10Gbps 10km Range 1310nm SFP+ Optical Transceiver

Optical Transceivers

Overview

ARIA's 10Gbps 10km Range 1310nm SFP+ Optical Transceiver is designed to transmit and receive optical data over single mode optical fiber with a link length of up to 10km.

The transceiver module is comprised of a transmitter with 1310nm uncooled DFB laser and receiver with a PIN photodiode.

The SFP+ 10km module electrical interface is compliant to SFI electrical specifications.

The module provides differential termination and reduces differential to common mode conversion for quality signal termination and low EMI.

Features

- Supports 1.25 Gb/s to 10.3 Gb/s bit rates
- Optical interface compliant to IEEE 802.3ae
- Electrical interface compliant to SFF-8431
- Hot Pluggable
- The transmitter input and receiver output impedance is 100Ω differential
- Data lines are internally AC coupled
- SFI typically operates over 200mm of improved FR4 material or up to about 150mm of standard FR4 with one connector
- Applications for the module are 10GBASE-LR at 10.3125Gbps or other optical links
- 1310nm DFB transmitter, PIN photo-detector
- Operating case temperature: 0 to 70 °C
- Low power consumption
- Applicable for 10km SMF connections
- All-metal housing for superior EMI performance
- Advanced firmware allows customer system encryption information to be stored in the transceiver
- Cost effective SFP+ solution, enables higher port densities and greater bandwidth
- RoHS6 compliant (lead free)

RoHS

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Absolute Maximum Rating

These values represent the damage threshold of the module. Stress in excess of any of the individual absolute maximum ratings can cause immediate catastrophic damage to the module even if all other parameters are within recommended operating conditions.

Parameter	Symbol	Minimum	Maximum	Units
Power Supply Voltage	Vcc	0	+3.6	V
Storage Temperature	T_C	-40	+85	°C
Operating Case Temperature	T_C	0	+70	°C
Relative Humidity	RH	5	95	%
RX Input Average Power	Pmax	-	0	dBm

Recommended Operating Environment

Recommended operating environment specifies parameters for which the electrical and optical characteristics hold unless otherwise noted.

Parameter	Symbol	Minimum	Typical	Maximum	Units
Power Supply Voltage	Vcc	3.135	3.300	3.465	V
Operating Case Temperature	T_C	0	25	70	°C

Low Speed Characteristics

Parameter	Symbol	Minimum	Maximum	Units
Power Consumption	-	-	1	W
TX_Fault,RX_LOS	VOL	0	0.4	V
	VOH	Host_Vcc-0.5	Host_Vcc+0.3	V
TX_DIS	VIL	-0.3	0.8	V
	VIH	2.0	VCCT+0.3	V
RS0,RS1	VIL	-0.3	0.8	V
	VIH	2.0	VCCT+0.3	V

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Optical Characteristics

The following optical characteristics are defined over the recommended operating environment unless otherwise specified.

Parameter	Units	Value
Operating Reach	m	10k
Transmitter		
Center Wavelength (Range)	nm	1260-1355
Side Mode Suppression Ratio (Min)	dB	30
Maximum Launched Power	dBm	0.5
Minimum Launched Power[1]	dBm	-8.2
OMA Launched Power	dBm	-5.2
OMA TDP (Min) Launched Power	dBm	-6.2
Transmitter and Dispersion Penalty[4]	dB	0
Average Launch Power of OFF Transmitter (Max)	dBm	-30
Extinction Ratio (Min)[2]	dB	3.5
RIN12 OMA (Max)	dB/Hz	-128
Optical Return Loss Tolerance (Min)	dB	12
Receiver		
Center Wavelength (Range)	nm	1260-1355
Receive Overload (Max) in Average Power[1]	dBm	0.5
Receive Sensitivity (Min) in Average Power[1, 3]	dBm	-14.4
Receiver Sensitivity (Max) in OMA[2, 3]	dBm	-12.6
Receiver Reflectance (Max)	dB	-12
Stressed Receiver Sensitivity (Max) in OMA[2]	dBm	-10.3
Vertical Eye Closure Penalty (Min)[3]	dB	2.2
Stressed Eye Jitter (Min)[2]	UIp-p	0.7
Receive Electrical 3dB Upper Cutoff Frequency (Max)	GHz	12.3
Receiver Power (Damage, Max)	dBm	1.5

