SPP-10E-ER-CDFC

Features

- Support 10GBASE-ER/EW application
- Up to 40km transmission on SMF
- 1550nm EML laser 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 1.5W
- 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 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	-5	-	+70	°C	
Power Supply Voltage	V_{CC}	3.14	3.3	3.47	V	
Power Supply Current	I_{CC}	-	-	430	mA	
Power Dissipation	P_D	-	-	1.5	W	
Bit Rate	BR	9.953	10.3125	-	Gbps	
Transmission Distance	TD	2	-	40,000	m	1

Note 1: Measured with SMF.

Optical Characteristics

Table 4 – Optical Characteristics

Transmitter						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Center Wavelength Range	λ_C	1530	-	1565	nm	
Average Output Power	P_{0UT}	-4.7	-	4.0	dBm	1
Average Output Power (Laser Off)	$P_{0UT-OFF}$	-	-	-30	dBm	1
Extinction Ratio	ER	3	-	-	dB	2
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Optical Return Loss Tolerance	ORLT	-	-	21	dB	
Optical Eye Mask	Compatible with IEEE 802.3-2008					2
Receiver						
Center Wavelength Range	λ_C	1530	-	1565	nm	
Receiver Sensitivity	$P_{IN-SENS}$	-	-	-15.8	dBm	3
Receiver Overload	P_{IN-OL}	-1	-	-	dBm	3
Receiver Reflectance	Ref	-	-	-26	dB	
LOS Assert	LOS_A	-25	-		dBm	

LOS De-assert	LOS_D	-	-	-17	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 @10.3125Gbps.
3. Measured with a PRBS 2^{31}-1 test pattern @10.3125Gbps, BER≤10^{-12}.

Electrical Characteristics

Table 5 – Electrical Characteristics

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter							
Differential Data Input Amplitude		$V_{IN,P-P}$	190	-	700	mVpp	
Input Differential Impedance		Z_{IN}	85	100	115	Ω	
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	Ω	
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

