



### Features

- Available in all 100GHz C-Band Wavelengths on the DWDM ITU Grid
- Support multi data rate from 6.1G to 10.3G
- Up to 25km transmission on SMF
- 1550nm EML laser and APD 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 2.5W
- Operating case temperature: -40~+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 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	$T_s$	-40	-	+85	°C	
Supply Voltage	$V_{CC}$	-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	$T_C$	-40	-	+85	°C	
Power Supply Voltage	$V_{CC}$	3.14	3.3	3.47	V	
Power Supply Current	$I_{CC}$	-	455	720	mA	
Power Dissipation	$P_D$	-	1.5	2.5	W	
Bit Rate	BR	6.1	-	10.3	Gbps	
Transmission Distance	TD	2	-	25,000	m	1

Note 1: Measured with G.652 SMF.

## Optical Characteristics

Table 4 – Optical Characteristics

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Center Wavelength Range	$\lambda_C$	1529.55	-	1560.61	nm	
	$f_C$	196.0	-	192.1	THz	
Channel Space	$\Delta f$	-	100	-	GHz	
Center Wavelength Tolerance	$\Delta\lambda_C$	-100	-	100	pm	
Average Output Power	$P_{OUT}$	1	1.5	3	dBm	1
Average Output Power (Laser Off)	$P_{OUT-OFF}$	-	-	-35	dBm	1
Side Mode Suppression Ratio	SMSR	35	-	-	dB	
Spectral Width (-20dB)	$\Delta\lambda_{20}$	-	-	0.3	nm	
Extinction Ratio	ER	8.2	-	-	dB	2
Dispersion Penalty	DP	-	-	2	dB	3
Relative Intensity Noise	RIN	-	-	-130	dB/Hz	

Reflectance Tolerance	RT	-	-	-27	dB	
Optical Eye Mask	Compliant with ITU-T G.691-2006					2
Receiver						
Center Wavelength Range	$\lambda_C$	1528	-	1565	nm	
Receiver Sensitivity	$P_{IN-SENS}$	-	-26	-25	dBm	3, 4
Receiver Overload	$P_{IN-OL}$	-7	-	-	dBm	3
Optical Return Loss	ORL	-	-	-27	dB	
LOS Assert	$LOS_A$	-38	-	-	dBm	
LOS Deassert	$LOS_D$	-	-	-28	dBm	
LOS Hysteresis	$LOS_H$	0.5	-	4	dB	

Notes:

1. The optical power is launched into SMF.
2. Measured with a PRBS  $2^{31}-1$  test pattern @9.9Gbps.
3. Measured with a PRBS  $2^{31}-1$  test pattern,  $BER \leq 10^{-12}$ .
4. We can support -26dBm for BOL, and -25dBm for EOL.

## Electrical Characteristics

Table 5 – Electrical Characteristics

Transmitter							
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes	
Differential Data Input Amplitude	$V_{IN,P-P}$	190	-	700	mVpp		
Input Differential Impedance	$Z_{IN}$	85	100	115	$\Omega$		
Tx_Fault	Normal Operation	$V_{OL}$	-0.3	-	0.4	V	
	Transmitter Fault	$V_{OH}$	2.4	-	$V_{CC}$	V	
Tx_Disable	Normal Operation	$V_{IL}$	-0.3	-	0.8	V	
	Laser Disable	$V_{IH}$	2.0	-	$V_{CC}+0.3$	V	
Receiver							
Differential Data Output Amplitude	$V_{OUT,P-P}$	300	-	850	mVpp		
Output Differential Impedance	$Z_O$	80	100	120	$\Omega$		
Rx_LOS	Normal Operation	$V_{OL}$	-0.3	-	0.4	V	
	Lose Signal	$V_{OH}$	2.4	-	$V_{CC}$	V	

