

Prolabs SFP-1G-SX

SFP-1G-SX Short Wavelength Optical Transceiver

Key Features

- Up to 1.25 GBd bi-directional data links
- Compliant with IEEE 802.3z Gigabit Ethernet and 1000BASE-SX
- Compliant with SFP MSA
- Hot-pluggable SFP footprint
- 850nm VCSEL laser transmitter
- Duplex LC connector
- Built-in digital diagnostic functions
- Up to 550m on 50/125um MMF
- Up to 300m on 62.5/125um MMF
- Single power supply 3.3V
- RoHS Compliance
- Class 1 laser product complies with EN 60825-1
- Operating temperature range: -5°C to 85°C.

Applications

- 1.25 GBd Gigabit Ethernet
- 1.063 GBd Fiber Channel

Ordering Information

Part Number	Description
SFP-1G-SX	GE/FC SFP 850nm LC Connectors 550m on MMF, with DOM function.

Introduction

PROLABS's SFP-1G-SX optical transceivers are based on Gigabit Ethernet IEEE 802.3 standard and Fiber Channel FC-PI Rev.10.0 and provide a reliable interface for the GE/FC application. The Digital diagnostics functions are available via 2-wire serial bus, they comply with the Small Form Factor Pluggable Multi Sourcing Agreement (MSA) and SFF-8472.

Compatible Ordering Information

Prolabs Ordering SKU	OEM Manufacturer	Product Description
0061003006-C	ADVA	1000BASE-SX SFP, 850nm, 550m over MMF
100-01660-C	Calix	1000BASE-SX SFP, 850nm, 550m over MMF
10051-C	Extreme	1000BASE-SX SFP, 850nm, 550m over MMF
1AB376720001-C	Alcatel	1000BASE-SX SFP, 850nm, 550m over MMF
321-0435-C	Netscout	1000BASE-SX SFP, 850nm, 550m over MMF
3CSFP91-C	HP 3Com	1000BASE-SX SFP, 850nm, 550m over MMF
3FE25773AA-C	Alcatel	1000BASE-SX SFP, 850nm, 550m over MMF
3HE00027AA-C	Alcatel	1000BASE-SX SFP, 850nm, 550m over MMF
81Y1622-C	BTN/IBM	1000BASE-SX SFP, 850nm, 550m over MMF
AA1419013-C	Avaya	1000BASE-SX SFP, 850nm, 550m over MMF
AA1419048-C	Avaya	1000BASE-SX SFP, 850nm, 550m over MMF
AGM731F-C	Netgear	1000BASE-SX SFP, 850nm, 550m over MMF
AT-SPSX-C	Allied	1000BASE-SX SFP, 850nm, 550m over MMF
BN-CKM-S-SX-C	BTN/IBM	1000BASE-SX SFP, 850nm, 550m over MMF
BTI-MGBIC-GSX-DD-LC-C	Telco	1000BASE-SX SFP, 850nm, 550m over MMF
CPAC-TR-1SX-C	Checkpoint	1000BASE-SX SFP, 850nm, 550m over MMF
DEM-311GT-C	D-Link	1000BASE-SX SFP, 850nm, 550m over MMF
E1MG-SX-OM-C	Brocade	1000BASE-SX SFP, 850nm, 550m over MMF
eSFP-GE-SX-MM850-C	Huawei	1000BASE-SX SFP, 850nm, 550m over MMF
EX-SFP-1GE-SX-C	Juniper	1000BASE-SX SFP, 850nm, 550m over MMF
F5-UPG-SFP-R-C	F5 Networks	1000BASE-SX SFP, 850nm, 550m over MMF
FG-TRAN-SX-C	Fortinet	1000BASE-SX SFP, 850nm, 550m over MMF
GLC-SX-MM-C	Cisco	1000BASE-SX SFP, 850nm, 550m over MMF
GLC-SX-MMD-C	Cisco	1000BASE-SX SFP, 850nm, 550m over MMF
GP-SFP2-1S-C	Dell Force10	1000BASE-SX SFP, 850nm, 550m over MMF
J4858C-C	HP ProCurve	1000BASE-SX SFP, 850nm, 550m over MMF
JD118B-C	HP Comware	1000BASE-SX SFP, 850nm, 550m over MMF
JD493A-C	HP Comware	1000BASE-SX SFP, 850nm, 550m over MMF
LACGSX-C	Cisco SB	1000BASE-SX SFP, 850nm, 550m over MMF
LBG200C-MLC-C	Blackbox	1000BASE-SX SFP, 850nm, 550m over MMF
LBG200CP-MLC-C	Blackbox	1000BASE-SX SFP, 850nm, 550m over MMF
LFP411-C	Blackbox	1000BASE-SX SFP, 850nm, 550m over MMF
MGBIC-01-C	Enterasys	1000BASE-SX SFP, 850nm, 550m over MMF
MGBSX1-C	Linksys	1000BASE-SX SFP, 850nm, 550m over MMF
MGB-SX-C	Planet	1000BASE-SX SFP, 850nm, 550m over MMF
Mini-GBIC-SX-C	Ruijie	1000BASE-SX SFP, 850nm, 550m over MMF
PAN-SFP-SX-C	Palo Alto	1000BASE-SX SFP, 850nm, 550m over MMF
RED-SFP-GE-SX-C	Redback	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-001-SX-C	Riverbed	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-007-SX -C	Riverbed	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-1.25G-SX-C	Huawei	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-1000BASE-SX-M-C	Packetfront	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-1G-SX-ARISTA-C	Arista	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-1GSXLC-C	Moxa	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-8519-7D-PAC-C	Packetfront	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-GE-M500-C	ZTE	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-GE-S-C	Cisco	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-GE-SXLC-C	Marconi	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-GE-SX-MM850-A-C	Huawei	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-GE-SX-MM850-A-H3C-C	H3C Huawei	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-GE-SX-MM850-C	Huawei	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-GIG-SX-C	Alcatel	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-M1000SX-C	Asante	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-M1-L24P8-C	Maipu	1000BASE-SX SFP, 850nm, 550m over MMF
SFP-SX-D-C	ZyXEL	1000BASE-SX SFP, 850nm, 550m over MMF
SMC1GSFP-SX-C	SMC	1000BASE-SX SFP, 850nm, 550m over MMF
SMCBGSLCX1-C	SMC	1000BASE-SX SFP, 850nm, 550m over MMF

