

10GE BIDI XFP Series

Datasheet



Features:

- Operating data rate is 10.3Gbps
- Distance up to 60km
- Single 3.3V Power supply and TTL Logic Interface
- Bi-directional single LC Connector Interface
- Hot Pluggable
- Compliant with MSA XFP Specification
- Compliant with Telcordia GR-253-CORE and IEEE802.3ae
- Digital Diagnostic Monitor Interface Compatible with SFF-8077I
- Operating Case Temperature Standard: -5°C~+70°C

Applications:

- 10G Ethernet
- 10G Fiber Channel
- Other Optical Link

Product Description

Trixon 10GE BIDI XFP series products are small form factor (10 Gb/s) pluggable transceiver for bi-directional optical data communications, the transmit distance up to 60km. It's comply with XFP multi-source agreement (MSA: SFF-8077I). The Digital diagnostics functions and standard transceiver serial ID information are available via a 2-wire serial interface according XFP MSA, the transceiver is RoHS compliant and lead-free per Directive 2002/95/EC and 2005/747/EC.

Ordering information

Part No.	Data Rate	Wavelength TX/RX	Fiber Type	Distance	Optical Interface	Bail Color	Temp. ^{*Note1}	DDMI
TXB-TG10-23DCR	10.3Gbps	1270nm-DFB 1330nm-PIN	SMF	10km	LC	Purple	ST	Y
TXB-TG10-32DCR	10.3Gbps	1330nm-DFB 1270nm-PIN	SMF	10km	LC	Blue	ST	Y
TXB-TG40-23DCR	10.3Gbps	1270nm-DFB 1330nm-PIN	SMF	40km	LC	Purple	ST	Y
TXB-TG40-32DCR	10.3Gbps	1330nm-DFB 1270nm-PIN	SMF	40km	LC	Blue	ST	Y
TXB-TG60-23DCR	10.3Gbps	1270nm-DFB 1330nm-APD	SMF	60km	LC	Purple	ST	Y
TXB-TG60-32DCR	10.3Gbps	1330nm-DFB 1270nm-APD	SMF	60km	LC	Blue	ST	Y

Note1: ST: -5 ~ +70 deg C

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	HBM class 1, 1000volts and above, Contact discharge on Golden Finger.
Electrostatic Discharge to the enclosure	IEC-61000-4-2 GR-1089-CORE	Compliant with standards.
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 VCCI Class B	Compliant with standards Noise frequency range: 30MHz to 18 GHz. System margins depend on customer host board and chassis design.
Immunity	IEC 61000-4-3	Compliant with standards.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product.
Component Recognition	UL and CUL EN60950-1:2006	Compliant with standards.
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards ^{*note2}

Note2:

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item 13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Trixon transceivers, because Trixon transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute Maximum Ratings^{*Note3}

Parameter	Symbol	Min	Max	Unit
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Storage Temperature	T_S	-40	+85	°C
Supply Voltage	V_{CC}	0	+4	V
Operating Humidity		5	95	%

Note3: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T_C	-5	-	70	°C	ST
Power Supply Voltage	VCC	3.14	3.3	3.47	V	
Power Supply Current	I_{CC}	-	-	450	mA	
Bit Rate		-	10.3	-	Gbps	
I2C Clock Frequency	f_{cl}	-	-	100	kHz	

Performance Specifications – Electrical

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Transmitter						
TX CML Inputs Voltage (Differential)	V_{in}	150	-	950	mVpp	AC coupled inputs
Input Impedance (Differential)	Z_{in}		100		ohm	
Tx_DISABLE Input Voltage – High		1.7	-	$V_{CC}+0.3$	V	
Tx_DISABLE Input Voltage – Low		-0.3	-	0.8	V	
Tx_FAULT Output Voltage – High		2	-	-	V	OC output, should be pull up with 4.7K – 10 K Ω on the host board
Tx_FAULT Output Voltage – Low		-	-	0.4	V	$I_{OL} = 1mA$
Receiver						
CML Outputs Voltage (Differential)	V_{out}	300	-	850	mVpp	AC coupled outputs
Output Impedance (Differential)	Z_{out}	-	100	-	ohm	
Rx_LOS Output Voltage – High		2	-	-	V	OC output, should be pull up with 4.7K – 10 K Ω on the host board
Rx_LOS Output Voltage – Low		-	-	0.4	V	$I_{OL} = 1mA$
MOD_DEF (0:2)	V_{OH}	2.5			V	
	V_{OL}	0		0.5	V	

