



RoHS compliant
TX-1310/RX-1550 nm Single-mode Bi-directional
SFP LC Simplex Connector DDM



Features

- Supports 4.9Gb/s data rates
- Simplex LC Connector Bi-Directional SFP Optical Transceiver
- Single 3.3V Supply
- Up to 10km on 9/125um SMF
- A:1310nm DFB Laser transmitter,1550nm PIN receiver
- B:1550nm DFB Laser transmitter,1310nm PIN receiver
- Gigabit Ethernet compatible
- SFP MSA SFF-8074i Compliant
- Digital Diagnostic SFF-8472 Compliant
- Digital Diagnostic Monitoring : Internal Calibration or External Calibration
- RoHS compliant and Lead Free

Applications

- Multi-Rate 2.4576Gbps/3.0720Gbps/4.9142Gbps for CPRI
- Other Optical Links

Ordering Information

PART NUMBER	INPUT/OUTPUT	SIGNAL DETECT	TEMPERATURE	Distance
CL-SFP-WDM-10-31 DD CPRI	AC/AC	TTL	-5°C to 70 °C	10km
CL-SFP-WDM-10-31 DD CPRI i	AC/AC	TTL	-40°C to 85 °C	10km



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Description

The G CL-SFP-WDM-10-31 DD CPRI and CL-SFP-WDM-10-55 DD CPRI series single mode transceiver is small form factor pluggable module for Bi-directional optical data communications, such as OBSAI and CPRI optical links. It is with the SFP 20-pin connector to allow hot plug capability.

The transceiver is designed to transmit/receive data rates from 2.4576Gbps to 4.9142Gbps. The transceiver consists of three sections: a BOSA , including a DFB laser transmitter and a PIN photodiode integrated with a trans-impedance preamplifier (TIA); Transceiver IC, consisting of LD Driver and Post-Amplifier; and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

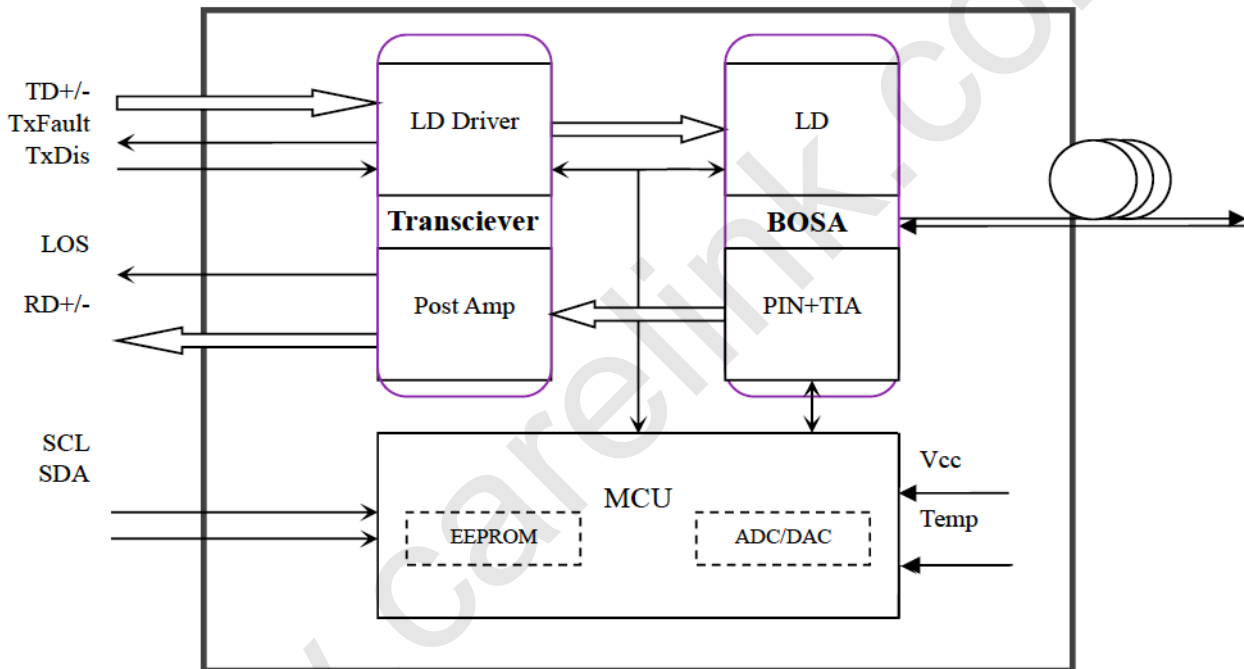


Figure1.Principle diagram of SFP Module

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%



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Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Power Supply Voltage	V _{cc}	3.13	3.3	3.47	V
Power Supply Current	I _{cc}			400	mA
Operating Case Temperature	T _c	-5		+70	°C
Data Rate			4.25	4.9	Gbps

Notes:

- [1] Supply current is shared between VCCTX and VCCR_X.
- [2] In-rush is defined as current level above steady state current requirements.