**Recommended Host Board Power Supply Circuit**

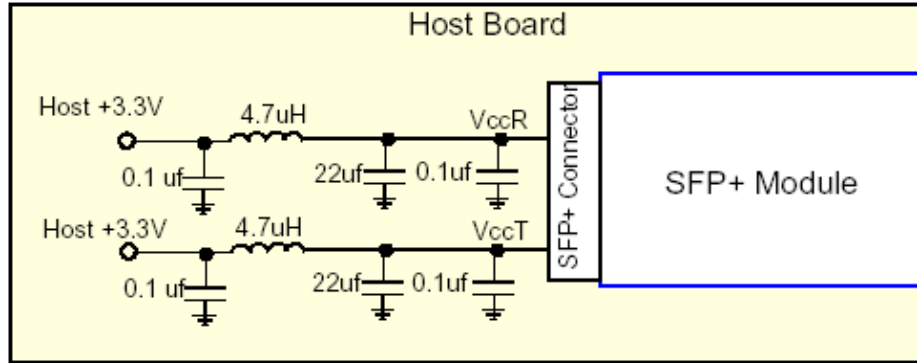


Figure 1, Recommended Host Board Power Supply Circuit

**Recommended Interface Circuit**

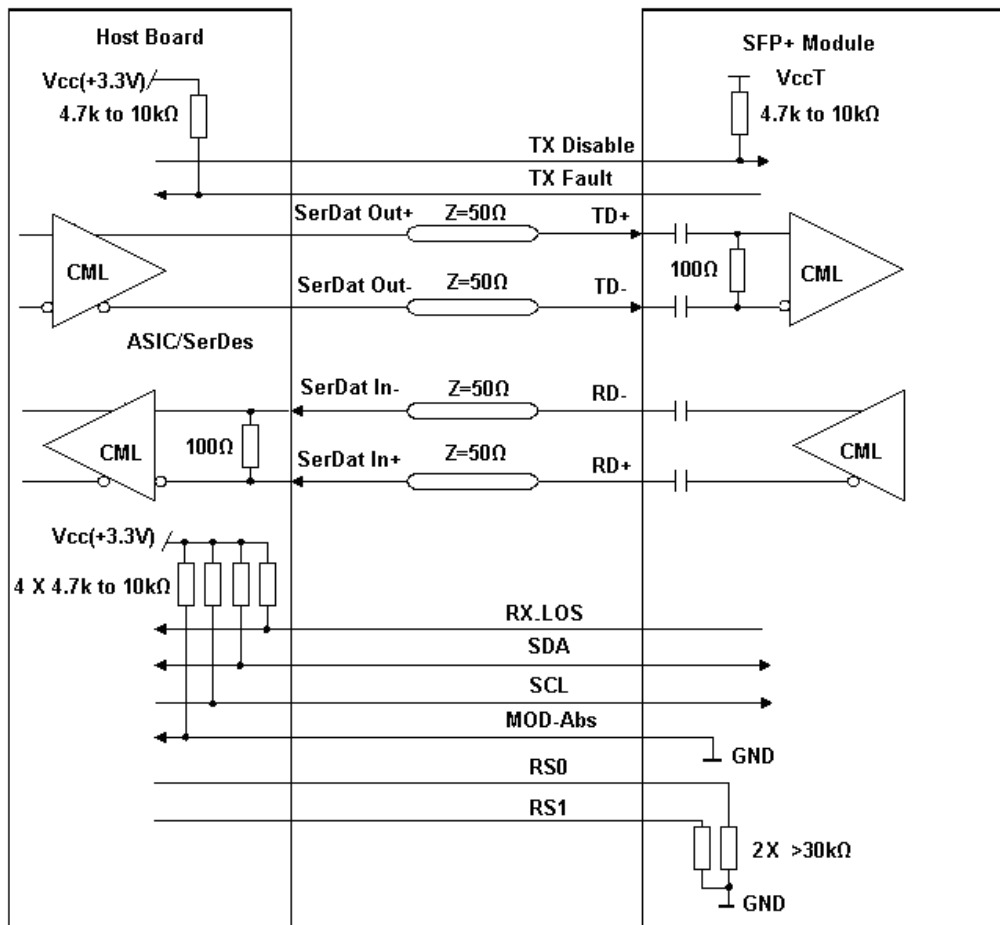


Figure 2, Recommended Interface Circuit

## Pin Definitions

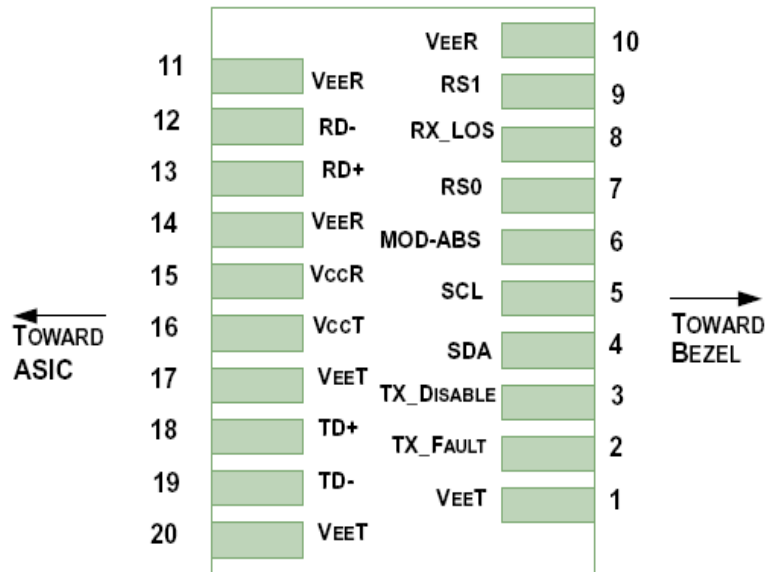


Figure 3, Pin View

Table 6–Pin Function Definitions

Pin	Logic	Symbol	Name/Description	Note
1		$V_{EE T}$	Module Transmitter Ground	1
2	LVTTL-O	$T X_{_F A U L T}$	Module Transmitter Fault	2
3	LVTTL-I	$T X_{_D I S A B L E}$	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 $V_{EE T}$ or $V_{EE R}$ 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		$V_{EE R}$	Module Receiver Ground	1
11		$V_{EE R}$	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		$V_{EE R}$	Module Receiver Ground	1
15		$V_{C C R}$	Module Receiver 3.3 V Supply	
16		$V_{C C T}$	Module Transmitter 3.3 V Supply	
17		$V_{EE T}$	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		$V_{EE T}$	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 3.47V on host board.
3. The pin is pulled up to  $V_{CCT}$  with a 4.7K-10K $\Omega$  resistor in the module.
4. The pins are pulled low to  $V_{EET}$  with a >30k $\Omega$  resistor in the module.

