

**100-32SM-LR20-DDMI** Transceiver is a high performance, cost effective module which have a Duplex LC optics interface. Standard AC coupled CML for high speed signal and LVTTTL control and monitor signals. The receiver section uses a PIN receiver and the transmitter uses 1310 nm FP laser, up to 12.5dB link budge ensure this module 1000Base Ethernet 20Km application.

**Features:**

- Up to 1.25Gb/s Data Links
- Hot-Pluggable
- 1310nm FP laser transmitter
- Duplex LC connector
- RoHS compliant and Lead Free
- Up to 20 km on 9/125µm SMF
- Single +3.3V Power Supply
- Low power dissipation <600mW typically
- Industrial /Extended/ Commercial operating temperature range: -40°C to 85°C/-5°C to 85°C/0°C to 70°C Version available



**Applications:**

- Metro/Access Networks
- 1.25 Gb/s 1000Base-LX Ethernet
- 1xFiber Channel
- Other Optical Links

**Absolute Maximum Ratings**

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T <sub>S</sub>	-40		+85	°C
Supply Voltage	V <sub>CC</sub> T, R	-0.5		4	V
Relative Humidity	RH	0		85	%
Case Operating Temperature	Top	Industrial		85	°C
		Extended	-5	85	
		Commercial	0	70	

**Recommended Operating Environment**

Parameter	Symbol	Min.	Typical	Max.	Unit
Supply Voltage	V <sub>CC</sub> T, R	3.0		3.6	V
Power Supply Rejection		100			mV <sub>P</sub> . P
Case Operating Temperature	T <sub>C</sub>	Industrial			°C
		Extended			
		Commercial	0	+70	

**Electrical Characteristics (TOP = -5 to 70°C, VCC = 3.0 to 3.60 Volts)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Supply Voltage	V <sub>CC</sub>	3.0	3.30	3.60	V	
Supply Current	I <sub>CC</sub>		160	280	mA	
Inrush Current	I <sub>surge</sub>			I <sub>CC</sub> +30	mA	
Maximum Power	P <sub>max</sub>			1.0	W	
<b>Transmitter Section:</b>						
Input differential impedance	R <sub>in</sub>	90	100	110	Ω	1
Single ended data input swing	V <sub>in PP</sub>	200		1200	mVp-p	
Transmit Disable Voltage	V <sub>D</sub>	V <sub>CC</sub> - 1.3		V <sub>CC</sub>	V	2
Transmit Enable Voltage	V <sub>EN</sub>	V <sub>EE</sub>		V <sub>EE</sub> + 0.8	V	
Transmit Disable Assert Time	T <sub>dessert</sub>			10	us	
<b>Receiver Section:</b>						
Single ended data output swing	V <sub>out,pp</sub>	300		1000	mv	3
Data output rise time	t <sub>r</sub>			150	ps	4

Data output fall time	$t_f$			150	ps	4
LOS Fault	$V_{los\ fault}$	$V_{CC} - 0.5$		$V_{CC\_host}$	V	5
LOS Normal	$V_{los\ norm}$	$V_{EE}$		$V_{EE}+0.5$	V	5
Power Supply Rejection	PSR	100			mVpp	6
Deterministic Jitter Contribution	$RX\Delta DJ$			51.7	ps	7
Total Jitter Contribution	$RX\Delta TJ$			122.4	ps	

**Note:**

- AC coupled.
- Or open circuit.
- Into 100 ohm differential termination.
- 20 – 80 %.
- LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
- All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 14, 2000.
- Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and . DJ.

