

## Product Features

- Compliant with IEEE Std 802.3bm, 100G BASE SR4 Ethernet, 40G BASE SR4 Ethernet
- Compliant with QSFP28 MSA
- Management interface specifications per SFF-8636
- Single MPO connector receptacle
- 4 channels 850nm VCSEL array
- 4 channels PIN photo detector array
- Up to 103.1Gb/s data rates
- Quad 25G CDR, auto bypass at 40G application
- Single +3.3V power supply
- Class 1 laser safety certified
- Commercial operating temperature: 0°C to +70°C
- Up to 70m on OM3 MMF and 100m on OM4 MMF
- RoHS6 Compliant



## Applications

- 100G BASE-SR4 Ethernet
- 40G BASE-SR4 Ethernet
- Data Center

## Descriptions

LX8501CMR QSFP28 transceivers are designed for use in dual rates 100Gb/s and 40Gb/s links over multimode fiber. They integrate four channel VCSEL array and four channel PIN photodiode array, the module can operate at 103.1Gb/s and 41.2Gb/s up to 70m using OM3 or 100m using OM4 MMF. They are compliant with the QSFP28 MSA and IEEE 802.3bm 100GBASE-SR4.

LX8501CMR are compliant with RoHS.

## Ordering Information

**Table 1. Ordering Information**

Part Number	Transmitter	Output Power	Receiver	Sensitivity	Reach	Temp	DDM	RoHS
LX8501CMR	850nm VCSEL	-8.4 ~ +2.4dBm	PIN	< -11dBm	100m	0~ 70°C	Available	Compliant

## Pin Description

**Table 2. Pin Description**

Pin	Name	Function/Description	Notes
1	GND	Transmitter Ground (Common with Receiver Ground)	1
2	Tx2-	Transmitter Inverted Data Input	
3	Tx2+	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground (Common with Receiver Ground)	1
5	Tx4-	Transmitter Inverted Data Input	
6	Tx4+	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground (Common with Receiver Ground)	1
8	ModSelL	Module Select	2
9	ResetL	Module Reset	2
10	VccRx	3.3V Power Supply Receiver	
11	SCL	2-Wire serial Interface Clock	2
12	SDA	2-Wire serial Interface Data	2
13	GND	Transmitter Ground (Common with Receiver Ground)	1
14	Rx3+	Receiver Non-Inverted Data Output	
15	Rx3-	Receiver Inverted Data Output	
16	GND	Transmitter Ground (Common with Receiver Ground)	1
17	Rx1+	Receiver Non-Inverted Data Output	
18	Rx1-	Receiver Inverted Data Output	
19	GND	Transmitter Ground (Common with Receiver Ground)	1
20	GND	Transmitter Ground (Common with Receiver Ground)	1
21	Rx2-	Receiver Inverted Data Output	
22	Rx2+	Receiver Non-Inverted Data Output	
23	GND	Transmitter Ground (Common with Receiver Ground)	1
24	Rx4-	Receiver Inverted Data Output	1
25	Rx4+	Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground (Common with Receiver Ground)	1
27	ModPrsl	Module Present	
28	IntL	Interrupt	2
29	VccTx	3.3V power supply transmitter	
30	Vcc1	3.3V power supply	
31	LPMODE	Low Power Mode	2
32	GND	Transmitter Ground (Common with Receiver Ground)	1
33	Tx3+	Transmitter Non-Inverted Data Input	
34	Tx3-	Transmitter Inverted Data Output	
35	GND	Transmitter Ground (Common with Receiver Ground)	1
36	Tx1+	Transmitter Non-Inverted Data Input	
37	Tx1-	Transmitter Inverted Data Output	
38	GND	Transmitter Ground (Common with Receiver Ground)	1

**Notes:**

1. The module signal grounds are isolated from the module case.
2. This is open collector/drain output that on the host board requires a 4.7KΩ to 10KΩ pull-up resistor to VccHost.

