PROLABS – DWDM-SFP-XXXX-C

2.5G SFP (Small Form Pluggable) DWDM Transceiver

DWDM-SFP-XXXX-C Overview

PROLABS's DWDM-SFP-XXXX-C DWDM SFP optical transceivers are designed for operation in Metro Access Rings and Core networks using DWDM networking equipment. They are available in 100GHz ITU Grid, C Band. Digital diagnostics functions are available via a 2 wire serial bus. In addition, they comply with the small form factor pluggable multi sourcing agreement (MSA) and SFF-8472.

Product Features

- Up to 2.67GBd bi-directional data links
- Compliant with IEEE 802.3z Gigabit Ethernet standard
- Compliant with Fiber Channel and 2X Fiber Channel
- Industry standard small form pluggable (SFP) package
- Compliant with SFP MSA
- Hot-pluggable SFP footprint
- Temperature-stabilized DWDM rated DFB laser transmitter
- 100GHz ITU Grid, C Band
- Receiver with APD
- Duplex LC connector
- Up to 120km – 160km
- Built-in digital diagnostic functions
- Single power supply 3.3V
- RoHS Compliance
- Class 1 laser product complies with EN 60825-1
- Operating temperature range: 0℃ to 70℃.

Applications

- DWDM NETWORKS

Ordering Information

Part Number	*Description*
DWDM-SFP-XXXX-C	2.5G DWDM SFP Transceiver, Single Mode Fiber (ITU 100GHz Grid).120km – 160km.

Product Selection

Product number	*Description*	*ITU channel*
DWDM-SFP-3033-C	DWDM SFP transceiver 1530.33 nm (100-GHz ITU grid)	59
DWDM-SFP-3112-C	DWDM SFP Transceiver 1531.12 nm (100-GHz ITU grid)	58
DWDM-SFP-3190-C	DWDM SFP Transceiver 1531.90 nm (100-GHz ITU grid)	57
DWDM-SFP-3268-C	DWDM SFP Transceiver 1532.68 nm (100-GHz ITU grid)	56
DWDM-SFP-3347-C	DWDM SFP Transceiver 1533.47 nm (100-GHz ITU grid)	55
DWDM-SFP-3425-C	DWDM SFP Transceiver 1534.25 nm (100-GHz ITU grid)	54
DWDM-SFP-3504-C	DWDM SFP Transceiver 1535.04 nm (100-GHz ITU grid)	53
DWDM-SFP-3582-C	DWDM SFP Transceiver 1535.82 nm (100-GHz ITU grid)	52
DWDM-SFP-3661-C	DWDM SFP Transceiver 1536.61 nm (100-GHz ITU grid)	51
DWDM-SFP-3740-C	DWDM SFP Transceiver 1537.40 nm (100-GHz ITU grid)	50
DWDM-SFP-3819-C	DWDM SFP Transceiver 1538.19 nm (100-GHz ITU grid)	49
DWDM-SFP-3898-C	DWDM SFP Transceiver 1538.98 nm (100-GHz ITU grid)	48
DWDM-SFP-3977-C	DWDM SFP Transceiver 1539.77 nm (100-GHz ITU grid)	47
DWDM-SFP-4056-C	DWDM SFP Transceiver 1540.56 nm (100-GHz ITU grid)	46
DWDM-SFP-4135-C	DWDM SFP Transceiver 1541.35 nm (100-GHz ITU grid)	45
DWDM-SFP-4214-C	DWDM SFP Transceiver 1542.14 nm (100-GHz ITU grid)	44
DWDM-SFP-4294-C	DWDM SFP Transceiver 1542.94 nm (100-GHz ITU grid)	43
DWDM-SFP-4373-C	DWDM SFP Transceiver 1543.73 nm (100-GHz ITU grid)	42
DWDM-SFP-4453-C	DWDM SFP Transceiver 1544.53 nm (100-GHz ITU grid)	41
DWDM-SFP-4532-C	DWDM SFP Transceiver 1545.32 nm (100-GHz ITU grid)	40
DWDM-SFP-4612-C	DWDM SFP Transceiver 1546.12 nm (100-GHz ITU grid)	39
DWDM-SFP-4692-C	DWDM SFP Transceiver 1546.92 nm (100-GHz ITU grid)	38
DWDM-SFP-4772-C	DWDM SFP Transceiver 1547.72 nm (100-GHz ITU grid)	37
DWDM-SFP-4851-C	DWDM SFP Transceiver 1548.51 nm (100-GHz ITU grid)	36
DWDM-SFP-4932-C	DWDM SFP Transceiver 1549.32 nm (100-GHz ITU grid)	35
DWDM-SFP-5012-C	DWDM SFP Transceiver 1550.12 nm (100-GHz ITU grid)	34
DWDM-SFP-5092-C	DWDM SFP Transceiver 1550.92 nm (100-GHz ITU grid)	33
DWDM-SFP-5172-C	DWDM SFP Transceiver 1551.72 nm (100-GHz ITU grid)	32
DWDM-SFP-5252-C	DWDM SFP Transceiver 1552.52 nm (100-GHz ITU grid)	31
DWDM-SFP-5333-C	DWDM SFP Transceiver 1553.33 nm (100-GHz ITU grid)	30
DWDM-SFP-5413-C	DWDM SFP Transceiver 1554.13 nm (100-GHz ITU grid)	29
DWDM-SFP-5494-C	DWDM SFP Transceiver 1554.94 nm (100-GHz ITU grid)	28
DWDM-SFP-5575-C	DWDM SFP Transceiver 1555.75 nm (100-GHz ITU grid)	27
DWDM-SFP-5655-C	DWDM SFP Transceiver 1556.55 nm (100-GHz ITU grid)	26
DWDM-SFP-5736-C	DWDM SFP Transceiver 1557.36 nm (100-GHz ITU grid)	25
DWDM-SFP-5817-C	DWDM SFP Transceiver 1558.17 nm (100-GHz ITU grid)	24
DWDM-SFP-5898-C	DWDM SFP Transceiver 1558.98 nm (100-GHz ITU grid)	23
DWDM-SFP-5979-C	DWDM SFP Transceiver 1559.79 nm (100-GHz ITU grid)	22
DWDM-SFP-6061-C	DWDM SFP Transceiver 1560.61 nm (100-GHz ITU grid)	21

