

## Product Features

- Compliant with ITU-T G.691
- Compliant to IEEE Std 802.3-2005 10Gb Ethernet 10GBase-ER/EW
- XFP MSA Rev. 4.5 compliant
- Full digital diagnostic management interface
- XFP MSA package with duplex LC connector
- DWDM-rated EML Transmitter
- 100GHz ITU Grid, C-Band
- Up to 11.3Gb/s bi-directional data links
- Class 1 laser safety certified
- Commercial operating temperature: 0°C to +70°C
- Up to 40km on 9/125µm SMF
- RoHS Compliant



## Applications

- 40km 10Gb/s DWDM Network
- 40km 10G Ethernet 10GBASE-ER/EW
- 40km 10G Fiber Channel

## Description

LX31xxCDR XFP transceivers, according to 10 Gigabit Small Form Factor Pluggable Module Multi-Sourcing Agreement (XFP-MSA) INF-8077i Revision 4.5, are designed for serial optical data communications at 9.95 Gb/s to 11.3 Gb/s. They meet the requirements for 40km 10G DWDM Network, IEEE Std 802.3-2005 10G Ethernet 10GBase-ER/EW and 40km 10G Fiber Channel.

LX31xxCDR are compliant with RoHS.

## Ordering Information

**Table 1. Ordering Information**

Part Number	Transmitter	Output Power	Receiver	Sensitivity	Reach	Temp	DDM	RoHS
LX31xxCDR	DWDM EML	-1 ~ +2dBm	PIN	< -16dBm	40km	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	LX3117CDR	191.7	1563.86
18	LX3118CDR	191.8	1563.05
19	LX3119CDR	191.9	1562.23
20	LX3120CDR	192.0	1561.42

21	LX3121CDR	192.1	1560.61
22	LX3122CDR	192.2	1559.79
23	LX3123CDR	192.3	1558.98
24	LX3124CDR	192.4	1558.17
25	LX3125CDR	192.5	1557.36
26	LX3126CDR	192.6	1556.55
27	LX3127CDR	192.7	1555.75
28	LX3128CDR	192.8	1554.94
29	LX3129CDR	192.9	1554.13
30	LX3130CDR	193.0	1553.33
31	LX3131CDR	193.1	1552.52
32	LX3132CDR	193.2	1551.72
33	LX3133CDR	193.3	1550.92
34	LX3134CDR	193.4	1550.12
35	LX3135CDR	193.5	1549.32
36	LX3136CDR	193.6	1548.51
37	LX3137CDR	193.7	1547.72
38	LX3138CDR	193.8	1546.92
39	LX3139CDR	193.9	1546.12
40	LX3140CDR	194.0	1545.32
41	LX3141CDR	194.1	1544.53
42	LX3142CDR	194.2	1543.73
43	LX3143CDR	194.3	1542.94
44	LX3144CDR	194.4	1542.14
45	LX3145CDR	194.5	1541.35
46	LX3146CDR	194.6	1540.56
47	LX3147CDR	194.7	1539.77
48	LX3148CDR	194.8	1538.98
49	LX3149CDR	194.9	1538.19
50	LX3150CDR	195.0	1537.40
51	LX3151CDR	195.1	1536.61
52	LX3152CDR	195.2	1535.82
53	LX3153CDR	195.3	1535.04
54	LX3154CDR	195.4	1534.25
55	LX3155CDR	195.5	1533.47
56	LX3156CDR	195.6	1532.68
57	LX3157CDR	195.7	1531.90

