

# 1000BASE-T Copper SFP Transceiver

## (For 100m reach over cat 5 UTP cable)



AMXP-24RJX

### Features:

- Up to 1.25Gb/s bi-directional data links
- SFP form with compact RJ-45 connector
- Single + 3.3V Power Supply, Low Power dissipation
- 10/100/1000 BASE-T operation in host systems with SGMII interface
- Intelligent Auto-Negotiation support for automatic duplex, speed, and flow control resolution
- Link lengths at 1.25 Gbps: up to 100 meter
- Detailed product information in EEPROM
- Physical layer IC can be accessed via 2-wire serial bus.

### Application:

- LAN 1000Base-T
- Switch to Switch Interface
- Router/Server interface
- Switched backplane applications

### Standard:

- Compatible with SFP MSA
- Compatible with IEEE Std 802.3™-2002

### Description:

AOC 1000BASE-T copper SFP transceiver is based on the SFP Multi-Source Agreement (MSA). They are compatible with the Gigabit Ethernet and 1000BASE-T standards as specified in IEEE Std 802.3:2000, which support 1000Mbps data-rate up to 100 meters reach over unshielded twisted-pair category-5 cable.

There are total three kinds of products for selection in this series:

AMXP-24RJN, SERDES interface with auto-negotiation enabled default.

AMXP-24RJFD, SERDES interface with auto-negotiation disabled default, and supports RX\_LOS as link indication function.

AMXP-24RJS, SGMII interface with auto-negotiation enabled default.

The transceiver supports 1000Mbps 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 transceiver provides standard serial ID information compatible with SFP MSA, which can be accessed with address of A0h via the two-wire serial CMOS EEPROM protocol. The physical IC can also be accessed via two-wire serial bus at address Ach.

## Specification:

### Absolute Maximum Ratings

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

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Ambient Operating Temperature	T <sub>A</sub>	0		+70	°C	
Power Supply Voltage	V <sub>CC</sub>	3.13	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>			390	mA	

### Transceiver Electrical and Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Data Input Swing Differential	V <sub>in</sub> P-P	500		2400	mV	1
Data Output Swing Differential	V <sub>out</sub> P-P	350	1200	1400	mV	2
Module Reset Assert Time				10	μs	3
Data Rate		10		1000	Mbps	4
Bit Error Rate	BER			10 <sup>-10</sup>		5
Output Data Rise/Fall Time			180		psec	6
Serial ID Clock Rate				100	KHz	

Notes:

1. Internally ac coupled and terminated (100 Ohm differential).
2. Internally ac coupled with an external 100 ohm differential load termination.
3. Time from rising edge of Tx Disable until link comes down.
4. 10/100/1000 BASE-T operation requires the host system to have an SGMII interface with no clocks, and the module will operate as 1000BASE-T only when the host system use SERDES interface.
5. Measured over 100m Cat-5 UTP cable.
6. 20%-80% rise and fall times measured from the module's internally generated Gigabit Ethernet idle pattern at 1.25 Gbps.

### EEPROM information:

The SFP MSA defines a 256-byte memory map in EEPROM describing the transceiver's capabilities, standard interfaces, manufacturer, and other information, which is accessible over a 2 wire serial interface at the 8-bit address A0H, see table 4 for the memory contents.

Table 4 – EEPROM Serial ID Contents (A0h)

Addr	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifier	03	SFP
1	1	Ext. Identifier	04	MOD4
2	1	Connector	00	
3-10	8	Transceiver	00 00 00 08 00 00 00 00	1000BASE-T
11	1	Encoding	01	8B10B
12	1	BR, nominal	0D	1.25G
13	1	Reserved	00	
14	1	Length (9um)-	00	
15	1	Length (9um)	00	
16	1	Length (50um)	00	
17	1	Length (62.5um)	00	
18	1	Length (copper)	64	100m
19	1	Reserved	00	
20-35	16	Vendor name		"AOC"(ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN		"AMXP-24RJ" (ASCII)
56-59	4	Vendor rev	Xx xx xx	
60-61	2	Wavelength	00 00	
62	1	Reserved		
63	1	CC BASE	xx	
64-65	2	Options	00 00	
66	1	BR, max	00	
67	1	BR, min	00	
68-83	16	Vendor SN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	(ASCII)
84-91	8	Vendor date code	xx xx xx xx xx xx xx xx	

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92-94	3	Reserved	00 00 00	
95	1	CC EXT	xx	
96-255	160	Vendor specific		

Note: The "XX" byte should be filled in according to practical case.

