

## 10G SFP+ Transceiver

**MODEL: SFP+SR**



### PRODUCT FEATURES

- Hot pluggable
- Up to 10.7Gbps Data Links
- SFP+ MSA package with LC connector
- Digital Diagnostic Monitor Interface
- Very low EMI and excellent ESD protection
- Power dissipation < 1.0W
- Uncooled 850nm VCSEL laser
- Single + 3.3V Power Supply and LVTTTL Logic
- Operating temperature range -40°C to 85°C

### APPLICATIONS

- 10GBASE-SR/SW 10G Ethernet

### STANDARD

- SFP+ MSA Compliant
- SFF-8472 reversion 9.5 compliant
- IEEE802.3-2005 compliant
- Telcordia GR-468-CORE compliant
- FCC 47 CFR Part 15, Class B compliant
- FDA 21 CFR 1040.10 and 1040.11, class1 compliant
- RoHS compliant

## Pin Definitions:

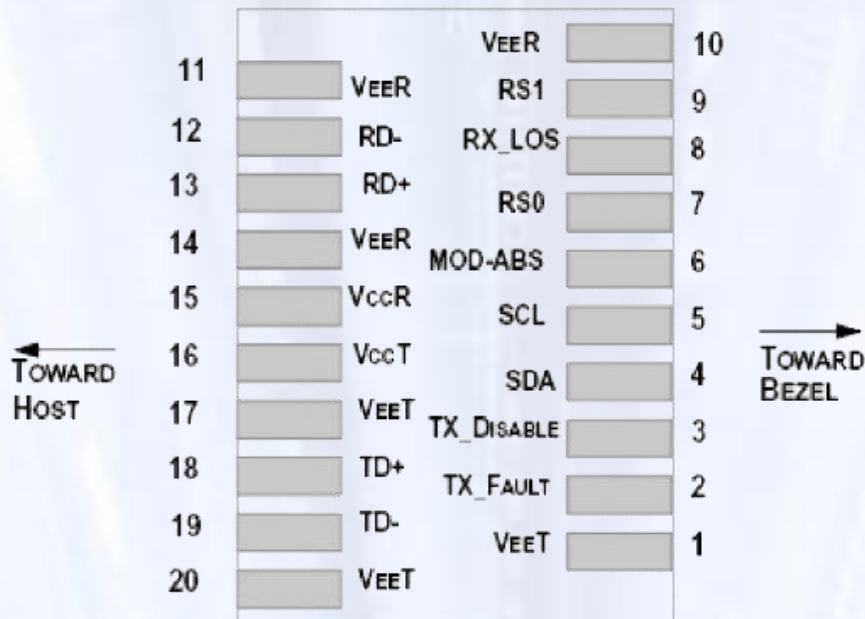


Diagram of Host Board Connector Block Pin Numbers of Names

Pin Num.	Name	Function	Notes
1	VeeT	Transmitter Ground	Note.1
2	TX Fault	Module Transmitter Fault	Note.2, Module
3	TX Disable	Transmitter Disable; Turns off transmitter laser output	disables on high or
4	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i)	open
5	SCL	2-wire Serial Interface Clock (Same as MOD-DEF1 as defined in the INF-8074i)	Note.3, 2 wire serial
6	MOD-ABS	Module Absent, connected to VeeT or VeeR in the module	ID interface
7	RS0	Not used	Note.3, 2 wire serial
8	RX_LOS	Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated at Signal Detect)	Note.4
9	RS1	Not used	Function not
10	VeeR	Module Receiver Ground	available
11	VeeR	Module Receiver Ground	Note.5
12	RD-	Receiver Inverted Data Output	
13	RD+	Receiver Non-Inverted Data Output	Note.5
14	VeeR	Module Receiver Ground	Note.5
15	VccR	Module Receiver 3.3 V Supply	3.3 ± 5%, Note.7
16	VccT	Module Transmitter 3.3 V Supply	3.3 ± 5%, Note.7
17	VeeT	Module Transmitter Ground	Note.5
18	TD+	Transmitter Non-Inverted Data Input	Note.8
19	TD-	Transmitter Inverted Data Input	Note.8
20	VeeT	Module Transmitter Ground	Note.5

### Notes

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 K Ω resistor. Its states are:

Low (0 – 0.8V):	Transmitter on
(>0.8, < 2.0V):	Undefined
High (2.0 – 3.465V):	Transmitter Disabled
Open:	Transmitter Disabled

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR (see Section IV for further details). Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID Mod-Def 2 is the data line of two wire serial interface for serial ID

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

5) VeeR and VeeT may be internally connected within the SFP module.