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	*DR*	0.622		2.7	GBd	
Bit Error Rate	*BER*		10^{-12}			
Operating Temperature	T_{OP}	0		70	℃	Case temperature
Storage Temperature	T_{STO}	– 40		85	℃	Ambient temperature
Operating Current	I_{OP}			400	mA	Absolute Rating
Supply Current	I_S		250	300	mA	For electrical power interface
Input Voltage	V_{CC}	3.1	3.3	3.6	V	
Maximum Voltage	V_{MAX}	– 0.5		4	V	For electrical power interface

Optical Characteristics – Transmitter

V_{CC}=3.1V to 3.6V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Output Optical Power	P_{TX}	0		5	dBm	Class 1 Product
Center Wavelength space			100		GHz	
Optical Center Wavelength	λ_C	X-100	X	X+100	pm	
Extinction Ratio	*ER*	8.2			dB	
SideMode Supression ratio	*SMSR*	30			dB	
Spectral Width (– 20dB)	$\Delta\lambda$			0.3	nm	
Optical Rise/Fall Time (20% - 80%)	T_{RF_IN}			180	ps	
Relative Intensity Noise	*RIN*			– 120	dB/Hz	
Transmitter Jitter	*TJ*			100	ps	
Dispersion Power Penalty				3.0	dB	

