



**Features:**

- Support 8G FC, 10GBASE-LR/LW and SONET/SDH application
- Support multi-rate 8.5G and 9.95G to 11.3G
- Up to 10km transmission on SMF
- 1310nm DFB laser and PIN receiver
- Dual CDR integrated
- SFI high speed electrical interface
- 2-wire interface with integrated Digital Diagnostic monitoring
- SFP+ MSA package with duplex LC connector
- Single +3.3V power supply
- Power consumption less than 1.5 W
- Operating case temperature: -5~+70°C

**Regulatory Compliance**

**Table 1 – Regulatory Compliance**

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000V for SFI pins, >2000V for other pins.)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product.
RoHS	2011/65/EU	Compliant with standards

**Absolute Maximum Ratings**

**Table 2 – Absolute Maximum Ratings**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	TS	-40	-	+85	°C	
Supply Voltage	VCC	-0.5	-	+4.0	V	
Operating Relative Humidity	RH	-	-	+85	%	

## Recommended Operating Conditions

**Table 3 – Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T <sub>C</sub>	-5	-	+70	°C	
Power Supply Voltage	V <sub>CC</sub>	3.14	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>	-	-	430	mA	
Power Dissipation	P <sub>D</sub>	-	-	1.5	W	
Bit Rate	BR	8.5	9.95	11.3	Gbps	
Transmission Distance	TD	2	-	10,000	m	With SMF

## Optical and Electrical Characteristics

**Table 4 – Transmitter Optical Specifications**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Center Wavelength Range	λ <sub>C</sub>	1290	-	1330	nm	
Average Output Power	P <sub>OUT</sub>	-6	-	-1	dBm	1
Average Output Power (Laser Off)	P <sub>OUT-OFF</sub>	-	-	-30	dBm	1
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Spectral Width (-20dB)	Δλ	-	-	1	nm	
Extinction Ratio	ER	6	-	-	dB	2
Optical Eye Mask	Compliant with ITU-T G.691-2006					2

Note:

1. The optical power is launched into SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @9.953Gbps..

**Table 5 – Receiver Optical Specifications**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Center Wavelength Range	λ <sub>C</sub>	1260	-	1355	nm	
Receiver Sensitivity	P <sub>IN-SENS</sub>	-	-14	-11	dBm	1
Receiver Overload	P <sub>IN-OL</sub>	-1	-	-	dBm	1
Receiver Reflectance	Ref	-	-	-14	dB	
Optical Path Penalty	TP	-	-	1	dB	
LOS Assert	LOS <sub>A</sub>	-25	-	-	dBm	
LOS Deassert	LOS <sub>D</sub>	-	-	-15	dBm	
LOS Hysteresis	LOS <sub>H</sub>	0.5	-	4	dB	

Note:

1. Measured with a PRBS 2<sup>31</sup>-1 test pattern @9.953Gbps, BER≤10<sup>-12</sup>.

**Table 6 – Electrical Specifications**

Transmitter (Module Input)						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential Data Input Amplitude	V <sub>IN,P-P</sub>	180	-	700	mVpp	
Input Differential Impedance	Z <sub>IN</sub>	85	100	115	Ω	
Tx_Fault	Normal Operation	V <sub>OL</sub>	-0.3	-	0.4	V
	Transmitter Fault	V <sub>OH</sub>	2.4	-	V <sub>CC</sub>	V
Tx_Disable	Normal Operation	V <sub>IL</sub>	-0.3	-	0.8	V
	Laser Disable	V <sub>IH</sub>	2.0	-	V <sub>CC</sub> +0.3	V
Receiver (Module Output)						
Differential Data Output Amplitude	V <sub>OUT,P-P</sub>	300	-	850	mVpp	
Output Differential Impedance	Z <sub>O</sub>	80	100	120	Ω	
Rx_LOS	Normal Operation	V <sub>OL</sub>	-0.3	-	0.4	V
	Lose Signal	V <sub>OH</sub>	2.4	-	V <sub>CC</sub>	V

