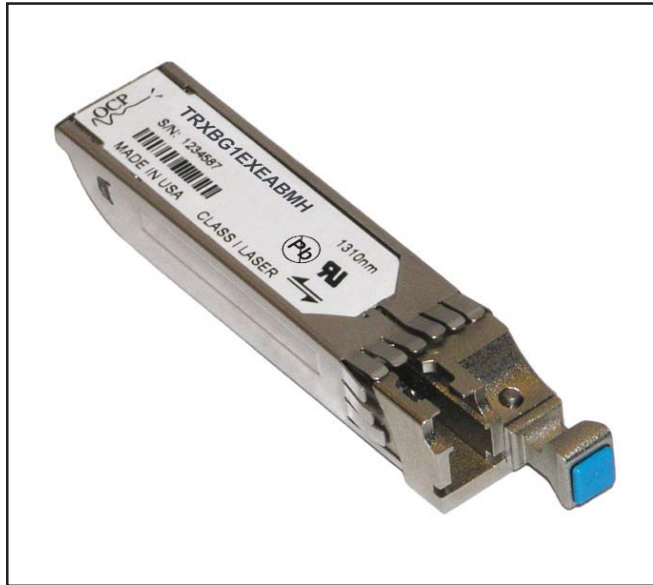




TRXBG1EXM

Multi-rate Single Fiber Bi-Directional Gigabit Ethernet SFP Transceivers with Digital Diagnostics



Features

- ☑ Lead Free Design & Fully RoHS Compliant
- ☑ Compatible with SFP MSA
- ☑ Compatible with IEEE 802.3-2005 Gigabit Ethernet 1000BASE-BX PMD Specifications
- ☑ Wavelengths of 1310nm & 1550nm
- ☑ Digital Diagnostics through Serial Interface
- ☑ Internal Calibration for Digital Diagnostics
- ☑ Distances up to 40km
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Duplex LC Optical Interface
- ☑ Hot-pluggable
- ☑ TX Fault & Loss of Signal Outputs
- ☑ TX Disable Input
- ☑ Single +3.3V Power Supply

Description

The TRXBG1EXM modules are single fiber, bi-directional SFP transceivers that provide a quick and reliable interface for 1000BASE-BX Gigabit Ethernet applications. Two types of modules are available: 1310nm DFB laser-based transceiver (BX-U), and 1550nm DFB laser-based transceivers (BX-D). These transceivers are designed to support data rates ranging from 1250Mb/s down to 125Mb/s and are integrated with digital diagnostics monitoring, which provides features to detect a problem before system performance is impacted. The diagnostic functions, alarms and warning features are provided via an I²C serial interface as described per the Multi-Source Agreement (MSA) document, SFF-8472 (Rev. 9.4).

All modules meet Class I Laser Safety requirements in accordance with the U.S. and international standards as described in the FDA/CDRH and IEC-60825 documents,

respectively. The TRXBG1EXM transceivers connect to standard 20-pad SFP connectors for hot plug capability. This allows the system designer to make configuration or maintenance changes by simply plugging in different types of transceivers without removing the power supply from the host system.

The transceivers have color-coded latches that identify the TX wavelength. The MSA compatible latch offers an easy and convenient way to release the module.

The transmitter and receiver DATA interfaces are AC-coupled internally. LV-TTL Transmitter Disable control input and Loss of Signal output interfaces are also provided.

The transceivers operate from a single +3.3V power supply over an operating case temperature range of -5°C to +70°C or -40°C to +85°C. The package is made of metal.

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_{st}	- 40	+ 85	°C
Operating Case Temperature ¹	Commercial	- 5	+ 70	°C
	Industrial	- 40	+ 85	
Supply Voltage	V_{CC}	0	+ 4.5	V
Input Voltage	V_{in}	0	V_{CC}	V
Lead Terminal Finish, Reflow Profile Limits and MSL	-	-	NA	-

¹Measured on top side of SFP module at the front center vent hole of the cage.