**Optical Parameters (TOP = -40 to 85°C, VCC = 3.00 to 3.60 Volts)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
<b>Transmitter Section:</b>						
Center Wavelength	$\lambda_c$	1270	1310	1360	nm	1
Spectral Width				3	nm	
Optical Output Power	$P_{out}$	-9.5		-3	dBm	2
Optical Rise/Fall Time	$t_r / t_f$			160	ps	3
Extinction Ratio	ER	9.2			dB	
Deterministic Jitter Contribution	$TX\Delta DJ$			56.5	ps	4
Total Jitter Contribution	$TX\Delta TJ$			119	ps	
Eye Mask for Optical Output	Compliant with Eye Mask Defined in IEEE 802.3 standard					
<b>Receiver Section:</b>						
Optical Input Wavelength	$\lambda$	1100		1670	nm	
Optical Input Power	$P_{in}$	-22		-3	dBm	5.6
Receiver Reflectance		12			dB	
Receiver Overload	$P_{ol}$			-3	dBm	5.6
RX Sensitivity	$Sen$			-22	dBm	5.6
RX_LOS Assert	$LOS_A$	-34			dBm	
RX_LOS Deassert	$LOS_D$			-24	dBm	
RX_LOS Hysteresis	$LOS_H$		2	2.5	dB	
<b>General Specifications:</b>						
Data Rate	BR	1062		1250	Mb/s	
Bit Error Rate	BER			$10^{-12}$		
Max. Supported Link Length on 50/125µm MMF@155Mb/s	LMAX		20		km	7
Total System Budget	LB	12.5			dB	8

**Note:**

- Also specified to meet curves in FC-PI 13.0 Figures 18 and 19, which allow trade-off between wavelength spectral width.
- Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
- Unfiltered, 20-80%. Complies with IEEE 802.3 (Gig. E), FC 1x and 2x eye masks when filtered.
- Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and . DJ.
- Measured with conformance signals defined in FC-PI 13.0 specifications.
- Measured with PRBS  $2^{7-1}$  at  $10^{-12}$  BER.
- Dispersion limited per FC-PI Rev. 13.
- Attenuation of 0.45 dB/km is used for the link length calculations. Distances are indicative only. Please refer to the Optical Specifications in Table IV to calculate a more accurate link budget based on specific conditions in your application.

