



RoHS compliant
1310 nm Single-mode Transceiver
Small Form Pluggable (SFP+), with Diagnostic Monitoring
Fiber Channel 10G,8.5G,4.25G, 2.125G, 1.0625Gb/s,
10G BASE-LW/LR,1000 Base-LX Ethernet



Features

- Compliant with SFP+ MSA SFF-8431
- Compliant with IEEE802.3ae 10GBASE-LW/LR Ethernet standard
- Compliant with 10GFC 1200-SM-LL-L Fiber Channel standard
- Compliant with 8.5G Fiber Channel FC-PI-4 800-SM-LC-L standard
- Compliant with 4.25G Fiber Channel FC-PI-4 400-SM-LC-L standard
- Compliant with 2.125G Fiber Channel FC-PI-4 200-SM-LC-L standard
- Compliant with 1.0625G Fiber Channel FC-PI-4 100-SM-LC-L standard
- Compliant with IEEE802.3z Gigabit Ethernet standard
- Compliant with SFF8472 diagnostic monitoring interface Duplex LC connector
- Differential LVPECL inputs and CML outputs
- Single power supply 3.3V
- Hot Pluggable
- Class 1 laser product complies with EN 60825-1

Ordering Information

PART NUMBER	INPUT/OUTPUT	SIGNAL DETECT	VOLTAGE	TEMPERATURE
CL-SFP+_LR_20	AC/AC	TTL	3.3V/5V	-5°C to 70 °C
CL-SFP+_LR_20i	AC/AC	TTL	3.3V/5V	-30°C to 70 °C
CL-SFP+_LR_20i	AC/AC	TTL	3.3V/5V	-40°C to 85 °C

Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Storage Temperature	T_S	-40	85	°C	
Supply Voltage	V_{CC}	-0.5	4.0	V	
Input Voltage	V_{IN}	-0.5	V_{CC}	V	
Output Current	I_o	---	50	mA	
Operating Current	I_{OP}	---	400	mA	



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Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Case Operating Temperature	T_c	-5	70	°C	CL-SFP+_LR_20
		-30	70	°C	CL-SFP+_LR_20e
		-45	85	°C	CL-SFP+_LR_20i
Supply Voltage	V_{cc}	3.1	3.5	V	
Supply Current	$I_{TX} + I_{RX}$	---	200	mA	
Power Consumption	P	---	1	W	

Transmitter Electro-optical Characteristics

$V_{cc} = 3.1\text{ V to }3.5\text{ V}$, $T_c = -5\text{ °C to }70\text{ °C}$ & $T_c = -40\text{ °C to }85\text{ °C}$ for CL-SFP+_LR_20x

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Data Rate	B		10.3125	11.3	Gbps	
Output Optical Power (50/125 μ m fiber, NA=0.20) (62.5/125 μ m fiber, NA=0.275)	P_{ow}	-6	---	0.5	dBm	
Optical Modulation Amplitude	OMA	-5.2			dBm	
Extinction Ratio	ER	3.5			dB	
Center Wavelength	λ_c	1290	1310	1330	nm	
Spectrum Width	$\Delta \lambda$			1	nm	
Sidemode Supression ratio	SSR_{min}	30			dB	
Relative Intensity Noise	RIN	---	---	-128	dB/Hz	
Output Eye		Compliant with IEEE802.3ae				
Reference Differential Input Impedance	Z_d		100		Ω	
Input AC Common Mode Voltage		0		25	mV	RMS
Differential Input Voltage Swing	V_{DIFF}	100		800	mV	
Differential Input S-parameter	$SDD11$			-10	dB	
Differential to Common Mode Conversion	$SCD11$			-10	dB	



