

The GigaTech Products **DS-CWDM-1510-GT** is programmed to be fully compatible and functional with all intended CISCO MDS 9000 CWDM switching devices. This SFP optical transceiver is based on the Gigabit Ethernet IEEE 802.3 and Fiber Channel 100-SM-LC-L standards and is designed to be compliant with SFF-8472 SFP Multi-source Agreement (MSA). These modules are designed for single mode fiber and operate at a nominal CWDM wavelength from 1270nm to 1610nm in 20nm steps.

Features:

- Up to 1.25GBd bi-directional data links
- Hot-pluggable SFP footprint
- Uncooled DFB laser transmitter
- Receiver with PIN
- Duplex LC Connectors
- Built in Digital Diagnostics
- Up to 80km over 9/125 SMF
- Single power supply 3.3V
- Operating temperature range
C-Temp: 0°C to 70°C



Compliance:

- IEEE 802.3z Gigabit Ethernet
- Fiber Channel 100-SM-LC-L
- SFP MSA SFF-8472
- RoHS
- Class 1 laser product EN 60825

Applications

- 1.25 GBd Gigabit Ethernet
- 1.063 GBd Fiber Channel

Warranty:

GigaTech Branded Optical Transceivers- Lifetime Warranty

Product Selection

<i>Part Number</i>	<i>Wavelength</i>	<i>Color</i>	<i>Description</i>
GTSC2712-SxD80	1270nm	Light Purple	CWDM SFP 1270nm GE/FC 80km 23db LC SMF DOM
GTSC2912-SxD80	1290nm	Sky Blue	CWDM SFP 1290nm GE/FC 80km 23db LC SMF DOM
GTSC3121-SxD80	1310nm	Yellow Green	CWDM SFP 1310nm GE/FC 80km 23db LC SMF DOM
GTSC3312-SxD80	1330nm	Yellow Ocher	CWDM SFP 1330nm GE/FC 80km 23db LC SMF DOM
GTSC3512-SxD80	1350nm	Pink	CWDM SFP 1350nm GE/FC 80km 23db LC SMF DOM
GTSC3712-SxD80	1370nm	Beige	CWDM SFP 1370nm GE/FC 80km 23db LC SMF DOM
GTSC3912-SxD80	1390nm	White	CWDM SFP 1390nm GE/FC 80km 23db LC SMF DOM
GTSC4121-SxD80	1410nm	Silver	CWDM SFP 1410nm GE/FC 80km 23db LC SMF DOM
GTSC4312-SxD80	1430nm	Black	CWDM SFP 1430nm GE/FC 80km 23db LC SMF DOM
GTSC4512-SxD80	1450nm	Yellow Orange	CWDM SFP 1450nm GE/FC 80km 23db LC SMF DOM
GTSC4712-SxD80	1470nm	Gray	CWDM SFP 1470nm GE/FC 80km 23db LC SMF DOM
GTSC4912-SxD80	1490nm	Violet	CWDM SFP 1490nm GE/FC 80km 23db LC SMF DOM
GTSC5121-SxD80	1510nm	Blue	CWDM SFP 1510nm GE/FC 80km 23db LC SMF DOM
GTSC5312-SxD80	1530nm	Green	CWDM SFP 1530nm GE/FC 80km 23db LC SMF DOM
GTSC5512-SxD80	1550nm	Yellow	CWDM SFP 1550nm GE/FC 80km 23db LC SMF DOM
GTSC5712-SxD80	1570nm	Orange	CWDM SFP 1570nm GE/FC 80km 23db LC SMF DOM
GTSC5912-SxD80	1590nm	Red	CWDM SFP 1590nm GE/FC 80km 23db LC SMF DOM
GTSC6121-SxD80	1610nm	Brown	CWDM SFP 1610nm GE/FC 80km 23db LC SMF DOM

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	DR	0.622		1.25	GBd	IEEE 802.3
Bit Error Rate	BER			10 ⁻¹²		
Input Voltage	V _{CC}	3.1	3.3	3.6	V	
Maximum Voltage	V _{max}	-0.5		4	V	Electric Power Interface
Operating Current	I _{OP}			400	mA	Absolute Rating
Supply Current	I _S		200	300	mA	Electric Power Interface
Storage Temperature	T _{STO}	-40		85		Ambient Temperature

