

## Product Features

- Electrical interface specifications per SFF-8431
- Management interface specifications per SFF-8431 and SFF-8472
- SFP+ MSA package with duplex LC connector
- DWDM-rated EML Transmitter
- Up to 14.025Gb/s bi-directional data links
- Build-in dual CDR at 14.025CDR and Bypass at 4.25Gb/s and 8.5Gb/s
- 100GHz ITU Grid, C-Band
- Single +3.3V power supply
- Class 1 laser safety certified
- Commercial operating temperature:0°C to +70°C
- Up to 20km on 9/125µm SMF
- RoHS Compliant



## Applications

- Tri Rate 4.25 / 8.5 / 14.025 Gb/s Fibre Channel through Rate

## Descriptions

LX56xxCDH SFP+ transceivers, according to 16 Gigabit Small Form Factor Pluggable “SFP+” Multi-Sourcing Agreement (MSA) SFF-8431 Rev. 3.0 and SFF-8472 Rev. 11.0, are designed for use in Fibre Channel links up to 14.025Gb/s data rate and up to 20km link length. They are compatible with FC-PI-5 Rev. 6.10.

LX56xxCDH are compliant with RoHS.

## Ordering Information

**Table 1. Ordering Information**

Part Number	Transmitter	Output Power	Receiver	Sensitivity	Reach	Temp	DDM	RoHS
LX56xxCDH	DWDM EML	-1~ +3dBm	PIN	< -14dBm	20km	0 ~ 70 °C	Available	Compliant

Notes: See Table 2 – Wavelength Guide for “xx” value.

**Table 2. Wavelength Guide for “xx” value (100GHz ITU-T channel)**

Channel #	Product Part Number	Frequency (THz)	Center Wavelength (nm)
17	LX5617CDH	191.7	1563.86
18	LX5618CDH	191.8	1563.05
19	LX5619CDH	191.9	1562.23

20	LX5620CDH	192.0	1561.42
21	LX5621CDH	192.1	1560.61
22	LX5622CDH	192.2	1559.79
23	LX5623CDH	192.3	1558.98
24	LX5624CDH	192.4	1558.17
25	LX5625CDH	192.5	1557.36
26	LX5626CDH	192.6	1556.55
27	LX5627CDH	192.7	1555.75
28	LX5628CDH	192.8	1554.94
29	LX5629CDH	192.9	1554.13
30	LX5630CDH	193.0	1553.33
31	LX5631CDH	193.1	1552.52
32	LX5632CDH	193.2	1551.72
33	LX5633CDH	193.3	1550.92
34	LX5634CDH	193.4	1550.12
35	LX5635CDH	193.5	1549.32
36	LX5636CDH	193.6	1548.51
37	LX5637CDH	193.7	1547.72
38	LX5638CDH	193.8	1546.92
39	LX5639CDH	193.9	1546.12
40	LX5640CDH	194.0	1545.32
41	LX5641CDH	194.1	1544.53
42	LX5642CDH	194.2	1543.73
43	LX5643CDH	194.3	1542.94
44	LX5644CDH	194.4	1542.14
45	LX5645CDH	194.5	1541.35
46	LX5646CDH	194.6	1540.56
47	LX5647CDH	194.7	1539.77
48	LX5648CDH	194.8	1538.98
49	LX5649CDH	194.9	1538.19
50	LX5650CDH	195.0	1537.40
51	LX5651CDH	195.1	1536.61
52	LX5652CDH	195.2	1535.82
53	LX5653CDH	195.3	1535.04
54	LX5654CDH	195.4	1534.25
55	LX5655CDH	195.5	1533.47
56	LX5656CDH	195.6	1532.68

57	LX5657CDH	195.7	1531.90
58	LX5658CDH	195.8	1531.12
59	LX5659CDH	195.9	1530.33
60	LX5660CDH	196.0	1529.55
61	LX5661CDH	196.1	1528.77

