TS-WDM-0120B

155Mbps SFP Bi-Directional Transceiver, 20km Reach
1310nm TX / 1550nm RX

Features

- Up to 155Mbps data-rate
- 1310nm FP laser and PIN photodetector for 20km transmission
- Compliant with SFP MSA and SFF-8472 with simplex LC or SC receptacle
- Digital Diagnostic Monitoring:
  Internal Calibration or External Calibration
- Compatible with RoHS
- +3.3V single power supply
- Operating case temperature range of
  0°C to +70°C (Commercial) or -40°C to +85°C (Industrial)
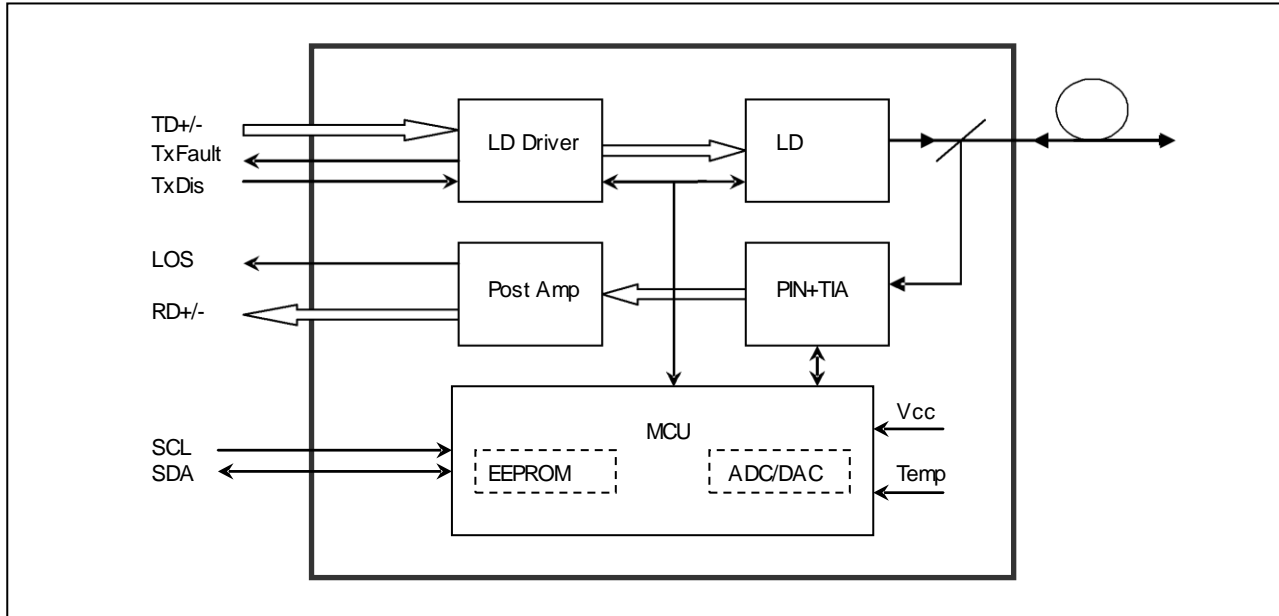
Applications

- SDH STM-1, S-1.1,L-1.1, L-1.2
- SONET OC-3 IR1,LR1,LR2
- Other optical links

Description

The SFP-BIDI transceivers are high performance, cost effective modules supporting data-rate of 155Mbps 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.

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Page 1 of 10
Nov 01 / 2014
Rev. 2.0

Module Block Diagram

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	%

Recommended Operating Conditions

Parameter		Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Commercial	Tc	0		+70	°C
	Industrial		-40		+85	°C
Power Supply Voltage		Vcc	3.13	3.3	3.47	V
Power Supply Current		Icc			300	mA
Data Rate				155		Mbps

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Page 2 of 10
Nov 01 / 2014
Rev. 2.0

Optical and Electrical Characteristics

Parameter		Symbol	Min	Typical	Max	Unit	Notes
Transmitter							
Centre Wavelength		λc	1260	1310	1360	nm	
Spectral Width (RMS)		Δλ			4	nm	
Average Output Power		Pout	-15		-8	dBm	1
Extinction Ratio		ER	10		18	dB	
Optical Rise/Fall Time (20%~80%)		t_r/t_f			1.3	ns	
Data Input Swing Differential		V_{IN}	400		1800	mV	2
Input Differential Impedance		Z_{IN}	90	100	110	Ω	
TX Disable	Disable		2.0		Vcc	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		Vcc	V	
	Normal		0		0.8	V	
Receiver							
Centre Wavelength		λc	1480		1580	nm	
Receiver Sensitivity					-33	dBm	3
Receiver Overload			-3			dBm	3
LOS De-Assert		LOS_D			-34	dBm	
LOS Assert		LOS_A	-45			dBm	
LOS Hysteresis			1		4	dB	
Data Output Swing Differential		Vout	400		1800	mV	4
LOS	High		2.0		Vcc	V	
	Low				0.8	V	

