

X2-LR

10Gb/s 1310nm X2 Optical Transponder

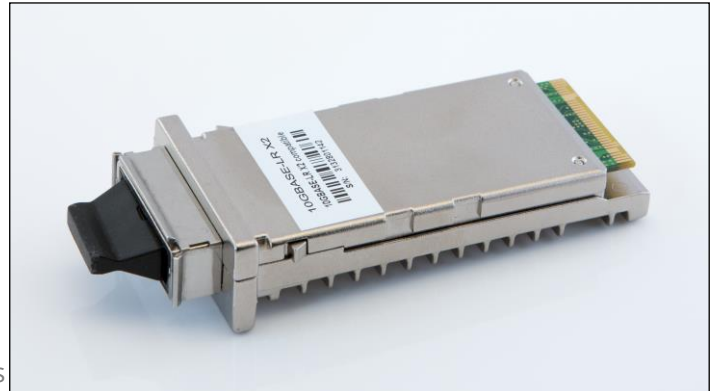
10GBASE-SR 10km Reach



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Product Features

- ✓ Hot pluggable X2 MSA form factor
- ✓ Support of IEEE 802.3ae 10GBASE-LR at 10.3125Gbps
- ✓ Hot Pluggable 70-PIN Connector with XAUI Electrical Interface
- ✓ SC Duplex Optical Receptacle
- ✓ Uncooled 1310nm DFB Laser
- ✓ Full duplex transmission mode
- ✓ Digital Optics Monitoring
- ✓ Management and control via MDIO 2-wire bus
- ✓ Power Supply :+3.3V, APS(+1.2V)
- ✓ Commercial operating temperature:0°C to +70°C
- ✓ Up to 10Km on SMF
- ✓ RoHS Compliant



Applications

- ✓ 10G Ethernet 10GBASE-LR

Descriptions

X2-LR is a high performance and cost effective optical transponder module. It consists of 10.3Gbit/s 1310nm uncooled directly-modulated DFB transmitter and PIN receiver, 4x3.125Gbps Ethernet Signal input XAUI interface, Mux and Demux with clock and data recovery (CDR). Digital diagnostics functions are available via MDIO 2-wire bus, they are compliant with IEEE Std 802.3ae 10G Ethernet 10GBase-LR and X2 MSA Rev2.0b X2-LR is compliant with RoHS.

Ordering Information

Table 1. Ordering Information

Part Number	Transmitter	Output Power	Receiver Sensitivity	Reach	Temp	DDM	RoHS
X2-LR	1310nm DFB	-8.2 ~ 0.5dBm	PIN < -14.4dBm	10Km	0 ~ 70°C	Available	Compliant

Electrical Pin Description

Table 2. Electrical Pin Description

Pin	Logic	Symbol	Name/Description
1	-	GND	Electrical Ground
2	-	GND	Electrical Ground
3	-	GND	Electrical Ground
4	-	5.0V	Reserved - Not Required
5	I	3.3V	Power Supply
6	I	3.3V	Power Supply
7	I	APS	Adaptive power supply

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8	I	APS	Adaptive power supply
9	Open Drain-O	LASI	Link Alarm Status Interrupt. 10-22KΩ resistor pull-up to 1.2V on host Logic High: Normal Operation; Logic low: Link Alarm is indicated
10	Open Drain-I	RESET	Low active Reset input ,10KΩ pull-up inside Transponder Logic High: Normal Operation; Logic low: Reset asserted
11	-	VEND SPECIFIC	Vendor Specific Pin, leave unconnected
12	Open Drain-I	TX ON/OFF	High active Transmitter Enable, 10KΩ pull-up inside Transponder Logic High: Transmitter on ; Logic low: Transmitter off
13	-	RESERVED	Reserved
14	O	MOD DETECT	1KΩ to Ground inside Transponder
15	-	VEND SPECIFIC	Vendor Specific Pin, leave unconnected
16	-	VEND SPECIFIC	Vendor Specific Pin, leave unconnected
17	Open Drain-I/O	MDIO	Management Data I/O. Requires external 10-22KΩ pull-up to 1.2V on host
18	1.2V COMS-I	MDC	Management Clock Input
19	1.2V COMS-I	PRTAD4	Port Address bit 4(low=0)
20	1.2V COMS-I	PRTAD3	Port Address bit 3(low=0)
21	1.2V COMS-I	PRTAD2	Port Address bit 2(low=0)
22	1.2V COMS-I	PRTAD1	Port Address bit 1(low=0)
23	1.2V COMS-I	PRTAD0	Port Address bit 0(low=0)
24	-	VEND SPECIFIC	Vendor Specific Pin, leave unconnected
25	I	APS SET	Feedback input for APS, Input of APS setting resistor
26	-	RESERVED	Reserved
27	O	APS SENSE	APS Sense output for APS control circuit
28	I	APS	Adaptive power supply
29	I	APS	Adaptive power supply
30	I	3.3V	Power Supply
31	I	3.3V	Power Supply
32	-	5.0V	Reserved - Not Required
33	-	GND	Electrical Ground
34	-	GND	Electrical Ground
35	-	GND	Electrical Ground

