



Features

- Support ITU-T G.987.2 XGPON OLT side application
- Single fiber bi-directional data links with asymmetric 9.953Gbps downstream and 2.488Gbps upstream
- Integrated with micro-optics WDM filter for dual wavelength Tx/Rx operation at 1577nm/1270nm
- 1577nm continuous-mode transmitter with EML laser
- 1270nm burst-mode receiver with APD-TIA
- 2-wire interface for integrated digital diagnostic Monitoring
- Digital receiving signal strength indication (RSSI)
- XFP MSA package with SC receptacle optical interface
- +3.3V power supplies
- Operating case temperature: 0~70°C
- RoHS With Exemption

Regulatory Compliance

Table 1 - Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>500 V)
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class1 laser product.
Component Recognition	UL and CSA	Compliant with standards
RoHS Compliance	2011/65/EU	Compatible with Standards

Absolute Maximum Ratings

Table 2 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Storage Ambient Temperature	TS	-40	-	+85	°C	
Operating Case Temperature	Tc	0		70	°C	1
Supply Voltage	VCC3	-0.5	-	+4.0	V	
Operating Relative Humidity	RH	-	-	+85	%	

Note 1: When ambient temperature is above 60°C, airflow at rate higher than 1m/sec is required

Recommended Operating Conditions

Table 2 – Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	TC	0	-	70	°C	
Power Supply Voltage	VCC3	3.14	3.3	3.46	V	
Power Supply Current	ICC3	-	-	1100	mA	
Power Consumption				3.5	W	

Optical Characteristics

Table 4 – Optical Characteristics

10G Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Centre Wavelength	λ_C	1575	1577	1580	nm	
Data Rate			9.95328		Gbit/s	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	

Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power	POUT	2		6	dBm	1
Average Launch Power-OFF	POFF			-39	dBm	
Extinction Ratio	EX	8.2			dB	2
Optical Eye Mask	Compliant With ITU-T G.987.2					
2.5G Receiver						
Operating Wavelength	λC	1260		1280	nm	
Data Rate			2.48832		Gbit/s	
Sensitivity	PSEN			-27.5	dBm	3
Saturation	PSAT	-7			dBm	
Signal Detected Deassert Level	Psdd	-39			dBm	
Signal Detected Assert Level	Psda			-29.5	dBm	

Notes:

1. The optical power is launched into 9/125um SMF.
2. Measured with PRBS 231-1 test pattern @9.953Gbps, ER is measured with 4th order Bessel-Thompson filter ON.
3. Measured with a PRBS 223-1 test pattern @2.488Gbps and ER=8.2dB, BER =10⁻⁴,

