# ES-T4-R

## 1000BASE-T Copper SFP Transceiver

## PRODUCT FEATURES

- Up to 1.25Gb/s bi-directional data links
- Hot-pluggable SFP footprint
- TX Disable and RX Los/without Los function
- 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
- Operating case temperature range of

  -40°C to +85°C (Industrial)

## APPLICATIONS

- 10/100/1000BASE-T Cat 5 cable
- 1.25 Gigabit Ethernet over Cat 5 cable

## DESCRIPTIONS

ETU-LINK`s ES-T4-R Copper Small Form Pluggable (SFP)transceivers 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 supporting 1000Mbps data- rate up to 100meters reach over unshielded twisted-pair category 5cable. The module supports1000 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.

## Ordering Information

| Part number | Speed mode | MAC interface | TX Disable function | Link Indicator on RX_LOS Pin | Temp |
|---|---|---|---|---|---|
| ES-T4-R | 1000M | SERDES | Yes | Yes | -40°C~+85°C |

## 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 | Maximum |

## 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, 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

| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
|---|---|---|---|---|---|---|
| Single ended data input swing | Vinswing | 250 | | 1200 | mV | Single ended |
| Single ended data output swing | Voutswing | 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

| Parameter | | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|---|
| Operating Case Temperature | **Industrial** | Tc | -40 | | 85 | °C |
| Storage Temperature | | | -40 | | 85 | °C |

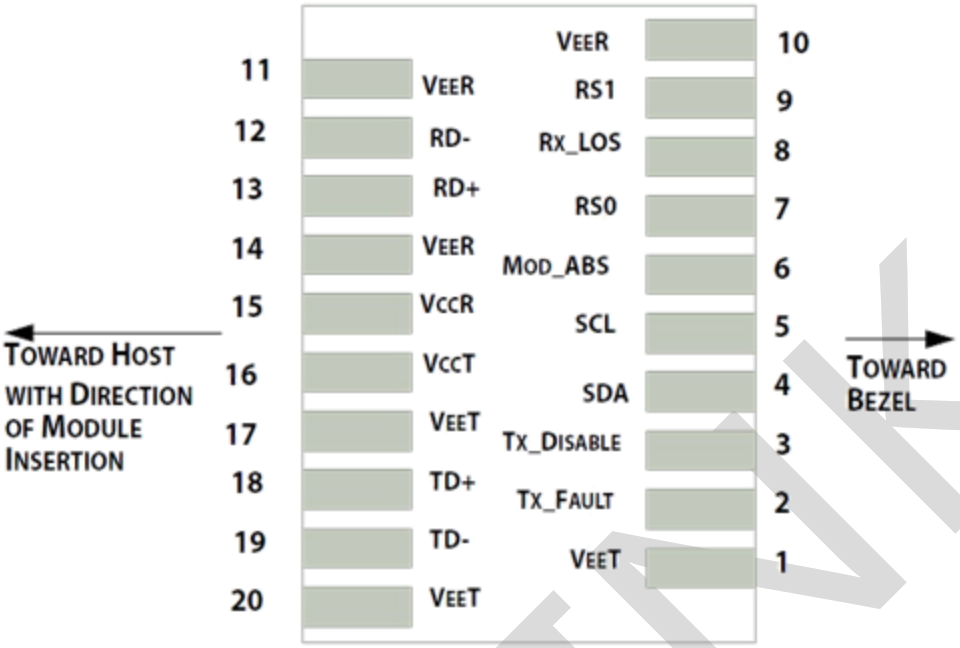
## References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA) September 2000.

2. IEEE802.3 – 2002.

3. “AT24C01A/02/04/08/16 2-Wire Serial CMOS E2PROM”, Atmel Corporation.