## Pin Description

**Table 3. Pin Description**

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

**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.

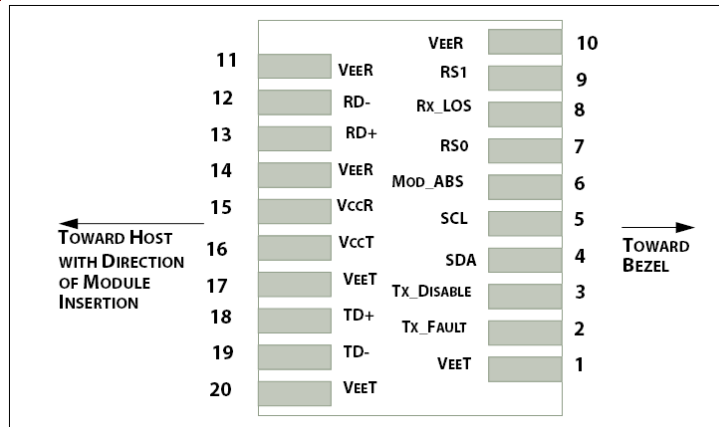


Figure 1. Host PCB SFP+ pad assignment top view

## 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 4. 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 5. 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	-	-	4.25/8.5/14.025	-	Gb/s

## Transceiver Electrical Characteristics

**Table 6. Transceiver Electrical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Module Supply Current	I <sub>cc</sub>	-	-	545	mA	-
Power Dissipation	P <sub>D</sub>	-	-	1800	mW	-

Transmitter							
Input Differential Impedance		$Z_{IN}$	-	100	-	$\Omega$	-
Differential Data Input Swing		$V_{IN, P-P}$	180	-	700	mV <sub>P-P</sub>	-
TX_FAULT	Transmitter Fault	$V_{OH}$	2.0	-	$V_{CCHOST}$	V	-
	Normal Operation	$V_{OL}$	0	-	0.8	V	-
TX_DISABLE	Transmitter Disable	$V_{IH}$	2.0	-	$V_{CCHOST}$	V	-
	Transmitter Enable	$V_{IL}$	0	-	0.8	V	-
Receiver							
Output Differential Impedance		$Z_O$	-	100	-	$\Omega$	-
Differential Data Output Swing		$V_{OUT, P-P}$	300	-	850	mV <sub>P-P</sub>	1
Data Output Rise Time, Fall Time		$t_r, t_f$	28	-	-	ps	2
RX_LOS	Loss of signal (LOS)	$V_{OH}$	2.0	-	$V_{CCHOST}$	V	3
	Normal Operation	$V_{OL}$	0	-	0.8	V	3

**Notes:**

1. Internally AC coupled, but requires a external 100 $\Omega$  differential load termination.
2. 20–80%.
3. LOS is an open collector output. Should be pulled up with 4.7K $\Omega$  on the host board.

## Transmitter Optical Characteristics

**Table 7. Transmitter Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Launch Optical Power	$P_o$	-1	-	+3.0	dBm	1
Center Wavelength Range	$\lambda_c$	1528.77	-	1563.86	nm	-
Center Wavelength Spacing	-	-	100	-	GHz	-
Center Wavelength Tolerance	$\Delta\lambda_c$	-100	-	100	pm	-
Extinction Ratio	EX	6	-	-	dB	2
Side Mode Suppression Ratio	SMSR	30	-	-	dB	-
Transmitter and Dispersion Penalty	TDP	-	-	4.0	dB	-
Relative Intensity Noise	RIN	-	-	-128	dB/Hz	-
Optical Return Loss Tolerance	ORLT	-	-	21	dB	-
Pout @TX-Disable Asserted	$P_{off}$	-	-	-30	dBm	1