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36	-	GND	Electrical Ground
37	-	GND	Electrical Ground
38	-	RESERVED	Reserved
39	-	RESERVED	Reserved
40	-	GND	Electrical Ground
41	O	RX LANE 0+	Module XAUI output lane 0+
42	O	RX LANE 0-	Module XAUI output lane 0-
43		GND	Electrical Ground
44	O	RX LANE 1+	Module XAUI output lane 1+
45	O	RX LANE 1-	Module XAUI output lane 1-
46		GND	Electrical Ground
47	O	RX LANE 2+	Module XAUI output lane 2+
48	O	RX LANE 2-	Module XAUI output lane 2-
49		GND	Electrical Ground
50	O	RX LANE 3+	Module XAUI output lane 3+
51	O	RX LANE 3-	Module XAUI output lane 3-
52		GND	Electrical Ground
53		GND	Electrical Ground
54		GND	Electrical Ground
55	I	TX LANE 0+	Module XAUI Input lane 0+
56	I	TX LANE 0-	Module XAUI Input lane 0-
57		GND	Electrical Ground
58	I	TX LANE 1+	Module XAUI Input lane 1+
59	I	TX LANE 1-	Module XAUI Input lane 1-
60		GND	Electrical Ground
61	I	TX LANE 2+	Module XAUI Input lane 2+
62	I	TX LANE 2-	Module XAUI Input lane 2-
63		GND	Electrical Ground
64	I	TX LANE 3+	Module XAUI Input lane 3+
65	I	TX LANE 3-	Module XAUI Input lane 3-
66		GND	Electrical Ground
67		RESERVED	Reserved
68		RESERVED	Reserved
69		GND	Electrical Ground
70		GND	Electrical Ground

