

# 1.25Gbps SFP Transceiver, 20km Reach

## PRODUCT OVERVIEW

The SFP transceivers are high performance, cost effective modules supporting dual data-rate of 1.25Gbps/1.0625Gbps and 20km transmission distance with SMF.

The transceiver consists of three sections: a FP laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) 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.

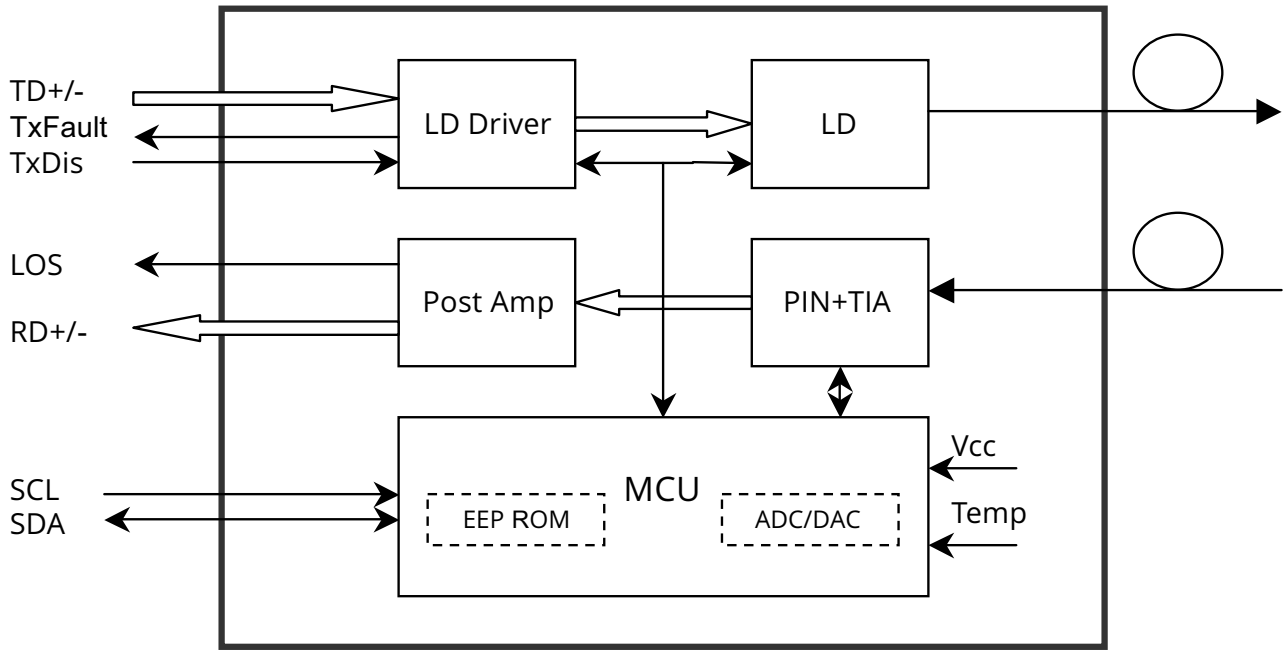


## KEY FEATURES

- Dual data-rate of 1.25Gbps/1.063Gbps operation
- 1310nm FP laser and PIN photodetector for 20km transmission.
- Compliant with SFP MSA and SFF-8472 with duplex LC receptacle.
- Digital Diagnostic Monitoring: Internal Calibration or External Calibration.
- Compatible with SONET OC-24-LR-1.
- Compatible with RoHS.
- +3.3V single power supply.
- Operating case temperature: Standard: 0 to +70°C Industrial: -40 to +85°C .

## APPLICATIONS

- Gigabit Ethernet.
- Fiber Channel.
- Switch to Switch interface.
- Switched backplane applications.
- Router/Server interface.
- Other optical transmission systems.



