



RoHS Compliant
XGS-PON OLT SFP+ Transceiver
9.953Gbps Continuous Mode EML Transmitter
9.953Gbps/2.488Gbps Dual Rate Burst Mode APD Receiver



Features

- Compliant with ITU-T G.9807.1 XGPON-OLT
- Compliant with ITU-T G.9807.1 XGSPON-OLT
- SC/UPC Simplex Receptacle Optical Interface
- 2x10 SFP+ Housing
- Compliant with SFP+ MSA SFF-8431
- TTL signal detect indicator
- Hot Pluggable
- Power consumption < 2.2W

Ordering Information

PART NUMBER	INPUT/OUTPUT	SIGNAL DETECT	VOLTAGE	TEMPERATURE
LS48-H3L-TC-N-N1	AC/DC	TTL	3.3V	0°C to 70°C
LS48-H3L-TI-N-N1	AC/DC	TTL	3.3V	-40°C to 85°C
LS48-H3L-TC-N-N2	AC/DC	TTL	3.3V	0°C to 70°C
LS48-H3L-TI-N-N2	AC/DC	TTL	3.3V	-40°C to 85°C

Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Storage Temperature	T_s	-40	85	°C	
Supply Voltage	V_{cc3}	-0.3	3.6	V	



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Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTE
Case operating Temperature	T_c	0 -40		70 85	°C	LS48-H3L-TC-N-Nx LS48-H3L-TI-N-Nx
Supply Voltage	V_{cc3}	3.13	3.3	3.47	V	
Supply Current	I_{cc3}	---	~	1000	mA	

Diagnostics

PARAMETER	RANGE	ACCURACY	UNIT	CALIBRATION
Temperature	-40 to 85	± 3	°C	
Voltage	3.13 to 3.47	± 0.1	V	
Bias Current	0 to 120	± 10%	mA	Internal
TX Power	+2 to +7	± 3	dB	
RX average Power	-5 to -30	± 3	dB	



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Transmitter Electro-optical Characteristics

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Transmission Data Rate	DR		9.95		Gb/s	
Output Power	P_{OUT}	+2	---	+5	dBm	N1
		+4		+7	dBm	N2
Extinction Ratio	ER	8.2	---	---	dB	
Center Wavelength	λ_C	1575	1577	1580	nm	
Average Launch Power @ Tx OFF	P_{OFF}			-40	dBm	
Side mode Suppression ratio	SSR_{min}	30	---	---	dB	
Spectrum Width(-20dB)	σ			1	nm	
Output Eye		Compliant ITU-T G.9807.1				
Differential Input Voltage	V_{DIFF}	120	---	820	mV	
Transmit Disable Input-Low	TX_FAULT_L	0.0	---	0.8	V	
Transmit Disable Input-High	TX_FAULT_H	2.0	---	V_{CC}	V	
Transmit Fault Output-Low	TX_FAULT_L	0.0	---	0.5	V	
Transmit Fault Output-High	TX_FAULT_H	2.4	---	V_{CC}	V	



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Receiver Electro-optical Characteristics

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Optical Input Power-maximum	P_{max}	-5			dBm	@9.95Gbps,N1
		-7			dBm	@9.95Gbps,N2
		-7			dBm	@2.488Gbps,N1
		-9			dBm	@2.488Gbps,N2
Receiver Sensitivity	P_{sen}	---	---	-26	dBm	@9.95Gbps,N1 NOTE1
				-28	dBm	@9.95Gbps,N2 NOTE1
				-27.5	dBm	@2.488Gbps,N1 NOTE2
				-29.5	dBm	@2.488Gbps,N2 NOTE2
Operating Center Wavelength	λ_C	1260	---	1280	nm	
Optical Return Loss	ORL	---	---	-20	dB	
Loss of Signal-Asserted	P_A	-44	---	---	dBm	
Loss of Signal-Deasserted	P_D	---	---	-30	dBm	
Differential Output Voltage	V_{DIFF}	340		850	mV	