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Transmitter Performance Characteristics (over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate	B	125	-	1250	Mb/s
Optical Output Power ¹	BX-U	- 6.5	-	0	dBm
	BX-D	- 7.0	-	0	
Center Wavelength	BX-U	1260	1310	1360	nm
	BX-D	1540	1550	1560	
Spectral Width (-20dB)	$\Delta\lambda_{20}$	-	-	1.0	nm
Extinction Ratio	P_{hi}/P_{lo}	8	-	-	dB
Transmitter OFF Output Power	-	-	-	- 45	dBm
Relative Intensity Noise	RIN_{12OMA}	-	-	- 113	dB/Hz
Optical Return Loss Tolerance	$ORLT$	-	-	12	dB
Transmitter Reflectance	TR	-	-	- 12	dB
Total Jitter	TJ	-	-	227	ps
Transmitter Output Eye	Compliant with Eye Mask Defined in IEEE 802.3-2005 Standard				
¹ Measured average power coupled into single mode fiber.					

Receiver Performance Characteristics (over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate	B	125	-	1250	Mb/s
Minimum Input Optical Power (10^{-12} BER) ¹	P_{min}	- 23.5	-	-	dBm
Maximum Input Optical Power (10^{-12} BER) ¹	P_{max}	- 3.0	-	-	dBm
LOS Thresholds	Increasing Light Input	P_{los+}	-	- 23.5	dBm
	Decreasing Light Input	P_{los-}	- 35.0	-	
LOS Hysteresis ¹	-	0.5	-	-	dB
Total Jitter	TJ	-	-	266	ps
Wavelength of Operation	BX-D	1260	-	1360	nm
	BX-U	1480	-	1560	
Receiver Reflectance	-	-	-	- 12	dB
Electrical 3dB Upper Cutoff Frequency	-	-	-	1500	MHz
¹ Measured at 1250Mb/s with 2 ⁷ -1 PRBS and 1310nm, 1490nm, and 1550nm wavelengths.					

Laser Safety: All transceivers are Class I Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions.



Optical Communication Products, Inc.

DATE OF MANUFACTURE:

MANUFACTURED IN THE USA

This product complies with

21 CFR 1040.10 and 1040.11

Meets Class I Laser Safety Requirements

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Transmitter Electrical Interface (over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input Voltage Swing (TD+ & TD-) ¹	V_{PP-DIF}	0.5	-	2.4	V
Input HIGH Voltage (TX Disable) ²	V_{IH}	2.0	-	V_{CC}	V
Input LOW Voltage (TX Disable) ²	V_{IL}	0	-	0.8	V
Output HIGH Voltage (TX Fault) ³	V_{OH}	2.0	-	$V_{CC} + 0.3$	V
Output LOW Voltage (TX Fault) ³	V_{OL}	0	-	0.8	V

¹Differential peak-to-peak voltage.

²There is an internal 4.7 to 10k Ω pull-up resistor to V_{CC} .

³Open collector compatible, 4.7 to 10k Ω pull-up resistor to V_{CC} (Host Supply Voltage).

Receiver Electrical Interface (over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output Voltage Swing (RD+ & RD-) ¹	V_{PP-DIF}	0.6	-	2.0	V
Output HIGH Voltage (LOS) ²	V_{OH}	2.0	-	$V_{CC} + 0.3$	V
Output LOW Voltage (LOS) ²	V_{OL}	0	-	0.5	V

¹Differential peak-to-peak voltage across external 100 Ω load.