Notes:

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS $2^{23}-1$ test pattern @155Mbps, BER≤1×10^{-10}.
4. Internally AC-coupled.

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Page 3 of 10
Nov 01 / 2014
Rev. 2.0

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		Vcc	V
MOD_DEF (0:2)-Low	V_L			0.8	V

Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-15 to -8	dBm	±3dB	Internal / External
RX Power	-31 to -8	dBm	±3dB	Internal / External

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Page 4 of 10
Nov 01 / 2014
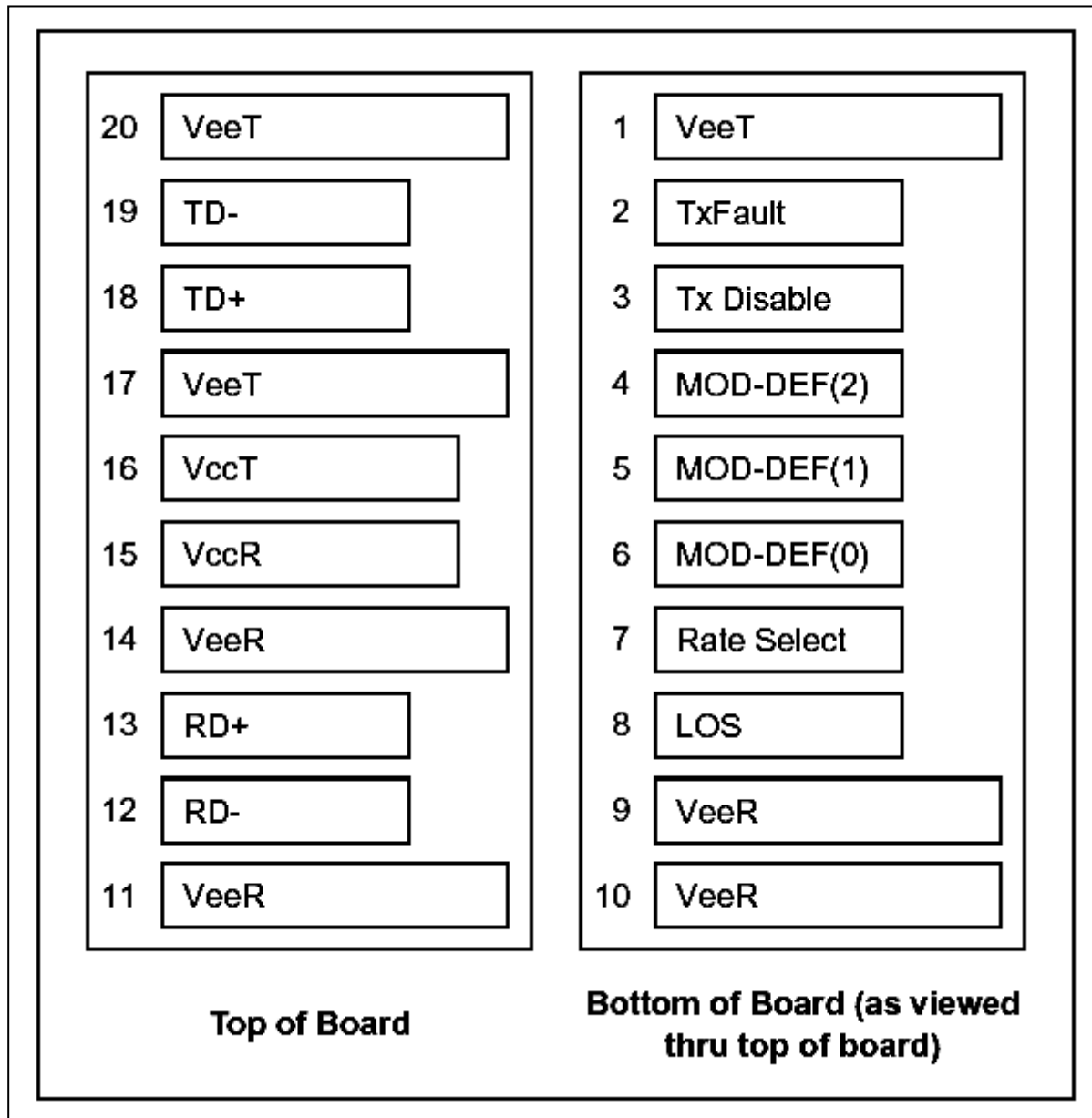Rev. 2.0

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.

