

## Product Features

- Electrical interface specifications per SFF-8431
- Management interface specifications per SFF-8431 and SFF-8472
- SFP+ MSA package with Single LC receptacle
- 1330nm DFB Laser, PIN photo-detector
- Up to 10.5G bi-directional data links
- Single +3.3V power supply
- Class 1 laser safety certified
- Operating temperature Options
  - (Commercial) 0°C to +70°C
  - (Industrial) -40°C to +85°C
- Up to 10km on 9/125µm SMF
- RoHS Compliant



## Applications

- 10GBASE-BX Ethernet
- Other high speed data connections

## Descriptions

LX4402C(I)DR are designed for Single Fiber Bidirectional serial optical data communications up to 10.5 Gb/s. applications for a radio base station system. The electrical interface is compliant with SFI specifications of SFF-8431. The transceiver consists of 10Gbit/s 1330nm DFB optical transmitter and PIN receiver, and transmission distance up to 10Km on single mode fiber.

LX4402C(I)DR offer commercial and industrial operating temperature options.

## Ordering Information

Table 1. Ordering Information

Part Number	Transmitter	Output Power	Receiver	Sensitivity	Reach	Temp	DDM	RoHS
LX4402CDR	1330nm DFB	-8.2 ~ +0.5dBm	1270nm PIN	< -14.4dBm	10km	0 ~ 70 °C	Available	Compliant
LX4402IDR	1330nm DFB	-8.2 ~ +0.5dBm	1270nm PIN	< -14.4dBm	10km	-40 ~ 85 °C	Available	Compliant

## Pin Description

Table 2. 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	Internal 33K pull-down to ground	-
8	RX_LOS	Receiver Loss of Signal (LVTTTL-O)	2
9	RS1	Internal 33K pull-down to ground	-
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 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.
3. This input is internally biased high with a 4.7K $\Omega$  to 10K $\Omega$  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 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.

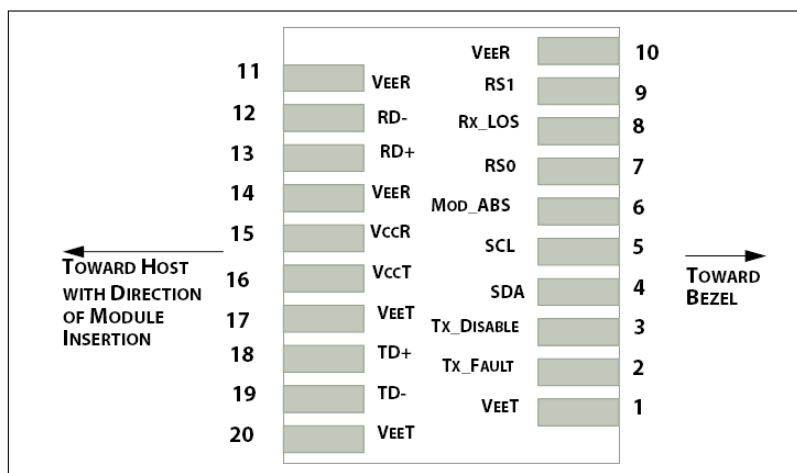


Figure 1. Host PCB SFP+ pad assignment top view

## 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 3. Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	$T_S$	-40	85	°C
Relative Humidity	RH	5	95	%
Supply Voltage	$V_{CC}$	-0.3	4.0	V

## Recommended Operating Conditions

**Table 4. Recommended Operating Conditions**

Parameter	Symbol	Min	Typ	Max	Unit	
Operating Case Temperature	LX4402CDR	$T_C$	0	25	70	°C
	LX4402IDR	$T_C$	-40	25	85	°C
Supply Voltage	$V_{CC}$	3.135	3.3	3.465	V	
Data Rate	-	9.95	-	10.52	Gb/s	

## Transceiver Electrical Characteristics

**Table 5. Transceiver Electrical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes	
Module Supply Current	$I_{CC}$	-	-	350	mA	-	
Power Dissipation	$P_D$	-	-	1200	mW	-	
<b>Transmitter</b>							
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	-
<b>Receiver</b>							
Output Differential Impedance	$Z_O$	-	100	-	$\Omega$	-	
Differential Data Output Swing	$V_{OUT,P-P}$	400	-	850	mV <sub>P-P</sub>	1	

Data Output Rise Time, Fall Time	$t_r, t_f$	-	60	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 100Ω differential load termination.
2. 20–80%.
3. LOS is an open collector output. Should be pulled up with 4.7KΩ on the host board.

