

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 10.3Gb/s bi-directional data links
- 100GHz ITU Grid, C-Band
- Single +3.3V power supply
- Class 1 laser safety certified
- Operating temperature: -40°C to +85°C
- Up to 40km on 9/125µm SMF
- RoHS Compliant



Applications

- 10G Ethernet 10GBASE-ER/EW
- 40km 10G DWDM Network

Descriptions

LX41xxIDR SFP+ transceivers, according to Enhanced 8.5 and 10 Gigabit Small Form Factor Pluggable “SFP+” Multi-Sourcing Agreement (MSA) SFF-8431 and SFF-8472, revision 10.4, are designed for DWDM 10G ethernet data communications up to 40km over single mode fiber. They are compliant with IEEE Std 802.3-2005 10Gb Ethernet 10GBase-ER/EW.

LX41xxIDR are compliant with RoHS.

Ordering Information

Table 1. Ordering Information

Part Number	Transmitter	Output Power	Receiver	Sensitivity	Reach	Temp	DDM	RoHS
LX41xxIDR	DWDM EML	-1~ +2dBm	PIN	< -15.8dBm	40km	-40 ~ 85°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	LX4117IDR	191.7	1563.86
18	LX4118IDR	191.8	1563.05
19	LX4119IDR	191.9	1562.23
20	LX4120IDR	192.0	1561.42

21	LX4121IDR	192.1	1560.61
22	LX4122IDR	192.2	1559.79
23	LX4123IDR	192.3	1558.98
24	LX4124IDR	192.4	1558.17
25	LX4125IDR	192.5	1557.36
26	LX4126IDR	192.6	1556.55
27	LX4127IDR	192.7	1555.75
28	LX4128IDR	192.8	1554.94
29	LX4129IDR	192.9	1554.13
30	LX4130IDR	193.0	1553.33
31	LX4131IDR	193.1	1552.52
32	LX4132IDR	193.2	1551.72
33	LX4133IDR	193.3	1550.92
34	LX4134IDR	193.4	1550.12
35	LX4135IDR	193.5	1549.32
36	LX4136IDR	193.6	1548.51
37	LX4137IDR	193.7	1547.72
38	LX4138IDR	193.8	1546.92
39	LX4139IDR	193.9	1546.12
40	LX4140IDR	194.0	1545.32
41	LX4141IDR	194.1	1544.53
42	LX4142IDR	194.2	1543.73
43	LX4143IDR	194.3	1542.94
44	LX4144IDR	194.4	1542.14
45	LX4145IDR	194.5	1541.35
46	LX4146IDR	194.6	1540.56
47	LX4147IDR	194.7	1539.77
48	LX4148IDR	194.8	1538.98
49	LX4149IDR	194.9	1538.19
50	LX4150IDR	195.0	1537.40
51	LX4151IDR	195.1	1536.61
52	LX4152IDR	195.2	1535.82
53	LX4153IDR	195.3	1535.04
54	LX4154IDR	195.4	1534.25
55	LX4155IDR	195.5	1533.47
56	LX4156IDR	195.6	1532.68
57	LX4157IDR	195.7	1531.90

58	LX4158IDR	195.8	1531.12
59	LX4159IDR	195.9	1530.33
60	LX4160IDR	196.0	1529.55
61	LX4161IDR	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.

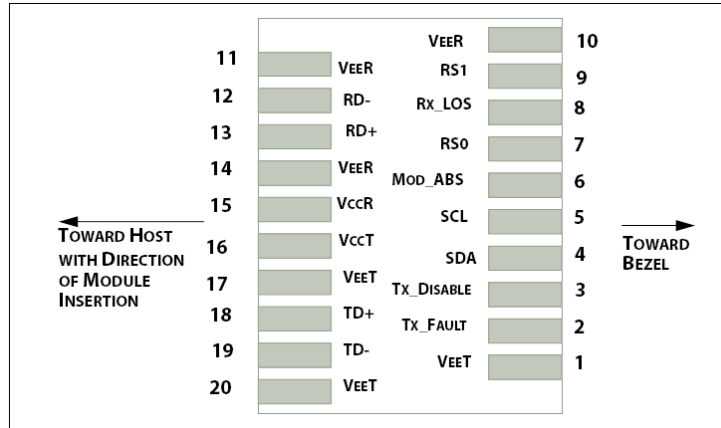


Figure 1. Host PCB SFP+ pad assignment top view

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 _s	-40	85	°C
Relative Humidity	RH	5	95	%
Supply Voltage	V _{cc}	-0.5	4.0	V