58	LX3158CDR	195.8	1531.12
59	LX3159CDR	195.9	1530.33
60	LX3160CDR	196.0	1529.55
61	LX3161CDR	196.1	1528.77

## Electrical Pin Description

**Table 3. Electrical Pin Description**

Pin	Logic	Symbol	Name/Description	Note
1	-	GND	Module Ground	1
2	-	V <sub>EE5</sub>	Optional -5.2V Power Supply - <b>Not Required</b>	-
3	LVTTL-I	Mod_DeSel	Module De-select; When held low allows module to respond to 2-wire serial interface	-
4	LVTTL-O	Interrupt	Interrupt; Indicates presence of an important condition which can be read over the 2-wire serial interface	2
5	LVTTL-I	TX_DIS	Transmitter Disable; Turns off transmitter laser output	-
6	-	V <sub>CC5</sub>	+5V Power Supply	-
7	-	GND	Module Ground	1
8	-	V <sub>CC3</sub>	+3.3V Power Supply	-
9	-	V <sub>CC3</sub>	+3.3V Power Supply	-
10	LVTTL-I/O	SCL	2-Wire Serial Interface Clock	2
11	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
12	LVTTL-O	Mod_Abs	Indicates Module is not present. Grounded in the Module	2
13	LVTTL-O	Mod_NR	Module Not Ready; Indicating Module Operational Fault	2
14	LVTTL-O	RX_LOS	Receiver Loss Of Signal Indicator	2
15	-	GND	Module Ground	1
16	-	GND	Module Ground	1
17	CML-O	RD-	Receiver Inverted Data Output	-
18	CML-O	RD+	Receiver Non-Inverted Data Output	-
19	-	GND	Module Ground	1
20	-	V <sub>CC2</sub>	+1.8V Power Supply - <b>Not Required</b>	-
21	LVTTL-I	P_Down/RST	Power down; When high, requires the module to limit power consumption to 1.5W or below. 2-Wire serial interface must be functional in the low power mode. Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	-
22	-	V <sub>CC2</sub>	+1.8V Power Supply - <b>Not Required</b>	-
23	-	GND	Module Ground	1
24	PECL-I	RefCLK+	Reference Clock Non-Inverted Input, AC coupled on the host board - <b>Not Required</b>	3
25	PECL-I	RefCLK-	Reference Clock Inverted Input, AC coupled on the host board - <b>Not Required</b>	3
26	-	GND	Module Ground	1

27	-	GND	Module Ground	1
28	CML-I	TD-	Transmitter Inverted Data Input	-
29	CML-I	TD+	Transmitter Non-Inverted Data Input	-
30	-	GND	Module Ground	1

**Notes:**

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7KΩ to 10KΩ to a voltage between 3.15V and 3.45V on the host board.
3. Reference Clock is not required. If present, it will be ignored.

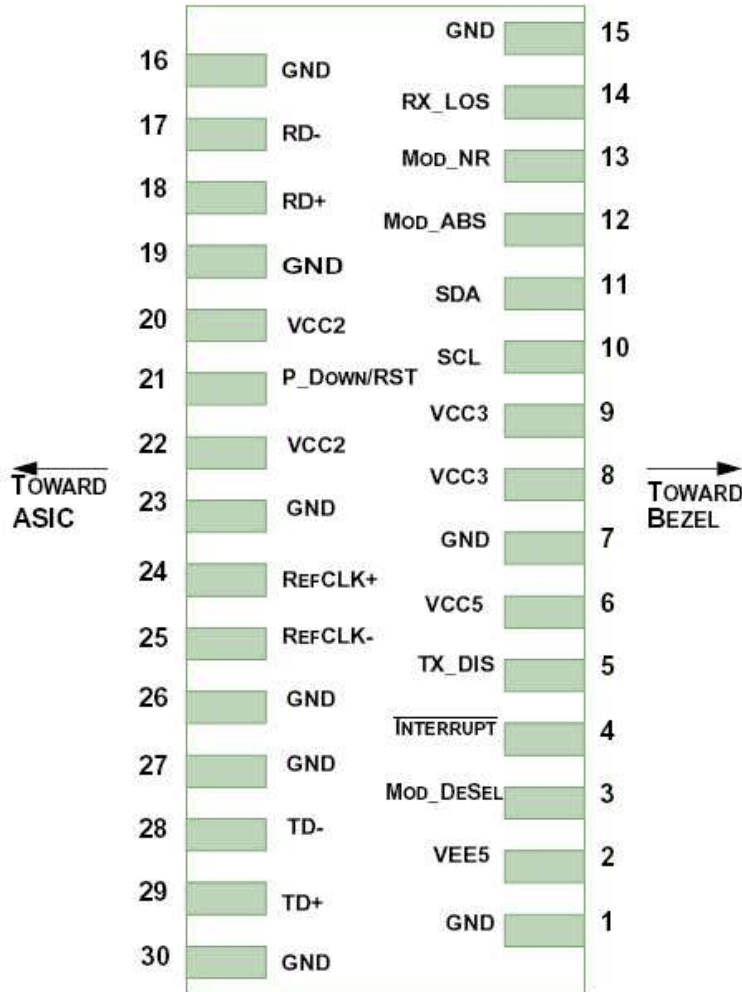


Figure 1. Host PCB XFP Pinout Top View

## 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	$T_S$	-40	85	°C
Relative Humidity	RH	5	95	%
Supply Voltage	$V_{CC3}$	-0.5	4.0	V
Supply Voltage	$V_{CC5}$	-0.5	6.0	V

## Recommended Operating Conditions

**Table 5. Recommended Operating Conditions**

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature (Commercial )	$T_C$	0	-	70	°C
Supply Voltage	$V_{CC3}$	3.135	3.3	3.465	V
Supply Voltage	$V_{CC5}$	4.75	5.00	5.25	V
Data Rate	-	9.953	-	11.3	Gb/s

