PROLABS – GP-XFP-1S-C

10 Gigabit 850nm MultiMode XFP Optical Transceiver

GP-XFP-1S-C Overview

ProLabs's GP-XFP-1S-C 10 GBd XFP optical transceivers are designed for the IEEE 802.3ae 10GBASE-SR, 10GBASE-SW and 10GFC 1200-Mx-SN-I interconnects. The GP-XFP-1S-C are compliant with the XFP Multi-Source Agreement (MSA) Specification. The Digital diagnostics functions are available via 2-wire serial interface, as specified in the XFP MSA.

Product Features

- Up to 9.95 GBd to 10.5GBd bit rates.
- Compliant with IEEE 802.3ae, 10GBASE-SR/SW, 10GFC application.
- Compliant with XFP MSA.
- Uncooled 850nm VCSEL laser.
- 30 pin XFP compatible connector.
- Standard bail mechanism for consistent installation and removal
- Built-in digital diagnostic functions.
- Hot Pluggable XFP footprint.
- Duplex LC Connectors.
- Up to 300m on MMF
- Power Supply: 3.3V and 1.8V
- RoHS Compliance
- Operating temperature range: 0℃ to 70℃.

Applications

- 10GBASE-SR 10G Ethernet
- 10GBASE-SW 10G Ethernet
- 1200-Mx-SN-I 10G Fiber Channel

Ordering Information

Part Number	*Description*
GP-XFP-1S-C	10 Gigabit XFP Transceiver, LC Connectors, 850nm, MultiMode Fiber 300m

Absolute Maximum Ratings

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Storage Ambient Temperature	T_S	– 40		85	℃	
Supply Voltage 3.3V	V_{CC}	– 0.5		4	V	
Supply Voltage 1.8V	V_{CC}	– 0.5		2	V	

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	*DR*	9.95		10.5	GBd	10GBASE-SR/SW 1200-Mx-SN-I
Bit Error Rate	*BER*			10^{-12}		
Total Power Consumption	*P*			1.5	W	
Supply Voltage	V_{CC3}	3.13		3.45	V	Operating Environment
Supply Voltage	$V_{CC1.8}$	1.71		1.89	V	Operating Environment
Supply Current	I_{CC3}			400	mA	
Case Operating Temperature	T_C	0		70	℃	

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_{CC3}=3.13V to 3.45V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Wavelength	λ	840	850	860	nm	
Optical Power	P_{OUT}	– 5		– 1	dBm	Average
Launch Power in OMA	P_{OUT_OMA}	–2.8	– 1.5		dBm	
Launch Power of OFF Transmitter	P_{OUT_OFF}			– 30	dBm	Average
Side Mode Suppression Ratio	*SMSR*	30			dB	
Spectral Width (RMS)	$\Delta\lambda$		0.4	0.45	dB	
Optical Extinction Ratio	*ER*	3	5.5		dB	
Relative Intensity Noise	*RIN*			– 128	dB/Hz	
Transmitter Dispersion Penalty	*TDP*			3.9	dB	
Transmitter Jitter	According to IEEE 802.3ae requirement					

Optical Characteristics - Receiver
V_{CC3}=3.13V to 3.45V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Center Wavelength Range	λ_C	840		860	nm	
Maximum Input Power	P_{IN}	0.5			dBm	
Receiver Sensitivity in OMA @ 10.3Gb/s	P_{SENS1}			– 11.1	dBm	Measured with worst ER: BER<10^{-12} 2^{31}-1 PRBS
Stressed Receiver Sensitivity in OMA @ 10.3Gb/s	P_{SENS2}			– 7.5	dBm	IEEE 802.3ae
Receiver Reflectance	TR_{RX}			– 12	dB	
LOS Assert	LOS_A	– 30			dBm	
LOS De-Assert	LOS_D			– 12	dBm	
LOS Hysteresis		0.5			dB	

Electrical Characteristics – Transmitter
V_{CC3}=3.13V to 3.45V, T_C=0℃ to 70℃

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Input differential impedance	R_{in}		100		Ω	After internal AC coupling
Differential data input swing	V_{IN_PP}	120		1000	mV	
Transmit Disable Voltage	V_D	2		V_{CC}	V	Or open circuit
Transmit Enable Voltage	V_{EN}	GND		GND+0.8	V	
Transmit Disable Assert Time				10	us	

