

## Product Features

- Compliant to standard SFF-8436 for QSFP+ and standard SFF-8431 for SFP+
- High speed / high density: support up to 4X10 Gb/s bi-directional operation
- Reliable VCSEL and PIN photonic devices
- I<sup>2</sup>C standard management interface
- Excellent high speed signal integrity
- Operating temperature Options
  - (Commercial) 0°C to +70°C
- RoHS6 Compliant



## Applications

- 10G/40G Ethernet
- Proprietary high speed, high density data
- High performance computing, server and data storage.

## Descriptions

LX498xCDR is a 40Gb/s QSFP+ to 4x 10G SFP+ , hot pluggable active optical cable for Infiniband and Ethernet data transmission. It provides parallel interconnects: 4 transmitting / 4 receiving data lanes and supports distance up to 100 meters.

LX498xCDR is designed to meet the requirements of high speed, high density and low power consumption for applications in today's data centers.

## Ordering Information

Table 1. Ordering Information

Part Number	Reach	Temp	RoHS
LX4981CDR	1m	0 ~ 70 °C	Compliant
LX4982CDR	2m	0 ~ 70 °C	Compliant
LX4983CDR	3m	0 ~ 70 °C	Compliant
LX4984CDR	5m	0 ~ 70 °C	Compliant
LX4984CDL	7m	0 ~ 70 °C	Compliant
LX4985CDR	10m	0 ~ 70 °C	Compliant
LX4985CDL	15m	0 ~ 70 °C	Compliant
LX4986CDR	20m	0 ~ 70 °C	Compliant
LX4987CDR	30m	0 ~ 70 °C	Compliant
LX4988CDR	50m	0 ~ 70 °C	Compliant
LX4989CDR	100m	0 ~ 70 °C	Compliant

## Pin Description

Table 2.1 Pin Description for QSFP+

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 an open collector/drain output that on the host board requires a 4.7KΩ to 10KΩ pull-up resistor to VccHost.

