LP-SFP-TMRI

Copper SFP Transceiver

Features

- Up to 1.25Gb/s bi-directional data links
- Hot-pluggable SFP footprint
- Fully metallic enclosure for low EMI
- Low power dissipation (1.05 W typical)
- Compact RJ-45 connector assembly
- Access to physical layer IC via 2-wire serial bus
- 1000 BASE-T operation in host systems with SERDES interface
- 10/100/1000Mbps compliant in host systems with SGMII interface
- Operating case temperature:

  Commercial : 0 to +70°C

  Industrial: -40 to +85°C

Applications

- 1.25 Gigabit Ethernet over Cat 5 cable

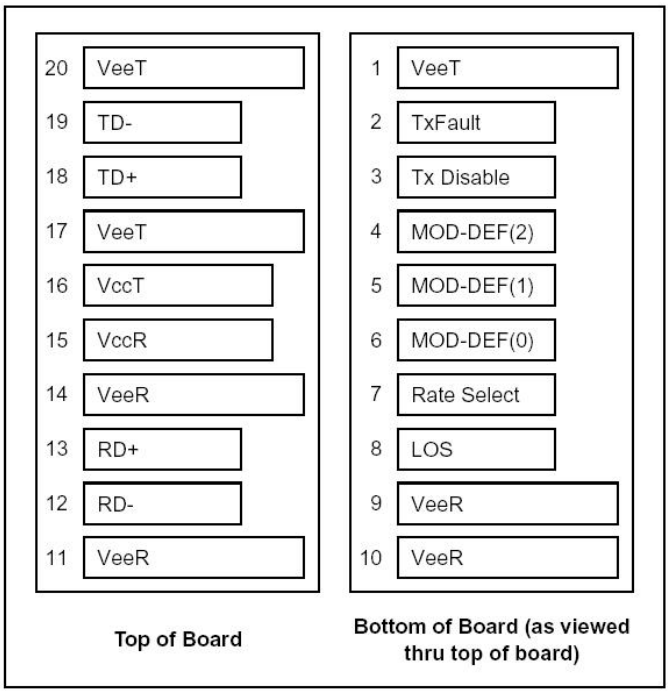
Description

The Copper SFP Transceiver 10/100/1000Base-T or 1000Base-T only SFP Copper Transceiver is high performance, cost effective module, compliant with the Gigabit Ethernet and 1000BASE-T standards as specified in IEEE 802. 3-2002 and IEEE 802.3ab, which supports 1000Mb/s data-rate up to 100 meters reach over twisted-pair category 5 cable.

The module supports 1000 Mbps full duplex data-links with 5-level Pulse Amplitude Modulation (PAM) signals. All four pairs in the cable are used with symbol rate at 250Mbps on each pair. The module provides standard serial ID information compliant with SFP MSA, which can be accessed with address of A0h via the 2wire serial CMOS EEPROM protocol. The physical IC can also be accessed via 2wire serial bus at address A0h.

Pin Definitions

Pin Diagram



Pin Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	V_{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note1
3	TX DISABLE	Transmitter Disable	3	Note2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note3
6	MOD_DEF(0)	TTL Low	3	Note3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	V_{EER}	Receiver ground	1	
10	V_{EER}	Receiver ground	1	
11	V_{EER}	Receiver ground	1	
12	RX-	Inv. Received Data Out	3	Note 5
13	RX+	Received Data Out	3	Note 5
14	V_{EER}	Receiver ground	1	
15	V_{CCR}	Receiver Power Supply	2	
16	V_{CCT}	Transmitter Power Supply	2	

17	V_{EET}	Transmitter Ground	1	
18	TX+	Transmit Data In	3	Note 6
19	TX-	Inv. Transmit Data In	3	Note 6
20	V_{EET}	Transmitter Ground	1	

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

1) 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.
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 ¨C 10 K resistor. Its states are:
   Low (0 to 0.8V): Transmitter on
   (>0.8, < 2.0V): Undefined
   High (2.0 to 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 to 10K 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 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 to 10K resistor. Pull up voltage between 2.0V and VccT, 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) RD-/+: These are the differential receiver o utputs. They are AC coupled 100 differential lines which should be terminated with 100 (differential) at the user SERDES.
6) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential termination inside the module.