Electrical Characteristics

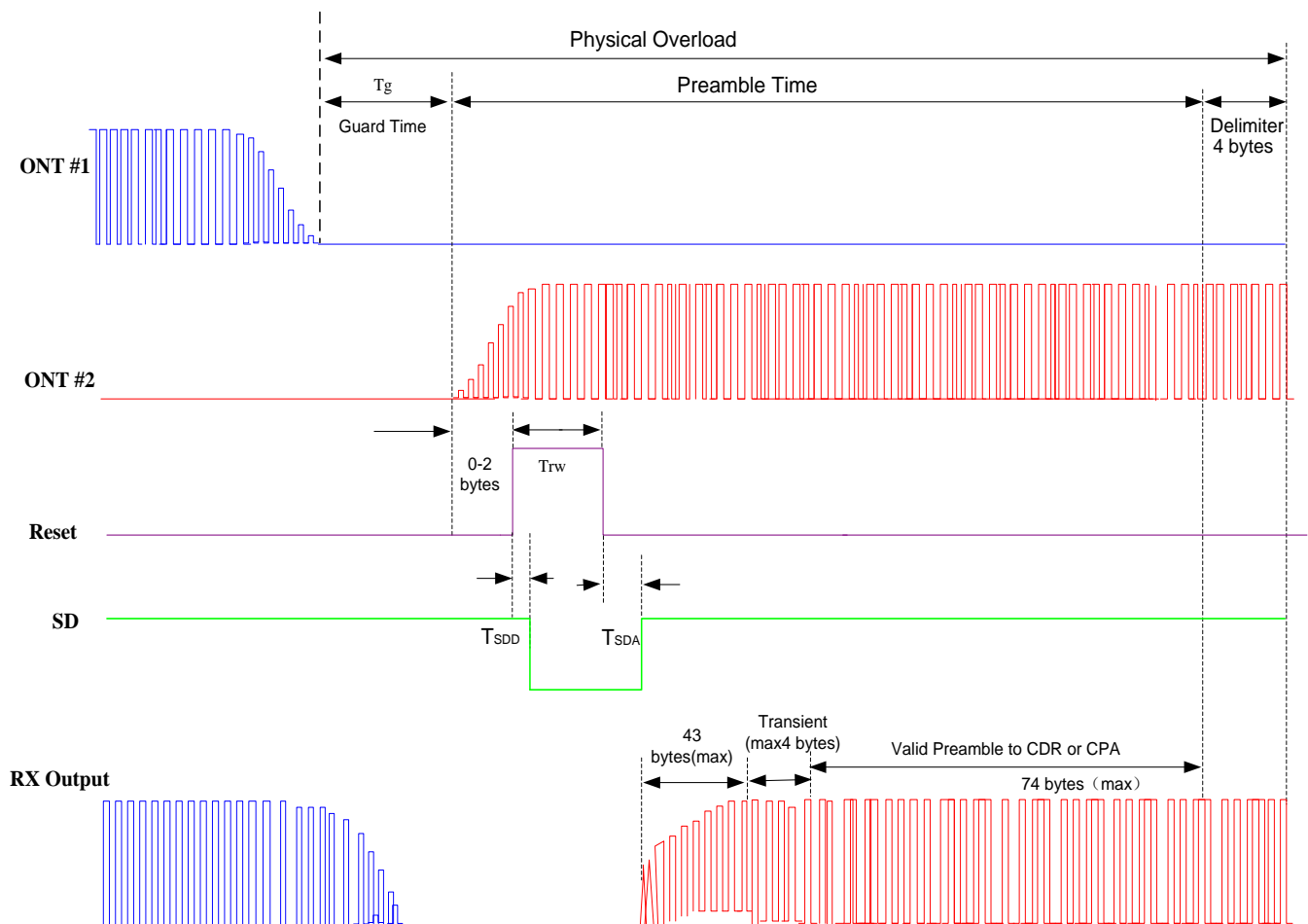
Table 5 – Electrical Characteristics

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Data Input Differential Swing	VIN	200	-	1000	mVp-p	
Input Differential Impedance	ZIN	80	100	120	Ω	
Tx_Diable Voltage	VIL	0	-	0.8	V	
	VIH	2.0	-	VCC3	V	
Receiver						
Data Output Differential Swing	VOUT	650	800		mVP-P	
Signal Detected Voltage_low	VSD, L	0		0.8	V	
Signal Detected Voltage_high	VSD, H	2.4		VCC3	V	
Signal Detected Assert Time	TSDA			100	ns	

Signal Detected Deassert Time	T _{SDD}			12.8	ns	
Receiver Settling Time	T _{settling}			140	ns	
RSSI Trigger Delay	T _{trigger}	25			ns	
RSSI Sampling Time	T _{sampling}	600			ns	

Notes:

1. See Recommended Interface Circuit



Note:

1. The bytes means that ONT rate is 2.488Gbps, 1byte=3.2ns

Figure 1, Timing Parameter Definition in Burst Mode Sequence (Dual ONT Application)