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Total Jitter	TJ			0.28	UI(p-p)
Data Dependant Jitter	DDJ			0.1	UI(p-p)
Uncorrelated Jitter	UJ			0.023	RMS
Max. P_{out} TX-DISABLE Asserted	P_{OFF}	---	---	-35	dBm
Transmit Fault Output-Low	TX_FAULT_L	0.0	---	0.5	V
Transmit Fault Output-High	TX_FAULT_H	2.4	---	V_{CC}	V
TX_DISABLE Assert Time	t_{off}	---	---	10	μs
TX_DISABLE Negate Time	t_{on}	---	---	1	ms
Time to initialize, include reset of TX_FAULT	t_{init}	---	---	300	ms
TX_FAULT from fault to assertion	t_{fault}	---	---	100	μs
TX_DISABLE time to start reset	t_{reset}	10	---	---	μs

Receiver Electro-optical Characteristics

$V_{cc} = 3.1\text{ V to }3.5\text{ V}$, $T_c = -10\text{ }^\circ\text{C to }70\text{ }^\circ\text{C}$ & $T_c = -40\text{ }^\circ\text{C to }85\text{ }^\circ\text{C}$ for CL-SFP+ 10

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
	L					
Data Rate	B		10.3125	11.3	Gbps	
Optical Input Power-maximum	P_{IN}	0.5	---	---	dBm	BER < 10^{-12}
Receiver Sensitivity	P_{IN}	---	---	-14.4	dBm	BER < 10^{-12}
Receiver Sensitivity(OMA)	P_{IN}	---	---	-12.6	dBm	BER < 10^{-12}
Stressed Receiver Sensitivity	P_{IN}	---	---	-12.5	dBm	BER < 10^{-12}
Stressed Receiver Sensitivity(OMA)	P_{IN}	---	---	-10.3	dBm	BER < 10^{-12}
Operating Center Wavelength	λ_c	1260	---	1355	nm	
Optical Return Loss	ORL	12	---	---	dB	
Loss of Signal-Asserted	P_A	-30	---	---	dBm	
Loss of Signal-Deasserted	P_D	---	---	-18	dBm	
Reference Differential Output Impedance	Z_d	---	100	---	Ω	



