

25G SFP28 LR 1310nm 10km Optical Transceiver Module

Features

- Hot-pluggable SFP28 form factor
- Full-duplex transceiver module
- 1310nm DFB laser and PIN photo-detector
- Compliant with SFP28 MSA and IEEE 802.3cc 25GBASE-LR
- Data rate up to 25.78125Gbps
- Reach up to 10km over SMF
- Power consumption < 1.5W
- Dual LC receptacles
- Operating case temperature range from 0°C to 70°C
- 3.3V power supply voltage
- RoHS compliant (lead free)



Applications

- 25GBASE-LR Ethernet

Description

The FiberStamp 25G SFP28 LR 1310nm 10km Optical Transceiver Module is a single-Channel, Pluggable, Fiber-Optic SFP28 for 25 Gigabit Ethernet and Infiniband EDR Applications. It is a high performance module for short-range data communication and interconnect applications which operate at 25.78125 Gbps up to 10km. This module is designed to operate over single mode fiber systems using a nominal wavelength of 1310nm. The electrical interface uses a 20 contact edge type connector. The optical interface uses duplex LC receptacle. This module incorporates FiberStamp proven circuit and technology to provide reliable long life, high performance, and consistent service.

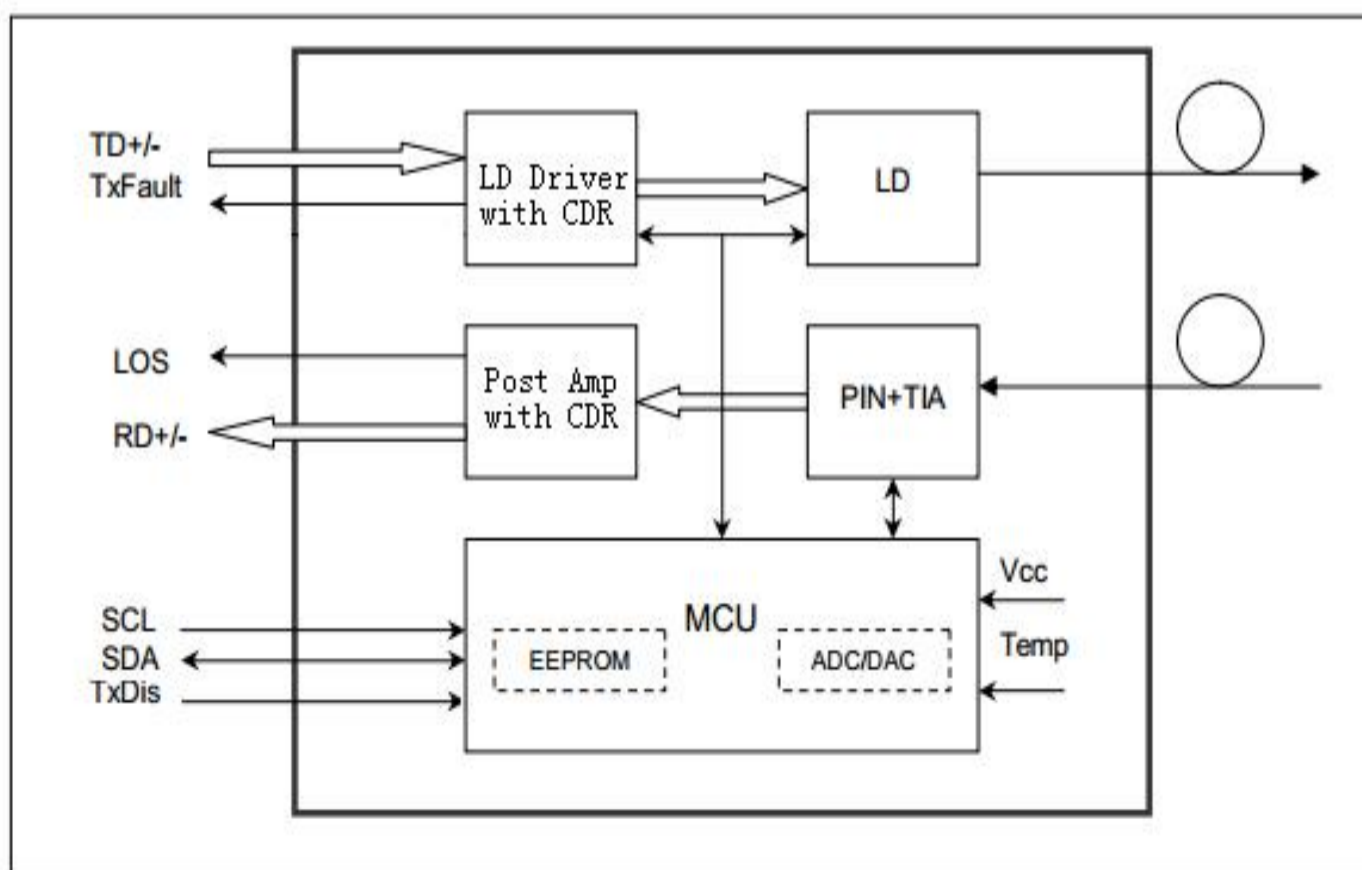


Figure 1. Module Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.3	3.6	V
Input Voltage	Vin	-0.3	Vcc+0.3	V
Storage Temperature	Ts	-40	+85	°C
Case Operating Temperature	Tc	0	70	°C
Humidity (non-condensing)	Rh	5	85	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	Vcc	3.13	3.3	3.47	V
Operating Case Temperature	Tc	0		70	°C
Data Rate Per Lane	fd	8.5	25.78125	28.05	Gb/s
Humidity	Rh	5		85	%
Power Dissipation	Pm		1.0	1.1	W

Electrical Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Differential Input Impedance	Zin	90	100	110	ohm
Differential Output Impedance	Zout	90	100	110	ohm
Differential Input Voltage Amplitude1	ΔVin	200		900	mVp-p
Differential Output Voltage Amplitude2	ΔVout	300		900	mVp-p
Bit Error Rate	BER		5E-5		
Input Logic Level High	VIH	2.0		Vcc	V
Input Logic Level Low	VIL	0		0.8	V
Output Logic Level High	VOH	2.0		Vcc	V
