



### Features

- Support 2.125/4.25/8.5G fiber channel applications
- Up to 150m transmission on OM3 MMF
- 850nm VCSEL and PIN receiver
- 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 0.85W
- Operating case temperature: -5~+85°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	2002/95/EC 4.1&4.2 2005/747/EC	Compliant with standards <sup>note</sup>

**Note:**

In light of item 5 in Annex of 2002/95/EC, "Pb in the glass of cathode ray tubes, electronic components and fluorescent tubes." and item 13 in Annex of 2005/747/EC, "Lead and cadmium in optical and filter glass.", the two exemptions are being concerned for Source Photonics transceivers, because Source Photonics transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

## Absolute Maximum Ratings

**Table 2 - Absolute Maximum Ratings**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	$T_S$	-40	-	+85	°C	
Supply Voltage	$V_{CC}$	-0.5	-	+4.0	V	
Operating Relative Humidity	RH	10	-	+90	%	

## Recommended Operating Conditions

**Table 3 – Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	$T_C$	-5	-	+85	°C	
Power Supply Voltage	$V_{CC}$	3.14	3.3	3.46	V	
Power Supply Current	$I_{CC}$	-	-	240	mA	
Power Dissipation	$P_D$	-	-	0.85	W	
Bit Rate	BR	2.125		8.5	Gbps	
Transmission Distance (8.5 Gbps)	TD	0.5	-	50	m	1
Transmission Distance (4.25 Gbps)	TD	0.5	-	150	m	1
Transmission Distance (2.125 Gbps)	TD	0.5	-	300	m	1
Transmission Distance (8.5 Gbps)	TD	0.5	-	150	m	2
Transmission Distance (4.25 Gbps)	TD	0.5	-	380	m	2
Transmission Distance (2.125 Gbps)	TD	0.5	-	500	m	2

Notes:

1. Measured on OM2 MMF fiber
2. Measured on OM3 MMF fiber

## Optical Characteristics

**Table 4 – Optical Characteristics**

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Centre Wavelength	$\lambda_C$	840	-	860	nm	
Average Output Power	$P_{OUT}$	-8.2	-	-	dBm	1,2
Optical Modulation Amplitude @ 2.125 Gb/s	$P_{OMA@2.125G}$	196	-	-	μW	3
Optical Modulation Amplitude @ 4.25 Gb/s	$P_{OMA@4.25G}$	247	-	-	μW	3
Optical Modulation Amplitude @ 8.5 Gb/s	$P_{OMA@8.5G}$	302	-	-	μW	3
Spectral Width	$\Delta\lambda$	-	-	0.65	nm	
Transmitter Waveform and Dispersion Penalty	TWDP	-	-	4.2	dB	4

Optical Rise/Fall Time, 20%-80% @ 2.125G	$T_R/T_F$	-	-	150	ps	
Optical Rise/Fall Time, 20%-80% @ 4.25G	$T_R/T_F$			90	ps	
Relative Intensity Noise	RIN	-	-	-128	dB/Hz	
Deterministic Jitter @ 2.125 Gb/s	DJ	-	-	56.5	ps	
Total Jitter @ 2.125 Gb/s	TJ	-	-	119.6	ps	
Deterministic Jitter @ 4.25 Gb/s	DJ	-	-	28.2	ps	
Total Jitter @ 4.25 Gb/s	TJ	-	-	59.8	ps	
Optical Eye Mask	Compliant with FC-PI-4 (REV 8.00)					
<b>Receiver</b>						
Centre Wavelength	$\lambda_C$	840	-	860	nm	
Average Receiver Power	$P_{in}$	-	-	0	dBm	
Receiver OMA Sensitivity @ 2.125 Gb/s	$P_{IN-SENS(OMA)}$	49	-	-	$\mu W$	
Receiver OMA Sensitivity @ 4.25 Gb/s	$P_{IN-SENS(OMA)}$	61	-	-	$\mu W$	
Receiver OMA Sensitivity @ 8.5 Gb/s	$P_{IN-SENS(OMA)}$	76	-	-	$\mu W$	
Stressed Receiver Sensitivity @ 2.125 Gb/s	$P_{IN-SENS\_STRESS(OMA)}$	83	-	-	$\mu W$	5
Stressed Receiver Sensitivity @ 4.25 Gb/s	$P_{IN-SENS\_STRESS(OMA)}$	126	-	-	$\mu W$	5
Stressed Receiver Sensitivity @ 8.5 Gb/s	$P_{IN-SENS\_STRESS(OMA)}$	148	-	-	$\mu W$	5
Return Loss	$R_{LOSS}$	12	-	-	dB	
LOS Assert	$LOS_A$	-25	-	-	dBm	
LOS Deassert	$LOS_D$	-	-	-13	dBm	
LOS Hysteresis	$LOS_H$	0.5	-	-	dB	

