

# YSP12-TG

## Features

- ✓ Hot-pluggable SFP Footprint
- ✓ Fully Metallic Enclosure for Low EMI
- ✓ Low Power Dissipation
- ✓ Compact RJ-45 Connector Assembly
- ✓ Detailed Product Information in EEPROM
- ✓ +3.3V Single Power Supply
- ✓ Access to Physical Layer IC via 2-wire Serial Bus
- ✓ 10/100/1000-BASE-T Operation in Host Systems with SGMII Interface
- ✓ Compliant with SFP MSA
- ✓ Compliant with IEEE 802.3TM-2002
- ✓ Operating case temperature:  
Commercial: 0°C to +70°C  
Industrial: -40°C to +85°C

## Applications

- ✓ Switch/Route to Switch/Route Link
- ✓ LAN10/100/1000Base-T
- ✓ High Speed I/O for File Servers
- ✓ Gigabit Ethernet over Cat 5 cable

## Cable Length

| Standard          | Cable | Reach | Host Port |
|-------------------|-------|-------|-----------|
| 10/100/1000base-T | CAT5  | 100m  | SGMII     |

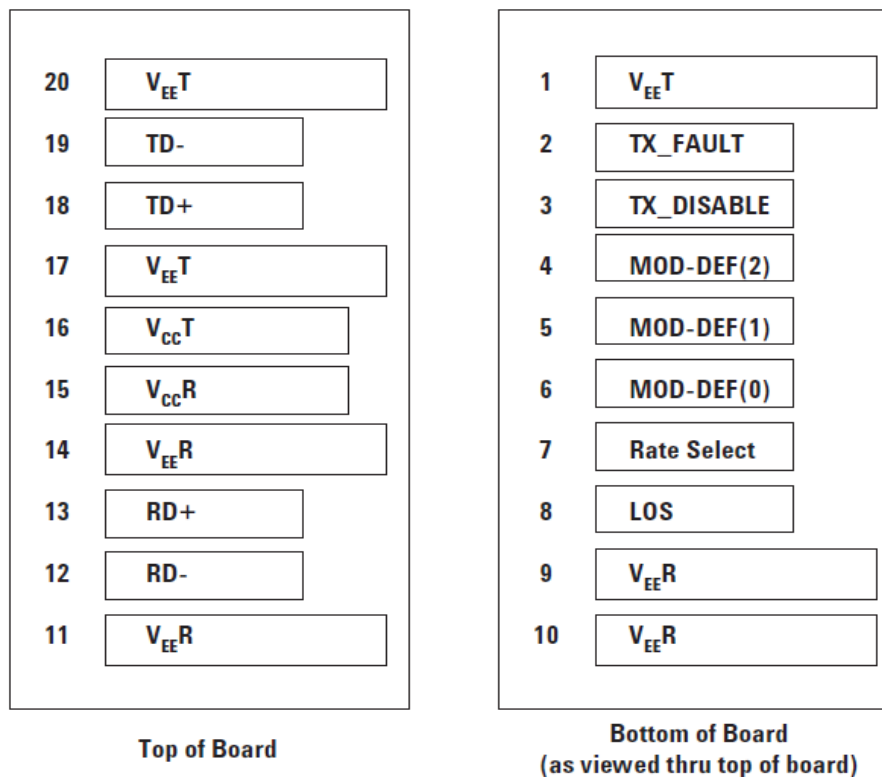
## Description

The Copper SFP Transceiver 10/100/1000Base-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 Copper SFP Transceiver supports 1000 Mb/s full duplex data-links with 5-level Pulse Amplitude Modulation (PAM) signals. All four pairs in the cable are used with symbol rate at 250Mb/s on each pair.

The Copper SFP Transceiver provides standard serial ID information compliant with SFP MSA, which can be accessed with address of A0h via the 2-wire serial CMOS EEPROM protocol. The physical IC can also be accessed via 2-wire serial bus at address ACh. The address of the PHY is 1010110x where x is the R/W bit.