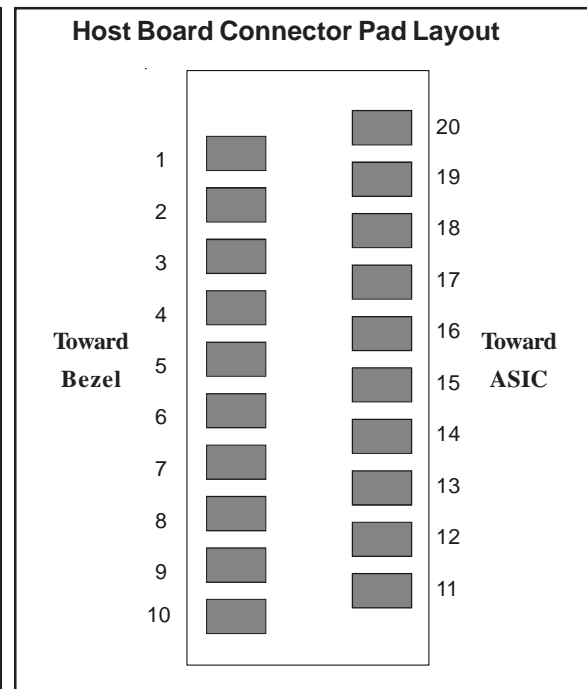
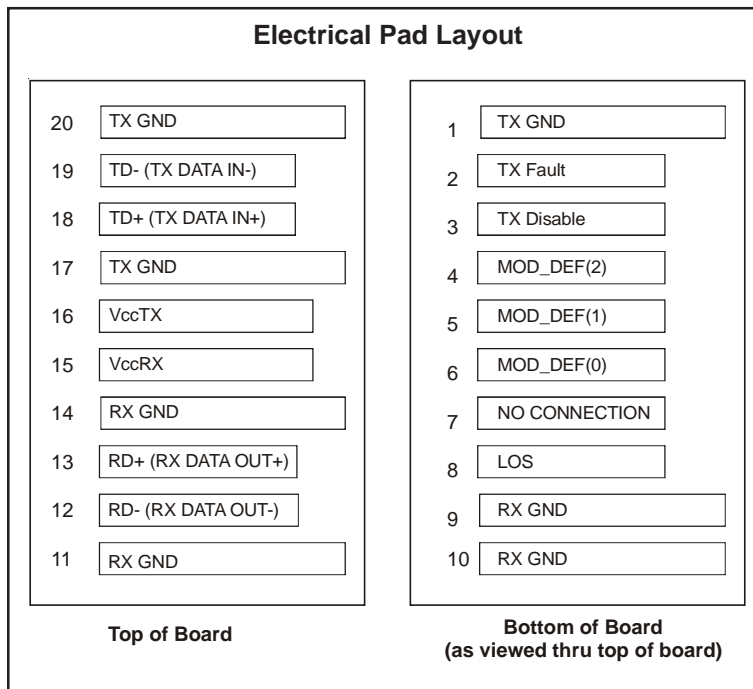
²Open collector compatible, 4.7 to 10k Ω pull-up resistor to V_{CC} (Host Supply Voltage).

Electrical Power Supply Characteristics (over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	V_{CC}	3.13	3.3	3.47	V
Supply Current	I_{CC}	-	175	300	mA