Electrical Characteristics(T_{OP}=25°C, V_{CC}=3.3 Volts)

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Supply Voltage	V _{CC}	3.00	3.30	3.60	V	1
Supply Current	I _{CC}			400	mA	1
Transmitter						
Input Differential Impedance	R _{in}	90	100	110	Ω	3
Single-ended Data Input Swing	V _{in,pp}	150		1200	mV _{pp}	2
Transmit Disable Voltage	V _D	2		V _{CC} +0.3	V	
Transmit Enable Voltage	V _{EN}	V _{ee}		V _{ee} +0.8	V	
TX Fault	Fault	V _{Fault}	2.0	V _{CC}	V	
	Normal	V _{Normal,Fault}	V _{ee}	V _{ee} +0.4	V	
Receiver						
Output Differential Impedance	R _{out}	90	100	110	Ω	3
Single-ended Data Output Swing	V _{out,pp}	300		700	mV _{pp}	2
LOS Fault	V _{LOS,fault}	2		V _{CC}	V	4
LOS Normal	V _{LOS,norm}	V _{ee}		V _{ee} +0.8	V	4

Notes:

- 1. Module power consumption never exceeds 1.1W.
- 2. AC coupled.
- 3. 100 ohm differential termination.
- 4. LOS is LVTTTL. Logic 0 indicates normal operation; logic1 indicates no signal detected.



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Optical Characteristics(TOP=25°C, VCC=3.3 Volts)

(CL-SFP-WDM-10-31 DD CPRI,1310nm DFB&PIN/TIA)

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Centre Wavelength	λ_c	1300	1310	1320	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Spectral Width (-20dB)	σ			1	nm	
Average Output Power	P _{out}	-5		-1	dBm	1,2
Extinction Ratio	ER	4			dB	
Transmitter and Dispersion Penalty	TDP			2	dB	
Average Power of OFF Transmitter	P _{Disable}			-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	
Receiver						
Centre Wavelength	λ_c	1540		1560	nm	
Average Receiver Power	P _{sensitivity}			-15	dBm	2,3
Receiver Overload	P _{MAX}			+0.5	dBm	
LOS De-Assert	LOS _D			-15	dBm	
LOS Assert	LOS _A	-28			dBm	
LOS Hysteresis		1		5	dB	

Notes:

- Output is coupled into a 9/125um SMF.
- Average Receiver Power (Min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant.
- Measured with a PRBS231-1 test pattern @10.3125Gbps, BER ≤ 10⁻¹².
- Rise and fall times, 20% to 80%, are measured following a fourth-order Bessel-Thompson filter with a bandwidth of 0.75 x clock frequency corresponding to the serial data rate.

(CL-SFP-WDM-10-55 DD CPRI, 1550nm DFB&PIN/TIA)

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Centre Wavelength	λ_c	1540	1550	1560	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Spectral Width (-20dB)	σ			1	nm	
Average Output Power	P _{out}	-5		-1	dBm	10km
Extinction Ratio	ER	4			dB	
Transmitter and Dispersion Penalty	TDP			2	dB	
Average Power of OFF Transmitter	P _{Disable}			-30	dBm	



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Relative Intensity Noise	RIN			-128	dB/Hz	
Receiver						
Centre Wavelength	λ_c	1320		1340	nm	
Average Receiver Power	$P_{\text{Sensitivity}}$			-15	dBm	1,2
Receiver Overload	P_{MAX}			+0.5	dBm	
LOS De-Assert	LOSD			-15	dBm	
LOS Assert	LOSA	-28			dBm	
LOS Hysteresis		1		5	dB	

Notes:

1. Average Receiver Power (Min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant.
2. Measured with a PRBS₂₃₁-1 test pattern @10.3125Gbps, BER ≤ 10⁻¹².
3. Rise and fall times, 20% to 80%, are measured following a fourth-order Bessel-Thompson filter with a bandwidth of 0.75 x clock frequency corresponding to the serial data rate.

