

XSFP-T-RJ12-0101 1000Base-T Copper SFP Transceiver



Product Overview

The electrical Small Form Factor Pluggable (SFP) transceiver module is specifically designed for the high performance integrated full duplex data link at 1.25Gbps over four pair Category 5 UTP. The transceiver module is compliant with the SFP MultiSource Agreement (MSA) and IEEE802.3:2002. With the hot pluggability, the module offers a flexible and easy way to be installed into SFP MSA compliant ports at any time without the interruption of the host equipments operating online.

The 1000Base-T electrical SFP transceivers use an integrated RJ-45 connector with transformer and PHY IC. The link length is up to 100m over four pair Category 5 UTP cabling

Applications

- 1000Base-T Gigabit Ethernet switch to switch interface
- 10/100/1000 BASE-T operation in host system and specified switch with SGMII interface.
- Gigabit Media Converter
High speed I/O for file server

Production Selection

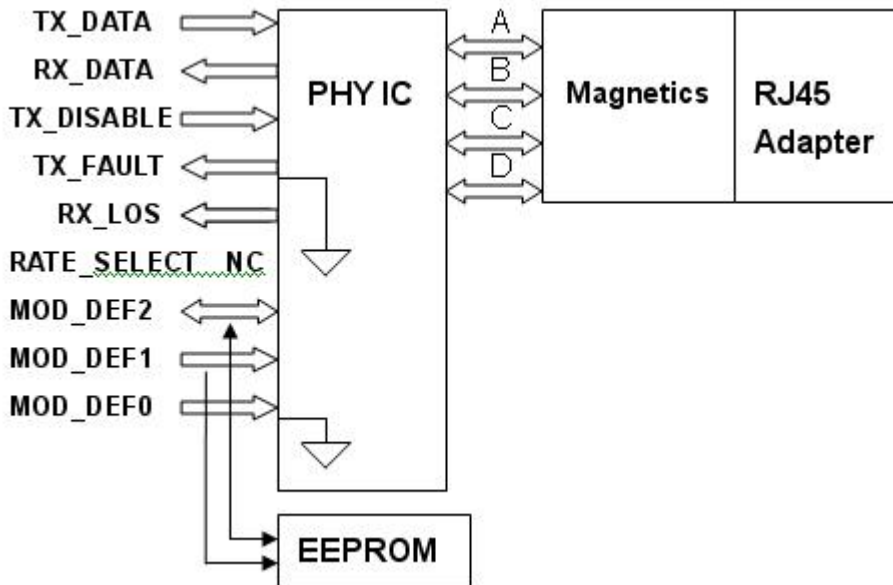
- XSFP-T-RJ12-0101: 1000BASE-T Copper SFP with SERDES interface, operation temperature range 0°C ~ 70°C, support RX_LOS indication function and disable auto-negotiation

Features

- Hot pluggable
- Industry-Standard MSA-Compliant, Small Form Factor Pluggable
- Compatible with IEEE 802.3:2002
- Single 3.3V power supply operation and low power dissipation
- Integrated RJ-45 connector with transformer
- Link length up to 100m at 1.25Gbps with four pair Category 5 UTP cabling
- Auto-negotiation 1000Base-X and 1000Base-T
- Auto-detect MDI/MDI-X
- Access to EEPROM and PHY IC via 2-wire serial bus at address ACh.

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Block diagram



The transceiver is fundamentally consisted by three parts: RJ45+Magnetics, PHY IC and EEPROM. The transceiver module can be turned on by setting TX_DISABLE = LOW and can be reset by setting TX_DISABLE =High or OPEN. TX_FAULT is not supported in Copper products and always connected to ground. For the access of serial identification information, an EEPROM is used to store the required data via the 2-wire serial CMOS EEPROM protocol. The detailed signal descriptions are listed in the following sections. The registers of PHY IC are also accessible via the 2-wire serial CMOS EEPROM protocol at address ACh.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T _{OP}	0	70	°C	
Storage Temperature	T _{st}	- 40	85	°C	1
Supply Voltage	V _{cc}	- 0.5	3.6	V	
Supply Current	I _s		375	mA	
Inrush Current	I _{sh}		30	mA	
Relative Humidity	RH	5	95	%	

Notes:

1. Ambient Temperature



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Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Temperature	T _{OP}	0		70	°C	
Supply Voltage		3.15	3.3	3.45	V	
Supply Current	I _S		300	350	mA	

