

The AC-E-SFPPXSTCU-xx-yy is a combination of XGS-PON OLT and GPON OLT optical transceiver in an SFP+ housing. It is designed to support both the XGS-PON OLT and the GPON OLT specifications over a single fiber via coarse wave division multiplexing. The XGS-PON bidirectional link is configured with 1270nm/1577nm optics and the GPON link is configured with 1310nm/1490nm optics. The 1270nm and 1310nm optical burst mode receivers incorporate APD/TIA optics for maximum sensitivity. The 10G transmitter incorporates a 1577nm EML laser assembly and the 2.5G transmitter incorporates a 1490nm DFB laser assembly. The transmitters can be controlled by the LVTTTL Tx_DISABLE function and the receivers incorporate the LVTTTL Rx_SD output.

The AC-E-SFPPXSTCU-xx-yy is designed to support up to 32/64 subscribers over distances of up to 20km. It is FDA 21 CFR1040.10 and IEC 60825-2 Class I laser safety compliant and meets the EEC Directive 2002/95/EC for RoHS compliance.

Features

- SFP+ Package
- 3.3V DC power supply
- 4 Lambda
- SC receptacle optical connector
- Hot pluggable
- 2x10 SFP+ Electrical Interface
- ITU-T G.9807.1 Class N1/N2 compliant
- ITU-T G.987.2 Class N1/N2a compliant
- ITU-T G.984.2 Class B+/C+ compliant
- Refer to YD-T 1688.8

Applications

- 10 Gigabits Access networks
- FTTH
- FTTB
- FTTC

Optical Transmitter

- 1577nm CW Mode EML
- 9.95328Gb/s data rate
- LVCML AC Coupled input
- 1490nm CW Mode DFB Laser
- 2.48832Gb/s data rate
- LVPECL AC Coupled input

Optical Receiver

- 1270nm Burst Mode APD/TIA receiver
- 9.95328 or 2.48832Gb/s data rate
- LVCML DC Coupled output
- 1310nm Burst Mode APD/TIA receiver
- 1.24416Gb/s data rate
- LVPECL DC Coupled output

Control and Monitor Interface

- LVTTTL Tx_Disable
- LVTTTL Rx_SD_GPON
- LVTTTL Rx_SD_XGS-PON
- LVTTTL Rx_RSSI_Tri
- LVTTTL Rx_Reset_GPON
- Tri-level Ratesel/Reset_XGSPON

Case Operating Temperature:

- Commercial: 0°C to 70°C
- Industrial: -40°C to 85°C

I²C Serial Data

- SCL Serial Clock Input
- SDA Serial Data I/O

Ordering Information							
Part Number and	ODN Class	Latch Type		Temperature Range		RoHS Compliance	
		AC-E-SFPPXSTCU-1-yy	N1- B+	B	SC/UPC	C	0°C to 70°C
AC-E-SFPPXSTCU-I1-yy	I	-40°C to 85°C					
AC-E-SFPPXSTCU-2-yy	N2-C+	C	0°C to 70°C				
AC-E-SFPPXSTCU-I2-yy		I	-40°C to 85°C				

Absolute Maximum Ratings						
Parameter	Symbol	Min	Max	Units	Notes	
Storage Ambient Temperature	T _{stg}	-40	+85	°C	Exceeding the Absolute Maximum Ratings may cause irreversible damage to the device. The device is not intended to be operated under the condition of simultaneous Absolute Maximum Ratings, a condition which may cause irreversible damage to the device.	
Relative Humidity - Storage	RH _s	5	90	%		
Relative Humidity - Operating	RH _o	5	85	%		
Module Supply Voltage	V _{CC3}	0	3.6	V		

Absolute Maximum Ratings: Control Function Logic Levels						
Parameter	Symbol	Min	Max	Units	Notes	
Tx_DISABLE	Tx_Dis	0	V _{CC3} +0.5	V	LVTTTL	
Burst Mode SIGNAL Detect	Rx_SD	0	V _{CC3} +0.5	V	LVTTTL	
Rx_Reset	Rx_Reset	0	V _{CC3} +0.5	V	Signal Ended LVTTTL input	
Digital Rx_RSSI_Trigger Input	TRI	0	V _{CC3} +0.5	V	Single Ended LVTTTL Input	
I ² C Serial Data	SDA	0	V _{CC3} +0.5	V	Single Ended LVTTTL I/O	
I ² C Serial Clock	SCL	0	V _{CC3} +0.5	V	Single Ended LVTTTL Input	