## Pin Definitions



## Pin Descriptions

| Pin | Signal Name | Description                                           | Notes |
|-----|-------------|-------------------------------------------------------|-------|
| 1   | VeeT        | Module Transmitter Ground                             | 1     |
| 2   | Tx_Fault    | Transmitter Fault. Not supported, Grounded in module  | 2     |
| 3   | Tx_Disable  | Transmitter Disable - Module disables on high or open | 3     |
| 4   | MOD_DEF(2)  | Module Definition 2. Data line for Serial ID.         |       |

|    |             |                                                        |   |
|----|-------------|--------------------------------------------------------|---|
| 5  | MOD_DEF(1)  | Module Definition 1. Clock line for Serial ID.         |   |
| 6  | MOD_DEF(0)  | Module Absent, connected to VeeT or VeeR in the module |   |
| 7  | Rate Select | No connection                                          |   |
| 8  | Rx_LOS      | Loss of Signal - High Indicates Loss of Signal         | 2 |
| 9  | VeeR        | Module Receiver Ground                                 | 1 |
| 10 | VeeR        | Module Receiver Ground                                 | 1 |
| 11 | VeeR        | Module Receiver Ground                                 | 1 |
| 12 | RD-         | Receiver Inverted Data Output                          | 5 |
| 13 | RD+         | Receiver Non-Inverted Data Output                      | 5 |
| 14 | VeeR        | Module Receiver Ground                                 | 1 |
| 15 | VccR        | Module Receiver 3.3 V Supply                           | 4 |
| 16 | VccT        | Module Transmitter 3.3 V Supply                        | 4 |
| 17 | VeeT        | Module Transmitter Ground                              | 1 |
| 18 | TD+         | Transmitter Non-Inverted Data Input                    | 6 |
| 19 | TD-         | Transmitter Inverted Data Input                        | 6 |
| 20 | VeeT        | Module Transmitter Ground                              | 1 |

#### Notes:

- The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
- TX Fault is not used and is always tied to ground.
- 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 ASIC. This pin is pulled up within the module with a 4.7kΩ to 10kΩ resistor.  
Low (0–0.8 V): Transceiver on  
Between (0.8 V and 2.0 V): Undefined  
High (2.0–3.465 V): Transceiver in reset disable state  
Open: Transceiver in reset disable state
- VCCR and VCCT are the receiver and transmitter power supplies. They are defined as 3.3 V ± 5% at the SFP connector pin. The maximum supply current is about 300mA and the associated in-rush current will typically be no more than 30 mA above steady state after 500 nanoseconds.
- RD-/+: These are the differential receiver outputs. They are ac coupled 100 ohm differential lines which should be terminated with 100 ohm 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 600 and 2000 mV differential when properly terminated. These levels are compatible with CML and LVPECL voltage swings.
- TD-/+: These are the differential transmitter inputs. They are ac coupled differential lines with 100 ohm 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, though it is recommended that values between 500 and 1200 mV differential (250 – 600 mV single ended) be used for best EMI performance. These levels are compatible with CML and LVPECL voltage swings.

## Electrical Power Interface

| Parameter       | Symbol           | Min. | Typical | Max. | Unit | Note              |
|-----------------|------------------|------|---------|------|------|-------------------|
| Supply Current  | I <sub>s</sub>   |      | 300     | 350  | mA   |                   |
| Input Voltage   | V <sub>CC</sub>  | 3.13 | 3.3     | 3.47 | V    | Referenced to GND |
| Maximum Voltage | V <sub>max</sub> |      |         | 3.6  | V    |                   |

## Low-speed signals, electronic characteristics

| Parameter        | Symbol | Min.           | Max.           | Unit | Note                                                                |
|------------------|--------|----------------|----------------|------|---------------------------------------------------------------------|
| 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    |                                                                     |
| 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    |                                                                     |

## High-speed electrical interface, transmission line-SFP

| Parameter           | Symbol              | Min. | Typical | Max. | Unit | Note                                                       |
|---------------------|---------------------|------|---------|------|------|------------------------------------------------------------|
| Line Frequency      | f <sub>L</sub>      |      | 125     |      | MHz  | 5-level encoding, per IEEE 802.3                           |
| Tx Output Impedance | Z <sub>out,TX</sub> |      | 100     |      | Ohm  | Differential, for all Frequencies between 1MHz and 1250MHz |
| Rx Input Impedance  | Z <sub>in,RX</sub>  |      | 100     |      | Ohm  |                                                            |