**Block Diagram of Transceiver:**

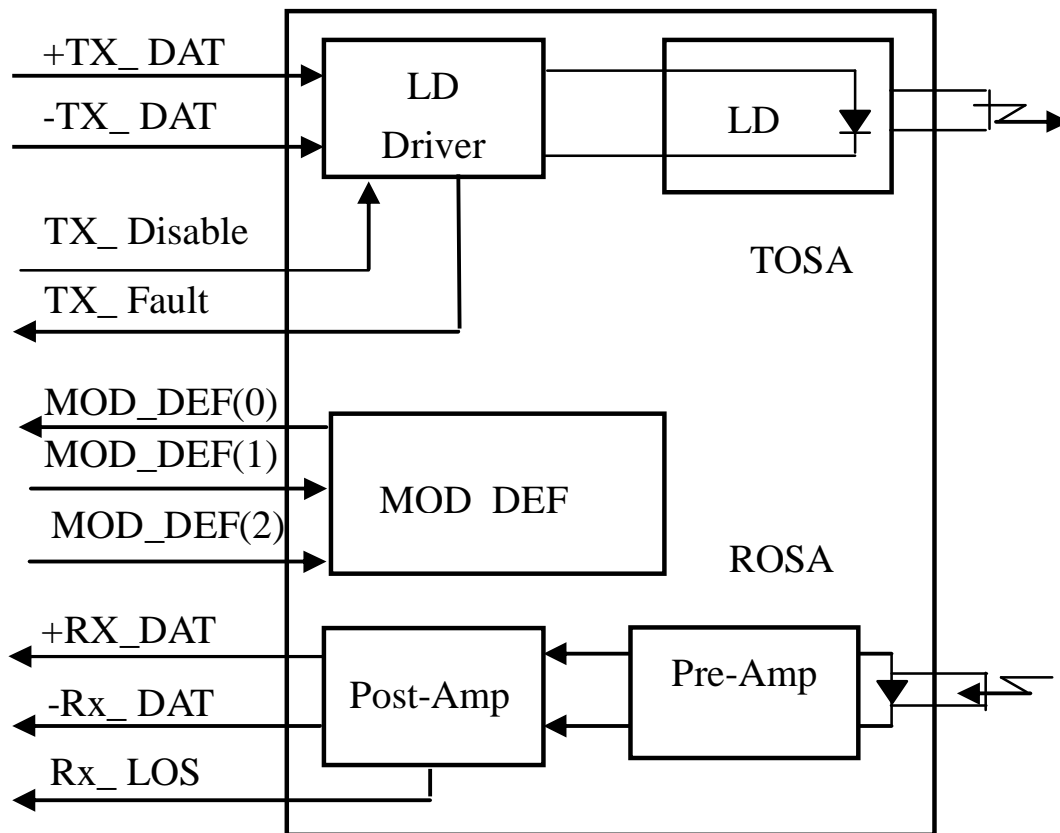


Figure1: Block Diagram

**Pin Assignment:**

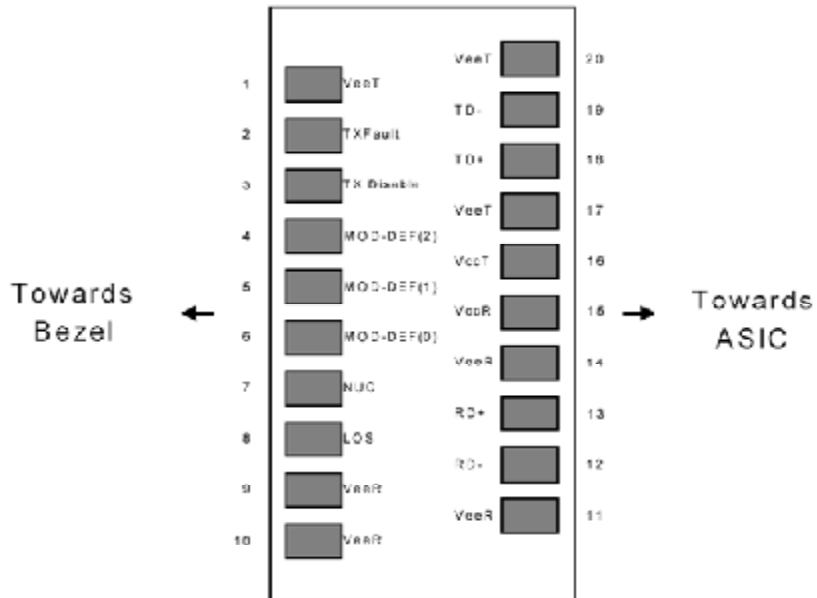


Figure2: Diagram of Host Board Connector Block Pin Numbers and Names

