

## Lightem SFP+9.953G & 2488G(Down)/ 9.953G/2488G & 1.244G (Up)XGS-PON&GPON OLT Class C+ 20km Optical Transceiver

### FEATURES

- Single-fiber bi-directional transmission
- 2x10 SFP+ Electrical interface
- SC receptacle optical connector
- Operating case temperature: 0 to 70°C, -20~85°C, -40~85°C
- 3.3 V power supply , Typical power consumption 2.5W
- ODN Class C+ , SFP+ Package , Hot pluggable
- RoHS 2 compliant , ITU-T G.987.2 compliant , ITU-T G.9807.1 compliant , ITU-T G.984.2 compliant



### APPLICATIONS

- Gigabits Access networks
- FTTH , FTTC , FTTB
- XGS-PON and GPON Combo access network

### ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Maximum Supply Voltage	Vcc		3.3	3.6	V	
Maximum Input Voltage	Vin	0		3.6	V	
Storage temperature	Ts	-40		+85	°C	
Relative humidity	RH	0		95	%	Non-condensing
Max Input power	Pmax	-3			dBm	

### RECOMMENDED OPERATING CONDITIONS

Electrical and optical characteristics below are defined under this operating environment, unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.135	3.3	3.465	V
Operating case Temperature	Tc	0	-	+70	°C
	TE	-20		+85	°C
	Ti	-40		+85	°C
Data Rate (Gigabit Ethernet)		TX: 9.953 & 2.488 ; RX: 9.953/2.488 & 1.244			Gbps
ODN Class		C+			
Link Distance with G.652		0.002		20	km

### ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit	Note
Power dissipation	P		2.5		W	
Supply current	Icc		0.75	1.1	A	
Input differential impedance	ZIN	80	100	120	Ω	
Differential data input swing(XG-PON input)	VIN	120		820	mV	AC couple
Differential data input swing(GPON input)	VIN	200		1600	mV	AC couple
Differential data output swing(XG-PON output)	VOU	400	600	800	mV	CML
Differential data output swing(GPON output)	VOU	600	900	1600	mV	LVPECL
Tx disable input Voltage	VIL	0		0.8	V	
	VIH	2		3.3	V	
SD output voltage	Fault	0		0.4	V	
	Normal	2		3.3	V	
Dimensions		H68 x W14 x D12 mm				

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## OPTICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit	Ref
<b>Transmitter (GPON)</b>						
Laser type			DFB			
Nominal bit rate			2.48832		Gbps	
Output average power		+3		+7	dBm	
Center wavelength		1480	1490	1500	nm	
Spectral width (-20dB width)				1.0	nm	
Extinction ratio		8.2			dB	
Eye Mask Margin		10% (ITU-T G.984.2 compliant)			%	
Side-Mode Suppression Ratio		30			dB	
Optical Power at Tx_disable				-39	dBm	
<b>Transmitter (XG-PON)</b>						
Laser type			EML			
Nominal bit rate			9.95328		Gbps	
Output average power		+4		+7	dBm	
Center wavelength		1575	1577	1580	nm	
Spectral width (-20dB width)				1.0	nm	
Extinction ratio		8.2			dB	
Eye Mask Margin (1000 consecutive snapshots at typical rate and room temperature)		5% (ITU-T G.987.2 compliant)			%	
Side-Mode Suppression Ratio		30			dB	
Optical Power at Tx_disable				-39	dBm	

Parameter	Symbol	Min	Typ	Max	Unit
<b>Receiver(GPON)</b>					
Center wavelength		1290	1310	1330	nm
Sensitivity @ Condition (BER=1*10 <sup>-4</sup> , 1.244Gbps, PRBS 2 <sup>23</sup> -1,NRZ)				-30	dBm
Overload		-9			dBm
Damaged Input Optical Power		-3			dBm
Receiver reflectance				20	dB
Optical Return Loss tolerance				10	dB
SDA @ 1.244Gbps				-30	dBm
SDD		-45			dBm
Rx_SD Hysteresis		0		6	dB
<b>Receiver(XGS-PON)</b>					
Center wavelength		1260	1270	1280	nm
Sensitivity @Condition (BER=1*10 <sup>-4</sup> , 2.488Gbps, PRBS 2 <sup>23</sup> -1,NRZ)				-29.5	dBm
Overload		-9			dBm
Sensitivity @Condition (BER=1*10 <sup>-3</sup> , 9.953Gbps, PRBS 2 <sup>23</sup> -1,NRZ)				-28	dBm
Overload		-7			dBm
Damaged Input Optical Power		-3			dBm
SDA@ 9.953Gbps				-29	dBm
SDA@2.488Gbps				-29	dBm
SDD		-45			dBm
Rx_SD Hysteresis		0		6	dB
Receiver reflectance				10	dB
Optical Return Loss tolerance				-20	dB

