PROLABS – XBR-4GFC-80KM-C

4.25** Gigabit Fiber Channel 80km **SFP+ Transceiver

XBR-4GFC-80KM-C Overview

PROLABS's XBR-4GFC-80KM-C 8GFC SFP+ optical transceivers are based on 4G Fiber Channel standard and SFF 8431 standard, and provide a quick and reliable interface for the 4G Fiber Channel application. The Digital diagnostics functions are available via 2-wire serial bus specified in the SFF 8472.

Product Features

- Up to 4.25 GBd bi-directional data links
- Compliant with 4G/2GFC
- Compliant with SFF8431
- Hot-pluggable SFP+ footprint
- DFB Laser Transmitter
- Duplex LC connector
- Built-in digital diagnostic functions
- 80km over SMF
- Single power supply 3.3V
- RoHS Compliance
- Class 1 Laser
- Operating temperature range: 0℃ to 70℃.

Applications

- 4G/2G Fiber Channel

Ordering Information

Part Number	*Description*
XBR-4GFC-80KM-C	4G SFP+ 1550nm LC Connectors 80km on SMF, with DOM function.

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	*DR*		4.25		GBd	FC-PI Rev 8.0
Bit Error Rate	*BER*			10^{-12}		
Operating Temperature	T_{OP}	0		70	℃	Case temperature
Storage Temperature	T_{STO}	– 40		85	℃	Ambient temperature
Supply Current	I_S			350	mA	For electrical power interface
Input Voltage	V_{CC}	3.1	3.3	3.5	V	
Maximum Voltage	V_{MAX}	– 0.5		4	V	For electrical power interface

Link Distances

Parameter	Fiber Type	Distance Range (Km)
4.25 GBd	9/125um SMF	80

Optical Characteristics – Transmitter

V_{CC}=3.1V to 3.5V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Output Optical Power	P_{TX}	0		4	dBm	Average
Optical Center Wavelength	λ_C	1530		1565	nm	
Extinction Ratio	*ER*	4.5			dB	
Spectral Width (– 20 dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	*SMSR*	30			dB	
Relative Intensity Noise	*RIN*			– 120	dB/Hz	
Transmitter Jitter	According to FC-PI-4 Rev8.0 requirement					
Launch Power of OFF Transmitter	P_{OUT_OFF}			– 30	dBm	Average

Optical Characteristics – Receiver

V_{CC}=3.1V to 3.5V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	λ_C	1260		1620	nm	
Optical Input Power	P_{IN}	-24		-7	dBm	Average, Informative
Receiver Sensitivity@ 4.25GBd	R_{X_SEN1}			-24	dBm	Measured with PRBS 2^7-1 at 10^{-12} BER
Return Loss		12			dB	
LOS Assert	LOS_A	– 42			dBm	
LOS De-Assert	LOS_D			– 26	dBm	
LOS Hysteresis		0.5			dB	

Electrical Characteristics – Transmitter

V_{CC}=3.1V to 3.5V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R_{IN}		100		Ω	Non condensing
Single ended data input swing	$V_{IN\ PP}$	125		800	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	

Electrical Characteristics – Receiver

V_{CC}=3.1V to 3.5V, T_C=0℃ to 70℃

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Single ended data output swing	$V_{OUT\ PP}$	300	300	470	mV	
Data output rise time (20%-80%)	T_R			120	ps	
Data output fall time (20%-80%)	T_F			120	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

XBR-4GFC-80KM-C 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 for XBR-4GFC-80KM-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.