Output Logic Level Low	VOL	0		0.8	V

Notes:

1. Differential input voltage amplitude is measured between Tx+ and Tx-.
2. Differential output voltage amplitude is measured between Rx+ and Rx-.



Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit
Transmitter					
Center Wavelength	λ_c	1295	1310	1325	nm
Spectral Width(20dB)	$\Delta\lambda$			1	nm
Average Launch Power (each lane)	P _{out}	-7.0		2.0	dBm
Optical Modulation Amplitude (each lane)	OMA	-4.0		2.2	dBm
Extinction Ratio	ER	3.0			dB
Average Launch Power of OFF Transmitter (each lane)	P _{off}			-20	dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3} Hit ratio 5×10 ⁻⁵ hits per sample.		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}			
Receiver					
Center Wavelength	λ_c	1295	1310	1325	nm
Stressed Receiver Sensitivity in OMA2 (Note1)				-9.5	dBm
Average Power at Receiver Input (each lane)		-13.3		2.0	dBm
Receiver Reflectance	RR			-26	dB
LOS Assert	LOSA	-18			dBm
LOS De-Assert	LOSD			-13.3	dBm
LOS Hysteresis	LOSH	0.5			dB

Notes:

1. Measured with conformance test signal at TP3 for BER=5*10⁻⁵



Pin Description

Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	1
2	LVTTTL-O	TX_Fault	Module Transmitter Fault	2
3	LVTTTL-I	TX_Dis	Transmitter Disable; Turns off transmitter laser output	3
4	LVTTTL-I/O	SDA	2-Wire Serial Interface Data Line	
5	LVTTTL-I	SCL	2-Wire Serial Interface Clock	
6		MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	
7	LVTTTL-I	RS0	Receiver Rate Select	
8	LVTTTL-O	RX_LOS	Receiver Loss of Signal Indication Active LOW	2
9	LVTTTL-I	RS1	Transmitter Rate Select	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Transmitter 3.3 V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

Notes:

1. The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
2. This contact is an open collector/drain output contact and shall be pulled up on the host. Pull ups can be connected to one of several power supplies, however the host board design shall ensure that no module contact has voltage exceeding module VccT/R +0.5 V.
3. Tx_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.