Optical Characteristics – Receiver

V_{CC}=3.1V to 3.6V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Receiver Power	P_{RX}			– 7	dBm	
Optical Center Wavelength	λ_C	1270		1620	nm	
Receiver Sensitivity @ 1.062GBd	R_{X_SEN1}			– 30	dBm	Measured with a PRBS 2^7-1 test pattern, BER<10^{-12}
Receiver Sensitivity @ 1.25GBd	R_{X_SEN2}			– 30	dBm	
Receiver Sensitivity @ 2.125GBd	R_{X_SEN3}			– 28	dBm	
Optical Return Loss	*ORL*	12			dB	
Loss of Signal-Asserted	P_{LOS_A}	– 35			dBm	
Loss of Signal-Deasserted	P_{LOS_D}			– 32	dBm	
Loss of Signal-Hysteresis			1		dB	

Electrical Characteristics – Transmitter

V_{CC}=3.1V to 3.6V, T_C=0℃ to 70℃

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

V_{CC}=3.1V to 3.6V, T_C=0℃ to 70℃

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Single ended data output swing	V_{OUT_PP}	250		800	mV	
Data output rise/fall time (20%-80%)	T_R		100	175	ps	
LOS Fault	V_{LOS_Fault}	V_{CC}–0.5		V_{CC_HOST}	V	
LOS Normal	V_{LOS_normal}	V_{EE}		V_{EE}+0.5	V	

Digital Diagnostic Functions

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

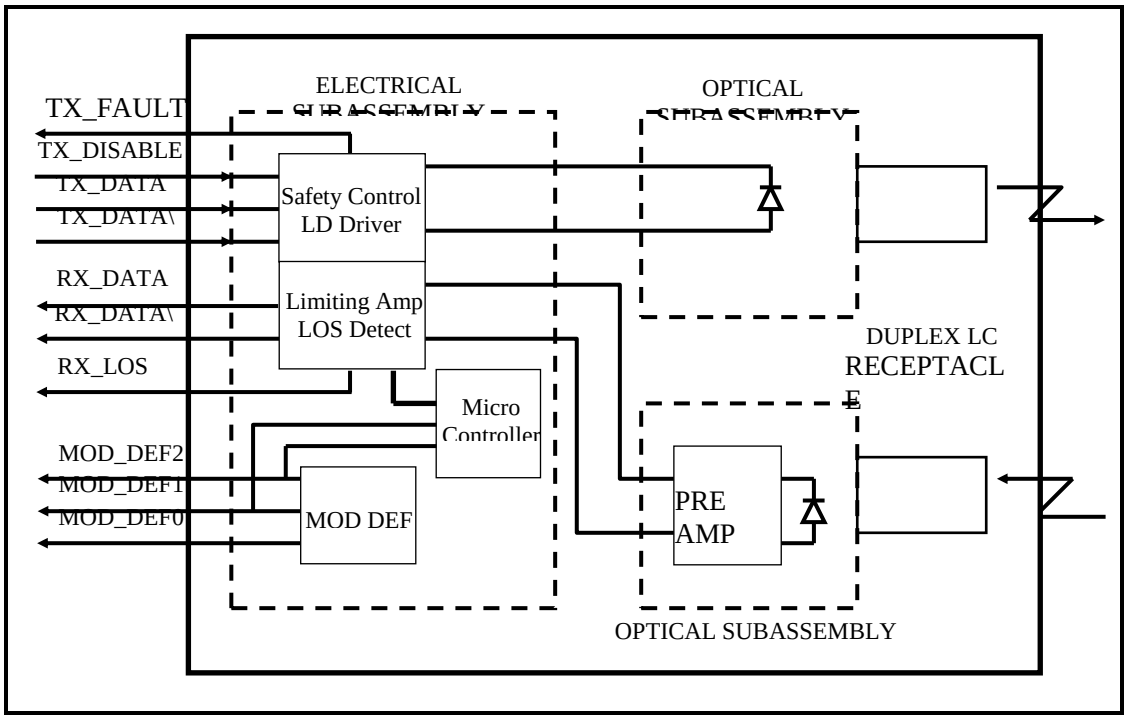
Transceiver Temperature, internally measured, represented as a 16 bit signed twos complement value in increments of 1/256 degrees Celsius, Temperature accuracy is better than ±3 degrees Celsius over specified operating temperature and voltage.
Transceiver Supply Power, internally measured, represented 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.

