



Features

- Single fiber, integrated triplexer transceiver
- Support IEEE802.3-av 10/10G base PR30 symmetric EPON OLT
- Support IEEE802.3-2008 EPON OLT
- Integrated with micro-optics WDM filter
- 1577nm continuous-mode transmitter with EML laser
- 1490nm continuous-mode transmitter with DFB laser
- Support receiver rate selected between 1.25Gbps bandwidth and 10.3125Gbps band width
- Optional supported 1270nm burst-mode receiver with APD-TIA
- Optional supported 1310nm burst-mode receiver with APD-TIA
- Digital diagnostic INF-8077i compliant
- +3.3V and +5V power supplies
- Operating case temperature:-5-70°C
- RoHS Compliant

Regulatory Compliance

Table 1 – Regulatory Compliance

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

Note:

In light of item 5 in Annex of 2011/65/EU, “Pb in the glass of cathode ray tubes, electronic components and fluorescent tubes.” and item 13 in Annex of 2005/747/EC, “Lead and cadmium in optical and filter glass.”, the two exemptions are being concerned for Source Photonics transceivers, because Source Photonics transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute Maximum Ratings

Table 2 – Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T_s	-40	-	+85	°C	
Operation Case Temperature	T_C	-5		70	°C	
Supply Voltage	Vcc3	-0.5	-	+4.0	V	
	Vcc5	-0.5		+6.0		
Operating Relative Humidity	RH	-	-	85	%	

Recommended Operating Conditions

Table 3 – Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	V _{CC3}	3.14	3.3	3.46	V	
	V _{CC5}	4.75	5.0	5.25		
Supply Current	I _{CC3}	-		650	mA	
	I _{CC5}			380		
Operating Temperature (Case)	T _{opr}	-5	-	70	°C	

Optical and Electrical Characteristics

Table 4 – Optical Characteristics

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
10G Transmitter						
Transmitter Signal Rate			10.3125G			
Centre Wavelength	λ_C	1575	1577	1580	nm	
Optical Spectrum Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Mode	SMSR	30			dB	
Average Launch Power	P _{OUT}	2		5		
Average Launch Power-OFF Transmitter	P _{OFF}			-39	dBm	
Extinction Ratio	EX	6			dB	2
Total Jitter	TJ			±0.23	UI	2
Rise/Fall Time (20%-80%)	T _R /T _F			80	ps	2,3

RIN ₁₅ OMA				-128	dB/Hz	
Optical Return Loss Tolerance				15	dB	
Transmitter Reflectance				-10	dB	
Transmitter and dispersion Penalty	TDP			1.5	dB	
Optical Eye Mask	Compliant With IEEE Std 802.3av™-2009					2,4
1G Transmitter						
Transmitter Signal Rate			1.25G			Gbps
Centre Wavelength	λ_C	1480	1490	1500	nm	
Optical Spectrum Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Mode	SMSR	30			dB	
Average Launch Power	P _{OUT}	3		7		
Average Launch Power-OFF Transmitter	P _{OFF}			-39	dBm	
Extinction Ratio	EX	9				5
Total Jitter	TJ			±0.43	UI	5
Rise/Fall Time (20%-80%)	T _R /T _F			260	ps	3,5
RIN ₁₅ OMA				-115	dB/Hz	
Optical Return Loss Tolerance				12	dB	
Transmitter Reflectance				-10	dB	
Transmitter and dispersion Penalty	TDP			2.3	dB	
Optical Eye Mask	Compliant With IEEE Std 802.3™-2008					5,6
10G Receiver⁷						
Transmitter Signal Rate			10.3125			Gbps
Operating Wavelength	λ_C	1260		1280	nm	
Sensitivity	P _{SEN}			-28	dBm	8
Saturation	P _{SAT}	-6				
Receiver Threshold Settling Time	T _{settling}			800	ns	10,11
Dynamic Range		-28		-6	dBm	
Loss of Signal Assert	P _{LOSA}	-45	-	-	dBm	
Loss of Signal Deassert	P _{LOSD}			-30	dBm	
Hysteresis	P _{LOSD} - P _{LOSA}	0.5	-	6		
Receiver Reflectance				-12	dB	
1G Receiver⁷						
Operating Wavelength	λ_C	1260	1310	1360	nm	

Sensitivity	P_{SEN}			-30	dBm	9
Saturation	P_{SAT}	-9				
Receiver Threshold Settling Time	$T_{setting}$			400	ns	10,11
Dynamic Range		-30		-9	dBm	
Loss of Signal Assert	P_{LOSA}	-45	-	-	dBm	
Loss of Signal Deassert	P_{LOSD}			-33	dBm	
Hysteresis	$P_{LOSD} - P_{LOSA}$	0.5	-	6		
Receiver Reflectance				-12	dB	

Notes:

- The optical power is launched into 9/125um SMF.
- Measured with PRBS $2^{31}-1$ test pattern @10.3125Gbps.
- Measured with the Bessel-Thompson filter OFF.
- Transmitter eye mask definition {0.25UI, 0.40UI, 0.45UI, 0.25UI, 0.28UI,0.40UI}.
- Measured with PRBS 2^7-1 test pattern @1.25Gbps.
- Transmitter eye mask definition {0.22UI, 0.375UI, 0.20UI, 0.20UI, 0.30UI}.
- Support receiver rate selected function between 1.25Gbps bandwidth and 10.3125Gbps bandwidth by set the level of PIN#13.If the PIN#13 defined as low level , 1.25Gbps bandwidth is selected. If the PIN#13 defined as high level, 10.3125Gbps bandwidth is selected.
- Measured with a PRBS $2^{31}-1$ test pattern @10.3125Gbps and ER=6dB, BER = 10^{-3}
- Measured with a PRBS 2^7-1 test pattern @1.25Gbps and ER=9 dB, BER= 10^{-12}
- See Figure 1, 2. For multiple ONUs application, It isn't easy to test $T_{SETTLING}$ directly, but there is a relationship $T_{SETTLING} = T_{GAP} - T_{GUARD}$ when $T_{ON} = T_{OFF}$, then $T_{SETTLING}$ can be calculated by T_{GAP} and a certain guard time at ONU side.
- See Figure 2. T_{GAP} be less than 250ns is guaranteed.

Table 5 – Electrical Specifications and Timing

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
10G Transmitter						
Data Input Differential Swing	V_{IN}	120		820	mVp-p	1
Input Differential Impedance	Z_{IN}	80	100	120	Ω	
Transmitter Disable Voltage - Low	$V_{TDIS, L}$	0		0.8	V	2
Transmitter Disable Voltage - High	$V_{TDIS, H}$	2.0		Vcc	V	
1G Transmitter						
Data Input Differential Swing	V_{IN}	200		1600	mVp-p	3
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
Transmitter Fault Indication Voltage -	VTFI, L	0		0.4	V	

Low						
Transmitter Fault Indication Voltage - High	VTFI, H	2.4		V _{CC}	V	
10G Receiver						
Data Output Differential Swing	V _{OUT}	120		850	mV _{P-P}	4
Loss of Signal Detected Voltage - Low	V _{LOS, L}	0		0.8	V	5
Loss of Signal Detected Voltage - High	V _{LOS, H}	2.4		V _{CC3}	V	
Loss of Signal Assert Time	T _{LOSA}			700	ns	
Loss of Signal Deassert Time	T _{LOSD}			512	ns	
Output Differential Impedance	R _{out}	80	100	120	Ω	
Time to Initialize 2-Wire Interface	t _{2w_start_u}	-	-	300	ms	
Time to Initialize	t _{start_up}	-	-	300	ms	
1G Receiver						
Data Output Differential Swing	V _{OUT}	400		1600	mV _{P-P}	6
Loss of Signal Detected Voltage - Low	V _{LOS, L}	0		0.4	V	
Loss of Signal Detected Voltage - High	V _{LOS, H}	2.4		V _{CC3}	V	
Loss of Signal Assert Time	T _{LOSA}			700	ns	
Loss of Signal Deassert Time	T _{LOSD}			512	ns	
Output Differential Impedance	R _{out}	80	100	120	Ω	
Time to Initialize 2-Wire Interface	t _{2w_start_u}	-	-	300	ms	
Time to Initialize	t _{start_up}	-	-	300	ms	

Notes:

1. Compatible with CML input, AC coupled internally. (See [Recommended Interface Circuit](#)).
2. Tx_Diablo (See [Pin Function Definitions](#)).
3. Compatible with LVPECL input, AC coupled internally. (See [Recommended Interface Circuit](#)).
4. Compatible with CML Output, AC coupled internally. guaranteed in the full range of input optical power (See [Recommended Interface Circuit](#))
5. LOS (See [Recommended Interface Circuit](#)).
6. Compatible with LVPECL Output, DC coupled internally. guaranteed in the full range of input optical power (See [Recommended Interface Circuit](#))

