Prolabs SFP-10G-SR

SFP-10G-SR Short Wavelength Optical Transceiver

Key Features

- Up to 10.5 GBd bi-directional data links
- Compliant with IEEE 802.3ae 10GBASE-SR/SW
- Compliant with SFF-8431
- Hot-pluggable SFP+ footprint
- 850nm VCSEL laser transmitter
- Duplex LC connector
- Built-in digital diagnostic functions
- Up to 300m on OM3 MMF
- Single power supply 3.3V
- RoHS Compliance
- Class 1 laser product complies with EN 60825-1
- Operating temperature range: 0℃ to 70℃.

Applications

- 10GBASE-SR/SW Ethernet

Ordering Information

Part Number	Description
SFP-10G-SR	MSA Compliant 10GBASR-SR/SW SFP+ 850nm LC Connectors 300m on MMF, with DOM function.

Introduction

PROLABS's SFP-10G-SR optical transceivers are based on 10G Ethernet IEEE 802.3ae standards and SFF-8431 MSA, and provide a reliable interface for 10G applications. The Digital diagnostics functions are available via 2-wire serial bus as specified in SFF-8472.

Compatible Ordering Information

OEM Manufacturer	Prolabs Ordering SKU	Product Description
ADVA	1061701855-01-C	10GBASE-SR SFP+, 850nm, 300m
Alcatel	1AB390930002-C	10GBASE-SR SFP+, 850nm, 300m
Alcatel	3FE65608AA-C	10GBASE-SR SFP+, 850nm, 300m
Alcatel	3HE04824AA-C	10GBASE-SR SFP+, 850nm, 300m
Alcatel	SFP-10G-SR-ALC-C	10GBASE-SR SFP+, 850nm, 300m
Allied	AT-SP10SR-C	10GBASE-SR SFP+, 850nm, 300m
Arista	SFP-10G-SR-ARISTA-C	10GBASE-SR SFP+, 850nm, 300m
Avaya	AA1403015-C	10GBASE-SR SFP+, 850nm, 300m
Blackbox	LSP421-C	10GBASE-SR SFP+, 850nm, 300m
Brocade	10G-SFPP-SR-C	10GBASE-SR SFP+, 850nm, 300m
BTN/IBM	46C3447-C	10GBASE-SR SFP+, 850nm, 300m
BTN/IBM	BN-CKM-SP-SR-C	10GBASE-SR SFP+, 850nm, 300m
Calix	100-01515-C	10GBASE-SR SFP+, 850nm, 300m
Checkpoint	CPAC-TR-10SR-C	10GBASE-SR SFP+, 850nm, 300m
Ciena	XCVR-S00Z85-C	10GBASE-SR SFP+, 850nm, 300m
Cisco	ONS-SC+-10G-SR-C	10GBASE-SR SFP+, 850nm, 300m
Cisco	SFP-10G-SR-C	10GBASE-SR SFP+, 850nm, 300m
Cisco	SFP-10G-SR-S-C	10GBASE-SR SFP+, 850nm, 300m
Cisco SB	LACXGSR-C	10GBASE-SR SFP+, 850nm, 300m
Dell Force10	GP-10GSFP-1S-C	10GBASE-SR SFP+, 850nm, 300m
D-Link	DEM-431XT-C	10GBASE-SR SFP+, 850nm, 300m
D-Link	DEM-431XT-DD-C	10GBASE-SR SFP+, 850nm, 300m
Emulex	OC10-SR-OPT-1-C	10GBASE-SR SFP+, 850nm, 300m
Enterasys	10GB-SR-SFPP-C	10GBASE-SR SFP+, 850nm, 300m
Extreme	10301-C	10GBASE-SR SFP+, 850nm, 300m
F5 Networks	F5-UPG-SFP+-R-C	10GBASE-SR SFP+, 850nm, 300m
Fortinet	FG-TRAN-SFP+SR-C	10GBASE-SR SFP+, 850nm, 300m
Generic	SRL-SFP-10G-C	10GBASE-SR SFP+, 850nm, 300m
Generic	SR-SFP-10G-C	10GBASE-SR SFP+, 850nm, 300m
H3C Huawei	SFP-XG-SX-MM850-A-H3C-C	10GBASE-SR SFP+, 850nm, 300m
H3C Huawei	SFP-XG-SX-MM850-B-H3C-C	10GBASE-SR SFP+, 850nm, 300m
H3C Huawei	SFP-XG-SX-MM850-E-H3C-C	10GBASE-SR SFP+, 850nm, 300m
HP Comware	JD092B-C	10GBASE-SR SFP+, 850nm, 300m
HP ProCurve	J9150A-C	10GBASE-SR SFP+, 850nm, 300m
HP Server	455883-B21-C	10GBASE-SR SFP+, 850nm, 300m
Huawei	OMXD30000-C	10GBASE-SR SFP+, 850nm, 300m
Intel	E10GSFPSR-C	10GBASE-SR SFP+, 850nm, 300m
Juniper	EX-SFP-10GE-SR-C	10GBASE-SR SFP+, 850nm, 300m
Moxa	SFP-10GSRLC-C	10GBASE-SR SFP+, 850nm, 300m
MRV	SFP-10GD-SX-C	10GBASE-SR SFP+, 850nm, 300m
Netgear	AXM761-C	10GBASE-SR SFP+, 850nm, 300m
Netscout	321-1486-C	10GBASE-SR SFP+, 850nm, 300m
Packetfront	SFP-10GE-SR-C	10GBASE-SR SFP+, 850nm, 300m
Palo Alto	PAN-SFP-PLUS-SR-C	10GBASE-SR SFP+, 850nm, 300m
Planet	MTB-SR-C	10GBASE-SR SFP+, 850nm, 300m
Riverbed	SFP-004-SR-C	10GBASE-SR SFP+, 850nm, 300m
Riverbed	SFP-CSK-SR-C	10GBASE-SR SFP+, 850nm, 300m
Riverbed	TRC-1-SFPP-SR-C-C	10GBASE-SR SFP+, 850nm, 300m
Ruijie	XG-SFP-SR-MM850-C	10GBASE-SR SFP+, 850nm, 300m
Telco	BTI-10GSR-DD-SFP+-C	10GBASE-SR SFP+, 850nm, 300m
TP-Link	TXM431-SR-C	10GBASE-SR SFP+, 850nm, 300m
Transmode	TRX100103-C	10GBASE-SR SFP+, 850nm, 300m
ZTE	SFP-10GE-M-C	10GBASE-SR SFP+, 850nm, 300m
ZyXEL	SFP10G-SR-C	10GBASE-SR SFP+, 850nm, 300m