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Page 5 of 10
Nov 01 / 2014
Rev. 2.0
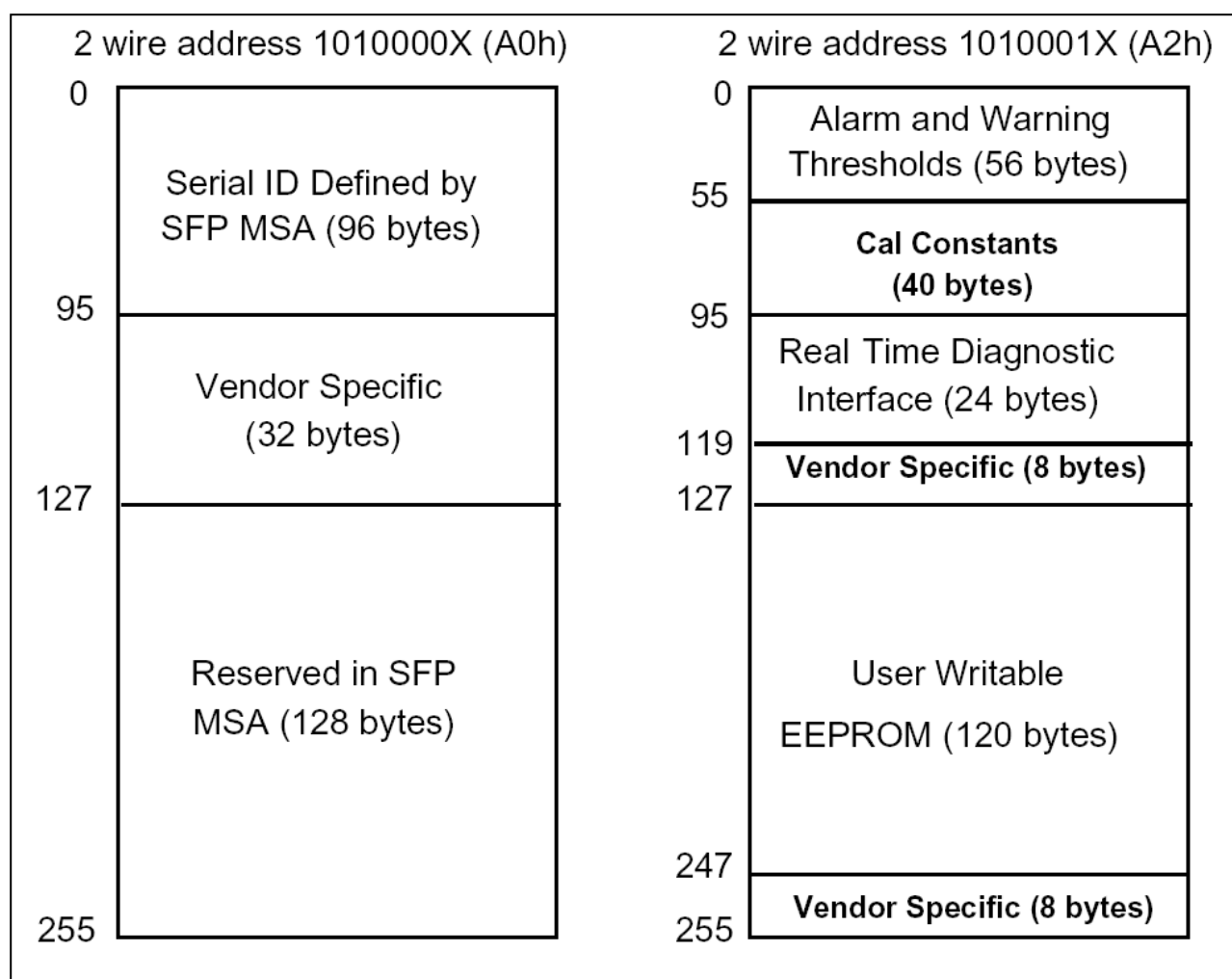
SFP Transceiver Electrical Pad Layout