SU57AD-C	Marconi	1000BASE-SX SFP, 850nm, 550m over MMF
SX-SFP-1G-C	Generic	1000BASE-SX SFP, 850nm, 550m over MMF
SX-SFP-1G-EXT-C	Generic	1000BASE-SX SFP, 850nm, 550m over MMF
TEG-MGBSX-C	Trendnet	1000BASE-SX SFP, 850nm, 550m over MMF
TL-SM311LM-C	TP-Link	1000BASE-SX SFP, 850nm, 550m over MMF
TRC-1-SFP-SX-C	Riverbed	1000BASE-SX SFP, 850nm, 550m over MMF
TRX100006-C	Transmode	1000BASE-SX SFP, 850nm, 550m over MMF
XCVR-000G85-C	Ciena	1000BASE-SX SFP, 850nm, 550m over MMF

Specification

General Specifications						
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	DR	-	1.25	-	GBd	IEEE 802.3
			1.062			FC-P1-2 Rev 10
Bit Error Rate	BER	-	-	-	-	-
Operating Temperature	T _{OP}	- 5	-	85	°C	Case temperature
Storage Temperature	T _{STO}	- 40	-	85	°C	Ambient temperature
Supply Current	I _S	-	-	180	mA	For electrical power interface
Input Voltage	V _{CC}	3	3.20	3.3	V	-
Maximum Voltage	V _{MAX}	- 0.5	3.3	4	V	For electrical power interface

