


**ETU-LINK**

Optical Communication System

**SFP Series**

## SFP

### ES-T1-R

#### 1000BASE-T Copper SFP Transceiver

- 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

0°C to +70°C (Commercial)

-20° C to +85° C (Extend)



## Applications

- 1.25 Gigabit Ethernet over Cat 5 cable

## Description

ETU-LINK's ES-T1-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 100 meters reach over unshielded 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 ACh.

## Pin Definitions

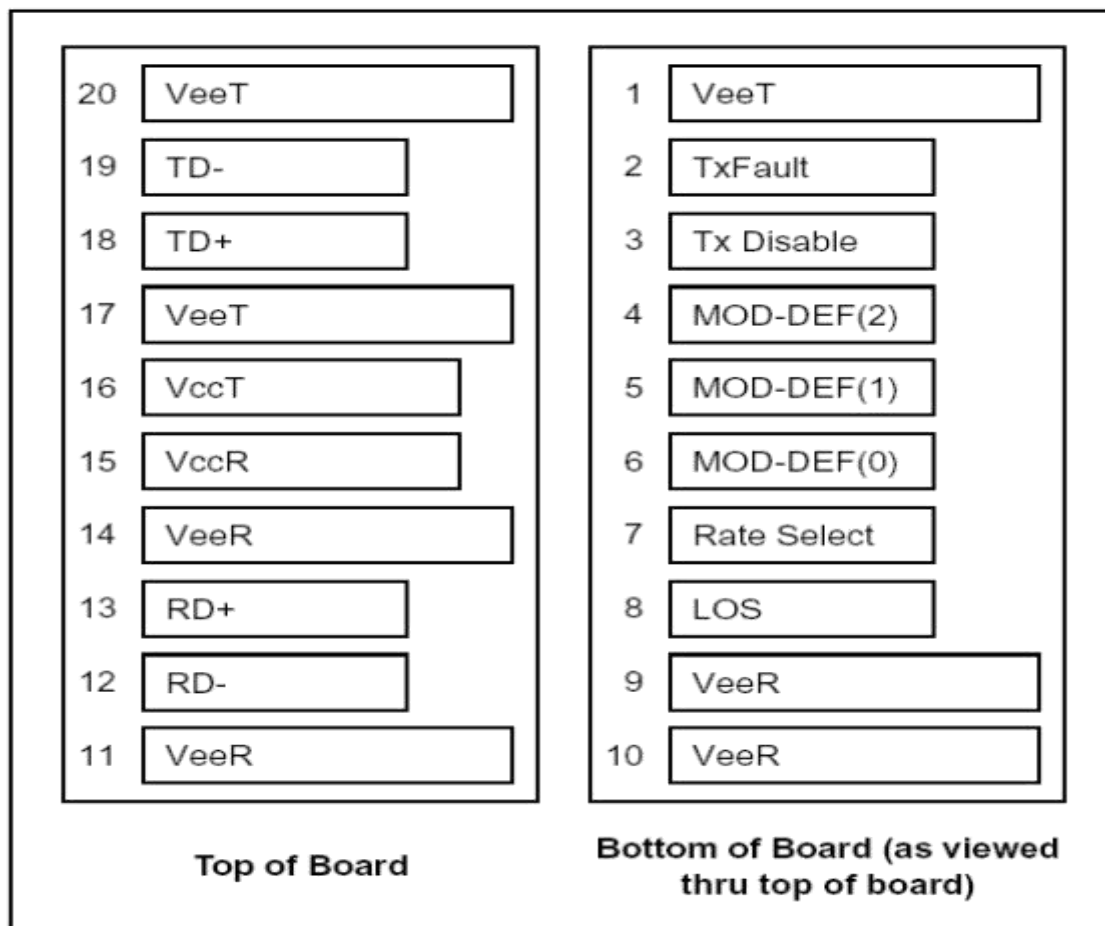


Figure 1. Pin Definitions

## Pin Descriptions

PIN	NAME	FUNCTION	SEQ.	NOTES
1	VeeT	Transmitter Ground	1	VeeT and VeeR are connected in SFP.
2	TX_FAULT	Transmitter Fault Indication	3	Not Implemented. Tied to VeeT in SFP.
3	TX_DISABLE	Transmitter Disable	3	See TX Disable.
4	MOD DEF (2)	Module Definition 2	3	Data Line for Serial ID and Bidirectional Data Transfer bus.
5	MOD DEF (1)	Module Definition 1	3	Clock Line for Serial ID and Bidirectional Data Transfer bus.
6	MOD DEF (0)	Module Definition 0	3	Tied to Vee in SFP.
7	RATE SELECT	Not Implemented	3	Not implemented. 33K pulldown to Vee in SFP.

8	LOS	Loss of Signal	3	See LOS option.
9	VeeR	Receiver Ground	1	VeeT and VeeR are connected in SFP.
10	VeeR	Receiver Ground	1	VeeT and VeeR are connected in SFP.
11	VeeR	Receiver Ground	1	VeeT and VeeR are connected in SFP.
12	RD-	Inverted Received Data out	3	AC coupled 100 ohm differential high speed data lines.
13	RD+	Non-Inverted Received Data out	3	AC coupled 100 ohm differential high speed data lines.
14	VeeR	Receiver Ground	1	VeeT and VeeR are connected in SFP.
15	VccR	Receiver Power	2	VccR and VccT are connected in SFP.
16	VccT	Transmitter Power	2	VccR and VccT are connected in SFP.
17	VeeT	Transmitter Ground	1	VeeT and VeeR are connected in SFP.
18	TD+	Non-inverted Data In	3	AC coupled 100 ohm differential high speed data lines.
19	TD-	Inverted Data In	3	AC coupled 100 ohm differential high speed data lines.