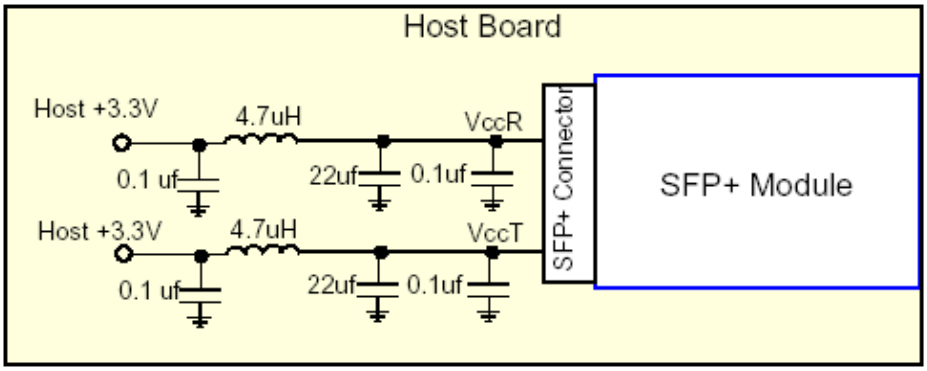

Figure 1, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

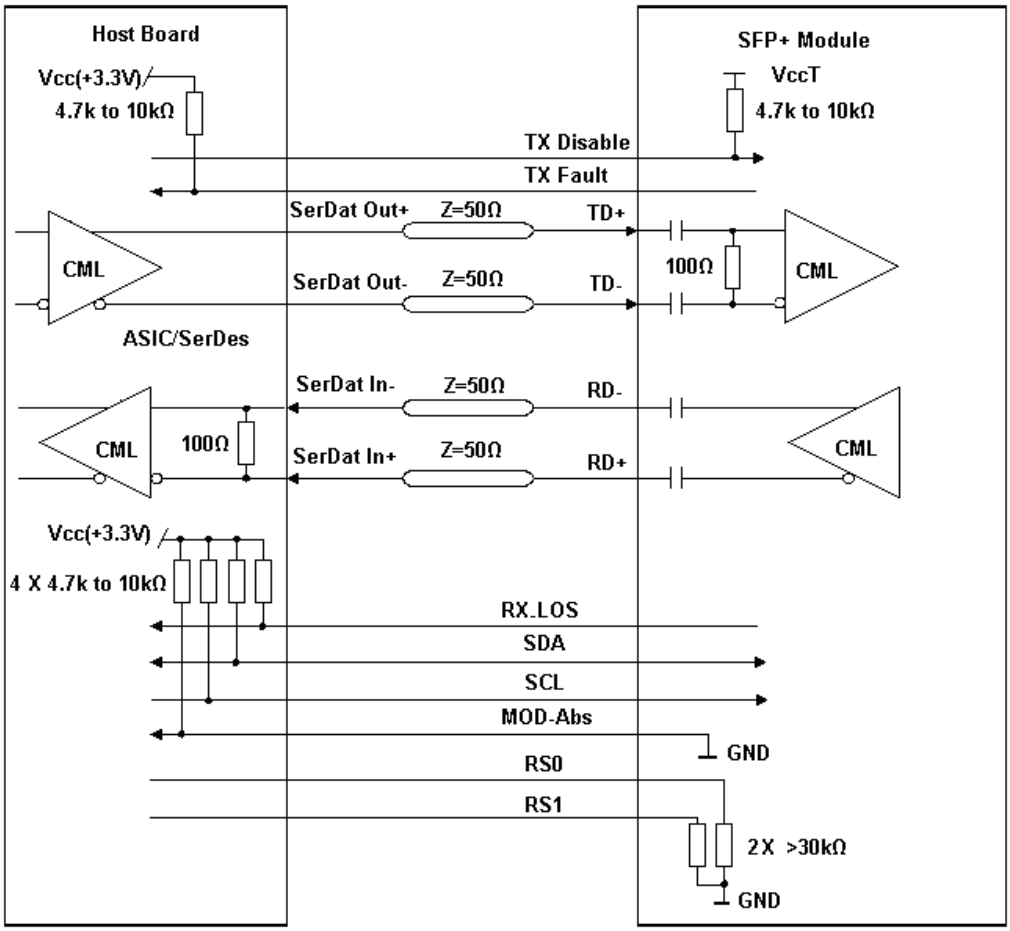

Figure 2, Recommended Interface Circuit

Pin Definitions

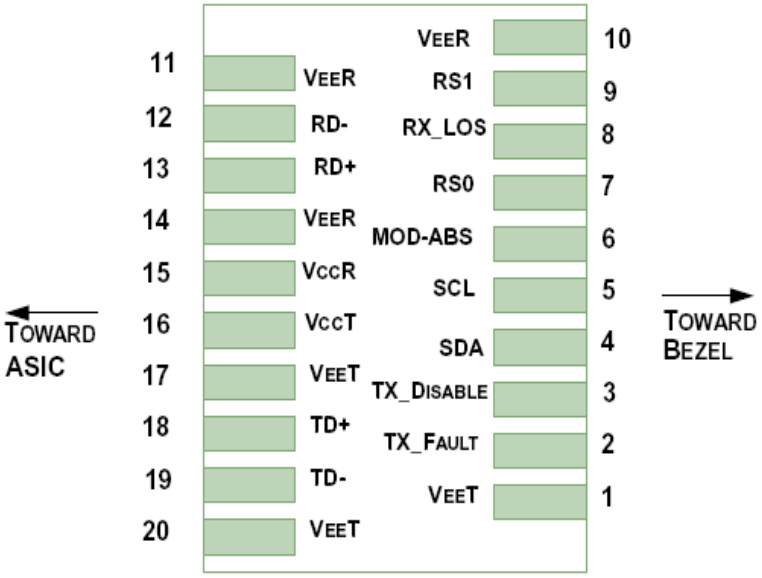

Figure 3, Pin View

Table 6–Pin Function Definitions

Pin	Logic	Symbol	Name/Description	Note
1		$V_{EE}T$	Module Transmitter Ground	1
2	LVTTL-O	TX_F_{AULT}	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 $V_{EE}T$ 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		$V_{CC}R$	Module Receiver 3.3 V Supply	
16		$V_{CC}T$	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 $V_{CC}T$ with a 4.7K-10KΩ resistor in the module.
4. The pins are pulled low to $V_{EE}T$ with a >30kΩ resistor in the module.

Mechanical Diagram

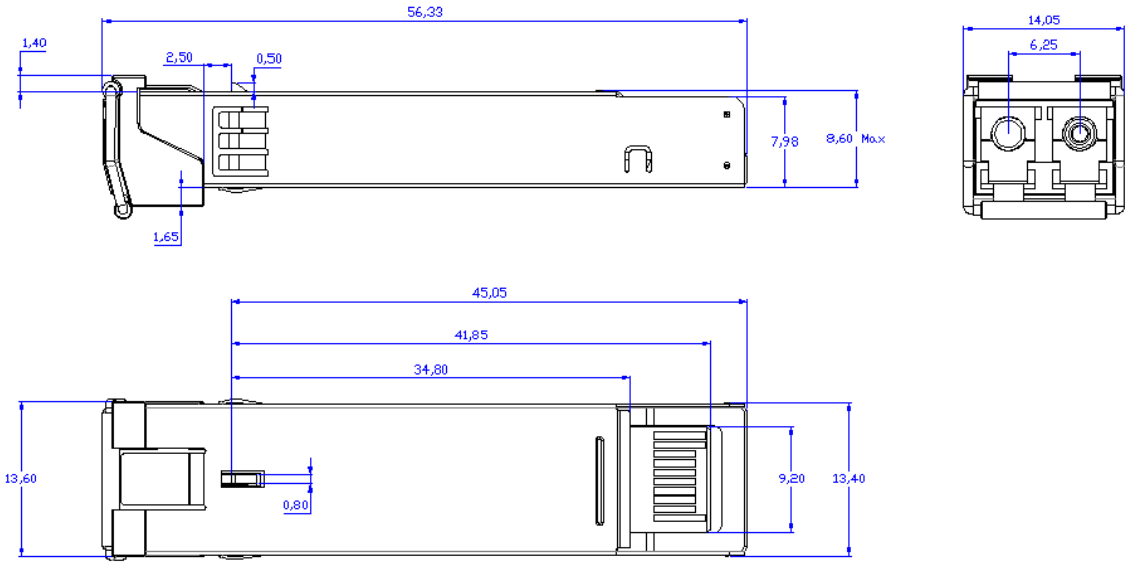

Figure 4, Mechanical Diagram of SFP+

Order Information

Table 7 – Order Information

Part No.	Application	Data Rate	Laser Source	Fiber Type	Latch Color
SPP-10E-ER-CDFC	10GBASE-ER/EW	9.953/10.3125G	1550nm EML	SMF	Red

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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