### Pin Definition:

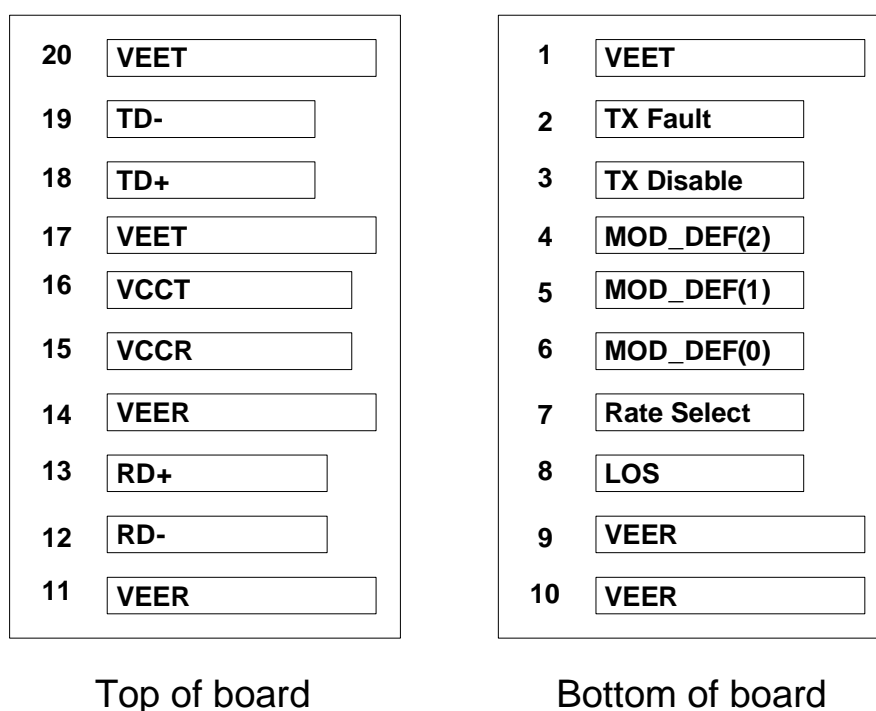


Figure1

Pin	Name	Description	Notes
1	VEET	Transmitter Ground	
2	TXFAULT	Transmitter Fault.	1
3	TXDIS	Transmitter Disable.	2
4	MOD_DEF(2)	SDA Serial Data Signal	3
5	MOD_DEF(1)	SCL Serial Clock Signal	3
6	MOD_DEF(0)	Grounded within the module.	3
7	Rate Select	No connection required	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	4
9	VEER	Receiver Ground	

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10	VEER	Receiver Ground	
11	VEER	Receiver Ground	
12	RD-	Receiver Inverted DATA out.	5
13	RD+	Receiver Non-inverted DATA out.	5
14	VEER	Receiver Ground	
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground	
18	TD+	Transmitter Non-Inverted DATA in.	6
19	TD-	Transmitter Inverted DATA in.	6
20	VEET	Transmitter Ground	

**Notes:**

1. TX Fault is not used and tied to ground via a 100ohm resistor.
2. TX Disable as described in the MSA is not applicable to the 1000BASE-T module, but is used for convenience as an input to reset the internal PHY  
Low (0 – 0.4V): Transceiver on  
Between (0.4V and 2.0 V): Undefined  
High (2.0 – 3.465 V): Transceiver in reset state  
Open: Transceiver in reset state
3. MOD-DEF 0, 1,2 are the module definition pins. They should be pulled up with a 4.7k~10kohm resistor on the host board. The pull-up voltage shall be VccT or VccR.  
MOD-DEF 0 is tied to ground within the module.  
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 is not used and is always tied to ground via a 100ohm resistor
5. These are the differential receiver output. They are internally AC-coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user side.
6. These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module.

