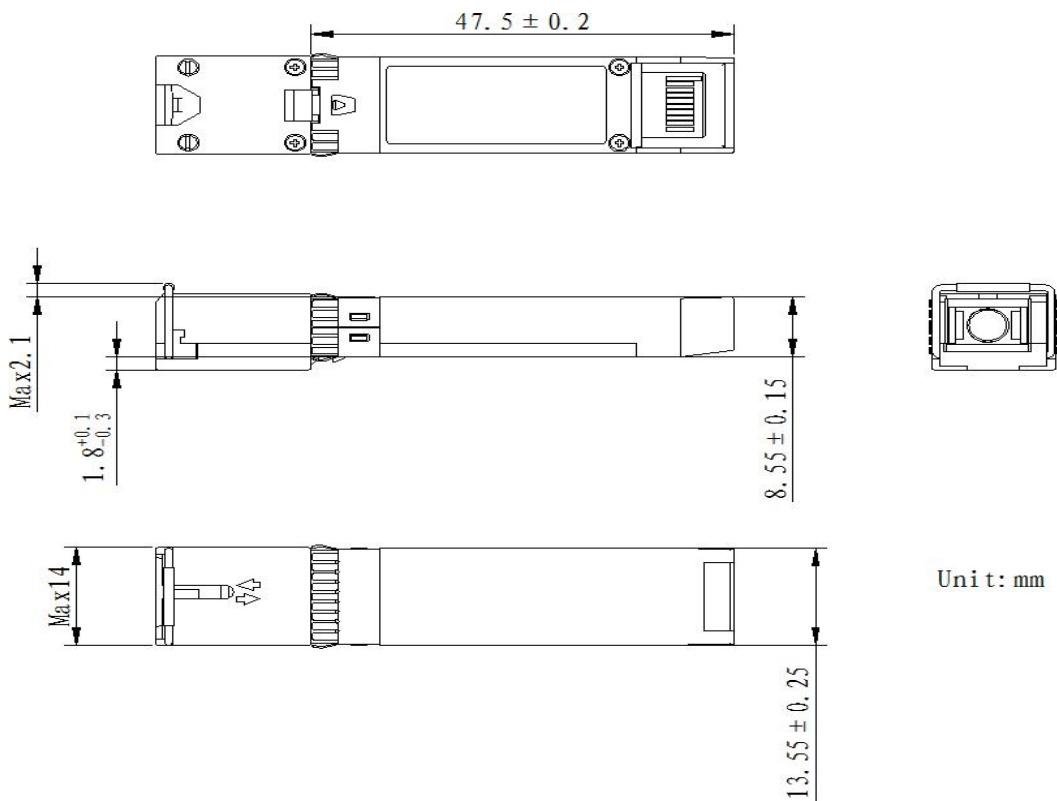
- (1) Alarm flags indicate conditions likely to result (or have resulted) in link failure and cause for immediate action.
- (2) Warning flags indicate conditions outside the guaranteed operating specification of transceiver but not necessarily causes of immediate link failures.

Table 2.2 Alarm and Warning Flags

Byte	Bit	Name	Description
112	7	Temperature High Alarm	Set when temperature monitor value exceeds high alarm level
112	6	Temperature Low Alarm	Set when temperature monitor value exceeds low alarm level.
112	5	Vcc High Alarm	Set when Vcc monitor value exceeds high alarm level.
112	4	Vcc Low Alarm	Set when Vcc monitor value exceeds Low alarm level.
112	3	Laser Bias High Alarm	Set when laser bias monitor value exceeds high alarm level.
112	2	Laser Bias Low Alarm	Set when laser bias monitor value exceeds low alarm level.
112	1	Tx Power High Alarm	Set when Tx power monitor value exceeds high alarm level
112	0	Tx Power Low Alarm	Set when Tx power monitor value exceeds low alarm level.
113	7	Rx Power High Alarm	Set when Rx power monitor value exceeds high alarm level
113	6	Rx Power Low Alarm	Set when Rx power monitor value exceeds low alarm level
113	5-0	Reserved	Allbits setto 0.
114	7-0	Reserved	Allbits setto 0.
115	7-0	Reserved	Allbits setto 0.
116	7	Temperature High warning	Set when temperature monitor value exceeds high warning level.
116	6	Temperature Low warning	Set when temperature monitor value exceeds low warning
116	5	Vcc High warning	Set when Vcc monitor value exceeds high warning level.
116	4	Vcc Low warning	Set when Vcc monitor value exceeds Low warning level.
116	3	Laser Bias High warning	Set when laser bias monitor value exceeds high warning level.

116	2	Laser Bias Low warning	Set when laser bias monitor value exceeds low warning level.
116	0	Tx Power Low warning	Set when Tx power monitor value exceeds low warning level.
117	7	Rx Power High warning	117Set when Rx power monitor value exceeds high warning level
117	6	Rx Power Low warning	Set when Rx power monitor value exceeds low warning level
117	5-0	Reserved	All bits set to 0.
118	7-0	Reserved	All bits set to 0.
119	7-0	Reserved	All bits set to 0.

X. Package Outline



XI. Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1 (>1.5kV) – Human Body Model
Electrostatic Discharge (ESD) Immunity	IEC61000-4-2	LV4(Air discharge 15kV,Contact discharge 8kV) Performance criterion B
Electromagnetic Interference (EMI)	CISPR22 ITE Class B EN55022 Class B	Compliant with standards
Immunity	IEC61000-4-3 Class 2 EN55024	Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHz applied to the transceiver without a chassis enclosure.
Eye Safety	FDA 21 CFR 1040.10 and 1040.11 UL TUV EN 60825-1	Compliant with Class 1 laser product

XII. Oder Information

Part Number	Description
XGS-SFP-52-20N1	XGSPON OLT SFP+ 1577nm-TX/ 1270nm-RX 9.953G-TX/9.953G-RX Class N1 20km DOM SC SMF Optical Transceiver Module