6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 – 1000 mV single ended) when properly terminated.

7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 500 – 2400 mV (250 – 1200mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600 mV single-ended) be used for best EMI performance.

### Absolute Maximum Ratings:

Parameter	Symbol	Min.	Max.	Unit	Note
Supply Voltage	Vcc	-0.3	4.0	V	
Storage temperature	Ts	-40	85	°C	
Relative Humidity			85	%	

**Note:** Stress in excess of the maximum absolute ratings can cause permanent damage to the module.

### Electrical Characteristics:

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	TC	-40		+85	°C	
Power Supply Voltage	VCC3	3.13	3.3	3.47		
Power Supply Current	ICC3			450	mA	
Power Dissipation	PD			1.5	W	
<b>Transmitter</b>						
Input Differential Impedance	Rinput	85	100	115	Ohm	
Differential Data Input Swing	Vin,pp	180		700	mV	
TX_DIS Voltage - High	VTX_DISH	2.0		Vcc+0.	V	
TX_DIS Voltage - Low	VTX_DISL	-0.3		0.8	V	
TX_Fault Output-High	VTX_Fault	2.4		Vcc	V	
TX_Fault Output-Low	VTX_FaultL	-0.3		0.8	V	
<b>Receiver</b>						
Output Differential Impedance	Routput	80	100	120	Ohm	
Differential Data Output Swing	Vout,pp	300		850	mV	
Receiver LOS Pull up Resistor	RLOS	4.7		10	KOhm	

Data Output Rise/Fall time	tr/tf	20		-	ps	
LOS Output Voltage-High	VLOSH	2		Vcc	V	
LOS Output Voltage-Low	VLOSL	-0.3		0.4	V	

### Optical Characteristics:

Transmitter						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate			10.3125		Gb/s	
Ave. Output Power	Po	-5		-1	dBm	
Output Centre Wavelength	$\lambda$	840	850	860	nm	
Disable Power	Poff			-30	dBm	1
Extinction Ratio	ER	3.0	5.5		dB	2
Spectral Width	$\Delta\lambda$			1	nm	
Rise/Fall Time (20%~80%)	Tr/Tf			20	PS	
Optical Modulation Amplitude	OMA			-128	dBm	
Optical Eye Mask 1		GR-253-CORE/ITU-T G.691				
Optical Eye Mask 2		IEEE802.3ae				
Receiver						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate			10.3125		Gb/s	
Overload	Po	-0.5			dBm	
Input Centre Wavelength	$\lambda$	840		860	nm	
Minimum Sensitivity	Pmin			-15.4	dBm	
Stressed Sensitivity in OMA				-10.3	dBm	
LOS Assert	LosA	-30			nm	
LOS De-assert	LosD			-14	dBm	
LOS Hysteresis		0.5		4	dBm	
Optical Return Loss		14			dB	
Jitter Tolerance		GR-253-CORE/ITU-T G.783				

- Note:** (1). The optical power is launched into SMF  
(2). Measured with RPBS 2^31-1 test pattern @10.3125Gbs

### SFP Module Control and Management:

Serial Interface for ID and DDM

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP MSA.

The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I2C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information(A0h) is listed in Table 2. And the DDM specification(A2h) is described in Table 3. For more details of the memory map and byte definitions, please refer to the SFF-8472 (Rev 9.3, Aug. 2002), "Digital Diagnostic Monitoring Interface for Optical Transceivers".

The DDM parameters have been internally calibrated.

**Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions):**

2 wire address 1010000X (A0h)		2 wire address 1010001X (A2h)	
Address	Information	Address	Information
0~95	Serial ID Defined by SFP MSA (96bytes)	0~55	Alarm and Warning Thresholds (56 bytes)
		0~95	Serial ID Defined by SFP MSA (96 bytes)
		56~95	Calibration Constants (40 bytes)

96~127	Vendor Specific (32 bytes)	96~119	Real Time Diagnostic Interface (24 bytes)
		96~127 Vendor Specific (32 bytes) 120~127	Vender Specific (8 bytes)
128~255	Reserved,SFF8079 (128 bytes)	128~247	User Writable EEPROM (120
		128~255Reserved ,SFF8079 (128	Vender Specific (8 bytes)

