100G QSFP28 PSM4 10km Optical Transceiver

Features

◎ Up to 25.78125Gbps Data rate per channel

◎ Up to reach 10km for G.652 SMF

◎ 4 channels 1310nm DFB

◎ 4 channels PIN photo detector array

◎ Hot-pluggable QSFP28 form factor

◎ Single MPO connector receptacle

◎ Internal CDR circuits on both receiver and Transmitter channels

◎ Support CDR bypass

◎ Built-in digital diagnostic functions

◎ Single +3.3V power supply

◎ Low power consumption<3.5 W

◎ Operating case temperature: 0~+70°C

◎ 4 channel full duplex transceiver modules

Applications

◎ 100G PSM4 applications with FEC

◎ Datacenter and Enterprise networking

◎ Other optical links

Standard

◎ Compliant with SFF-8636

◎ Compliant with IEEE 802.3bm 100GBASE-PSM4

◎ Compliant with Telcordia GR-468-CORE

◎ RoHS Compliant

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Table 1. Regulatory Compliance

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12+A2 EN 60825-1:2014 EN 60825-2:2004+A1+A2
UL	E317337	UL 60950-1 CSA C22.2 No. 60950-1-07
EMC CE	AE 50285865 0001	EN 55022:2010 EN 55024:2010
FCC	WTF14F0514417E	47 CFR PART 15 OCT., 2013
FDA	/	CDRH 1040.10
ROHS	/	2011/65/EU

Product Description

The transceiver is a four-channel, pluggable, parallel, fiber-optic QSFP28 PSM4 transceiver module for 100GBASE-PSM4 and 100G Ethernet, InfiniBand DDR, EDR applications. This high performance module is designed for data communication and interconnect applications. It integrates four data lanes in each direction with 100Gb/s bandwidth. Each lane can operate at 25.78125Gb/s Up to reach 10km for G.652 SMF. These modules are designed to operate over single mode fiber systems using a nominal wavelength of 1310nm. The electrical interface uses a 38 pin contact edge type connector. The optical interface uses an 12 fiber MTP(MPO) connector. This module incorporates Technologies proven circuit and Optical technology to provide reliable long life, high performance, and onsistent service.