Recommended Operating Conditions						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Case Operating Temperature	T _{CASE}	0	-	+70	°C	Temperature Range = C
		-40	-	85	°C	Temperature Range = H
Module Supply Voltage	V _{CC3}	3.135	3.3	3.465	V	
Module Supply Current	I _{CC3}	-	750	-	mA	
Power Consumption	P	-	-	3.5	W	

Transmitter Electrical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Tx Differential Input Impedance	Z _{IN}	90	100	110	Ω	
10Gb/s Tx Differential Input Amplitude	V _{IN10}	120	-	800	mV	
2.5Gb/s Tx Differential Input Amplitude	V _{IN1}	120	-	800	mV	
Tx_Dis = HIGH (Transmitter OFF / DISABLED)	V _{TDH}	0.7*V _{CC3}	-	V _{CC3}	V	LVTTTL (Control INPUT)
Tx_Dis = LOW (Transmitter ON / ENABLED)	V _{TDL}	0	-	0.8	V	LVTTTL (Control INPUT)

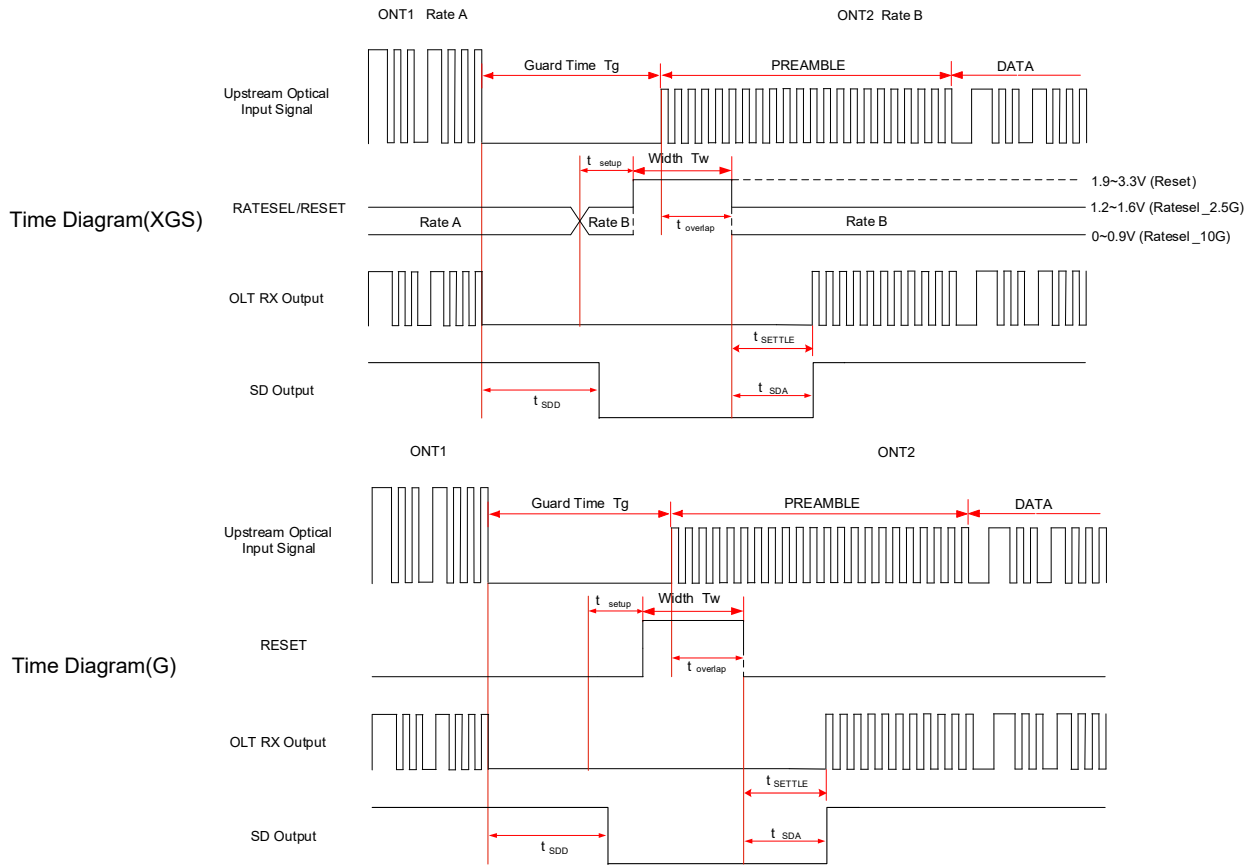
Receiver Electrical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Rx Differential Output Impedance	Z _{OUT}	90	100	110	Ω	
10Gb/s Rx_Data Differential Output Voltage Amplitude	V _{OUT10}	300	-	850	mV	LVCML
10Gb/s Output HIGH Voltage	V _{OH10}	V _{CC3} -20	V _{CC3} -5	V _{CC3}	mV	
10Gb/s Output LOW Voltage	V _{OL10}	V _{CC3} -400	V _{CC3} -350	V _{CC3} -300	mV	
1.25Gb/s Rx_Data Differential Output Voltage Amplitude	V _{OUT1}	600	-	1600	mV	LVPECL
1.25Gb/s Output HIGH Voltage	V _{OH1}	V _{CC3} -1085	V _{CC3} -955	V _{CC3} -880	mV	
1.25Gb/s Output LOW Voltage	V _{OL1}	V _{CC3} -1850	V _{CC3} -1705	V _{CC3} -1555	mV	
Rx_SD = HIGH (Receiver ON)	V _{OH}	2.0	-	V _{CC3}	V	LVTTTL (Monitor OUTPUT)
Rx_SD = LOW (Receiver OFF)	V _{OL}	0	-	0.8	V	LVTTTL (Monitor OUTPUT)
Ratesel/Reset=HIGH	V _{IH}	1.9	-	V _{CC3}	V	Tri-level (Control INPUT)
Ratesel/Reset=Middle	V _{IM}	1.2	-	1.6	V	Tri-level (Control INPUT)
Ratesel/Reset=LOW	V _{IL}	0	-	0.9	V	Tri-level (Control INPUT)
TRI=HIGH	V _{IH}	0.7*V _{CC3}	-	V _{CC3}	V	LVTTTL (Control INPUT)
TRI=LOW	V _{IL}	0	-	0.8	V	LVTTTL (Control INPUT)