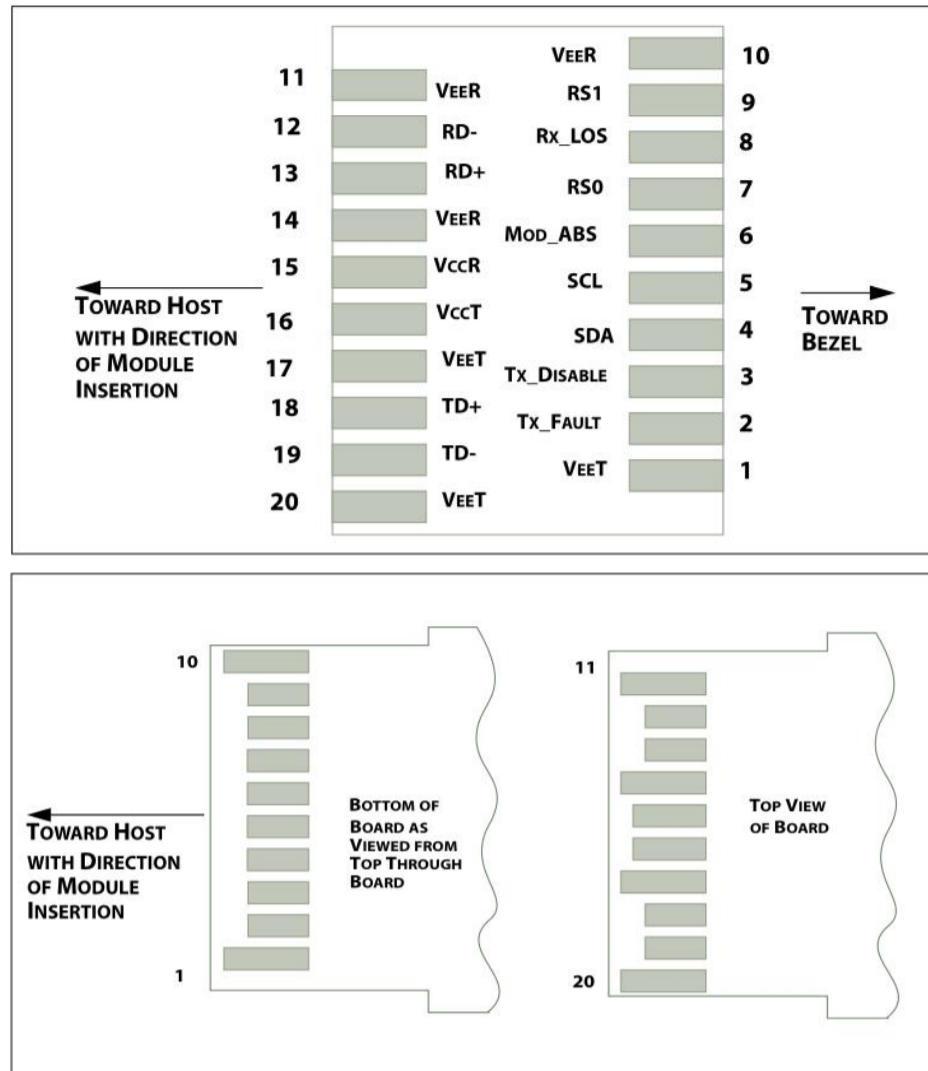


Figure 2. Electrical Pin-out Details

Tx_Fault Pin

Tx_Fault is a module output that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. If Tx_Fault is not implemented, the Tx_Fault contact signal shall be held low by the module and may be connected to Vee within the module. The Tx_Fault output is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7 kΩ to 10 kΩ.

Tx_Disable Pin

When Tx_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off unless the module is a passive cable assembly in which case this signal may be ignored. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor in modules and cable assemblies. Tx_Disable is a module input contact. When Tx_Disable is asserted low or grounded the module transmitter is operating normally.