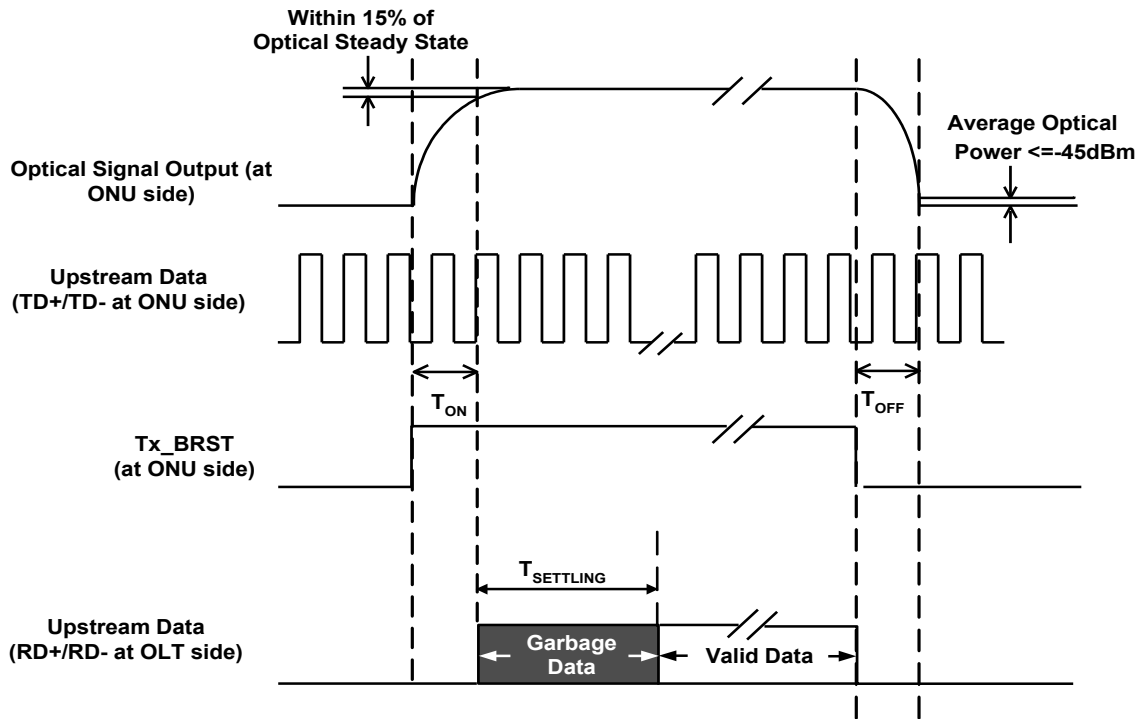


Figure 1, Timing Parameter Definition in Burst Mode Sequence (Sole ONU Application)

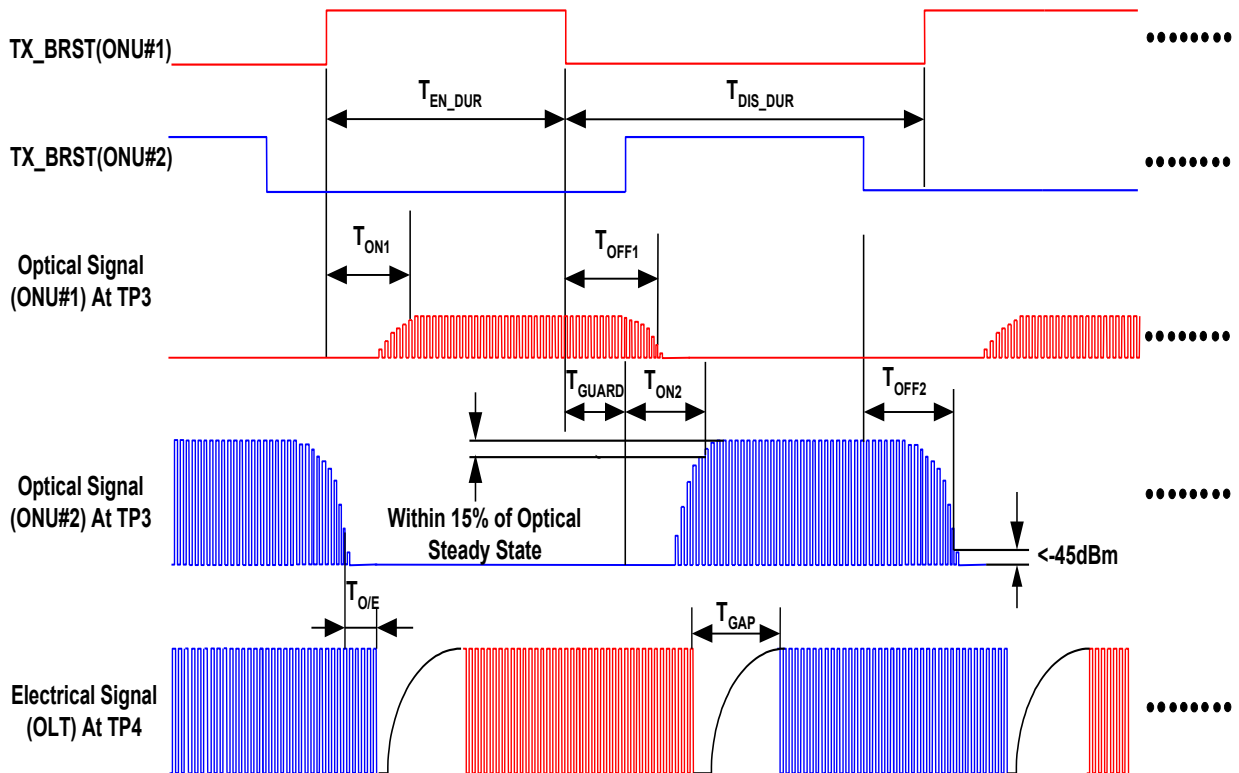


Figure 2, Timing Parameter Definition in Burst Mode Sequence (Dual ONUs Application)