# Pin Definitions



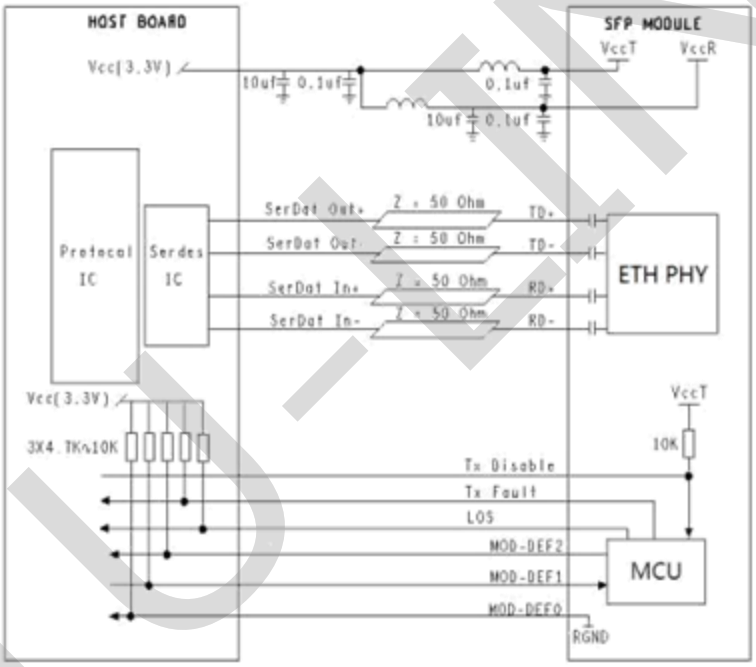

## Pin Definitions

| Pin | Symbol | Name/Description | Ref. |
|---|---|---|---|
| 1 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |
| 2 | $T_{FAULT}$ | Transmitter Fault. | 2 |
| 3 | $T_{DIS}$ | Transmitter Disable. Laser output disabled on high or open. | 3 |
| 4 | SDA | 2-wire Serial Interface Data Line | 4 |
| 5 | SCL | 2-wire Serial Interface Clock Line | 4 |
| 6 | MOD_ABS | Module Absent. Grounded within the module | 4 |
| 7 | RS0 | Rate Select 0 | 5 |
| 8 | LOS | Loss of Signal indication. Logic 0 indicates normal operation. | 6 |
| 9 | RS1 | No connection required | 1 |
| 10 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 11 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 12 | RD- | Receiver Inverted DATA out. AC Coupled | |
| 13 | RD+ | Receiver Non-inverted DATA out. AC Coupled | |
| 14 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 15 | $V_{CCR}$ | Receiver Power Supply | |
| 16 | $V_{CCT}$ | Transmitter Power Supply | |
| 17 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |
| 18 | TD+ | Transmitter Non-Inverted DATA in. AC Coupled. | |
| 19 | TD- | Transmitter Inverted DATA in. AC Coupled. | |
| 20 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |

**Notes:**

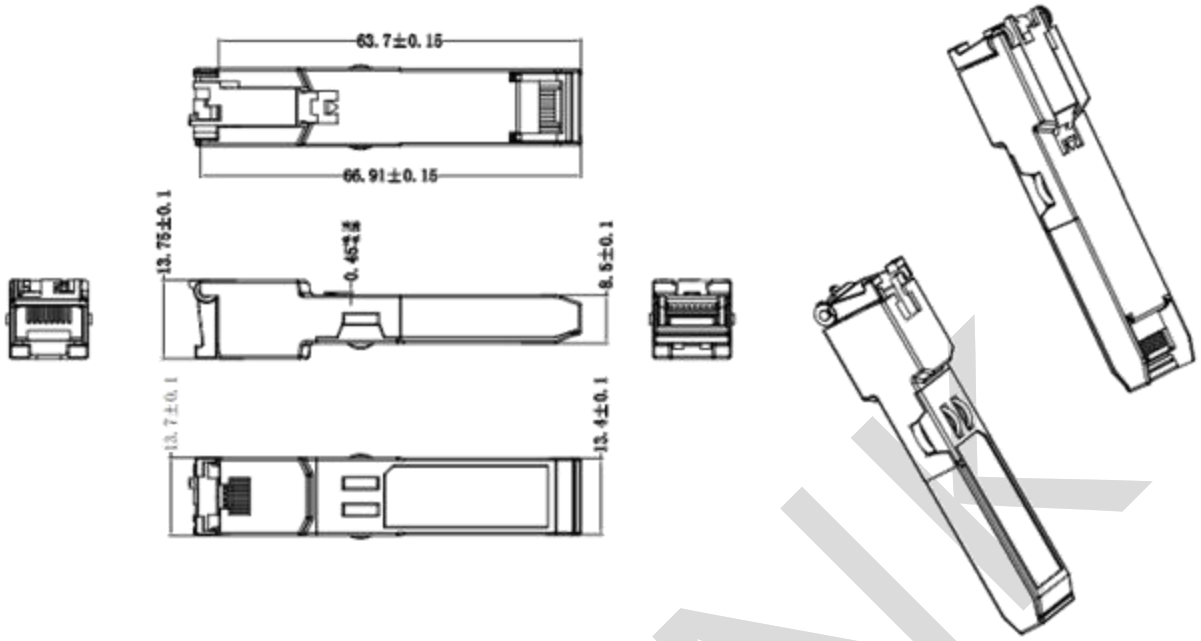
1) Circuit ground is internally isolated from chassis ground.
2) $T_{FAULT}$ is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V.A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3) Laser output disabled on $T_{DIS}$>2.0V or open, enabled on $T_{DIS}$<0.8V.
4) Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5) Internally pulled down per SFF-8431 Rev 4.1.
6) LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

## Recommended Interface Circuit




## Mechanical Diagram

The host-side of the ES-T1-R 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




## Revision History

| Version No. | Date | Description |
|---|---|---|
| 1.0 | February 8, 2016 | Preliminary datasheet |
| 2.0 | October 11,2023 | Product upgrades |
| 2.1 | July 24, 2024 | Format change |
| 2.2 | September 5, 2025 | Modify the name of the electrical interface |

Company: ETU-Link Technology Co., LTD
Production base: Right side of 3rd floor, No. 102 building, Longguan expressway, Dalang street, Longhua District, Shenzhen city, GuangDongProvince,China 518109
R&D base: Floor 4, Building 4, Nanshan Yungu Phase LI, Taoyuan Community, XiliStreet,Nanshan District, Shenzhen
Tel: +86-755 2328 4603

Addresses and phone number also have been listed at www.etulinktechnology.com.
Please e-mail us at sales@etulinktechnology.com or call us for assistance.