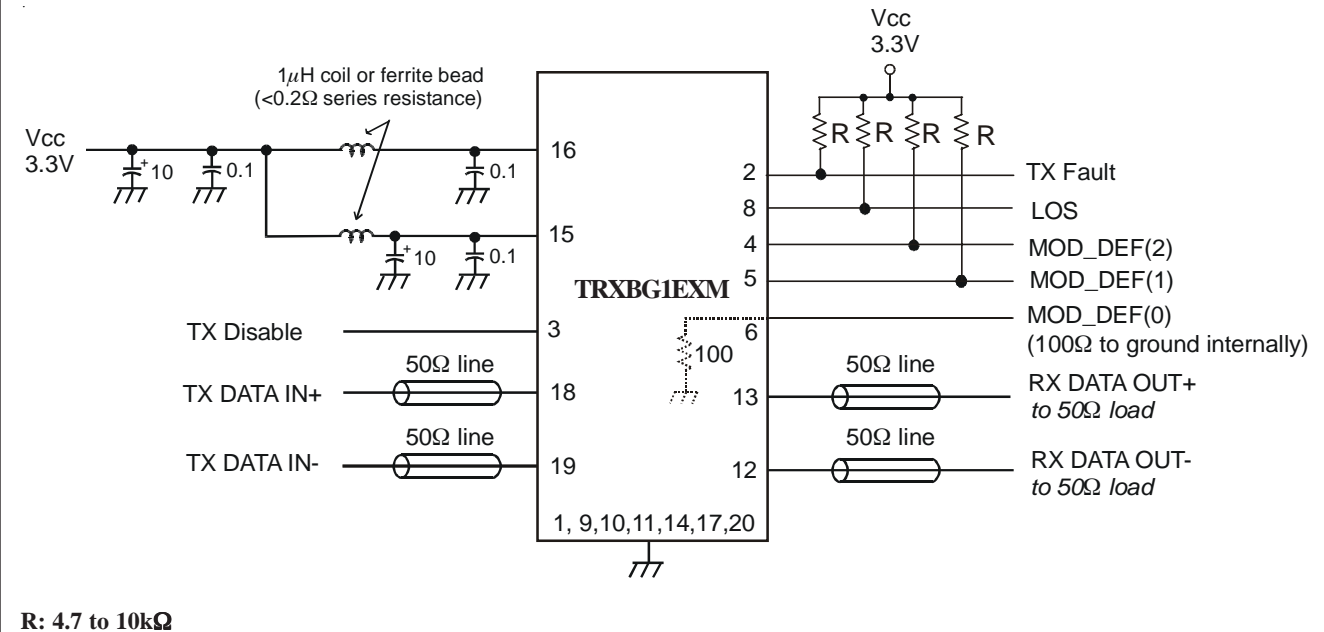
Module Definition

MOD_DEF(0) pin 6	MOD_DEF(1) pin 5	MOD_DEF(2) pin 4	Interpretation by Host
TTL LOW	SCL	SDA	Serial module definition protocol



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Example of SFP host board schematic



Application Notes

Electrical interface: All signal interfaces are compliant with the SFP MSA specification. The high speed DATA interface is differential AC-coupled internally and can be directly connected to a 3.3V SERDES IC. All low speed control and sense output signals are open collector TTL compatible and should be pulled up with a 4.7 - 10kΩ resistor on the host board.

Loss of Signal (LOS): The Loss of Signal circuit monitors the level of the incoming optical signal and generates a logic HIGH when an insufficient photocurrent is produced.

TX Fault: The output indicates LOW when the transmitter is operating normally, and HIGH with a laser fault including laser end-of-life. TX Fault is an open collector/drain output and should be pulled up with a 4.7 - 10kΩ resistor on the host board. TX Fault is non-latching (automatically deasserts when fault goes away).

TX Disable: When the TX Disable pin is at logic HIGH, the transmitter optical output is disabled (less than -45dBm).

Serial Identification and Monitoring: The module definition of SFP is indicated by the three module definition pins, MOD_DEF(0), MOD_DEF(1) and MOD_DEF(2).