## Transceiver Electrical Characteristics

**Table 6. Transceiver Electrical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Supply Current	$I_{CC3}$	-	-	750	mA	-
Supply Current	$I_{CC5}$	-	-	500	mA	-
Power Dissipation	$P_D$	-	-	3500	mW	-
<b>Transmitter</b>						
Input Differential Impedance	$Z_{IN}$	-	100	-	$\Omega$	-
Differential Data Input Swing	$V_{IN,P-P}$	120	-	1000	mV <sub>P-P</sub>	-
Tx_Disable, P_Down/RST	$V_{IH}$	2.0	-	$V_{CC3}+0.3$	V	-
	$V_{IL}$	-0.3	-	0.8	V	-
Transmit Disable Assert Time	-	-	-	10	us	-
<b>Receiver</b>						
Output Differential Impedance	$Z_O$	-	100	-	$\Omega$	-
Differential Data Output Swing	$V_{OUT,P-P}$	400	-	800	mV <sub>P-P</sub>	1
Data Output Rise Time, Fall Time	$t_r, t_f$	24	-	-	ps	2
Rx_LOS, Mod_NR, Interrupt	$V_{OH}$	$V_{CCHOST}-0.5$	-	$V_{CCHOST}+0.3$	V	3
	$V_{OL}$	0	-	0.4	V	3

**Notes:**

- Internally AC coupled, but requires a external 100 $\Omega$  differential termination.
- 20 – 80%.
- Loss Of Signal is an open collector output. Should be pulled up with a 4.7k $\Omega$ -10k $\Omega$  resistor on the host board.

## Transmitter Optical Characteristics

**Table 7. Transmitter Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Launch Average Optical Power	P <sub>o</sub>	-1	-	+2	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	8.2	-	-	dB	2
Spectral Width (-20dB)	$\Delta\lambda$	-	-	0.3	nm	-
Side Mode Suppression Ratio	SMSR	30	-	-	dB	-
Average Optical Power (Laser Off)	P <sub>OFF</sub>	-	-	-30	dBm	1
Eye Diagram	ITU-T G.691 SDH STM-64 S-64.2b compatible					2

**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 @ 9.953Gbps.

## 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 <sub>avg</sub> )	S	-	-	-16	dBm	1
Receiver Overload (P <sub>avg</sub> )	P <sub>OL</sub>	-1.0	-	-	dBm	1
Optical Return Loss	ORL	27	-	-	dB	-
LOS De-Assert	LOS <sub>D</sub>	-	-	-20	dBm	-
LOS Assert	LOS <sub>A</sub>	-27	-	-	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