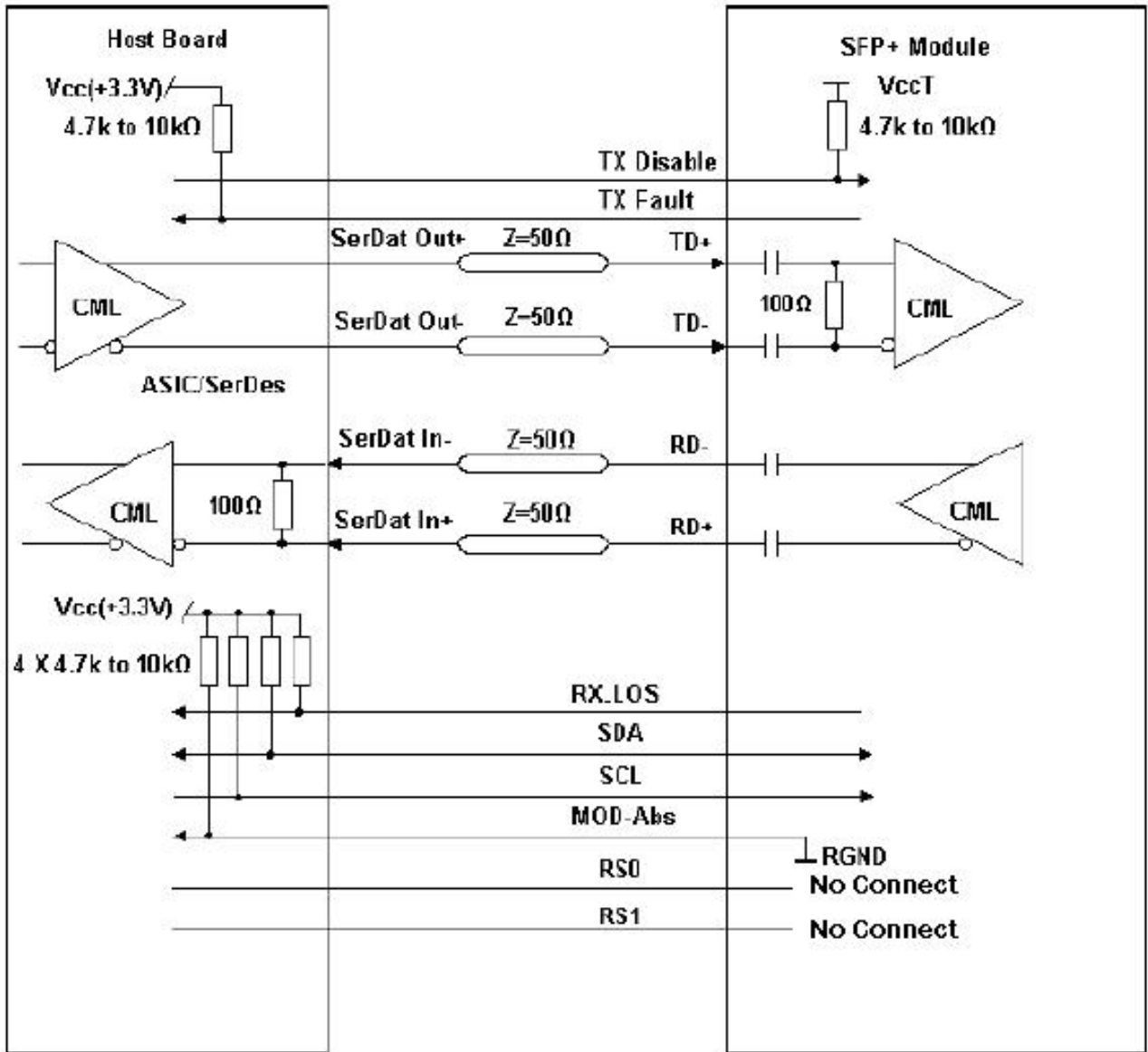
**Table 2 - EEPROM Serial ID Memory Contents (A0h):**