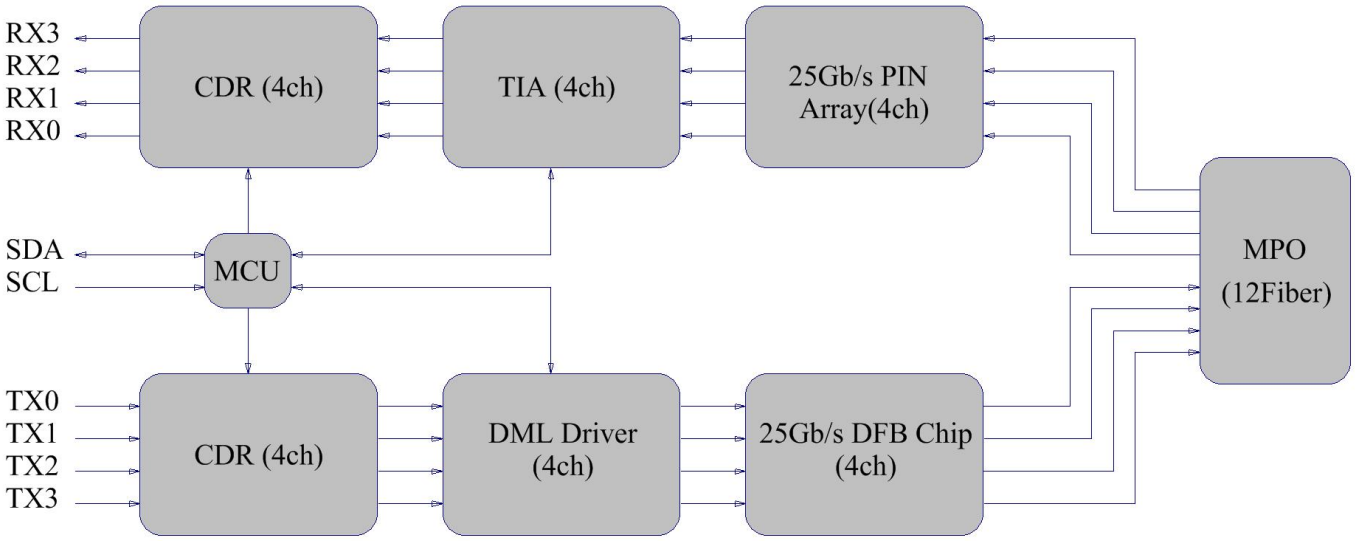

Figure 1.Transceiver functional Block Diagram

Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

(Exceeding the limits below may damage the transceiver module permanently)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Maximum Supply Voltage	VCC	-0.5	-	+4.0	V	
Storage Temperature	TS	-40	-	+85	℃	
Case Operating Temperature	TA	-5	-	+75	℃	
Relative Humidity	RH	5	-	95	%	1
Receiver Damage Threshold, each lane	PRdmg	3.0	-	-	dBm	

Notes:

1. Non-condensing.

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Recommend Operation Environment

Table 3. Recommend Operation Environment

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Data Rate,each lane	BR	-	25.78125	-	Gbps	
Power Supply Voltage	VCC	3.13	3.3	3.47	V	
Power Supply Current	ICC	-	-	1060	mA	
Power Dissipation	PD	-	-	3.5	W	
Case Operating Temperature	TA	0	-	+70	°C	
Relative Humidity	RH	5	-	85	%	1
Transmission Distance	TD	-	-	10	km	2

Notes:

1. Non-condensing.
2. Measured with ITU-T G.652 SMF

Electricalptical Characteristics

Table 4. Electrical Characteristics(T_{OP} = 0 to +70 °C, V_{CC} = 3.13 to 3.47 V)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Differential Data Input Amplitude	VIN,P-P	180	-	900	mVpp	
Input Differential Impedance	ZIN	90	100	110	Ω	
Transmitter Fault Output-High	VOH	2.4	-	VCC	V	
Transmitter Fault Output-Low	VOL	-0.3	-	0.4	V	
Transmitter Disable Voltage- High	VIH	2.0	-	VCC	V	
Transmitter Disable Voltage- low	VIL	0	-	0.8	V	
Receiver						
Differential output voltage swing	VOUT,P-P	300	-	900	mVpp	
Output Differential Impedance	ZOUT	90	100	110	Ω	
LOS Output Voltage-High	VLOSH	2.0	-	VCC	V	
LOS Output Voltage-Low	VLOSL	-	-	0.8	V	

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Optical Characteristics

Table 5. Optical Characteristics(T_{OP} = 0 to +70 °C, V_{CC} = 3.13 to 3.47 V)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Optical Center Wavelength	λC	1290	1310	1330	nm	
RMS Spectral Width (20dB)	Δσ	-	-	1.0	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Data Rate, each lane	BR	-	25.78125	-	Gbps	
Average Launch Power,each lane	PO	-5.0	-	2.0	dBm	1
Optical Modulation Amplitude, each lane	POMA	-5.0	-	2.2	dBm	
Transmitter and dispersion penalty (TDP), each lane	TDP	-	-	2.9	dBm	
Optical Extinction Ratio	ER	3.5	-	-	dB	
Relative Intensity Noise	RIN	-	-	-130	dB/Hz	
Optical Return Loss Tolerance	ORL	-	-	20	dB	
Transmitter Reflectance	RT	-	-	-20	dB	
Average Launch power of Tx OFF, each lane	POFF	-	-	-30	dBm	
Transmitter Eye Mask coordinates: X1, X2, X3, Y1, Y2, Y3	SPECIFICATION VALUES {0.31,0.4,0.45,0.34,0.38,0.4}					2
Receiver						
Center Wavelength Range	λC	1290	1310	1330	nm	
Data Rate, each lane	BR	-	25.78125	-	Gbps	
Receiver Power(OMA), each lane	ROMA	-	-	2.2	dBm	
Average Receive Power, each lane	RPO	-12.66	-	2.0	dBm	1
Receiver Sensitivity(OMA), each lane	RSENS	-	-	-11.4	dBm	
Stressed Receiver Sensitivity	RSRS	-	-	-6.8	dBm	3