Specification

General Specifications						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Remarks**
Data Rate	DR	-	10.3125	-	GBd	IEEE 802.3.
Bit Error Rate	BER	-	-	10^{-12}	-	-
Operating Temperature	T_{OP}	0	-	70	°C	Case temperature.
Storage Temperature	T_{STO}	-40	-	85	°C	Ambient temperature.
Supply Current	I_S	-	180	220	mA	-
Input Voltage	V_{CC}	3	3.3	3.6	V	-
Maximum Voltage	V_{MAX}	-0.5	-	4	V	-

Link Distances			
Parameter	**Fiber Type**	**Modal Bandwidth @ 850nm (MHz-km)**	**Distance Range (m)**
9.95 – 10.5 GBd	62.5/125um MMF	160	2-26
	62.5/125um MMF	200	2-33
	50/125um MMF	400	2-66
	50/125um MMF	500	2-82
	50/125um MMF	2000	2-300

Optical Characteristics-Transmitter V_{CC}=3V to 3.6V, T_C=0°C to 70°C						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Remarks**
Output Optical Power	P_{TX}	-5	-	-1	GBd	Class 1 Product
Optical Center Wavelength	λ_c	840	-	860	nm	-
Optical Modulation Amplitude	OMA	-	1.5	-	dB	IEEE 802.3ae
Extinction Ratio	ER	3	5.5	-	dB	-
Spectral Width (RMS)	$\Delta\lambda$	-	-	0.45	Nm	-
Relative Intensity Noise	RIN	-	-	-128	dB/Hz	-
Transmitter Dispersion Penalty	TDP	-	-	3.9	dB	-
Transmitter Jitter	-	-	-	-	-	According to IEEE 802.3 Requirements
Launch Power of OFF Transmitter	P_{OUT_OFF}	-	-	-30	dBm	Average Power

Specification

Optical Characteristics-Receiver V_{CC}=3V to 3.6V, T_C=0°C to 70°C						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Remarks**
Optical Center Wavelength	λ_c	840	-	860	nm	-
Receiver Sensitivity @ 10.3GBd	$R_{X\ SEN1}$	-	-	-11.1	dBm	Measured with worst ER: BER<10^{-12} 2^{31}-1 PRBS
Stressed Receiver Sensitivity @ 10.3Gb/s	P_{SENS2}	-	-	-7.5	dBm	IEEE 802.3ae
Maximum Input Power	P_{IN}	0.5	-	-	dBm	-
Receiver Reflectance	TR_{RX}	-	-	-12	dB	-
Loss of Signal-Asserted	$P_{LOS\ A}$	-30	-	-	dBm	-
Loss of Signal-Deasserted	$P_{LOS\ D}$	-	-	-12	dBm	-
Loss of Signal-Hysteresis	-	0.5	-	-	dB	-