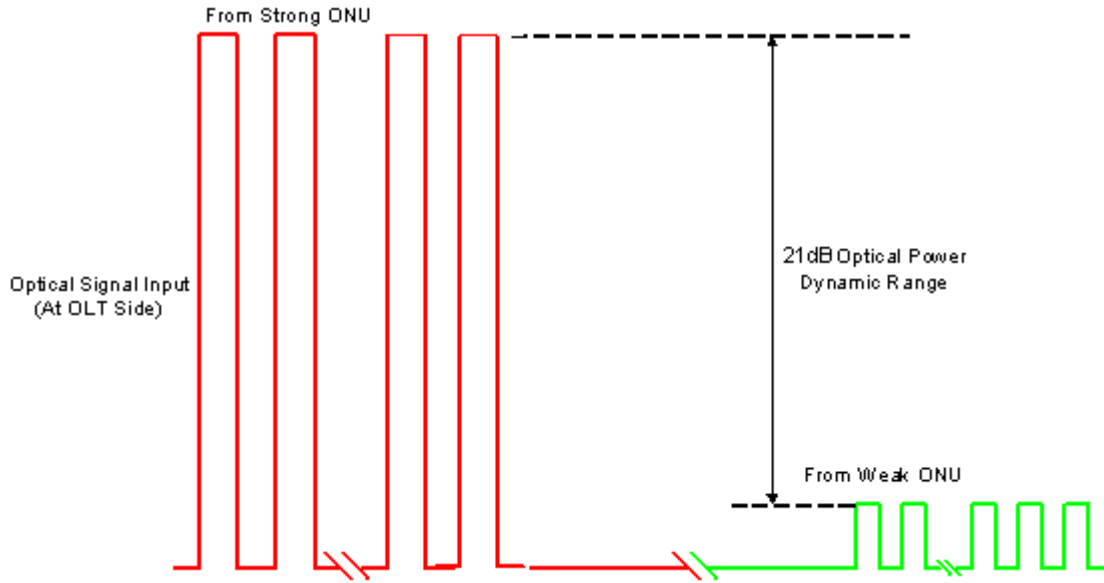


Figure 3, Burst Mode Receiver Dynamic Range

Diagnostics

Table 6 – Diagnostics (A0h)

Logic Address	Parameter	Range	Accuracy	Unit	Calibration	Notes
96-97	Temperature	-10 to 80	±3	°C	Internal	LSB equal to 1/256C
98-99	Voltage	0 to Vcc	±3%	V	Internal	LSB equal to 100uV
100-101	Bias Current(10G)	0 to 140	10%	mA	Internal	LSB equal to 4uA
106-107	Bias Current(1G)	0 to 80				LSB equal to 4uA
102-103	Tx Power(10G)	0 to 6	±3	dBm	Internal	LSB equal to 0.4uW
108-109	Tx Power(1G)	-1 to 8				LSB equal to 0.4uW
104-105	Rx Power	-30 to -9	±3	dBm	External	LSB equal to 0.1uW

Table 7 – EEPROM Serial ID (01h)

Name of Field	Description of Field	Address	Hex	ASCII
Identifier	Type of transceiver	128	06	XFP
Ext. Identifier	Extended identifier of type of transceiver	129	B0	
Connector	Code for connector type	130	01	SC/UPC
Transceiver	Code for electronic compatibility or optical compatibility	131	00	
		132	00	
		133	00	

		134	80	
		135	00	
		136	00	
		137	00	
		138	00	
Encoding	Code for high speed serial encoding algorithm	139	80	64B/66B
BR_MIN	Minimum bit rate, units of 100 Mbits/s.	140	67	10.3125Gbps
BR_MAX	Maximum bit rate, units of 100 Mbits/s	141	67	
Length (SMF)_Km	Link length supported for single mode fiber, units of km	142	14	20km
Length (E-50um)	Link length supported for EBW 50/125 μm, units of 2 m	143	00	
Length (20μm)	Link length supported for 20 um OM2 fiber, units of 10 m	144	00	
Length (62.5μm)	Link length supported for 62.5 um OM1 fiber, units of 10 m	145	00	
Length (Copper)	Link length supported for copper, units of meters	146	00	
Device Tech		147	F6	EML Laser and APD
Vendor Name	Vendor name (ASCII)	148	53	S
		149	4F	O
		150	55	U
		151	52	R
		152	43	C
		153	45	E
		154	50	P
		155	48	H
		156	4F	O
		157	54	T
		158	4F	O
		159	4E	N
		160	49	I
		161	43	C
162	53	S		
163	20	[Space]		

Table 8 – EEPROM Serial ID (01h)