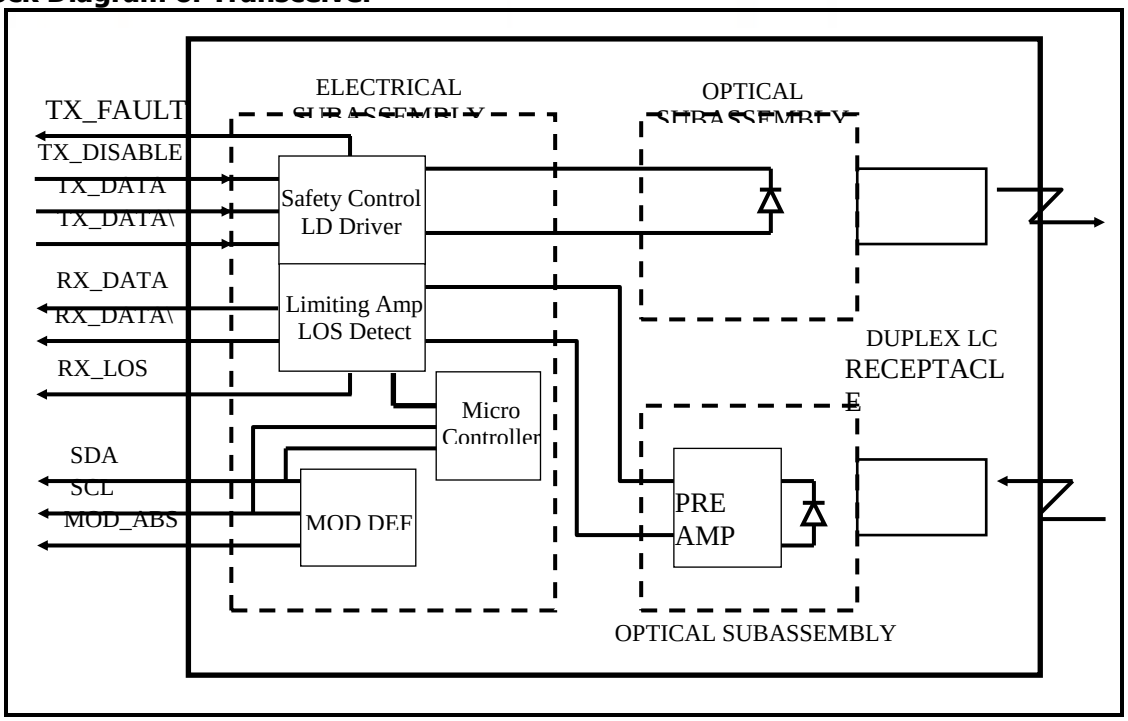
Transceiver Supply Power, internally measured, represented as a 16 bit unsigned integer with the voltage defined as the full 16 bit value (0 – 65535) with LSB equal to 100 µVolt, yielding a total range of 0 to +6.55 Volts.

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 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.1550 DFB 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.

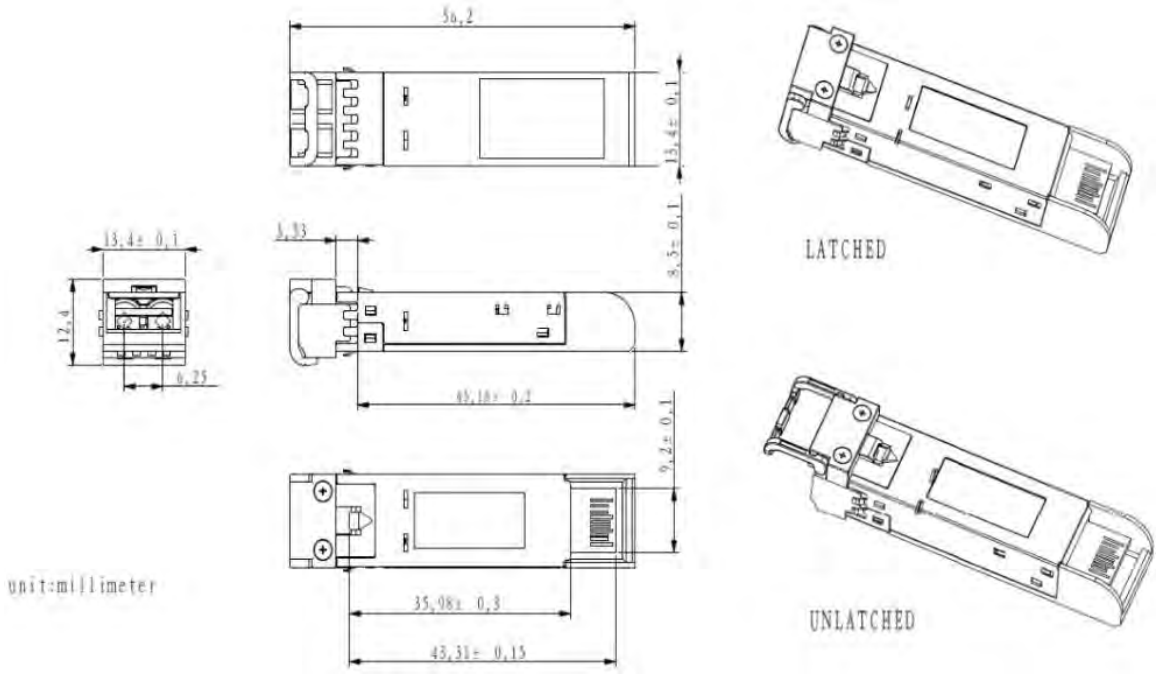
Receive Loss (RX_LOS)