20	VeeT		1	VeeT
19	TD-		2	TxFault
18	TD+		3	Tx Disable
17	VeeT		4	MOD-DEF(2)
16	VccT		5	MOD-DEF(1)
15	VccR		6	MOD-DEF(0)
14	VeeR		7	Rate Select
13	RD+		8	LOS
12	RD-		9	VeeR
11	VeeR		10	VeeR

Top of Board   **Bottom of Board (as viewed thru top of board)**

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Page 6 of 10
Nov 01 / 2014
Rev. 2.0

Pin Descriptions

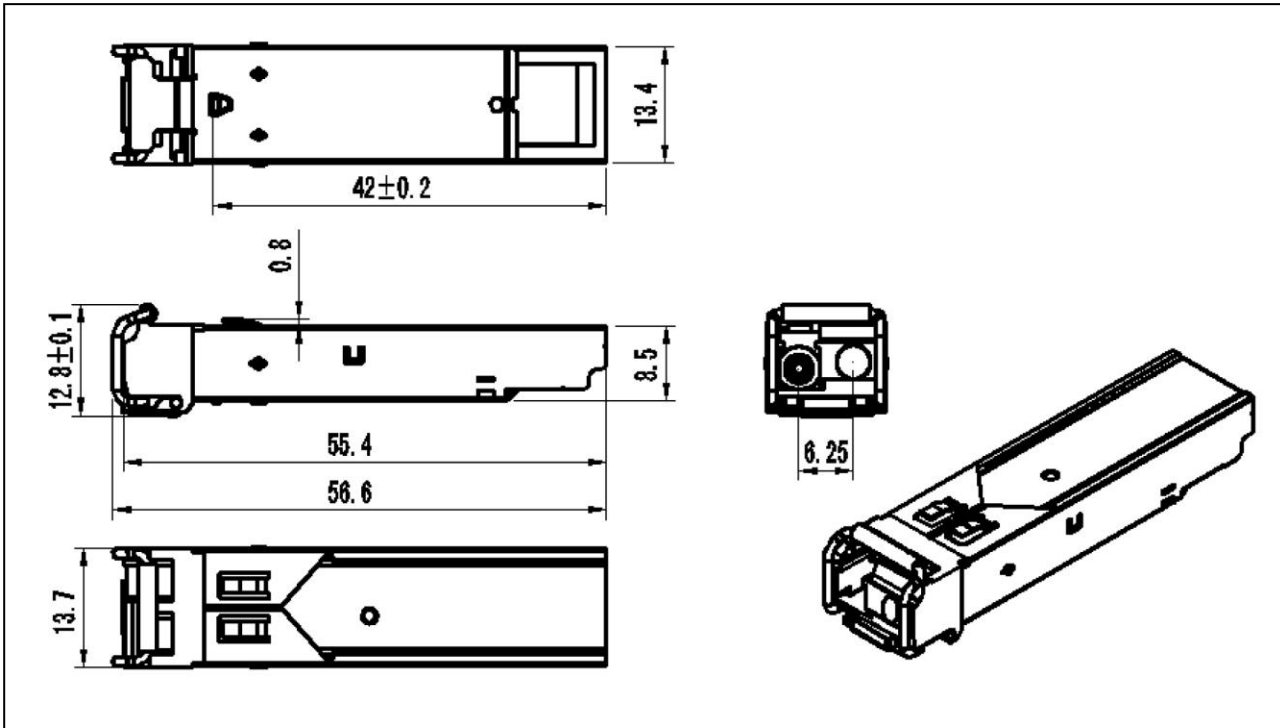| Pin	Signal Name	Description	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3
7	Rate Select	Not Connect	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