Timing and Electrical

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t _{on}			1	ms
Tx Disable Assert Time	t _{off}			10	μs
Time To Initialize, including Reset of Tx Fault	t _{init}			300	ms
Tx Fault Assert Time	t _{fault}			100	μs
Tx Disable To Reset	t _{reset}	10			μs
LOS Assert Time	t _{loss_on}			100	μs
LOS De-assert Time	t _{loss_off}			100	μs
Serial ID Clock Rate	f _{serial_clock}			400	KHz
MOD_DEF (0:2)-High	V _H	2		V _{cc}	V
MOD_DEF (0:2)-Low	V _L			0.8	V



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Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Temperature	-5 to +70	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-5 to -1	dBm	±3dB	Internal / External
RX Power	-15 to -3	dBm	±3dB	Internal / External

Pin Definitions

Pin Diagram

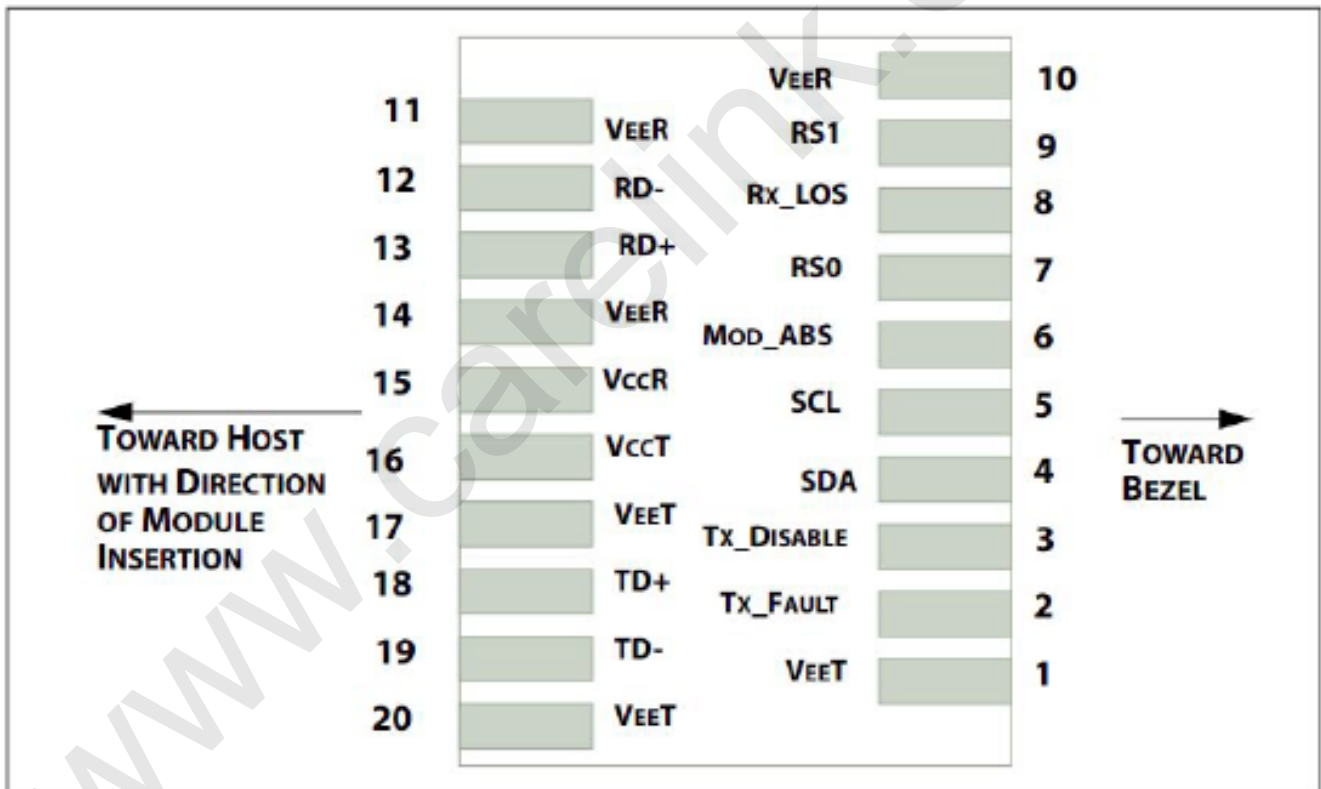


Figure2. Host PCB SFP+ pad assignment top view



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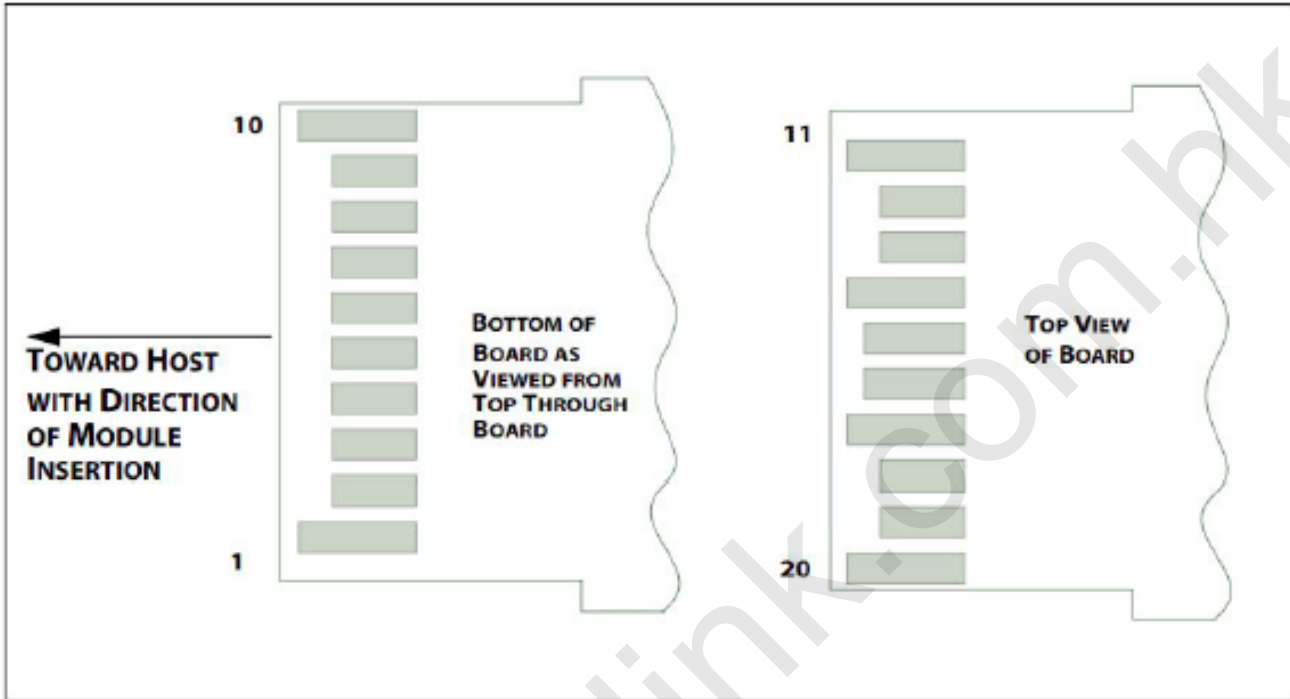


Figure3. SFP+ module contact assignment

Pin Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	VEET	Transmitter Ground	1	Note 1