## High-speed electrical interface, host-SFP

| Parameter                      | Symbol                         | Min. | Typical | Max. | Unit | Note         |
|--------------------------------|--------------------------------|------|---------|------|------|--------------|
| Single Ended Data Input Swing  | V <sub>in</sub>                | 250  |         | 1200 | mV   |              |
| Single Ended Data Output Swing | V <sub>out</sub>               | 300  |         | 1000 | mV   |              |
| Rise/Fall Time                 | T <sub>r</sub> ,T <sub>f</sub> |      |         | 250  | ps   | 20%-80%      |
| Tx Input Impedance             | Z <sub>in</sub>                |      | 100     |      | Ohm  | Differential |
| Rx Output Impedance            | Z <sub>out</sub>               |      | 100     |      | Ohm  | Differential |

## General specifications

| Parameter    | Symbol | Min. | Typical | Max. | Unit | Note                                   |
|--------------|--------|------|---------|------|------|----------------------------------------|
| Data Rate    | BR     |      | 1000    |      | Mbps | IEEE 802.3 compatible.                 |
| Cable Length | L      |      |         | 100  | m    | Category 5 UTP. BER <10 <sup>-12</sup> |

### Notes:

1. Clock tolerance is +/- 50 ppm.
2. By default, the YSP12-TG is a full duplex device in preferred master mode.
3. Automatic crossover detection is enabled. External crossover cable is not required.

## Environmental specifications

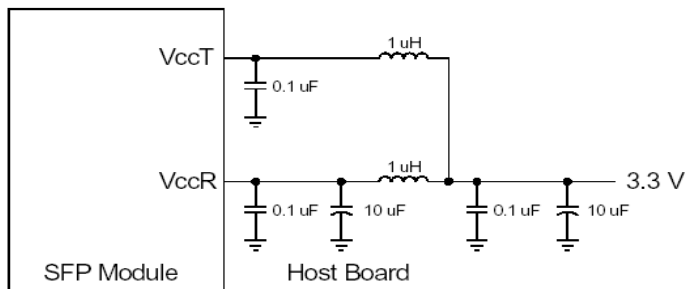
| Parameter                  | Symbol          | Min. | Typical | Max. | Unit |
|----------------------------|-----------------|------|---------|------|------|
| Power Supply Voltage       | V <sub>CC</sub> | 0    |         | 3.6  | V    |
| Storage Temperature        | T <sub>s</sub>  | -40  |         | +85  | °C   |
| Operating Case Temperature | Commercial      | 0    |         | 70   | °C   |
|                            | Industrial      | -40  |         | +85  | °C   |

