

Product Specification

SFP RJ45 10/100/1000 Transceiver



Product features

- Compliant with MSA SFP specification
- Die cast metal housing
- Single +3.3V power supply
- Serial ID functionality
- Bail latch style ejector mechanism
- TDR functionality support
- Auto MDI/MDIX crossover
- Shunt Auto Transformer
- Compatible with CAT 5 cable in excess of 100M in length
- 10/100/1000 BASE-T operation in host systems with SGMII interface

Operate condition

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Voltage	VccT, VccR	3.1	3.3	3.5	V
Current	I			300	mA ^[1]
Surge Current	I _{surge}			30	mA ^[2]
Power Consumption	P			1	W
Operating Temperature	T	0		70	C

Notes:

- [1] Steady State
[2] Hot Plug

Host Board Interface

The table below shows the host interface signals and their functions.

Pin Function Definitions.

Pin	Name	FUNCTION	Plug Seq.
1	VeeT	Transmitter Ground ^[1]	1
2	TX_FAULT	Transmitter Fault Indication ^[2]	2
3	TX_DISABLE	Transmitter Disable ^[4]	3
4	MOD DEF (2)	Module Definition 2 ^[5]	3
5	MOD DEF (1)	Module Definition 1 ^[6]	3
6	MOD DEF (0)	Module Definition 0 ^[7]	3
7	RATE SELECT	Not Implemented ^[8]	3
8	LOS	Loss of Signal ^[9]	3
9	VeeR	Receiver Ground ^[1]	1
10	VeeR	Receiver Ground ^[1]	1
11	VeeR	Receiver Ground ^[1]	1
12	RD-	Inverted Received Data out ^[3]	3
13	RD+	Non-Inverted Received Data out ^[3]	3
14	VeeR	Receiver Ground ^[1]	1
15	VccR	Receiver Power ^[1]	2
16	VccT	Transmitter Power ^[1]	2
17	VeeT	Transmitter Ground ^[1]	1
18	TD+	Non-inverted Data In ^[3]	3
19	TD-	Inverted Data In ^[3]	3
20	VeeT	Transmitter Ground ^[1]	1

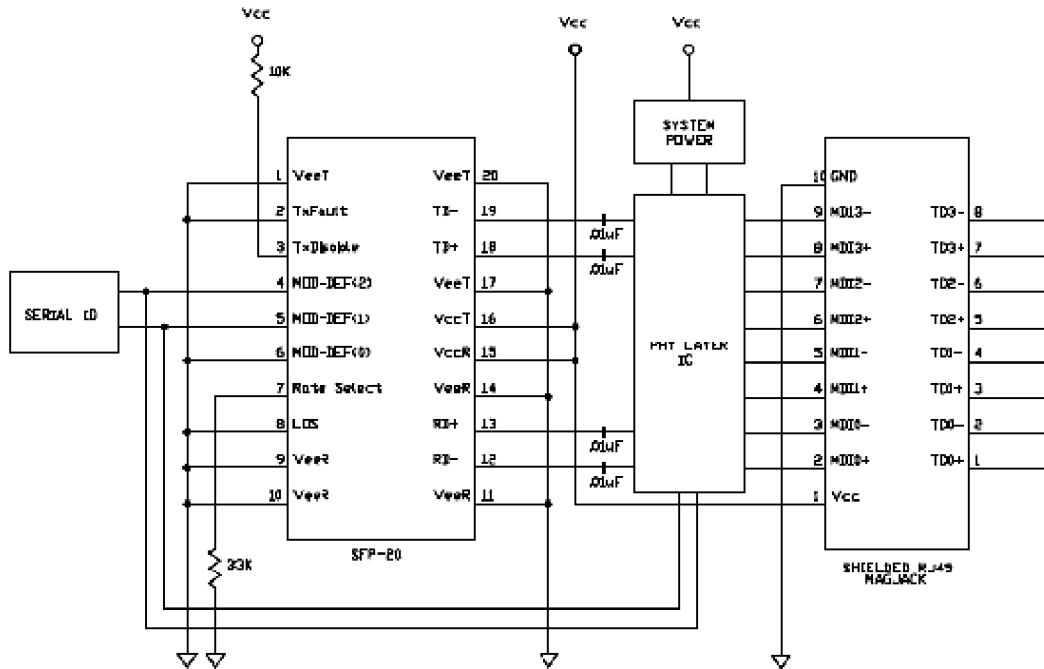
Notes:

- [1] VeeT and VeeR are connected in SFP.
- [2] Not Implemented. Tied to VeeT in SFP.
- [3] AC coupled 100 ohm differential high speed data lines.
- [4] See TX Disable.
- [5] Data Line for Serial ID and Bidirectional Data Transfer bus.
- [6] Clock Line for Serial ID and Bidirectional Data Transfer bus.
- [7] Tied to Vee in SFP.
- [8] Not implemented. 33K pulldown to Vee in SFP.
- [9] See LOS option.

Block diagram

The RJ45 Gigabit Ethernet pluggable transceiver module is a high performance integrated duplex data link for bi-directional communication over CAT 5 unshielded twisted pair

copper cable. It is compliant with the MSA Small Form Factor Pluggable (SFP) specification. The RJ45 transceiver is specifically designed for high speed Gigabit Ethernet data links at 1.25 Gbaud. The transceiver is hot pluggable and operates at +3.3V.



TX Disable

Pulled up to Vcc with 10K ohm resistor in SFP. For normal operation the Host must hold the TX Disable input low. An open or high input to the SFP holds the PHY in reset. The reset condition is removed 175ms after TX Disable goes low.

LOS Option

The SFP MSA specification defines a pin called LOS to indicate loss of signal to the motherboard. This is an output of the SFP module and an input to the motherboard. Eflow's 1000Base-T copper SFP Transceiver normally comes with the LOS signal connected to ground. The transceiver can be ordered with this signal connected to the LED_Link1000 output of the PHY to indicate a good link.

Bi-directional Data Transfer Bus

The Eflow 1000 Base-T Copper SFP Transceiver supports a bi-directional data transfer bus (BDT) to communicate with the PHY. The BDT operates with the same serial data line (SDA -MOD_DEF^[2]) and serial clock line (SCL MOD_DEF^[1]) that are used for serial identification. The device address for the PHY is 1010110X binary. The SDA is a bi-directional line while

the SCL line is not. Both of the bus interface lines are high when the bus is inactive. The PHY operates as the Slave port of the bus interface and all references to Slave refer to the PHY. The PHY BDT features are

- 7 bit device addresses / 8 bit data transfers
- 100 Kbps mode
- 400 Kbps mode

Termination Circuits

Inputs to the transceiver are AC coupled and internally terminated through 50 ohms. These modules can operate with PECL or ECL logic levels. The input signal must have at least a 325mV peak-to-peak (single ended) signal swing. Output from the receiver section of the module is also AC coupled and is expected to drive a 50 ohm load. Different termination strategies may be required depending on the particular Serializer/Deserializer chip set used. The transceiver is designed with AC coupled data inputs and outputs to provide the following advantages:

- Close positioning of SERDES with respect to transceiver;
- allows for shorter line lengths and at Gigabit speeds reduces EMI.
- Minimum number of external components. Internal termination reduces the potential for unterminated stubs which would otherwise increase jitter and reduce transmission margin. Subsequently, this affords the customer the ability to optimally locate the SERDES as close to the transceiver as possible and save valuable real estate. At Gigabit rates this can provide a significant advantage resulting in better transmission performance and accordingly better signal integrity.

Power Coupling

A suggested layout for power and ground connections is given in Figure 1 below. Connections are made via separate voltage and ground planes. The mounting posts are at case ground and should not be connected to circuit ground. The ferrite bead should provide a real impedance of 50 to 100 ohms at 100 to 1000 MHz. Bypass capacitors should be placed as close to the 20 pin connector as possible.

