

The GigaTech Products **ET4201-SX-GT** is programmed to be fully compatible and functional with all intended EDGE-CORE switching devices. This SFP optical transceiver is based on the Gigabit Ethernet IEEE 802.3 standard and is designed to be compliant with SFF-8472 SFP Multi-source Agreement (MSA). This module is designed for multimode fiber and operates at a nominal wavelength of 850nm.

## Features:

- Up to 1.25GBd bi-directional data links
- Hot-pluggable SFP footprint
- 850nm VCSEL laser transmitter
- Duplex LC Connectors
- Built in Digital Diagnostics
- Up to 300M over 62.5/125 MMF
- Up to 550M over 50/125 MMF
- Single power supply 3.3V
- Operating temperature range  
C-Temp: 0°C to 70°C



## Compliance:

- IEEE 802.3z Gigabit Ethernet
- SFP MSA SFF-8472
- RoHS
- Class 1 laser product EN 60825

## Applications

- 1.25GBd Gigabit Ethernet

## Warranty:

GigaTech Branded Optical Transceivers- Lifetime Warranty

## General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	DR		1.25		GBd	IEEE 802.3
Bit Error Rate	BER			10 <sup>-12</sup>		
Input Voltage	V <sub>CC</sub>	3	3.3	3.6	V	
Maximum Voltage	V <sub>MAX</sub>	-0.5		4	V	Electric Power Interface
Supply Current	I <sub>S</sub>		180	240	mA	Electric Power Interface
Storage Temperature	T <sub>STO</sub>	-40		85	°C	Ambient Temperature

## Optical Characteristics - Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	$\lambda$	830		860	nm	
Output Optical Power	P <sub>TX</sub>	-9		-3	dBm	Class 1 Product
Optical Modulation Amp	OMA	156			uW	
Extinction Ratio @ 1.25GBd	ER	9			dB	
Spectral Width (RMS)	$\Delta\lambda$			0.85	nm	
Relative Intensity Noise	RIN			-120	dB/Hz	
Optical Rise/Fall Time	T <sub>RF_IN</sub>		100	150	ps	
Deterministic Jitter Contribute	TX_ΔDJ		20	60	ps	
Total Jitter Contribution	TX_ΔTJ		65	125	ps	

## Optical Characteristics - Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	$\lambda_C$	770		860	nm	
Optical Receive Power	P <sub>RX</sub>			0	dBm	Average
Receiver Sensitivity @ 1.25GBd	P <sub>SENS1</sub>			-20	dBm	IEEE 802.3
Optical Return Loss	ORL	12			dB	
Receive Electrical 3dB Cutoff				1500	MHz	
LOS Assert	LOS <sub>A</sub>	-30			dBm	
LOS De-Assert	LOS <sub>D</sub>			-20	dBm	
LOS Hysteresis		0.5			dB	

## Electrical Characteristics – Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R <sub>in</sub>		100		Ω	Non Condensing
Single ended data input swing	V <sub>IN_PP</sub>	250		1200	mV	
Transmit Disable Voltage	V <sub>D</sub>	2		V <sub>CC</sub>	V	
Transmit Enable Voltage	V <sub>EN</sub>	V <sub>EE</sub>		V <sub>EE</sub> +0.8	V	

## Electrical Characteristics – Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Single ended data output swing	V <sub>OUT_PP</sub>	250	450	550	mV	
Data output rise time	T <sub>R</sub>		90	175	ps	20%-80%
Data output fall time	T <sub>F</sub>		90	175	ps	20%-80%
LOS Fault	V <sub>LOS_F</sub>	2		V <sub>CC_HOST</sub>	V	
LOS Normal	V <sub>LOS_N</sub>	V <sub>EE</sub>		V <sub>EE</sub> +0.5	V	

## Digital Diagnostic Functions

The SFP support the 2-wire serial communication protocol as defined in the SFF 8472. Digital diagnostic information are accessible over the 2-wire interface at the address 0xA2. Digital Diagnostics are internally calibrated by default. A micro controller unit inside the transceiver gathers the monitoring information and reports the status of transceiver.