**Notes:**

1. The optical power is launched into 9/125 $\mu$ m SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @14.025Gbps.

## Receiver Optical Characteristics

**Table 8. Receiver Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Center Wavelength	$\lambda_c$	1528	-	1565	nm	-
Receiver Sensitivity ( $P_{avg}$ )	S	-	-	-14	dBm	1
Receiver Overload ( $P_{avg}$ )	$P_{OL}$	-1.0	-	-	dBm	1
Optical Return Loss	ORL	26	-	-	dB	-
LOS De-Assert	$LOS_D$	-	-	-15	dBm	-
LOS Assert	$LOS_A$	-35	-	-	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

**Notes:**

1. Measured with PRBS  $2^{31}-1$  test pattern, 14.025Gb/s, BER <  $10^{-12}$ .
2. Comply with IEEE 802.3-2005.

## Recommended Host Board Power Supply Filter Network

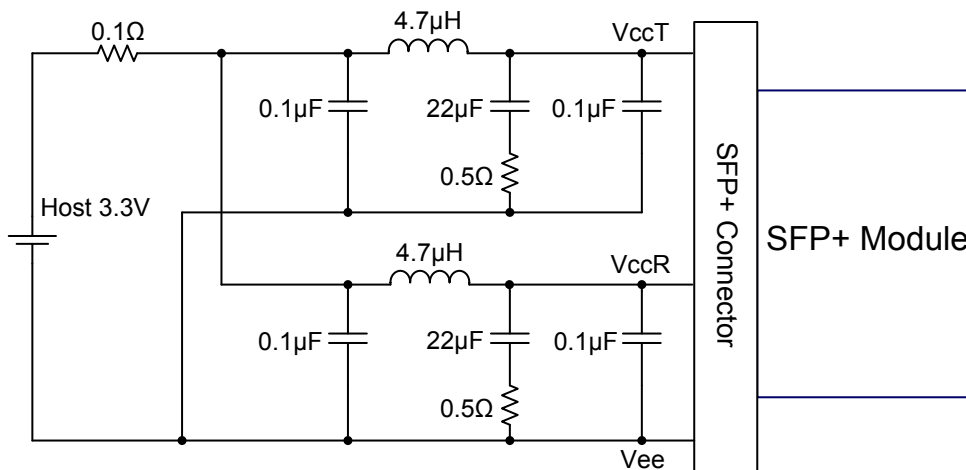


Figure 2. Recommended Host Board Power Supply Filter Network

## Recommended Application Interface Block Diagram

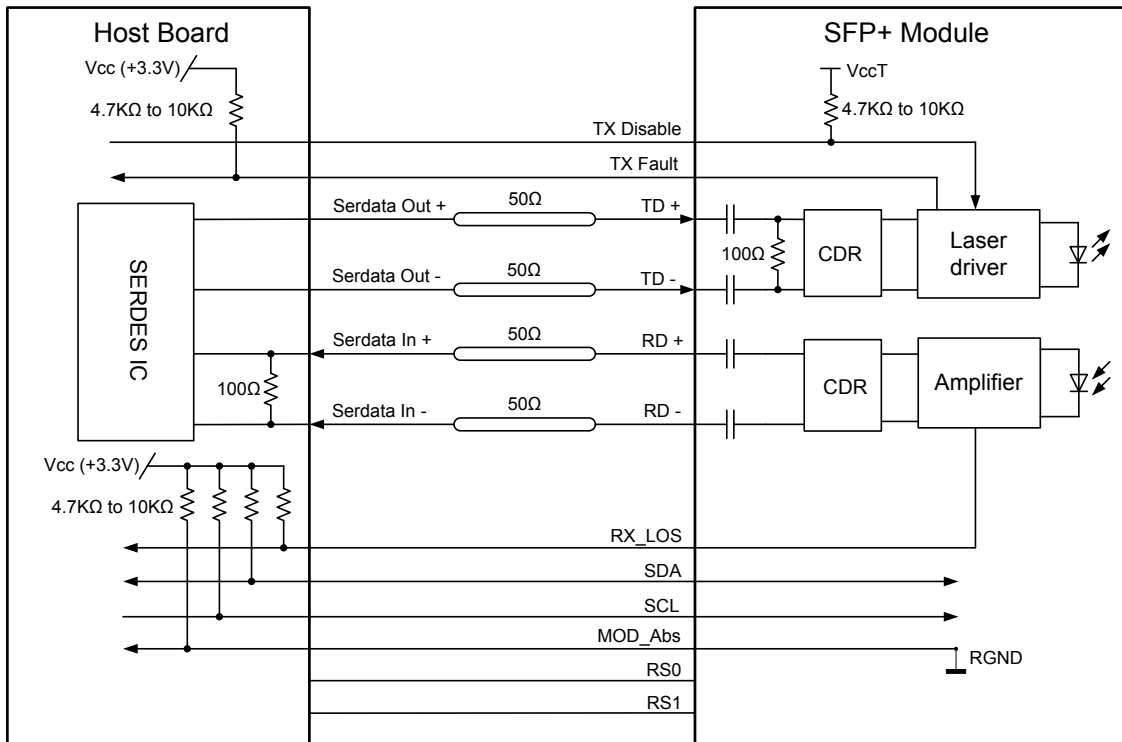


Figure 3. Recommended Application Interface Block Diagram

## Mechanical specifications

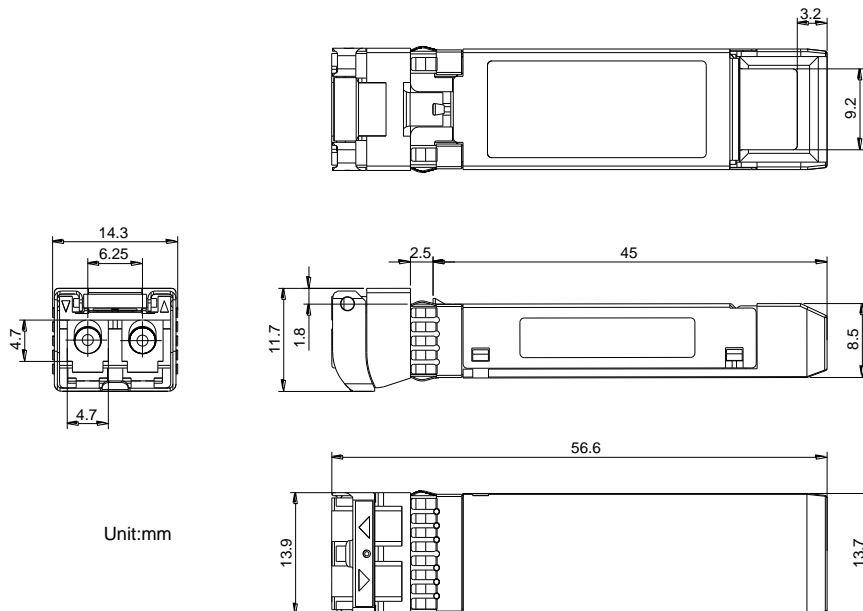


Figure 4. Outline Drawing

## PCB layout recommendation

- Notes:
1. Datum and basic dimensions established by customer
  2. Pads and vias are chassis ground, 11 places
  3. Thru holes, plating optional