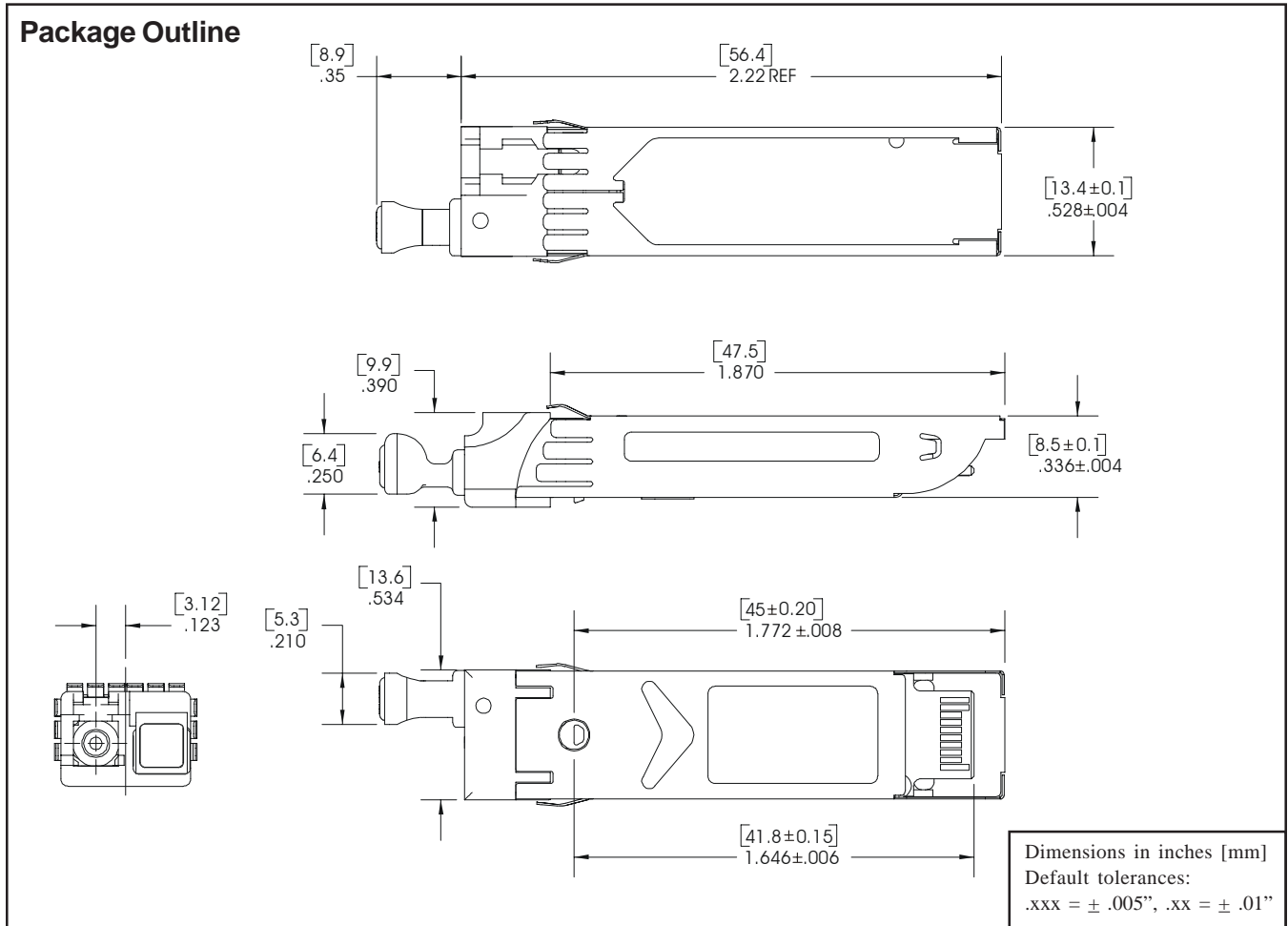
Upon power up, MOD_DEF(1:2) appear as NC (no connection), and MOD_DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol (standard two-wire I²C serial interface) and generates the serial clock signal (SCL). The positive edge clocks data into the EEPROM segments of the SFP that are not write protected, and the negative edge clocks data from the SFP. This device does not require clock stretching.

The serial data signal (SDA) is for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The supported monitoring functions are temperature, voltage, bias current, transmitter power, average receiver signal, all alarms and warnings, and software monitoring of TX Fault/LOS. The device is internally calibrated.

The data transfer protocol and the details of the mandatory and vendor specific data structures are defined in the SFP MSA, and SFF-8472, Rev. 9.4.

Power supply and grounding: The power supply line should be well-filtered. All 0.1µF power supply bypass capacitors should be as close to the transceiver module as possible.

TRXBG1EXM



Ordering Information

Model Name	Temperature Range	Latch Color	Typical Wavelength		Distance
			Tx	Rx	
TRXBG1EXNBBMH	- 5°C to +70°C	Blue	1310nm	1550nm	40km
TRXBG1EXNBYM5	- 5°C to +70°C	Yellow	1550nm	1310nm	40km
TRXBG1EXNABMH	- 40°C to +85°C	Blue	1310nm	1550nm	40km
TRXBG1EXNAYM5	- 40°C to +85°C	Yellow	1550nm	1310nm	40km

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