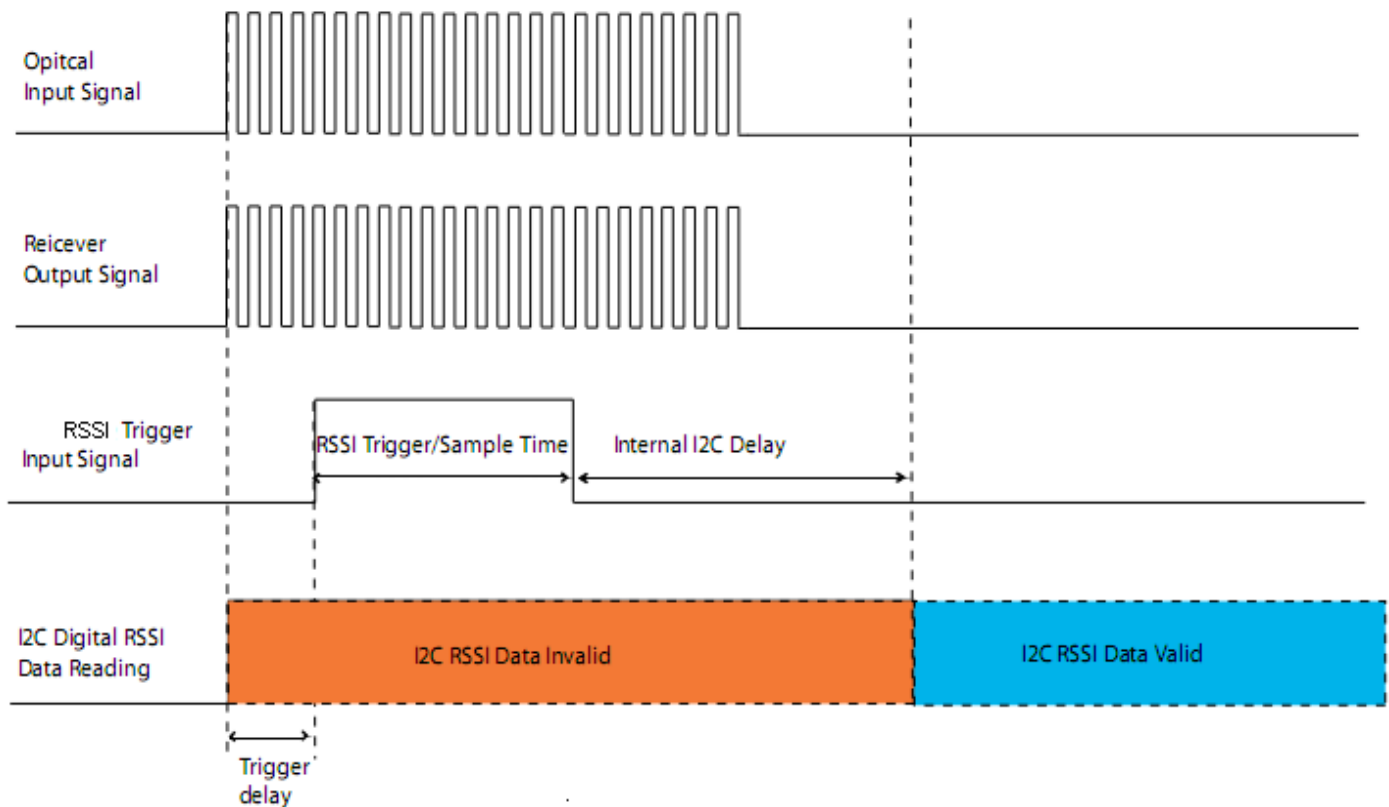


Figure 2, RSSI Timing Specification

Recommended Host Board Power Supply Circuit

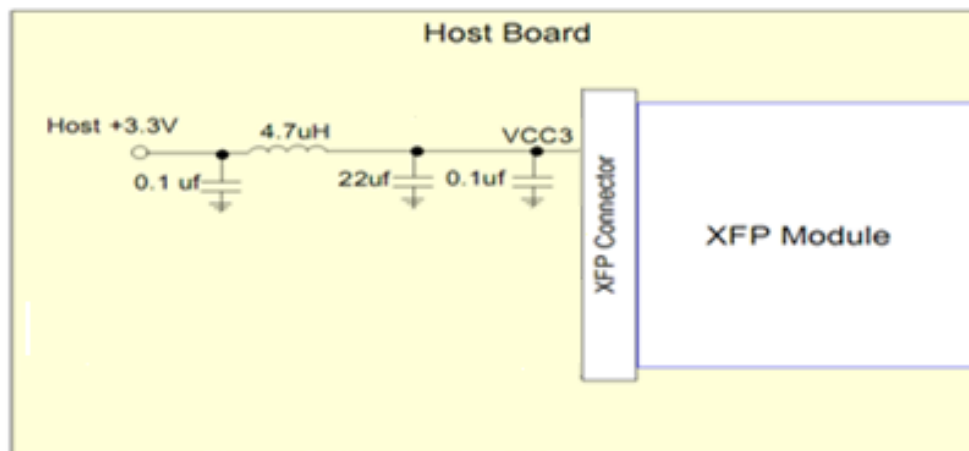


Figure 3, Recommended Host Board Power Supply Filtering Network

Recommended Interface Circuit

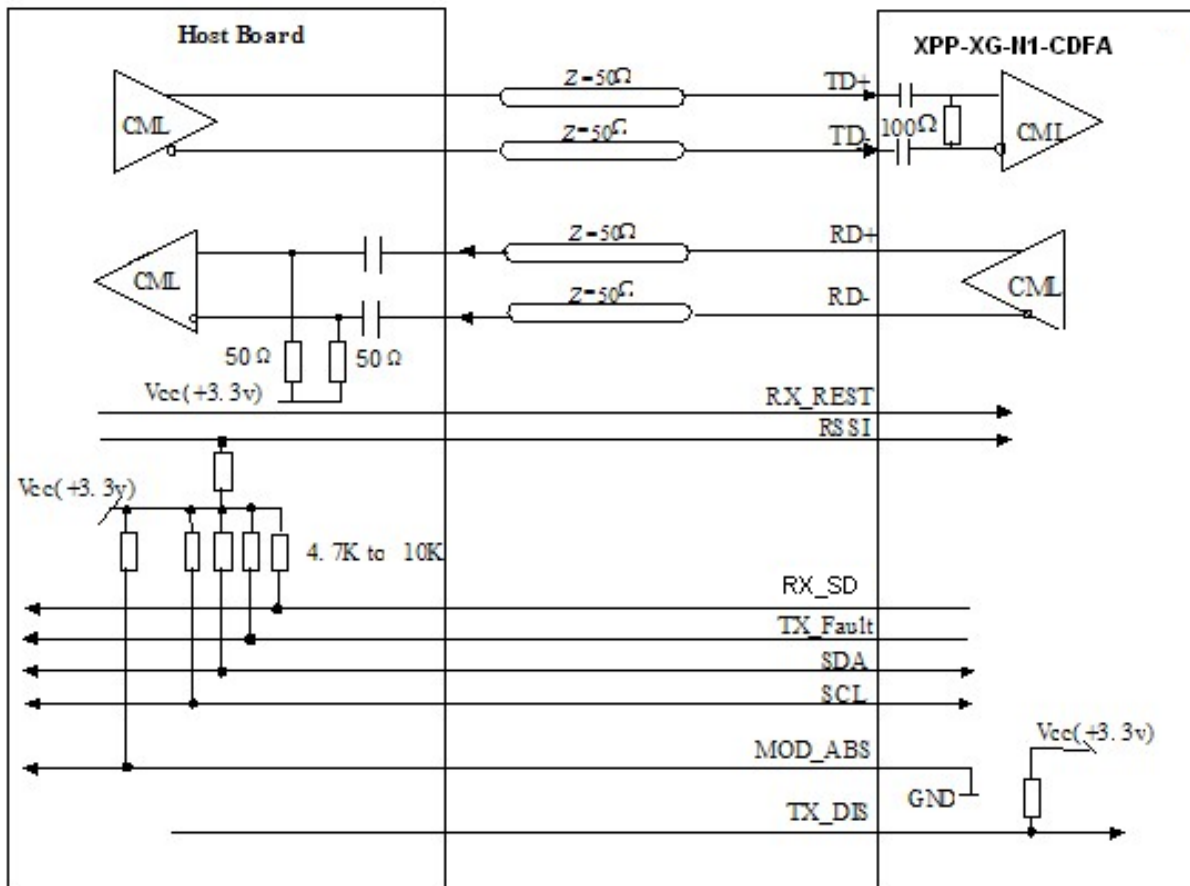


Figure 4, Recommended Interface Circuit

Pin Definitions

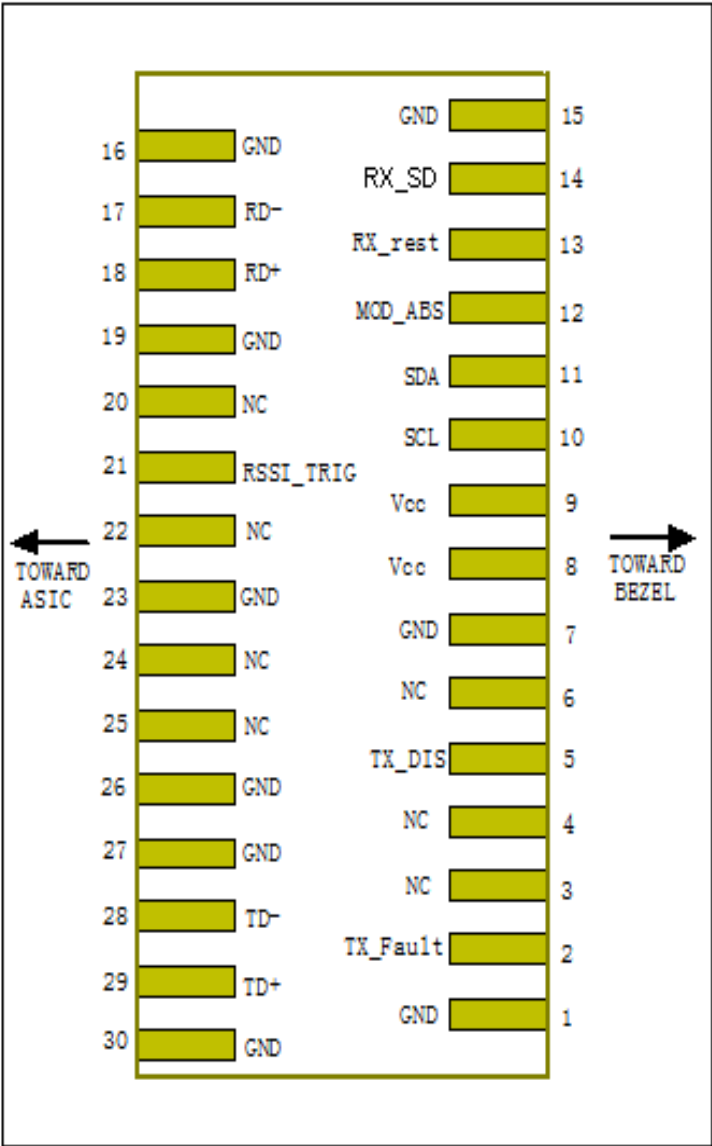


Figure 5, XFP Pin View (Golden Finger)

Table 6 - Module Pin Definitions

Pin	Logic	Symbol	Name/Description	Note
1		GND	Module Ground	
2	LVTTL-O	TX_Fault	Not Connect	
3	LVTTL-I	NC	Not Connect	
4		NC	Not Connect	

5	LVTTL-I	TX_DIS	Turns off transmitter laser output	