9.95328Gb/s Transmitter Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Laser Type		1577nm CW EML				
Downstream Signal Rate		9.95328			Gb/s	
Average Launch Power	P_{OUT10}	2	-	5	dBm	AC-E-SFPPXSTCU-1-yy AC-E-SFPPXSTCU-I1-yy
		4	-	7	dBm	AC-E-SFPPXSTCU-2-yy AC-E-SFPPXSTCU-I2-yy
Optical Center Wavelength	λ_{10}	1575	-	1580	nm	
Spectral Width	$\Delta\lambda_{10}$	-	-	1.0	nm	
Side Mode Suppression Ratio	$SMSR_{10}$	30	-	-	dB	
Extinction Ratio	ER_{10}	8.2	-	-	dB	
Output Eye Diagram	Compliant with ITU-T G.987.2 & ITU-T G.9807.1					

2.48832Gb/s Transmitter Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Laser Type		1490nm CW DFB Laser				
Downstream Signal Rate		2.48832			Gb/s	
Average Launch Power	P_{OUT2}	1.5	2.5	5	dBm	AC-E-SFPPXSTCU-1-yy AC-E-SFPPXSTCU-I1-yy
		3	-	7	dBm	
Optical Rise and Fall Time	T_r / T_f	-	-	200	ps	20% to 80%
Optical Center Wavelength	λ_1	1480	1490	1500	nm	
Spectral Width	$\Delta\lambda_1$	-	-	1.0	nm	
Side Mode Suppression Ratio	$SMSR_1$	30	-	-	dB	
Extinction Ratio	ER_1	8.2	-	-	dB	
Output Eye Diagram	Compliant with ITU-T G.984.2					