Recommended Operating Conditions

Table 5. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T _c	-40	25	85	°C
Supply Voltage	V _{cc}	3.135	3.3	3.465	V
Data Rate	-	-	10.3125	-	Gb/s

Transceiver Electrical Characteristics

Table 6. Transceiver Electrical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Module Supply Current	I _{cc}	-	-	500	mA	-
Power Dissipation	P _D	-	-	1650	mW	-

Transmitter							
Input Differential Impedance		Z_{IN}	-	100	-	Ω	-
Differential Data Input Swing		$V_{IN, P-P}$	180	-	700	mV _{P-P}	-
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	-	Ω	-
Differential Data Output Swing		$V_{OUT, P-P}$	300	-	850	mV _{P-P}	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:

- Internally AC coupled, but requires a external 100 Ω differential load termination.
- 20–80%.
- LOS is an open collector output. Should be pulled up with 4.7K Ω 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	-	+2.0	dBm	1
Center Wavelength Range	λ_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
Side Mode Suppression Ratio	SMSR	30	-	-	dB	-
Transmitter and Dispersion Penalty	TDP	-	-	2.0	dB	-
Relative Intensity Noise	RIN	-	-	-128	dB/Hz	-
Optical Return Loss Tolerance	ORLT	-	-	21	dB	-
Pout @TX-Disable Asserted	P_{off}	-	-	-30	dBm	1
Eye Diagram	IEEE Std 802.3-2005 10Gb Ethernet 10GBASE-ER compatible					

Notes:

- The optical power is launched into 9/125 μ m SMF.
- Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps.

Receiver Optical Characteristics

Table 8. Receiver Optical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Center Wavelength	λ_c	1528	-	1565	nm	-
Receiver Sensitivity (P_{avg})	S	-	-	-15.8	dBm	1
Receiver Overload (P_{avg})	P_{OL}	-1.0	-	-	dBm	1
Optical Return Loss	ORL	26	-	-	dB	-
LOS De-Assert	LOS_D	-	-	-16	dBm	-
LOS Assert	LOS_A	-35	-	-	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

Notes:

1. Measured with PRBS $2^{31}-1$ test pattern, 10.3125Gb/s, BER< 10^{-12} .
2. Comply with IEEE 802.3-2005.

Recommended Host Board Power Supply Filter Network

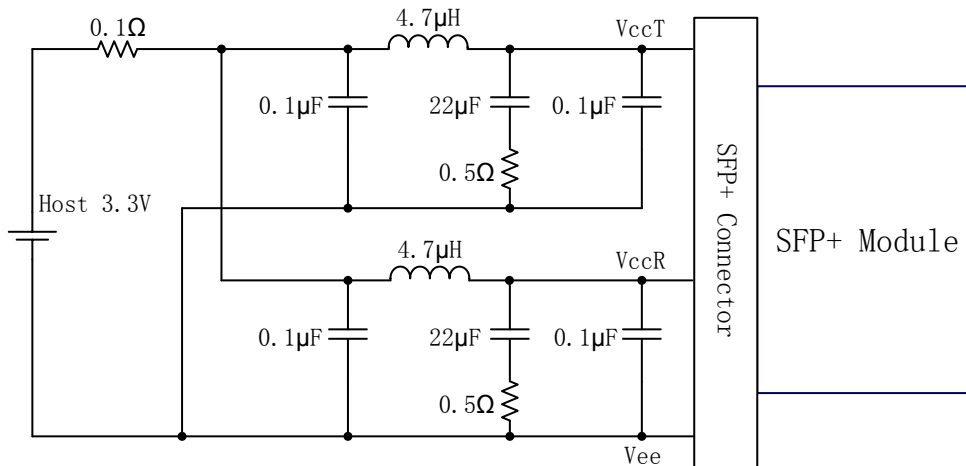


Figure 2. Recommended Host Board Power Supply Filter Network

Recommended Application Interface Block Diagram

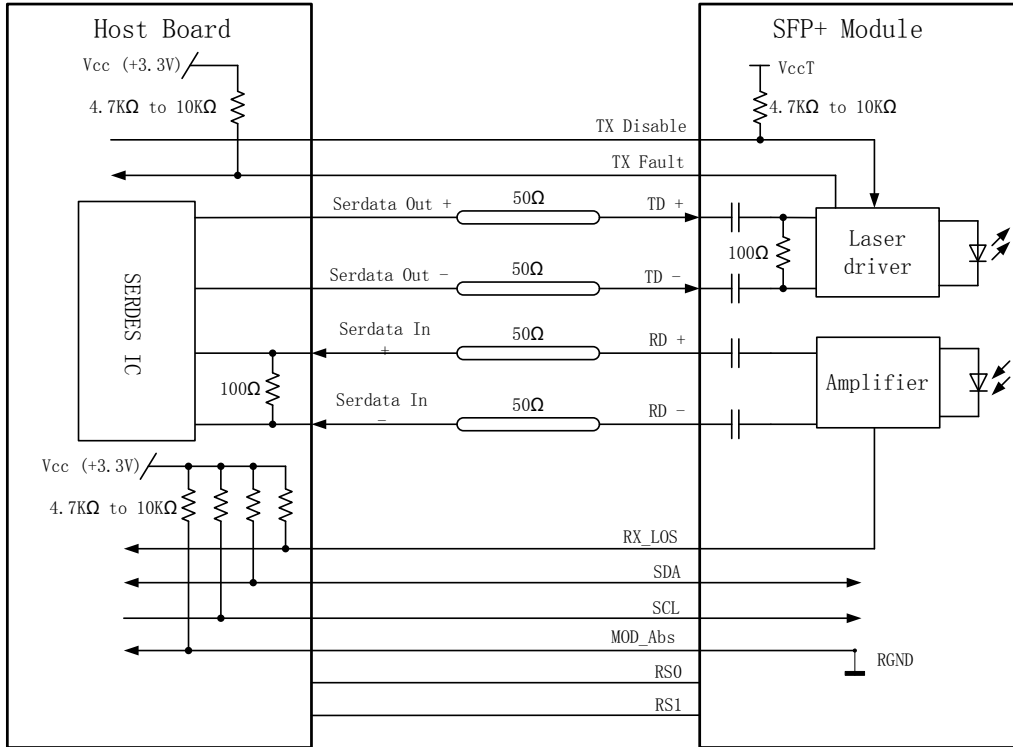