**PRODUCT SPECIFICATIONS**

**ABSOLUTE MAXIMUM RATING**

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

**Table 1: Absolute Maximum Rating**

**RECOMMENDED OPERATING CONDITIONS**

Parameters	Symbol	Min.	Typical	Max.	Units
Operating Case Temperature	Tc	0		+70	°C
		-40		+85	°C
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Power Supply Current	Icc			300	mA
Data Rate	Gigabit Ethernet		1.25		Gbps
	Fiber Channel		1.063		

**Table 2 - Recommended Operating Conditions**

**OPTICAL AND ELECTRICAL CHARACTERISTICS**

AP1000G-20: (FP and PIN, 1310nm, 20km Reach)

Parameters	Symbol	Min.	Typical	Max.	Units	Notes
<b>Transmitter</b>						
Centre Wavelength	$\lambda_c$	1260	1310	1360	nm	
Spectral Width (RMS)	$\Delta\lambda$			4	nm	
Average Output Power	Pout	-9		-3	dBm	1
Extinction Ratio	ER	9			dB	
Optical Rise/Fall Time (20%~80%)	tr/ta			0.26	ns	
Data Input Swing Differential	VIN	400		1800	mV	2
Input Differential Impedance	ZIN	90	100	110	$\Omega$	
TX Disable	Disable	2.0		Vcc	V	
	Enable	0		0.8	V	
TX Fault	Fault	2.0		Vcc	V	
	Normal	0		0.8	V	

**Table 3 - Optical and Electrical Characteristics**

## OPTICAL AND ELECTRICAL CHARACTERISTICS

Parameters	Symbol	Min.	Typical	Max.	Units	Notes
<b>Transmitter</b>						
Centre Wavelength	$\lambda_c$	1260		1580	nm	
Receiver Sensitivity				-23	dBm	3
Receiver Overload		-3			dBm	3
LOS De-Assert	$LOS_D$			-24	dBm	
LOS Assert	$LOS_A$	-30			dBm	
LOS Hysteresis	1			4	dB	
Data Output Swing Differential	$V_{out}$	400		1800	mV	4
LOS	High	2.0		$V_{cc}$	V	
	Low			0.8	V	

**Table 4 - Optical and Electrical Characteristics**

### Notes:

1. The optical power is launched into SMF.
2. BPECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 27-1 test pattern @1250Mbps, BER  $\leq 1 \times 10^{-10}$ .
4. Internally AC-coupled.

## TIMING AND ELECTRICAL

Parameters	Symbol	Min.	Max.	Units
Tx Disable Negate Time	$t_{on}$		1	ms
Tx Disable Assert Time	$t_{off}$		10	$\mu s$
Time To Initialize, including Reset of Tx Fault	$t_{init}$		300	ms
Tx Fault Assert Time	$t_{fault}$		100	$\mu s$
Tx Disable To Reset	$t_{reset}$	10		$\mu s$
LOS Assert Time	$t_{loss_{on}}$		100	$\mu s$
LOS De-assert Time	$t_{loss_{off}}$		100	$\mu s$
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

**Table 5 - Timing and Electrical**

## DIAGNOSTICS

Parameters	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	$\pm 3^\circ C$	Internal / External
	-40 to +85			
Voltage	3.0 to 3.6	V	$\pm 3\%$	Internal / External
Bias Current	0 to 100	mA	$\pm 10\%$	Internal / External
TX Power	-9 to -3	dBm	$\pm 3dB$	Internal / External
RX Power	-23 to -3	dBm	$\pm 3dB$	Internal / External