Optical Characteristics-Transmitter V _{CC} =3V to 3.6V, T _C =-5°C to 85°C						
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Output Optical Power 50/125um fiber, NA=0.2 62.5/125um fiber, NA- 0.275	P _{TX}	-9.5	-	-3	GBd	Class 1 Product
Optical Center Wavelength	λ _c	830	-	860	nm	-
Optical Modulation Amplitude@1.063GBd	OMA	156	-	-	uW	Equivalent extinction ratio specification for FC
Extinction Ratio@1.25GBd	ER	9	-	-	dB	-
Spectral Width (RMS)	Δλ	-	-	0.85	nm	-
Optical Rise/Fall Time (20% - 80%)	T _{RF IN}	-	100	150	ps	-
Relative Intensity Noise	RIN	-	-	-120	dB/Hz	-
Deterministic Jitter Contribution	TX_ΔDJ	-	20	60	ps	-
Total Jitter Contribution	TX_ΔTJ	-	65	125	ps	-
Mask Margin	-	-	45%	-	-	-

Specification

Optical Characteristics-Receiver $V_{CC}=3V$ to $3.6V$, $T_C=-5^{\circ}C$ to $85^{\circ}C$						
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Receiver Power	P_{RX}	-17	-	0	dBm	Average
Optical Center Wavelength	λ_C	770	-	860	nm	-
Receiver Sensitivity @ 1.063GBd	$R_{X\ SEN1}$	-	-	-20	dBm	FC-PI-2 Rev.10
Receiver Sensitivity @ 1.25GBd	$R_{X\ SEN2}$	-	-	-20	dBm	IEEE 802.3
Optical Return Loss	ORL	12	-	-	dB	-
Receiver Electrical 3dB Upper cutoff frequency	-	-	-	1500	MHz	-
Loss of Signal-Asserted	$P_{LOS\ A}$	-30	-	-	dBm	-
Loss of Signal-Deasserted	$P_{LOS\ D}$	-	-	-20	dBm	-
Loss of Signal-Hysteresis	-	0.5	-	-	dB	-

Electrical Characteristics-Transmitter $V_{CC}=3V$ to $3.6V$, $T_C=-5^{\circ}C$ to $85^{\circ}C$						
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R_{IN}	-	100	-	Ω	-
Single ended data input swing	$V_{IN\ PP}$	250	-	1200	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 $3.6V$, $T_C=-5^{\circ}C$ to $85^{\circ}C$						
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Single ended data output swing	$V_{OUT\ PP}$	250	450	550	mV	-
Data output rise time (20%-80%)	T_R	-	90	175	ps	-
Data output fall time (20%-80%)	T_F	-	90	175	ps	-
LOS Fault	$V_{LOS\ Fault}$	2	-	$V_{EE\ HOST}$	V	-
LOS Normal	$V_{LOS\ Normal}$	V_{EE}	-	$V_{EE}+0.5$	V	-

Specification

Digital Diagnostic Functions

SFP-1G-SX supports the 2-wire serial communication protocol as defined in SFP MSA. Digital diagnostic information are accessible over the 2-wire interface at the address 0xA2. Digital Diagnostics for SFP-1G-SX 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.