**Recommended Host Board Power Supply Circuit**

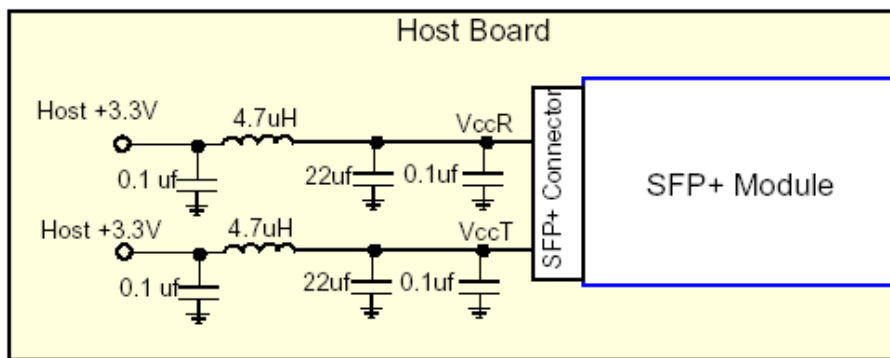


Figure 1, Recommended Host Board Power Supply Circuit

**Recommended Interface Circuit**

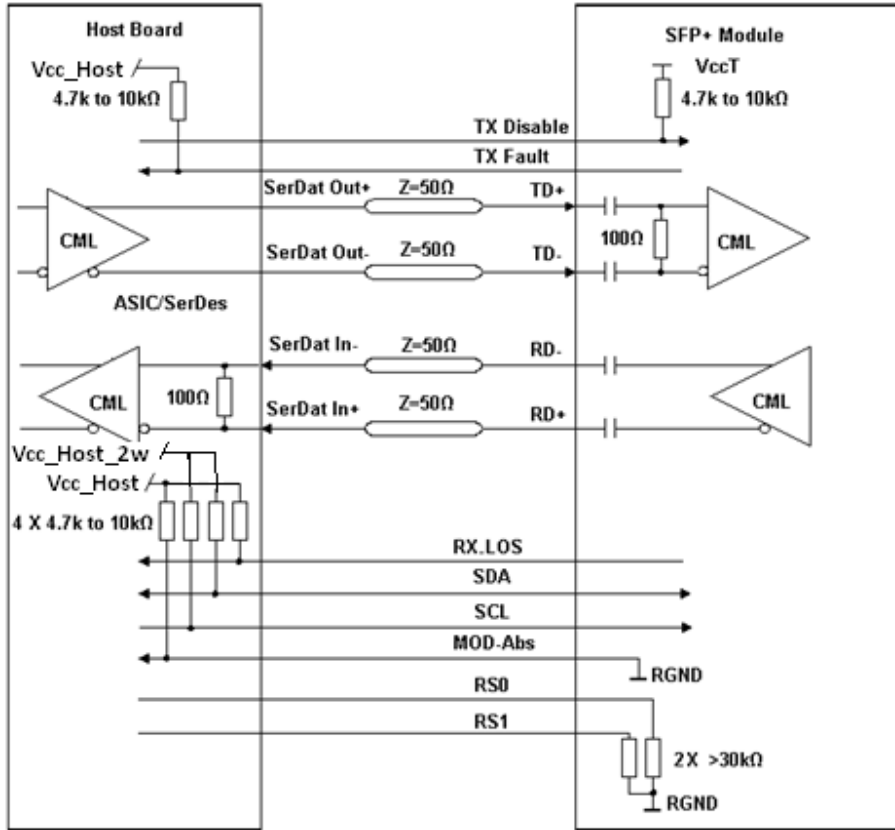


Figure 2, Recommended Interface Circuit

**Pin Definitions**

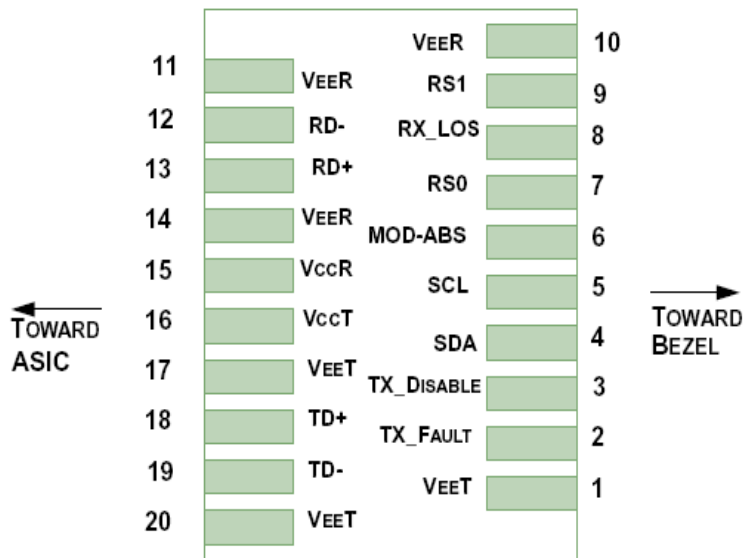


Figure 3, Pin View

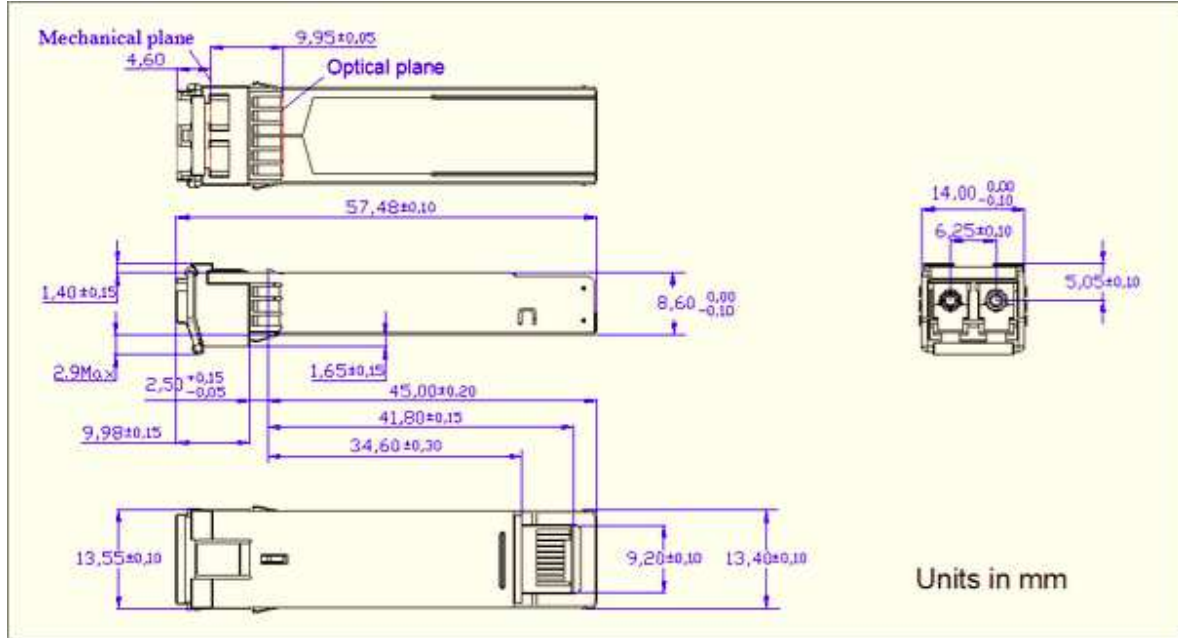
**Table 7 – Pin Definitions**

Pin	Logic	Symbol	Description	Notes
1		V <sub>EE</sub> T	Module Transmitter Ground	1
2	LVTTL-O	TX_FAULT	Module Transmitter Fault	2
3	LVTTL-I	TX_DISABLE	Transmitter Disable; Turns off transmitter laser output	3
4	LVTTL-I/O	SDL	2-Wire Serial Interface Data Line (MOD-DEF2)	
5	LVTTL-I/O	SCL	2-Wire Serial Interface Clock (MOD-DEF1)	
6		MOD_ABS	Module Absent, connected to V <sub>EE</sub> T or V <sub>EE</sub> R in the module	2
7	LVTTL-I	RS0	Rate Select 0, NOT implement	4
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication (in FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated as NOT Signal Detect)	2
9	LVTTL-I	RS1	Rate Select 1, NOT implement	4
10		V <sub>EE</sub> R	Module Receiver Ground	1
11		V <sub>EE</sub> R	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		V <sub>EE</sub> R	Module Receiver Ground	1
15		V <sub>CC</sub> R	Module Receiver 3.3 V Supply	
16		V <sub>CC</sub> T	Module Transmitter 3.3 V Supply	
17		V <sub>EE</sub> T	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		V <sub>EE</sub> T	Module Transmitter Ground	1

**Notes:**

1. The module ground pins are isolated from the module case.
2. The pins shall be pulled up with 4.7K-10Kohms to a voltage between 3.14V and 3.46V on host board.
3. The pin is pulled up to V<sub>CC</sub>T with a 4.7K-10KΩ resistor in the module.
4. The pins are pulled low to V<sub>EE</sub>T with a >30kΩ resistor in the module.

**Mechanical Diagram**



**Order Information**

**Table 8 – Order Information**

Part No.	Application	Data Rate	Laser Source	Fiber Type
SPP-10S-LR-CDFC	8GFC/I-64.1 10GBASE-LR/LW	8.5G/9.95~11.3G	1310nm DFB	SMF

## Warnings

**Handling Precautions:** This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

**Laser Safety:** Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

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