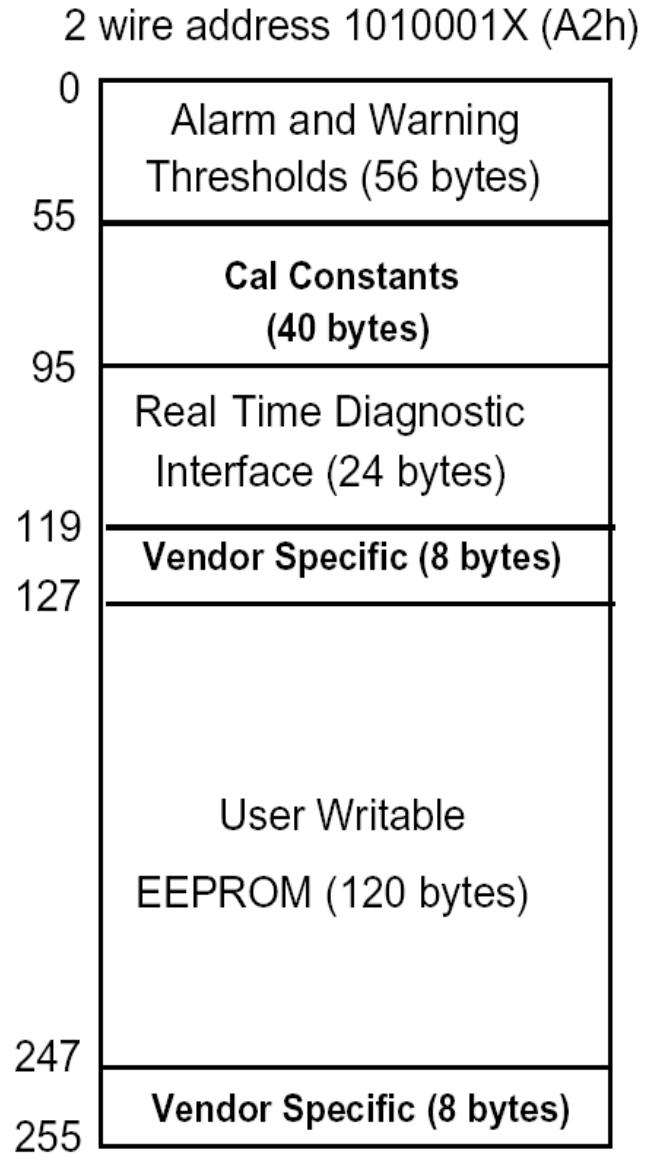
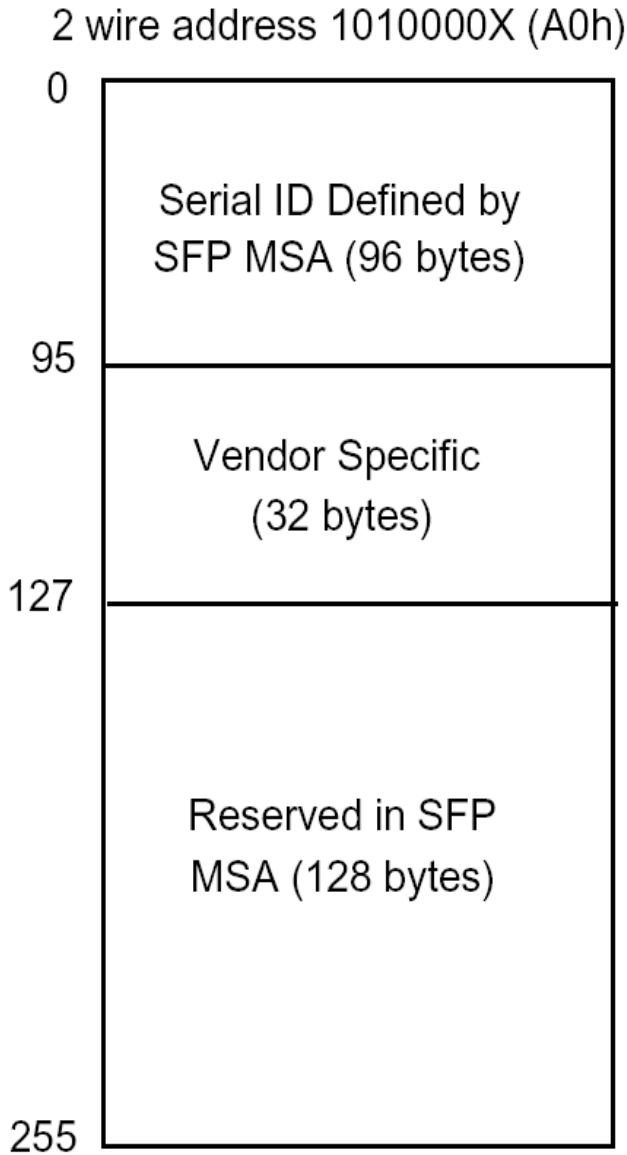
**Table 6 – Diagnostics Specification**