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

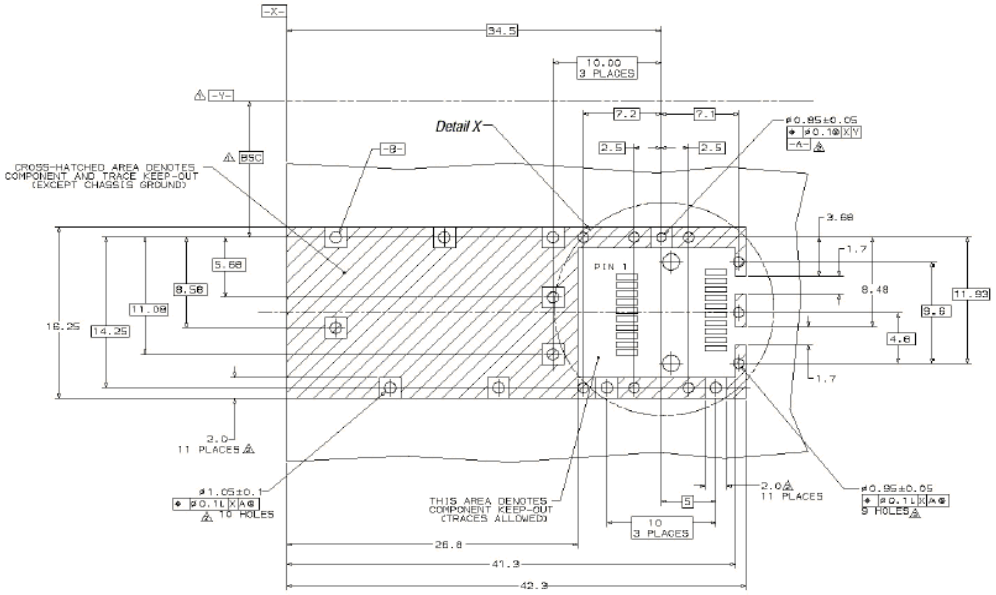
The micro controller unit monitors the operation information of LD driver and Limiting Amplifier. And report these status to the customer.