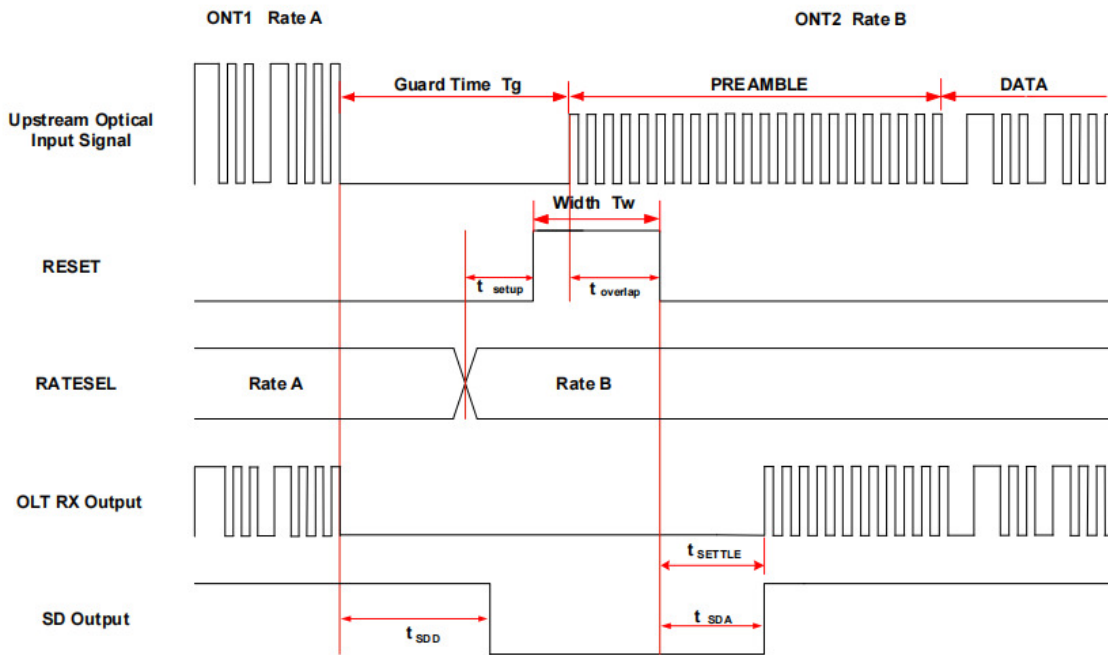
NOTE1: BER@10⁻³, Test Condition: PRBS: 2³¹-1, ER=8.2dB

NOTE2: BER@10⁻⁴, Test Condition: PRBS: 2²³-1, ER=8.2dB



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Burst mode Timing



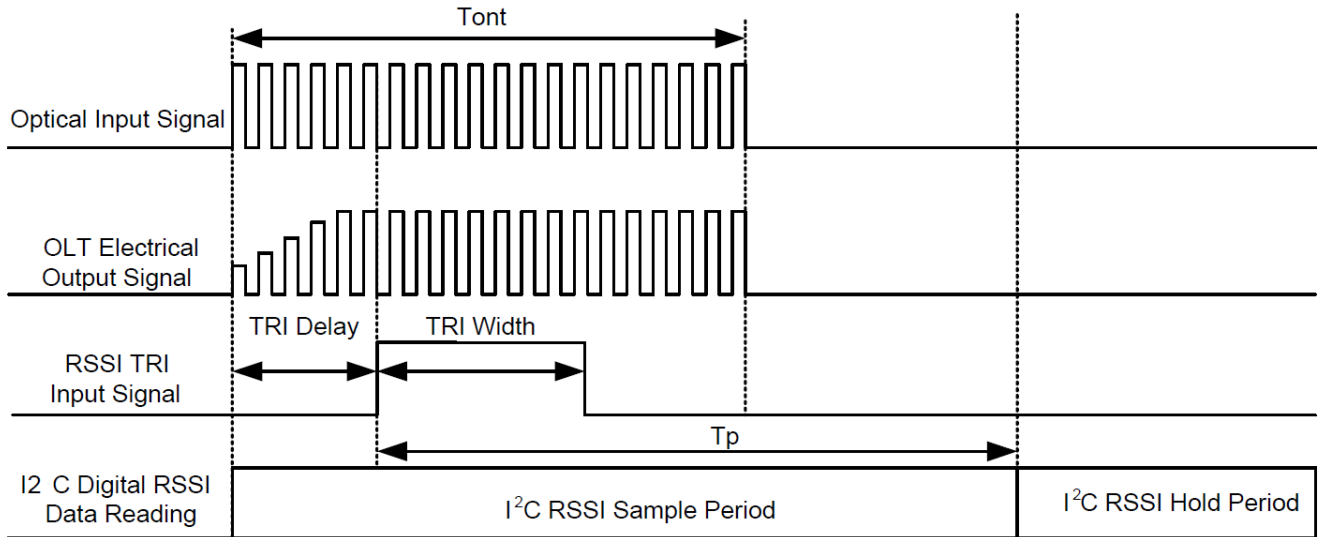
PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Guard Time	T_g	51.4	---	---	ns	
Reset Pulse Width	T_w	25	---	---	ns	
Reset overlap preamble	$T_{overlap}$	0	---	---	ns	1
Setup time for following burst	T_{setup}	5	---	---	ns	
Burst SD Assert	T_{SD_A}	---	---	100	ns	
Burst SD De-assert	T_{SD_Da}	---	100	---	ns	2
Burst Mode settling Time	T_{settle}	---	---	100	ns	

Note1: 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.