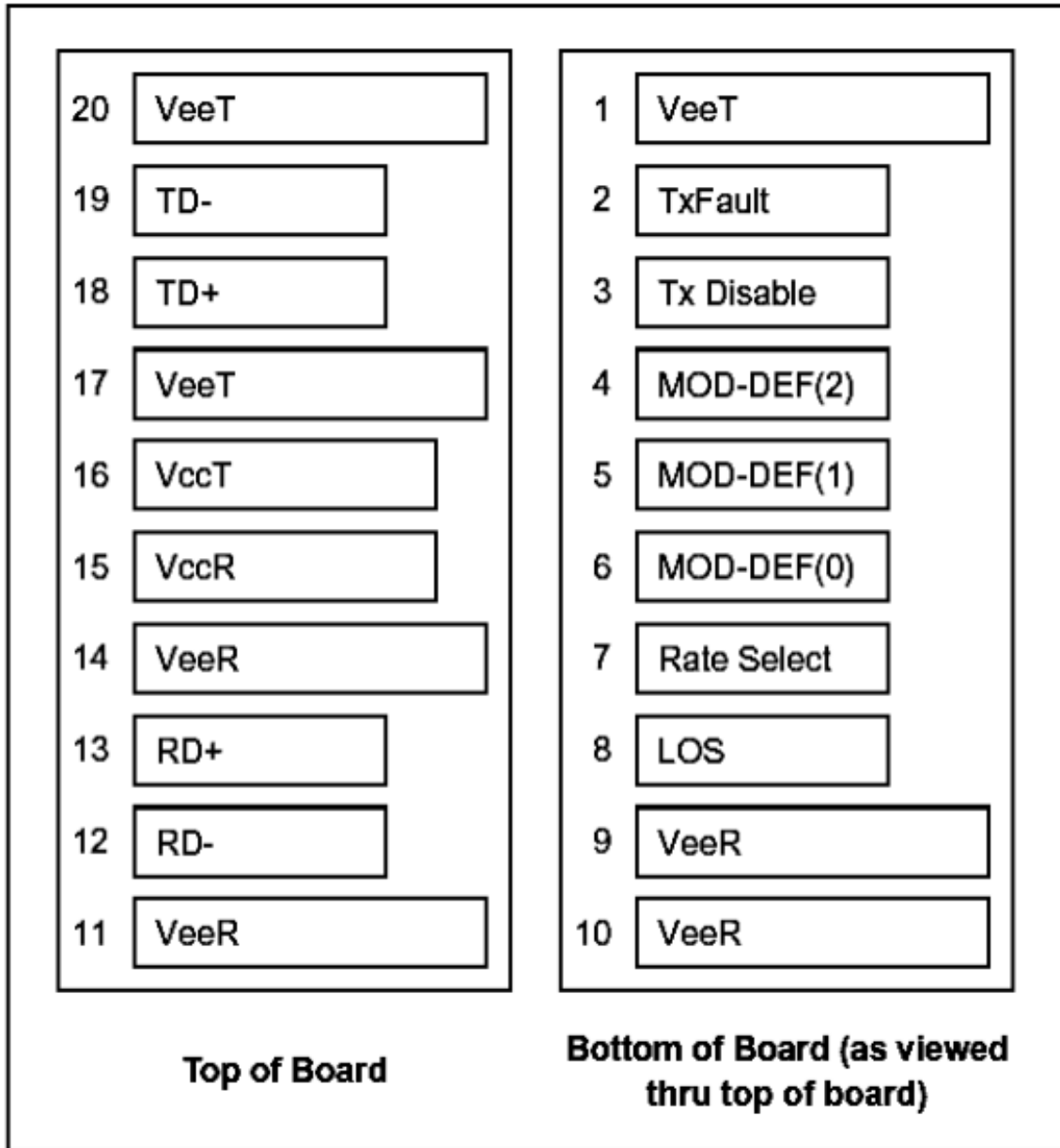
### DIGITAL DIAGNOSTIC MEMORY MAP

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.





**PIN DESCRIPTIONS**

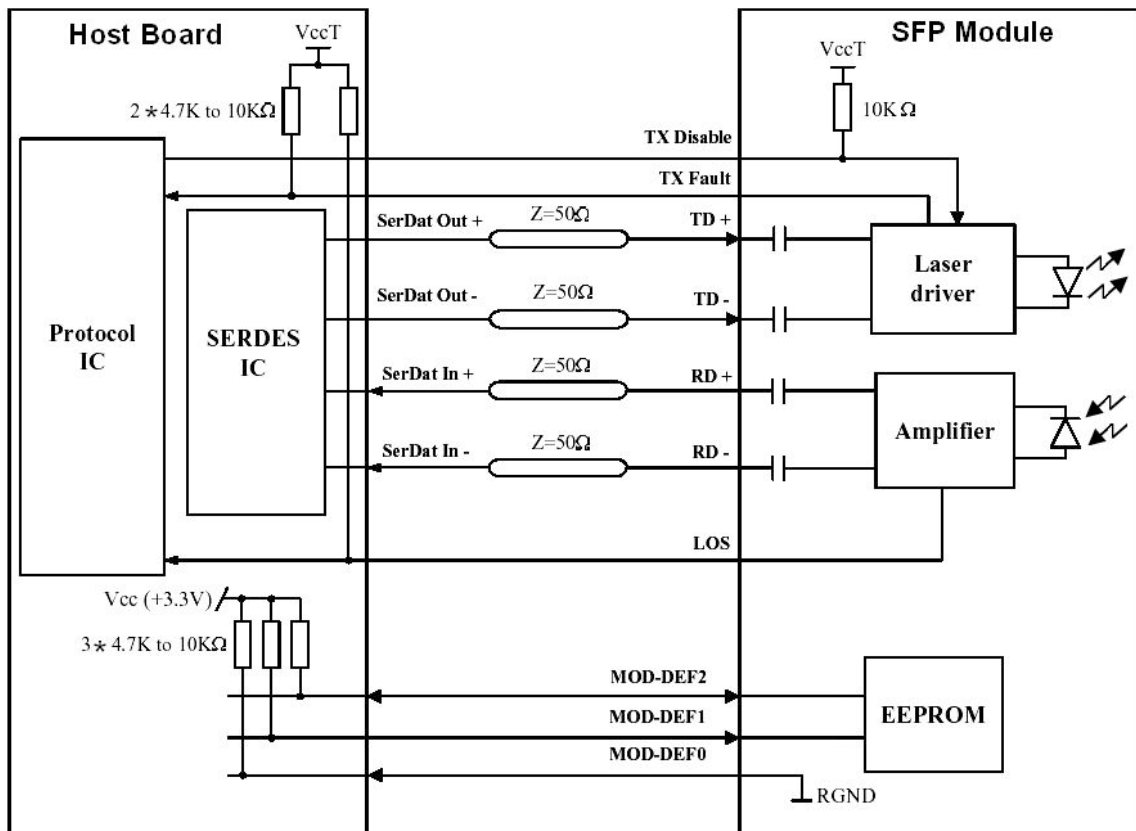
Pin	Signal Name	Description .	Plug Seq.	Notes
1	VEET	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TAX DISABLE	Transmitter Disable	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	VEER	Receiver ground	1	
10	VEER	Receiver ground	1	
11	VEER	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	VEER	Receiver ground	1	
15	VCCR	Receiver Power Supply	2	
16	VCCT	Transmitter Power Supply	2	
17	VEET	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	VEET	Transmitter Ground	1	