Timing Specifications

Parameter	Symbol	Min	Typ.	Max	Unit
TX Disable Assert Time	T_{off}	-	-	100	us
TX Disable Negate Time	T_{on}	-	-	2	ms
RX_LOS Assert Time	T_{los_on}	-	-	100	us
RX_LOS De-Assert Time	T_{los_off}	-	-	100	us

Performance Specifications – Optical

(1270nm/1330nm DFB and 1330nm/1270nm PIN, 10km-SMF)

Parameter	Symbol	Min	Typ.	Max	Unit
Transmitter					
Centre Wavelength	λ_c	1260	1270	1280	nm
		1320	1330	1340	nm
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Spectral Width (-20dB)	$\Delta\lambda$	-	-	1	nm
Average Output Power*note4	P _{out}	-5	-	0	dBm
Extinction Ratio	ER	3.5	-	-	dB
Average Power of OFF Transmitter	P _{out-off}	-	-	-30	dBm
Transmitter Dispersion Penalty	TDP	-	-	2	dB
Relative Intensity Noise	RIN	-	-	-128	dB/Hz
Output Optical Eye	Compliant with IEEE802.3ae-2005				
Receiver					
Centre Wavelength	λ_c	1320	-	1340	nm
		1260	-	1280	nm
Receiver Sensitivity*note5	SEN	-	-	-14	dBm
Receiver Overload	P _{max}	0.5	-	-	dBm
LOS De-Assert	LOS _D	-	-	-18	dBm
LOS Assert	LOS _A	-30	-	-	dBm
LOS Hysteresis	LOS _H	0.5	-	4	dB

(1270nm/1330nm DFB and 1330nm/1270nm PIN, 40km-SMF)

Parameter	Symbol	Min	Typ.	Max	Unit
Transmitter					
Centre Wavelength	λ_c	1260	1270	1280	nm
		1320	1330	1340	nm
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Spectral Width (-20dB)	$\Delta\lambda$	-	-	1	nm
Average Output Power*note4	P _{out}	+1	-	+5	dBm
Extinction Ratio	ER	3.5	-	-	dB
Average Power of OFF Transmitter	P _{out-off}	-	-	-30	dBm
Transmitter Dispersion Penalty	TDP	-	-	2	dB
Relative Intensity Noise	RIN	-	-	-128	dB/Hz
Output Optical Eye	Compliant with IEEE802.3ae-2005				
Receiver					
Centre Wavelength	λ_c	1320	-	1340	nm
		1260	-	1280	nm
Receiver Sensitivity*note5	SEN	-	-	-15	dBm
Receiver Overload	P _{max}	0.5	-	-	dBm
LOS De-Assert	LOS _D	-	-	-18	dBm

LOS Assert	LOSA	-30	-	-	dBm
LOS Hysteresis	LOSH	0.5	-	4	dB

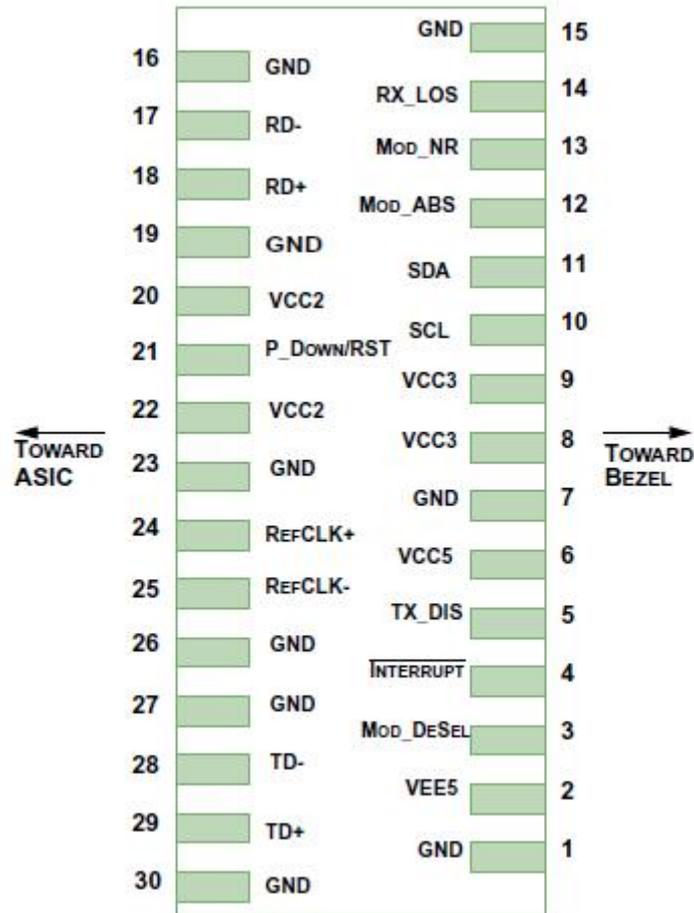
(1270nm/1330nm DFB and 1330nm/1270nm APD, 60km-SMF)