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. 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").

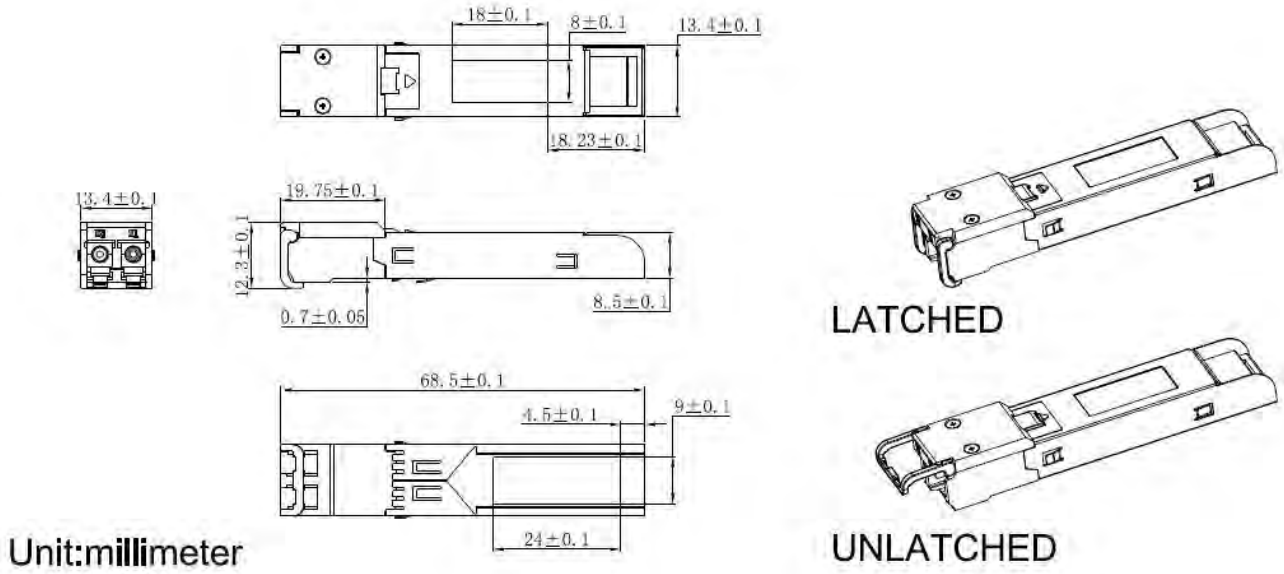
TX_FAULT
When the TX_FAULT signal is high, output indicates a laser fault of some kind. Low indicates normal operation.

Receiver Section
The receiver utilizes a APD 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.

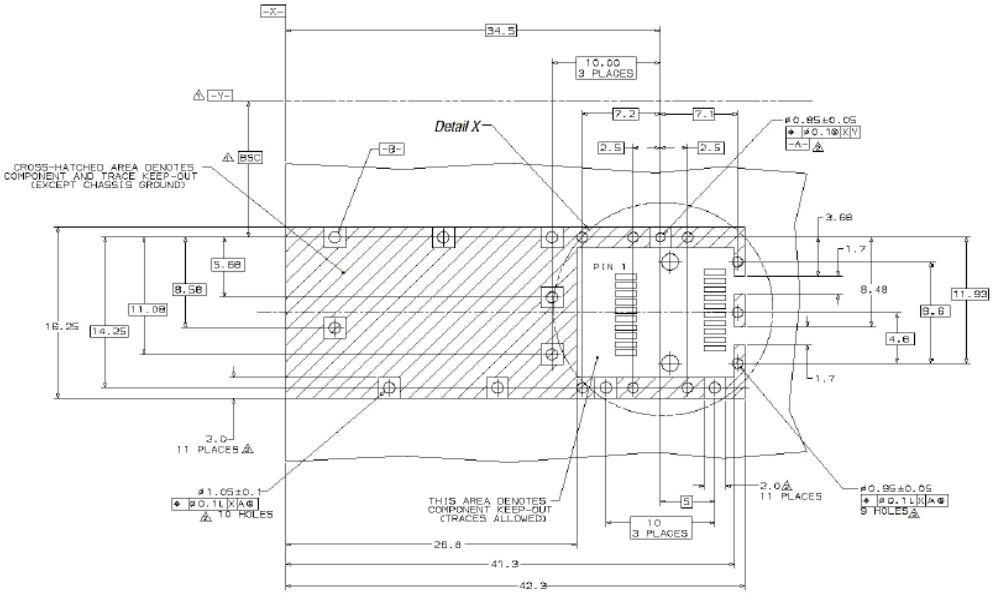
Controller Section
The micro controller unit monitors the operation information of LD driver and Limiting Amplifier. And report these status to the customer.