High-Speed Electrical Interface, Host to SFP

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
TD+, TD- Input Voltage Swing	V _{in+} , V _{in-}	250		1200	mV	2
RD+, RD- Output Voltage Swing	V _{out+} , V _{out-}	250		800	mV	2
Rise Time (Receiver)	t _r		180	250	ps	1
Fall Time (Receiver)	t _f		180	250	ps	1
Tx Input Impedance	Z _{in}		50		Ohm	2
Rx Output Impedance	Z _{out}		50		Ohm	2

Notes:

- 1.20% to 80% value
- 2.Single ended

High-Speed Electrical Interface, Cable to SFP

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmission Frequency	f _t		125		MHz	1
Tx Output Impedance	Z _{out.Tx}		100		Ohm	2
Rx Output Impedance	Z _{in.Rx}		100		Ohm	2

Notes:

1. 4D-PAM-5 encoding per IEEE802.3: 2002
2. Differential for frequencies from 1MHz to 125MHz

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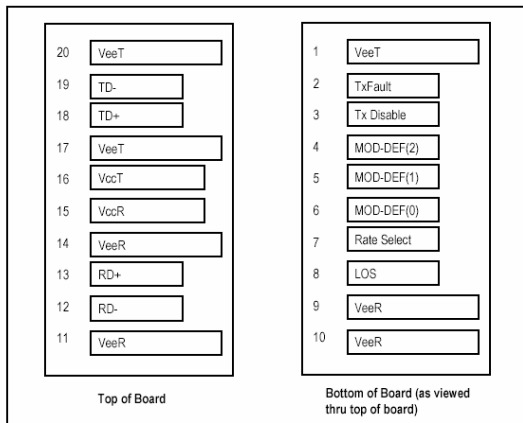
General Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Data Rate	DR		1000		Mb/sec	1
Bit Error Rate	BER			10 ⁻¹⁰		2

Notes:

- 1.10/100/1000 BASE-T operation requires the host system to have an SGMII interface with no clocks and the module PHY to be configured by user.
- 2.100m Cat 5 UTP Cable per 802.3:2002

Pin Description



SFP Transceiver Electric Pad Layout

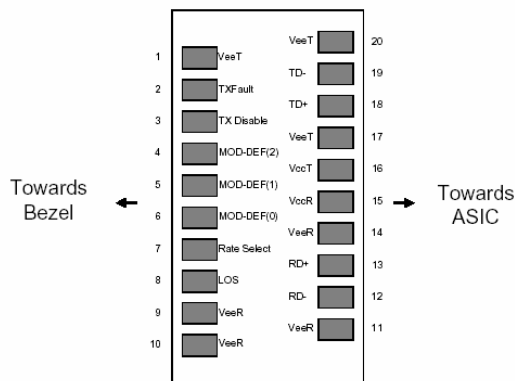


Diagram of Host Board Connector Block
Pin Numbers and Names

Pin No	Pin Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	1
3	TX Disable	Transmitter Disable	3	2
4	MOD_DEF 2	Module Definition 2	3	3
5	MOD_DEF 1	Module Definition 1	3	3
6	MOD_DEF 0	Module Definition 0	3	3
7	Rate Select	Select between full or reduced receiver bandwidth	3	4
8	RX_LOS	Receiver Loss of Signal	3	5
9	VeeR	Receiver Ground	1	6
10	VeeR	Receiver Ground	1	6
11	VeeR	Receiver Ground	1	6

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Pin No	Pin Name	Function	Plug Seq.	Notes
12	RD -	Inv. Received Data Out	3	7
13	RD +	Received Data Out	3	7
14	VeeR	Receiver Ground	1	6
15	VccR	Receiver Power	2	8
16	VccT	Transmitter Power	2	8
17	VeeT	Transmitter Ground	1	6
18	TD +	Transmit Data In	3	9
19	TD -	Inv. Transmit Data In	3	9
20	VeeT	Transmitter Ground	1	6

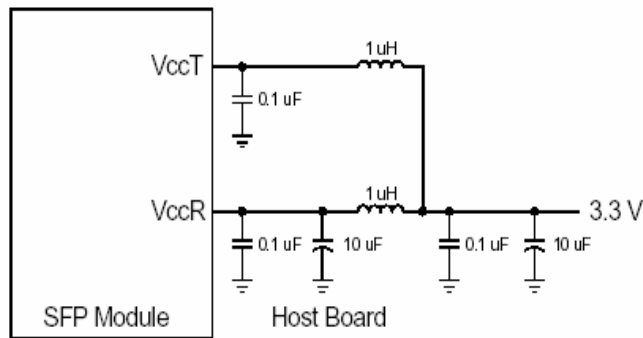
Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

