

Product Features

- Compliant with IEEE Std 802.3-2005
10G Ethernet 10GBase-SR
- Electrical interface specifications per SFF-8431
- Management interface specifications per SFF-8431 and SFF-8472
- SFP+ MSA package with duplex LC connector
- Uncooled 850nm VCSEL Laser
- Dual CDR from 9.95 to 11.3Gb/s bi-directional data links
- Single +3.3V power supply
- Class 1 laser safety certified
- Operating temperature:
 - (Commercial) 0°C to +70°C
 - (Industrial) -40°C to +85°C
- Up to 300m on 2000 MHz km MMF
- RoHS 6/6 Compliant



Applications

- 10G Ethernet 10GBASE-SR/SW
- Support 10G LAN/WAN/FC application
- Support OTU2/2e/2f application

Descriptions

LX4001x1DH 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 11.0, are designed for 10G Ethernet serial optical data communication up to 300m on multimode fiber. They are compatible with IEEE Std 802.3-2005 10Gb Ethernet 10GBase-SR.

LX4001x1DH are compliant with RoHS.

Ordering Information

Table 1. Ordering Information

Part Number	Transmitter	Output Power	Receiver	Sensitivity	Reach	Temp	DDM	RoHS
LX4001CDH	850nm VCSEL	-5 ~ -1dBm	PIN	< -9.9dBm	300m	0 ~ 70 °C	Available	Compliant
LX4001IDH	850nm VCSEL	-5 ~ -1dBm	PIN	< -9.9dBm	300m	-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	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.

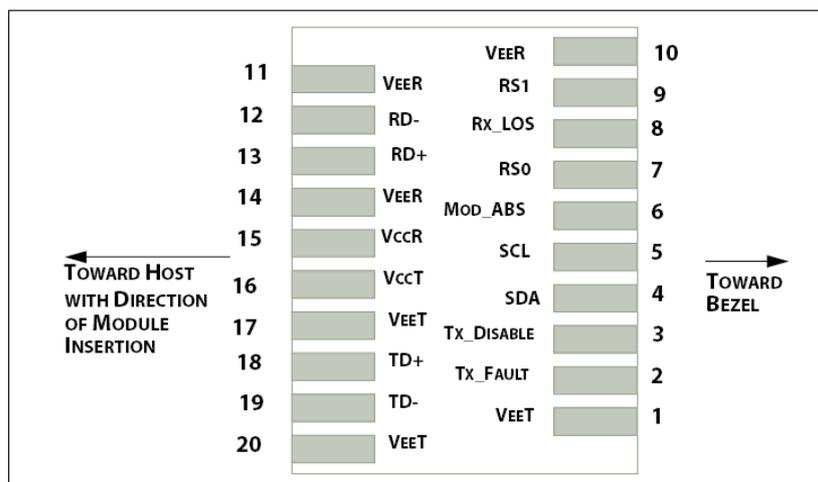


Figure 1. Host PCB SFP+ pad assignment top view

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 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}	-0.5	4.0	V

Recommended Operating Conditions

Table 4. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature (Commercial)	T_C	0	25	70	°C
Operating Temperature (Industrial)	T_C	-40	25	85	°C
Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Data Rate	-	9.95	10.3125	11.3	Gb/s

Transceiver Electrical Characteristics

Table 5. Transceiver Electrical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes	
Module Supply Current	I_{CC}	-	-	300	mA	-	
Power Dissipation	P_D	-	-	1000	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:

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	Po	-5	-	-1	dBm	1
Center Wavelength Range	λ_c	840	850	860	nm	-
Extinction Ratio	EX	3	-	-	dB	2
Optical Modulation Amplitude	OMA	Refer to Table 7			dBm	1
Spectral Width (RMS)	$\Delta\lambda$	Refer to Table 7			nm	-
Transmitter and Dispersion Penalty	TDP	-	-	3.9	dB	-
Optical Return Loss Tolerance	ORLT	-	-	12	dB	-
Pout @TX-Disable Asserted	P _{off}	-	-	-30	dBm	1
Eye Diagram	IEEE Std 802.3-2005 10Gb Ethernet 10GBASE-SR compatible					

Notes:

1. 50/125μm fiber with NA = 0.2, 62.5/125μm fiber with NA = 0.275.
2. Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps.