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(OMA) , each lane						
LOS Assert	LOSA	-30	-	-	dBm	
LOS De-Assert	LOSD	-	-	-14	dBm	
LOS Hysteresis	LOSH	0.5	-	5.0	dB	
Receiver Reflectance	RR	-	-	-26	dB	

Notes:

1. Average launch/receive power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch/receive power below this value cannot be compliant; however, a value above this does not ensure compliance.

2. Hit Ratio 5 x 10^-5 hits/sample

3. Measured with worst ER=3.5dB, RPBS 2^31-1 test pattern @25.78125Gbs BER=<1x10^-12.

Pin Assignment

Table 6. Pin Descriptions

Pin	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	2
9	ResetL	Module Reset	2
10	Vcc Rx	+3.3 V Power supply receiver	
11	SCL	2-wire serial interface clock	2
12	SDA	2-wire serial interface data	2
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	

16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	2
29	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc1	+3.3 V Power Supply	
31	LPMode	Low Power Mode	2
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Notes:

1. Circuit ground is internally isolated from chassis ground.

2. Open collector; should be pulled up with a 4.7kΩ to 10kΩ resistor on host board to a voltage between 3.15Vand 3.6V.

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Pin Assignment (continued)

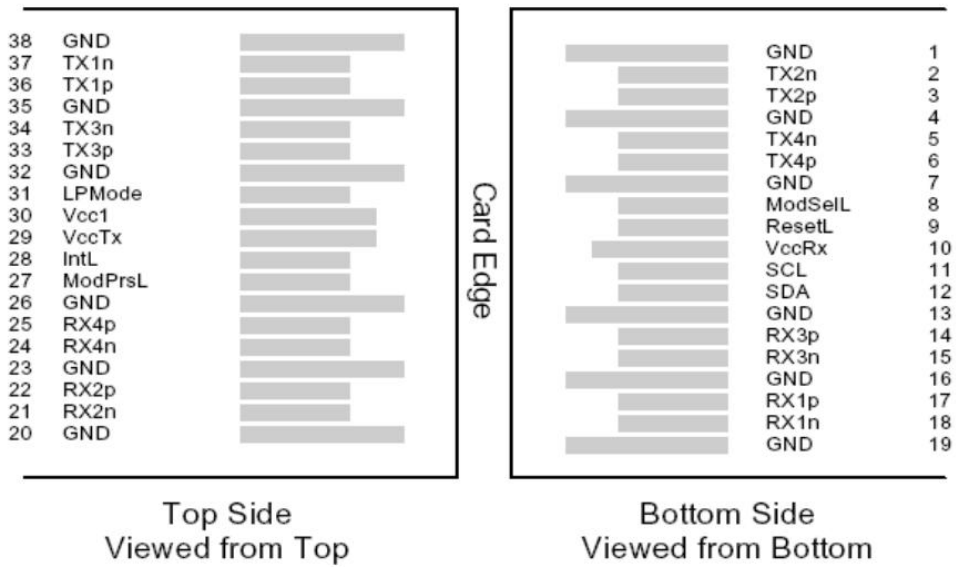

Figure 2. Host PCB QSFP28 pad assignment top view and Names

Optical Interface Lanes and Assignment

The optical interface port is a male MPO connector, the keying feature of the MPO receptacle is on the top, then fibers are numbered left to right as 12 through 1 looking into the receptacle. The four fiber positions on the left (fibers 12, 11, 10, 9) are used for the optical transmit signals (Channel 1 through 4). The fiber positions on the right (fibers 4, 3, 2, 1) are used for the optical receive signals (Channel 4 through 1). The central four fibers (5, 6, 7, 8) may be physically present.