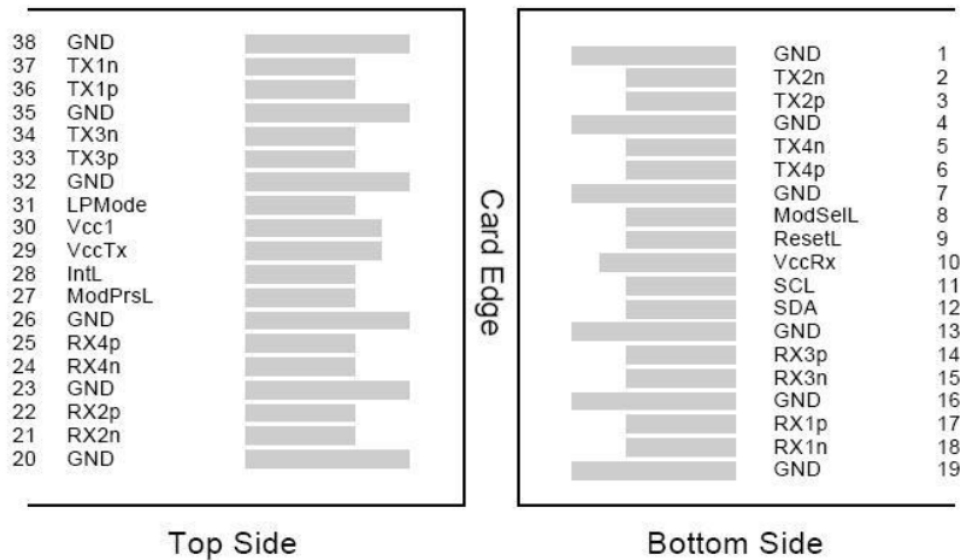


Figure 1. Host PCB QSFP28 pad assignment top view

## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

**Table 3. Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	T <sub>s</sub>	-40	85	°C
Relative Humidity	RH	5	95	%
Supply Voltage	V <sub>cc</sub>	-0.5	4.0	V

## Recommended Operating Conditions

**Table 4. Recommended Operating Conditions**

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T <sub>c</sub>	0	25	70	°C
Supply Voltage	V <sub>cc</sub>	3.135	3.3	3.465	V
Data Rate PER Channel	-	-	25.78125	-	Gb/s

## Transceiver Electrical Characteristics

**Table 5. Transceiver Electrical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Module Supply Current	I <sub>cc</sub>	-	-	750	mA	-
Power Dissipation	P <sub>D</sub>	-	-	2.5	W	-
<b>Transmitter</b>						
Input Differential Impedance	Z <sub>IN</sub>	-	100	-	Ω	-
Differential Data Input Swing	V <sub>IN, P-P</sub>	180	-	900	mV <sub>P-P</sub>	-
<b>Receiver</b>						
Output Differential Impedance	Z <sub>O</sub>	-	100	-	Ω	-
Differential Data Output Swing	V <sub>OUT, P-P</sub>	300	-	850	mV <sub>P-P</sub>	1
Transition Time (20% to 80%)	T <sub>r, Tf</sub>	12			ps	

**Notes:**

- Internally AC coupled, but requires a external 100Ω differential load termination.

## Transmitter Optical Characteristics

**Table 6. Transmitter Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Launch Optical Power	P <sub>o</sub>	-8.4	-	+2.4	dBm	1
Center Wavelength Range	λ <sub>c</sub>	840	850	860	nm	-
Extinction Ratio	EX	2	-	-	dB	2
Spectral width(RMS)	Δλ	-	-	0.6	nm	
Transmitter and Dispersion Penalty	TDP	-	-	4.3	dB	-
Optical Return Loss Tolerance	ORLT	-	-	12	dB	-
Eye Diagram						IEEE Std 802.3bm compatible

**Notes:**

- The optical power is launched into OM3 MMF.
- Measured with a PRBS 2<sup>31</sup>-1 test pattern @25.78125Gbps.

## Receiver Optical Characteristics

**Table 7. Receiver Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Center Wavelength	λ <sub>c</sub>	840	850	860	nm	-
Average Receiver Sensitivity (P <sub>avg</sub> )	S	-	-	-11	dBm	1
Average Receiver Sensitivity (P <sub>avg</sub> )	S			-7.5	dBm	2
Receiver Overload (P <sub>avg</sub> )	P <sub>OL</sub>	2.5	-	-	dBm	
Damage Threshold	P <sub>OL</sub>	3.4	-	-	dBm	

Optical Reflectance	ORL	-	-	-12	dB	-
LOS De-Assert	LOS <sub>D</sub>	-	-	-11.5	dBm	-
LOS Assert	LOS <sub>A</sub>	-30	-	-	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

**Notes:**

1. Measured with PRBS 2<sup>31</sup>-1 test pattern, 10.3125Gb/s and 25.78125Gb/s, BER<5E<sup>-5</sup>.
2. Measured with PRBS 2<sup>31</sup>-1 test pattern, 10.3125Gb/s and 25.78125Gb/s, BER<10<sup>-12</sup>.