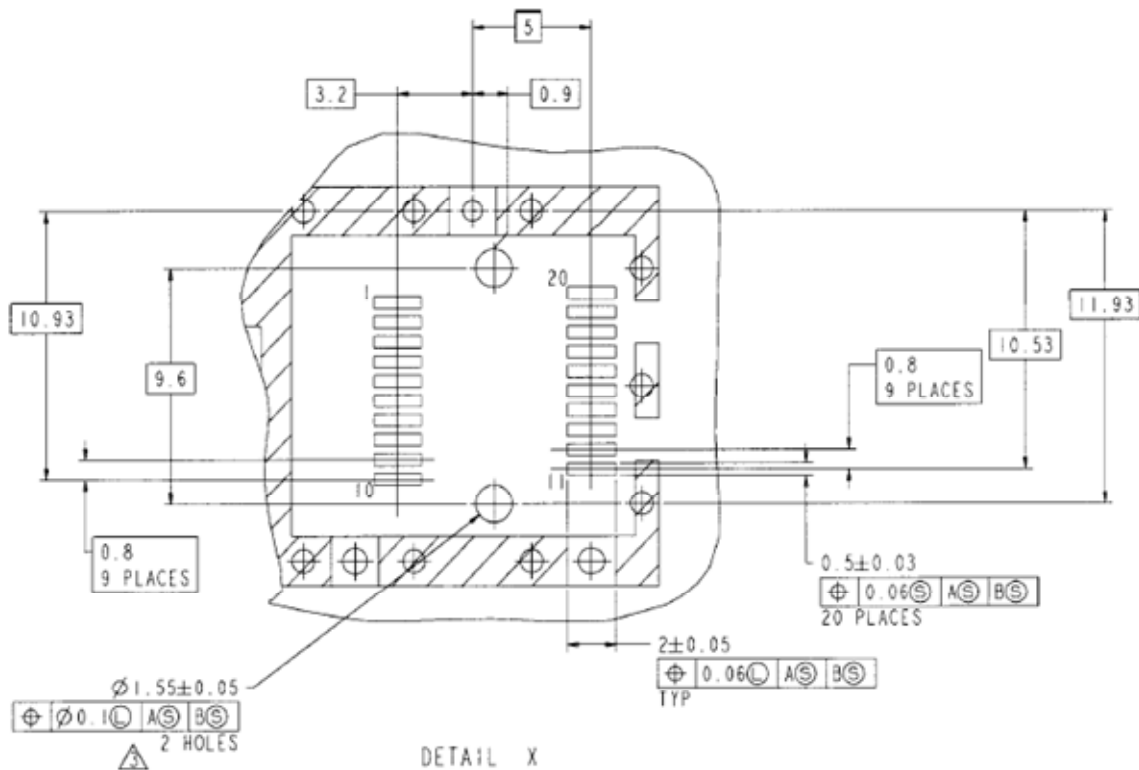


Figure 3. SFP Host Board Mechanical Layout

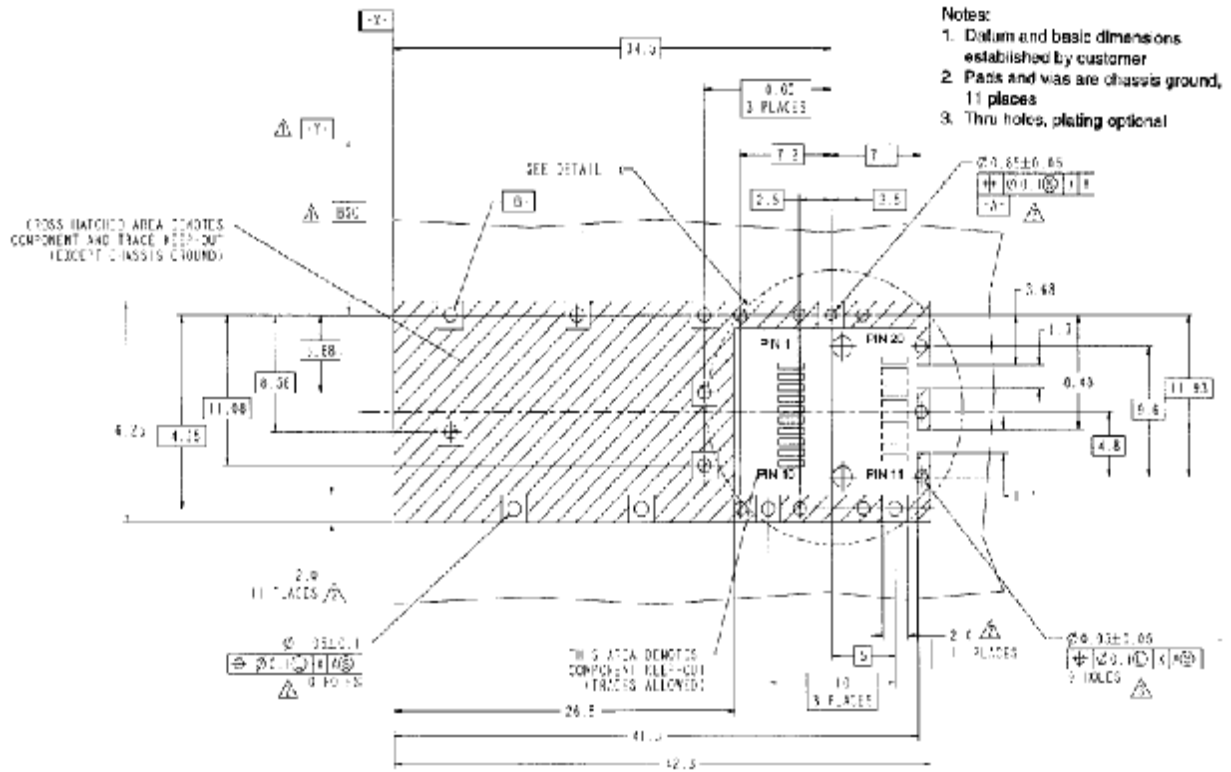


Figure 4. SFP Host Board Mechanical Layout (Cont)

Pin Description:

Pin No	Name	Function	Plug Seq	Notes
1	VeeT	Transmitter Ground	1	1
2	TX Fault	Transmitter Fault Indication	3	
3	TX Disable	Transmitter Disable	3	2
4	MOD-DEF2	Module Definition	2	3
5	MOD-DEF1	Module Definition 1	3	3
6	MOD-DEF0	Module Definition 0	3	3
7	Rate Select	Not Connected	3	4
8	LOS	Loss of Signal	3	5
9	VeeR	Receiver Ground	1	1
10	VeeR	Receiver Ground	1	1
11	VeeR	Receiver Ground		1
12	RD-	Inv. Received Data Out	3	6
13	RD+	Received Data Out	3	6
14	VeeR	Receiver Ground	3	1
15	VccR	Receiver Power	2	1
16	VccT	Transmitter Power	2	
17	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	6
19	TD-	Inv. Transmit In	3	6
20	VeeT	Transmitter Ground	1	

**Note:**

- Circuit ground is internally isolated from chassis ground.
- Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- Should be pulled up with 4.7k – 10 kohms on host board to a voltage between 2.0V and 3.6V. MOD\_DEF(0) pulls line low to indicate module is plugged in.
- Rate select is not used
- LOS is open collector output. Should be pulled up with 4.7k – 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- AC Coupled