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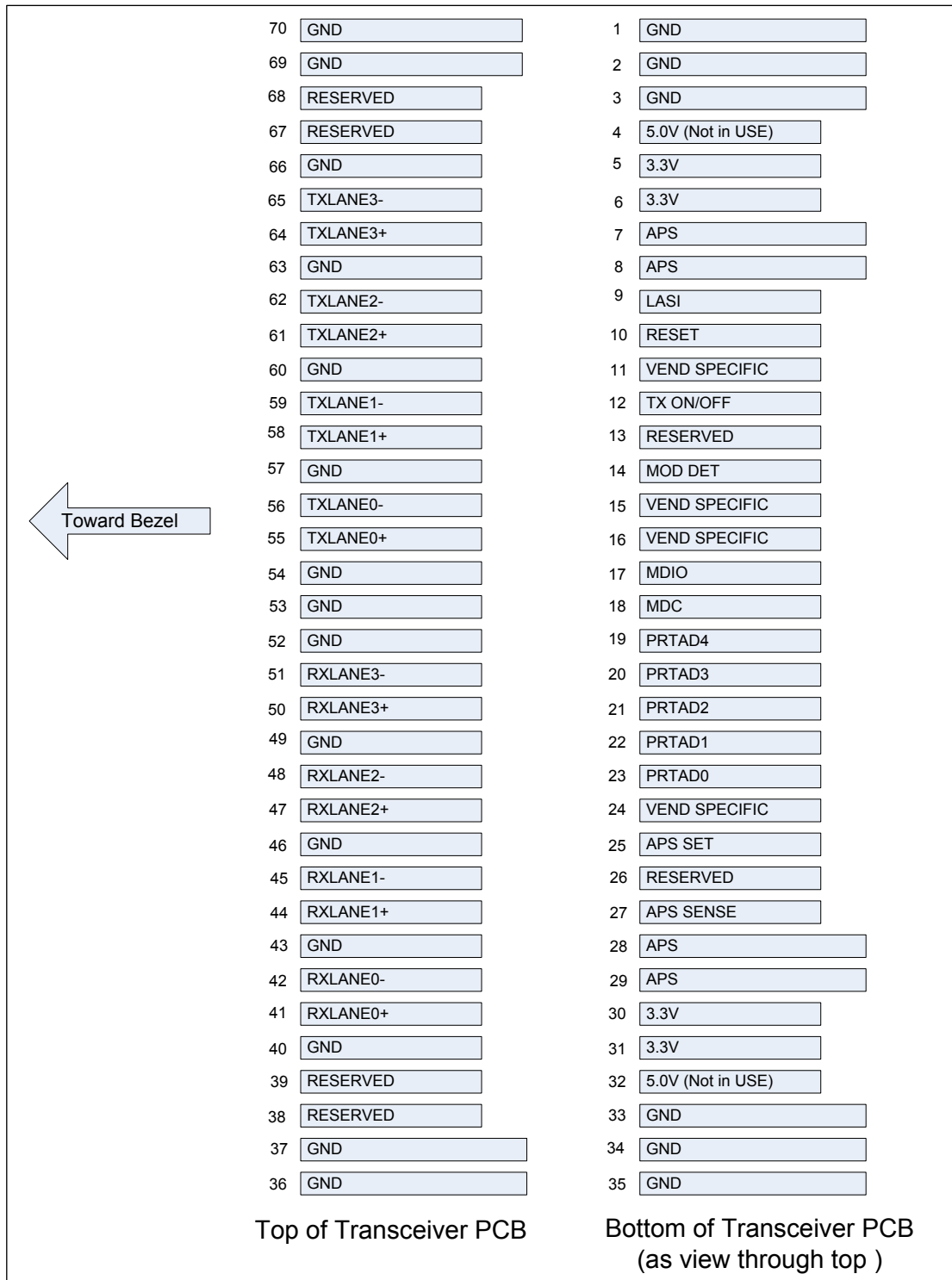


Figure 1. X2 Transponder Electrical Pad Layout

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Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Table 3. Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	T_S	-40	85	°C
Supply Voltage	V_{CC3}	0	4.0	V
Supply Voltage APS	V_{CC5}	0	1.5	V
Average Receive Optical Power	RX_{Pmax}		1.5	dBm

Recommended Operating Conditions

Table 4. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T_C	0	25	70	°C
Supply Voltage	V_{CC3}	3.135	3.3	3.465	V
Supply Voltage	V_{aps}	1.152	1.2	1.248	V
Total Power Dissipation	-		3.5	4.0	W

Transponder Electrical Characteristics

Table 5. Transponder Electrical Characteristics

XAUI I/O	Symbol	Minimum	Typical	Maximum	Unit	Notes
XAUI Data Rate	DR	-	3.125		Gb/s	-
XAUI Baud Rate Tolerance		-100	-	+100	ppm	-
XAUI Eye Mask		According to IEEE 802.3ae				
Output Differential Impedance	Z_{OUT_XAUI}	80	100	120	Ω	
Differential Input Amplitude	V_{in_xau}	220		1600	mv	1
Differential Output Amplitude	V_{out_xau}	800		1600	mv	1
Total Jitter	T_{JXAUI}			0.35	UI	2
Deterministic Jitter	D_{JXAUI}			0.37	UI	2
1.2V CMOS I/O						
Output High Voltage	V_{OH}	1	-	-	V	-