Notes:

1. The optical power is launched into SMF
2. Measured with a PRBS 2^{31}-1 test pattern@10.3125Gbps
3. Measured with a PRBS 2^{31}-1 test pattern@10.3125Gbps BER≤ 10^{-12}
4. In G.652 and G.655(NDSF)

Electrical Characteristics

The following electrical characteristics are defined over the recommended operating environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max.	Units
Data Rate	-	1.250	10.3125	-	Gbps
Power Consumption	-	-	-	1000	mW
	Transmitter				
Single Ended Output Voltage Tolerance	-	-0.3	-	4.0	V
C Common Mode Voltage Tolerance	-	15	-	-	mV
Tx Input Diff Voltage	VI	400	-	1600	mV
Tx Fault[1]	VoL	-0.3	-	0.4	V
Data Dependent Input Jitter	DDJ	-	-	0.10	UI
Data Input Total Jitter	TJ	-	-	0.28	UI
	Receiver				
Single Ended Output Voltage Tolerance	-	-0.3	-	4.0	V
Rx Output Diff Voltage	Vo	300	-	850	mV
Rx Output Rise and Fall Time[2]	Tr/Tf	30	-	-	ps
Total Jitter	TJ	-	-	.70	UI
Deterministic Jitter	DJ	-	-	0.42	UI

Notes:

1. At 0.7 mA.
2. 20% to 80%.

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Figure 1: Interface to Host PCB