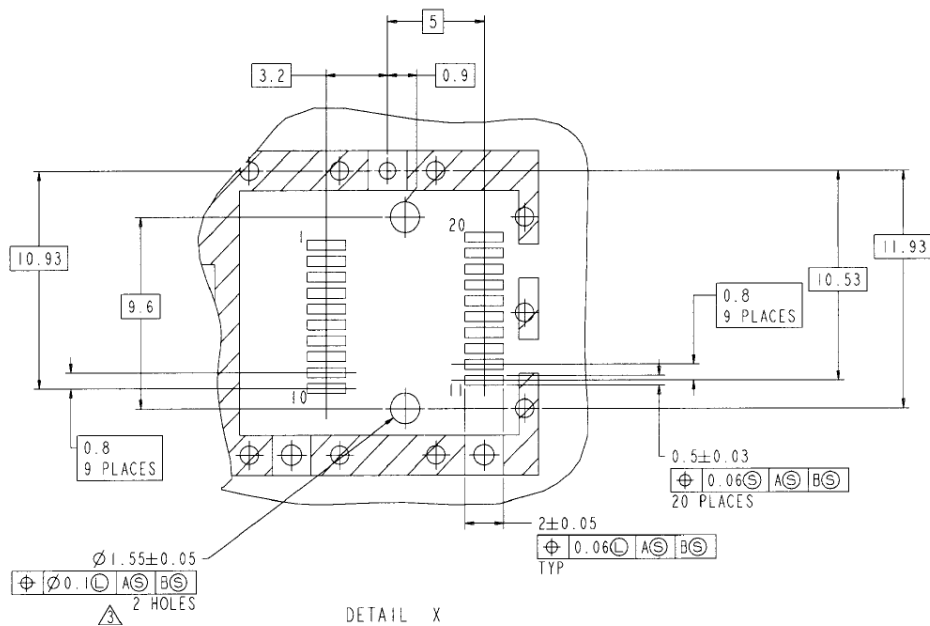
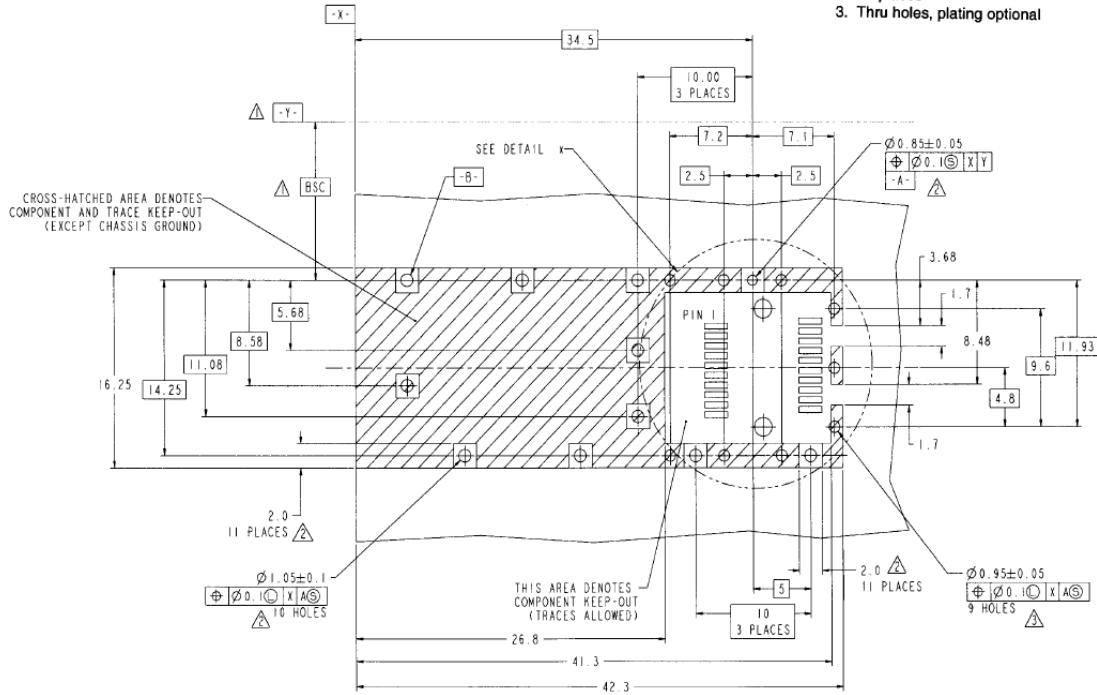


Figure 5. PCB layout recommendation





**LX56xxCDH**  
**16G 20km DWDM SFP+ Transceiver**  
**16G Fiber Channel**

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## **For More Information**

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