Electrical Power Interface

The LP-SFP-xxxx has an input voltage range of +5V +/- 5%. The 3.3V maximum voltage is not allowed for continuous operation.

Table 1. +3.3V Volt electrical power interface

+3.3V volt Electrical Power Interface						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Supply Current	Is		320	375	mA	1.2W max power over full range of voltage and temperature. See caution note below
Input Voltage	Vcc	3.13	3.3	3.47	V	Referenced to GND
Maximum Voltage	Vmax			4	V	
Surge Current	Isurge			30	mA	Hot plug above steady state current. See caution note below

Caution: Power consumption and surge current are higher than the specified values in the SFP MSA

Low-Speed Signals

MOD_DEF(1) (SCL) and MOD_DEF(2) (SDA), are open drain CMOS signals (see section VII, "Serial Communication Protocol"). Both MOD_DEF(1) and MOD_DEF(2) must be pulled up to host_Vcc

Table 2. Low-speed signals, electronic characteristics

Low-Speed Signals, Electronic Characteristics					
Parameter	**Symbol**	**Min**	**Max**	**Units**	**Notes/Conditions**
SFP Output LOW	VOL	0	0.5	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector
SFP Output HIGH	VOH	host_Vcc - 0.5	host_Vcc + 0.3	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector
SFP Input LOW	VIL	0	0.8	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector
SFP Input HIGH	VIH	2	Vcc + 0.3	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector

High-Speed Electrical Interface

All high-speed signals are AC-coupled internally.

Table 3. High-speed electrical interface, transmission line-SFP

High-Speed Electrical Interface Transmission Line-SFP						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Line Frequency	fL		125		MHz	5-level encoding, per IEEE 802.3
Tx Output Impedance	Zout,TX		100		Ohm	Differential, for all Frequencies between 1MHz and 125MHz
Rx Input Impedance	Zin,RX		100		Ohm	Differential, for all Frequencies between 1MHz and 125MHz

High-speed electrical interface, host-SFP

Table 4. High-speed electrical interface, host-SFP

High-Speed Electrical Interface, Host-SFP						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Single ended data input swing	Vinsing	250		1200	mV	Single ended
Single ended data output swing	Voutsing	350		800	mV	Single ended
Rise/Fall Time	Tr,Tf		175		psec	20%-80%
Tx Input Impedance	Zin		50		Ohm	Single ended
Rx Output Impedance	Zout		50		Ohm	Single ended

General Specifications

Table 5. General specifications

General						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Data Rate	BR	10		1,000	Mb/sec	IEEE 802.3 compatible. See Notes 2 through 4 below
Cable Length	L			100	m	Category 5 UTP. BER <10-12

Notes:

1. Clock tolerance is +/- 50 ppm
2. By default, the LP-SFP-xx is a full duplex device in preferred master mode
3. Automatic crossover detection is enabled. External crossover cable is not required
4. 1000 BASE-T operation requires the host system to have an SGMII interface with no clocks, and the module PHY to be configured per Application Note AN-2036. With a SERDES that does not support SGMII, the module will operate at 1000BASE-T only.

Environmental Specifications

Table 6. Environmental specifications

Environmental Specifications						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Operating Temperature	C	0		70	°C	Commercial Case temperature
	I	-40		85	°C	Industry Case temperature
Storage Temperature	Tsto	-40		85	°C	Ambient temperature

References

1. Gigabit Interface Converter (SFP) Transceiver Multi-Source Agreement (MSA),
2. IEEE Std 802.3, 2002 Edition. IEEE Standards Department, 2002.
3. "24C01A/02/04/08/16 2-Wire Serial CMOS E2PROM".
4. "Alaska Ultra 88E1111 Integrated 10/100/1000M Gigabit Ethernet Transceiver",Marvell Corporation.

Mechanical Specifications

The host-side of the LP-SFP-xx conforms to the mechanical specifications outlined in the SFP MSA1. The front portion of the SFP (part extending beyond the face plate of the host) is larger to accommodate the RJ-45 connector.