**Recommended Circuit:**

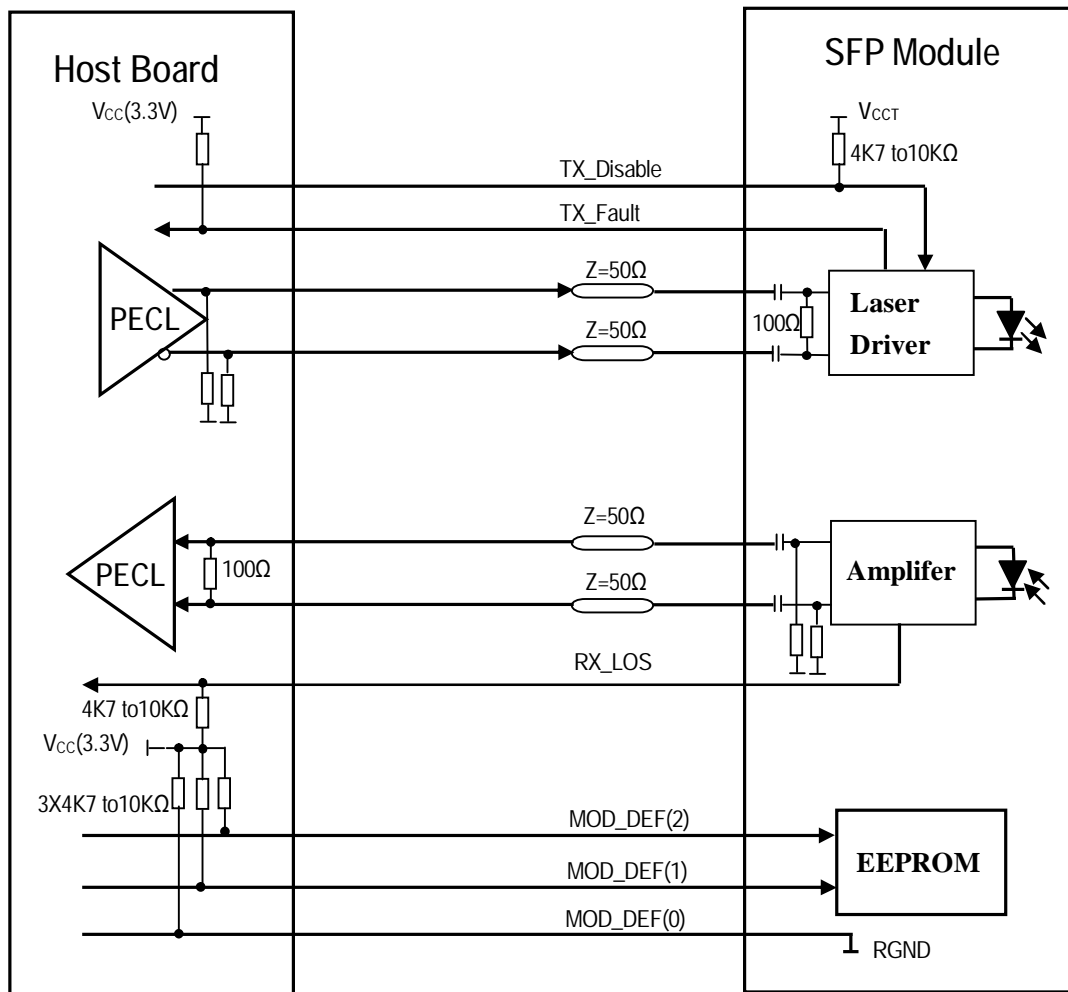


Figure 5. SFP Host Recommended Circuit

### Serial ID Memory Contents:

Data Address	Length (Byte)	Name of Length	Description and Contents
<b>Base ID Fields</b>			
0	1	Identifier	Type of Serial transceiver (03h=SFP)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	Gigabit Ethernet 1000Base-SX & Fiber Channel
11	1	Encoding	8B10B (01h)
12	1	BR,Nominal	Nominal baud rate, unit of 100Mbps
13	1	Reserved	(0000h)
14	1	Length	Link length supported for 9/125um fiber, units of km
		(9um,km)	
15	1	Length (9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length (50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length (62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length (Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name:
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "FTXXXXX" (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-62	3	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
<b>Extended ID Fields</b>			
64-65	2	Option	Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
<b>Vendor Specific ID Fields</b>			
96-127	32	Readable	Vendor specific date, read only

### References

- IEEE Std 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-SX. IEEE Standards Department, 2002.
- "Fibre Channel Physical and Signaling Interface (FC-PH, FC-PH2, FC-PH3)". American National Standard for Information Systems.
- "Fibre Channel Draft Physical Interface Specification (FC-PI 13.0)". American National Standard for Information Systems.
- Small Form-factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA) September 14, 2000.

Mechanical Dimensions:

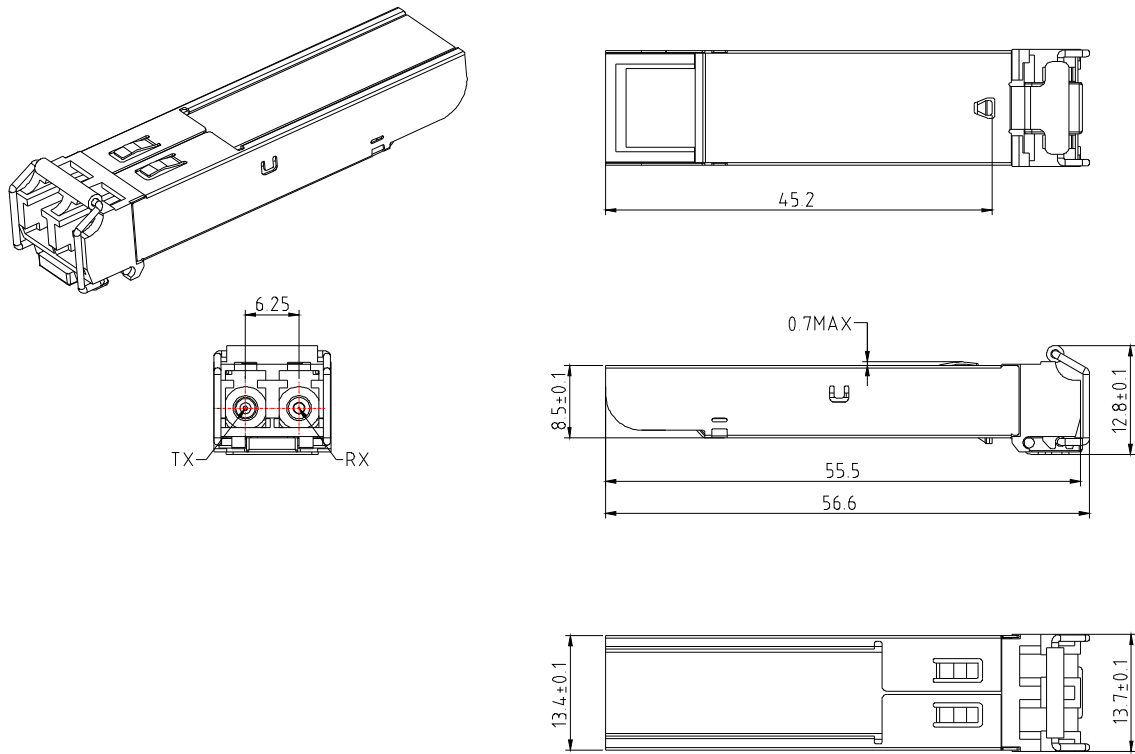


Figure 6. Mechanical Drawing