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Output Low Voltage	V_{OL}	-	-	0.15	V	-
Input High Voltage	V_{IH}	0.84	-	1.5	V	-
Input Low Voltage	V_{IL}	-	-	0.36	V	-
MDIO I/O						
Output High Voltage	V_{OHM}	1.0	-	1.5	V	-
Output Low Voltage	V_{OLM}	-0.3	-	0.2	V	-
Input High Voltage	V_{IHM}	0.84	-	1.5	V	-
Input Low Voltage	V_{ILM}	-0.3	-	0.36	V	-
MDIO Data Hold Time	t_{HOLD}	10			ns	
MDIO Data Setup Time	t_{SU}	10			ns	
Delay from MDC Rising Edge to MDIO Data Change	t_{DELAY}			300	ns	
MDC Clock Rate	f_{MAX}			2.5	MHz	

Notes:

1. Internally AC coupled.
2. XAUI Output ,No pre-equalization.

Transmitter Optical Characteristics

Table 6. Transmitter Optical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Operating Data Rate	-	-	10.3125	-	Gb/s	-
Launch Average Optical Power	P_o	-8.2	-	0.5	dBm	1
Launch Power in OMA	P_{o-OMA}	-5.2			dBm	
Center Wavelength Range	λ_c	1290	1310	1330	nm	-
Side Mode Suppression Ratio	SMSR	30			dB	
Spectral Width (-20dB)	$\Delta\lambda$		-	0.6	nm	
Extinction Ratio	EX	3.5	-	-	dB	-
Transmitter and Dispersion Penalty	TDP	-	-	3.2	dB	-
Average Optical Power (Laser Off)	P_{OFF}	-	-	-30	dBm	1
Eye Diagram						IEEE802.3ae Compliant

Notes:

1. The optical power is launched into 9/125µm SMF..

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Receiver Optical Characteristics

Table 7. Receiver Optical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Operating Data Rate	-	-	10.3125	-	Gb/s	-
Center Wavelength	λ_c	1260	-	1360	nm	
Receiver Overload (P_{avg})	P_{OL}	0.5	-	-	dBm	1
Stressed Sensitivity (OMA)	-	-	-	-10.3	dBm	
Receiver Sensitivity (OMA)	S_{OMA}	-	-	-12.6	dBm	1
Average sensitivity	S			-14.4	dBm	1
Optical Return Loss	ORL	12	-	-	dB	-

Notes:

1. PRBS $2^{31}-1$ test pattern, BER $<10^{-12}$.

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Mechanical specifications

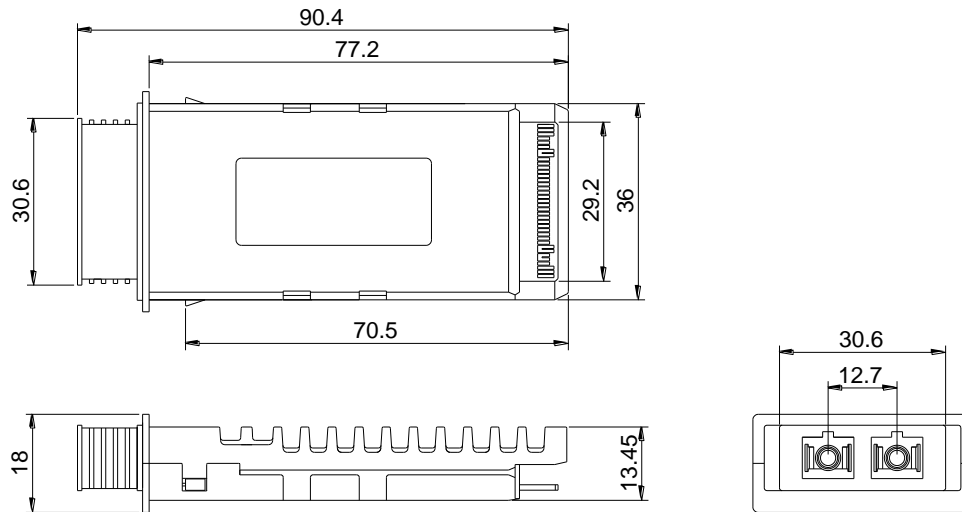


Figure 4. Outline Drawing

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