**Transceiver Temperature-** Internally measured, represented as a 16 bit signed twos complement value in increments of 1/256 degrees Celsius, Temperature accuracy is better than  $\pm 3$  degrees Celsius over specified operating temperature and voltage.

**Transceiver Supply Power-** Internally measured, represented as a 16 bit unsigned integer with the voltage defined as the full 16 bit value (0 – 65535) with LSB equal to 100  $\mu$ Volt, yielding a total range of 0 to +6.55 Volts.

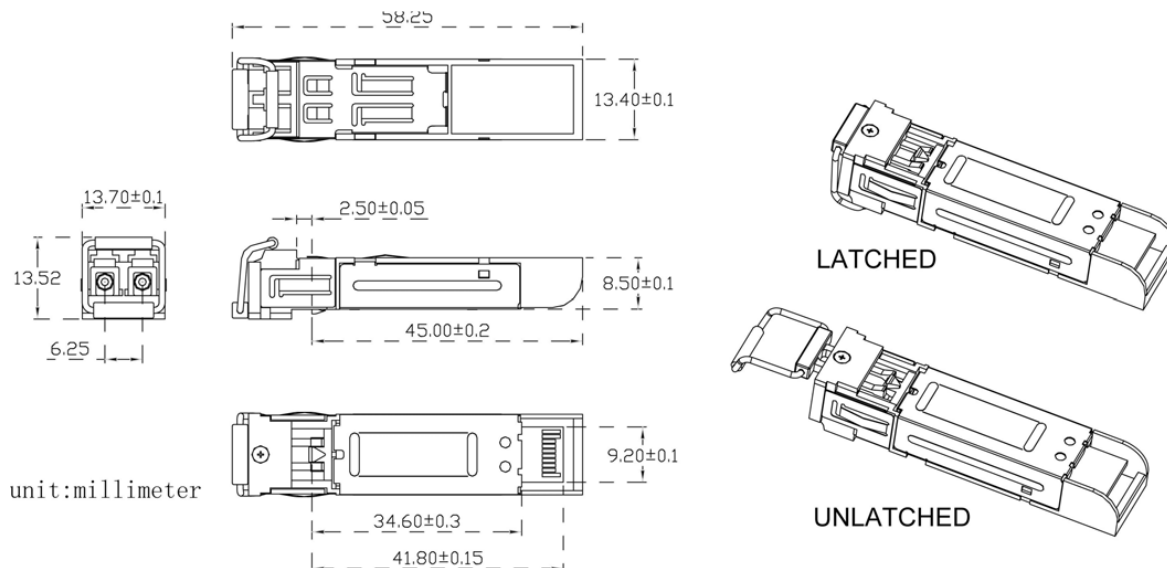
**Transceiver TX bias current-** Internally measured, represented as a 16 bit unsigned integer with the current defined as the full 16 bit value (0 – 65535) with LSB equal to 2  $\mu$ A, yielding a total range of 0 to 131mA. Accuracy is better than  $\pm 10\%$  over specified operating temperature and voltage.

**Transceiver TX output power-** Internally measured, represented as a 16 bit unsigned integer with the power defined as the full 16 bit value (0 – 65535) with LSB equal to 0.1  $\mu$ W. Data is assumed to be based on measurement of laser monitor photodiode current. Accuracy is better than  $\pm 3$ dB over specified temperature and voltage. Data is not valid when the transmitter is disabled.

**Transceiver RX received optical power-** Internally measured, represented as a 16 bit unsigned integer with the power defined as the full 16 bit 35 value (0 – 65535) with LSB equal to 0.1  $\mu$ W. Accuracy is better than  $\pm 3$ dB over specified temperature and voltage.