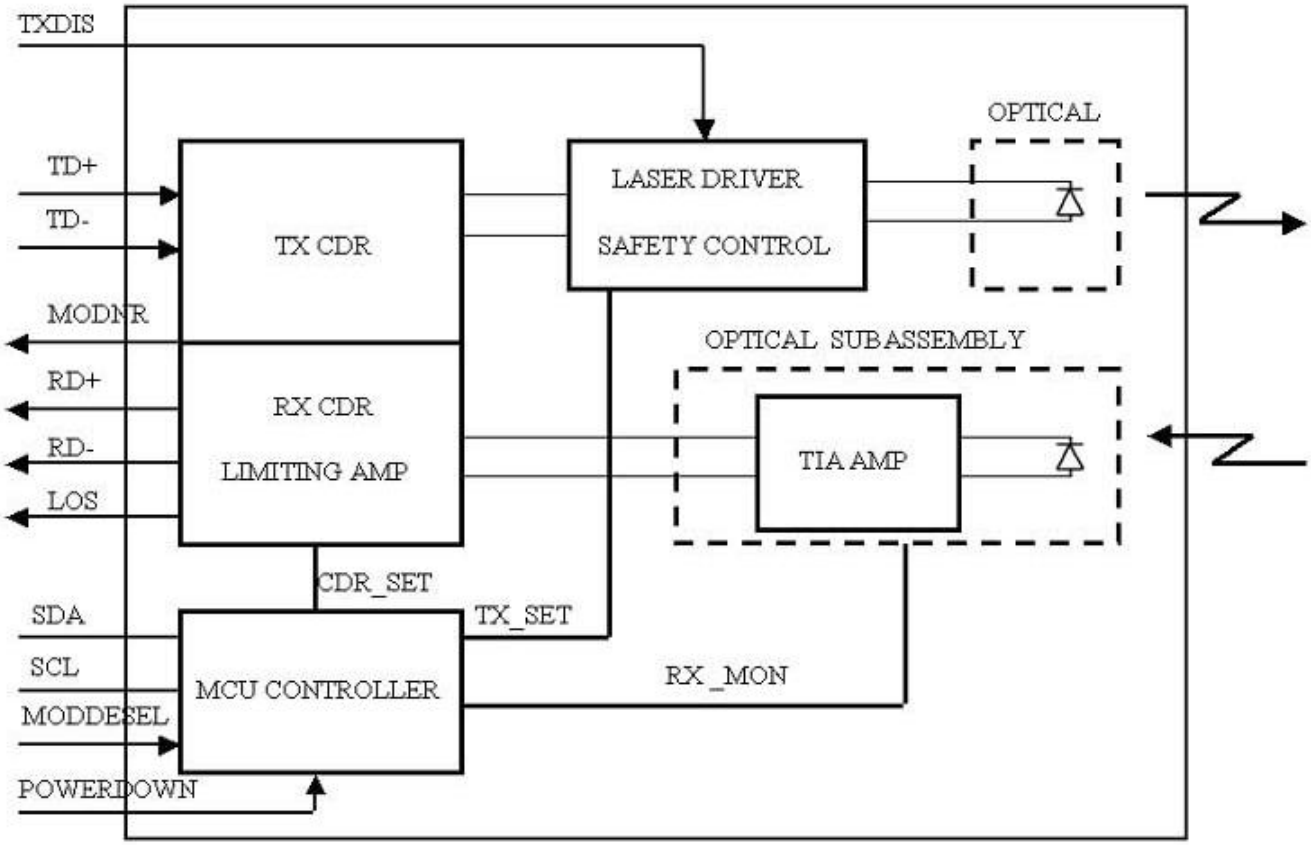
Electrical Characteristics – Receiver
V_{CC3}=3.13V to 3.45V, T_C=0℃ to 70℃