Figure 3. Recommended Application Interface Block Diagram

Mechanical specifications

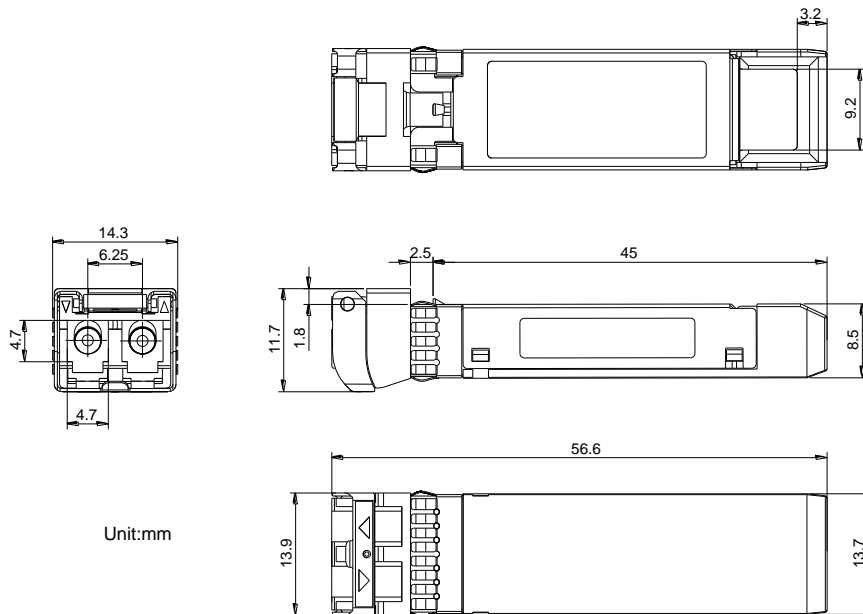


Figure 4. Outline Drawing

PCB layout recommendation

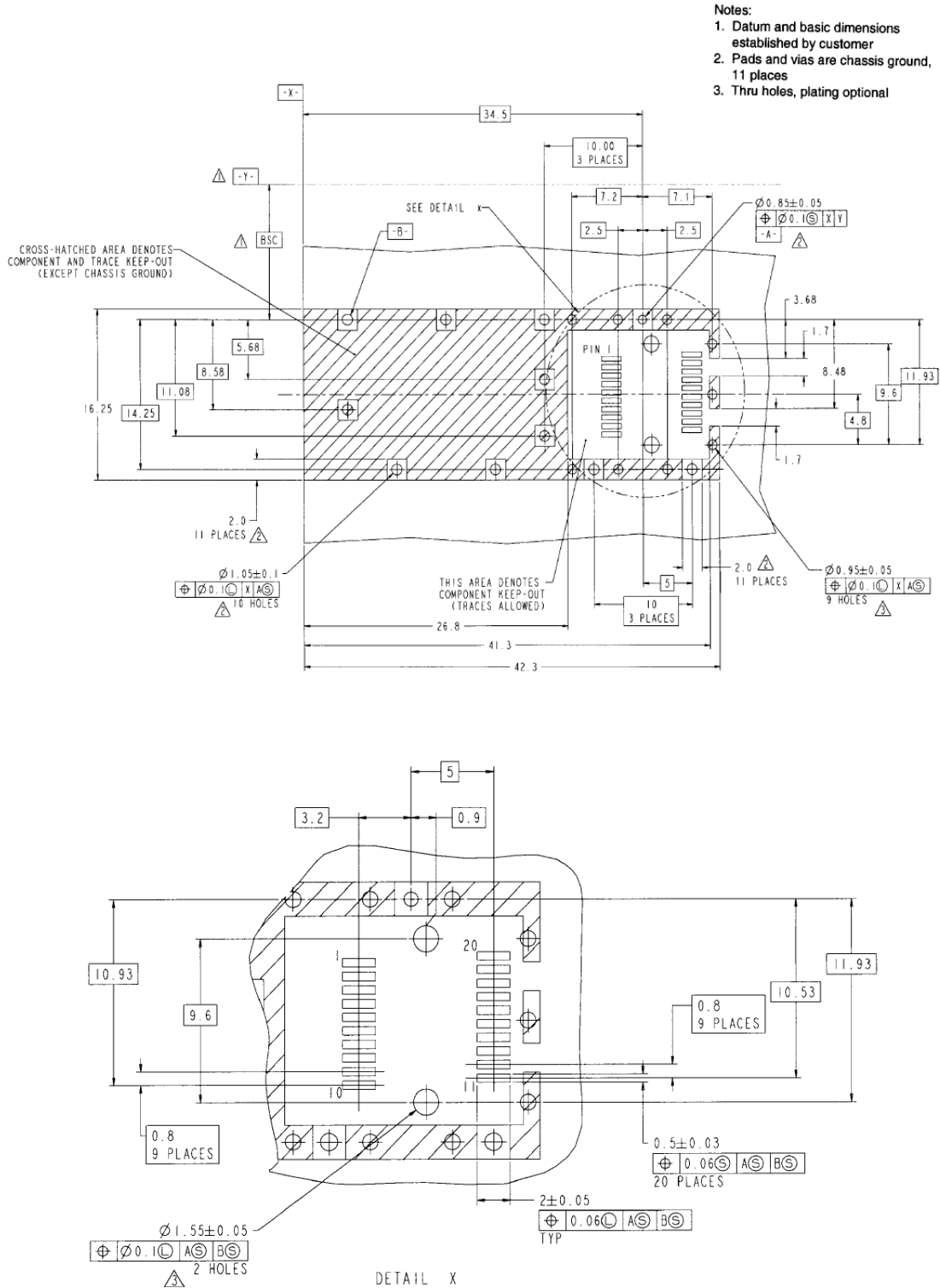


Figure 5. PCB layout recommendation

For More Information

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10GBASE-ER / 10GBASE-EW

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