9.95328/2.48832Gb/s Receiver Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Receiver Type		1270nm APD/TIA Receiver				
Upstream Signal Rate		9.95328/2.48832			Gb/s	
Optical Center Wavelength	λ	1260	1270	1280	nm	
XGS-PON Receiver Sensitivity ¹	P_{IN}	-	-	-26	dBm	AC-E-SFPPXSTCU-1-yy AC-E-SFPPXSTCU-I1-yy
		-	-	-28	dBm	AC-E-SFPPXSTCU-2-yy AC-E-SFPPXSTCU-I2-yy
XG-PON Receiver Sensitivity ²	P_{IN}	-	-	-27.5	dBm	AC-E-SFPPXSTCU-1-yy AC-E-SFPPXSTCU-I1-yy
		-	-	-29.5	dBm	AC-E-SFPPXSTCU-2-yy AC-E-SFPPXSTCU-I2-yy
XGS-PON Receiver Optical Overload [*]	$P_{IN}(SAT)$	-5	-	-	dBm	AC-E-SFPPXSTCU-1-yy AC-E-SFPPXSTCU-I1-yy
		-7	-	-	dBm	AC-E-SFPPXSTCU-2-yy AC-E-SFPPXSTCU-I2-yy
XG-PON Receiver Optical Overload [*]	$P_{IN}(SAT)$	-7	-	-	dBm	AC-E-SFPPXSTCU-1-yy AC-E-SFPPXSTCU-I1-yy
		-9	-	-	dBm	AC-E-SFPPXSTCU-2-yy AC-E-SFPPXSTCU-I2-yy
Damaged Input Optical Power	P_d	-	-	-5	dBm	
Rx_SD Assert	P_A	-45	-	-29.5	dBm	
Rx_SD De Assert	P_D	-45	-	-29.5	dBm	
Rx_SD Hysteresis	P_{Hy}	0	-	7	dBm	
Note : 1: BER@10 ⁻³ *; Test Condition: PRBS: 2 ³¹ -1, ER=8.2 dB 2: BER@10 ⁻⁴ *; Test Condition: PRBS: 2 ²³ -1, ER=8.2 dB						

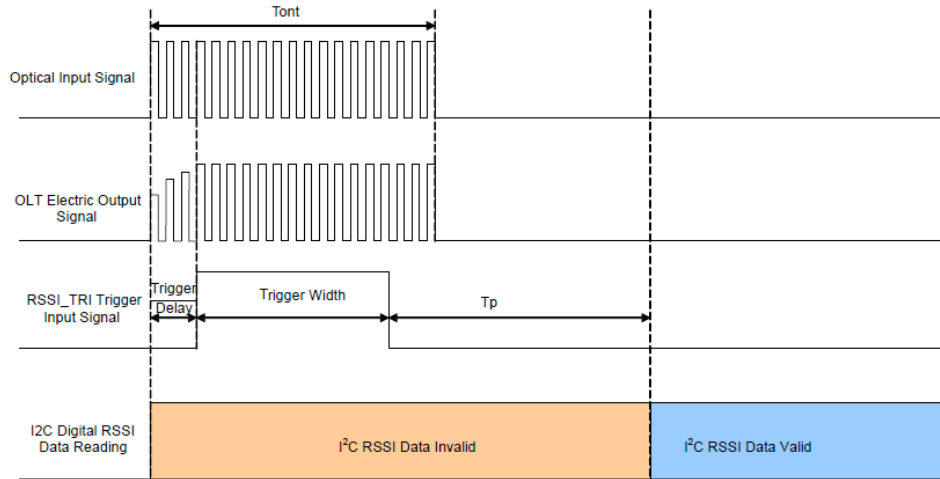
1.24416Gb/s Receiver Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Receiver Type		1310nm Burst APD/TIA Receiver				
Upstream Signal Rate		1.24416			Gb/s	
Optical Center Wavelength	λ	1290	1310	1330	nm	
Receiver Sensitivity	P_{IN}^*	-	-	-28	dBm	AC-E-SFPPXSTCU-1-yy AC-E-SFPPXSTCU-I1-yy
		-	-	-30	dBm	AC-E-SFPPXSTCU-2-yy AC-E-SFPPXSTCU-I2-yy
Receiver Optical Overload	$P_{IN}(SAT)$	-7	-	-	dBm	
Damaged Input Optical Power	P_d	-	-	-5	dBm	
Receiver Settling Time	T_{RX}	-	-	51.2	ns	
Rx_SD Assert	P_A	-45	-	-30	dBm	
Rx_SD De Assert	P_D	-45	-	-30	dBm	
Rx_SD Hysteresis	P_{Hy}	0	-	7	dB	
Note : * Test Condition : BER@10 ⁻¹⁰ , PRBS 2 ²³ -1, ER=10dB						