6		NC	Not connect	
7		GND	Module Ground	
8		V _{CC3}	+3.3V Power Supply	
9		V _{CC3}	+3.3V Power Supply	
10	LVTTL-I	SCL	2-Wire Serial Interface Clock	
11	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	
12	LVTTL-O	Mod_ABS	High Indicates module absent.	
13	LVTTL-I	RX_Reset	Burst Module Reset Signal, High Indicates Burst Start	
14	LVTTL-O	RX_SD	High Indicates optic receive power detected	
15		GND	Module Ground	
16		GND	Module Ground	
17	LVPECL-O	RD-	Receiver Inverted Data Output	
18	LVPECL-O	RD+	Receiver Non-Inverted Data Output	
19		GND	Module Ground	
20		NC	Not connect	
21	LVTTL-I	RSSI_TRIG	High value indicates ready for RSSI measurement	
22		NC	Not connect	
23		GND	Module Ground	
24		NC	Not connect	
25		NC	Not connect	
26		GND	Module Ground	
27		GND	Module Ground	
28	LVCML-I	TD-	Transmitter Inverted Data Input	
29	LVCML-I	TD+	Transmitter Non-Inverted Data Input	
30		GND	Module Ground	

Notes:

1. See Recommended Interface Circuit

Diagnostics

Table 7– Diagnostics

Address	Parameter	Range	Accuracy	Unit	Notes	Calibration
96	Temperature	0 to 70	±5	°C	LSB equal to 1/256c	Internal
98	Voltage	3 to V _{CC3}	±3%	V	LSB equal to 100uv	Internal
100	Tx Bias Current	0 to 150	±10%	mA	LSB equal to 4uA	Internal

102	Tx Power	2 to 6	±3	dB	LSB equal to 0.1uW	Internal
104	Rx Power	-29 to -7	±3	dB	LSB equal to 0.1uW	Internal

Table 8– EEPROM Serial ID (A0)