## EEPROM Information

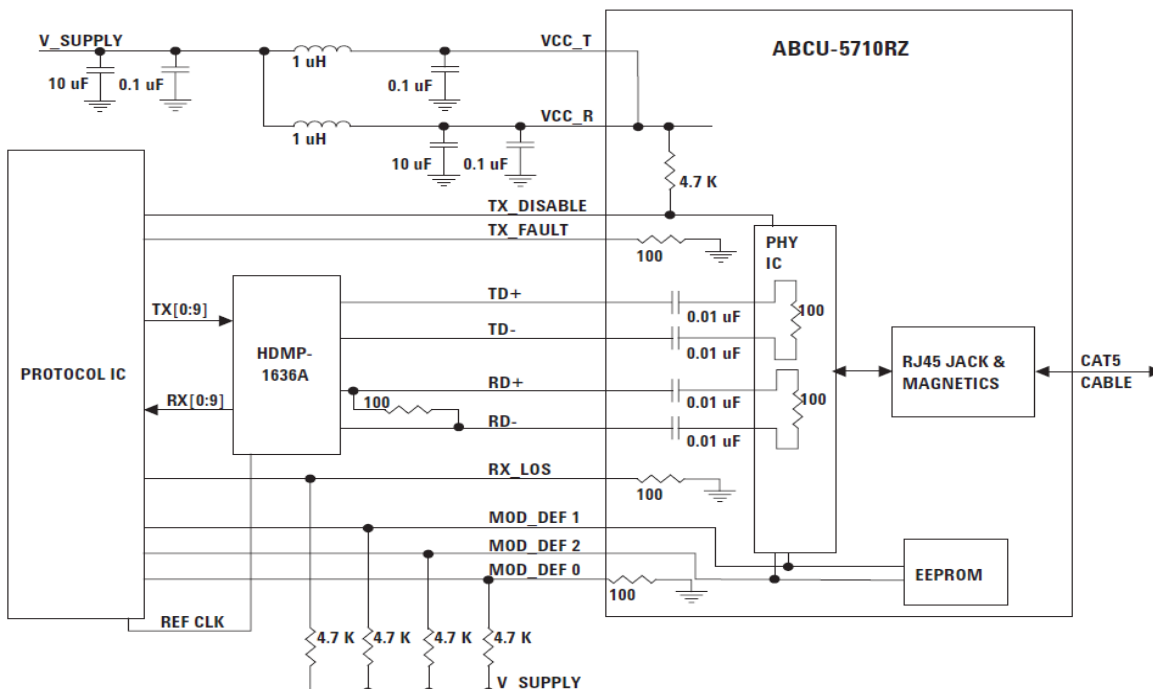
| Address | Byte | Name           | Description and Contents                                    | Hex                        |
|---------|------|----------------|-------------------------------------------------------------|----------------------------|
| 0       | 1    | Identifier     | Type of Serial transceiver (SFP)                            | 03                         |
| 1       | 1    | Reserved       | Extended identifier of type serial transceiver (MOD4)       | 04                         |
| 2       | 1    | Connector      | Code of optical connector type (Copper)                     | 22                         |
| 3-10    | 8    | Transceiver    | Gigabit Ethernet 1000Base-T Copper                          | 00 00 00 08<br>00 00 00 00 |
| 11      | 1    | Encoding       | 8B10B                                                       | 01                         |
| 12      | 1    | BR, Nominal    | 1.25G/s                                                     | 0d                         |
| 13      | 1    | Reserved       |                                                             | 00                         |
| 14      | 1    | Length (9um)   | Link length supported for 9/125um fiber, units of 1km       | 00                         |
| 15      | 1    | Length(9um)    | Link length supported for 9/125um fiber, units of 100m      | 00                         |
| 16      | 1    | Length(50um)   | Link length supported for 50/125um fiber, units of 10m      | 00                         |
| 17      | 1    | Length(62.5um) | Link length supported for 62.5/125um fiber, units of 10m    | 00                         |
| 18      | 1    | Length(Copper) | Link length supported for copper, units of meters           | 64                         |
| 19      | 1    | Reserved       |                                                             | 00                         |
| 20-35   | 16   | Vendor Name    | "Youthton"(ASCII)                                           |                            |
| 36      | 1    | Reserved       |                                                             | 00                         |
| 37-39   | 3    | Vendor OUI     | SFP transceiver vendor OUI ID                               | 00 00 00                   |
| 40-55   | 16   | Vendor PN      | Part Number: "YSP12-T " (ASCII)                             |                            |
| 56-59   | 4    | Vendor rev     | Revision level for part number (means 1.0 revision)         | 31 30 20 20                |
| 60-61   | 2    | Wavelength     | Least significant byte of Check sum of data in address 0-62 | 00 00                      |

|        |    |                 |                                                                        |          |
|--------|----|-----------------|------------------------------------------------------------------------|----------|
| 62     | 1  | Reserved        |                                                                        | 00       |
| 63     | 1  | CCID            | Least significant byte of Check sum of data in address 0-62            | xx       |
| 64-65  | 2  | Option          | Indicates which optical SFP signals are implemented                    | 00 10    |
| 66     | 1  | BR, max         | Upper bit rate margin, units of %                                      | 00       |
| 67     | 1  | BR, min         | Lower bit rate margin, units of %                                      | 00       |
| 68-83  | 16 | Vendor SN       | Serial number (ASCII)                                                  | xx       |
| 84-91  | 8  | Date code       | Manufacturing date code Year (4 bytes), Month (2 bytes), Day (2 bytes) | xx       |
| 92-94  | 3  | Reserved        |                                                                        | 00 00 00 |
| 95     | 1  | CC_EX           | Check code for the extended ID Fields (addresses 64 to 94)             | xx       |
| 96-127 | 32 | Vendor specific | specific date, read only                                               |          |