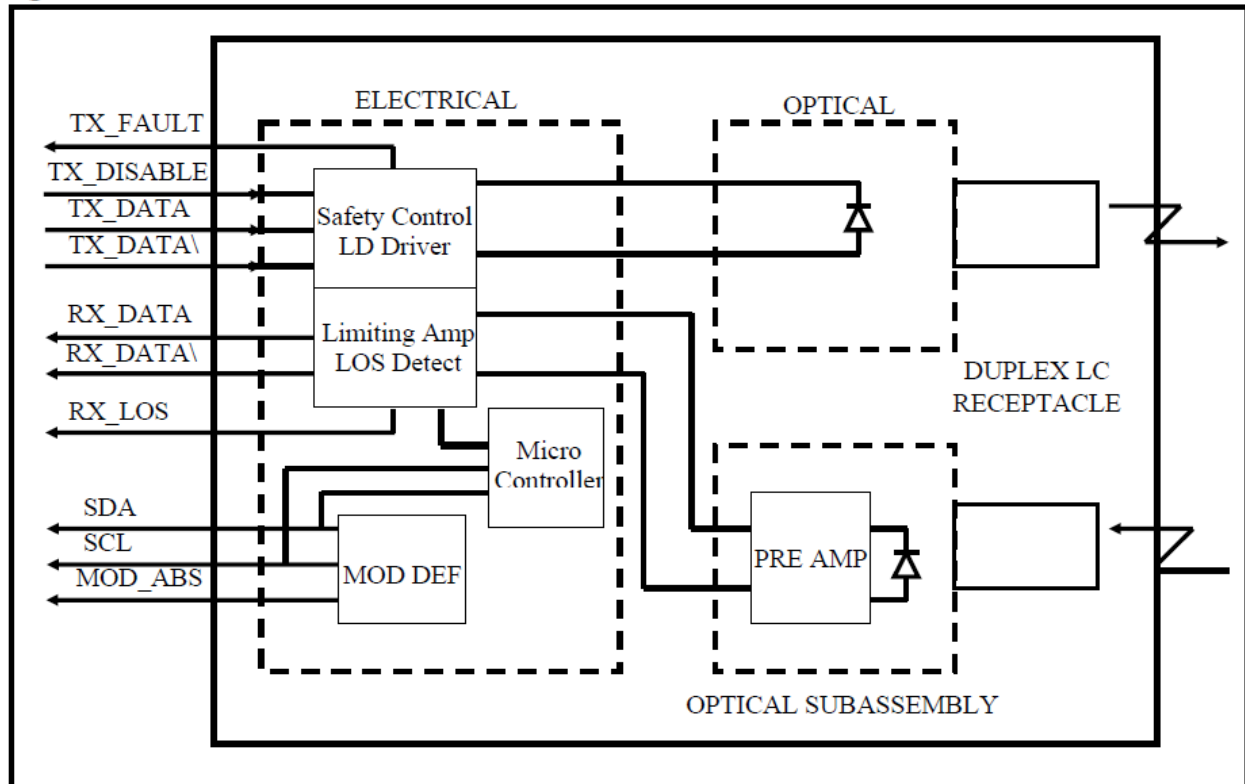
Parameter	Symbol	Accuracy	Units	Report Range	Unit	Remarks
Temperature	$T_{mon}$	$\pm 3$	$^{\circ}\text{C}$	-40 - +95	$^{\circ}\text{C}$	
Voltage	$V_{mon}$	$\pm 0.1$	V	2.9 - 3.7	V	
Bias Current	$T_F$	$\pm 10$	%	1 – 15	mA	
Tx Power	$V_{LOS\_F}$	$\pm 3$	dB	-12 – 1	dBm	
Rx Power	$V_{LOS\_N}$	$\pm 3$	dB	-25 - 1	dBm	

## Dimensions



ALL DIMENSIONS ARE  $\pm 0.2$ mm UNLESS OTHERWISE SPECIFIED UNIT: mm

## Block Diagram of Transceiver



### Transmitter Section

The VCSEL laser driver accept differential input data and provide bias and modulation currents for driving a laser. An automatic power-control (APC) feedback loop is incorporated to maintain a constant average optical power. 850nm VCSEL in an eye safe optical subassembly (OSA) mates to the fiber cable.