Optical Characteristics - Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	λ	1xx0 -20	1xx0	1xx0 +20	nm	
Output Optical Power	P _{TX}	0		5	dBm	Class 1 Product
Wavelength Temp Dependence			0.08	0.125	nm/°C	
Extinction Ratio	ER	9			dB	
Side Mode Suppression Ratio	SMSR	30			dB	
Spectral Width (-20)	$\Delta\lambda$			1	nm	
Relative Intensity Noise	RIN			-120	dB/Hz	
Optical Rise/Fall Time	T _{RF,IN}			180	ps	20% - 80%
Transmitter Jitter	TJ			100	ps	
Output Eye	Compliant with IEEE 802.3z					

Optical Characteristics - Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	λ_C	1270		1620	nm	
Optical Receive Power	P _{RX}	0			dBm	
Receiver Sensitivity @ 1.25GBd	R _{X,SEN}			-23	dBm	IEEE 802.3
Optical Return Loss	ORL	12			dB	
LOS Assert	LOS _A	-30			dBm	
LOS De-Assert	LOS _D			-23	dBm	
LOS Hysteresis			1		dB	

Electrical Characteristics – Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R _{IN}		100		Ω	AC Coupled
Single ended data input swing	V _{IN,PP}	250		1200	mV	
Transmit Disable Voltage	V _D	V _{CC} -1.3		V _{CC}	V	
Transmit Enable Voltage	V _{EN}	V _{EE}		V _{EE} +0.8	V	
Transmit Disable Assert Time				10	us	

Electrical Characteristics – Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Single ended data output swing	V _{OUT,PP}	250		500	mV	
Data output rise/fall time	T _R		100	175	ps	20%-80%
LOS Fault	V _{LOS,F}	V _{CC} -0.5		V _{CC,HOST}	V	
LOS Normal	V _{LOS,N}	V _{EE}		V _{EE} +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 ± 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 μ Volt, yielding a total range of 0 to +6.55 Volts.

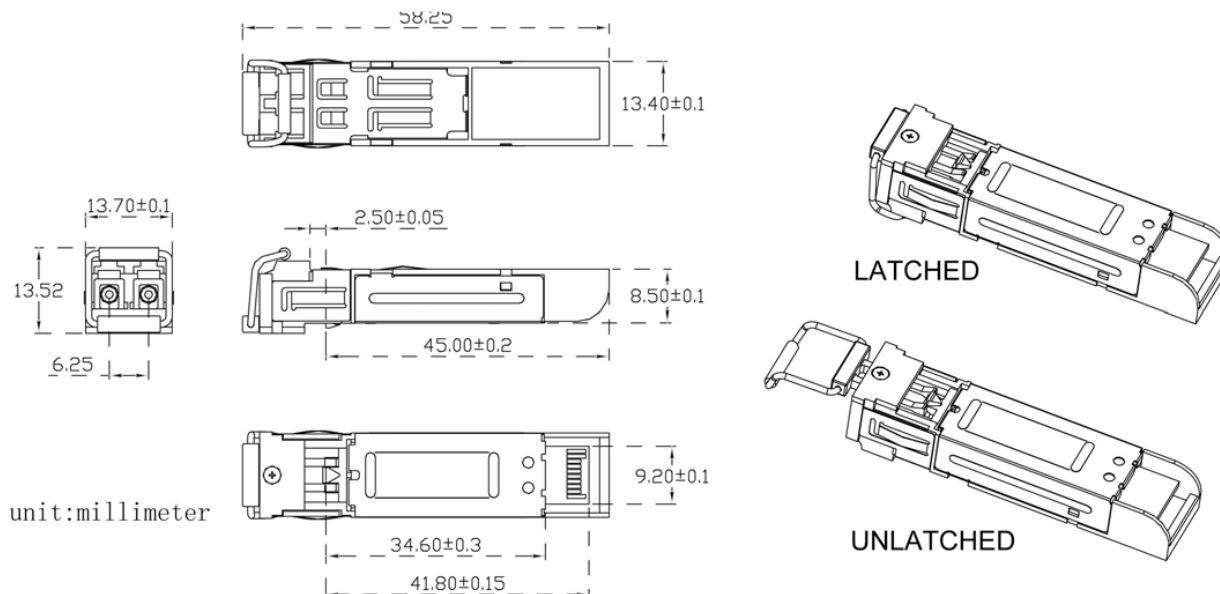
Transceiver TX bias current- Internally measured, represented as a 16 bit unsigned integer with the current defined as the full 16 bit value (0 – 65535) with LSB equal to 2 μ A, yielding a total range of 0 to 159mA. Accuracy is better than $\pm 10\%$ over specified operating temperature and voltage.