RS0/RS1 Pin

RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module. RS0 optionally selects the optical receive signaling rate coverage(Low: Data rate 8.5Gbps~24.3Gbps, High: Data rate 24.3Gbps~28.1Gbps). RS1 optionally selects the optical transmit signaling rate coverage(Low: Data rate 8.5Gbps~24.3Gbps, High: Data rate 24.3Gbps~28.1Gbps).

Mod_ABS Pin

Mod_ABS is connected to VeeT or VeeR in the SFP28 module. The host may pull this contact up to Vcc_Host with a resistor in the range 4.7 kΩ to 10 kΩ. Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot. In the SFP MSA (INF-8074i) this contact has the same function but is called MOD_DEF0.

Rx_LOS Pin

Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. Rx_LOS is an open drain/collector output, but may also be used as an input by supervisory circuitry in the module. For a nominally 3.3 V Vcc_Host using a resistive pull up to Vcc_Host the resistor value shall be in the range 4.7 kΩ to 10 kΩ. For a nominally 2.5 V Vcc_Host using a resistive pull up to Vcc_Host the resistor value shall be in the range 4.7 kΩ to 7.2 kΩ.



Power Supply Filtering

The host board should use the power supply filtering shown in Figure 3.

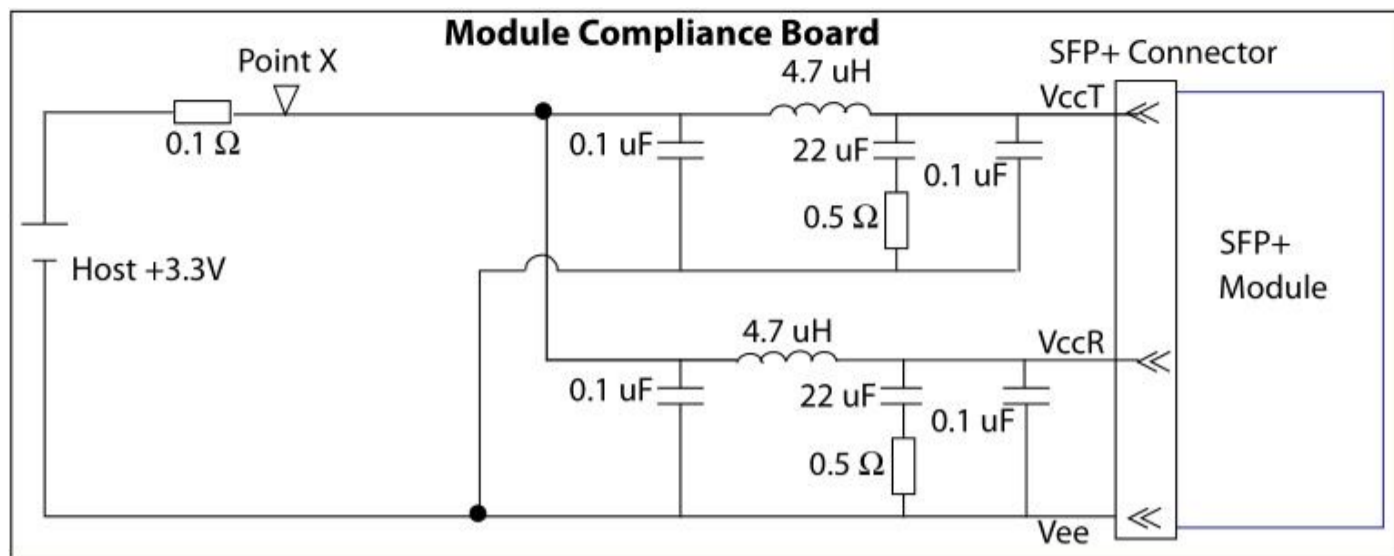


Figure 3. Host Board Power Supply Filtering

Optical Interface Lanes and Assignment

The optical interface port is Duplex LC connector and shown in Figure 4.