Receiver Timing Diagram						
Parameter	Symbol	Min	Typical	Max	Units	Note
Guard Time (GPON)	Tg	25.6	-	-	ns	
Guard Time (XGS-PON)	Tg	51.2	-	-	ns	
Reset Pulse Width (GPON)	Tw	12.8	-	-	ns	Note 1
Reset Pulse Width (XGS-PON)	Tw	25.6	-	-	ns	
Reset time overlapping preamble	t_overlap	0	-	-	ns	
Setup time of rate level for following burst	t_setup	5	-	-	ns	
Burst Signal Detect Assert (GPON)	T_SDA	-	-	25.6	ns	
Burst Signal Detect Assert (XGS-PON)	T_SDA	-	25	100	ns	
Burst Signal Detect De-assert (GPON)	T_SDD	-	-	100	ns	Note 2
Burst Signal Detect De-assert (XGS-PON)	T_SDD	-	-	100	ns	
Burst Mode Receiver Setting Time (GPON)	Tsettle	-	-	19.2	ns	
Burst Mode Receiver Setting Time (XGS-PON)	Tsettle	-	100	-	ns	

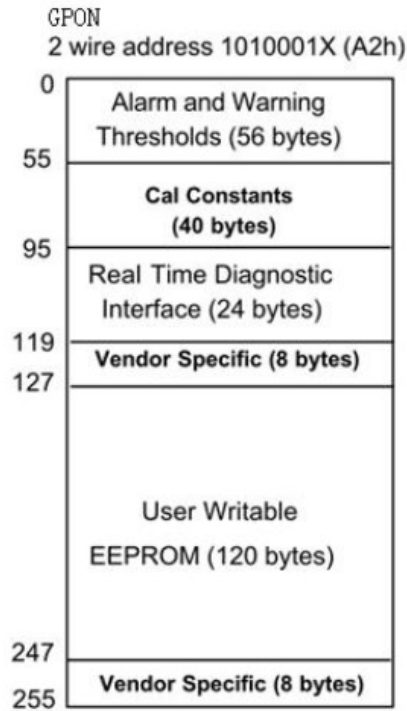
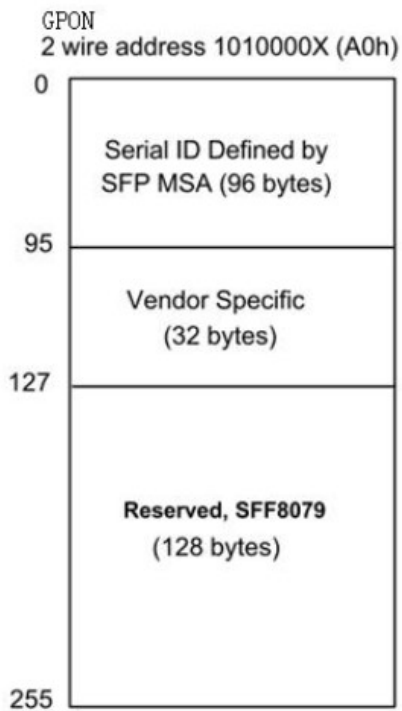
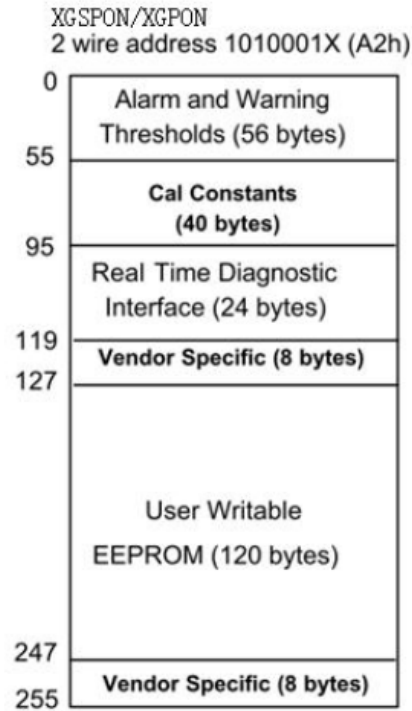
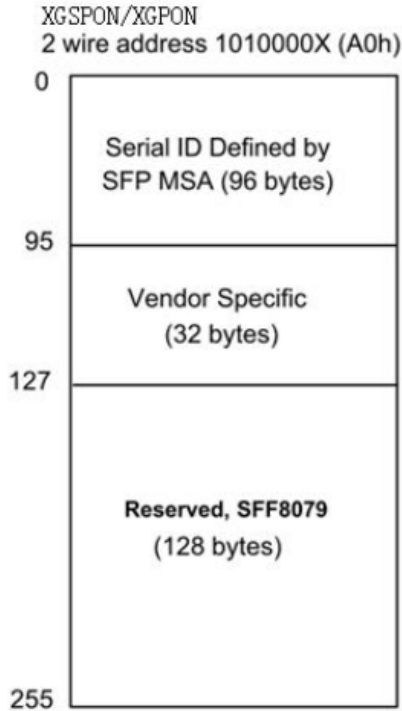
Note 1: Reset pulse is required to be partially inside preamble.
 Note 2: Auto reset function is applied. Signal detect de-assert time is about 100ns forced by auto reset, and will short to about 20ns with external Reset pulse.

