

# 1.25G 1310nm Duplex SFP Transceiver Module

## Features

- ✧ Operating data rate up to 1.25/1.063Gbps
- ✧ 1310nm FP LD Transmitter, 1310nm PIN-TIA
- ✧ Distance up to 20KM
- ✧ Single 3.3V Power supply and TTL Logic Interface
- ✧ Duplex LC Connector Interface
- ✧ Hot Pluggable
- ✧ Operating Case Temperature  
Standard: 0°C~+70°C;Industrial:-40°C~+85°C
- ✧ Compliant with MSA SFP Specification
- ✧ Digital diagnostic monitor interface compatible with SFF-8472 and DDM optional

## Applications

- ✧ Gigabit Ethernet Switches and Routers
- ✧ Fiber Channel Switch Infrastructure
- ✧ XDSL Applications
- ✧ Metro Edge Switching

## Product Description

The SFP SM series single mode transceivers is small form factor pluggable module for bi-directional serial optical data communications such as Gigabit Ethernet 1000BASE-LX and Fibre Channel 1x SM-LC-L FC-PI. It is with the SFP 20-pin connector to allow hot plug capability. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm.

The transmitter section uses a multiple quantum well laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

The SFP SM (I) series are designed to be compliant with SFF-8472 SFP Multi-source Agreement (MSA) and Industry working temperature.

Laser Eye Safety

Class 1 Laser Product as defined by the Internal Standard IEC 60825-

1: 2014 and by USA regulations for class 1 products per CDRH 21 CFR 1040.1 and 1040.11.

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T <sub>S</sub>	-40	+85	°C
Supply Voltage	V <sub>CC</sub>	-0.5	3.6	V

## Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Temperature	T <sub>A</sub>	Standard	0	+70	°C
		Industrial	-40	+85	
Power Supply Voltage	V <sub>CC</sub>	3.15	3.3	3.45	V
Data Rate	Giga Ethernet		1.25		Gbps
	Fiber Channel		1.063		
Total Supply Current	I <sub>CC</sub>			300	mA

## PERFORMANCE SPECIFICATIONS - ELECTRICAL

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>TRANSMITTER</b>						
CML/PECL Inputs (Differential)	V <sub>in</sub>	400		1800	mVpp	AC coupled inputs
Input Impedance (Differential)	Z <sub>in</sub>	90	100	110	ohms	R <sub>in</sub> > 100 kohms @ DC
Tx_DISABLE Input Voltage - High		2		3.45	V	
Tx_DISABLE Input Voltage - Low		0		0.8	V	
Tx_FAULT Output Voltage -- High		V <sub>CC</sub> -0.5		V <sub>CC</sub> +0.3	V	I <sub>o</sub> = 400µA; Host V <sub>CC</sub>
Tx_FAULT Output Voltage -- Low		0		0.5	V	I <sub>o</sub> = -4.0mA
TX_Disable Assert Time	t <sub>off</sub>			10	usm	
TX_Disable Negate Time	t <sub>off</sub>			1	usm	
<b>RECEIVER</b>						

CML Outputs (Differential)	V <sub>out</sub>	370		1800	mVpp	AC coupled outputs
Output Impedance (Differential)	Z <sub>out</sub>	90	100	110	ohms	
Rx_LOS Output Voltage - High		V <sub>cc</sub> -0.5		V <sub>cc</sub> +0.3	V	I <sub>o</sub> = 400μA; Host V <sub>cc</sub>
Rx_LOS Output Voltage - Low		0		0.8	V	I <sub>o</sub> = -4.0mA

## SFP Transceiver Electrical Pad Layout

**Figure 1 Transceiver pin descriptions**

### Pin Function Definitions

Pin Number	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, Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	Note 3, Data line for Serial ID.
5	MOD-DEF1	Module Definition 1	3	Note 3, Clock line for Serial ID.
6	MOD-DEF0	Module Definition 0	3	Note 3, Grounded within the module.
7	Rate Select	Not Connect	3	Function not available
8	LOS	Loss of Signal	3	Note 4
9	VeeR	Receiver Ground	1	Note 5
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	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. Pull up voltage between 2.0V and  $V_{ccT}$ ,  $R+0.3V$ . When high, this output indicates the received optical power is 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)  $V_{eeR}$  and  $V_{eeT}$  may be internally connected within the SFP module.

6) RD-/+: These are the differential receiver outputs. They are AC coupled  $100\Omega$  differential lines which should be terminated with  $100\Omega$  (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)  $V_{ccR}$  and  $V_{ccT}$  are the receiver and transmitter power supplies. They are defined as  $3.3V \pm 5\%$  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.  $V_{ccR}$  and  $V_{ccT}$  may be internally connected within the SFP transceiver module.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with  $100\Omega$  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 – 600mV single-ended) be used for best EMI performance.

## **Digital Diagnostic Memory Map**

**Figure 2 Digital Diagnostic Memory Map**

**Recommend Circuit Schematic**

**Figure 3 Recommend Circuit Schematic**

**Mechanical Specifications**