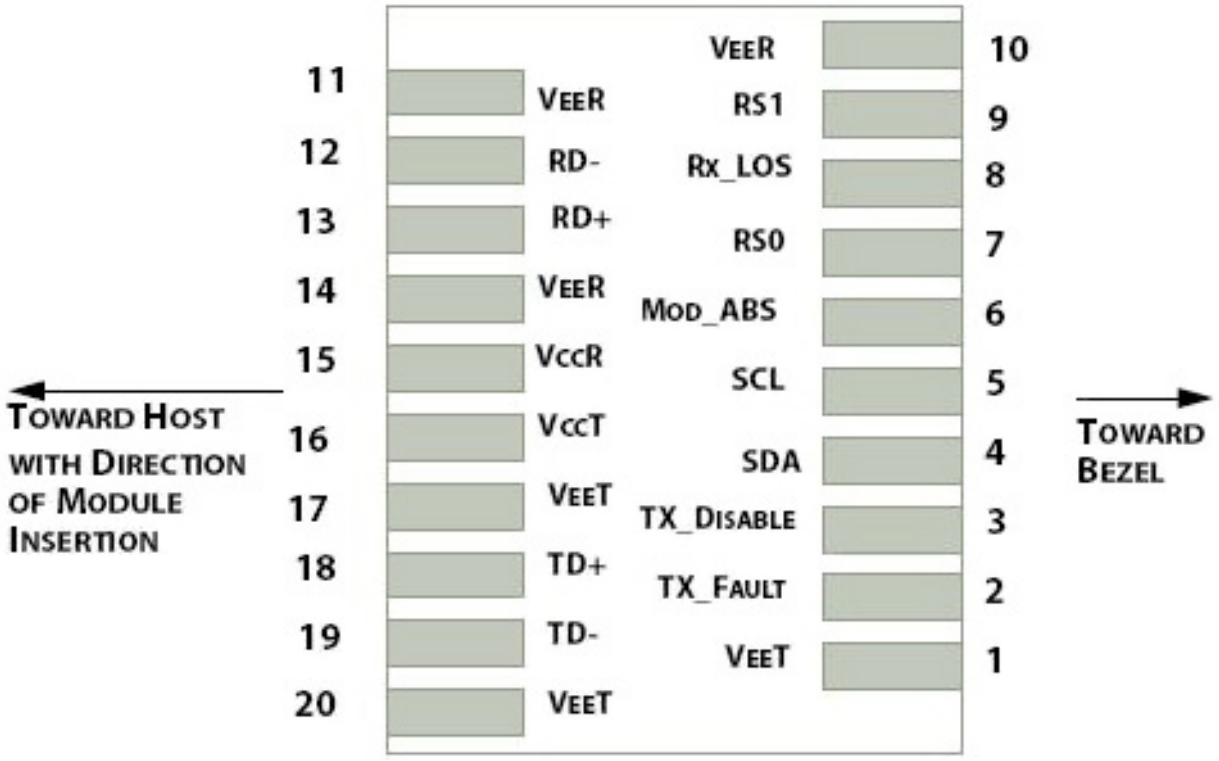
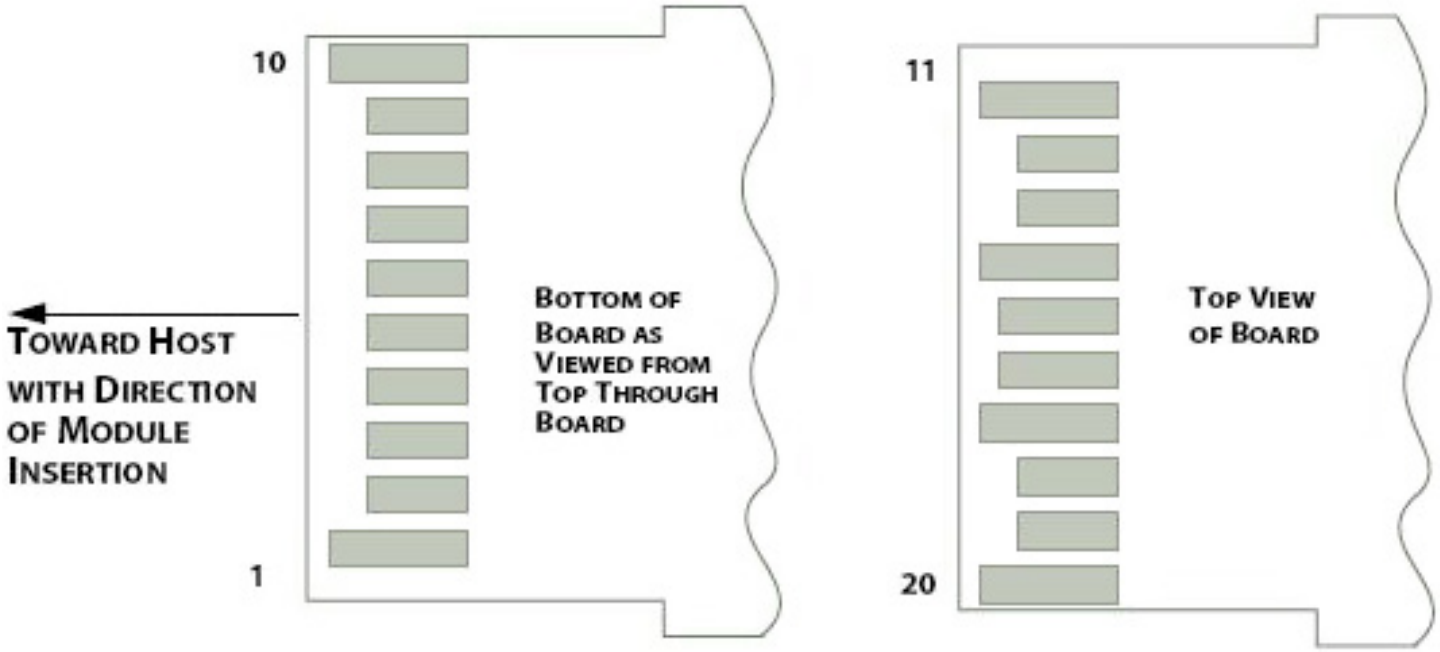


Figure 2: Module Contact Assignment



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Pin Definition

Pin	Symbol	Name/Description
1	VEET[1]	Transmitter ground
2	Tx_FAULT[2]	Transmitter fault
3	Tx_DIS[3]	Transmitter disable. Laser output disabled on high or open
4	SDA[2]	2-Wire serial interface data line
5	SCL[2]	2-Wire serial interface clock line
6	MOD_ABS[4]	Module absent. Grounded within the module
7	RS0[5]	Rate select 0
8	RX_LOS[2]	Loss of signal indication. Logic 0 indicates normal operation
9	RS1[5]	Rate select 1
10	VEER[1]	Receiver ground
11	VEER[1]	Receiver ground
12	RD-	Receiver inverted DATA out. AC coupled
13	RD+	Receiver DATA out. AC coupled
14	VEER[1]	Receiver ground
15	VCCR	Receiver power supply
16	VCCT	Transmitter power supply
17	VEET[1]	Transmitter ground
18	TD+	Transmitter DATA in. AC coupled
19	TD-	Transmitter inverted DATA in. AC coupled
20	VEET[1]	Transmitter ground