Digital RSSI Sample/Hold Timing

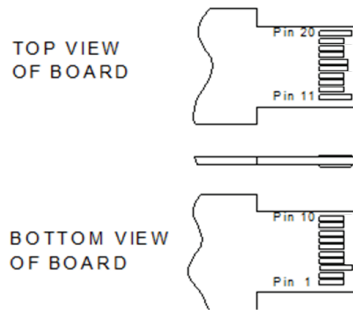


Digital RSSI Sample/Hold Timing						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical Input Signal Width	T_{ont}	525	-	-	ns	
RSSI Trigger Delay	T_{tri} (TRI Delay)	25	-	3000	ns	
RSSI Trigger Width	T_{I2C} (TRI Width)	500	-	$T_{ont} - T_{tri}$	ns	
I ² C Protect Time	T_p	500	-	-	μs	
RSSI Monitor Range	P_{mon}	-6	-	-30	dBm	XGS-PON
		-6	-	-30	dBm	XGPON
		-8	-	-30	dBm	GPON
RSSI Precision	P_{rsi}	-3	+/-1	3	dB	
$T_{tri} + T_{I2C} < T_{ont}$						

2-Wire Serial Memory Map



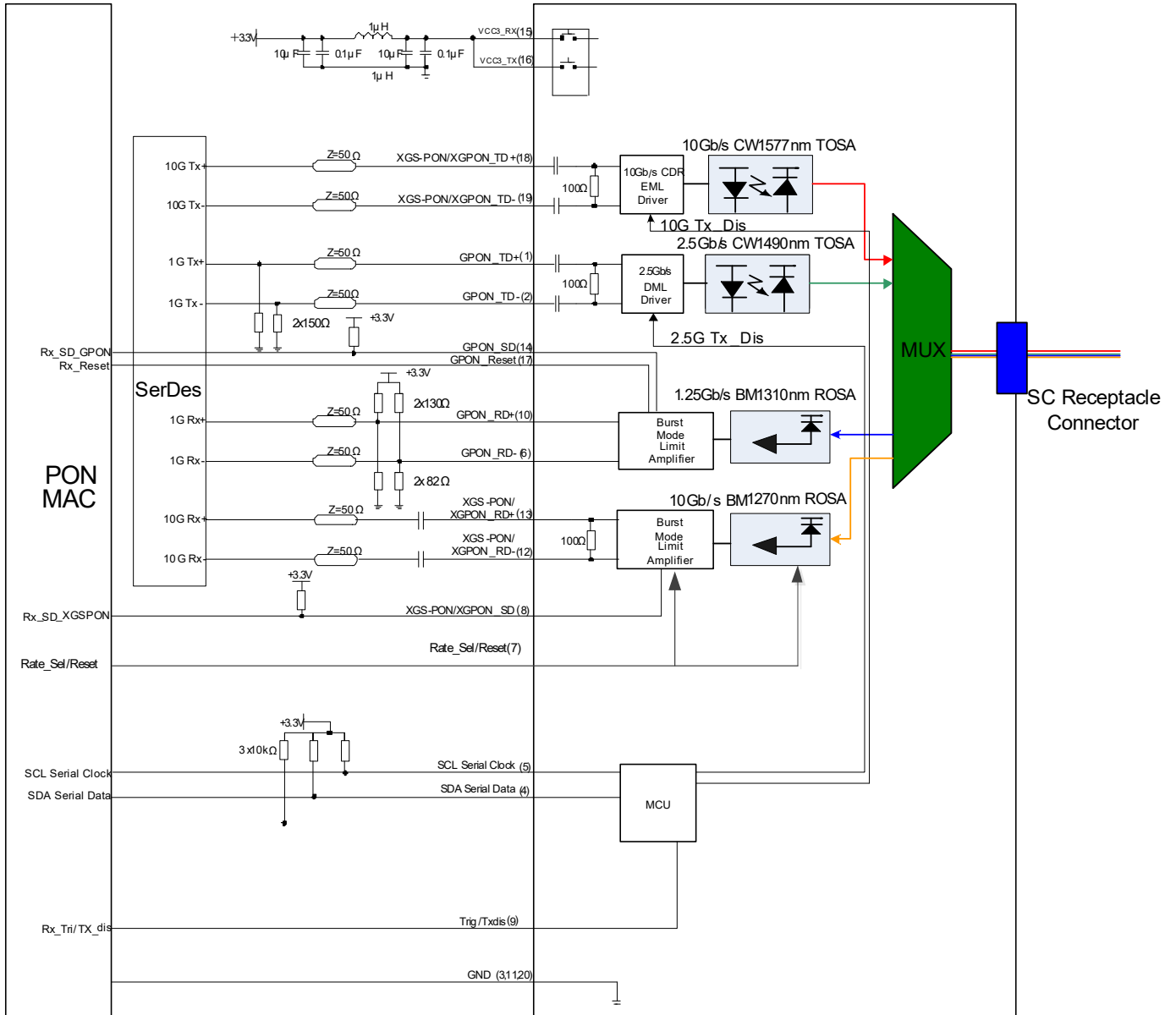
Pin Assignment



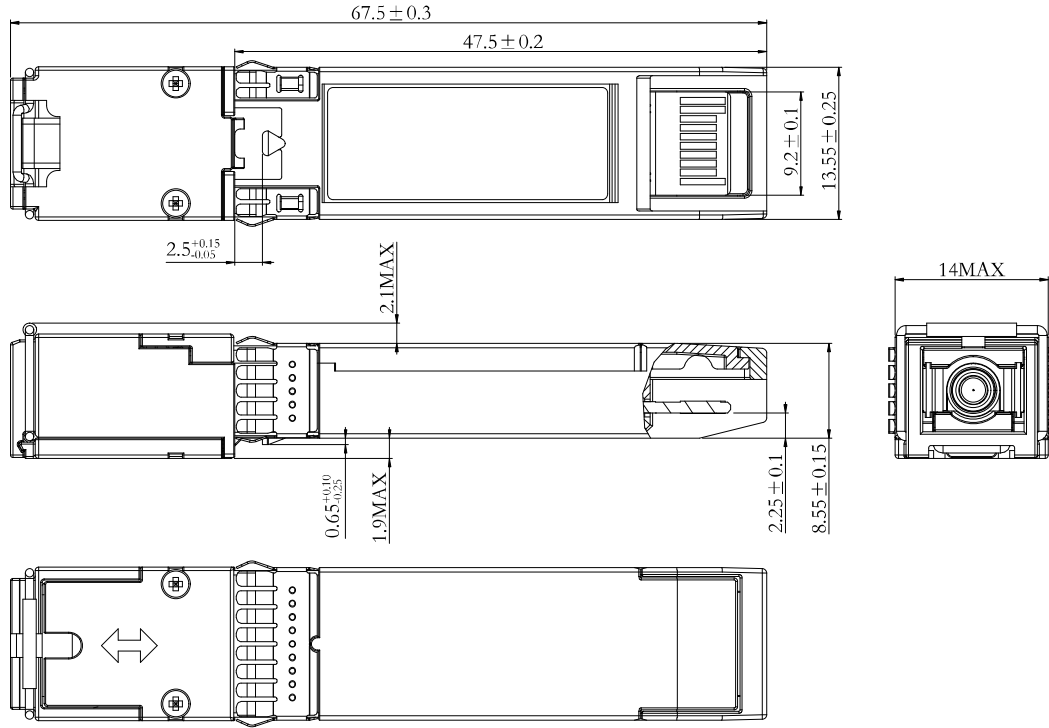
Pin Description			
Pin	Name	Description	Note
1	GPON_TD+	Transmit Non-Inverted 2.48832Gb/s Data Input; AC coupled inside the module.	
2	GPON_TD-	Transmit Inverted 2.48832Gb/s Data Input; AC coupled inside the module.	
3	GND	Module Ground.	
4	SDA	2-Wire Serial Interface Data Line, with the pull-up resistance: 4.7kΩ~10kΩ.	
5	SCL	2-Wire Serial Interface Clock, with the pull-up resistance: 4.7kΩ~10kΩ.	