2	TX_FAULT	Transmitter Fault Indication	3	Note 2
3	TX_DISABLE	Transmitter Disable, Laser output disabled on high or open	3	Note 3
4	SDA	2-wire Serial Interface Data Line, SDA Serial Data Signal	3	Note 2
5	SCL	2-wire Serial Interface Data Line, SCL Serial Clock Signal	3	Note 2
6	MOD_ABS	Module Absent. Grounded within the module	3	Note 4
7	RS0	RS0 for Rate Select: Open or Low = Module supports ≤4.25Gbps High = Module supports 9.95 Gb/s to 10.3125 Gb/s	3	Note 5
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation	3	Note 2
9	RS1	No connection required	1	Note 5
10	VEER	Receiver ground	1	Note 1
11	VEER	Receiver ground	1	Note 1
12	RD-	Receiver Inverted Data out. AC Coupled	3	Note 6



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13	RD+	Receiver Data out. AC Coupled	3	Note 6
14	VEER	Receiver ground	1	Note 1
15	VCCR	Receiver Power Supply	2	
16	VCCT	Transmitter Power Supply	2	
17	VEET	Transmitter Ground	1	Note 1
18	TD+	Transmit Data In.AC Coupled	3	Note 7
19	TD-	Transmit Inverted Data In. AC Coupled	3	Note 7
20	VEET	Transmitter Ground	1	Note 1