Notes:

1. Module circuit ground is isolated from module chassis ground within the module.
2. Should be pulled up with 4.7kΩ -10kΩ on host board to a voltage between 3.15V and 3.6V.
3. Tx_Disable is an input contact with a 4.7kΩ-10kΩ pull up to VccT inside the module.
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 of 4.7kΩ-10kΩ. 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 > 30kΩ resistors in the module.

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Figure 3: Host Board Power Supply Filters Circuit

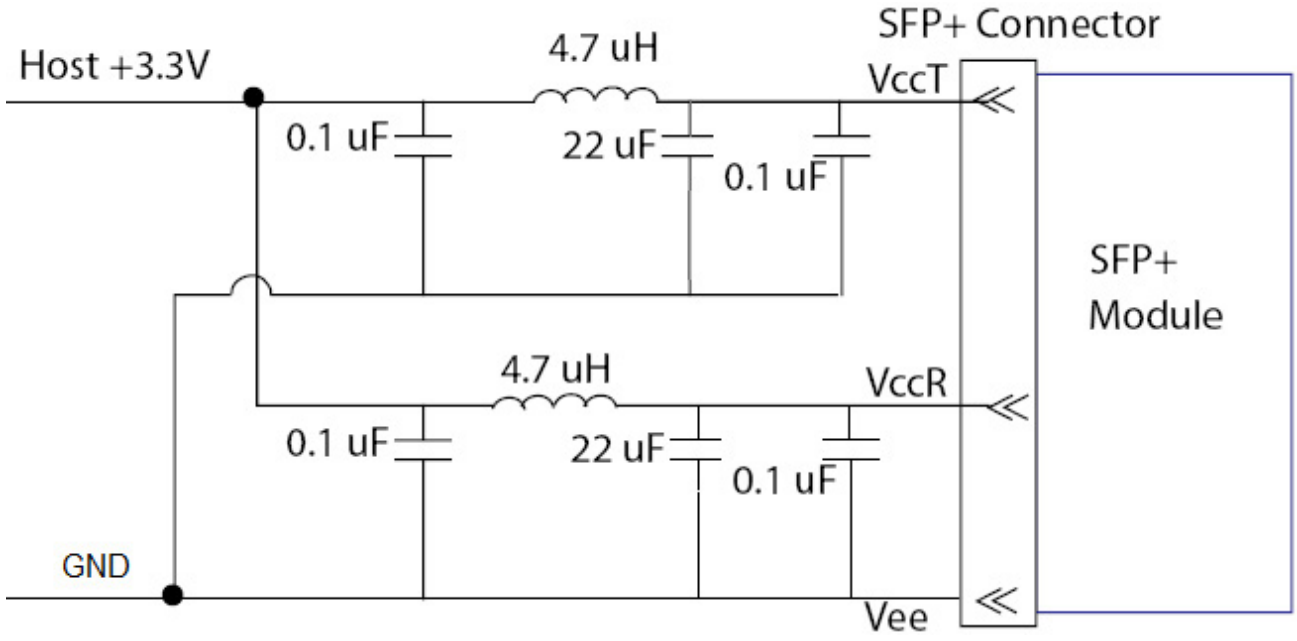