Table 7. Minimum Optical Modulation Amplitude as a function of center wavelength and spectral width

Center Wavelength (nm)	RMS Spectral Width (nm)								
	Up to 0.05	0.05 to 0.1	0.1 to 0.15	0.15 to 0.2	0.2 to 0.25	0.25 to 0.3	0.3 to 0.35	0.35 to 0.4	0.4 to 0.45
840 to 842	-4.2	-4.2	-4.1	-4.1	-3.9	-3.8	-3.5	-3.2	-2.8
842 to 844	-4.2	-4.2	-4.2	-4.1	-3.9	-3.8	-3.6	-3.3	-2.9
844 to 846	-4.2	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-2.9
846 to 848	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-2.9
848 to 850	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-3.0
850 to 852	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.4	-3.0
852 to 854	-4.3	-4.2	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
854 to 856	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
856 to 858	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.5	-3.1
858 to 860	-4.3	-4.3	-4.2	-4.2	-4.1	-3.9	-3.7	-3.5	-3.2

Receiver Optical Characteristics

Table 8. Receiver Optical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
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Center Wavelength	λ_c	840	850	860	nm	-
Receiver Sensitivity (P_{avg})	S	-	-	-9.9	dBm	1
Receiver Overload (P_{avg})	P_{OL}	0.5	-	-	dBm	1
Optical Return Loss	ORL	12	-	-	dB	-
LOS De-Assert	LOS_D	-	-	-12	dBm	-
LOS Assert	LOS_A	-30	-	-	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

Notes:

1. Measured with PRBS 2³¹-1 test pattern, 11.3Gb/s, BER<10⁻¹².
2. Comply with IEEE 802.3-2005.

Digital Diagnostic Memory Map

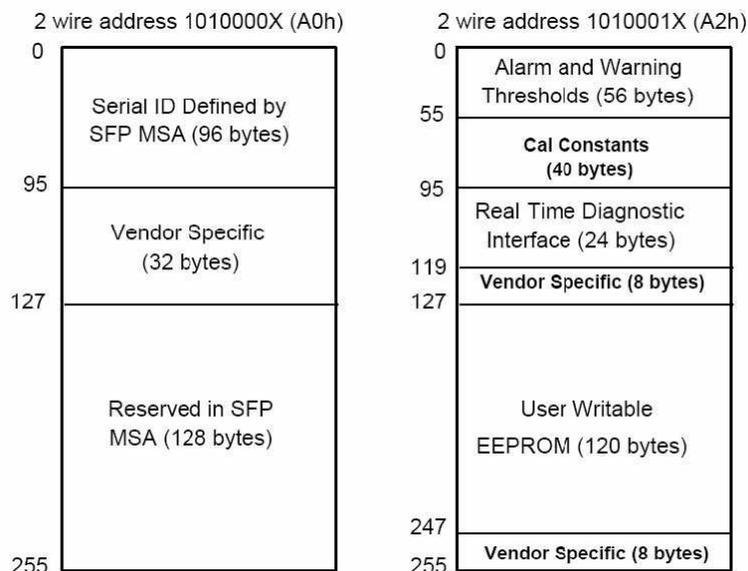


Figure 2. Digital Diagnostic Memory Map Specific Data Field Descriptions

Diagnostic Monitor Specifications

The digital diagnostic monitoring interface also defines another 256-byte memory map in EEPROM, which makes use of the 8 bit address 1010001X (A2h). Please see Figure 2. For detail EEPROM information, please refer to the related document of SFF-8472 Rev 11.0. The monitoring specification of this product is described in Table 9.

Table 9. Diagnostic Monitor Specifications

Parameter	Range	Accuracy	Calibration
Temperature	-43 to +88 C	±3 C	Internal
Voltage	2.9 to 3.6V	±3%	Internal
Bias Current	1 to 12mA	±10%	Internal