## Recommended Host Board Power Supply Circuit

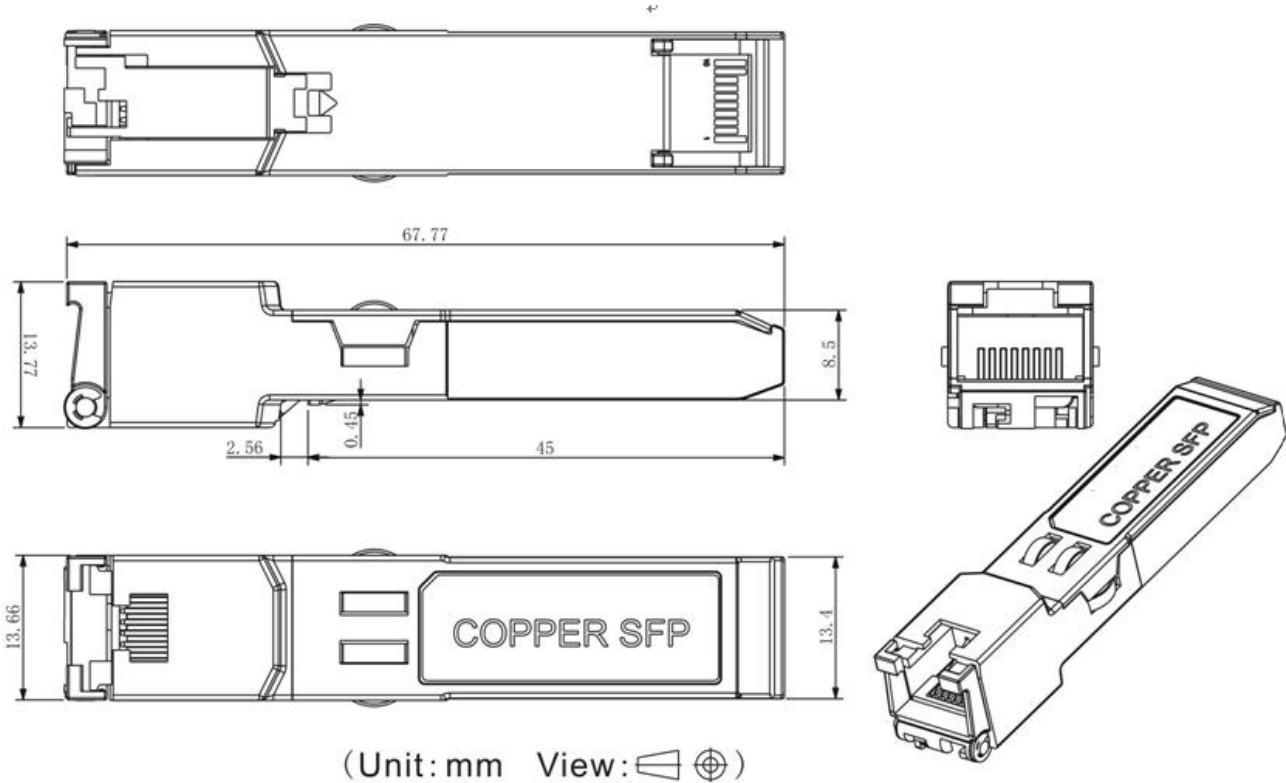


## Recommended Interface Circuit



## Mechanical Specifications

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



## Ordering Information

| Part number | Speed mode      | MAC interface   | TX Disable function | Link Indicator on RX_LOS Pin | Temp    |
|-------------|-----------------|-----------------|---------------------|------------------------------|---------|
| YSP12-TG    | 10/100/1000Mbps | SGMII interface | YES                 | YES                          | 0~70℃   |
| YSP12-TGT   | 10/100/1000Mbps | SGMII interface | YES                 | YES                          | -40~85℃ |

## References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000.
2. IEEE Std802.3, 2002 Edition. IEEE Standards Department, 2002.
3. "AT24C01A/02/04/08/16 2-Wire Serial CMOS E2PROM", Atmel Corporation.[www.Atmel.com](http://www.Atmel.com).
4. "Alaska Ultra 88E1111 Integrated 10/100/1000 Gigabit Ethernet Transceiver", Marvell Corporation.  
[www.marvell.com](http://www.marvell.com)

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