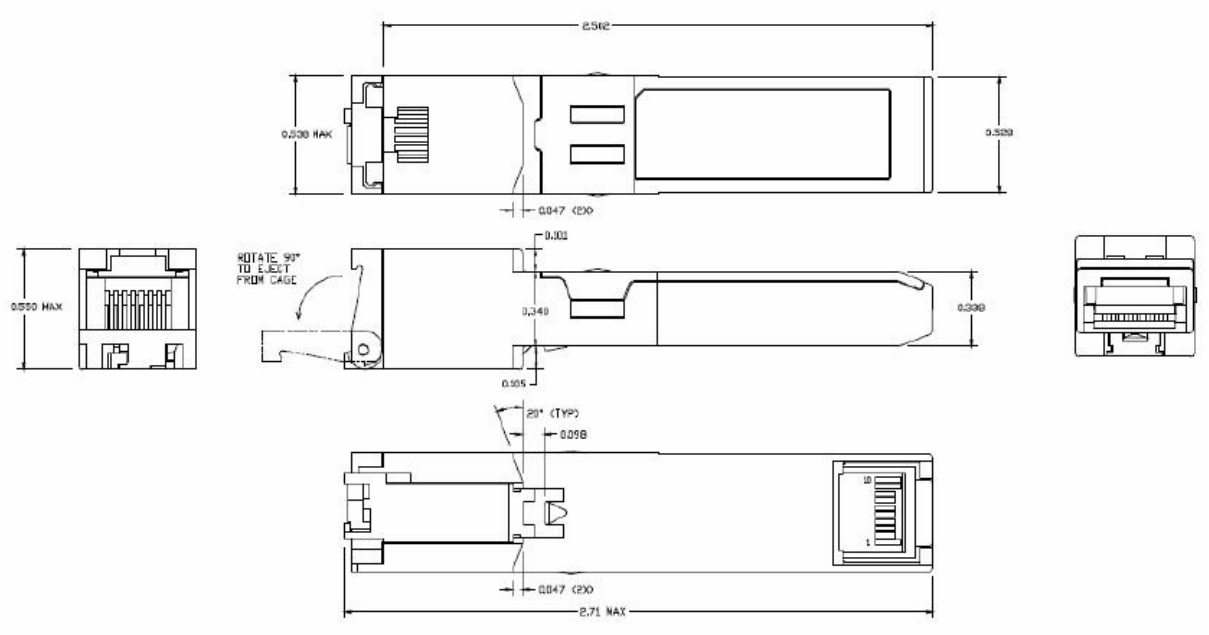


Figure 2. mechanical dimensions

References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA),
2. IEEE Std 802.3, 2002 Edition. IEEE Standards Department, 2002.
3. "24C01A/02/04/08/16 2-Wire Serial CMOS E2PROM".

Ordering information

Part Number	Description
LP-SFP-TMRC	10/100/1000Mbps, SGMII interface, Copper SFP with spring latch, 0~70℃, Realtek RTL8213B
LP-SFP-MSRC	1000Mbps only, SERDES interface, Copper SFP with spring latch, 0~70℃,Realtek RTL8213B
LP-SFP-TM8C	10/100/1000Mbps, SGMII interface, Copper SFP with spring latch, 0~70℃, Marvel 88E1111
LP-SFP-MS8C	1000Mbps only, SERDES interface, Copper SFP with spring latch, 0~70℃, Marvel 88E1111
LP-SFP-TMRI	10/100/1000Mbps, SGMII interface, Copper SFP with spring latch, -40~85℃,Realtek RTL8213B
LP-SFP-MSRI	1000Mbps only, SERDES interface, Copper SFP with spring latch, -40~85℃,Realtek RTL8213B
LP-SFP-TM8I	10/100/1000Mbps, SGMII interface,Copper SFP with spring latch,-40~85℃,Marvel 88E1111
LP-SFP-MS8I	1000Mbps only, SERDES interface,Copper SFP with spring latch, -40~85℃, Marvel 88E1111

NOT: All SFP module have Tx-disable and Rx_los function default.