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## RECEIVER TIMING CHARACTERISTICS

Parameter	Symbol.	Min.	Typ.	Max.	Unit	Note
Guard Time	Tg	64			ns	XGSPON
	Tg	8			ns	XGPON
	Tg	4			ns	GPON
10G Reset Pulse Width	Tr1	25.6			ns	
1.25G Reset Pulse Width	Tr2	12.8			ns	
Data Recovery Time	Tsettle			24	ns	
SD Assert Time	TSDA			25	ns	
SD De-assert Time	TSDD			25	ns	

## RSSI CHARACTERISTICS

Parameter	Symbol.	Min.	Typ.	Max.	Unit	Note
RSSI Trigger-Low		0		0.8	V	
RSSI Trigger-High		2		VCC	V	
RSSI Trigger Delay	TD	100	300		ns	
Optical Signal During Time	Tout	1			ns	
RSSI Trigger width	Tw	300		Td-Tout	ns	
I2C Access Prohibited Time	Tp	500			us	
RSSI monitoring range	Pmon	-5		-25.5	ns	XGSPON
	Pmon	-5		-27.5	ns	XGPON
	Pmon	-8		-28	ns	GPON

## DIGITAL DIAGNOSTIC MONITORING INTERFACE

Parameter	Range	Accuracy	Notes
<b>XGS-PON</b>			
Temperature	A2[00]: 96-97	± 3°C	Floating/255 Note 1,2
Voltage	A2[00]: 98-99	±3%	Unit 1mV Note 2
Bias Current	A2[00]: 100-101	±10%	Unit 4uA Note 2
TX Power	A2[00]: 102-103	±3dB	Unit 0.2uW Note 2
RX Power	A2[00]: 104-105	±3dB	Unit 0.1uW Note 2
<b>GPON</b>			
Temperature	A2[00]: 96-97	± 3°C	Floating/255 Note 1,2
Voltage	A2[00]: 98-99	±3%	Unit 1mV Note 2
Bias Current	A2[00]: 100-101	±10%	Unit 4uA Note 2
TX Power	A2[00]: 102-103	±3dB	Unit 0.2uW Note 2
RX Power	A2[00]: 104-105	±3dB	Unit 0.1uW Note 2

Note:

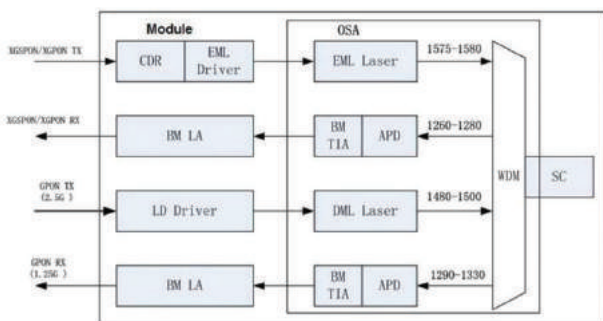
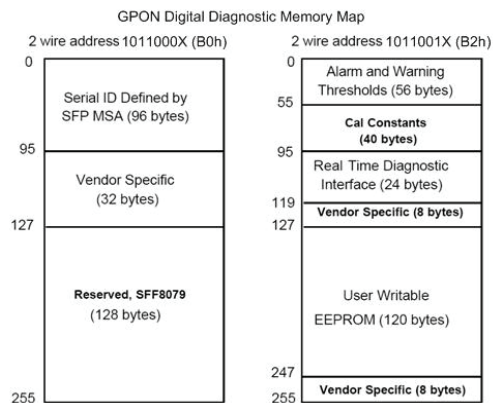
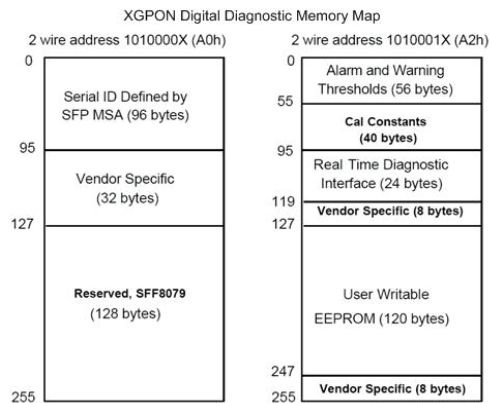
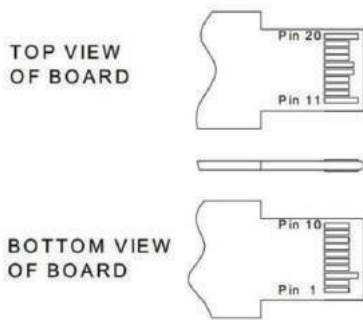
1. An actual temperature test point is fixed on the module case around the laser array.
2. Full operating temperature range.
3. RSSI DDM working range is between -12 to -30dBm