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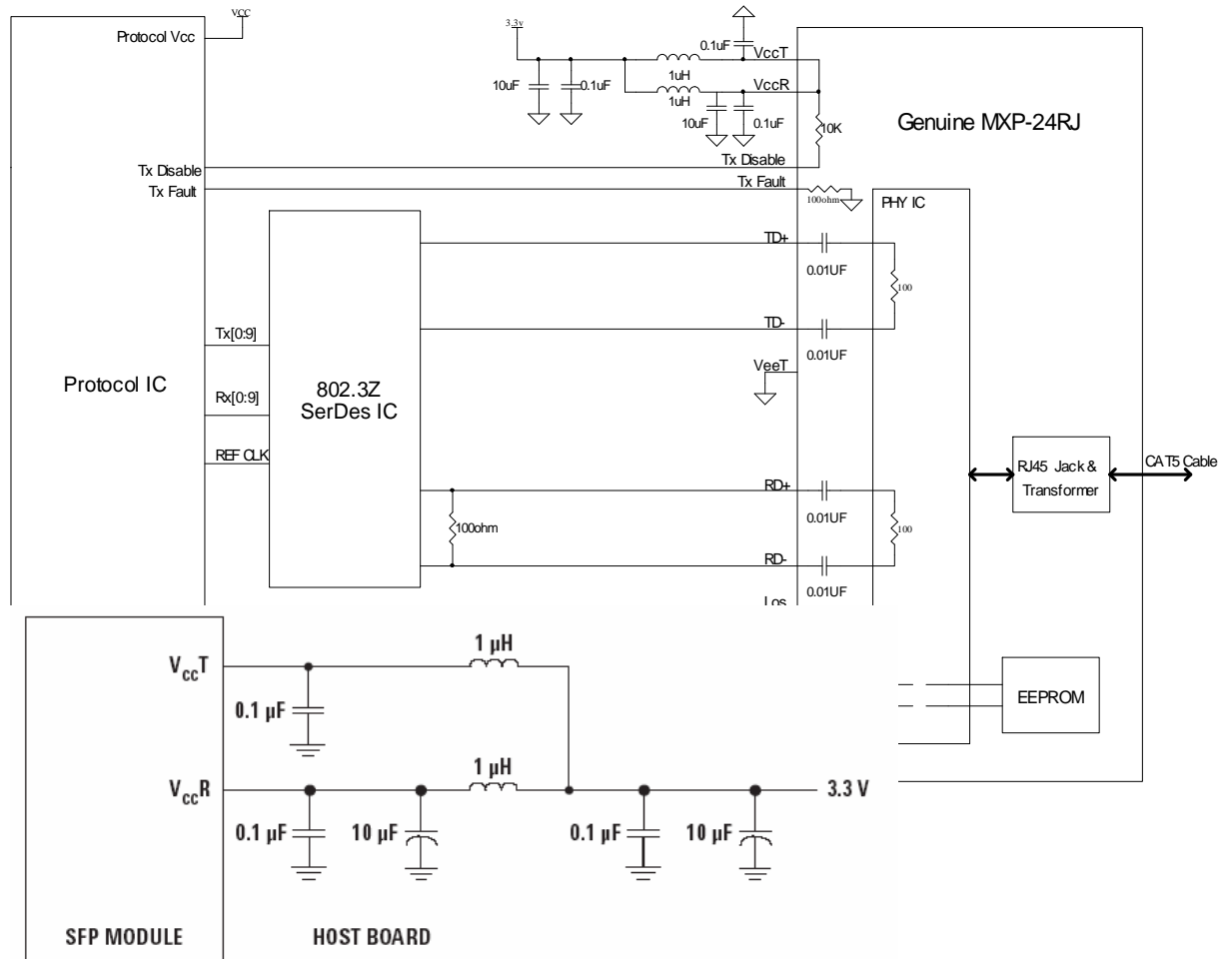
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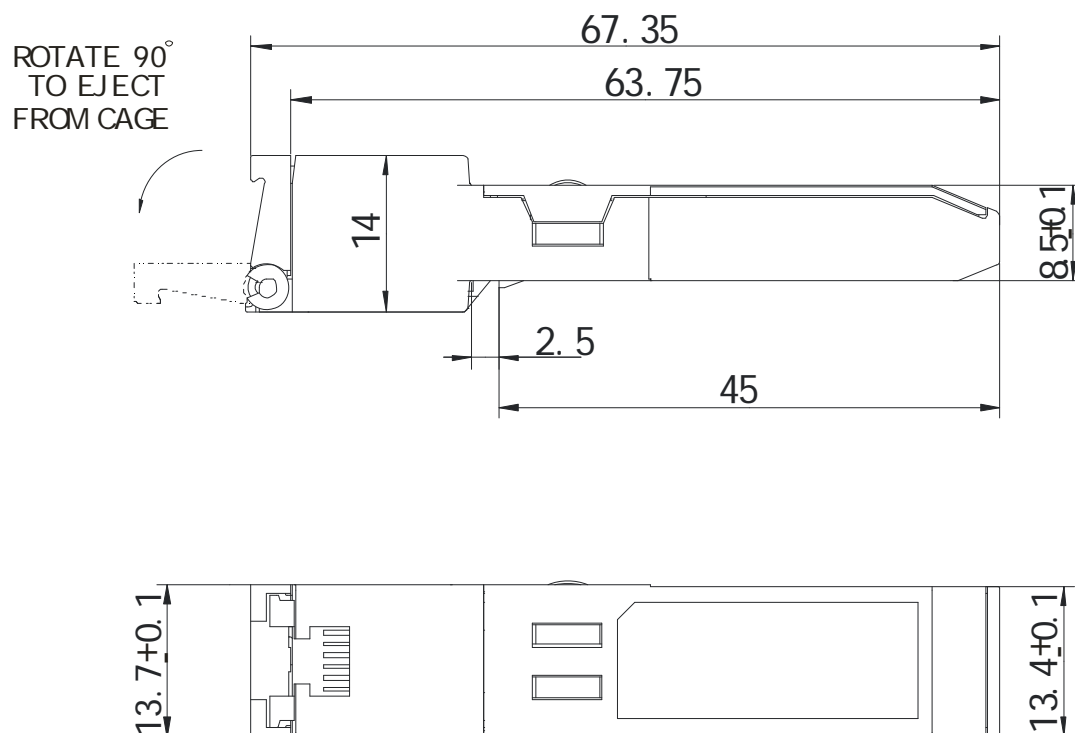
## Recommended Interface Circuit



Note: Inductors must have less than 1 ohm series resistance per MSA.

### Mechanical Dimensions

Unit is millimeter. All dimensions are  $\pm 0.1$ mm unless otherwise specified.



### Caution

All adjustments have been done at the factory before the shipment of the devices. No maintenance and user serviceable part is required. Tampering with and modifying the performance of the device will result in voided product warranty.

### Ordering Information:

Part No.	Product Description
AMXP-24RJN	1000Mbps, SERDES interface, auto-negotiation is on, Copper SFP with Bail latch, 0°C~+70°C
AMXP-24RJFD	1000Mbps, SERDES interface, auto-negotiation is off, Copper SFP with Bail latch, 0°C~+70°C, support RX_LOS as link indication function
AMXP-24RJS	10/100/1000Mbps, SGMII interface, Copper SFP with Bail latch, 0°C~+70°C

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