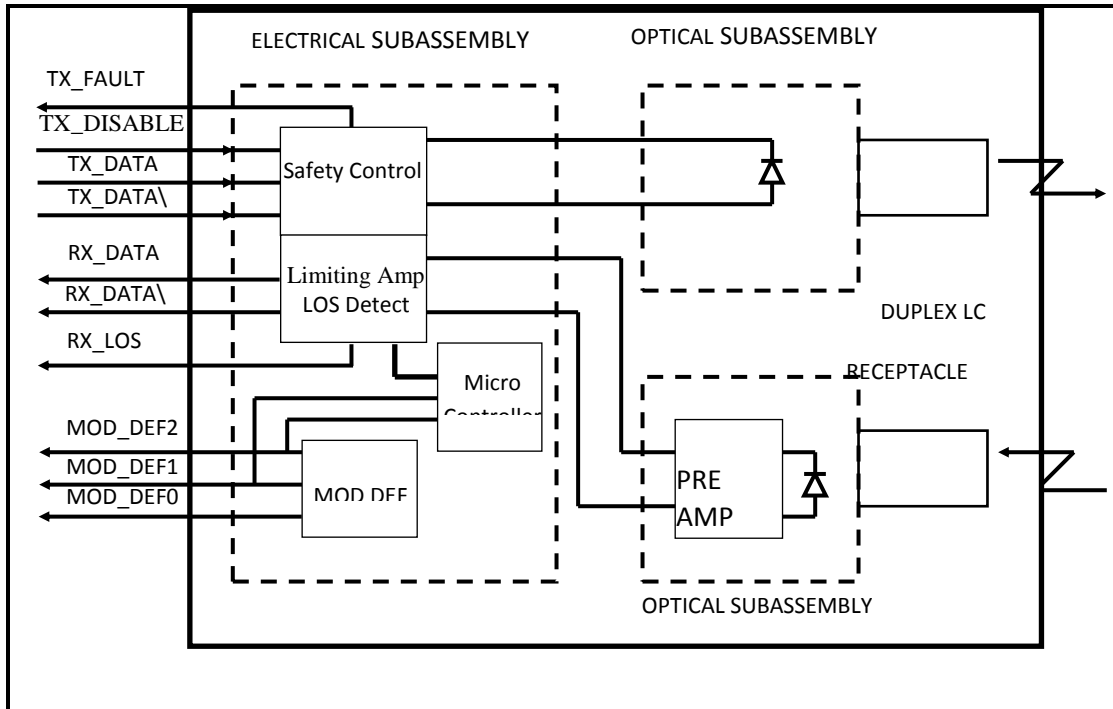
Transceiver TX bias current, internally measured, represented as a 16 bit unsigned integer with the current defined as the full 16 bit value (0 – 65535) with LSB equal to 2 μ A, yielding a total range of 0 to 131mA. Accuracy is better than $\pm 10\%$ over specified operating temperature and voltage.

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 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 value (0 – 65535) with LSB equal to 0.1 μ W. Accuracy is better than ± 3 dB over specified temperature and voltage.

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.

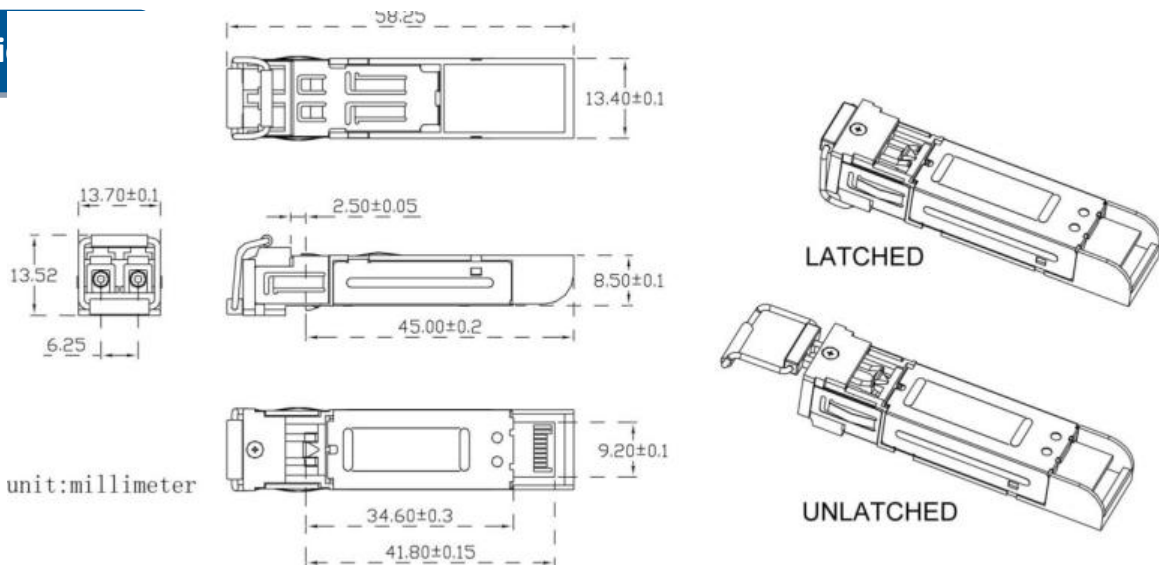
Receive Loss (RX_LOS)

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.