6	GPON_RD-	Receive Burst Mode Inverted 1.2488Gb/s Data Output; DC coupled inside the module.	1
7	Ratesel/Reset	Three-level input combining "Rate Select" and "Reset" information. Set high level to reset TIA/LA. Middle level indicates 2.5G data rate. Low level indicates 10G data rate.	
8	XGS-PON_SD	Receiver Signal Detect Indicator for XGS-PON/XGPON Receiver, when Low, indicates insufficient optical input power to the module; when High, means in normal.	
9	Trig/Txdis	Two signals multiplex, which selected by the register. Receiver signal strength indication trigger for Digital RSSI. As TXdisable, when Low level, the transceiver port work in normal; when High level, both 10Gb/s and 2.5Gb/s are disabled.	
10	GPON_RD+	Receive Burst Mode Non-Inverted 1.2488Gb/s Data Output; DC coupled inside the module.	1
11	GND	Module Ground.	
12	XGS-PON_RD-	Receive Burst Mode Inverted 9.953 or 2.48832Gb/s Data Output. DC coupled inside the module.	
13	XGS-PON_RD+	Receive Burst Mode Non-Inverted 9.953 or 2.48832Gb/s Data Output. DC coupled inside the module.	
14	GPON_SD	Receiver Signal Detect Indicator for G-PON Receiver. When Low, indicates insufficient optical input power to the module. When High, means in normal.	