**TX\_DISABLE-** The TX\_DISABLE signal is high (TTL logic "1") to turn off the laser output. The laser will turn on within 1ms when TX\_DISABLE is low (TTL logic "0").

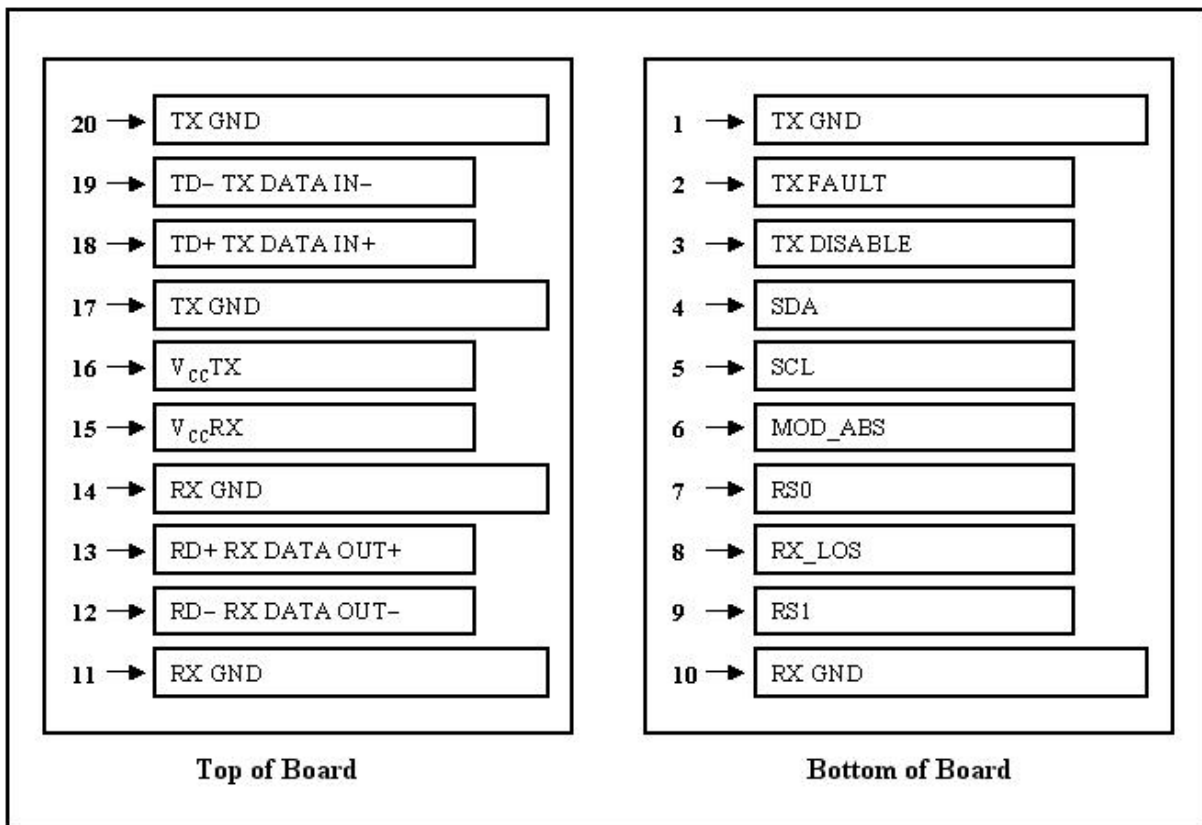
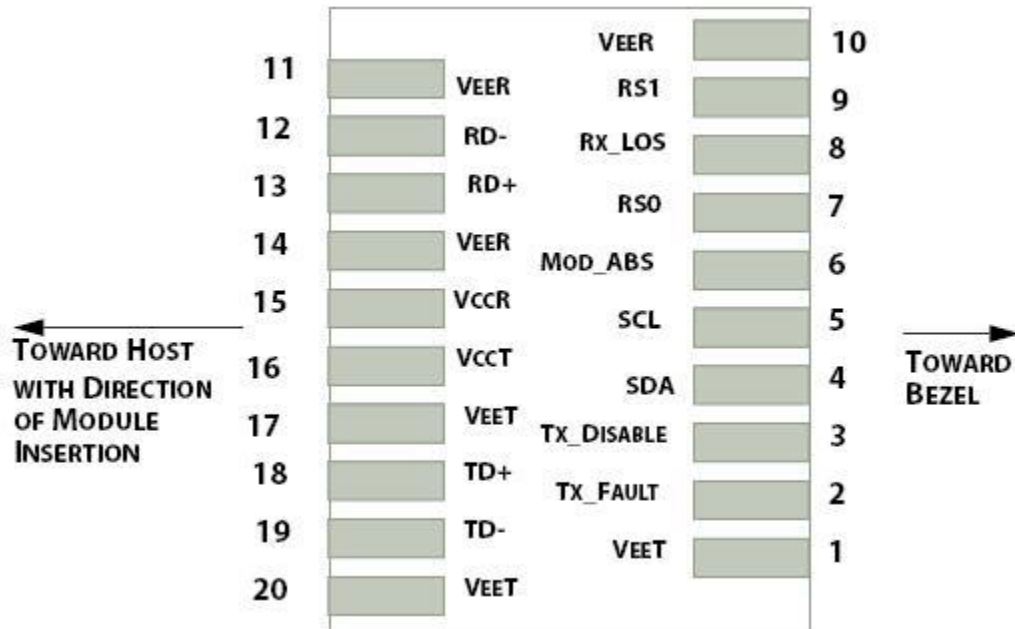
**TX\_FAULT-** When the TX\_FAULT signal is high, output indicates a laser fault of some kind. Low indicates normal operation.