Dimensi

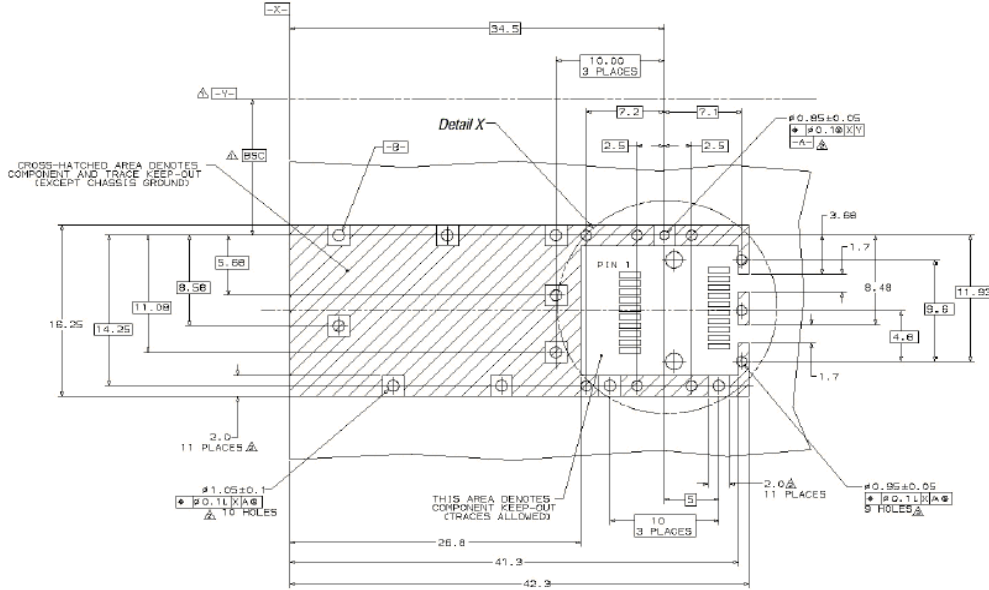


ALL DIMENSIONS ARE $\pm 0.2\text{mm}$ UNLESS OTHERWISE SPECIFIED

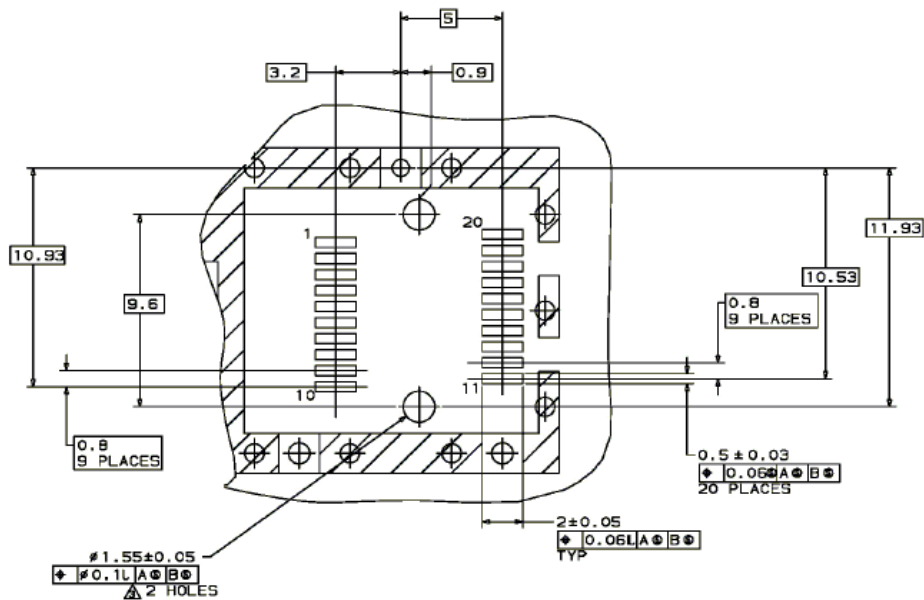
UNIT: mm

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FCB Layout Recommendation



- Δ Datum and Basic Dimension Established by Customer
- Δ Pads and Vias are Chassis Ground, 11 Places
- Δ Through Holes are Unplated



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. 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 connected to 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, 2002.
2. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000.
3. Fiber Channel Draft Physical Interface Specification (FC-PI-2 Rev.10).
4. Digital Diagnostics Monitoring Interface for Optical Transceivers – SFF-8472.