Parameter	Symbol	Min	Typ.	Max	Unit
Transmitter					
Centre Wavelength	λ_c	1260	1270	1280	nm
		1320	1330	1340	nm
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Spectral Width (-20dB)	$\Delta\lambda$	-	-	1	nm
Average Output Power*note4	P _{out}	+1	-	+6	dBm
Extinction Ratio	ER	3.5	-	-	dB
Average Power of OFF Transmitter	P _{out-off}	-	-	-30	dBm
Transmitter Dispersion Penalty	TDP	-	-	2	dB
Relative Intensity Noise	RIN	-	-	-128	dB/Hz
Output Optical Eye	Compliant with IEEE802.3ae-2005				
Receiver					
Centre Wavelength	λ_c	1320	-	1340	nm
		1260	-	1280	nm
Receiver Sensitivity*note5	SEN	-	-	-20	dBm
Receiver Overload	P _{max}	0.5	-	-	dBm
LOS De-Assert	LOSD	-	-	-18	dBm
LOS Assert	LOSA	-30	-	-	dBm
LOS Hysteresis	LOSH	0.5	-	4	dB

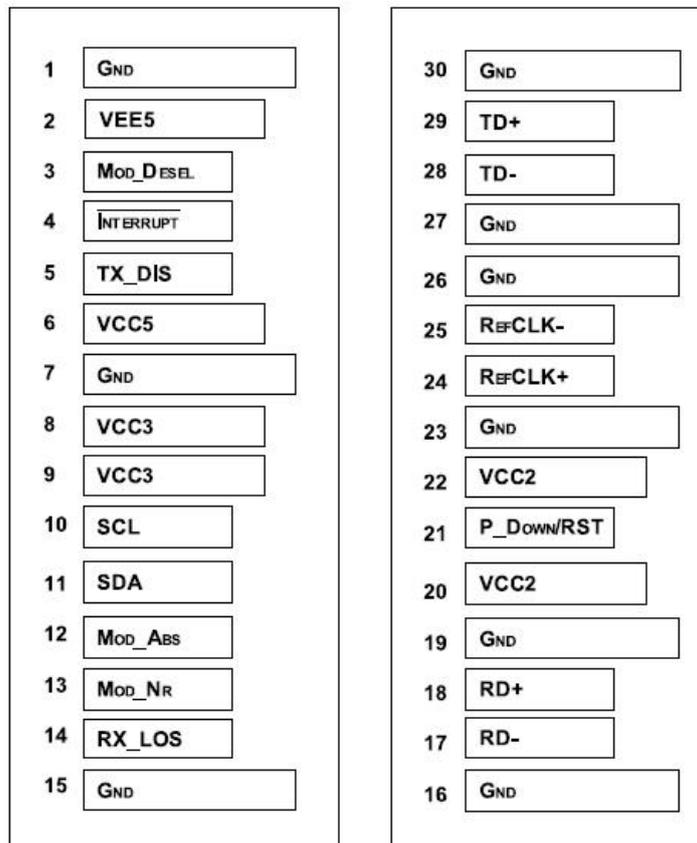
Note4: Output is coupled into a 9/125um SMF.