Name of Field	Description of Field	Address	Hex	ASCII
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CDR support	CDR Rate Support	164	40	For 10.3Gb/s
Vendor OUI	XFP vendor IEEE company ID for Source Photonics Inc.	165	00	
		166	1F	
		167	22	
Vendor PN	Part number in ASCII, e.g. XPPXER3CDFB	168	58	X
		169	50	P
		170	50	P
		171	58	X
		172	45	E
		173	52	R
		174	33	3
		175	43	C
		176	44	D
		177	46	F
		178	42	B
		179	20	[Space]
		180	20	[Space]
		181	20	[Space]
		182	20	[Space]
		183	20	[Space]
Vendor Rev.	Revision level for part number provide by vendor (ASCII)	184	30	01version
		185	31	
Wavelength	Laser wavelength, nm	186	7B	1577nm
		187	3C	
Wavelength tolerance	Guaranteed range of laser wavelength (+/- value) from Nominal wave-length.	188	03	5nm
		189	E8	
Max Case Temp	Maximum Case Temperature	190	4B	75c
CC_BASE	Check code for Base ID Fields addresses (120-190)	191	xx	
Power Supply	Power supply current requirements and max power dissipation	192	C8	3.5W(max)
		193	00	
		194	8A	
		195	00	
Vendor SN	Serial number provided by vendor	196	xx xx xx xx	
Date Code	Vendor's manufacturing date code	212	xx xx xx xx xx xx xx xx	
Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented	220	08	Average power
Enhanced Option	Indicates which optional enhanced features are implemented	221	xx	

AUX monitoring	Defines quantities reported by Aux. A/D channels	222	27	+3.3v power supply
CC_EXT	Check code for the Extended ID Fields (addresses 192 to 222)	223	xx	
Wavelength for 2.5G		224	xx xx	
Wavelength for 1.25G		226	74	1490nm
		227	68	
Vendor Spec.		228	xx xx xx xx xx xx xx xx	

Table 9 – Pin Definitions

Pi n	Logic	Symbol	Name/Description	
1		GND	Module Ground	1
2	LVPECL-I	TX_1G+	Transmitter Non-Inverted Data Input(1G)	2
3	LVPECL-I	TX_1G-	Transmitter Inverted Data Input(1G)	
4		GND	Module Ground	
5	LVTTL-I	TX_DIS	Turn off Transmitter Laser Out, Control 10G and 1G Transmitter	3
6		V _{CC5}	+5V Power Supply(For TEC)	
7		GND	Module Ground	
8		V _{CC3}	+3.3V Power Supply(TX)	
9		V _{CC3}	+3.3V Power Supply(RX)	
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	Module Absent Indication	
13	LVTTL-I	RX_Rate Select	RX_RateSel, When hold low, 1.25Gb/s bandwidth is selected; When hold high, 10.3125 Gb/s bandwidth is selected. Host connect serial 200ohm resistor.	
14	LVTTL-O	RX_LOS	Receiver Loss of Signal indication	4
15		GND	Module Ground	2
16		GND	Module Ground	
17	CML-O	RX_10G-	Receiver Inverted Data Output(10G),DC coupled	2
18	CML-O	RX_10G+	Receiver Non-Inverted Data Output(10G), DC coupled	
19		GND	Module Ground	
20	LVPECL-O	RD_1G-	Receiver Inverted Data Output(10G),DC coupled	5
21	LVPECL-O	RD_1G+	Receiver Non-Inverted Data Output(10G), DC coupled	
22		NC	Not Connect	
23	LVTTL-I	RX_RSSI_TRIG	RSSI Trigger Input	
24		NC	Not Connect	

25		NC	Not Connect	
26		NC	Not Connect	2
27		GND	Module Ground	
28	CML-I	TD-	Transmitter Inverted Data Input(10G)	6
29	CML-I	TD+	Transmitter Non-Inverted Data Input(10G)	
30		GND	Module Ground	2

Note

1. Module ground pins GND are isolated from the module case and chassis ground within the module.
2. Compatible with LVPECL/CML input, AC coupled internally. (See [Recommended Interface Circuit](#))
3. Tx_Diable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7-10 KΩ resistor.
4. LOS is an open collector/drain output, which should be pulled up with a 4.7K-10KΩ resistor. Pull up voltage between 2.0V and V_{CCT}. (See [Recommended Interface Circuit](#))
These are the differential receiver outputs.
5. They are DC coupled 100 Ω differential lines which should be terminated with 100 Ω (differential) at the user SERDES. (See [Recommended Interface Circuit](#))
6. These are the differential transmitter inputs. They are AC coupled differential lines with 100Ω differential termination inside the module. (See [Recommended Interface Circuit](#))