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 μ W. Data is assumed to be based on measurement of laser monitor photodiode current. Accuracy is better than ± 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 μ W. Accuracy is better than ± 3 dB over specified temperature and voltage.

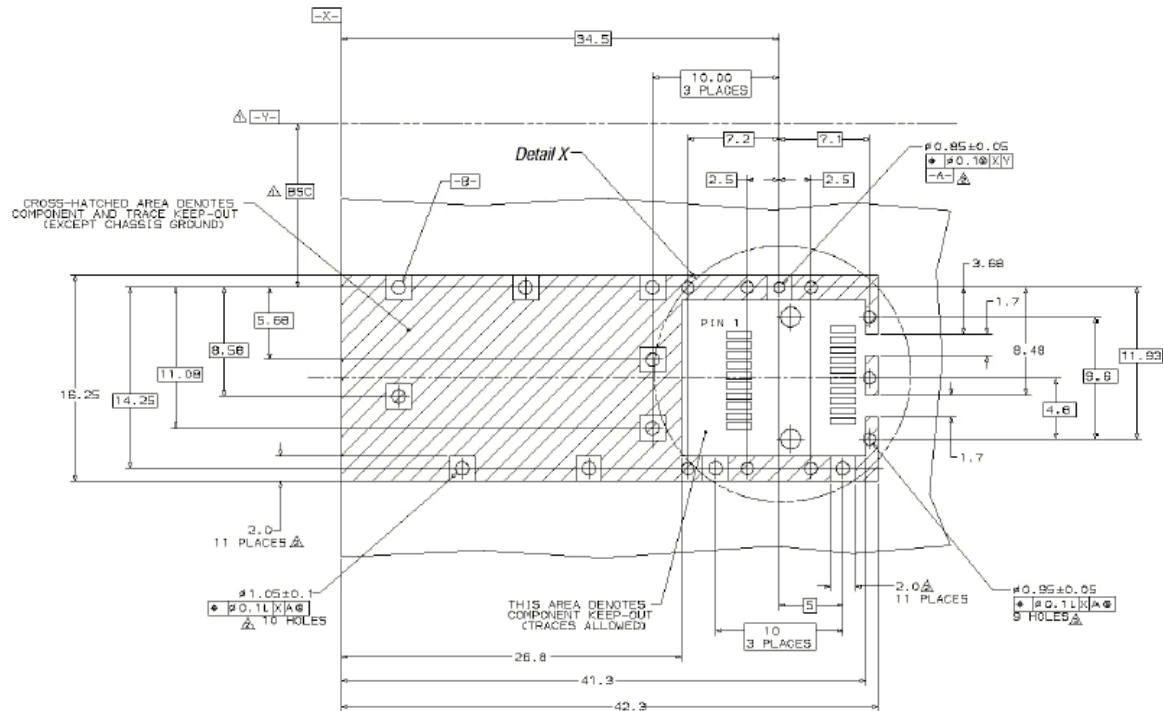
Parameter	Symbol	Accuracy	Units	Report Range	Unit	Remarks
Temperature	T_{mon}	± 3	$^{\circ}\text{C}$	-40 - +95	$^{\circ}\text{C}$	
Voltage	V_{mon}	± 0.1	V	+2.7 - +3.9	V	
Bias Current	T_F	± 10	%	+1 - +80	mA	
Tx Power	V_{LOS_F}	± 3	dB	-5 - +5	dBm	
Rx Power	V_{LOS_N}	± 3	dB	-25 - +5	dBm	