TX Power	-6 to 0dBm	±3dB	Internal
RX Power	-12 to 0.5dBm	±3dB	Internal

Recommended Host Board Power Supply Filter Network

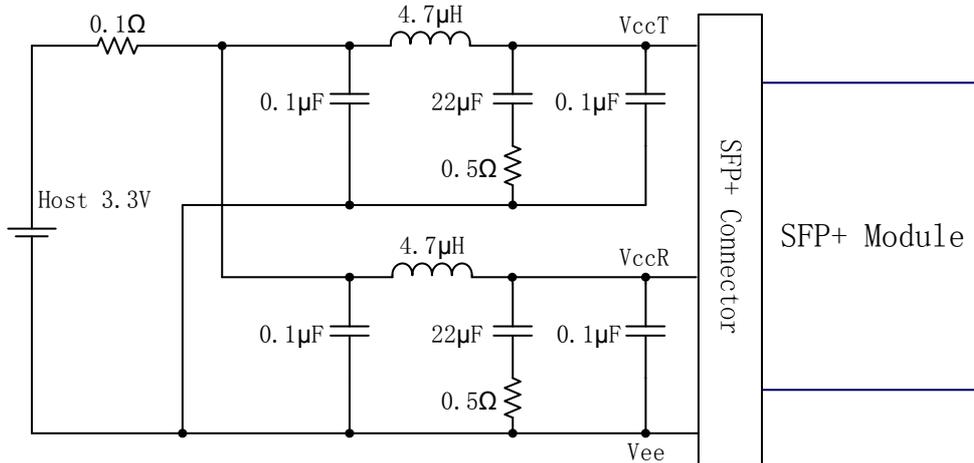


Figure 3. Recommended Host Board Power Supply Filter Network

Recommended Application Interface Block Diagram

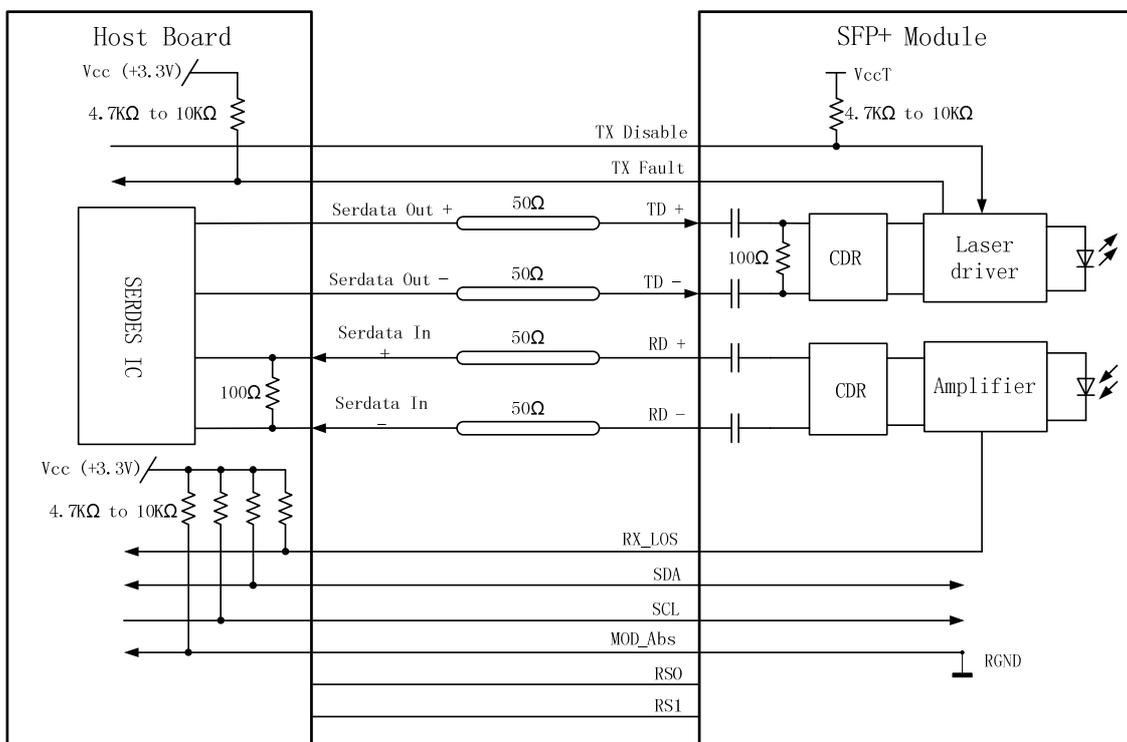


Figure 4. Recommended Application Interface Block Diagram

Mechanical specifications

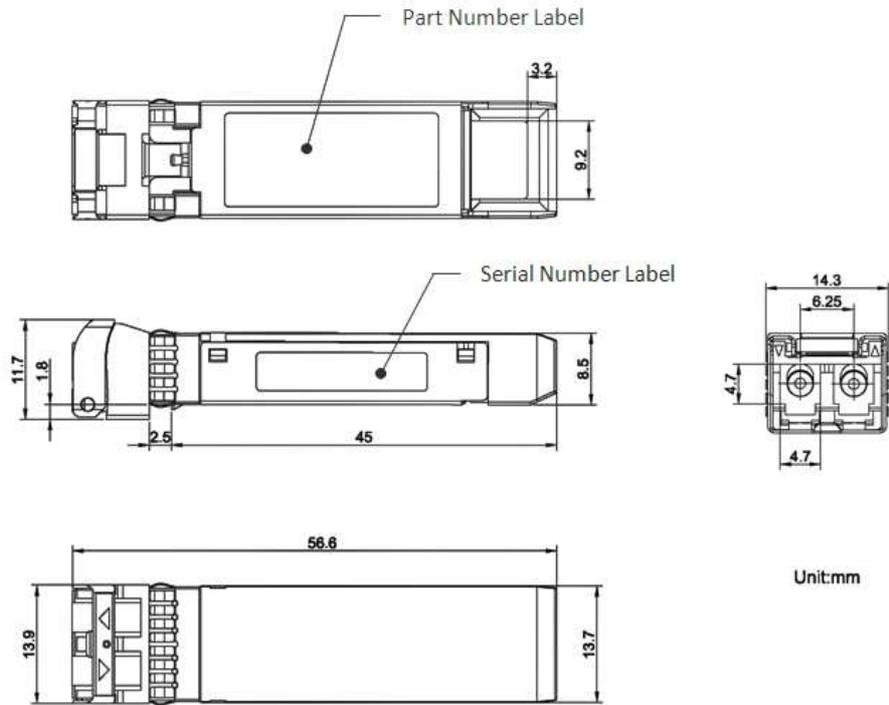


Figure 5. Outline Drawing



LX4001
10G Ethernet 850nm SFP+ Transceiver
10GBASE-SR / 10GBASE-SW

For More Information

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