**Notes:**

1. Measured with worst ER; 1550nm; PRBS 2<sup>31</sup>-1 test pattern, BER<10<sup>-12</sup>.

## Recommended Host Board Power Supply Filter Network

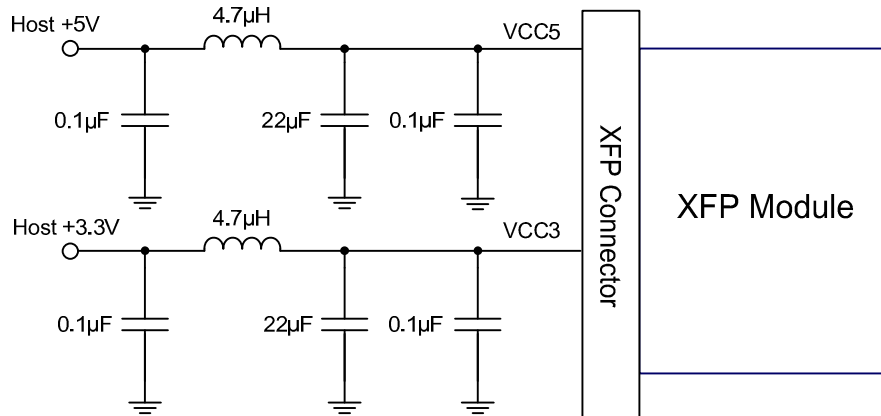


Figure 2. Recommended Host Board Power Supply Filter Network

## Recommended Application Interface Block Diagram

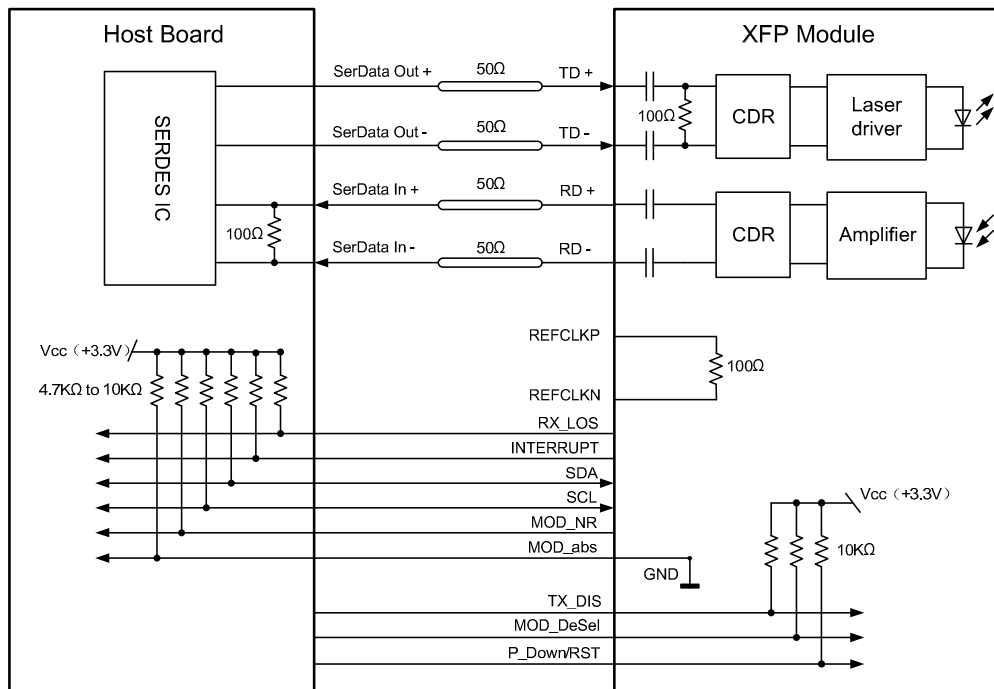
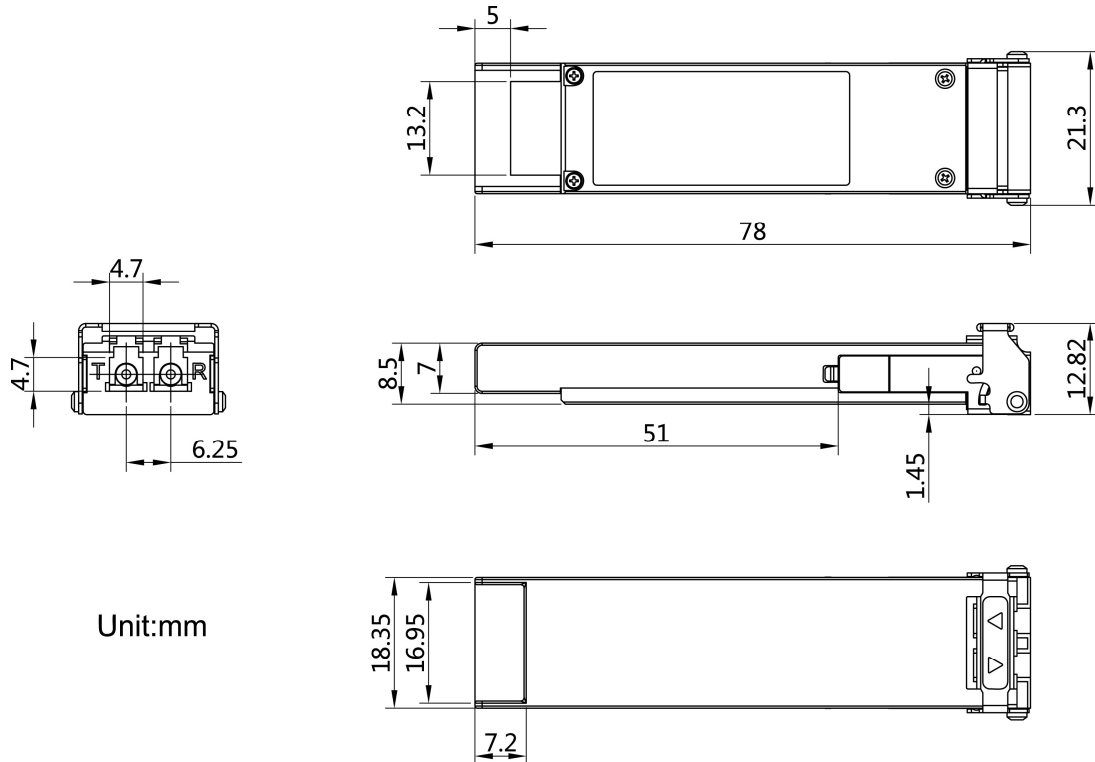


Figure 3. Recommended Application Interface Block Diagram

## Mechanical specifications



Unit:mm

Figure 4. Outline Drawing



## For More Information

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