15	VCC3_RX	+3.3V power supply for RX. Tolerance: 3.3V±5%.	
16	VCC3_TX	+3.3V power supply for TX. Tolerance: 3.3V±5%.	
17	GPON_Reset	Burst Mode Receiver Reset for GPON Receiver. When HIGH, indicates the receiver is OFF/being reset.	
18	XGS-PON_TD+	Transmit Non-Inverted 9.95328Gb/s Data Input; AC coupled inside the module.	
19	XGS-PON/_TD-	Transmit Inverted 9.95328Gb/s Data Input; AC coupled inside the module.	
20	GND	Module Ground.	

Note 1: When GPON_RD+/- set as LVPECL, and the module without the pull-down resistances. The differential signal amplitude must be satisfied with the Electrical Characteristics.

Electrical Interface

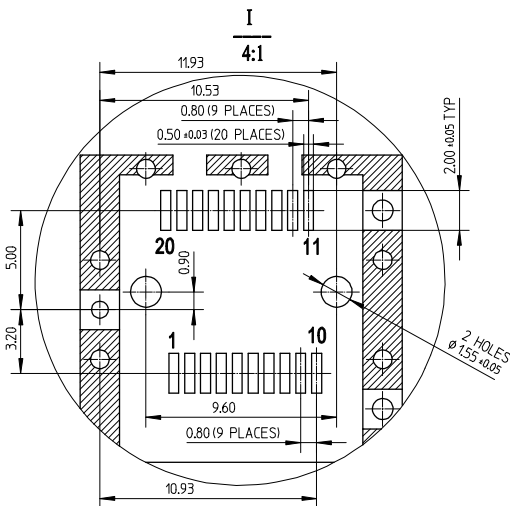


Mechanical Dimensions



- NOTES:
 1. TOLERANCE: +/- 0.1MM
 2. OTHERS ACCORDING WITH SFF-8074i/SFF-8432 OR CUSTOMER SPEC.
 3. LIGHT PORT ACCORDING WITH FIBER CONNECTOR SPEC.

SFP+ Connector Dimensions



- Notes:
 1. Datum and basic dimensions established by customer
 2. Pads and vias are chassis ground, 11 places
 3. Thru holes, plating optional