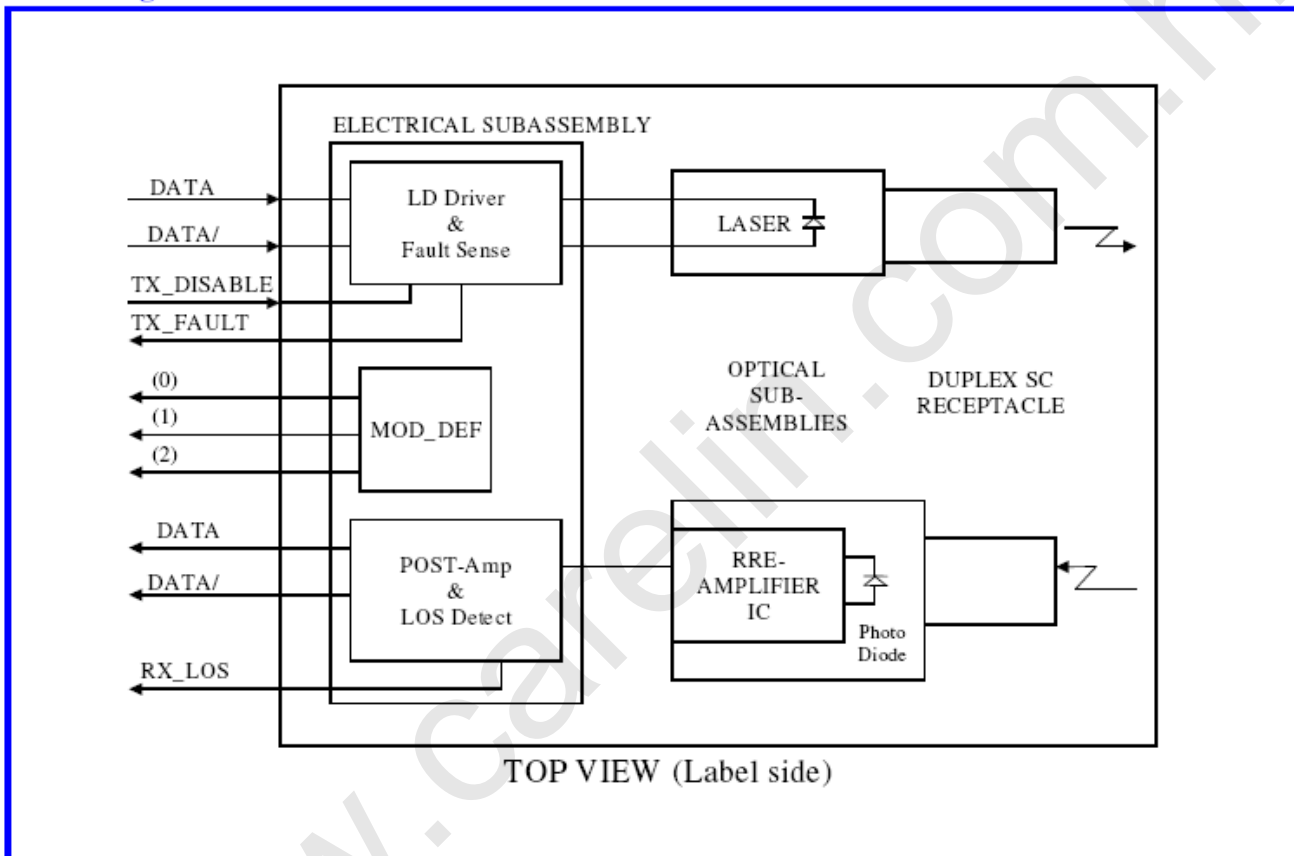
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Output AC Common Mode Voltage				15	mV	RMS
Differential Output Voltage	V_{DIFF}	350	660	850	mV	
Output Rise and Fall Time	T_r, T_f			35	ps	20% to 80%
Differential Output S-parameter	SD_{22}			-10	-dB	
Common Mode Output Return Loss	SC_{22}			-6	dB	0.01~2.5GHz
				-3	dB	2.5~11.3GHz
Deterministic Jitter	DJ			0.42	UI(p-p)	
Total Jitter	TJ			0.7	UI(p-p)	
Receiver Loss of Signal Output Voltage-Low	RX_LO	0	---	0.5	V	
	S_L					
Receiver Loss of Signal Output Voltage-High	RX_LO	2.4	---	V_{CC}	V	
	S_H					
Receiver Loss of Signal Assert Time (off to on)	t_{A,RX_LOS}	---	---	100	μs	
Receiver Loss of Signal Assert Time (on to off)	t_{D,RX_LOS}	---	---	100	μs	



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Block Diagram of Transceiver



Transmitter Section

The transmitter section consists of a 1310 nm DFB laser in an eye safe optical subassembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current.

TX_FAULT

When sensing an improper power level in the laser driver, the SFP set this signal high and turns off the Laser. TX_FAULT can be reset with the TX_DISABLE line. The signal is in TTL level.

TX_DISABLE

The TX_DISABLE signal is high (TTL logic "1") to turn off the laser output. The laser will turn on within 1ms when



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TX_DISABLE is low (TTL logic "0").

Receiver Section

The receiver utilizes a MSM detector integrated with a trans-impedance preamplifier in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

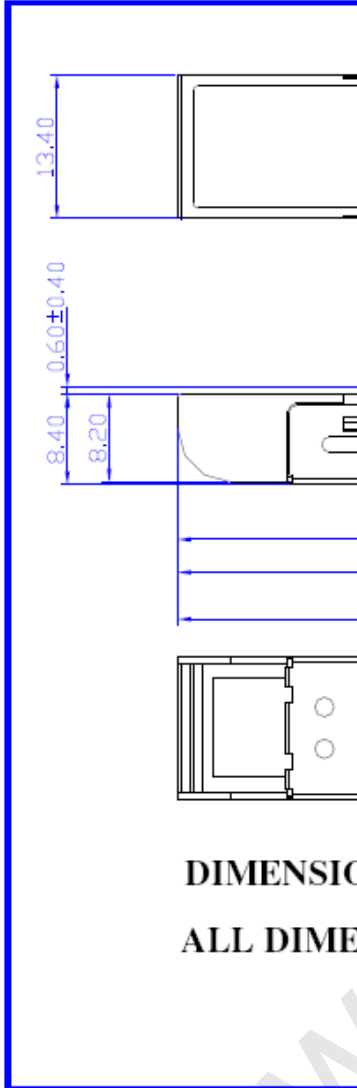
Receive Loss (RX_LOS)

The RX_LOS is high (logic "1") when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.



