



Features:

- Data rate 155Mbps
- 1310nm FP laser and PIN photodetector for 15km transmission
- Digital diagnostic monitor interface compliant with SFF-8472
- SFP MSA package with duplex LC connector
- +3.3V single power supply
- Power consumption less than 1W
- Operating case temperature
Standard temp: -5~+70°C
Industrial temp: -40~+85°C
- RoHS compliant

Regulatory Compliance

Table 1 – Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2	Compliant with standard
Electromagnetic Interference (EMI)	FCC Part 15 Class B	Compliant with standard
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1,2	Compliant with Class I laser product.
RoHS	2011/65/EU	Compliant with RoHS

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	-	+3.6	V	
Operating Relative Humidity	RH	+5	-	+95	%	

Recommended Operating Conditions

Table 3 – Recommended Operating Conditions

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	Standard	T _C	-5	-	+70	°C	
	Industrial		-40	-	+85	°C	
Power Supply Voltage		V _{CC}	3.13	3.3	3.47	V	
Power Supply Current		I _{CC}	-	-	300	mA	
Power Dissipation		P _D	-	-	1	W	
Data Rate				155		Mbps	

Optical Characteristics

Table 4 – Optical Characteristics

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Centre Wavelength	λ _C	1261		1360	nm	
Average Output Power	P _{OUT}	-15		-8	dBm	1
Spectral Width (RMS)	Δλ			7.7	nm	
Extinction Ratio	EX	8.2			dB	
Jitter Generation (RMS)				0.01	UI	
Jitter Generation (pk-pk)				0.1	UI	
Optical Eye Mask	Compliant with Telcordia GR-253-CORE and ITU-T G.957					2
Receiver						
Centre Wavelength	λ _C	1260		1580	nm	
Receiver Sensitivity	P _{IN}			-28	dBm	3
Receiver Overload	P _{IN}	-8			dBm	3
Optical Path Penalty				1	dB	4
LOS Assert	LOS _A	-45			dBm	
LOS Deassert	LOS _D			-31	dBm	
LOS Hysteresis		0.5		4	dB	

Note:

1. The optical power is launched into SMF.
2. Measured with a PRBS 2²³-1 test pattern @155Mbps.
3. Measured with a PRBS 2²³-1 test pattern @155Mbps, BER ≤ 1 × 10⁻¹².
4. Measured with a PRBS 2²³-1 test pattern @155Mbps, over 15km G.652 SMF, BER ≤ 1 × 10⁻¹².

Electrical Characteristics

Table 5 – Receiver Optical Specifications

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Data Input Swing Differential	V_{IN}	500		2400	mV	1
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
Tx_DIS Disable	V_D	2.0		V_{CC}	V	
Tx_DIS Enable	V_{EN}	GND		GND+0.8	V	
TX_ Fault (Fault)		2.0		$V_{CC}+0.3$	V	
TX_ Fault (Normal)		0		0.8	V	
Receiver						
Data Output Swing Differential	V_{OUT}	370		2000	mV	1
Rx_LOS Fault	$V_{LOS-Fault}$	2.0		$V_{CC}+0.3$	V	
Rx_LOS Normal	$V_{LOS-Normal}$	GND		GND+0.8	V	

Notes:

- Internally AC coupled

Recommended Host Board Power Supply Circuit

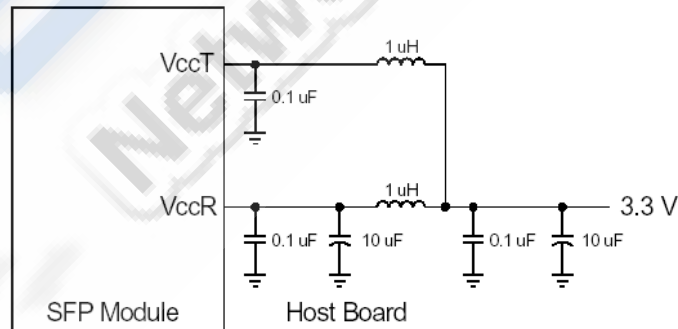


Figure 1, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

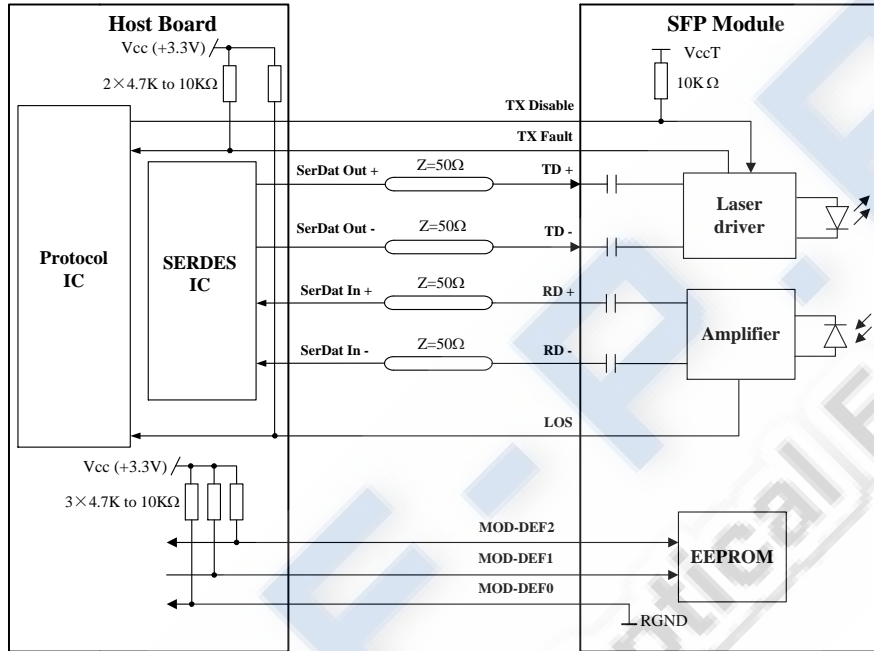


Figure 2, Recommended Interface Circuit

Pin Definitions

Figure 3 below shows the pin numbering of SFP electrical interface. The pin functions are described in Table 6 with some accompanying notes.

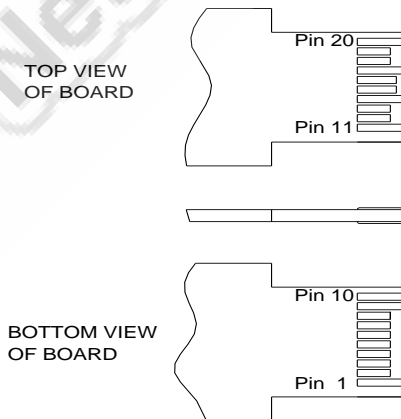


Figure 3, Pin View

Table 6 – Pin Definitions

Pin No.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2
4	MOD-DEF2	Module Definition 2	3	Note 3
5	MOD-DEF1	Module Definition 1	3	Note 3
6	MOD-DEF0	Module Definition 0	3	Note 3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	VeeR	Receiver Ground	1	
10	VeeR	Receiver Ground	1	
11	VeeR	Receiver Ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	VeeR	Receiver Ground	1	
15	VccR	Receiver Power	2	
16	VccT	Transmitter Power	2	
17	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	VeeT	Transmitter Ground	1	

Notes:

- TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:
 - Low (0~0.8V): Transmitter on
 - (>0.8V, <2.0V): Undefined
 - High (2.0~3.465V): Transmitter Disabled
 - Open: Transmitter Disabled
- MOD-DEF 0,1,2 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.
 - MOD-DEF 0 is grounded by the module to indicate that the module is present
 - MOD-DEF 1 is the clock line of two wires serial interface for serial ID
 - MOD-DEF 2 is the data line of two wires serial interface for serial ID
- LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; logic 1 indicates loss of signal. In the low state, the output will be pulled to less than 0.8V.
- These are the differential receiver output. They are internally AC-coupled 100Ω differential lines which

should be terminated with 100Ω (differential) at the user SERDES.

- These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module

Monitoring Specification

Follow SFF-8472 Rev 9.5.