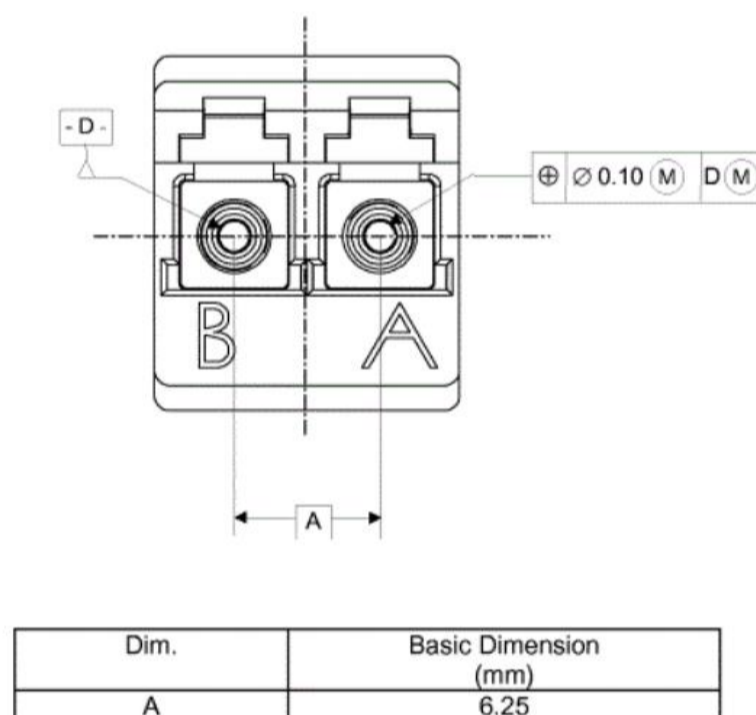


Figure 4. Optical Media Interface port

Digital Diagnostic Interface

Digital diagnostics monitoring function is available on all FiberStamp SFP28 transceivers. A 2-wire serial interface provides user to contact with module.

The structure of the memory is shown in Figure 5.

The enhanced Digital Diagnostic interface uses the two-wire serial bus address 1010001X, commonly referred to as A2h, and where X can be 0 for a read operation or 1 for a write operation. Reads from this address provide diagnostic information about the module's present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture.