## EEPROM Serial ID Memory Contents

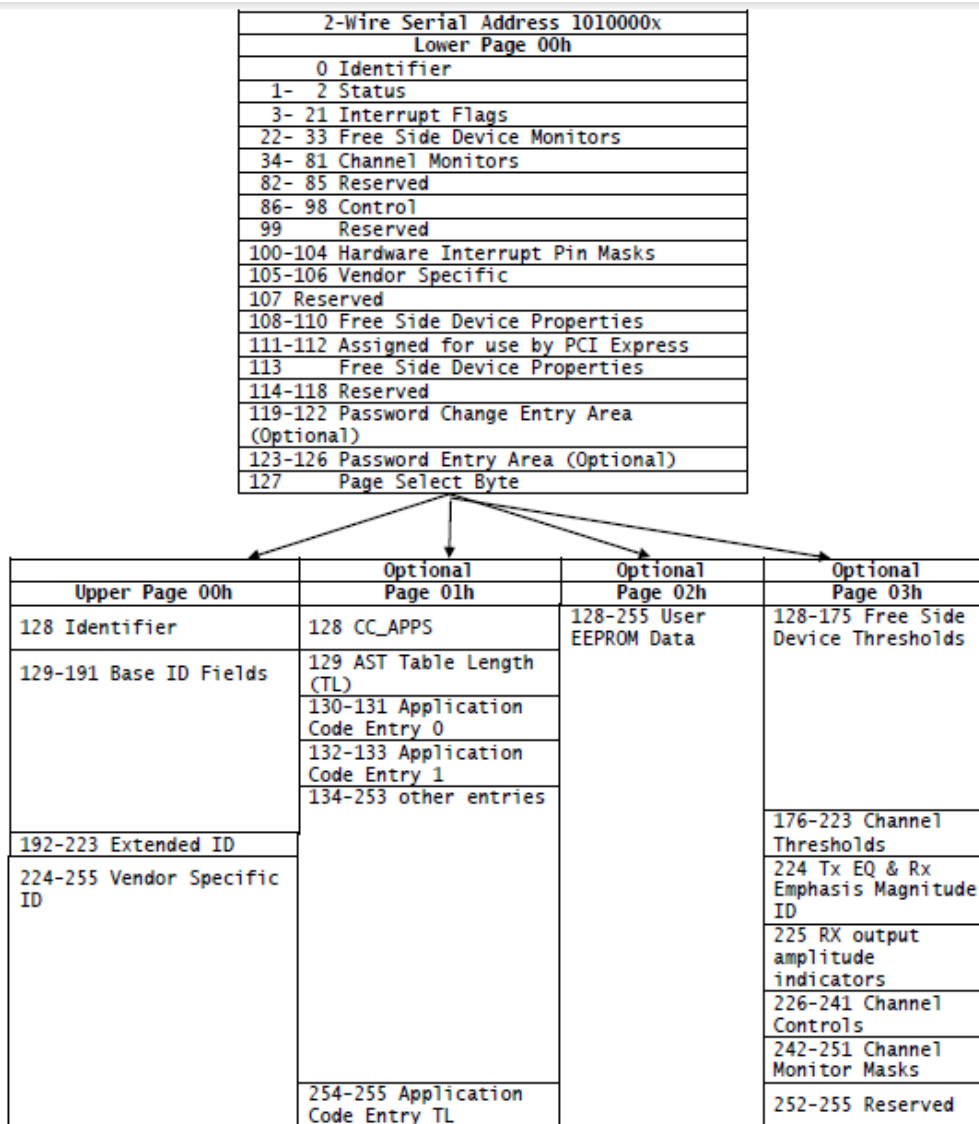


FIGURE 6-1 COMMON MEMORY MAP

The QSFP28 SMA defines the operation of the QSFP28 2-wire serial interface which is used for serial ID, digital diagnostics, and certain control functions. The 2-wire serial interface is mandatory for all QSFP28 modules. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage

monitoring and temperature monitoring all are implemented. The memory contents are shown in Table 8.