**Notes:**

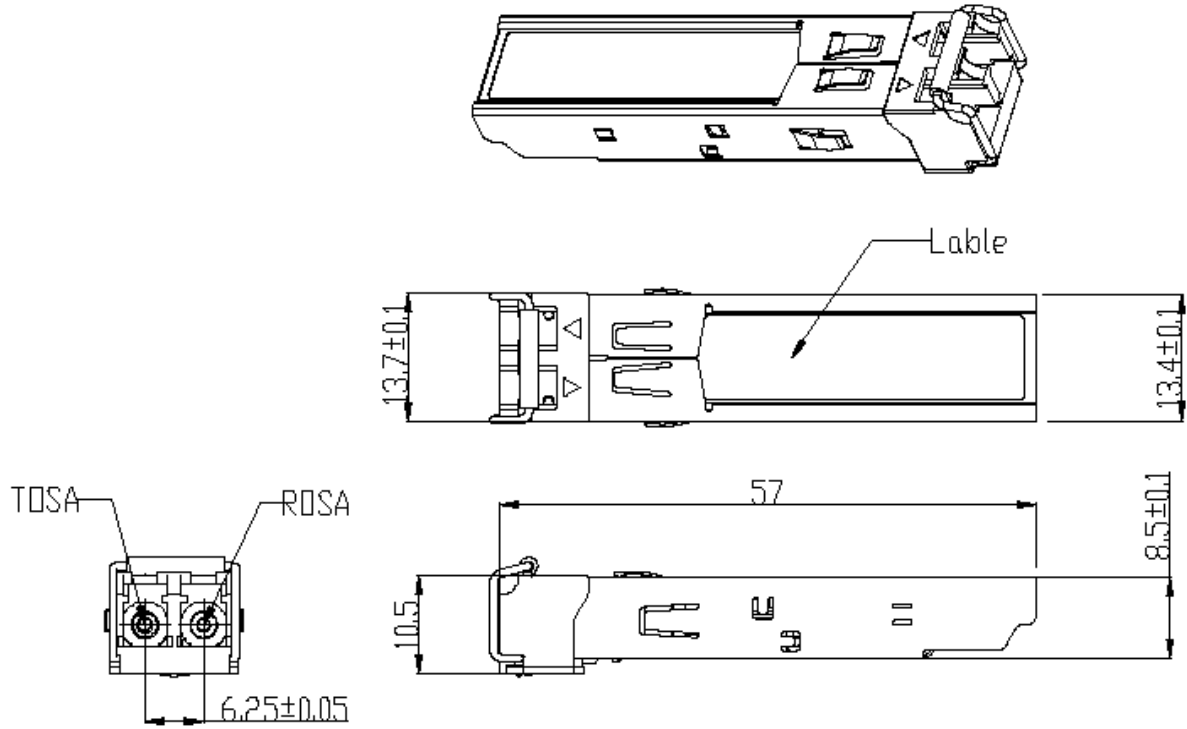
Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault 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 Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 2) 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
- 3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.  
 Mod-Def 0 is grounded by the module to indicate that the module is present  
 Mod-Def 1 is the clock line of two wire serial interface for serial ID  
 Mod-Def 2 is the data line of two wire serial interface for serial ID
- 4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.
- 5) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 6) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

**RECOMMENDED INTERFACE CIRCUIT**



## MECHANICAL DIMENSIONS



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