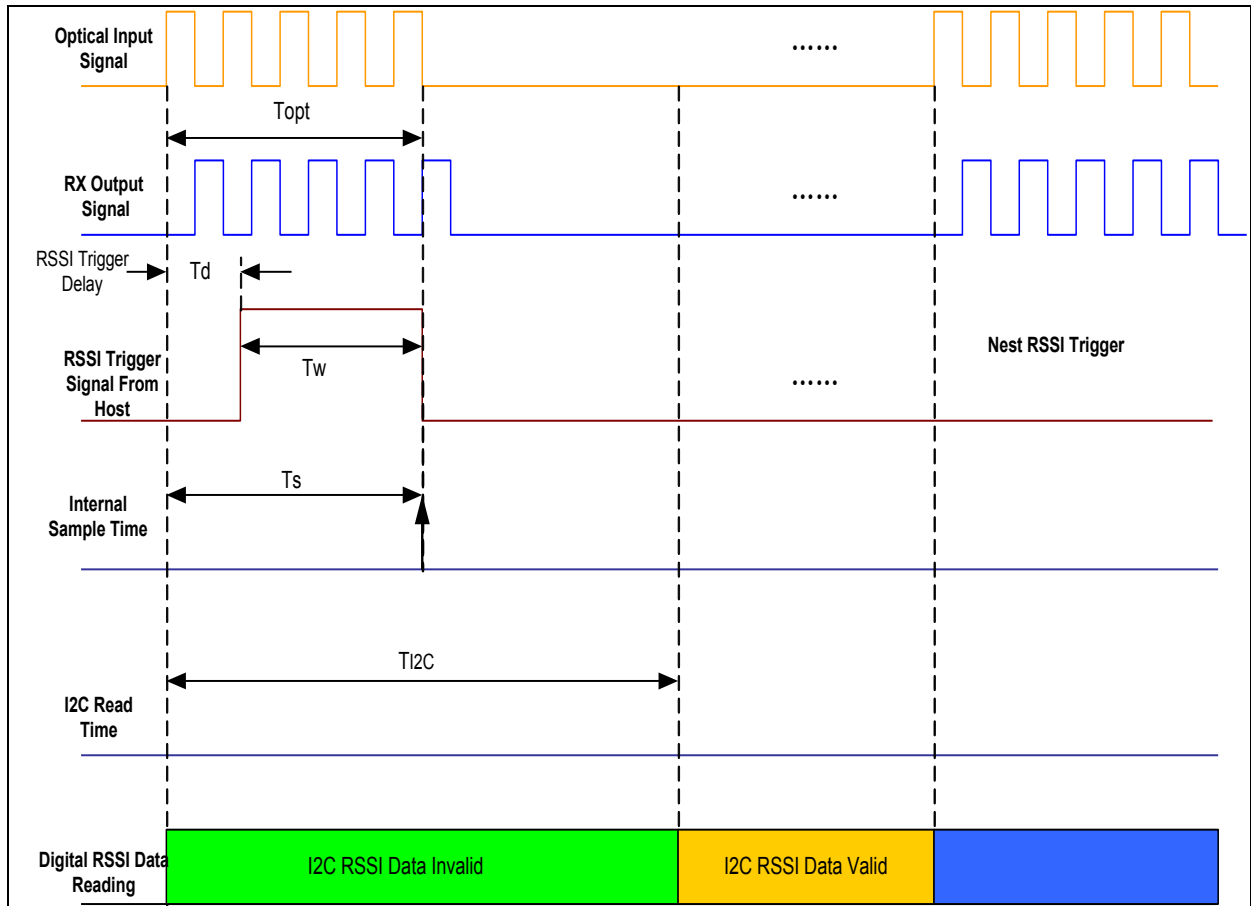
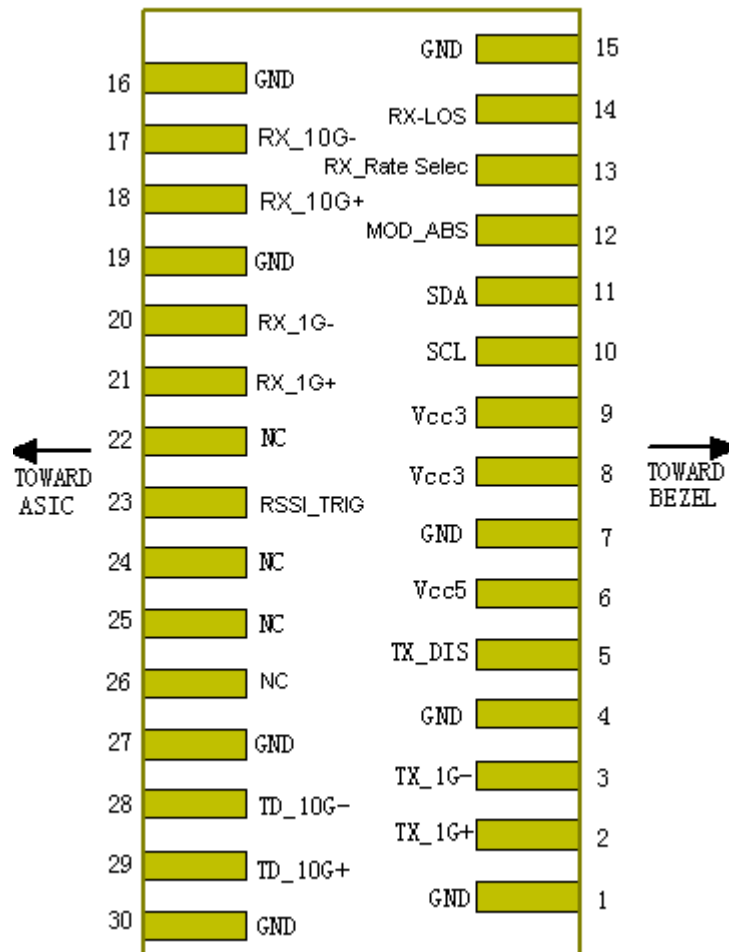