**Table 8. Serial ID Memory Contents**

Data Address	Name of Field	Contents(Hex)	Description
128	Identifier	11	QSFP28
129	Ext. Identifier	8C	2.5W max, With TX/RX CDR
130	Connector	0C	MPO 1x12
131-138	Specification Compliance	80 00 00 00 40 40 02 00	Transceiver Codes
139	Encoding	07	256B/257B
140	BR, Normal(100Mb/s)	FF	
141	Extended Rate Select Compliance	00	
142	Length (SMF)-km	00	
143	Length (OM3-50µm)	23	-
144	Length (OM2-50µm)	00	-
145	Length(OM1-62.5µm)	00	-
146	Length (Copper or OM4-50µm)	32	-
147	Device Tech	00	Uncooled transmitter and PIN detector
148-163	Vendor name	4C 49 4E 4B 54 45 4C 20 20 20 20 20 20 20 20 20	LINKTEL (ASCII)
164	Extended Module	00	
165-167	Vendor OUI	00 00 00	
168-183	Vendor PN	4C 58 38 35 30 31 43 4D 52 20 20 20 20 20 20 20	LX8501CMR(ASCII)
184-185	Vendor rev	31 2E	Rev 1.0 ( ASCII)
186-187	Wavelength(1/20nm)	42 68	850nm
188-189	Wavelength Tolerance	07 D0	+/-10nm
190	Max Case Temp	46	70°C
191	CC_BASE	xx	Check sum of bytes 128 - 190
192	Link Codes	02	100GBASE-SR4,25GBASE-SR
193-195	Options	00 30 9A	
196-211	Vendor SN	33 31 36 30 34 30 37 30 31 35 20 20 20 20 20 20	Serial Number of transceiver (ASCII). For example "3160407016".
212-219	Date code	xx xx xx xx xx xx 20 20	Year (2 bytes), Month (2 bytes), Day (2 bytes)
220	Diagnostic Monitoring Type	0C	Transmitter and Receiver average power
221	Enhanced Options	00	
222	BR, Normal(250Mb/s)	67	25.78Gb/s
223	CC_EXT	xx	Check sum for bytes 192-222

**Note:** The “xx” byte should be filled in according to practical case. For more information, please refer to the related document of SFF-8636.

## Diagnostic Monitor Specifications

The digital diagnostic monitoring interface also defines memory map in EEPROM, For detail EEPROM information, please refer to the related document of SFF-8636. The monitoring specification of this product is described in Table 9.

**Table 9. Diagnostic Monitor Specifications**

Parameter	Range	Accuracy	Calibration	
Temperature	LX8501CMR	-10 to +80°C	±3°C	Internal
Voltage		2.9 to 3.6V	±3%	Internal
Bias Current		2 to 14mA	±10%	Internal
TX Power		-9.4 to +3.4dBm	±2dB	Internal
RX Power		-12 to +3.4dBm	±2dB	Internal