Note5: Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps, BER≤10⁻¹², with 9/125um SMF

SFP Transceiver Electrical Pad Layout



Host PCB XFP pad assignment top view



Bottom of Board
(As viewed thru top of board)

Top of Board

XFP module contact assignment

Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 10
2	TX Fault	Transmitter Fault Indication	3	Note 6
3	TX Disable	Transmitter Disable	3	Note 7, Module disables on high or open.
4	SDA	Module Definition 2	3	2-wire Serial Interface Data Line.
5	SCL	Module Definition 1	3	2-wire Serial Interface Clock.
6	MOD-ABS	Module Definition 0	3	Note 8
7	RS0	RX Rate Select (LVTTTL).	3	Rate Select 0, optionally controls SFP+ module receiver. This pin is pulled low to VeeT with a >30K resistor..
8	LOS	Loss of Signal	3	Note 9
9	RS1	TX Rate Select (LVTTTL).	1	Rate Select 1, optionally controls SFP+ module transmitter. This pin is pulled low to VeeT with a >30K resistor
10	VeeR	Receiver Ground	1	Note 10
11	VeeR	Receiver Ground	1	Note 10
12	RD-	Inv. Received Data Out	3	Note 11
13	RD+	Received Data Out	3	Note 11
14	VeeR	Receiver Ground	1	Note 10
15	VccR	Receiver Power	2	3.3V ± 5%, Note 12
16	VccT	Transmitter Power	2	3.3V ± 5%, Note 12
17	VeeT	Transmitter Ground	1	Note 10
18	TD+	Transmit Data In	3	Note 13
19	TD-	Inv. Transmit Data In	3	Note 13
20	VeeT	Transmitter Ground	1	Note 10

Note6: TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10K_Ω resistor on the host board. Pull up voltage between 2.0V and VccT/R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

Note7: TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K – 10 K_Ω resistor. Its states are: Low: Transmitter on; High: Transmitter Disabled; Open: Transmitter Disabled.

Note8: Module Absent, connected to VeeT or VeeR in the module.

Note9: LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K –10K_Ω resistor. Pull up voltage between 2.0V and VccT/R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

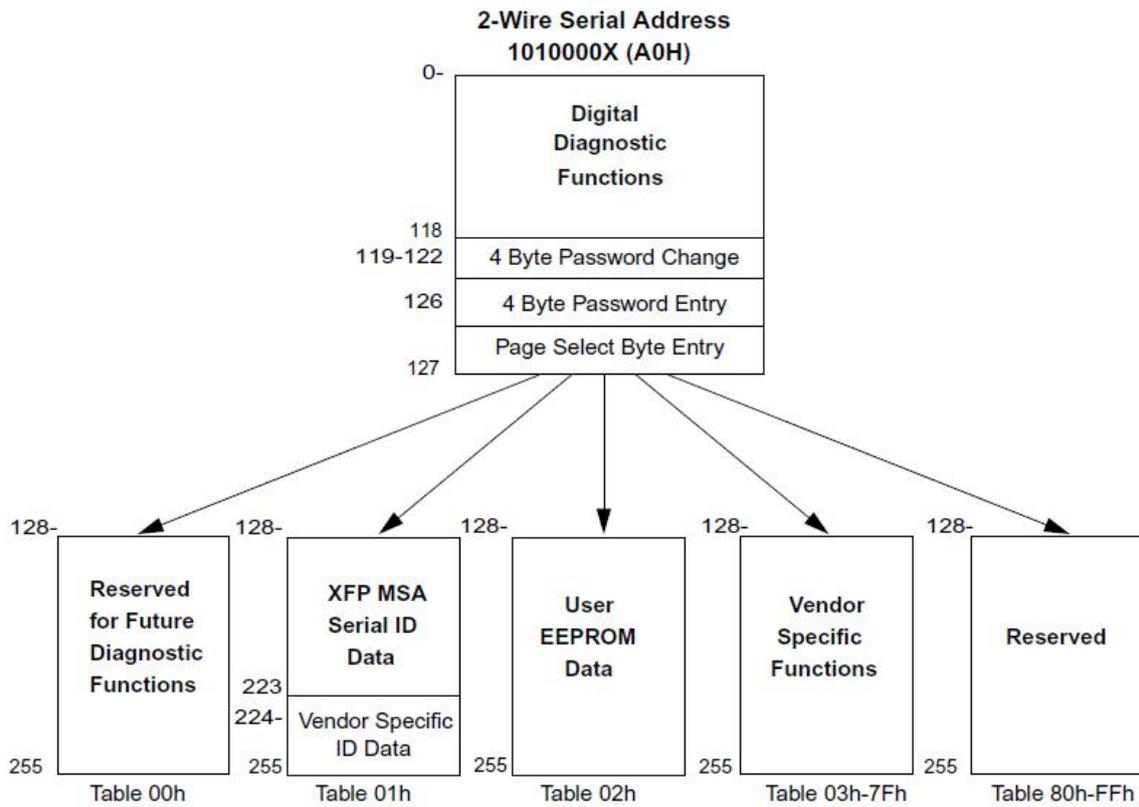
Note10: The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.