Addr	Description	Hex	Value	Unit
0	Identifier	06	XFP	
1	Signal Conditioner Control	20	9.9	Gb/s
2	Temp High Alarm MSB	64	100	°C
3	Temp High Alarm LSB	00		
4	Temp Low Alarm MSB	F6	-10	°C
5	Temp Low Alarm LSB	00		
6	Temp High Warning MSB	5A	90	°C
7	Temp High Warning LSB	00		
8	Temp Low Warning MSB	FB	-5	°C
9	Temp Low Warning LSB	00		
10	Reserved	00		
11	Reserved	00		
12	Reserved	00		
13	Reserved	00		
14	Reserved	00		
15	Reserved	00		
16	Reserved	00		
17	Reserved	00		
18	Bias High Alarm MSB	92	150	mA
19	Bias High Alarm LSB	7C		
20	Bias Low Alarm MSB	09	10	mA
21	Bias Low Alarm LSB	C4		
22	Bias High Warning MSB	88	140	mA
23	Bias High Warning LSB	B8		
24	Bias Low Warning MSB	13	20	mA
25	Bias Low Warning LSB	88		
26	TX Power High Alarm MSB	9B	6	dBm
27	TX Power High Alarm LSB	82		
28	TX Power Low Alarm MSB	3D	2	dBm
29	TX Power Low Alarm LSB	E8		
30	TX Power High Warning MSB	8A	5.5	dBm
31	TX Power High Warning LSB	99		
32	TX Power Low Warning MSB	45	2.5	dBm
33	TX Power Low Warning LSB	76		
34	RX Power High Alarm MSB	07	-7	dBm
35	RX Power High Alarm LSB	CB		
36	RX Power Low Alarm MSB	00	-27.5	dBm
37	RX Power Low Alarm LSB	11		
38	RX Power High Warning MSB	03	-10	dBm
39	RX Power High Warning LSB	E8		

40	RX Power Low Warning MSB	00	-25	dBm
41	RX Power Low Warning LSB	1F		
42	3.3V High Alarm MSB	88	3.5	nm
43	3.3V High Alarm LSB	B8		
44	3.3V Low Alarm MSB	7A	3.14	nm
45	3.3V Low Alarm LSB	A8		
46	3.3V High Warning MSB	87	3.46	nm
47	3.3V High Warning LSB	28		
48	3.3V Low Warning MSB	7C	3.18	nm
49	3.3V Low Warning LSB	38		
50	AUX2 High Alarm MSB	00	Not required	
51	AUX2 High Alarm LSB	00		
52	AUX2 Low Alarm MSB	00	Not required	
53	AUX2 Low Alarm LSB	00		
54	AUX2 High Warning MSB	00	Not required	
55	AUX2 High Warning LSB	00		
56	AUX2 Low Warning MSB	00	Not required	
57	AUX2 Low Warning LSB	00		
58	Optional VPS Control Registers	00	Not required	
59	Optional VPS Control Registers	00		
60	Reserved	00	not used	
61	Reserved	00	not used	
62	Reserved	00	not used	
63	Reserved	00	not used	
64	Reserved	00	not used	
65	Reserved	00	not used	
66	Reserved	00	not used	
67	Reserved	00	not used	
68	Reserved	00	not used	
69	Reserved	00	not used	
70	Acceptable BER	00	Not required	
71	Actual BER	00	Not required	
72	Wavelength Control	00	Not required	
73	Wavelength Control	00		
74	Wavelength Control	00	Not required	
75	Wavelength Control	00	Not required	
76	FEC	00	Not required	
77		00	Not required	
78		00	Not required	
79		00	Not required	
80_7	Latched high Temperature alarm	0		
80_6	Latched low Temperature alarm	0		
80_5	Reserved	0		
80_4	Reserved	0		

80_3	Latched high TX Bias alarm	0		
80_2	Latched low TX Bias alarm	0		
80_1	Latched high TX Power alarm	0		
80_0	Latched low TX Power alarm	0		
81_7	Latched high RX Power alarm	0		
81_6	Latched low RX Power alarm	0		
81_5	Latched high Voltage alarm	0		
81_4	Latched low Voltage alarm	0		
81_3	Latched high AUX2 monitor alarm	0		
81_2	Latched low AUX2 monitor alarm	0		
81_1	Reserved	0		
81_0	Reserved	0		
82_7	Latched high Temperature warning	0		
82_6	Latched low Temperature warning	0		
82_5	Reserved	0		
82_4	Reserved	0		
82_3	Latched high TX Bias warning	0		
82_2	Latched low TX Bias warning	0		
82_1	Latched high TX Power warning	0		
82_0	Latched low TX Power warning	0		
83_7	Latched high RX Power warning	0		
83_6	Latched low RX Power warning	0		
83_5	Latched high Voltage warning	0		
83_4	Latched low Voltage warning	0		
83_3	Latched high AUX2 monitor warning	0		
83_2	Latched low AUX2 monitor warning	0		
83_1	Reserved	0		
83_0	Reserved	0		
84_7	Latched TX_NR Status	0		
84_6	Latched Laser Fault condition.Generated by laser safety system.	0		
84_5	Latched TX CDR Loss of Lock	0		
84_4	Latched RX_NR Status	0		
84_3	Latched mirror of RX_LOS pin(Receiver loss of optical signal)	0		
84_2	Latched RX CDR Loss of Lock	0		
84_1	Latched Mirror of MOD_NR pin	0		
84_0	Latched Reset Complete Flag	0		
85_7	Latched APD Supply Fault	0		
85_6	Latched TEC Fault	0		
85_5	Latched Wavelength Unlocked Condition	0		
85_4 to 85_0	Reserved	0		
86_7	VCC5 High Alarm Flag	0		
86_6	VCC5 Low Alarm Flag	0		
86_5	VCC3 High Alarm Flag	0		
86_4	VCC3 Low Alarm Flag	0		
86_3	VCC2 High Alarm Flag(not used)	0		
86_2	VCC2 Low Alarm Flag(not used)	0		
86_1	Vee5 High Alarm Flag(not used)	0		