Electrical Characteristics-Transmitter V_{CC}=3V to 3.6V, T_C=0°C to 70°C						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Remarks**
Input differential impedance	R_{IN}	-	100	-	Ω	-
Single ended data input swing	$V_{IN\ PP}$	250	-	800	mV	-
Transmit disable voltage	V_D	2	-	V_{CC}	V	-
Transmit enable voltage	V_{EN}	V_{EE}	-	V_{EE}+0.8	V	-

Electrical Characteristics-Receiver V_{CC}=3V to 3.6V, T_C=0°C to 70°C						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Remarks**
Single ended data output swing	$V_{OUT\ PP}$	150	300	425	mV	-
Data output rise time (20%-80%)	T_R	-	30	-	ps	-
Data output fall time (20%-80%)	T_F	-	30	-	ps	-
LOS Fault	$V_{LOS\ Fault}$	2	-	$V_{CC\ HOST}$	V	-
LOS Normal	$V_{LOS\ Normal}$	V_{EE}	-	V_{EE}+0.5	V	-

Specification

Digital Diagnostic Functions
SR-SFP-10G-C supports the 2-wire serial communication protocol as defined in SFF-8472. Digital diagnostic information is accessible over the 2-wire interface at the address 0xA2. Digital Diagnostics for SFP-SR-10G 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 µVolt, 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 µA, yielding a total range of 0 to 131mA. Accuracy is better than ±10% over specified operating temperature and voltage.

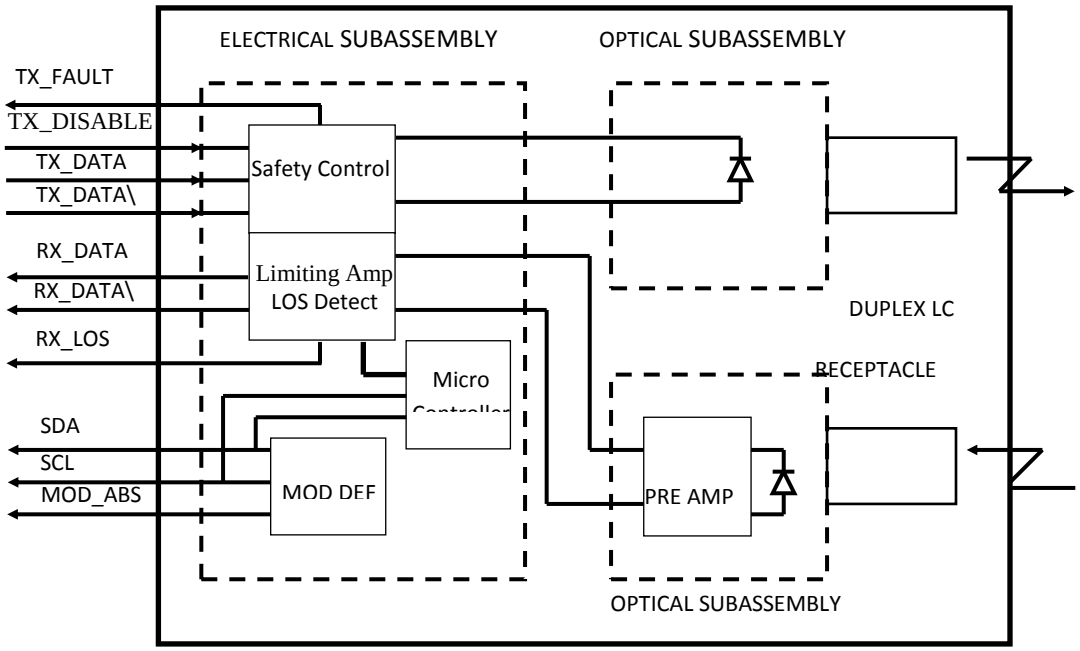
Transceiver TX output power,
internally measured, represented as a 16 bit unsigned integer with the power defined as the full 16 bit value (0 – 65535) with LSB equal to 0.1 µW. Data is assumed to be based on measurement of laser monitor photodiode current. Accuracy is better than ±3dB over specified 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 µW. Accuracy is better than ±3dB over specified temperature and voltage.