**Receiver Section-** The receiver utilizes a PIN detector integrated with a trans-impedance preamplifier in an OSA. This OSA is connected to a Limiting Amplifier which providing post-amplification quantization, and optical signal detection. The limiting Amplifier is AC-coupled to the transimpedance amplifier, with internal 100Ω differential termination.

**Receive Loss (RX\_LOS)-** The RX\_LOS is high (logic "1") when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

**Controller Section-** The micro controller unit monitors the operation information of LD driver and Limiting Amplifier and report these status to the customer.

## Electrical Pad Layout



## Pin Assignment

<i><b>PIN #</b></i>	<i><b>Symbol</b></i>	<i><b>Description</b></i>	<i><b>Remarks</b></i>
1	VEET	Transmitter ground (common with receiver ground)	Circuit ground is isolated from chassis ground
2	TFAULT	Transmitter Fault	
3	TDIS	Transmitter Disable. Laser output disable on high or open	Disabled: TDIS>2V or open Enabled: TDIS<0.8V
4	SDA	Data line for serial ID	Should Be pulled up with 4.7k – 10k ohm on host board to a voltage between 2V and 3.6V
5	SCL	Clock line for serial ID	
6	MOD_ABS	Module Absent. Ground within the module	
7	RS0	No Connection required	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation	LOS is open collector output
9	RS1	+3.3V Power Supply	Circuit ground is isolated from chassis ground
10	VEER	Receiver ground (common with transmitter ground)	
11	VEER	Receiver ground (common with transmitter ground)	
12	RD-	Receiver Inverted DATA out. AC coupled	
13	RD+	Receiver Non-inverted DATA out. AC coupled	
14	VEER	Receiver ground (common with transmitter ground)	Circuit ground is isolated from chassis ground
15	VCCR	Receiver power supply	
16	VCCT	Transmitter power supply	Same as Pin# 1
17	VEET	Transmitter ground (common with receiver ground)	Circuit ground is connected to chassis ground
18	TD+	Transmitter Non-inverted DATA out. AC coupled	
19	TD-	Transmitter Inverted DATA out. AC coupled	
20	VEET	Transmitter ground (common with receiver ground)	Circuit ground is connected to chassis ground

## References

1. IEEE standard 802.3. IEEE Standard Department, 2002.
2. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000.
3. Digital Diagnostic Monitoring Interface for Optical Transceivers- SFF-8472.