

# SFP-STx

## 1000BASE-T Copper Transceiver

### SFP-STx

#### ■ Product Features

- ✓ Up to 1.25Gb/s bi-directional data links
- ✓ Hot-pluggable SFP footprint
- ✓ Case temperature range (0°C to +70°C )
- ✓ 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
- ✓ 1000BASE-T operation in host systems with SERDES interface
- ✓ 10/100/1000Mbps compliant in host systems with SGMII interface



#### ■ Applications

- ✓ Gigabit Ethernet over Cat 5 cable

#### ■ General

SFP-STx Copper Small Form Pluggable (SFP) transceivers is high performance, cost effective module compliant with the Gigabit Ethernet and 1000- BASE-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 CAT 5 cable. The module supports1000 Mbps (or 10/100/1000Mbps) 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 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.

#### ■ Product Selection

Part Number	Product Features
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**SFP-STx**

SFP-ST1	1000BASE-T
SFP--ST2	10/100/1000Base-T

## ■ Pin Descriptions

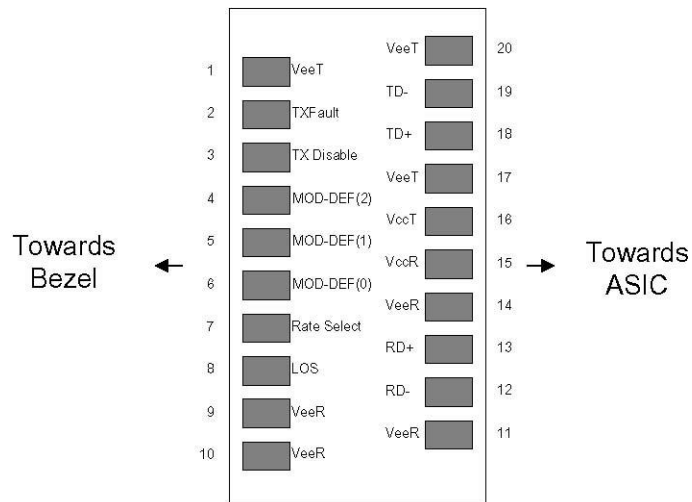
Pin	Symbol	Name/Description	Ref.
1	VeeT	Transmitter Ground (Common with Receiver Ground)	1
2	TX Fault	Transmitter Fault. Not supported	
3	TX Disable	Transmitter Disable. PHY disabled on high or open.	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	3
7	Rate Select	No connection required	
8	LOS	Loss of Signal indication.	4
9	VeeR	Receiver Ground (Common with Transmitter Ground)	1
10	VeeR	Receiver Ground (Common with Transmitter Ground)	1
11	VeeR	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	VeeR	Receiver Ground (Common with Transmitter Ground)	1
15	VccR	Receiver Power Supply	
16	VccT	Transmitter Power Supply	
17	VeeT	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	VeeT	Transmitter Ground (Common with Receiver Ground)	1

### **Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. PHY disabled on TDIS > 2.0V or open, enabled on TDIS < 0.8V.
3. Should be pulled up with 4.7k-10k Ohms on host board to a voltage between 2.0 V and 3.6V. MOD\_DEF (0) pulls line low to indicate module is plugged in.

## SFP-STx

4. LVTTTL compatible with a maximum voltage of 2.5V. Not supported on AP-ST2.



### Pin-out of Connector Block on Host Board

#### ■ +3.3V Volt Electrical Power Interface

1. The SFP-STx has an input voltage range of 3.3 V +/- 5%. The 4 V maximum voltage is not allowed for continuous operation.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Current	Icc		320	375	mA	1
Power Supply Voltage	Vcc	3.13	3.30	3.47	V	
Maximum Voltage	Vmax			4	V	
Surge Current	I <sub>surge</sub>			30	mA	2

#### **Notes:**

2. 1.2W max power over full range of voltage and temperature
3. Hot plug above steady state current.