Dimensions



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

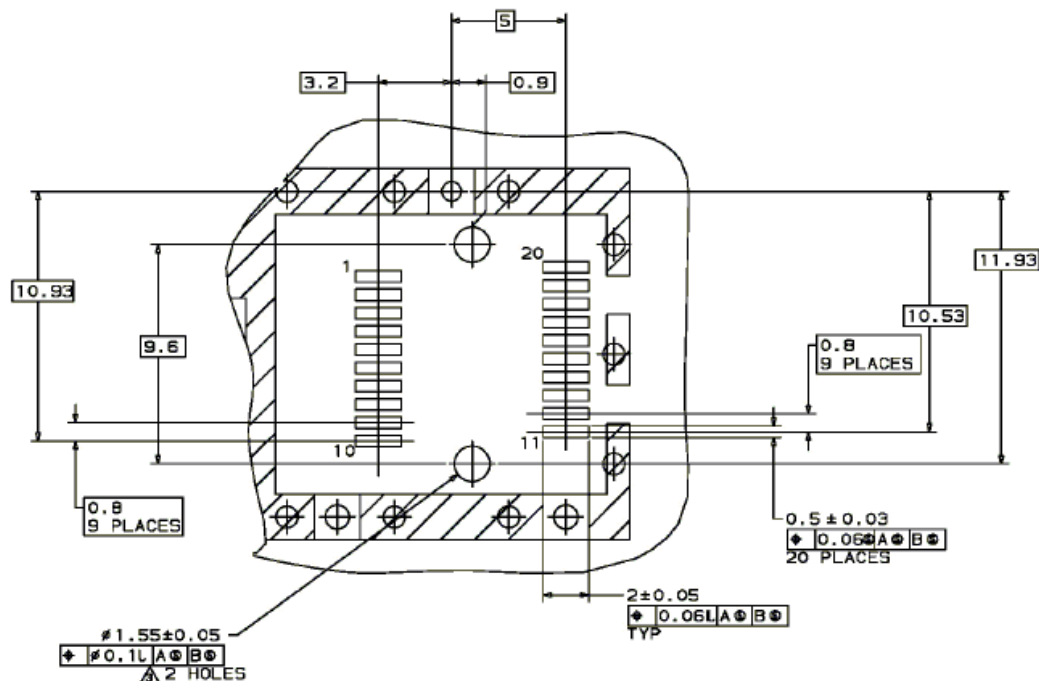
PCB Layout Recommendation



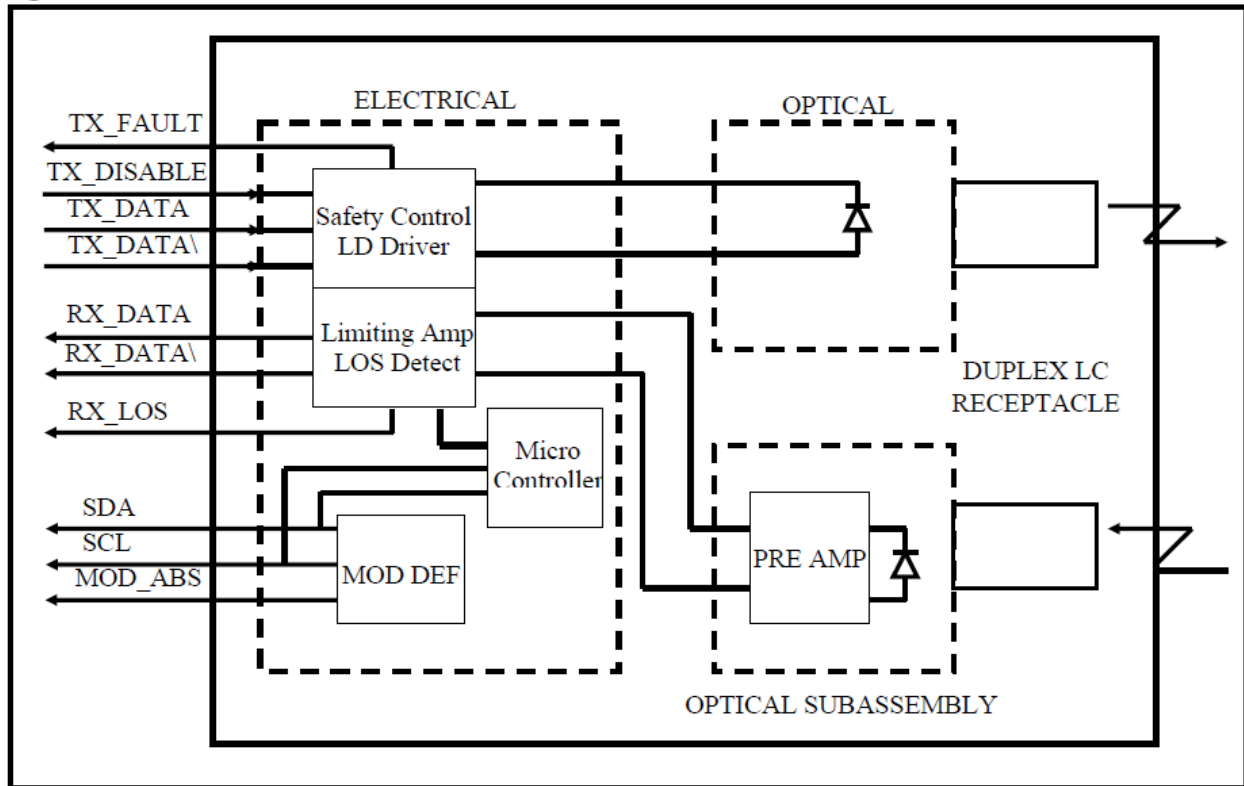
△ Datum and Basic Dimension Established by Customer

△ Pads and Vias are Chassis Ground, 11 Places

△ Through Holes are Unplated



Block Diagram of Transceiver



Transmitter Section- The DFB 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. The DFB laser 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").