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## PIN DESCRIPTION

Pin	Symbol	Name /Description	
1	GPON TD+	Transmit Data Input	AC-coupled
2	GPON TD-	Inv. Transmit Data Input	AC-coupled
3	GND	Ground	Ground
4	SDA	2-wire Serial ID Interface, SDA	LVTT
5	SCL	2-wire Serial ID Interface, SCL	LVTTTL
6	GPON RD-	GPON Inv. Received Data Output	LVPECL, DC coupled
7	XGS/ XG-PON Reset /RateSel	Burst Mode Module Reset signal and rate select signal	Tri-level Input
8	XGS/XG-PON SD	High: normal; Low: loss of signal	LVTTTL Output
9	Trig/TXDIS	RSSI Trigger input/TX_Disable	
10	GPON RD+	GPON Received Data Output	LVTTTL Output
11	GND	Ground	
12	XGS/XG-PON RD-	Inv. Receiver Data Output	CML, DC-coupling in module, coupling capacitor on board.
13	XGS/XG-PON RD+	Receiver Data Output	CML, DC-coupling in module, coupling capacitor on board.
14	GPON SD	GPON RX Signal Detect	LVTTTL Output
15	VccR	Receiver Power	3.3V± 5%
16	VccT	Transmitter Power	3.3V± 5%
17	GPON Reset	Reset for GPON Receiver	LVTTTL Input
18	XGS/XG -PON TD+	Transmitter Data Input	CML, AC-coupled
19	XGS/XG -PON TD-	Inv. Transmitter Data Input	CML, AC-coupled
20	GND	Ground	

## BOARD & DIAGRAM

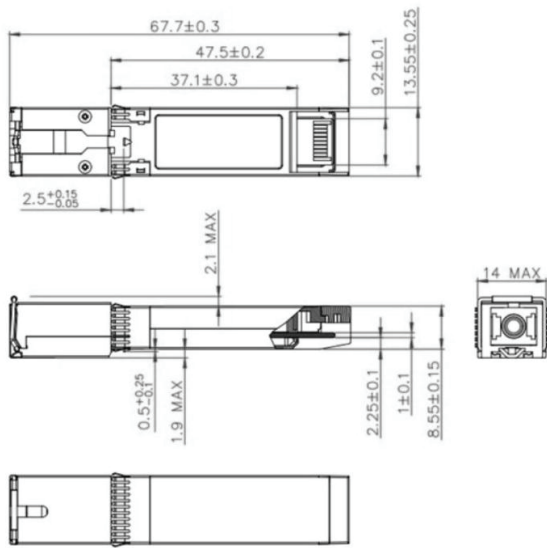


Transceiver Block Diagram

EEPROM Definitions

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## MECHANICAL DIMENSIONS



Units in mm

## ORDERING INFORMATION

PN	Description
LXGGOLT	Lightem SFP+9.953G & 2488G(Down)/ 9.953G/2488G & 1.244G (Up)XGS-PON&GPON OLT Class C+ 20km Optical Transceiver