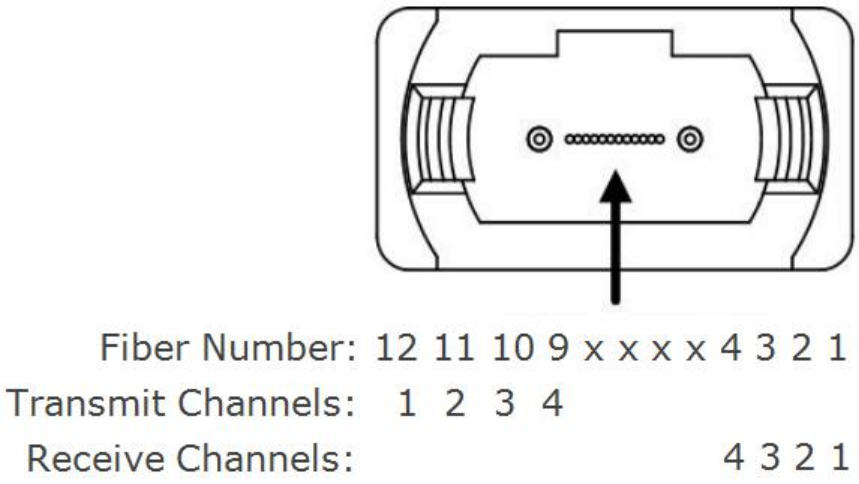

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Figure 3. QSFP28 Optical Receptacle and Channel Orientation

Digital Diagnostic Monitoring Interface

Digital diagnostics monitoring function is available on all QSFP28 module. A 2-wire serial interface provides user to contact with module. The structure of the memory is shown in Figure 4. The memory space is arranged into a lower, single page, address space of 128 bytes and multiple upper address space pages. This structure permits timely access to addresses in the lower page, such as Interrupt Flags and Monitors. Less time critical time entries, such as serial ID information and threshold settings, are available with the Page Select function. The interface address used is A0xh and is mainly used for time critical data like interrupt handling in order to enable a one-time-read for all data related to an interrupt situation. After an interrupt, IntL, has been asserted, the host can read out the flag field to determine the affected channel and type of flag.