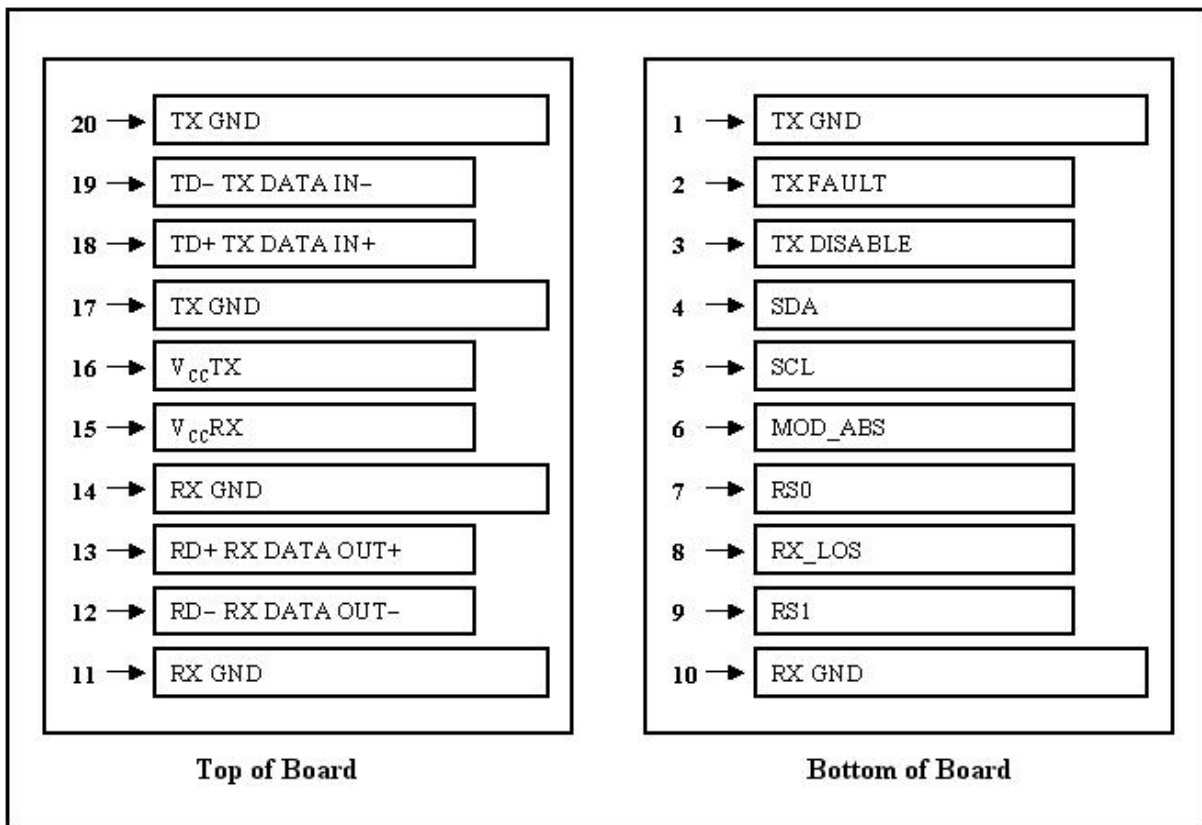
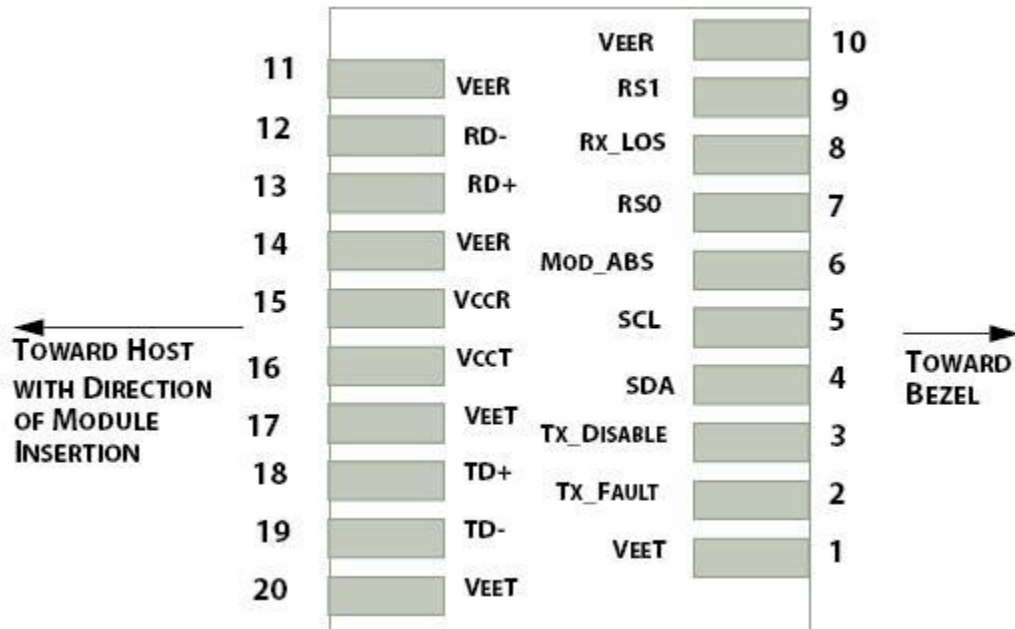
TX_FAULT- When the TX_FAULT signal is high, output indicates a laser fault of some kind. Low indicates normal operation.

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>PIN #</i>	<i>Symbol</i>	<i>Description</i>	<i>Remarks</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 Diagnostics Monitoring Interface for Optical Transceivers – SFF-8472.
4. Bellcore GR-253 and ITU-T G.957 Specifications.
5. Fiber Channel Physical and Signaling Interface- FC-PH/PH2/PH3.