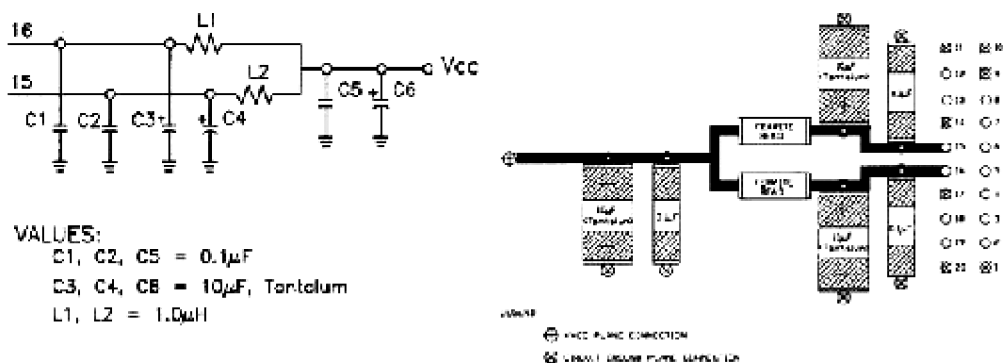


Figure 1: Suggested Power Coupling

Mechanical Description

The transceiver shall be compliant with common SFP mechanical outline 1000Base-T SFP Transceiver Dimensions. Figure 2 Illustrates the Mechanical Dimensions of the Transceiver

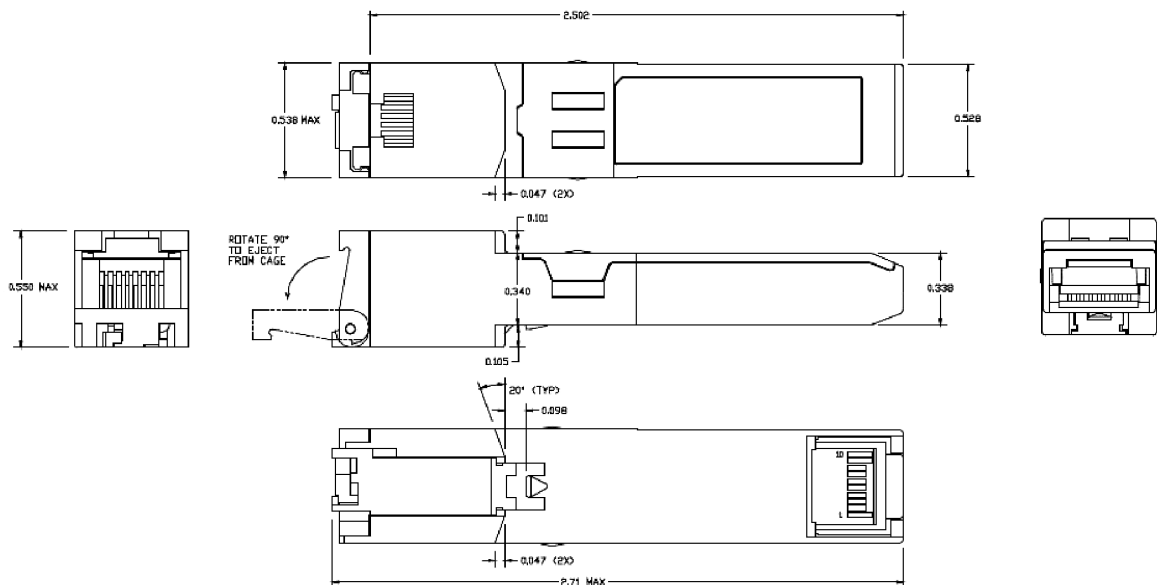


Figure 2 Mechanical Dimensions of Transceiver

Mating of SFP Transceiver to SFP Host Board Connector

The pads on the PCB of the SFP transceiver shall be designed for a sequenced mating as follows:

- First mate: Ground contacts
- Second mate: Power contacts
- Third mate: Signal contacts

The SFP MSA specification for a typical contact pad plating for the PCB is 0.38 micrometers minimum hard gold over 1.27 micrometers minimum thick nickel. To ensure the long term reliability performance after a minimum of 50 insertion removal cycles, the contact plating of the transceiver is 0.762 micron (30 microinches) over 3.81 micron (150 microinches) of Ni on Cu contact pads.

RJ45 Connector

RJ45 connector shall support shielded and unshielded cables. Also, the connector is mechanically robust enough and designed to prevent loss of link, when the cable is positioned or moves in different angles. The connector shall pass the «wiggle» RJ45 connector operational stress test. During the test, after the cable is plugged in, the cable is moved in circle to cover all 360 deg in the vertical plane, while the data traffic is on. There shall be no link or data loss.