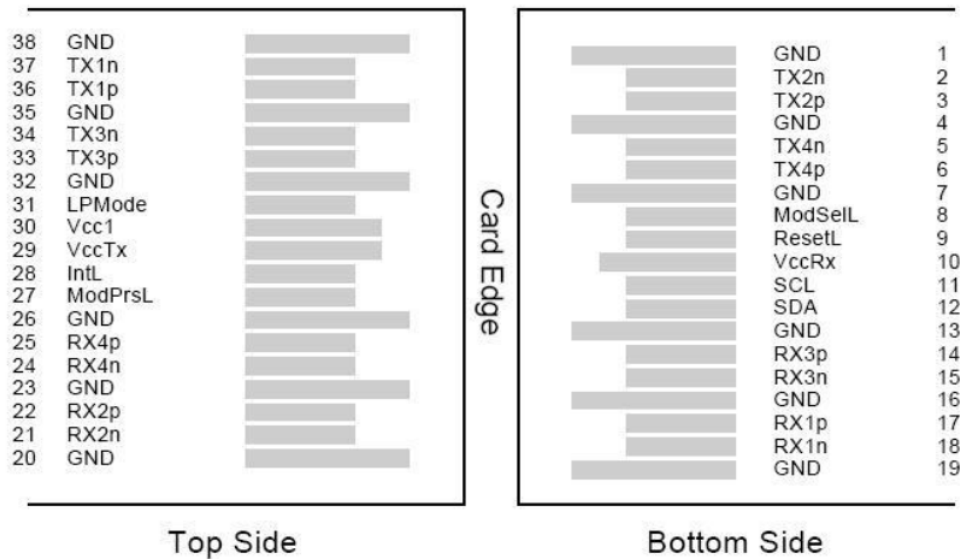


Figure 1. Host PCB QSFP+ pad assignment top view

Table 2.2 Pin Description for SFP+

Pin	Name	Function/Description	Notes
1	VeeT	Transmitter Ground	1
2	TX_Fault	Transmitter Fault (LVTTTL-O) - High indicates a fault condition	2
3	TX_Disable	Transmitter Disable (LVTTTL-I) – High or open disables the transmitter	3
4	SDA	Two wire serial interface Data Line (LVCMOS-I/O) (MOD-DEF2)	4
5	SCL	Two wire serial interface Clock Line (LVCMOS-I/O) (MOD-DEF1)	4
6	MOD_ABS	Module Absent (Output), connected to VeeT or VeeR in the module	5
7	RS0	Rate Select 0 – Not used, Presents high input impedance	-
8	RX_LOS	Receiver Loss of Signal (LVTTTL-O)	2
9	RS1	Rate Select 1 – Not used, Presents high input impedance	-
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inverse Received Data out (CML-O)	-
13	RD+	Received Data out (CML-O)	-
14	VeeR	Receiver Ground	-
15	VccR	Receiver Power - +3.3V	-
16	VccT	Transmitter Power - +3.3 V	-
17	VeeT	Transmitter Ground	1
18	TD+	Transmitter Data In (CML-I)	-
19	TD-	Inverse Transmitter Data In (CML-I)	-

20	VeeT	Transmitter Ground	1
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**Notes:**

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that on the host board requires a 4.7KΩ to 10KΩ pull-up resistor to VccHost.
3. This input is internally biased high with a 4.7KΩ to 10KΩ pull-up resistor to VccT.
4. Two-Wire Serial interface clock and data lines require an external pull-up resistor dependent on the capacitance load.
5. This is a ground return that on the host board requires a 4.7KΩ to 10KΩ pull-up resistor to VccHost.

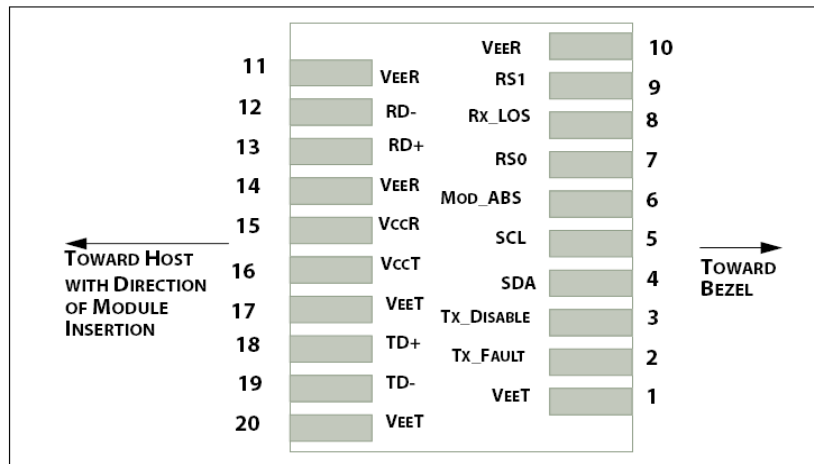


Figure 2. Host PCB SFP+ pad assignment top view

## 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	85	%
Supply Voltage	V <sub>CC</sub>	0	3.6	V

## Recommended Operating Conditions

Table 4. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	LX498xCDR 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	-	-	4*10.3	-	Gb/s

## Transceiver Electrical Characteristics

Table 5. Transceiver Electrical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Low speed output: Transmitter Fault(TX_FAULT) / Loss of Signal (LOS)	VOH	2.0	-	Vcc	V	1
	VOL	0	-	0.8	V	1
Low speed input: Transmitter Disable (TX_DISABLE), MOD_DEF 1, MOD_DEF 2	VIH	2.0	-	Vcc	V	2
	VIL	0	-	0.8	V	2
Clock Rate-I2C	f	-	-	400	kHz	3
Module Turn-on time	-	-	-	2000	ms	4

Notes:

1. For all control input pins: LPMode,Reset and ModSelL.
2. For all status output pins: ModPrsL,IntL.
3. For management interface.
4. Time from module power-on / insertion/ ResetL deassert to module full functional.