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Page 8 of 10
Nov 01 / 2014
Rev. 2.0
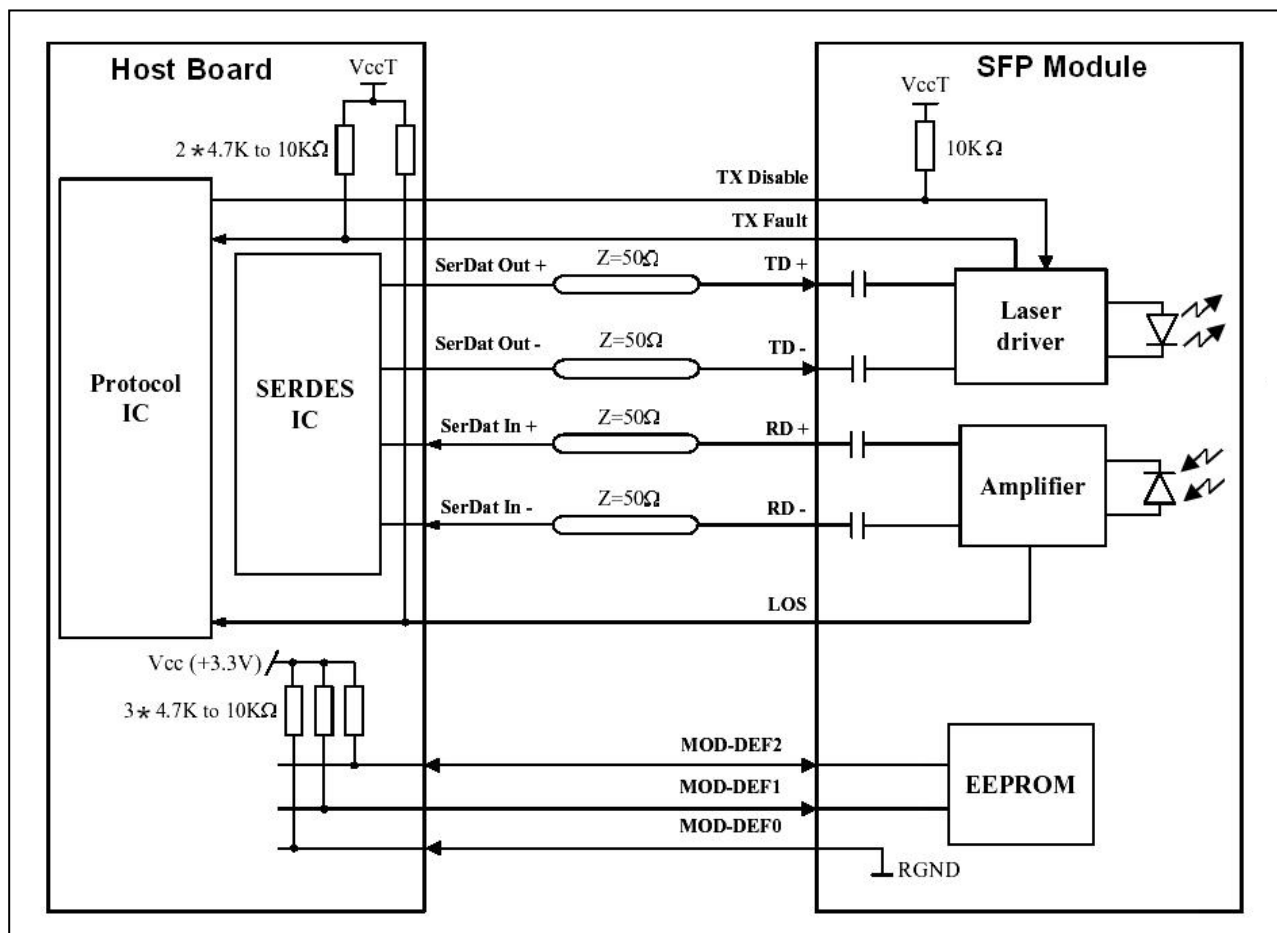
Mechanical Dimensions

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>500 V) Isolation with the case
Electromagnetic Interference (EMI)	FCC Part 15 Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product. Compatible with TüV standards
Component Recognition	UL and CUL	UL file E317337
Green Products	2002/95/EC 2005/618/EC	RoHS6

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Page 9 of 10
Nov 01 / 2014
Rev. 2.0

Ordering information

Part Number	Product Description
TS-WDM-0120B	Tx1310/Rx1550nm, 155Mbps, LC, 20km, 0°C~+70°C
TS-WDM-0120DB	Tx1310/Rx1550nm, 155Mbps, LC, 20km, 0°C~+70°C, With Digital Diagnostic Monitoring
TS-WDM-0120IB	Tx1310/Rx1550nm, 155Mbps, LC, 20km, -40°C~+85°C
TS-WDM-0120DIB	Tx1310/Rx1550nm, 155Mbps, LC, 20km, -40°C~+85°C, With Digital Diagnostic Monitoring

References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000.

2. Telcordia GR-253-CORE and ITU-T G.957 Specifications.

Important Notice

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Page 10 of 10
Nov 01 / 2014
Rev. 2.0