Dimensions



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

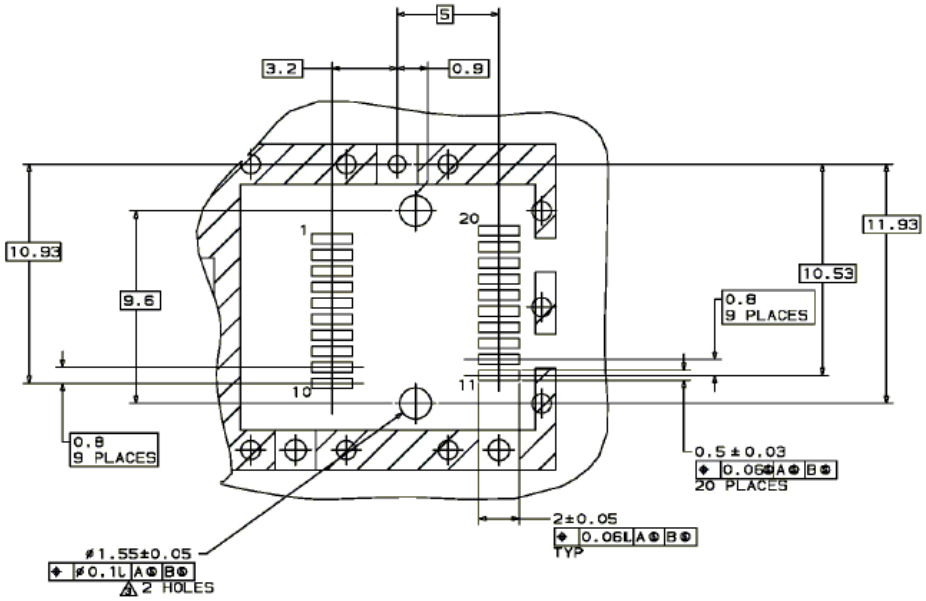
PCB Layout Recommendation



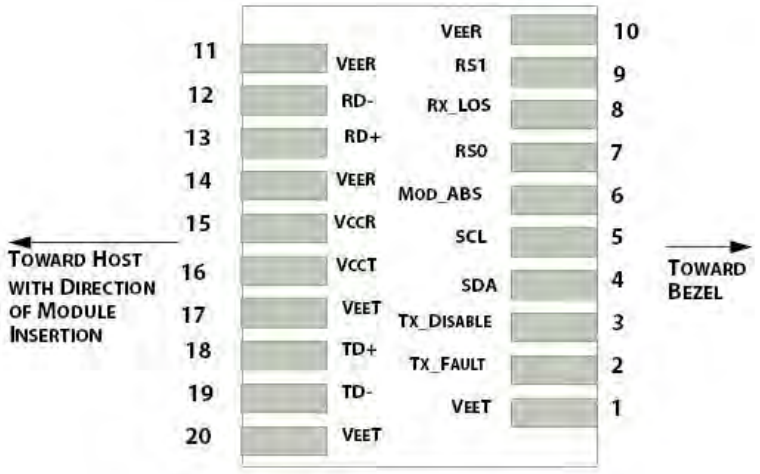
Datum and Basic Dimension Established by Customer

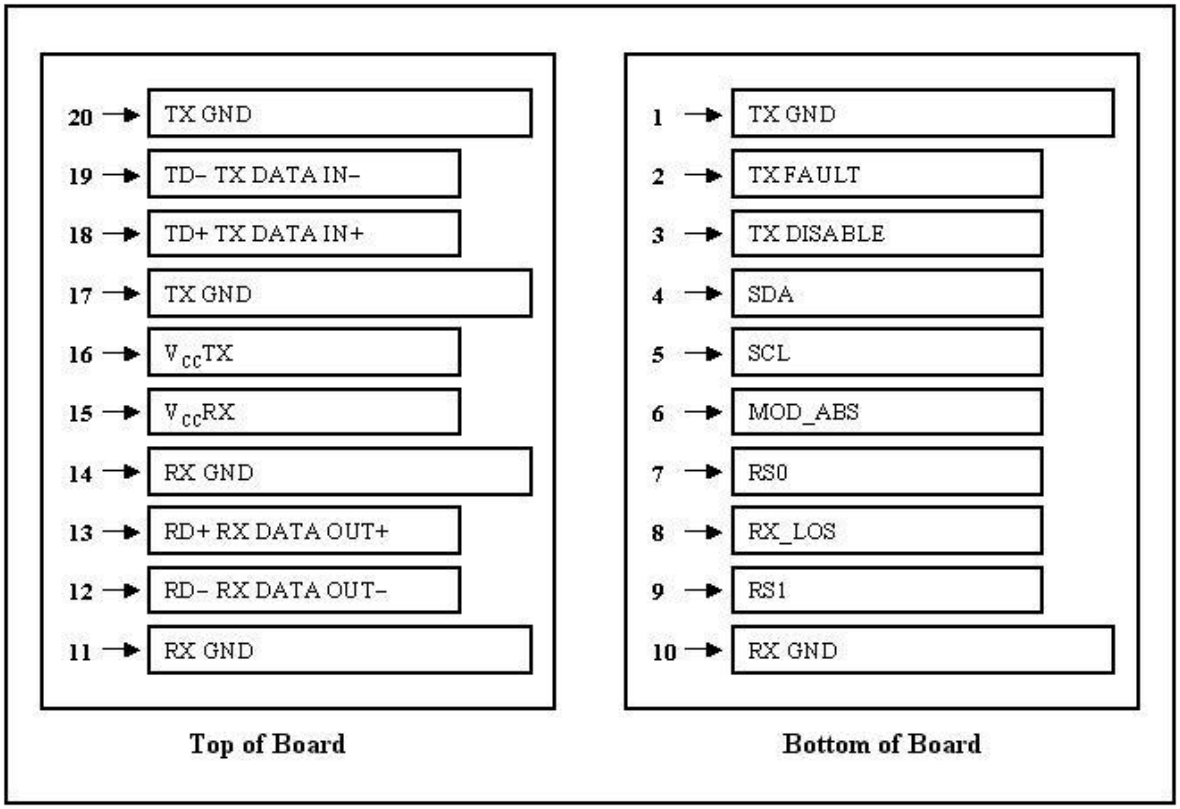
Rads and Vias are Chassis Ground, 11 Places

Through Holes are Unplated



Electrical Pad Layout





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.	
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	RS0	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 isolated from 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 isolated from chassis ground

References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000.
2. Fiber Channel Draft Physical Interface Specification (FC-PI-2 Rev8.0).
3. Digital Diagnostics Monitoring Interface for Optical Transceivers – SFF-8472.
4. Fiber Channel Physical and Signaling Interface (FC-PH/PH2/PH3).