## Recommended Host Board Power Supply Filter Network

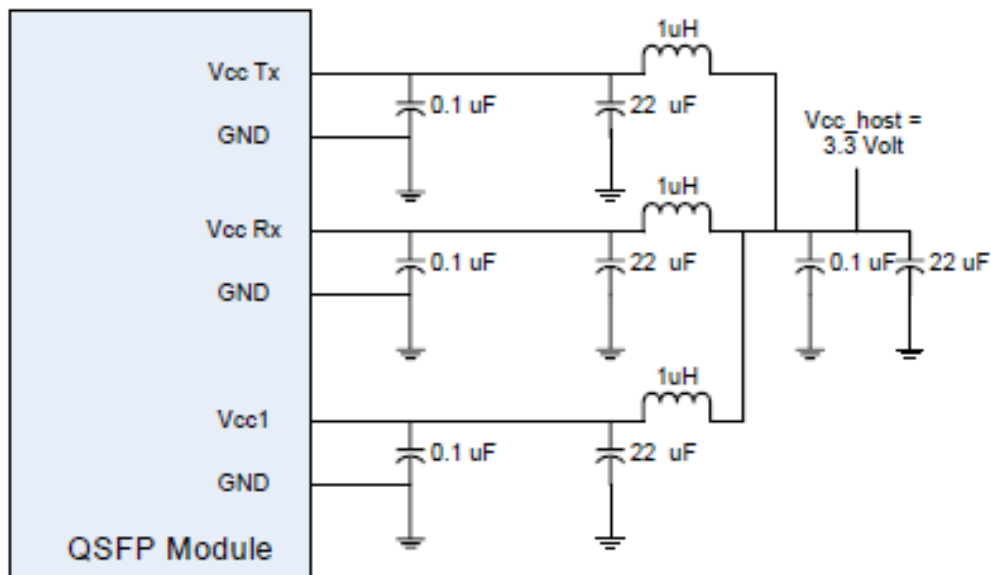


Figure 2. Recommended Host Board Power Supply Filter Network

## Recommended Application Interface Block Diagram

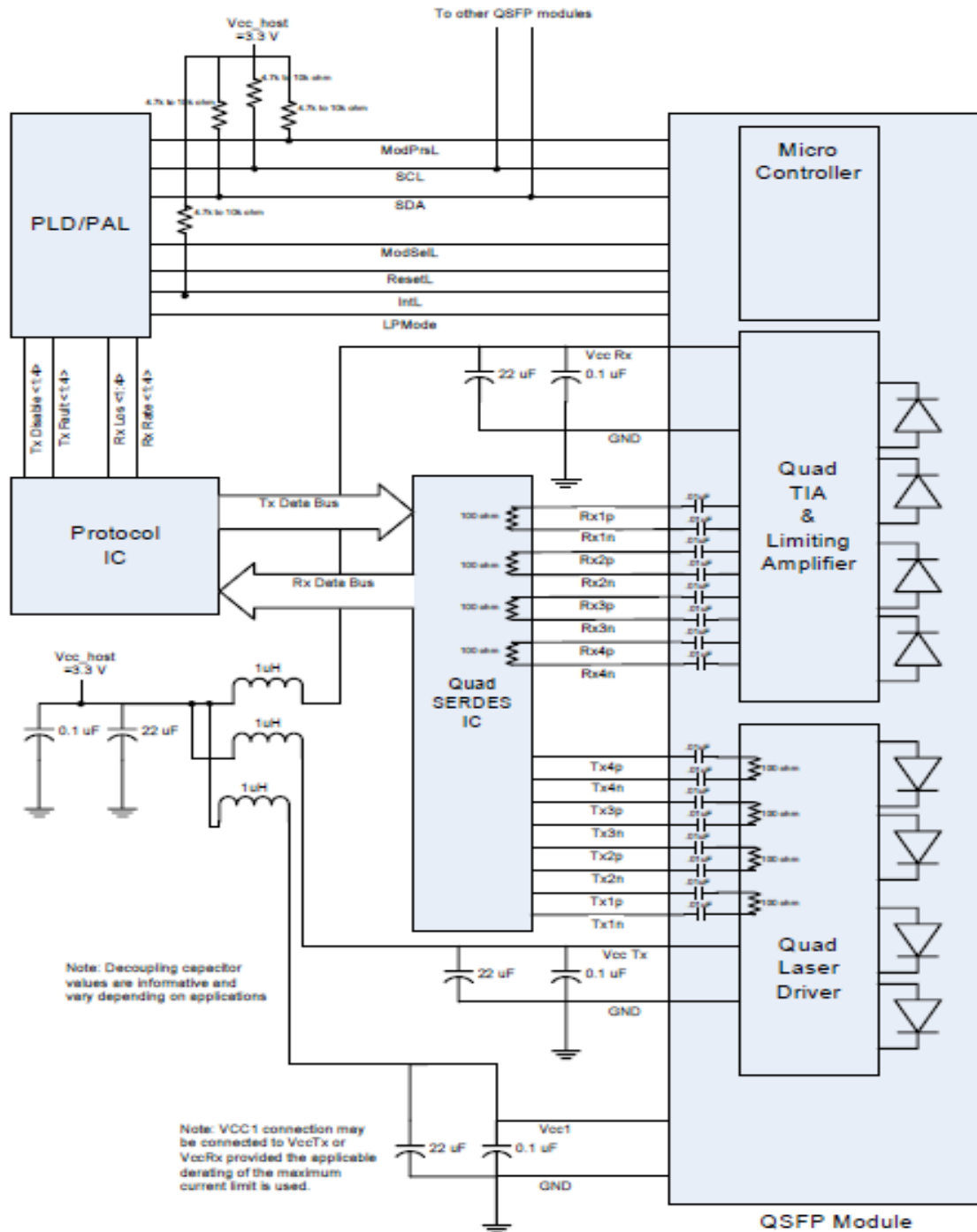