Figure 4, RSSI Timing Diagram

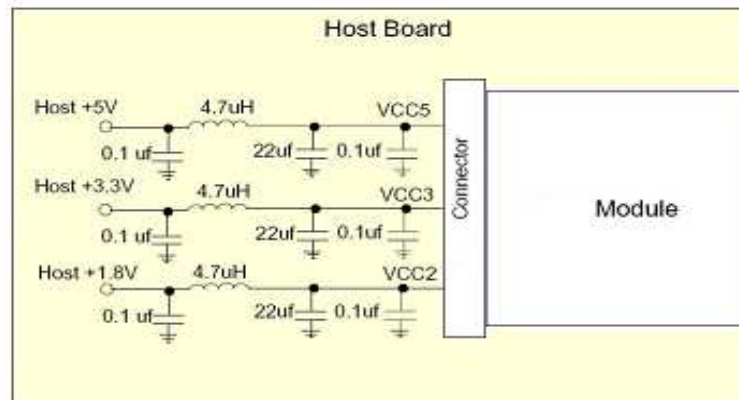
Table 10 – RSSI Parameter

Item	Symbol	Min	Typ	Max	unit
Optical Signal Length	T _{opt}	1184	1200	1216	ns
RSSI Trigger Delay	T _d	496	512	528	ns
RSSI Trigger Delay Width	T _w	584	600	616	ns
Internal Sample Time	T _s	1080	1112	1216	ns
I ² C Read Time	T _{I²C}	500			us
RSSI				+/-3	dB