## Transmitter Optical Characteristics

**Table 6. Transmitter Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Launch Optical Power	$P_o$	-8.2	-	+0.5	dBm	1
Center Wavelength Range	$\lambda_c$	1323	1330	1337	nm	-
Extinction Ratio	EX	3.5	-	-	dB	2
Optical Modulation Amplitude	OMA	-5.2	-	-	dBm	
Spectral Width (-20dB)	$\Delta\lambda$	-	-	1	nm	-
Side Mode Suppression Ratio	SMSR	30	-	-	dB	-
Relative Intensity Noise	RIN			-128	dB/Hz	
Pout @TX-Disable Asserted	$P_{off}$	-	-	-35	dBm	1

**Notes:**

1. The optical power is launched into 9/125μm SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps.

## Receiver Optical Characteristics

**Table 7. Receiver Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Center Wavelength	$\lambda_c$	1263	1270	1277	nm	-
Receiver Sensitivity ( $P_{avg}$ )	S	-	-	-14.4	dBm	1
Receiver Sensitivity (OMA)	$S_{OMA}$	-	-	-12.6	dBm	1
Receiver Overload ( $P_{avg}$ )	$P_{OL}$	0.5	-	-	dBm	1
Stressed Sensitivity (OMA)	-	-	-	-10.3	dBm	
Optical Return Loss	ORL	12	-	-	dB	-
LOS De-Assert	$LOS_D$	-	-	-17	dBm	-
LOS Assert	$LOS_A$	-30	-	-	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