Data Addres	Size (Bytes)	Name of Field	Value(Hex)	Description of Field
<b>BASE ID FIELDS</b>				
0	1	Identifier	03	SFP+
1	1	Ext. Identifier	04	SFP with serial ID
2	1	Connector	07	LC
3-10	8	Transceiver	00 00 00 00 00 00 00 00	
11	1	Encoding	01	NRZ
12	1	BR, Nominal	67	
13	1	Reserved	00	
14	1	Length(9µm,km)	00	
15	1	Length (9µm)	00	
16	1	Length (50µm)	00	
17	1	Length (62.5µm)	00	
18	1	Length (Copper)	00	
19	1	Reserved	00	
20-35	16	Vendor name		
36	1	Reserved	00	
37-39	3	Vendor OUI	000000	
40-55	16	Vendor PN		
56-59	4	Vendor rev	31 30 20 20	10
60-61	2	Wavelength	05 1E	
62	1	Reserved	00	
63	1	CC_BASE	XX	Check code for Base ID
<b>EXTENDED ID FIELDS</b>				
64-65	2	Options	001A	Los,Tx_falt, Tx_diabile
66	1	BR, max	00	Upper bit rate margin, units of %
67	1	BR, min	00	Lower bit rate margin, units of %
68-83	16	Vendor SN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	Serial number(ASCII)
84-91	8	Date code	xx xx xx xx xx xx xx xx	Vendor's manufacturing date
92	1	Diagnostic Monitoring Type	68	Digital diagnostics and internal calibration
93	1	Enhanced Options	80	Alarm/Warning flags implemented
94	1	SFF-8472 Compliance	04	
95	1	CC_EXT	xx	Check code for the Extended
<b>VENDOR SPECIFIC ID FIELDS</b>				
96-127	32	Vendor Specific		Vendor Specific EEPROM

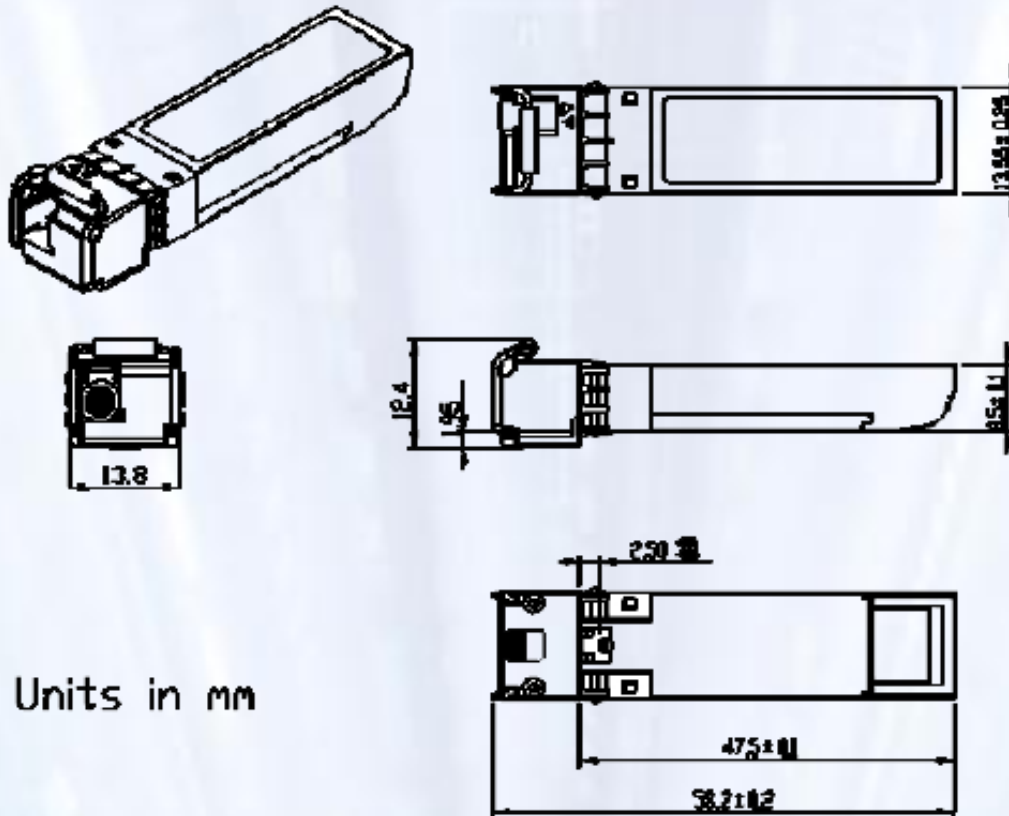
128-	128	Reserved	Reserved for SFF-8079.
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**Note:** The “xx” byte should be filled in according to practical case. For more information, please refer to the related document of SFF-8472 Rev 9.4.

**Table 3 - DDM Specification:**



**Package Dimensions:**



Units in mm

Due to continuous improvement, all products specifications are subject to change without further notice.  
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