## Transmitter Optical Characteristics

Table 6. Transmitter Optical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Reference Differential Input Impedance	Z <sub>d</sub>	-	100	-	Ω	1
Optical Return Loss Tolerance				12	dB	
Differential Data Input Swing	V <sub>in_pp</sub>	180	-	1200	mV	-
Differential Data Input Threshold			50		mV	2

Notes:

1. AC coupled inside AOC module.
2. Input swing to trigger TX-squelch.

## Receiver Optical Characteristics

Table 7. Receiver Optical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Reference Differential Input Impedance	Z <sub>d</sub>	-	100	-	Ω	1
Differential Data Output Swing	V <sub>out_pp</sub>	0	-	800	mV	
	-	0	-	-	%	2
Pre-emphasis Pulse Amplitude Percentage	-	10	-	-	%	
	-	20	-	-	%	
	-	40	-	-	%	
Pre-emphasis Pulse Duration	-	-	30	-	ps	
Signal Speed	-	-	4*10.3	-	Gb/s	-

Differential Data Output Swing	-	150	-	850	mV	-
Differential Data Output Swing When Squelched	-	-	-	50	mV	-
Rise / Fall Time (20% ~80%)	-	24	-	-	ps	-

Notes:

1. AC coupled inside AOC module.
2. User selectable. Percentage is the ratio of pre-emphasis amplitude to output swing. Users could change by writing to page 3 address 237, default value is "10"

## Recommended Application Interface Circuit

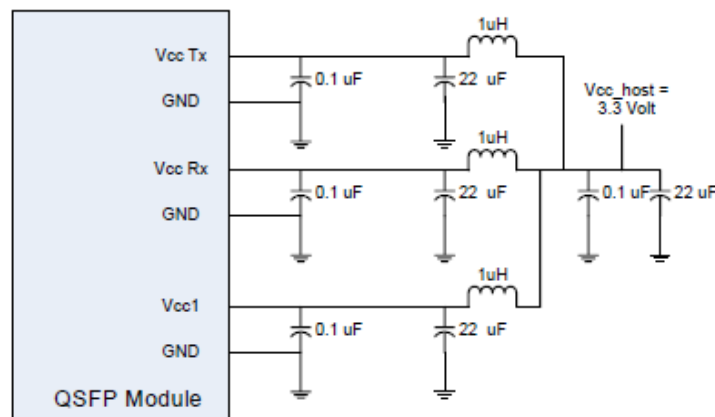


Figure 3. Recommended Host Board Power Supply Filter Network

## Mechanical specifications

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
AOC cable length (L <=5m)	L	L-0.06	L	L+0.06	M	-
AOC cable length (L > 5m)	L	L-(L*1.1%)	L	L+(L*1.1%)	M	-
Module Retention	-	90	-	170	N	-
Module Insertion	-	0	-	18	N	-
Module Extraction	-	0	-	25	N	-
Cable Pull Strength – Apply Load at 0°	-	44	-	-	N	-
Cable Pull Strength – Apply Load at 90°	-	33	-	-	N	-
Clearance Out of IO Bezel	-	75	-	-	nm	-
Cable Bending Radius	-	3	-	-	cm	-
Insertion / Removal Cycles	-	50	-	-	cycles	-