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

- 1) Module circuit ground is isolated from module chassis ground within the module.
- 2) TX Fault/RX_LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{Logic 0}. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind or loss of signal. In the low state, the output will be pulled to 0.8V. SDA/SCL should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.
- 3) TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:

Low (0 to 0.8V):	Transmitter on
(>0.8V, <2.0V):	Undefined
High (2.0 to 3.465V):	Transmitter Disabled
Open:	Transmitter Disabled
- 4) Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc_Host with a resistor in the range 4.7 kΩ. Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.
- 5) RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module.
- 6) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential)
- 7) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module



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Recommend Circuits

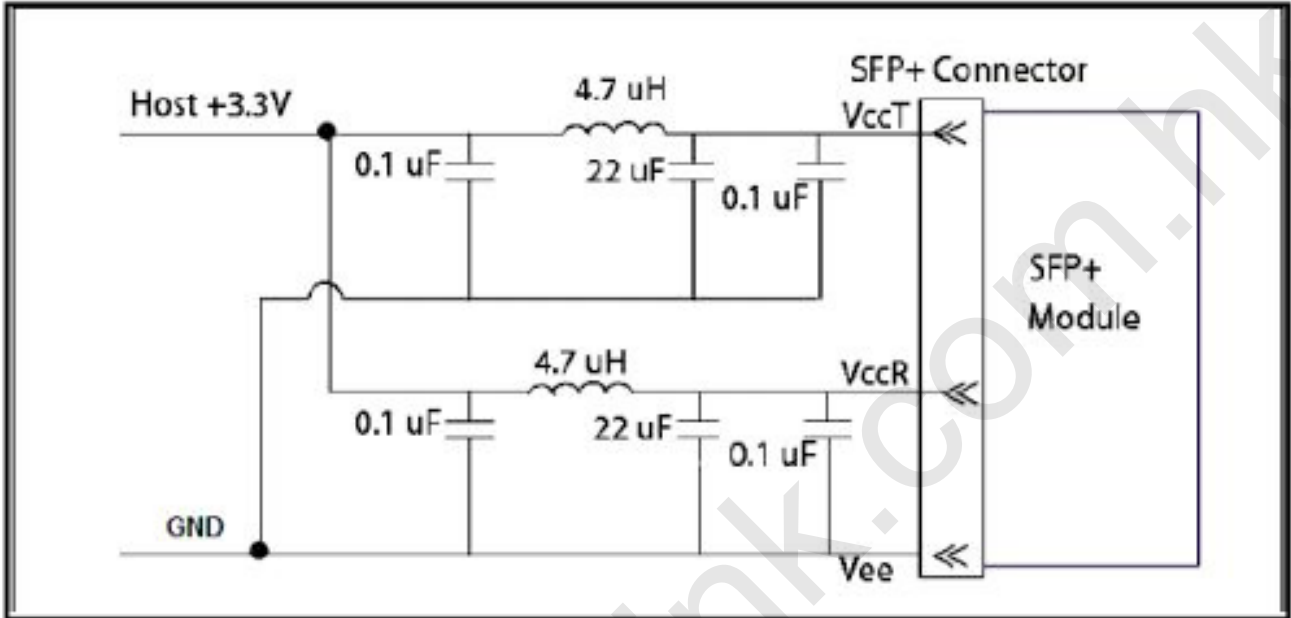


Figure4. Host Board Power Supply Filters Circuit

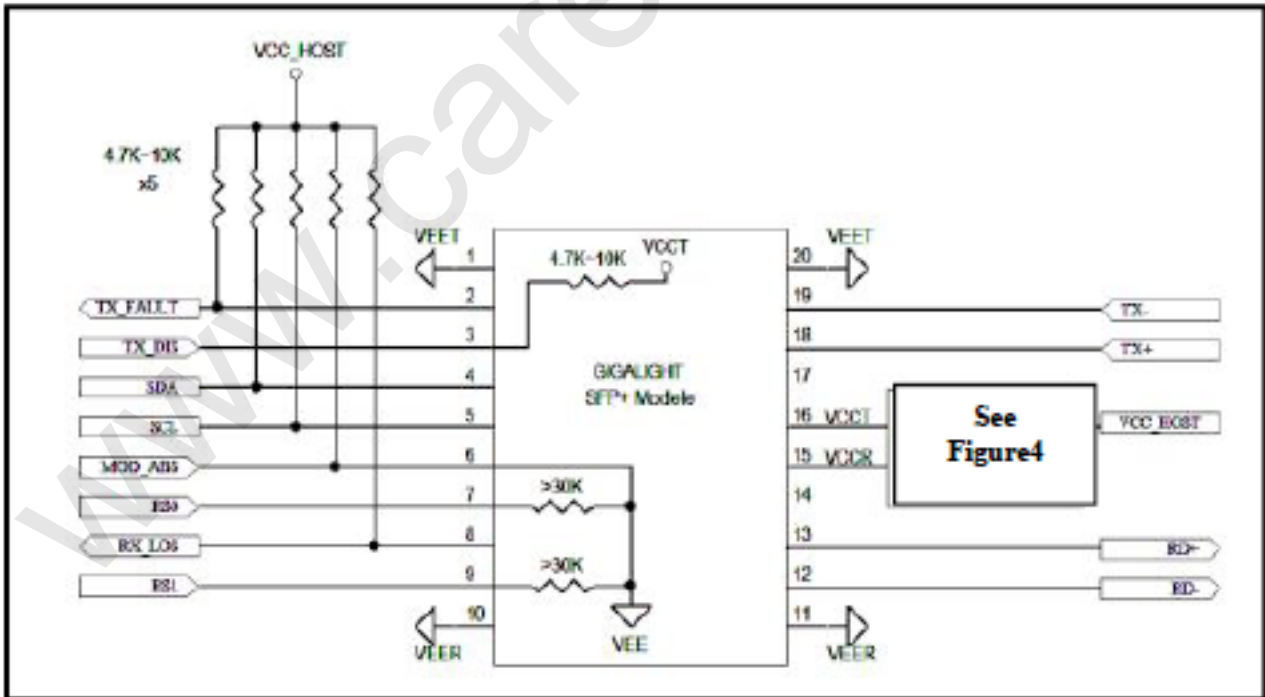
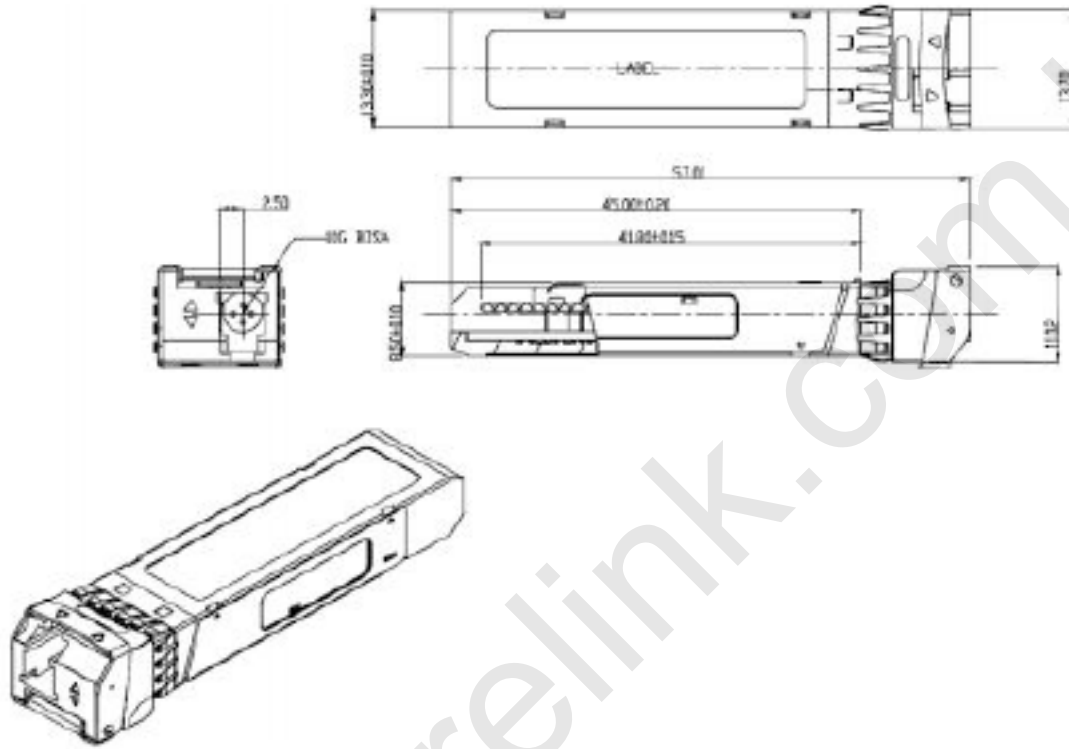


Figure5.Host-Module Interface



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Mechanical Dimensions



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