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Differential data output swing	V_{OUT_PP}	600	650	800	mV	
Data output rise time	T_R			40	ps	20%-80%
Data output fall time	T_F			40	ps	20%-80%
LOS Fault	V_{LOS_F}	V_{CC}-0.5		V_{CC_HOST}	V	
LOS Normal	V_{LOS_N}	GND		GND+0.5	V	

Digital Diagnostic
ProLabs's GP-XFP-1S-C incorporates a XFP compliant 2-wire management interface which is used for serial ID, digital diagnostics, and certain control functions. It is modeled on the SFF-8472 Rev 9.3 specification modified to accommodate a single 2-wire interface address. In addition to the basic I^2C read/write functionality the modules support packet error checking that, when enabled, allows the host system to confirm the validity of any read data. Details of the protocol and interface are explicitly described in the MSA. And the digital diagnostic functions via a 2-wire serial interface can provide real-time access to following operating parameters:

a. Transceiver Temperature
b. Laser Bias Current
c. Transmitted Optical Power
d. Received Optical Power
e. Transceiver Supply Voltage

Block Diagram



Transmitter Section:
The 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. Laser in an eye safe optical subassembly (OSA) mates to the fiber cable. TX CDR is used to overcomes host board and connector signal degradations by reshaping, regenerating, and attenuating jitter.

TXDIS:
TX_DIS is a input pin. When TX_DIS is asserted High, the XFP module transmitter output must be turned off.

Receiver Section:
The Receiver utilizes a PIN detector integrated with a trans-impedance preamplifier in an OSA. The 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 100ohm differential termination. RX CDR is used to overcomes host board degradations by reshaping, regenerating, and attenuating jitter.

LOS:
The LOS of an output pin , when LOS is high, it indicates insufficient optical power for reliable signal reception.

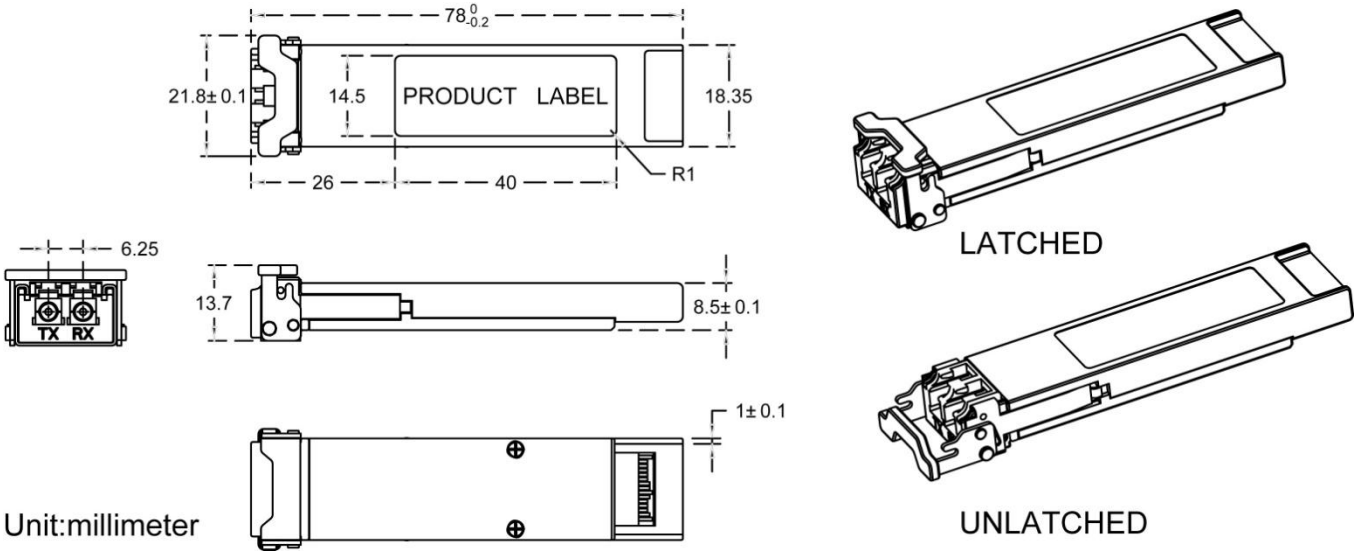
MODNR:
The MODNR is an output pin that when High, indicates that the module has detected a condition that renders transmitter and or receiver data invalid, shall consist of logical OR of the following signals:

a. Transmit Signal Conditioner Loss of Lock
b. Transmitter Laser Fault
c. Receiver Signal Conditioner Loss of Lock