20	VeeT	Transmitter Ground	1	VeeT and VeeR are connected in SFP.

#### Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

1) TX Fault is not supported and is always connected to ground.

2) TX disable, an input used to reset the transceiver module, This pin is pulled up within the module with a 4.7 K $\Omega$  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 state

Open: Transceiver in reset state

3) Mod-Def 0,1,2. These are the module definition pins. They 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 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) RX\_LOS (Loss of Signal): LVTTTL compatible with a maximum voltage of Host\_Vcc. RX\_LOS can enabled or disabled (Refer to Ordering information),RX\_LOS is not used and is always tied to ground via 100-ohm resistor.

5) RD-/+ : These are the differential receiver outputs. 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.

## +3.3V Volt Electrical Power Interface

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Supply Current	I <sub>s</sub>		320	375	mA	1.2W max power over full range of voltage and temperature. See caution note below
Input Voltage	V <sub>cc</sub>	3.13	3.3	3.47	V	Referenced to GND
Maximum Voltage	V <sub>max</sub>			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_V <sub>cc</sub> , measured at host side of connector
SFP Output HIGH	VOH	host_V <sub>cc</sub> -0.5	host_V <sub>cc</sub> + 0.3	V	4.7k to 10k pull-up to host_V <sub>cc</sub> , measured at host side of connector
SFP Input LOW	VIL	0	0.8	V	4.7k to 10k pull-up to V <sub>cc</sub> , measured at SFP side of connector
SFP Input HIGH	VIH	2	V <sub>cc</sub> +0.3	V	4.7k to 10k pull-up to V <sub>cc</sub> , measured at SFP side of connector

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

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
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 125MHz
Rx Input Impedance	Z <sub>in,RX</sub>		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