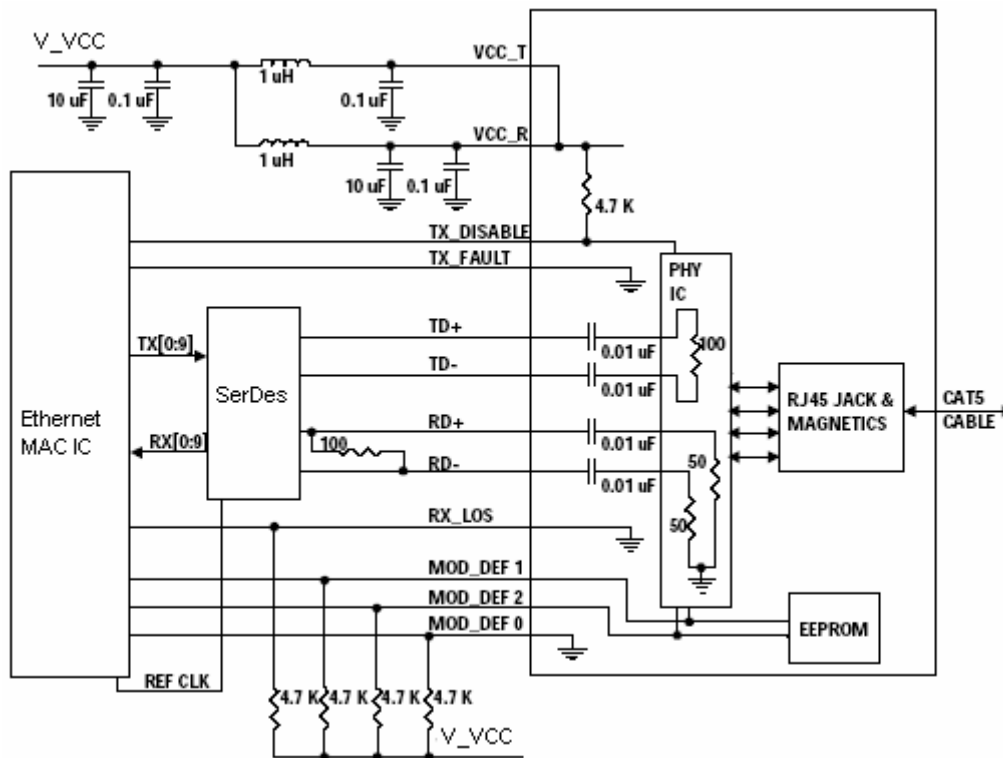
1. TX Fault is not supported.
2. TX disable, an input used to reset the transceiver module, is pulled up within the module with a 4.7 – 10 K. resistor. Its states are:
 Low (0 – 0.8V): transceiver module on.
 (>0.8, < 2.0V): Undefined.
 High (2.0 – 3.465V): transceiver module disabled.
 Open: transceiver module disabled.
3. Mod-Def 0,1,2, are the module definition pins which should be pulled up with a 4.7K - 10K resistor on the host board. The pull-up voltage shall be VccT or VccR.
 Mod-Def 0 is grounded in 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. Rate select is not required for connection.
5. RX_LOS (Loss of Signal): LVTTTL compatible with a maximum voltage of 2.5V.
6. VeeR and VeeT may be internally connected within the SFP module.
7. RD-/+, the differential receiver outputs, are AC coupled 100Ω differential lines which should be terminated with 100 Ω differential at the user SerDes. The AC coupling is done inside the module, thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 mV- 1000 mV single ended) when properly terminated.
8. VccR and VccT are the receiver and transmitter power supplies defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 350 mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 Ω 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 30 mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
9. TD-/+, the differential transmitter inputs, are AC-coupled differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module, thus not required on the host board. The inputs will accept differential swings of 500 – 2400mV (250 mV - 1200 mV single ended), though it is recommended that values between 500 and 1200mV differential (250 – 600mV single ended) be used for best EMI performance.

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Recommended Host Board Supply Filtering Network



SFP Host Board Schematic



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1000Base-T Copper SFP Transceiver

Mechanical Dimensions (Units in mm)