**Notes:**

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

## Recommended Host Board Power Supply Filter Network

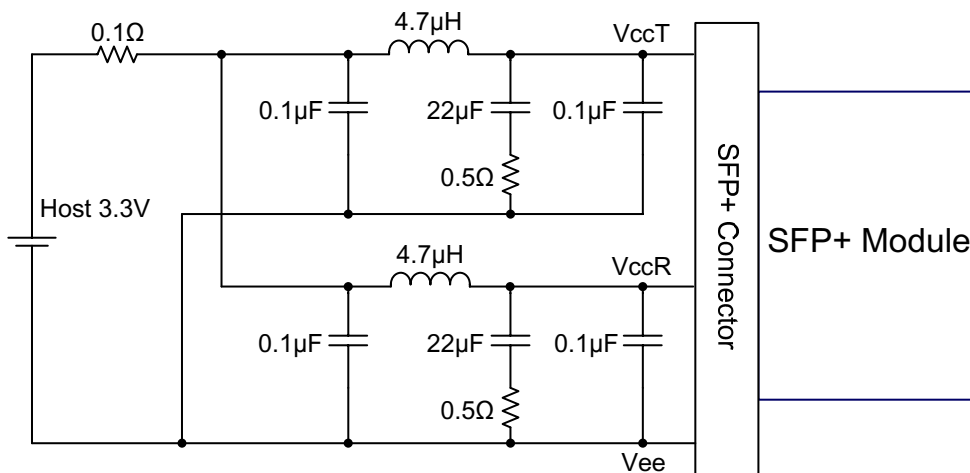


Figure 2. Recommended Host Board Power Supply Filter Network

## Recommended Application Interface Block Diagram

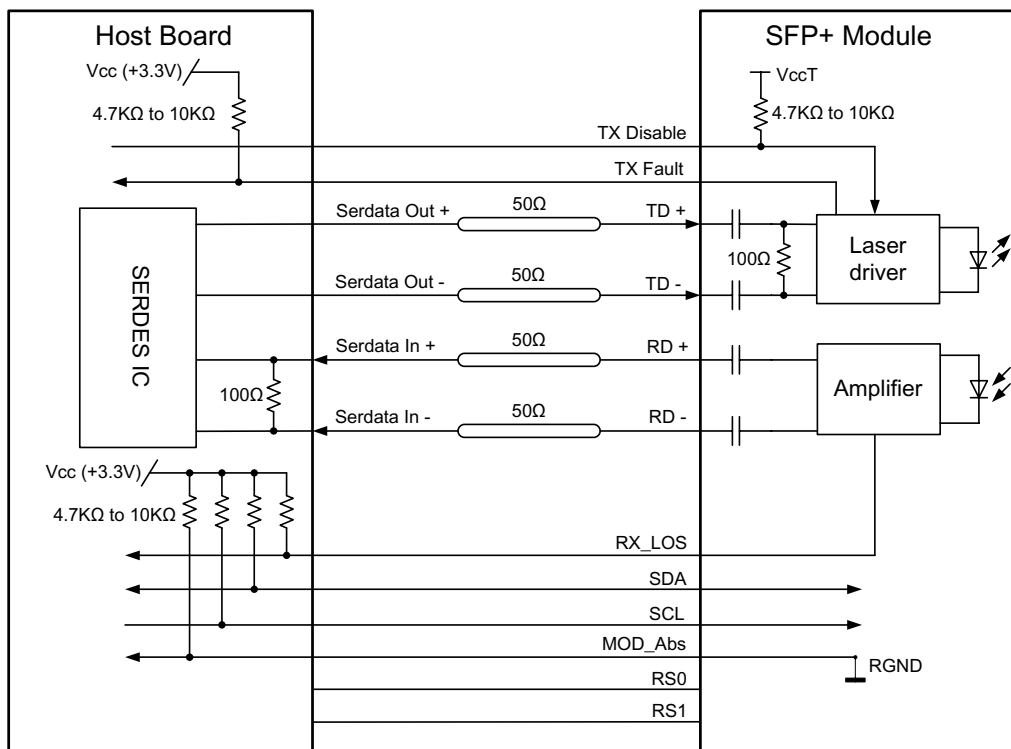


Figure 4. Recommended Application Interface Block Diagram

## Mechanical specifications

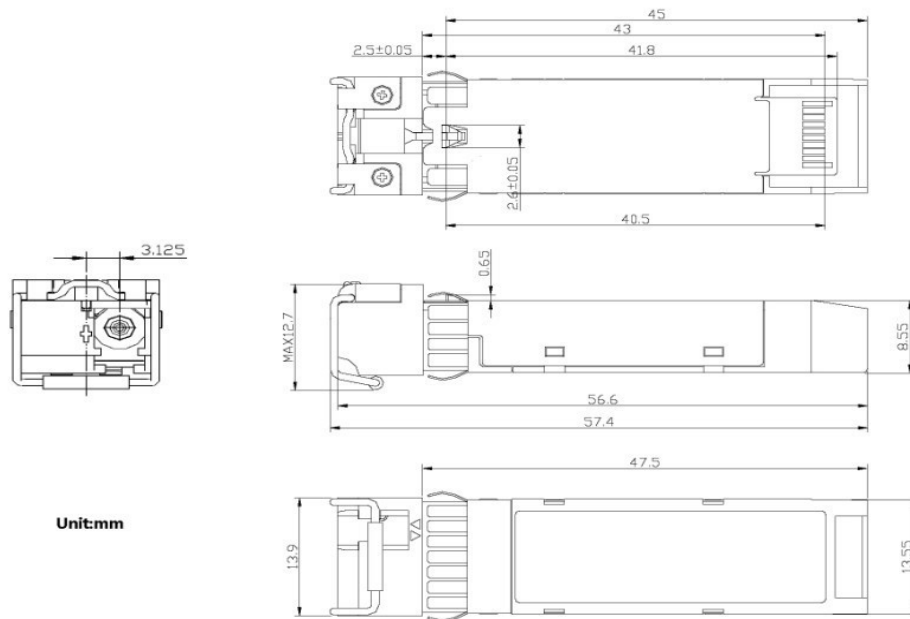
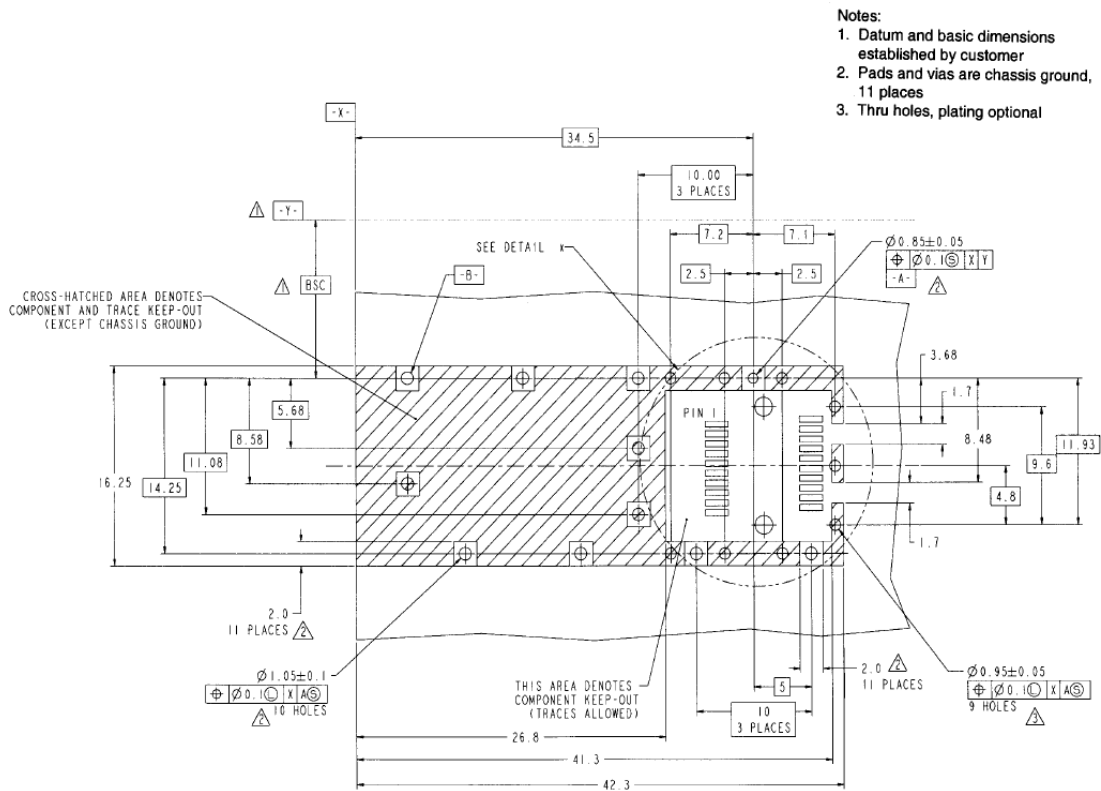