The SFP with Marvel 88E1111 IC may divided into below PN. The module have Tx-disable, Rx_los or not, can be customized.

Part Number	Description	Speed	Tx-disable	Rx_LOS
LP-SFP-TM8CNN	10/100/1000Mbps, with SGMII interface, enable the auto-negotiation default, without Tx-disable function, Not support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃., Marvel 88E1111	10/100/1000 Mbps	NO	NO
LP-SFP-TM8INN	10/100/1000Mbps, with SGMII interface, enable the auto-negotiation default, without Tx-disable function, Not support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature -40～85℃., Marvel 88E1111	10/100/1000 Mbps	NO	NO
LP-SFP-MS8CNY	1000Mbps, with 1Gbps SerDes interface, enable the auto-negotiation default, without Tx-disable function , support Rx-LOS as link indication function,nshielded twisted-pair (UTP) Category 5 Cable ,Transmission Distance 0.1Km,Temperature 0～70℃., Marvel 88E1111	1000Mbps	NO	YES
LP-SFP-MS8INY	1000Mbps, with 1Gbps SerDes interface, enable the auto-negotiation default, without Tx-disable function , support Rx-LOS as link indication function,nshielded twisted-pair (UTP) Category 5 Cable ,Transmission Distance 0.1Km,Temperature -40～85℃., Marvel 88E1111	1000Mbps	NO	YES
LP-SFP-MS8CNN	1000Mbps, with 1Gbps SerDes interface, enable the auto-negotiation default,without Tx_disable function, Not support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃., Marvel 88E1111	1000Mbps	NO	NO
LP-SFP-MS8INN	1000Mbps, with 1Gbps SerDes interface, enable the auto-negotiation default,without Tx_disable function, Not support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature -40～85℃., Marvel 88E1111	1000Mbps	NO	NO
LP-SFP-TM8CNY	10/100/1000Mbps, with SGMII interface, enable the auto-negotiation default, without Tx-disable function, support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃, Marvel 88E1111	10/100/1000 Mbps	NO	YES
LP-SFP-TM8INY	10/100/1000Mbps, with SGMII interface, enable the auto-negotiation default, without Tx-disable function, support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature -40～85℃, Marvel 88E1111	10/100/1000 Mbps	NO	YES
LP-SFP-TM8CYN	10/100/1000Mbps, with SGMII interface, enable the auto-negotiation default, with Tx_disable function, not support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃, Marvel 88E1111	10/100/1000 Mbps	YES	NO
LP-SFP-TM8CYN	10/100/1000Mbps, with SGMII interface, enable the auto-negotiation default, with Tx_disable function, not support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃, Marvel 88E1111	10/100/1000 Mbps	YES	NO
LP-SFP-MS8CYY	1000Mbps, with 1Gbps SerDes interface, enable the auto-negotiation default, with Tx_disable function,support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃, Marvel 88E1111	1000Mbps	YES	YES
LP-SFP-MS8IYY	1000Mbps, with 1Gbps SerDes interface, enable the auto-negotiation	1000Mbps	YES	YES

	default, with Tx_disable function,support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature -40～85℃, Marvel 88E1111			
LP-SFP-MS8CYN	1000Mbps, with 1Gbps SerDes interface, enable the auto-negotiation default, with Tx_disable function, not support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃, Marvel 88E1111	1000Mbps	YES	NO
LP-SFP-MS8CYN	1000Mbps, with 1Gbps SerDes interface, enable the auto-negotiation default, with Tx_disable function, not support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃, Marvel 88E1111	1000Mbps	YES	NO
LP-SFP-TM8CYY	10/100/1000Mbps, with SGMII interface, enable the auto-negotiation default,with Tx_disable function, support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature 0～70℃, Marvel 88E1111	10/100/1000 Mbps	YES	YES
LP-SFP-TM8IYY	10/100/1000Mbps, with SGMII interface, enable the auto-negotiation default,with Tx_disable function, support Rx_LOS as link indication function,unshielded twisted-pair (UTP) Category 5 Cable,Transmission Distance 0.1Km,Temperature -40～85℃, Marvel 88E1111	10/100/1000 Mbps	YES	YES