**Mechanical Diagram**

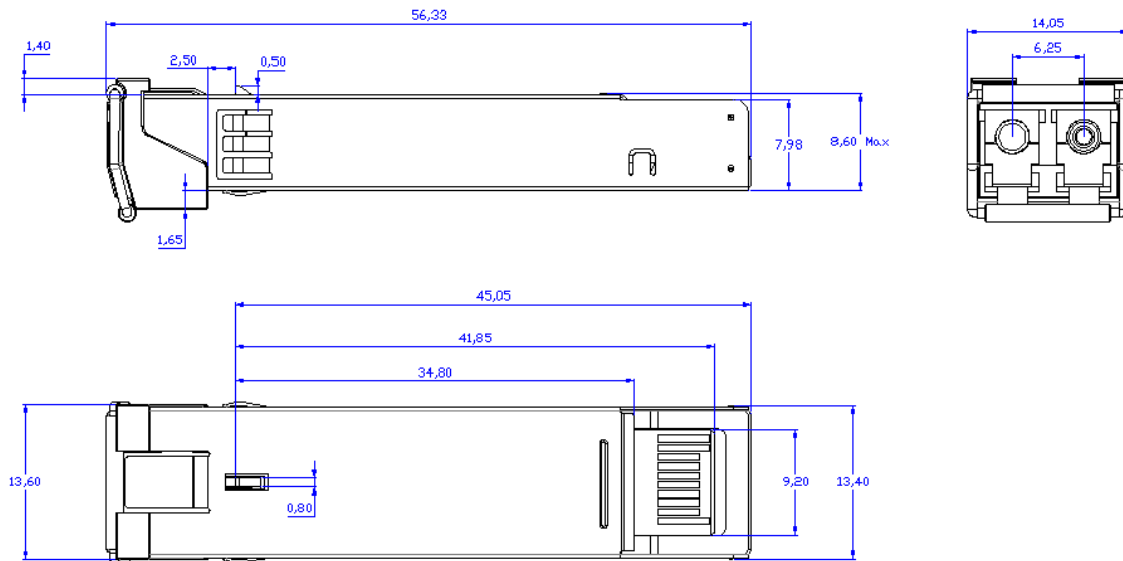


Figure 4, Mechanical Diagram of SFP+

**Order Information**

Table 7 – Order Information

Part No.	Application	Data Rate	Laser Source	Fiber Type	Latch Color
SPD-10S-ER-XXIDFB	6G/10G CPRI	6.1~10.3G	DWDM EML	SMF	Red

Note: see Table 10 – Wavelength Guide for “xx” value.

Table 10 – Wavelength Guide (xx value)

ITU Channel (xx)	Frequency (THz)	Wavelength (nm)	ITU Channel (xx)	Frequency (THz)	Wavelength (nm)
21	192.1	1560.606	41	194.1	1544.526
22	192.2	1559.794	42	194.2	1543.730
23	192.3	1558.983	43	194.3	1542.936
24	192.4	1558.173	44	194.4	1542.142
25	192.5	1557.363	45	194.5	1541.349

26	192.6	1556.555	46	194.6	1540.557
27	192.7	1555.747	47	194.7	1539.766
28	192.8	1554.940	48	194.8	1538.976
29	192.9	1554.134	49	194.9	1538.186
30	193.0	1553.329	50	195.0	1537.397
31	193.1	1552.524	51	195.1	1536.609
32	193.2	1551.721	52	195.2	1535.822
33	193.3	1550.918	53	195.3	1535.036
34	193.4	1550.116	54	195.4	1534.250
35	193.5	1549.315	55	195.5	1533.465
36	193.6	1548.515	56	195.6	1532.681
37	193.7	1547.715	57	195.7	1531.898
38	193.8	1546.917	58	195.8	1531.116
39	193.9	1546.119	59	195.9	1530.334
40	194.0	1545.322	60	196.0	1529.553

## 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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