Figure 5. Outline Drawing

## PCB layout recommendation



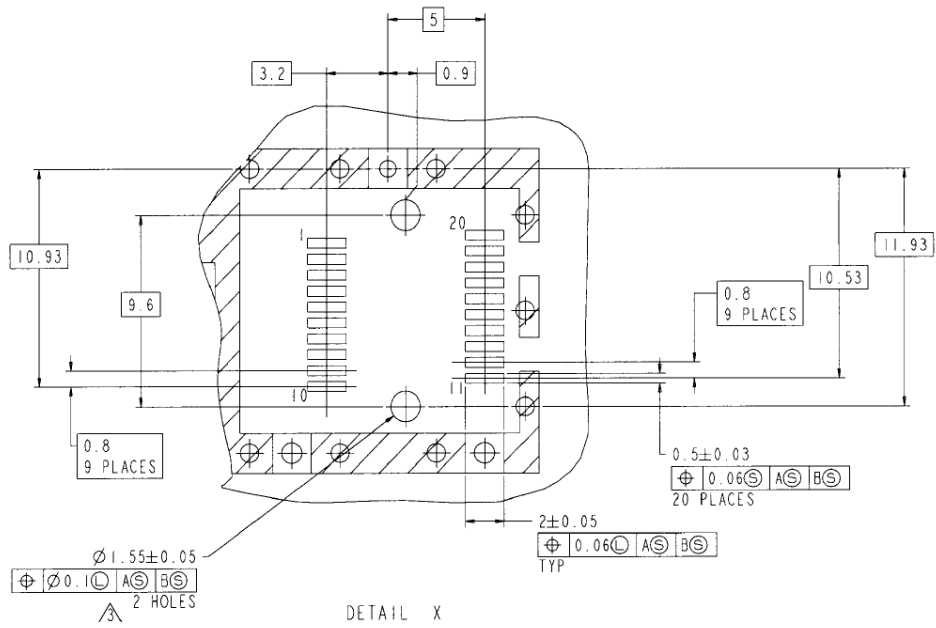


Figure 6. PCB layout recommendation

## For More Information

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