Figure 4. Recommended Application Interface Block Diagram



## Mechanical specifications

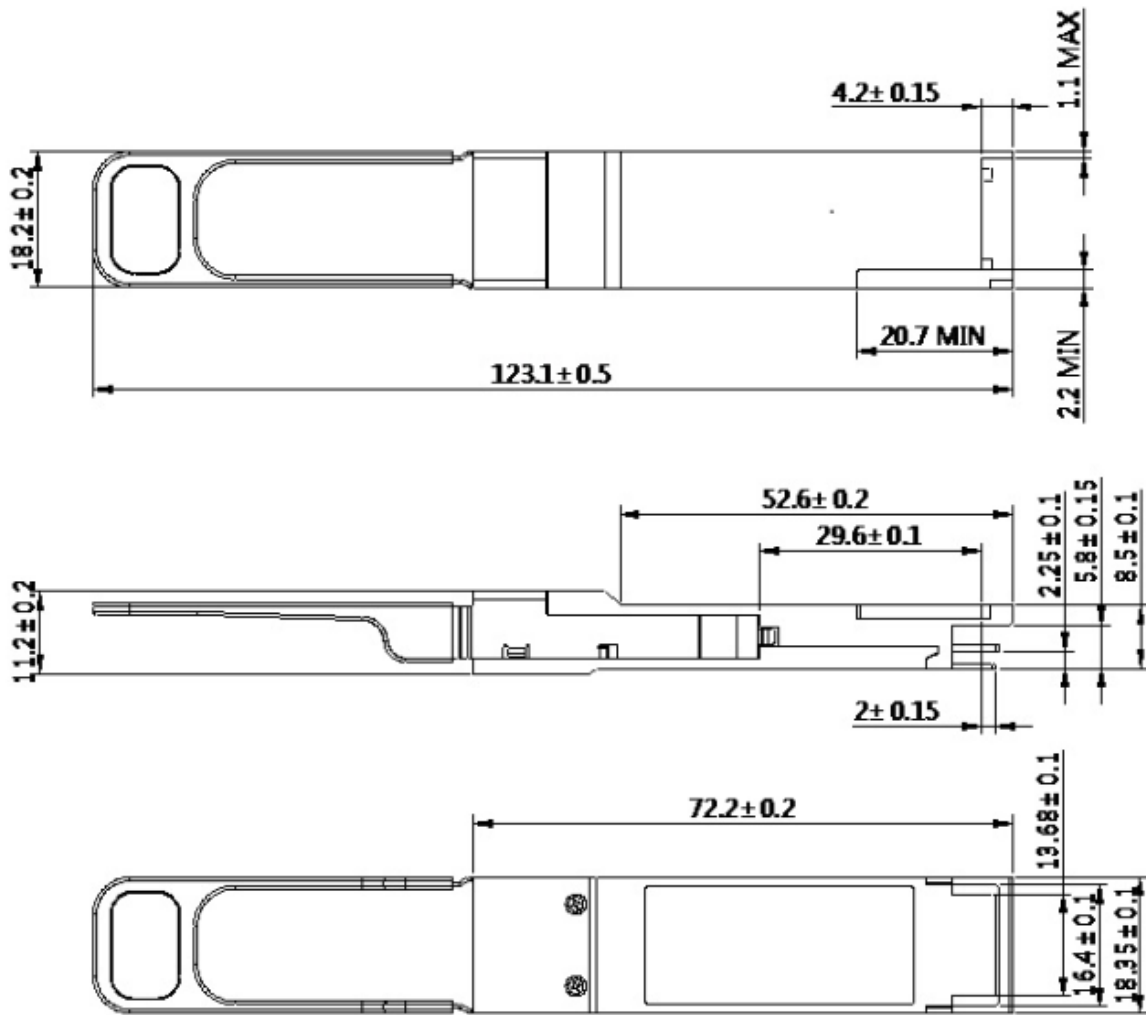


Figure 5. Outline Drawing

## **For More Information**

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