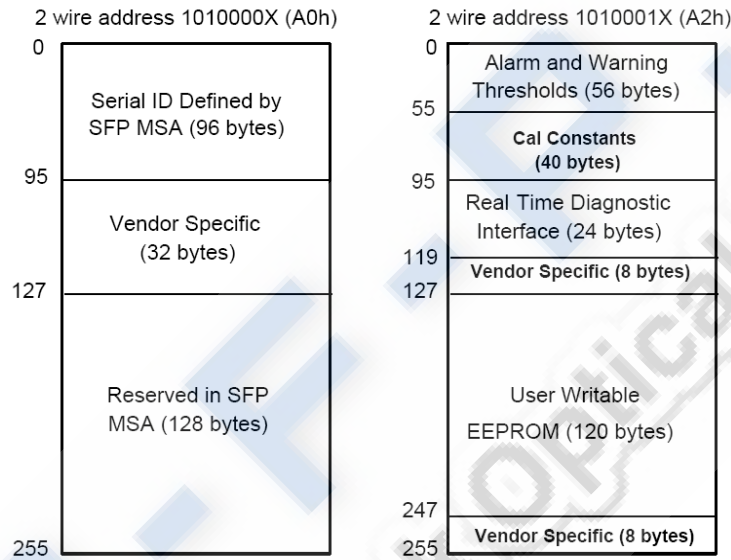


Figure 4, EEPROM Memory Map Specific Data Field Descriptions

Table 8- Monitoring Specification

Parameter		Range	Accuracy	Calibration
Temperature	Standard	-5 to 70°C	±3°C	External
	Industrial	-40 to 85°C	±3°C	External
Voltage		3.0 to 3.6V	±3%	External
Bias Current		0 to 80mA	±10%	External
TX Power		-16 to -7 dBm	±3dB	External
RX Power		-30 to -7 dBm	±3dB	External

Mechanical Diagram

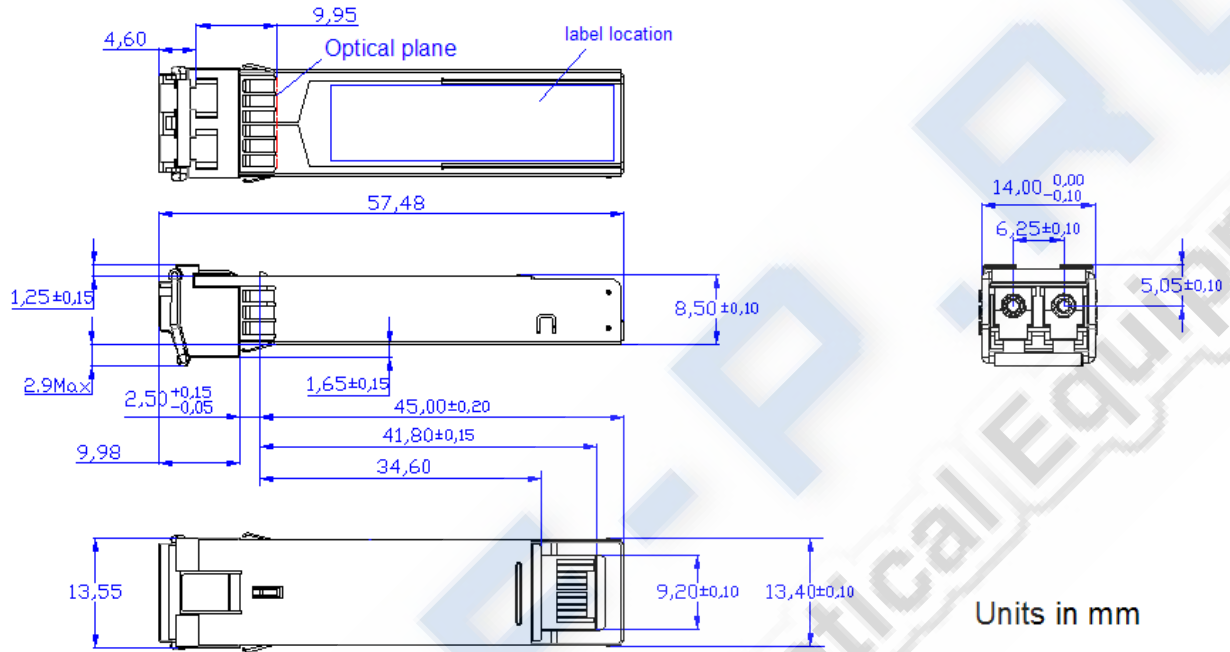


Figure 5, Mechanical Design Diagram of the SFP

Order Information

Table 9 – Order Information

Part No.	Application	Temperature	Data Rate	Laser Source	Fiber Type
SP-03-IR1-CDFO	SDH STM-1, S-1.1 SONET OC-3 IR1, 100BASE-LX10	-5~+70°C	155Mbps	1310nm FP	SMF
SP-03-IR1-IDFO	SDH STM-1, S-1.1 SONET OC-3 IR1, 100BASE-LX10	-40~+85°C	155Mbps	1310nm FP	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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