Figure 4: Host-Module Interface

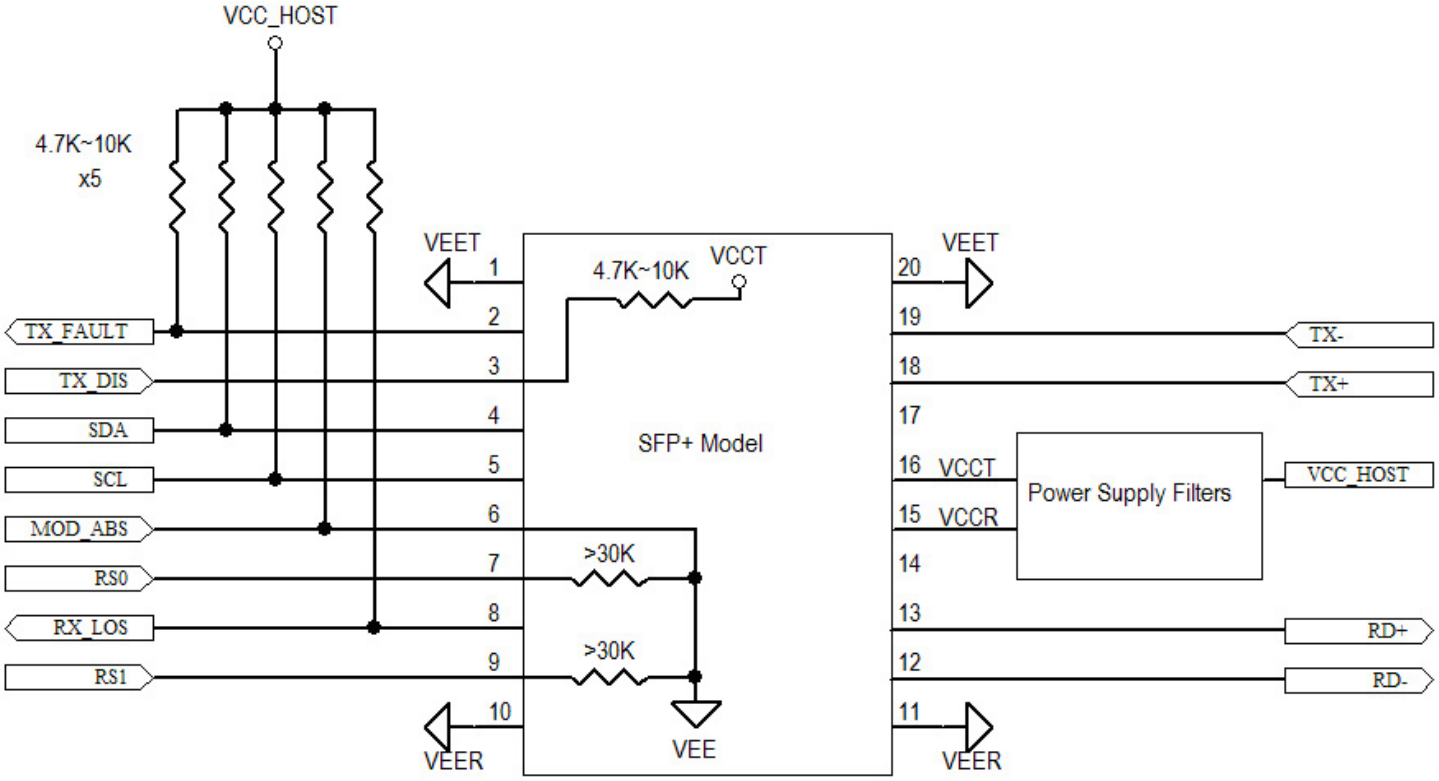

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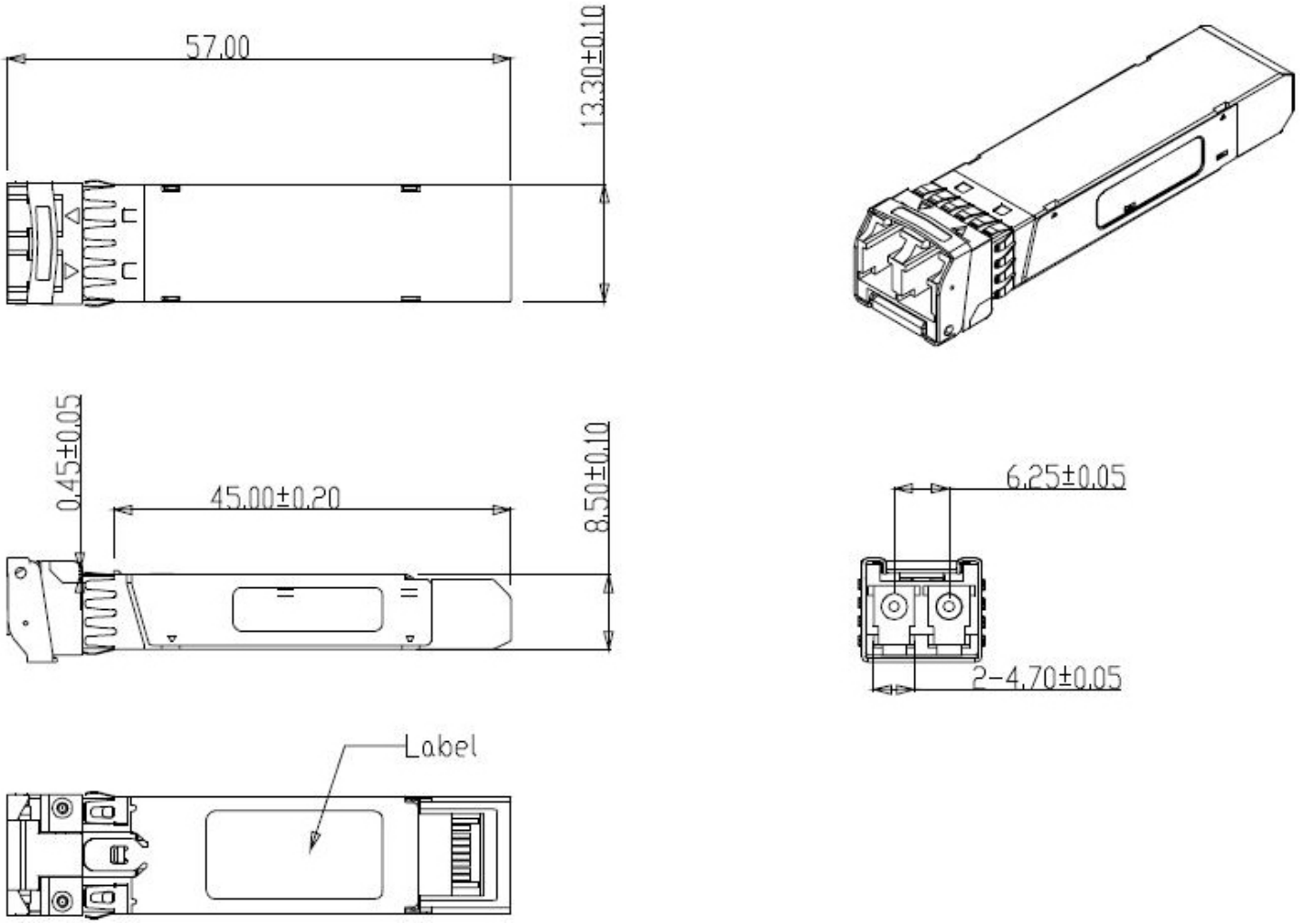
Figure 5: Mechanical Specifications



Regulatory Compliance

This SFP+ transceiver is designed to be Class I Laser safety compliant and is certified per the following standards:

Feature	Agency	Standard	Certificate/Comments
Laser Safety	FDA	CDRH 21 CFR 1040 and Laser Notice No. 50	1120292-000
Product Safety	UL	UL and CUL EN60950-2:2007	E347511
Environmental Protection	SGS	RoHS Directive 2002/95/EC	GZ1001008918/CHEM
EMC	WALTEK	EN 55022:2006+A1:2007 EN 55024:1998+A1+A2:2003	WT10093759-D-E-E

Ordering Information

Part Number	Product Description
AT-10.3Gbps10km-LRC	1310nm, 10.3Gbps, SFP+ 10km, 0°C - +70°C

References

1. “Specifications for Enhanced Small Form Factor Pluggable Module SFP+”, SFF-8431, Rev 4.1, July 6, 2009.
2. “Improved Pluggable Formfactor”, SFF-8432, Rev 4.2, Apr 18, 2007.
3. IEEE802.3ae - 2002.
4. “Diagnostic Monitoring Interface for Optical Transceivers” SFF-8472, Rev 10.3, Dec 1, 2007.

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