Parameter	Symbol	Accuracy	Units	Report Range		Unit	Remarks
Internal Calibration							
Temperature	T_{MON}	±3	°C	-5	75	ps	°C
Voltage	V_{MON}	±0.1	V	2.9	3.7	V	V
Bias Current	I_{MON}	±10	%	1	15	V	mA
Tx Power	P_{MON}	±3	dB	-10	0	mV_{PP}	dBm
Rx Power	P_{MON}	±3	dB	-20	0	ps	dBm

Specification

Block Diagram of Transceiver



Transmitter Section
The VCSEL 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 laser is packaged in an eye safe optical subassembly (OSA) which 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”).

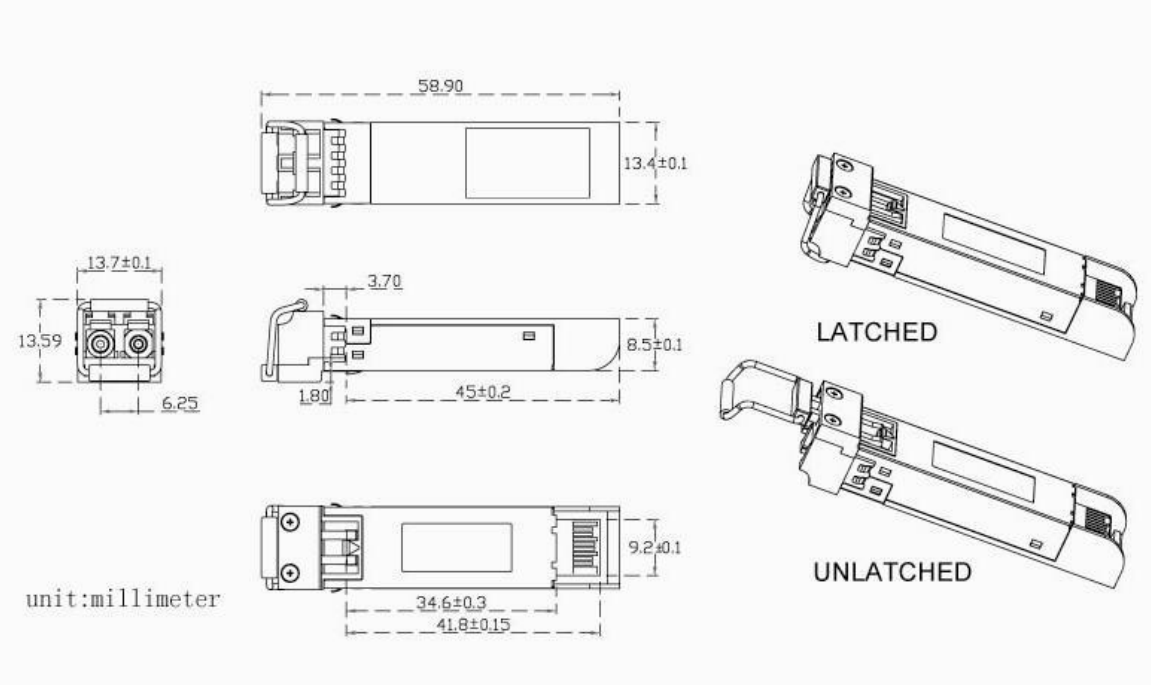
TX_FAULT
When the TX_FAULT signal is high, output indicates a laser fault of some kind. Low indicates normal operation.

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 trans impedance 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 statuses to the customer.