## Notes:

1. Maximum Pout is the lesser of Class 1 safety limits (CDRH and EN 60825) or maximum receiver power
2. Into 50/125  $\mu m$  multi-mode fiber
3. Enables smaller ER at higher average power
4. At 8.5 Gb/s
5. For 50/125  $\mu m$  OM3 fiber

## Electrical Characteristics

Table 5 – Electrical Characteristics

<b>Transmitter</b>						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential Data Input Amplitude	$V_{IN,P-P}$	180	-	1200	mVpp	
Input Differential Impedance	$Z_{IN}$	85	100	115	$\Omega$	
Transmit Enable Voltage	$V_{IL}$	GND	-	GND+0.8	V	
Transmit Disable Voltage	$V_{IH}$	2.0	-	$V_{CC}$	V	
<b>Receiver</b>						
Differential Data Output Amplitude	$V_{OUT,P-P}$	370	-	850	mVpp	
Total Jitter @ 2.125 Gb/s	$TJ_{@2.125G}$	-	-	123.5	ps	
Deterministic Jitter @ 2.125 Gb/s	$DJ_{@2.125G}$	-	-	47.1	ps	

Total Jitter @ 4.25 Gb/s	$TJ_{@4.25G}$	-	-	61.8	ps	
Deterministic Jitter @ 4.25 Gb/s	$DJ_{@4.25G}$	-	-	23.5	ps	
Total Jitter @ 8.5 Gb/s	$TJ_{@8.5G}$	-	-	83.5	ps	
Deterministic Jitter @ 8.5 Gb/s	$DJ_{@8.5G}$	-	-	49.4	ps	
Pulse Width Shrinkage @ 8.5 Gb/s	DDPWS	-	-	42.4	ps	
Rx_LOS Normal	$V_{OL}$	GND	-	GND+0.8	V	
Rx_LOS Fault	$V_{OH}$	2	-	$V_{CC}$	V	

## Digital Diagnostic Monitoring

**Table 6 – Digital Diagnostic Specifications**

Accuracy						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transceiver Internal Temperature	$ T_{INT} $	-	-	3	°C	1
Input Internal Supply Voltage	$ V_{INT} $	-	-	100	mV	2
T <sub>X</sub> Bias Current	$ I_{INT} $	-	-	10	%	
T <sub>X</sub> Output Power	$ P_T $	-	-	3	dB	3
R <sub>X</sub> Output Power	$ P_R $	-	-	3	dB	4

**Notes:**

- Valid from -5°C to 85°C
- Valid from 3 V to 3.6 V
- Into 50/125 μm multi-mode fiber, valid from -9 dBm to -2 dBm  $P_{AVG}$
- Into 50/125 μm multi-mode fiber, valid from -18 dBm to -0 dBm  $P_{AVG}$