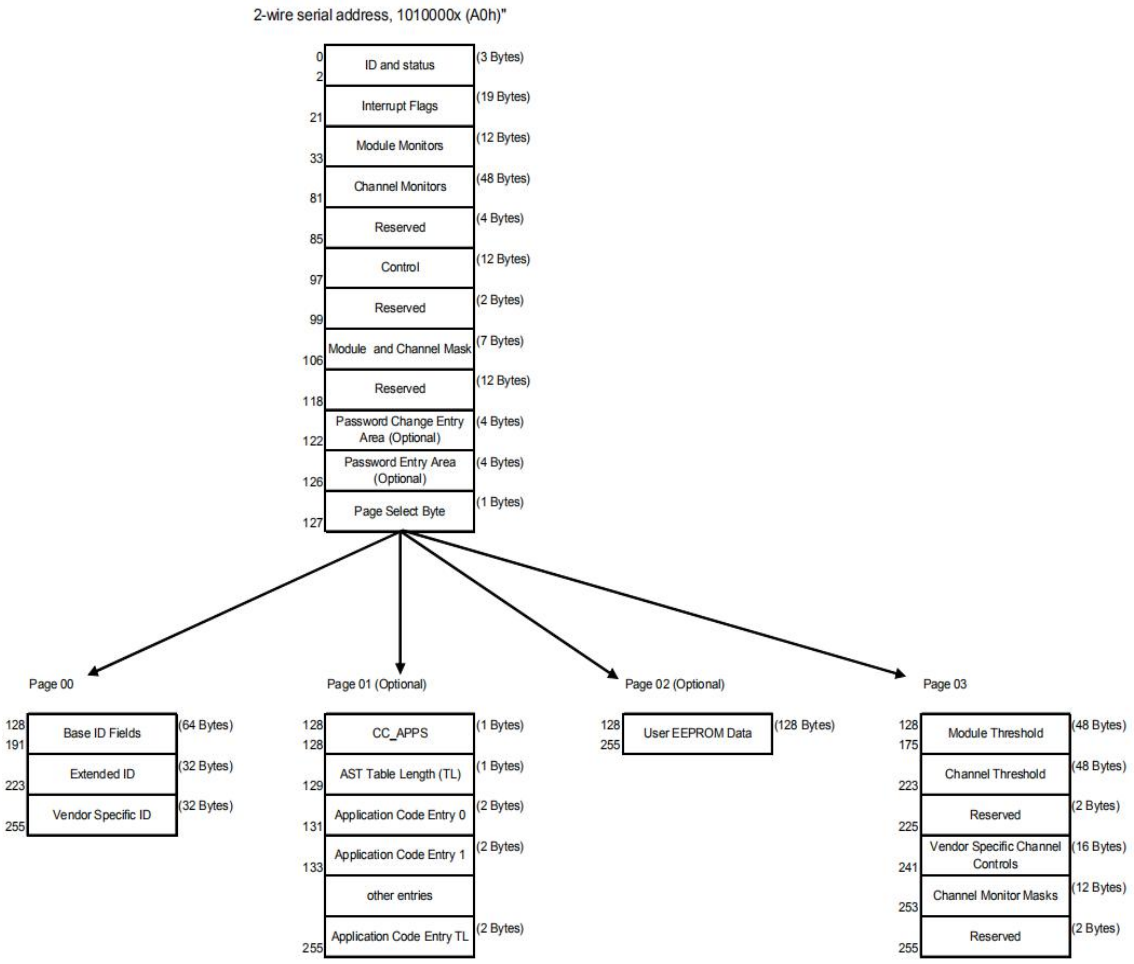

Figure 4, QSFP28 Memory Map (Specific Data Field Descriptions)

Table 7. Digital Diagnostic Monitor Characteristics

Parameter	Calibration	Range	Accuracy	Unit
Transceiver Internal Temperature	Internal	0 to +70°C	±3.0	°C
VCC Internal Supply Voltage	Internal	3.0 to 3.6V	±3.0	%
Laser Bias Current, each lane	Internal	0 to 90mA	±10	%
Tx Output Power, each lane	Internal	-5.0 to 2.5dBm	±3.0	dBm
Rx Input Power, each lane	Internal	-14.0 to 0dBm	±3.0	dBm

Table 8. Timing and Electrical

Parameter	Symbol	Min	Typ	Max	Unit
Initialization Time	t_init	-	-	2000	**ms**
Reset Init Assert Time	t_reset_init	-	-	2	**us**
Serial Bus Hardware Ready Time	t_serial	-	-	2000	**ms**
Monitor Data Ready Time	t_data	-	-	2000	**ms**
Reset Assert Time	t_reset	-	-	2000	**ms**
LPMode Assert Time	ton_LPMode	-	-	100	**us**
IntL Assert Time	ton_IntL	-	-	200	**ms**
IntL Deassert Time	toff_IntL	-	-	500	**us**
Rx LOS Assert Time	ton_los	-	-	100	**ms**
Tx Fault Assert Time	ton_Txfault	-	-	200	**ms**
Flag Assert Time	ton_flag	-	-	200	**ms**
Mask Assert Time	ton_mask	-	-	100	**ms**
Mask Deassert Time	toff_mask	-	-	100	**ms**
ModSelL Assert Time	ton_ModSelL	-	-	100	**us**
ModSelL Deassert Time	toff_ModSelL	-	-	100	**us**
Power_over-ride or Power-set Assert Time	ton_Pdown	-	-	100	**ms**
Power_over-ride or Power-set Deassert Time	toff_Pdown	-	-	300	**ms**