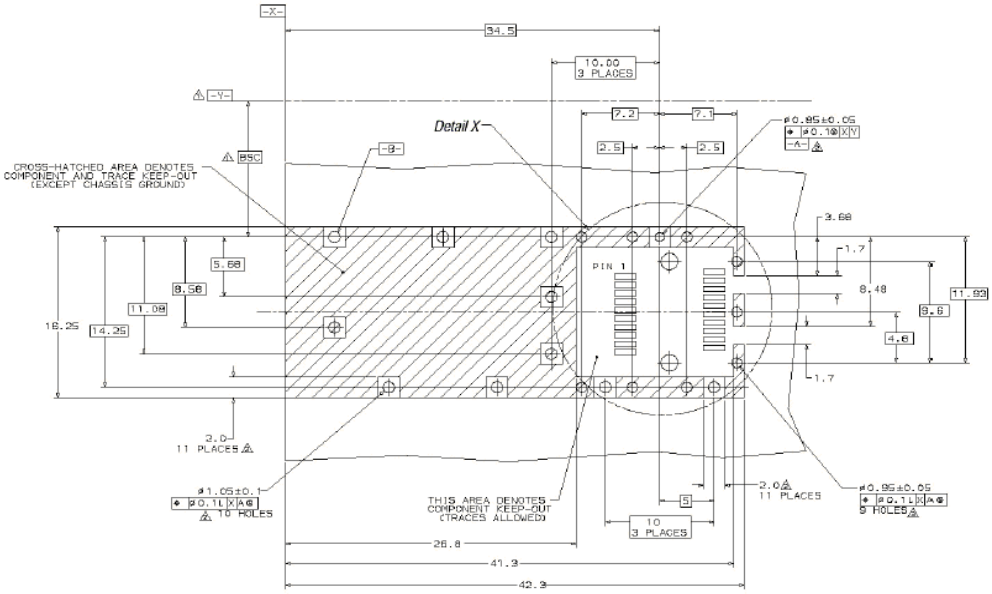
Dimensions



ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED

UNIT: mm

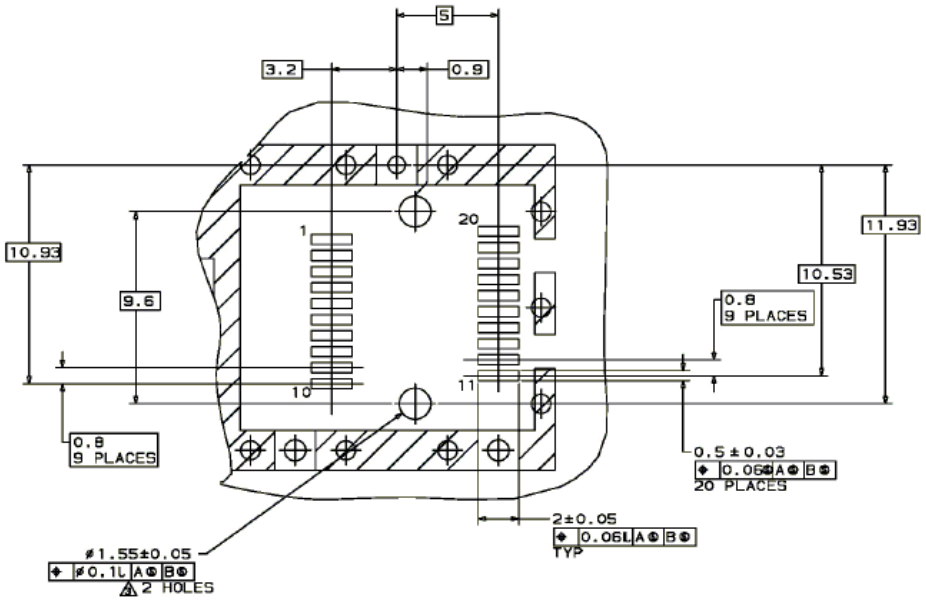
PCB Layout Recommendations



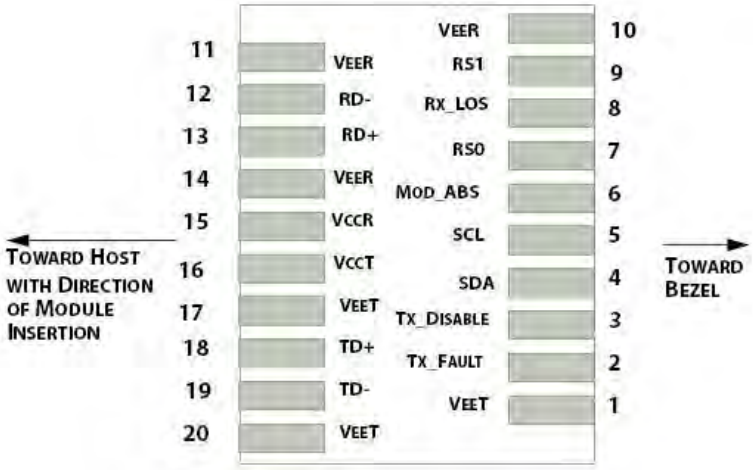
Datum and Basic Dimension Established by Customer