86_0	Vee5 Low Alarm Flag(not used)	0		
87_7	VCC5 High Warning Alarm Flag	0		
87_6	VCC5 Low Warning Flag	0		
87_5	VCC3 High Warning Flag	0		
87_4	VCC3 Low Warning Flag	0		
87_3	VCC2 High Warning Flag(not used)	0		
87_2	VCC2 Low Warning Flag(not used)	0		
87_1	Vee5 High Warning Flag(not used)	0		
87_0	Vee5 Low Warning Flag(not used)	0		
88-95	Interrupt Masking Bits	00 00 00 00 00 00 00 00	Not required	
96-97	Temperature	00 00		
98-99	TEC Current	00 00	measured module TEC current, MSB at low address	
100-101	10G TX Bias	00 00		
102-103	10G TX Power	00 00		
104-105	2.5G RX Power	00 00		
106-107	3.3V Supply Voltage	00 00		
108-109	AUX 2	00 00	reserved	
110-111	General Control/Status Bits	00 00	Not surport	
112-117	Reserved	00 00 00 00 00 00	Not used	
118	Serial Interface Read/Write Error Checking	00	Not required	
119-122	Password Change Entry Area		Not required	
123-126	Password Entry Area		Not required	
127	Page Select Byte			

Table 9– EEPROM Serial ID (Table 01)

Address	Description	Hex	Note	Unit
128	Identifier	06	XFP	
129	Ext.Identifier - Power Consumption	E8	3.5W Max	
130	Connector	01	SC	
131~138	10GE Compliance	02	Reserved	Transceiver Code for electronic compatibility or optical compatibility (10GBASE-EW, S- 64.1)
139	Encoding	10	NRZ	
140	BR-Min	63	9.9	Gb/s

141	BR-Max	6F	11.1	Gb/s
142	Length(SMF)-km	14	20	Km
143	Length(E-50um)-2m	00		Km
144	Length(50um)-1m	00		Km
145	Length(62.5um)-1m	00		Km
146	Length(Copper)-1m	00		Km
147	Device Tech - Transmitter	76		
148	Vendor name	53	S	
149	Vendor name	4F	O	
150	Vendor name	55	U	
151	Vendor name	52	R	
152	Vendor name	43	C	
153	Vendor name	45	E	
154	Vendor name	50	P	
155	Vendor name	48	H	
156	Vendor name	4F	O	
157	Vendor name	54	T	
158	Vendor name	4F	O	
159	Vendor name	4E	N	
160	Vendor name	49	I	
161	Vendor name	43	C	
162	Vendor name	53	S	
163	Vendor name	20	[space]	
164	CDR Support - Bit Rate	F8	9.95/10.3/10.5/1 0.7/11.1G	
165	Vendor OUI	00		
166	Vendor OUI	1F		
167	Vendor OUI	22		
168	Vendor PN	58	X	
169	Vendor PN	50	P	
170	Vendor PN	50	P	
171	Vendor PN	58	X	
172	Vendor PN	47	G	
173	Vendor PN	4E	N	
174	Vendor PN	31	1	
175	Vendor PN	43	C	
176	Vendor PN	44	D	
177	Vendor PN	46	F	
178	Vendor PN	41	A	
179	Vendor PN	20	[space]	
180	Vendor PN	20	[space]	
181	Vendor PN	20	[space]	
182	Vendor PN	20	[space]	
183	Vendor PN	20	[space]	
184	Vendor rev	30	0	mean:01 version
185	Vendor rev	31	1	
186	Wavelength(Room temp) Upper byte	7B	1577	nm
187	Wavelength(Room temp) Lower byte	34		
188	Wavelength Tolerance Upper byte	02	3	nm