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Recommended Circuit

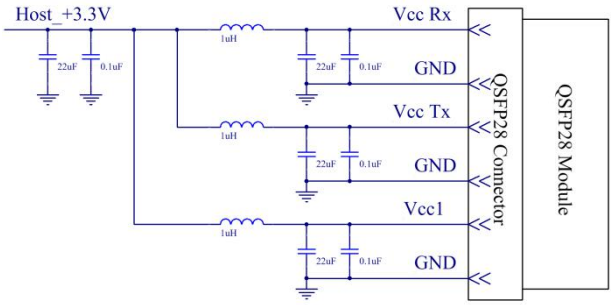

Figure 5, Recommended Host Board Power Supply Circuit

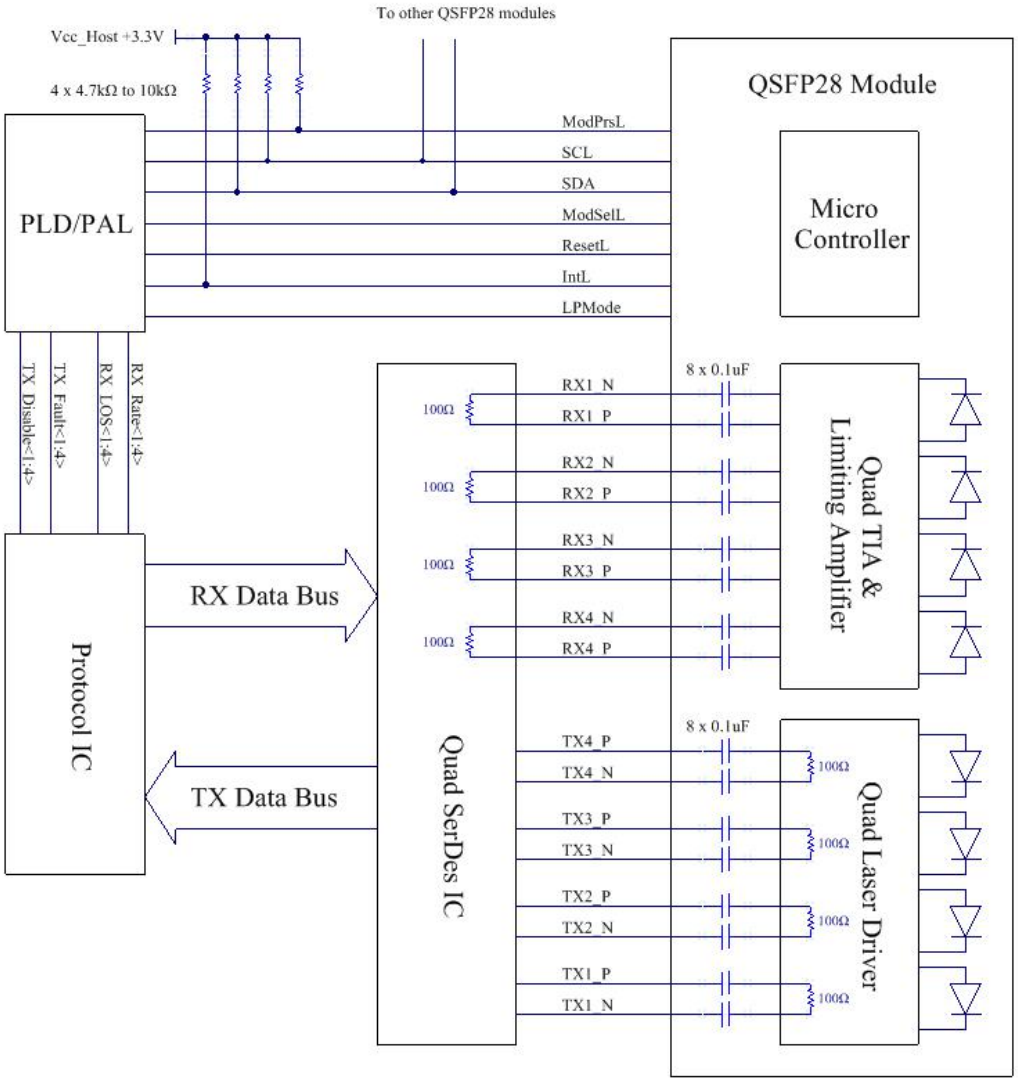

Figure 6, Recommended Interface Circuit