Controller Section

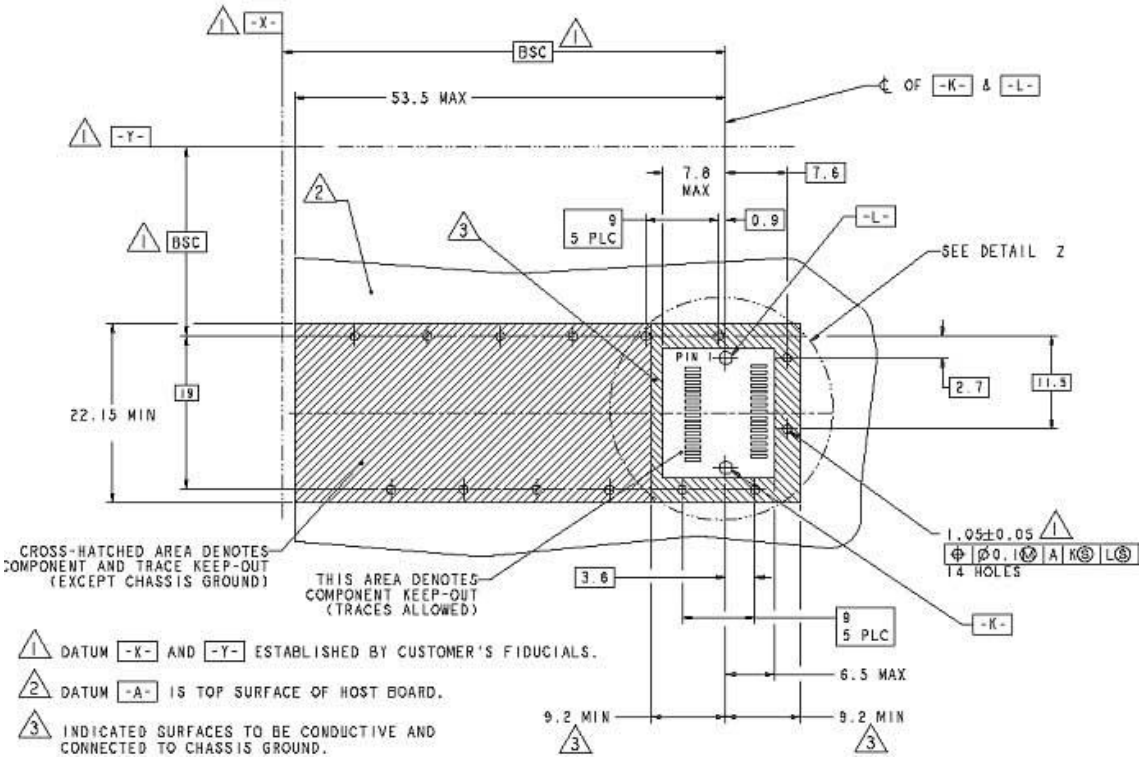
The micro controller unit initializes the control register of laser driver, limiting amplifier and CDR. And monitors the running information from the laser driver, limiting amplifier and CDR. Then report these information to the customer.