189	Wavelength Tolerance Lower byte	58		
190	Max Case Temp	46	70	°C
191	CC_BASE			
192	Max Power Dissipation	AF	3.5	W
193	Max Power Dissipation when Power Down	00	1.5	W
194	+5V Iccmax	AA	500	mA
	+3.3V Iccmax		800	mA
195	+1.8V Iccmax	00	1000	mA
196~211	Vendor SN	xx		
212~219	Date code	xxxxxxx		
220	Diagnostic Monitoring Type- BER	08	No BER support	
221	Enhanced Options - VPS	40	Not support VPS	
	Enhanced Options - VPS LV regulator		Not support VPS LV regulator	
	Enhanced Options - VPS bypass		Not support VPS bypass regulator	
	Enhanced Options - CMU Mode		Not support CMU mode	
	Optional Soft TX_DISABLE implemented			
	Optional Soft P_down implemented			
222	Aux Monitoring Input Types	00		
223	CC_EXT	XX		
224~255	Vendor Specific			

Package Diagram

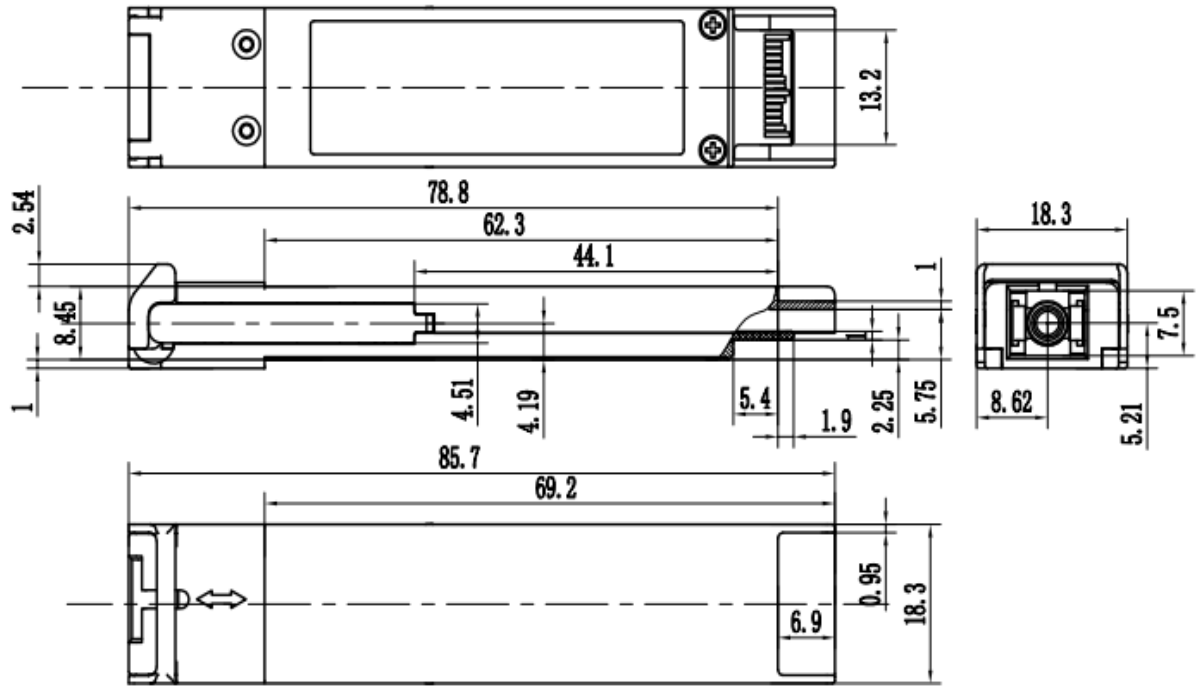


Figure 6, Mechanical Diagram

Ordering Information

Table 8 - Ordering Information

Part No.	Application	Data Rate	Laser Source	Fiber Type
XPP-XG-N1-CDFA	XG-PON N1 Class	Tx:9.95328Gb/s Rx:2.44832Gb/s	1577nm EML	SMF

Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

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