Dimensions



ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED
UNIT: mm

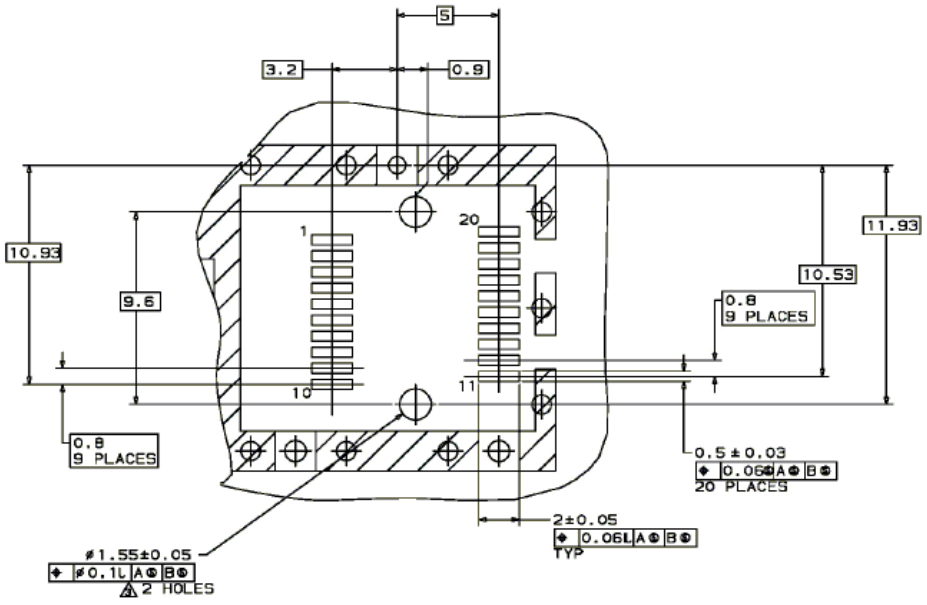
PCB Layout Recommendation



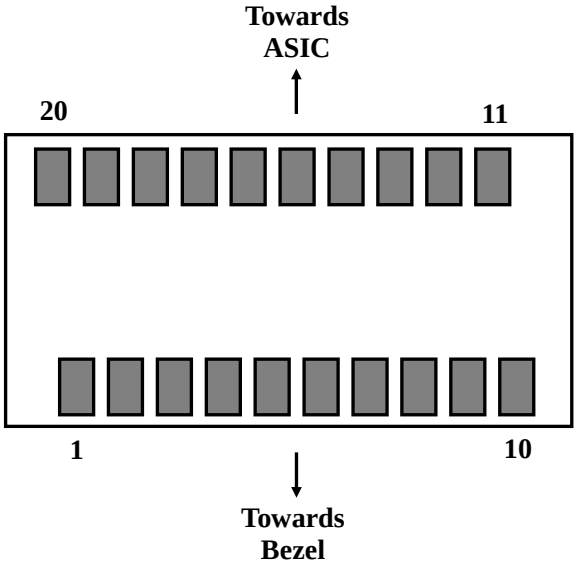
1 Datum and Basic Dimension Established by Customer