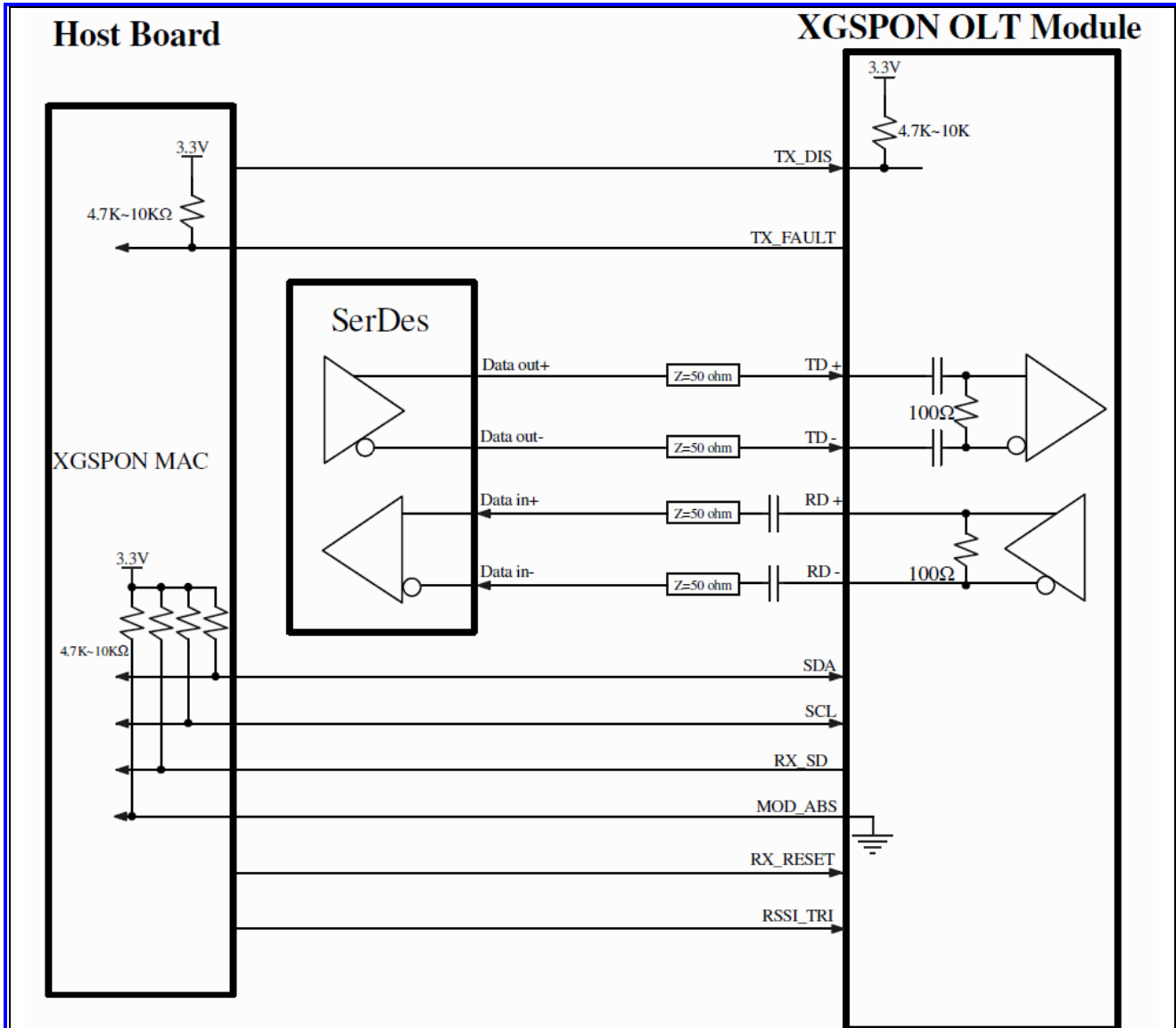
Digital RSSI Sample/Hold Timing



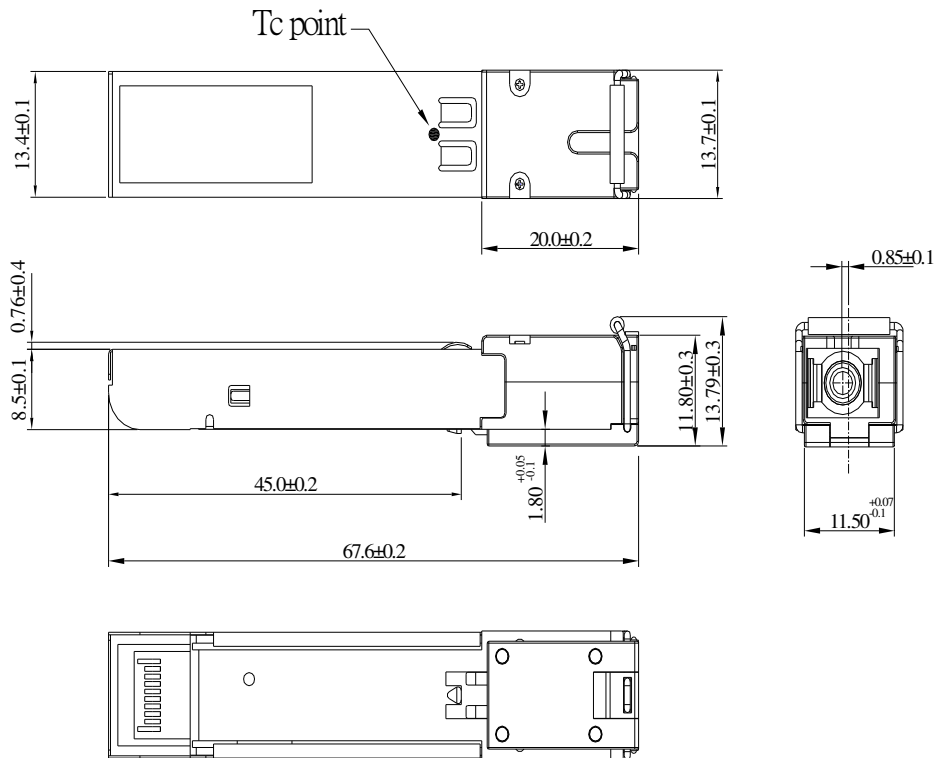
PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Optical Input Signal Width	T_{ont}	300	---	---	ns	
RSSI Trigger Delay	T_{tri}	0	300	---	ns	
RSSI Trigger Width	T_{I2C}	500			ns	
I2C Read Time	T_p	500			μ s	
RSSI Monitor Range	P_{mon}	-30		-7	dBm	
RSSI Precision	P_{rssi}	-3		+3	dB	

Note: $T_{tri} + T_{I2C} < T_{ont}$

Block Diagram of Transceiver



Dimensions



DIMENSIONS ARE IN MILLIMETERS

ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED

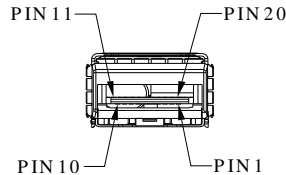
Latch color is Blue



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Pin Assignment

Pin-Out



Pin	Signal Name	I/O	Description	Note
1	GND		Module Ground	
2	TX_FAULT	O	Transmit Fault	
3	TX_DIS	I	Transmit Burst Control	
4	SDA	I/O	2-wire Serial Interface Data Line	
5	SCL	I/O	2-wire Serial Interface Clock	
6	MOD_ABS		Module Absent, Grounded inside the module	
7	RX_RESET	I	RX Reset Pulse Input	
8	RX_SD	O	Receiver Signal Detect, Assert High when burst packet coming	
9	RSSI_TRI	I	Receiver Signal Strength Indication Trigger Input	
10	GND		Module Ground	
11	GND		Module Ground	
12	RD-	O	Receive Data out Bar, DC coupled inside the module	
13	RD+	O	Receive Data out, DC coupled inside the module	
14	GND		Module Ground	
15	V _{CC3}		3.3V Power Supply Input	
16	V _{CC3}		3.3V Power Supply Input	
17	GND		Module Ground	
18	TD+	I	Transmit Data in, AC coupled inside the module	
19	TD-	I	Transmit Data in Bar, AC coupled inside the module	
20	GND		Module Ground	



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Eye Safety Mark

<p>The LS4 series single-mode transceiver is a class 1 laser product. It complies with EN 60825-1 and FDA 21 CFR 1040.10 and 1040.11. In order to meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.</p> <p><u>Caution</u> All adjustments have been done at the factory before the shipment of the devices. No maintenance and user serviceable part is required. Tampering with and modifying the performance of the device will result in voided product warranty.</p>	<p><u>Required Mark</u></p> <div data-bbox="798 562 1169 680" style="border: 1px solid black; padding: 5px; text-align: center;"><p>Class 1 Laser Product Complies with 21 CFR 1040.10 and 1040.11</p></div>
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Note : All information contained in this document is subject to change without notice.