#### ■ 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.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
SFP Output LOW	VOL	0		0.5	V	1

**SFP-STx**

SFP Output HIGH	VOH	V <sub>cc</sub> -0.5		V <sub>cc</sub> +0.3	V	1
SFP Input LOW	VIL	0		0.8	V	2
SFP Input HIGH	VIH	2.0		V <sub>cc</sub> +0.3		2

**Notes:**

1. 4.7k to 10k pull-up to host\_V<sub>cc</sub>, measured at host side of connector
2. 4.7k to 10k pull-up to V<sub>cc</sub>, measured at SFP side of connector

### ■ High-Speed Electrical Interface

All high-speed signals are AC-coupled internally.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Line Frequency	f <sub>L</sub>	-	125	-	MHz	1
Tx Output Impedance			100		Ohm	2
Rx Input Impedance	-		100		Ohm	2

**Notes:**

1. 5-level encoding, per IEEE 802.3.
2. Differential, for all Frequencies between 1MHz and 125MHz.

### ■ High-Speed Electrical Interface

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Single ended data input swing	V <sub>in</sub>	250	-	1200	mV	1
Single ended data output swing	V <sub>out</sub>	350		800	mV	1
Rise/Fall Time	tr/tf	-	175		ps	2
Tx Input Impedance	Z <sub>in</sub>	-	50		Ohm	1
Rx Output Impedance	Z <sub>out</sub>	-	50		Ohm	

**Notes:**

1. Single ended.
2. 20%-80%.

### ■ General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
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**SFP-STx**

Data Rate	BR	10	-	1000	Mbps	1
Cable Length	L			100	m	2

**Notes:**

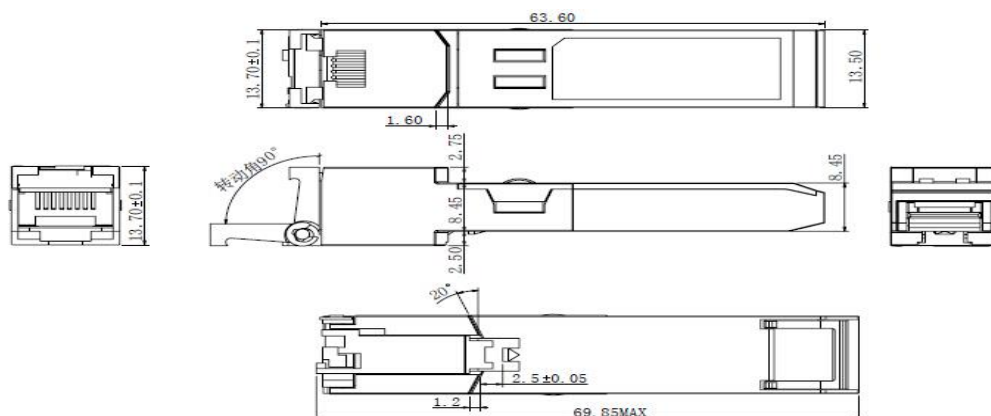
1. IEEE 802.3 compatible.
2. Category 5 UTP. BER <10<sup>-12</sup>.
3. Clock tolerance is +/- 50 ppm
4. By default, the GE-GB-P is a full duplex device in preferred master mode
5. Automatic crossover detection is enabled. External crossover cable is not required
6. 1000 BASE-T operation requires the 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**

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Operating Temperature	Top	0	-	+70	°C	
Storage Temperature	Tsto	-40		+85	°C	

**■ Mechanical Specifications**

The host-side of the SFP-STx conforms to the mechanical specifications outlined in the SFPMSA .The front portion of the SFP (part extending beyond the face plate of the host) is larger to accommodate the RJ-45 connector. See Figure 2 below for details, dimensions are in mm.

**■ Revision History**

Revision	Initiated	Reviewed	Approved	DCN	Release Date
Version1.0	yangpeiyun	sunbin	dingzheng	New Released.	July 29, 2016

**SFP-STx**

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Version1.1	yangpeiyun	sunbin	dingzheng	Change case temperature form 0~85℃ to 0~70℃	May 29, 2017
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