Note11: RD-/+: These are the differential receiver outputs. They are AC coupling that is done inside the module and is thus not required on the host board.

Note12: VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. VccR and VccT may be internally connected within the SFP transceiver module.

Note13: TD-/+: These are the differential transmitter inputs. They are AC-coupled that is done inside the module and is thus not required on the host board.

Digital Diagnostic Functions



Digital Diagnostic Memory Map Specific Data Field Descriptions

As defined by the XFP MSA, Trixon XFP series products provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory..

Digital Diagnostic Monitoring Specifications

Monitor accuracy				
Parameter	Min	Typ	Max	Units
Internally measured transceiver temperature	-	-	±3	°C

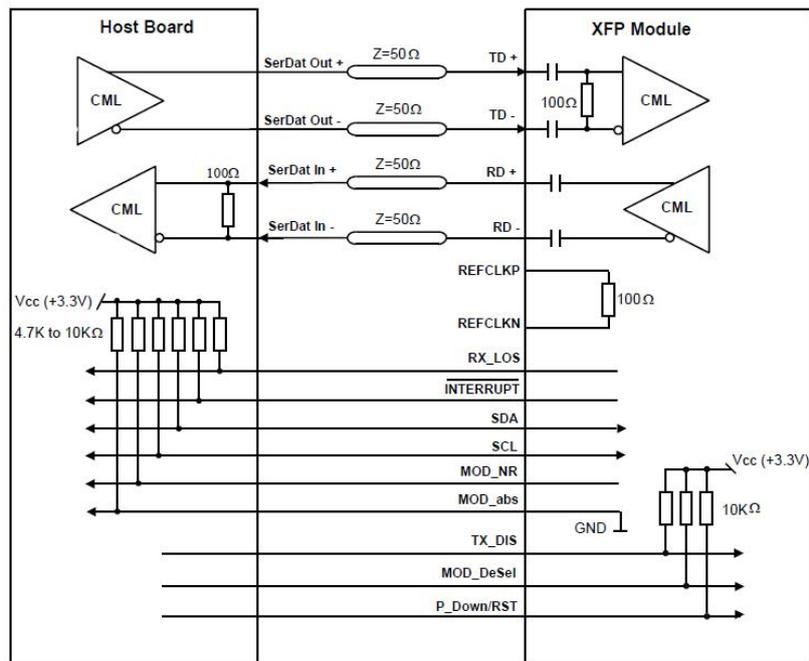
Internally measured transceiver supply voltage	-	-	±3%	V
Measured TX bias current	-	-	±10	%
Measured TX output power	-	-	±3	dBm
Measured RX received average optical power	-	-	±3	dBm