Module PCB Pin out



Recommended Host Board Power Supply Circuit



Recommended Interface Circuit

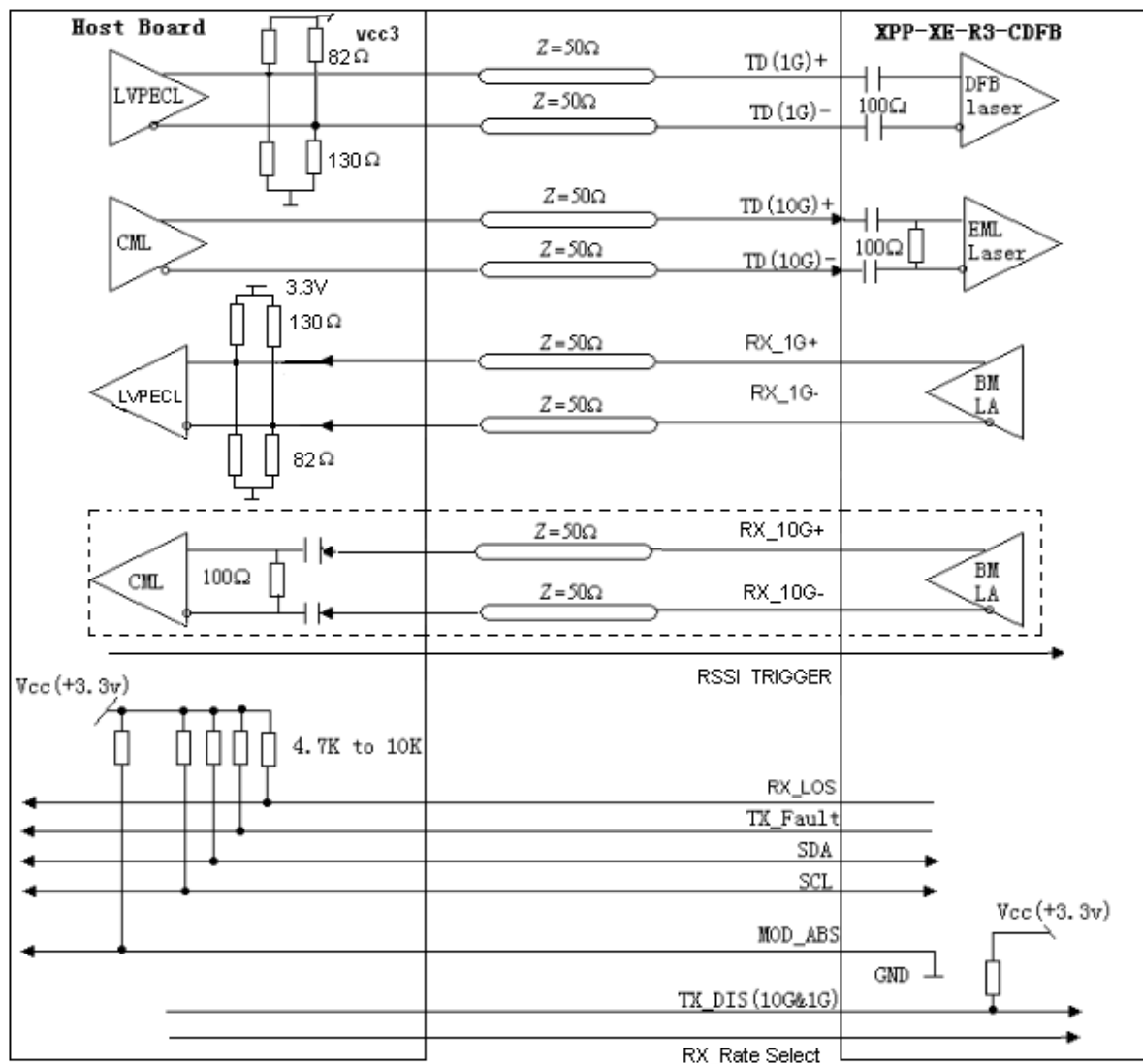
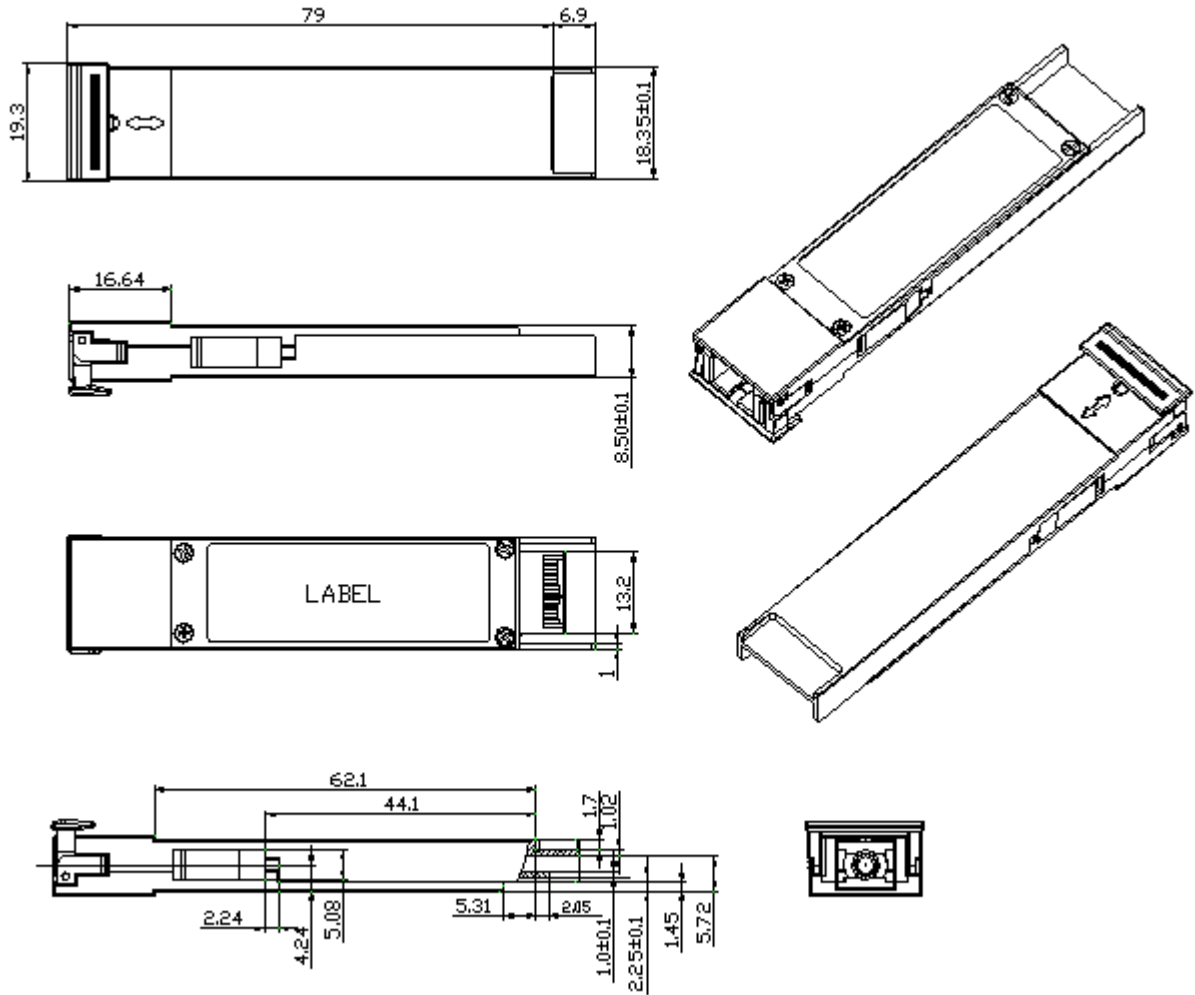


Figure 5, Recommended Interface Circuit

Notes: Support receiver rate selected between 1.25Gbps bandwidth and 10.3125Gbps bandwidth. The virtual box show the different interface circuit.

Mechanical Design



Order Information

Table 11– Order Information

Part No.	Application	Data Rate	Laser Source	Fiber Type
XPP-XE- R3-CDFB	10/10G Base PR30 OLT	Tx1 1.25Gb/s ,Tx2 10.3125G and Rx1 10.3125Gb/s or RX2 1.25Gb/s	1490 nm DFB 1577 nm 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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