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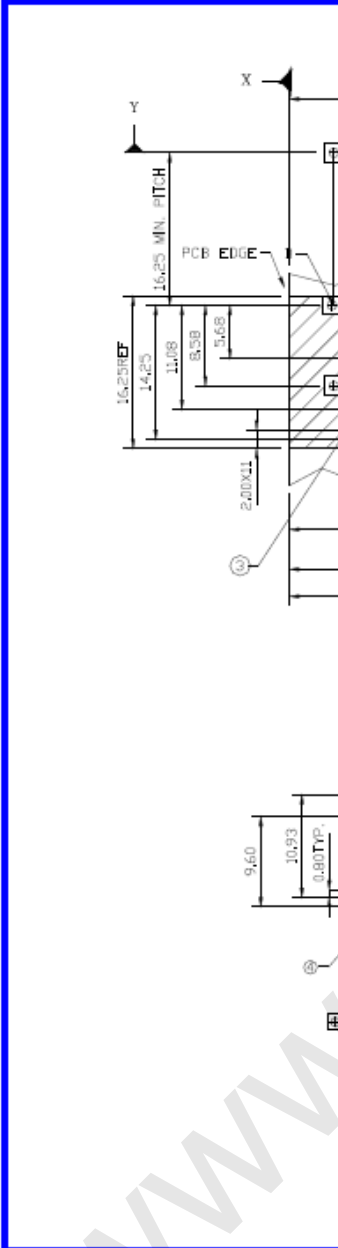
Dimensions





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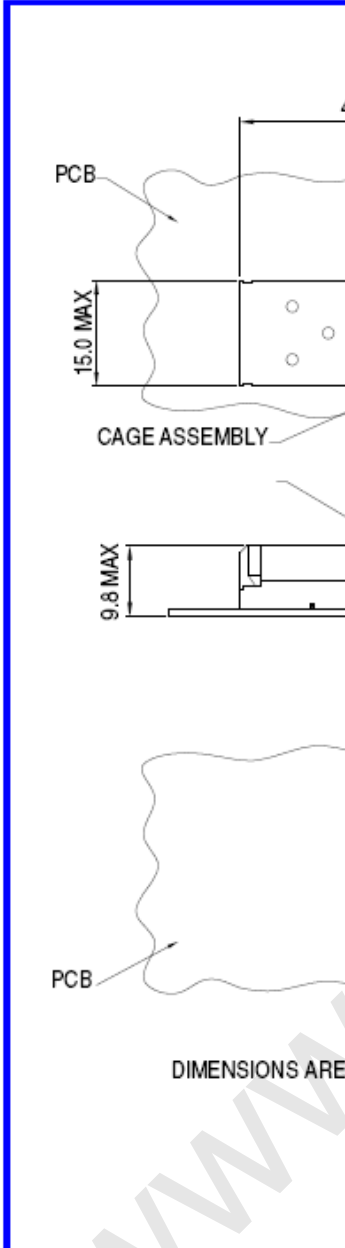
SFP host board mechanic





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Assembly drawing





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Pin Assignment

Pin-Out

Pin	Signal Name
1	T_{GND}
2	TX_FAULT
3	$TX_DISABLE$
4	$MOD_DEF (2)$
5	$MOD_DEF (1)$
6	$MOD_DEF (0)$
7	$RS0$
8	RX_LOS
9	$RS1$
10	R_{GND}
11	R_{GND}
12	$RX-$
13	$RX+$
14	R_{GND}
15	V_{CCR}
16	V_{CCT}
17	T_{GND}
18	$TX+$
19	$TX-$
20	T_{GND}