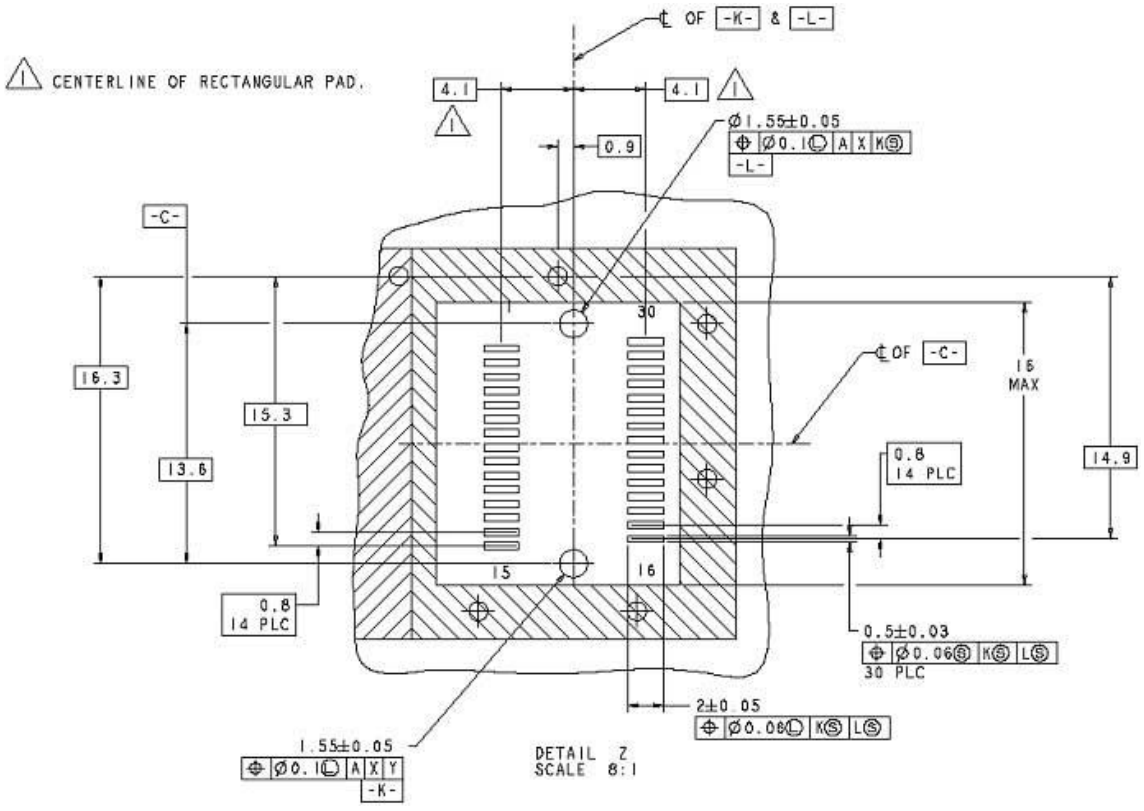
Dimensions



ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED

PCB Layout Recommendation





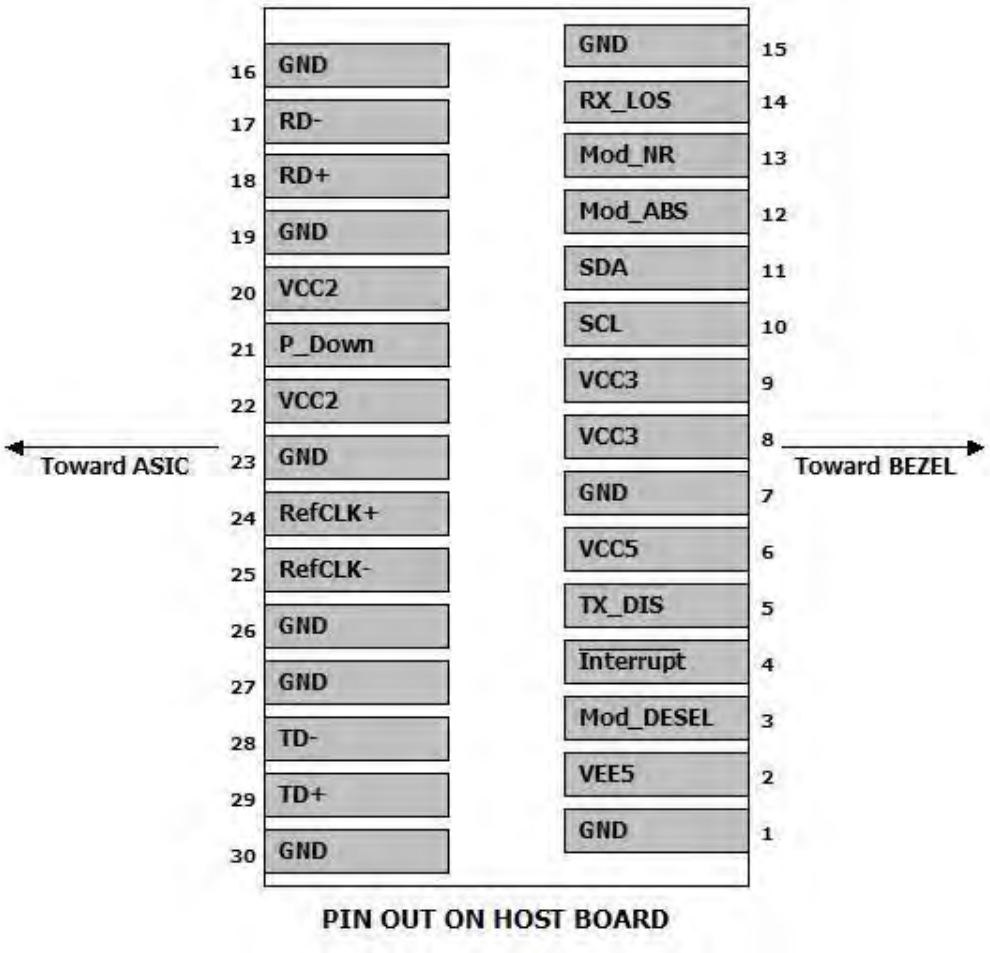
Pin Assignment – Pin 1 to Pin 23

PIN #	*Symbol*	*Logic*	*Description*	*Remarks*
1	GND		Module Ground	Module ground pins (GND) are isolated from the module case and chassis ground within the module
2	VEE5		Optional – 5.2 Power Supply (Not required)	
3	Mod-Desel	LVTTL-I	Module De-select, when held low allows the module to respond to 2-wire serial interface commands	
4	$\overline{\text{Interrupt}}$	LVTTL-O	Indicates presence of an important condition which can be read over the serial 2-wire interface	Open collector, should be pulled up with 4.7kΩ-10kΩ on host board to a voltage between 3.15V and 3.6V
5	TX_DIS	LVTTL-I	Transmitter Disable, Transmitter laser source turned off	
6	VCC5		+5V Power Supply (Not required)	
7	GND		Module Ground	Same as Pin# 1
8	VCC3		+3.3V Power Supply	
9	VCC3		+3.3V Power Supply	
10	SCL	LVTTL-I	Serial 2-wire interface clock	Same as Pin# 4
11	SDA	LVTTL-I/O	Serial 2-wire interface data line	Same as Pin# 4
12	Mod_Abs	LVTTL-O	Module Absent, Indicates module is not present. Grounded in the module	Same as Pin# 4