Dynamic range for operation*Note16

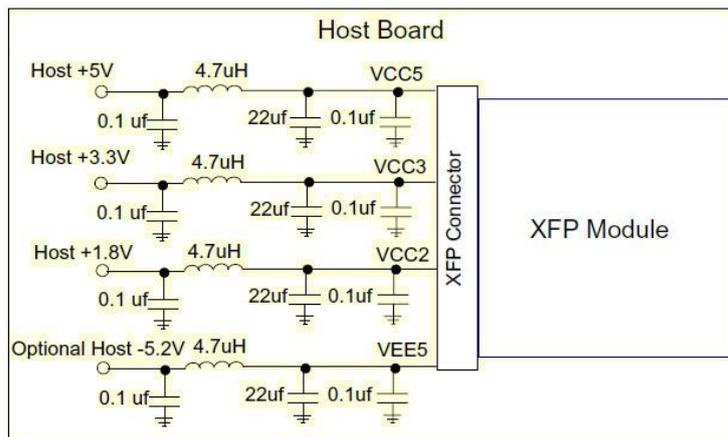
Parameter		H-Alarm	H-Warnin g	L-Warning	L-Alarm	Units
Internally measured transceiver temperature	ST	+85	+80	-5	-10	°C
	IT	+100	+95	-35	-40	
Internally measured transceiver supply voltage		3.63	3.47	3.13	2.97	V
Measured TX bias current	FP/DFB Laser	120	110	10	5	
Measured TX output power		Pout_MAX+1	Pout_MAX	Pout_MIN	Pout_MIN-1	dBm
Measured RX received average optical power		Overload+1	Overload	SEN	SEN-2	dBm

Note16: It is permissible to be adjusted according to the manufacturer's testing result.

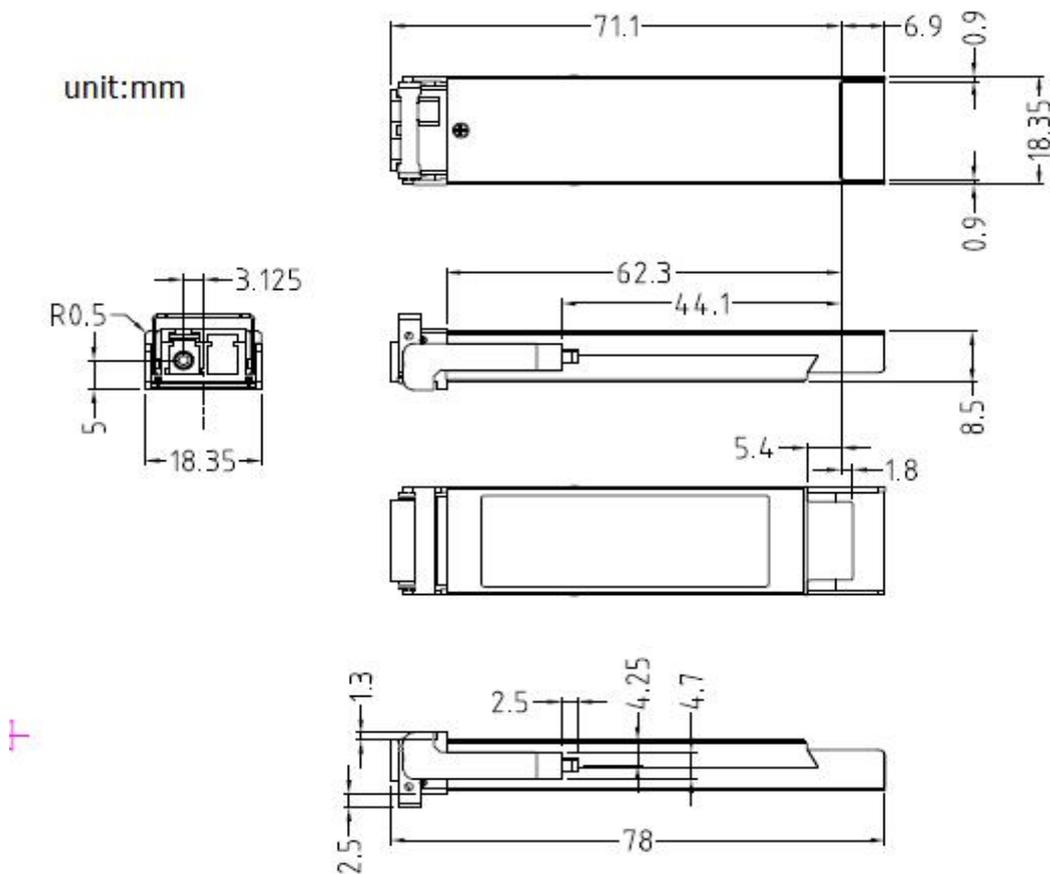
Recommended Circuit



Recommended Host Board Power Supply Circuit



Mechanical Dimension



Eye Safety

These transceivers are Class 1 laser products. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

Obtaining Document

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Notice

Trixon reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance.

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