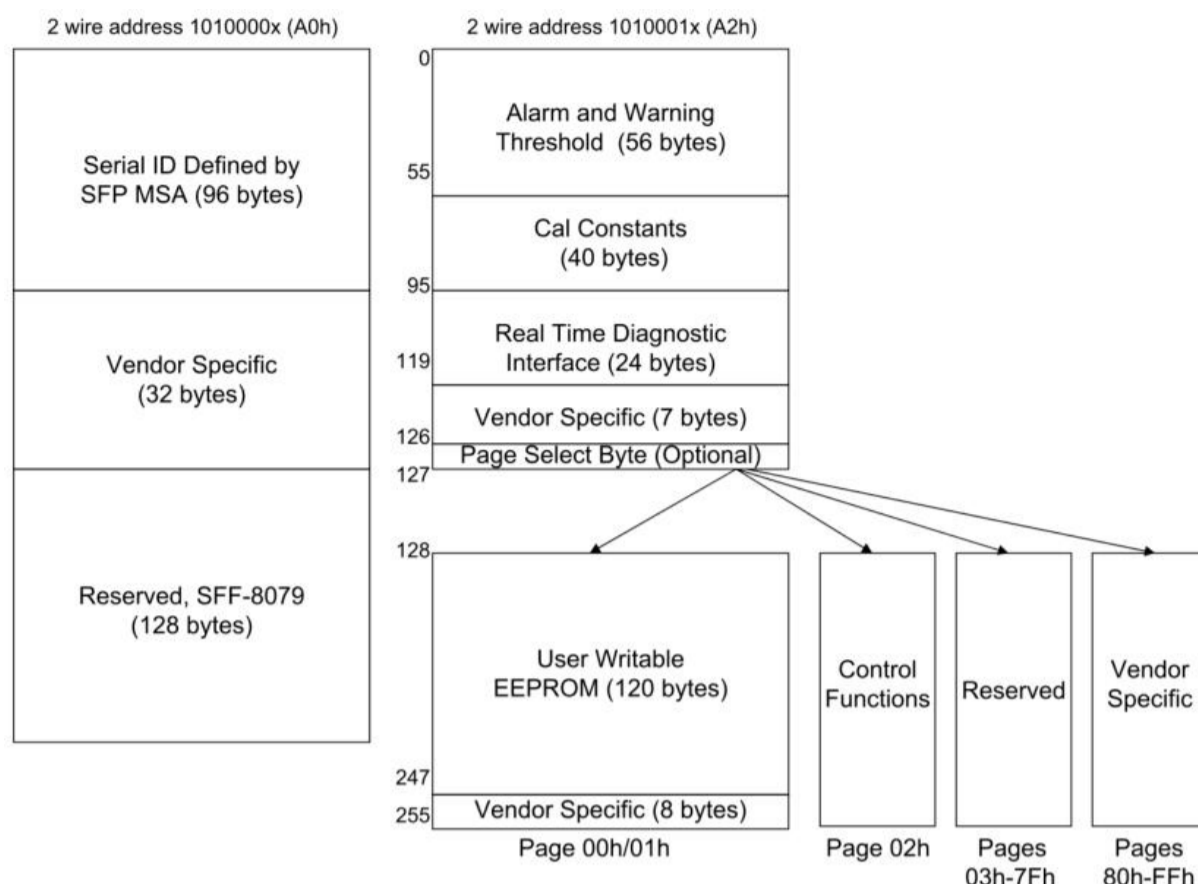


Figure 5. SFP28 Memory Map

Timing for Soft Control and Status Functions

Parameter	Symbol	Min.	Max.	Unit	Conditions
Tx_Disable assert time	t_off		100	µs	Rising edge of Tx_Disable to fall of output signal below 10% of nominal
Tx_Disable negate time	t_on		2	ms	Falling edge of Tx_Disable to rise of output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery.
Time to initialize 2-wire interface	t_2w_start_up		300	ms	From power on or hot plug after the supply meeting Table 8.
Time to initialize	t_start_up		300	ms	From power supplies meeting Table 8 or hot plug or Tx disable negated during power up, or Tx_Fault recovery, until non-cooled power level I part (or non-cooled power level II part already enabled at power level II for Tx_Fault recovery) is fully operational.
Time to initialize cooled module and time to power up a cooled module to Power Level II	t_start_up_cooled		90	s	From power supplies meeting Table 8 or hot plug, or Tx disable negated during power up or Tx_Fault recovery, until cooled power level I part (or cooled power level II part during fault recovery) is fully operational. Also, from stop bit low-to-high SDA transition enabling Power Level II until cooled module is fully operational
Time to Power Up to Level II	t_power_level2		300	ms	From stop bit low-to-high SDA transition enabling power level II until non-cooled module is fully operational
Time to Power Down from Level II	t_power_down		300	ms	From stop bit low-to-high SDA transition disabling power level II until module is within power level I requirements
Tx_Fault assert	Tx_Fault_on		1	ms	From occurrence of fault to assertion of Tx_Fault
Tx_Fault assert for cooled module	Tx_Fault_on_cooled		50	ms	From occurrence of fault to assertion of Tx_Fault
Tx_Fault Reset	t_reset	10		µs	Time Tx_Disable must be held high to reset Tx_Fault
RS0, RS1 rate select timing for FC	t_RS0_FC, t_RS1_FC		500	µs	From assertion till stable output
RS0, RS1 rate select timing non FC	t_RS0, t_RS1		24	ms	From assertion till stable output
Rx_LOS assert delay	t_los_on		100	µs	From occurrence of loss of signal to assertion of Rx_LOS
Rx_LOS negate delay	t_los_off		100	µs	From occurrence of presence of signal to negation of Rx_LOS