### Recommended Host Board Power Supply Circuit

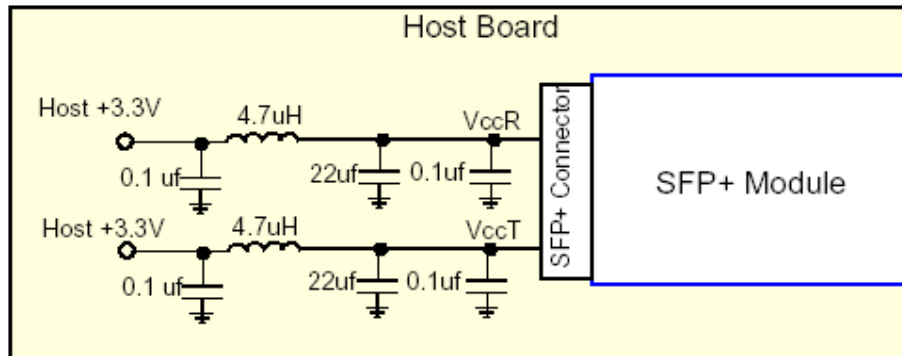


Figure 1, Recommended Host Board Power Supply Circuit

### Recommended Interface Circuit

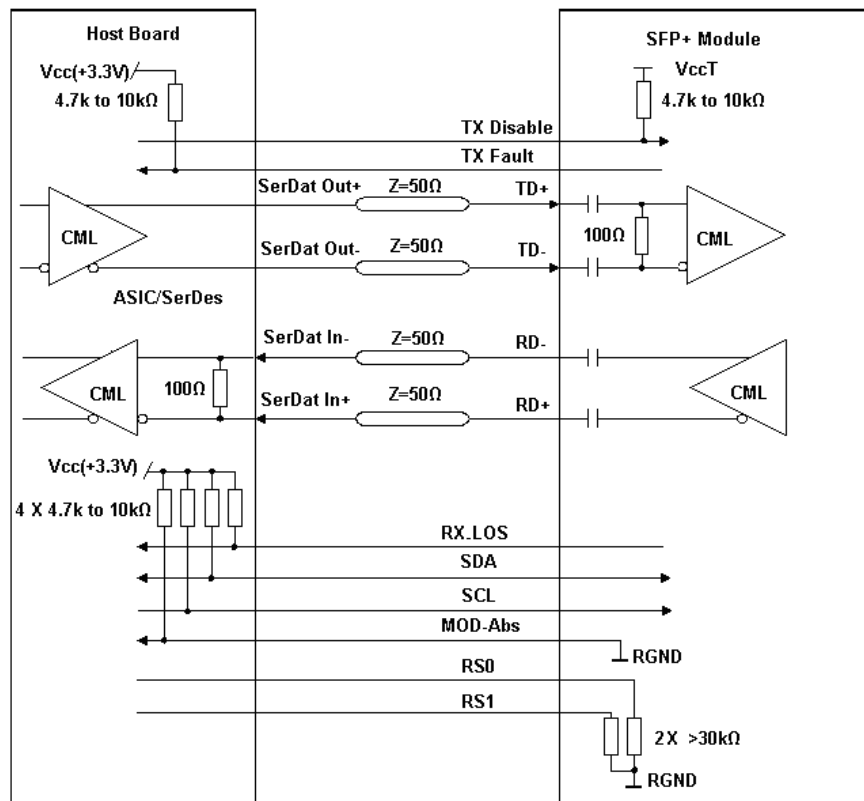


Figure 2, Recommended Interface Circuit

### Pin Definitions

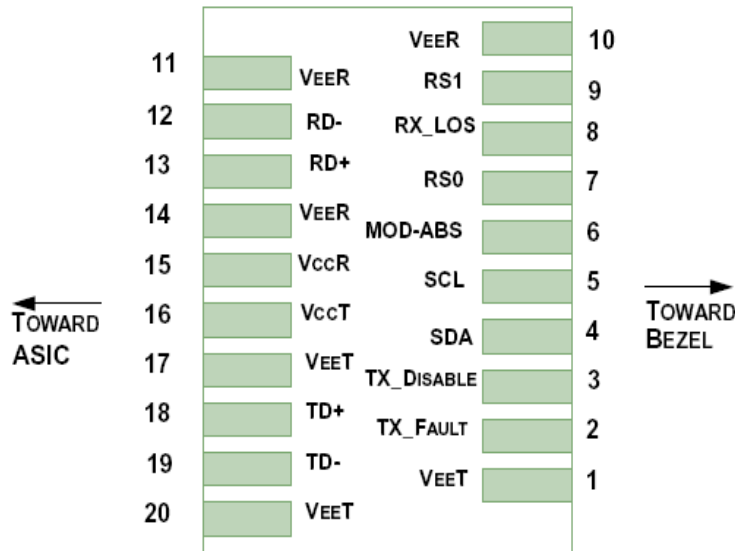


Figure 3, Pin View

Table 7–Pin Function Definitions

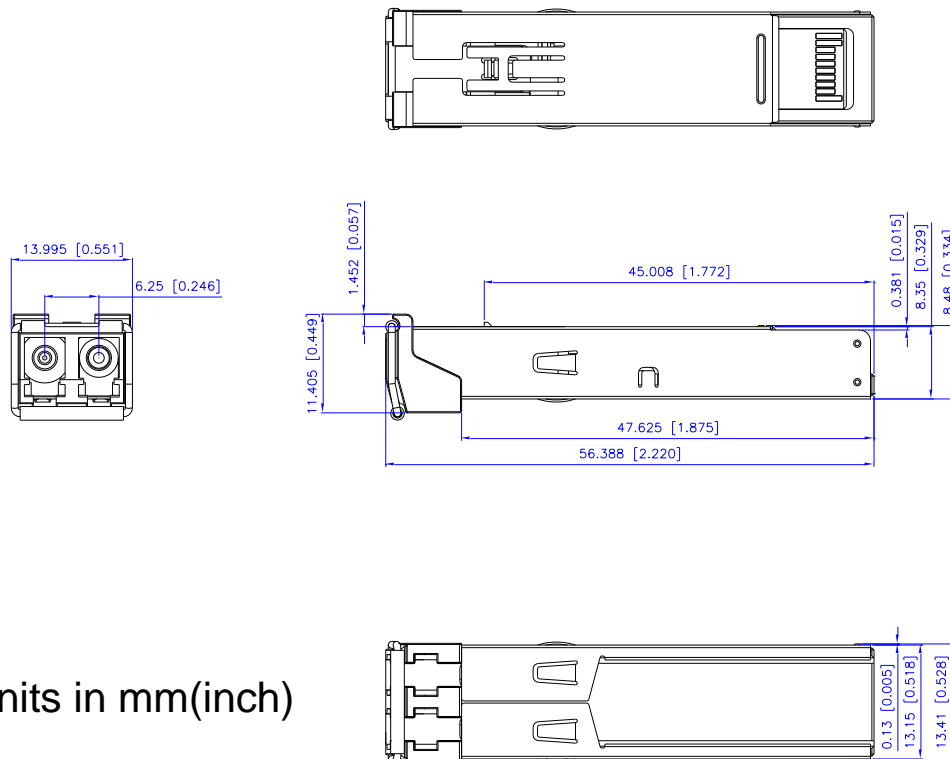
Pin	Symbol	Name/Description	Note
1	V <sub>EE</sub> T	Module Transmitter Ground	1
2	TX_FAULT	Module Transmitter Fault	2
3	TX_DISABLE	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2-Wire Serial Interface Data Line (MOD-DEF2)	4
5	SCL	2-Wire Serial Interface Clock (MOD-DEF1)	4
6	MOD_ABS	Module Absent, connected to V <sub>EE</sub> T or V <sub>EE</sub> R in the module	4
7	RS0	Rate Select 0, NOT implement	5
8	RX_LOS	Receiver Loss of Signal Indication	4
9	RS1	Rate Select 1, NOT implement	5
10	V <sub>EE</sub> R	Module Receiver Ground	1
11	V <sub>EE</sub> R	Module Receiver Ground	1
12	RD-	Receiver Inverted Data Output	
13	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	TD+	Transmitter Non-Inverted Data Input	
19	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. TX\_FAULT is an open collector/drain output. The pins must be pulled up with 4.7kΩ-10kΩ resistor. A high output indicates a transmitter fault. A low output indicates normal operation. In the low state, the output is pulled to < 0.8V.
3. The pin is pulled up to V<sub>CC</sub>T with a 4.7K-10KΩ resistor in the module. When TX\_Disable is > 2.0V, laser output is disabled. When TX\_Disable is < 0.8V, laser is enabled.
4. The pins must be pulled up with 4.7K-10Kohms to a voltage between 3.14V and 3.46V on host board.
5. The pins are pulled low to V<sub>CC</sub>T with a >30kΩ resistor in the module.

## Mechanical Diagram



Units in mm(inch)

Figure 4, Mechanical Diagram of SFP+

## Order Information

Table 8 – Order Information

Part No.	Application	Data Rate	Laser Source	Fiber Type
SPP-8F-SR-EDFM	8G Fiber Channel	2.125G~8.5G	850nm VCSEL	MMF

## 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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