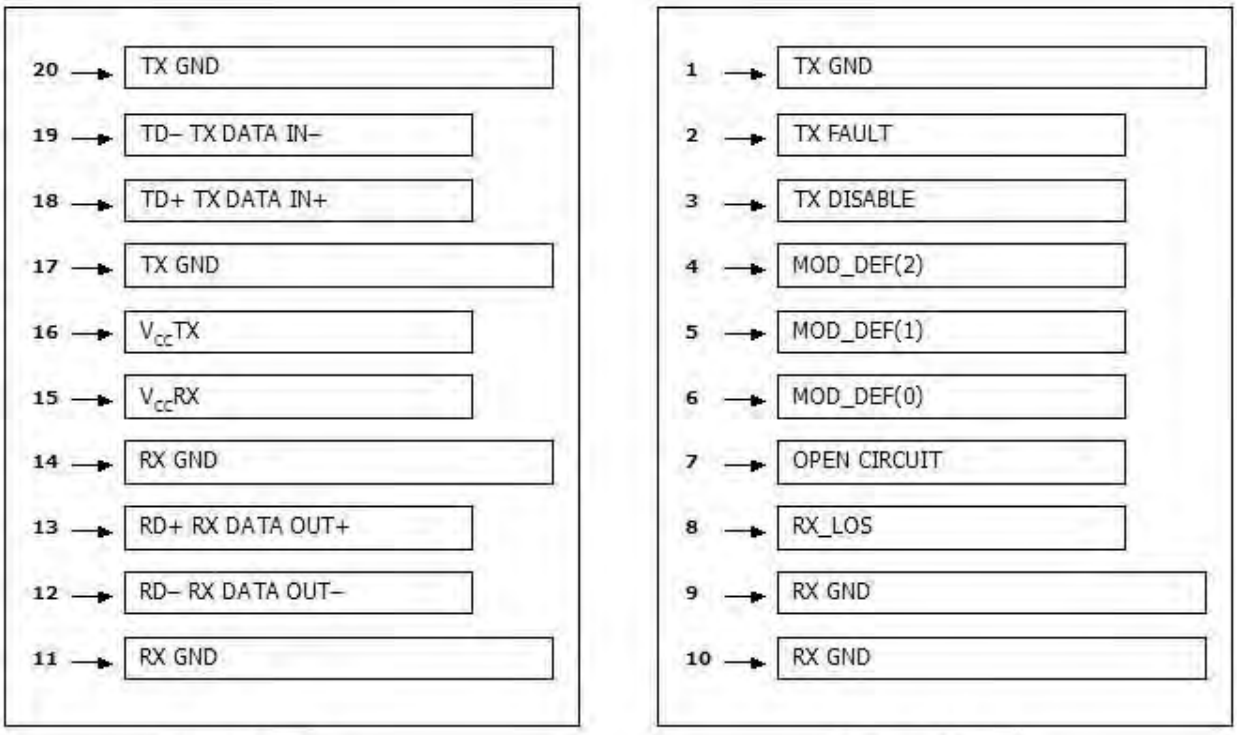
2 Pads and Vias are Chassis Ground, 11 Places

3 Through Holes are Unplated



Electrical Pad Layout





Top of Board

Bottom of Board

Pin Assignment

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. Not supported	
3	T_{DIS}	Transmitter Disable. Laser output disable on high or open	Disabled: T_{DIS}>2V or open Enabled: T_{DIS}<0.8V
4	MOD_DEF (2)	Module Definition 2. 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	MOD_DEF (1)	Module Definition 1. Clock line for serial ID	
6	MOD_DEF (0)	Module Definition 0. 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	V_{EER}	Receiver ground (common with transmitter ground)	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 802.3. IEEE Standard Department, 2005.
2. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000.
3. Fiber Channel Draft Physical Interface Specification (FC-PI-2 Rev7.0).
4. Digital Diagnostics Monitoring Interface for Optical Transceivers – SFF-8472.
5. Fiber Channel Physical and Signaling Interface (FC-PH/PH2/PH3).
6. Bellcore GR-253 and ITU-T G.957 Specifications.