Mechanical Dimensions

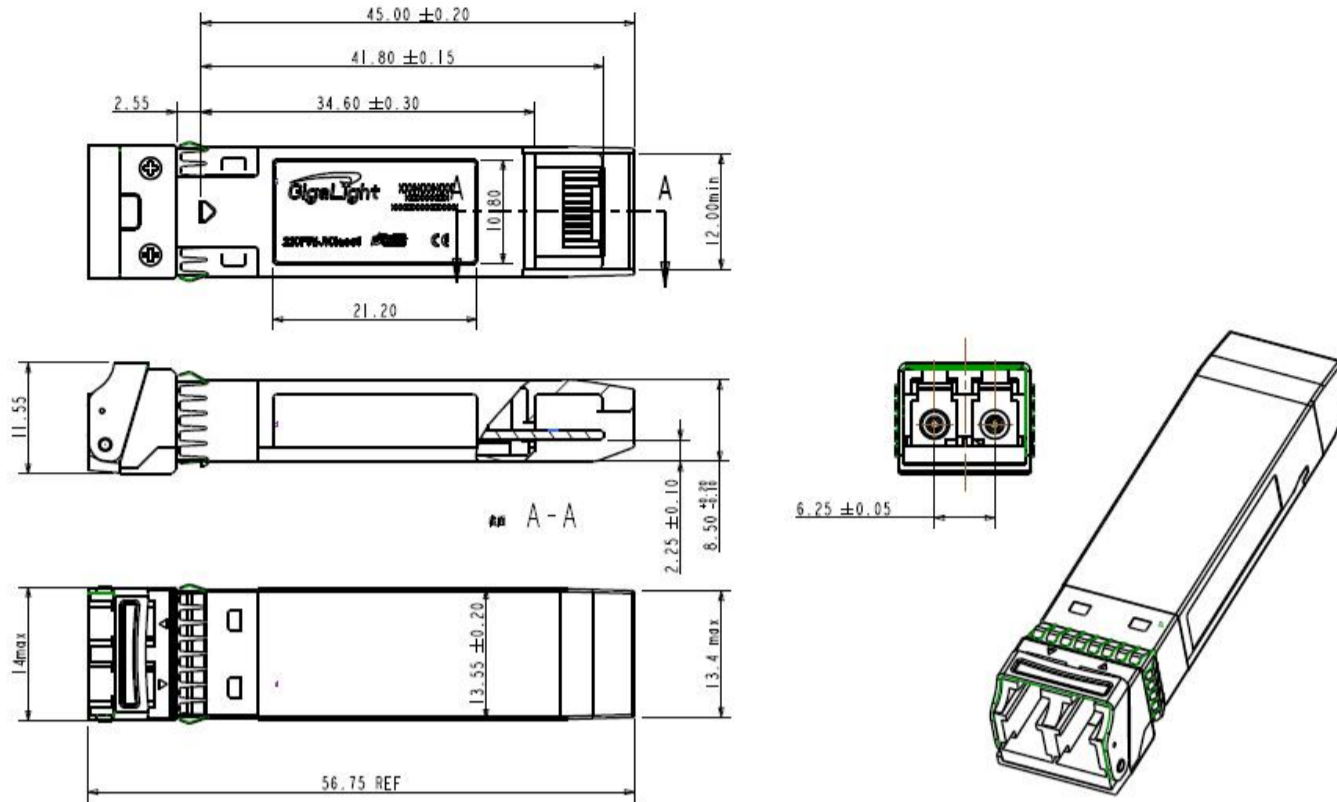


Figure 6. Mechanical Specifications

Regulatory Compliance

FiberStamp 25G SFP28 LR 1310nm 10km Optical Transceiver Module SFP28 transceivers are Class 1 Laser Products. They are certified per the following standards:

Feature	Standard
Laser Safety	IEC 60825-1:2014 (Third Edition)
Environmental protection	2011/65/EU
CE EMC	EN55032: 2015 EN55035: 2017 EN61000-3-2:2014
FCC	FCC Part 15, Subpart B; ANSI C63.4-2014

References

1. SFF-8431 Rev4.1
2. SFF-8472 Rev12.3
3. SFF-8424 Rev4.5
4. SFF-8432 Rev5.2
5. IEC61754-20
6. Ethernet 25GBASE-LR IEEE802.3cc
7. Directive 2011/65/EU of the European Parliament and of the Council, "on the restriction of the use of certain hazardous substances in electrical and electronic equipment," July 1, 2011.

⚠ CAUTION:

Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Ordering Information

Part Number	Product Description
FST-25G-LR	25G SFP28 LR 1310nm 10km Optical Transceiver Module



Important Notice

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