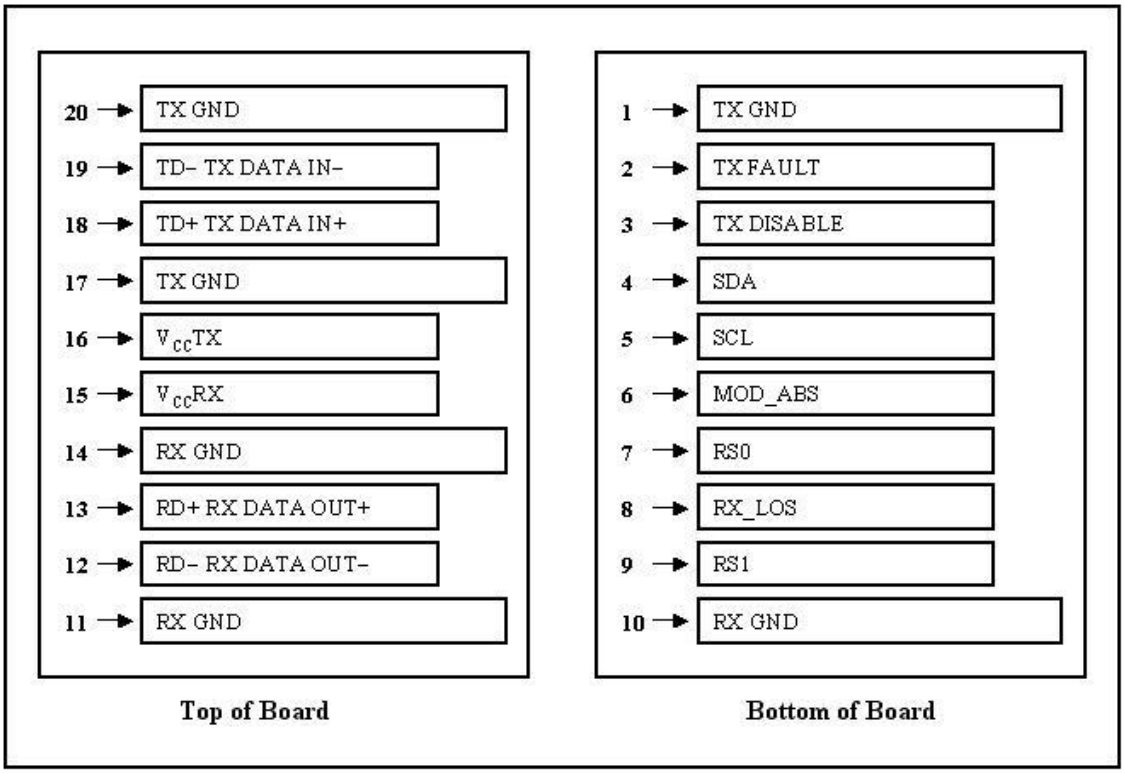
Rads and Vias are Chassis Ground, 11 Places

Through Holes are Unplated



Electrical Pad Layout





Pin Assignments

Pin Assignments			
Pin #	**Symbol**	**Description**	**Remarks**
1	V_{EET}	Transmitter ground (common with receiver ground)	Circuit ground is isolated from chassis ground
2	T_{FAULT}	Transmitter Fault.	-
3	T_{DIS}	Transmitter Disable. Laser output disable on high or open	Disabled: T_{DIS}>2V or open
			Enabled: T_{DIS}<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. Grounded within the module	
7	Rate Select	No connection required	-
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation	LOS is open collector output
9	RS1	No Connection Required.	Circuit ground is isolated from chassis ground
10	V_{EER}	Receiver ground (common with transmitter ground)	
11	V_{EER}	Receiver ground (common with transmitter ground)	
12	RD–	Receiver Inverted DATA out. AC coupled	-
13	RD+	Receiver Non-inverted DATA out. AC coupled	-
14	V_{EER}	Receiver ground (common with transmitter ground)	Circuit ground is isolated from chassis ground
15	V_{CCR}	Receiver power supply	-
16	V_{CCT}	Transmitter power supply	-
17	V_{EET}	Transmitter ground (common with receiver ground)	Circuit ground is connected to chassis ground
18	TD+	Transmitter Non-Inverted DATA in. AC coupled	-
19	TD–	Transmitter Inverted DATA in. AC coupled	-
20	V_{EET}	Transmitter ground (common with receiver ground)	Circuit ground is connected to chassis ground

References

1. IEEE standard 802.3ae. IEEE Standard Department, 2005.
2. Enhanced 8.5 and 10 Gigabit Small Form Factor Pluggable Module “SFP+” – SFF-8431
3. Digital Diagnostics Monitoring Interface for Optical Transceivers – SFF-8472.