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Mechanical Dimensions

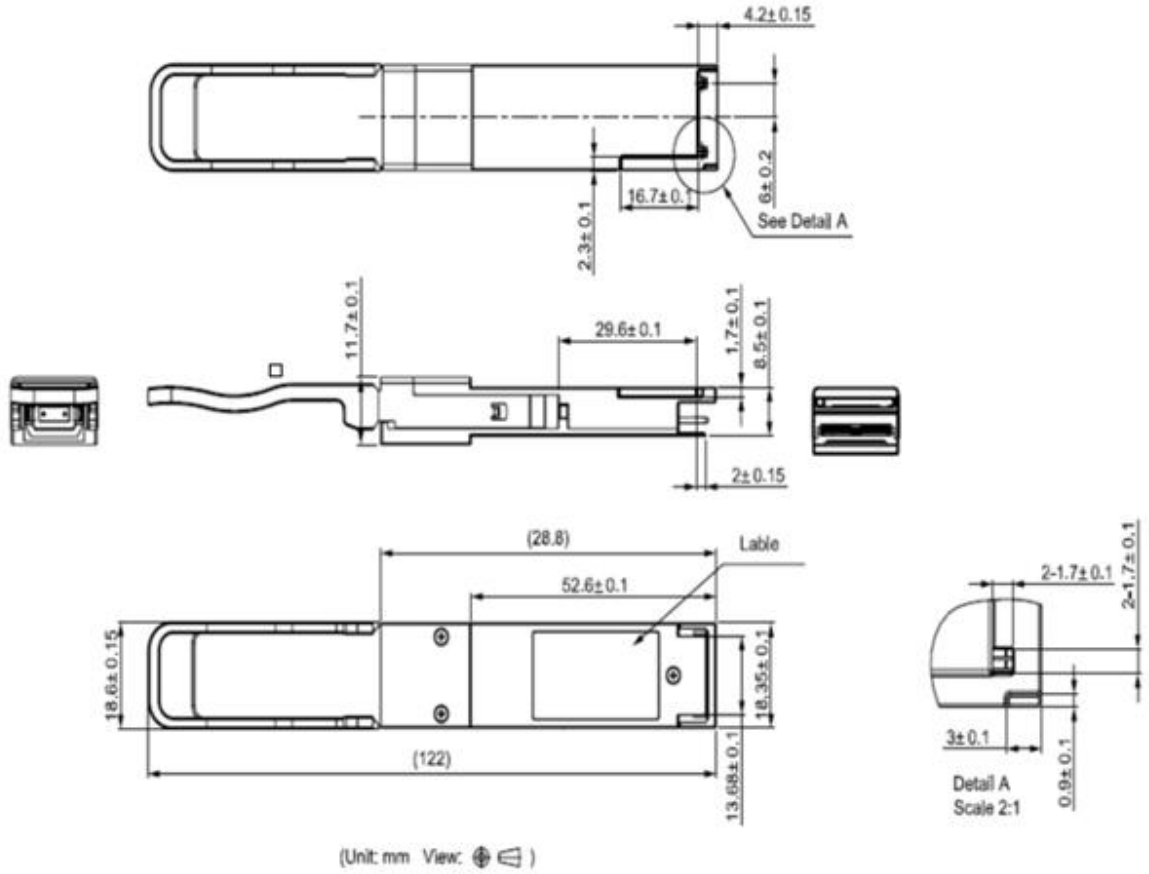

Figure 7, Mechanical Dimensions

Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes.

Avoid eye exposure to direct or indirect radiation.

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