13	Mod_NR	LVTTL-O	Module Not Ready, Indicates Module operating fault	Same as Pin# 4
14	RX_LOS	LVTTL-O	Receiver Loss of Signal indicator	Same as Pin# 4
15	GND		Module Ground	Same as Pin# 1
16	GND		Module Ground	Same as Pin# 1
17	RD-	CML-O	Receiver inverted data output	
18	RD+	CML-O	Receiver non-inverted data output	
19	GND		Module Ground	Same as Pin# 1
20	VCC2		+1.8V Power Supply	
21	P_Down/RST	LVTTL-I	Power Down, When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module rest Reset, The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle	
22	VCC2		+1.8V Power Supply	
23	GND		Module Ground	Same as Pin# 1

Pin Assignment – Pin 24 to Pin 30

PIN #	*Symbol*	*Logic*	*Description*	*Remarks*
24	RefCLK+	PECL-I	Reference Clock non-inverted input, AC coupled on the host board	
25	RefCLK-	PECL-I	Reference Clock inverted input, AC coupled on the host board	
26	GND		Module Ground	Same as Pin# 1
27	GND		Module Ground	Same as Pin# 1
28	TD-	CML-I	Transmitter inverted data input	
29	TD+	CML-I	Transmitter non-inverted data input	
30	GND		Module Ground	Same as Pin# 1

Electrical Pad Layout



References

1. 10 Gigabit Small Form Factor Pluggable Module (XFP) Multi-Source Agreement (MSA), Rev 4.5 – August 2005.