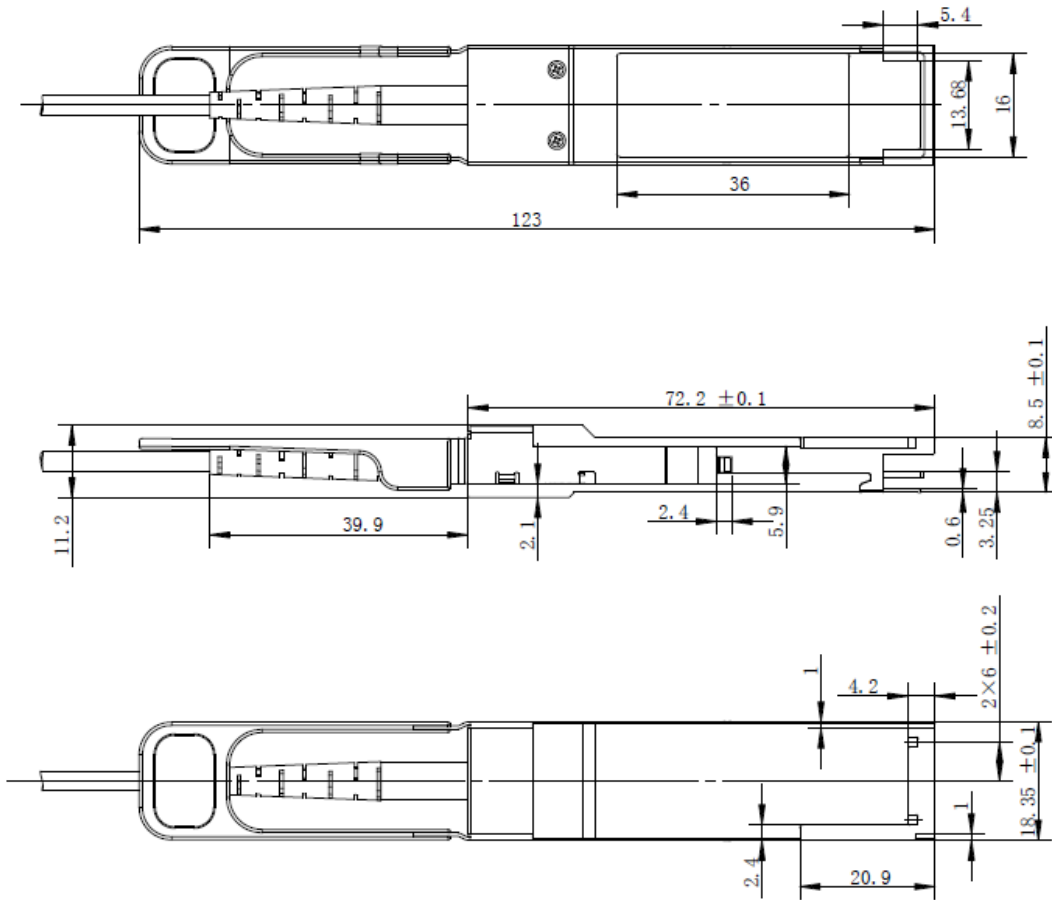


Figure 4. Outline Drawing for QSFP

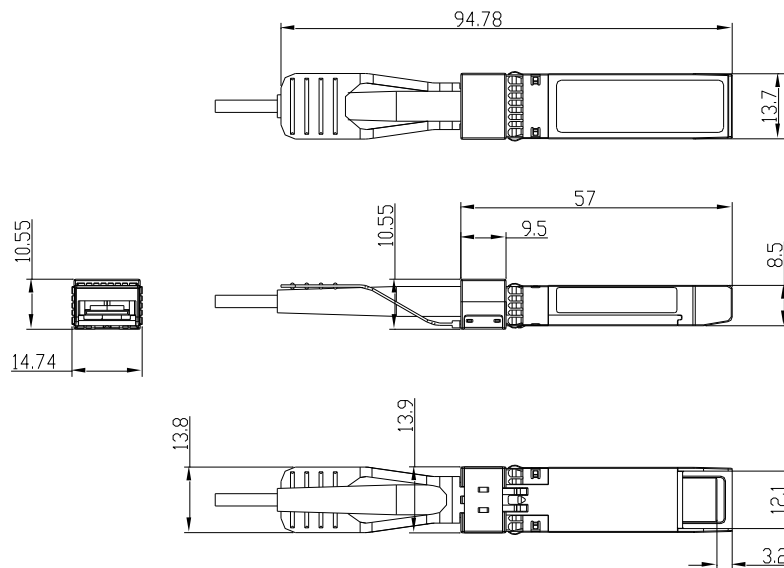


Figure 5. Outline Drawing for SFP+

## **For More Information**

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