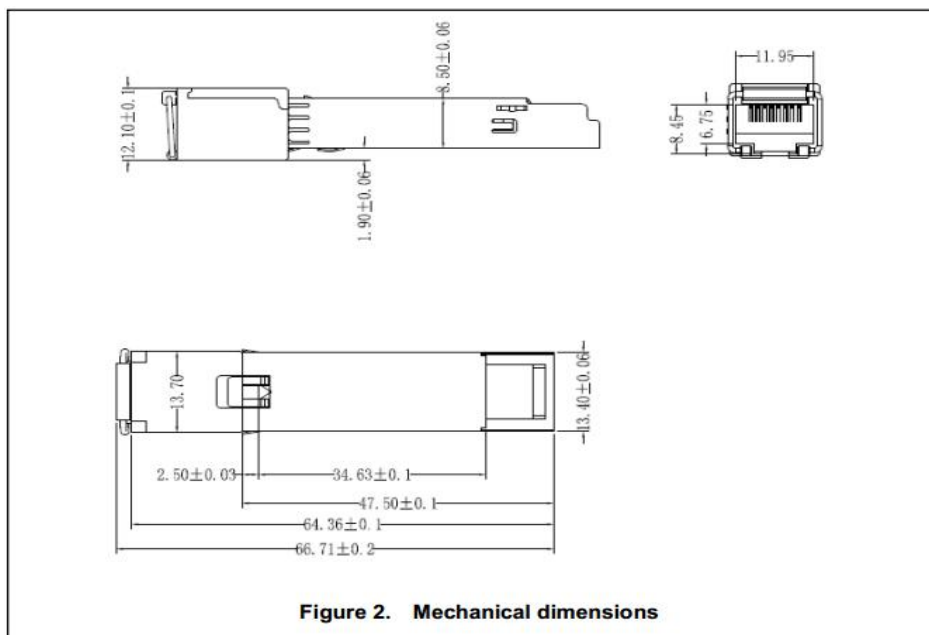
## General specifications

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Commercial	Tc	0	70	°C
	Extend		-20	85	°C
Storage Temperature		-40		85	°C

## Mechanical Specifications

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



## 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.

## Regulatory Compliance

Feature	Reference	Performance
Electrostatic discharge (ESD)	IEC/EN 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2	Class 1 laser product
Component Recognition	IEC/EN 60950, UL	Compatible with standards
ROHS	2002/95/EC	Compatible with standards
EMC	EN61000-3	Compatible with standards

## Ordering information

Part number	Speed mode	MAC interface	TX Disable function	Link Indicator on RX_LOS Pin	Temp
<b>ES-T1-R</b>	1000Mbps	SERDES	Yes	Yes	0~70°C
<b>ES-T2-R</b>	10/100/1000Mbps	SGMII	Yes	Yes	0~70°C
<b>ES-T3-R</b>	10/100M	SGMII	Yes	Yes	0~70°C
<b>ES-T4-R</b>	1000M	SERDES	Yes	Yes	-20°C~+85°C

## Compatibility Test

In order to ensure the product compatibility, our products will be tested on the switch before shipment. Our modules can be compatible with many mainstream brand switches, such as Cisco, Juniper, Extreme, Brocade, IBM, H3C, HP, Huawei, D-Link, Mikrotik, ZTE, TP-Link...

Our test equipment: VOLKTEK MEN-4110, HP 2530-8G, CRS226-24G-25+RM, Catalyst 2960G Series, Catalyst 3850 XS 10G SFP+, Catalyst 3750-E Series, HUAWEI S5700Series, H3C S3100V2 Series, Juniper-EX4200, etc.



**Cisco Catalyst 3850**



**HUAWEI S5700**



**H3C S3100V2**



**HP J9264AR**



**Juniper EX 4200**



**Alcatel 6850E-U24X**



**Mikrotik CR5226-24G-25+RM**



**Cisco Catalyst 2960G**



**Volktek MEN-4110**

## Product Production Process

# Quality Assurance

Continuous introduction of new equipment, produced by strict standards, strict quality inspection, to guarantee the high quality standard of each product.



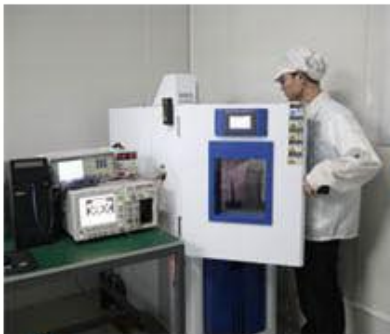
**Standardized  
Production Line**



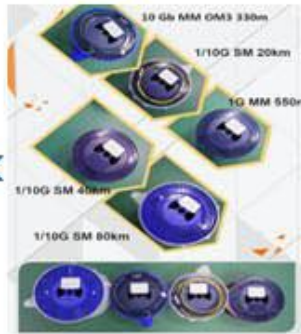
**Professional  
Welding**



**Assembling**



**Aging Testing**



**Distance Testing**



**Cleaning end face**



**Product Initial Test**



**Switch Testing**

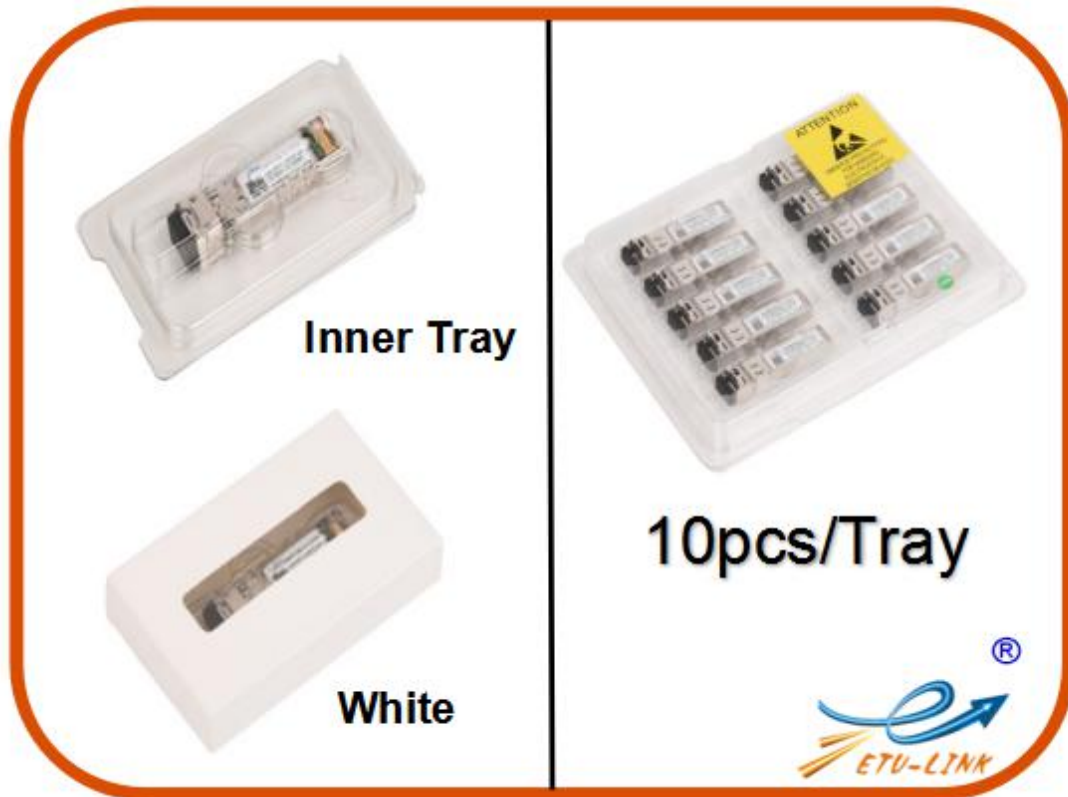


**Product Final Test**



## Packaging

ETU-Link provides two kinds of packaging, 10pcs/Tray and individual package.



Company: ETU-Link Technology Co., LTD

Address: 4th Floor, C Building, JinBoLong Industrial Park, QingQuan Road, LongHua District, Shenzhen city, Guangdong

Tel: +86-755 2328 4603

Addresses and phone number also have been listed at [www.etulinktechnology.com](http://www.etulinktechnology.com).

Please e-mail us at [sales@etulinktechnology.com](mailto:sales@etulinktechnology.com) or call us for assistance.