

# Specification

**ETS**  
ENTA SOURCE CO., LTD.

ETST10G



**SFP+ Copper 10G BASE-T 30m**

**Contact US**

LINE@

@ets.online



087-412-2552



## 1.PRODUCT FEATURES

- Support 10Gbase T / 5Gbase T / 2.5Gbase T / 1000base T
- Hot-pluggable SFP footprint
- Compact RJ-45 connector assembly
- RoHS compliant and lead-free
- Single +3.3V power supply
- 10 Gigabit Ethernet over Cat 6a cable
- Ambient Operating temperature: 0°C to +70°C

## 2.PRODUCT DESCRIPTION

SFP+-10GBASE-T Copper Small Form Pluggable (SFP) transceivers are based on the SFP Multi Source Agreement (MSA). They are compatible with the 10Gbase-T / 5Gbase-T / 2.5Gbase-T / 1000base-T standards as specified in IEEE Std 802.3. SFP+ 10GBASE-T uses the SFP's Rx\_LOS (must be pulled up on host) pin for link indication. If pull up or open SFP's Tx\_DISABLE pin, PHY IC be reset.

## 3. Cable Length

| Standard            | Cable | Reach | Host Port           |
|---------------------|-------|-------|---------------------|
| 10Gbase-T           | CAT6A | 30m   | XFI                 |
| 5Gbase-T/2.5Gbase-t | CAT5E | 50m   | 5GBase-R/2.5GBase-X |
| 1000base T          | CAT5E | 100m  | 1000base FX         |

## 4.SFP to Host Connector Pin Out

| Pin | Symbol      | Name/Description  | Ref. |
|-----|-------------|---|------|
| 1   | VEET        | Transmitter Ground (Common with Receiver Ground)            | 1    |
| 2   | TFAULT      | Transmitter Fault. Not supported.                           |      |
| 3   | TDIS        | Transmitter Disable. Laser output 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         | High indicates no linked. low indicates linked.             | 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 connected to chassis ground
2. PHY disabled on  $T_{DIS} > 2.0V$  or open, enabled on  $T_{DIS} < 0.8V$
3. Should be pulled up with 4.7k - 10k Ohms on host board to a voltage between 2.0 V and 3.6 V.  
MOD\_DEF (0) pulls line low to indicate module is plugged in.
4. LVTTTL compatible with a maximum voltage of 2.5V.

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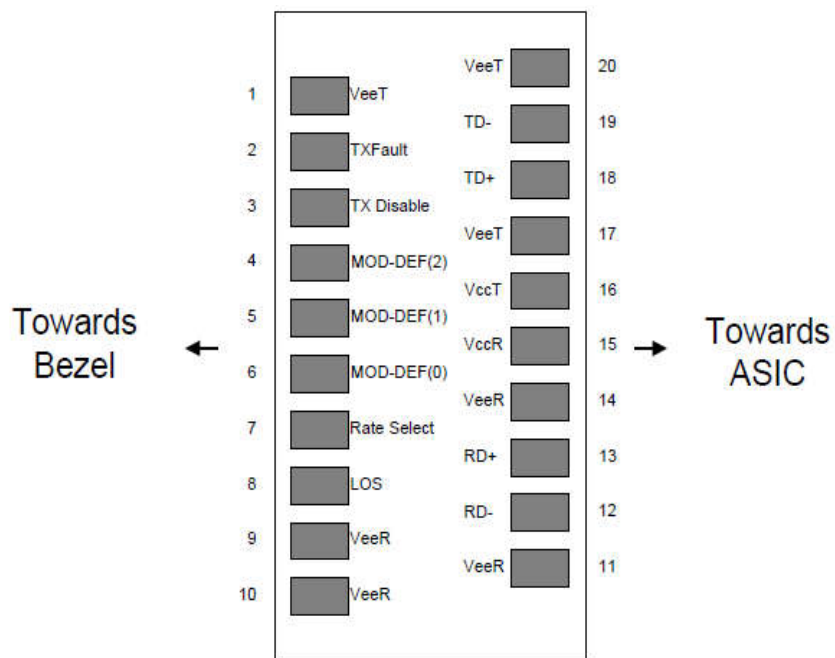


Figure 1. Diagram of host board connector block pin numbers and names

## 5. +3.3V Volt Electrical Power Interface

The SFP+-10GBASE-T has an input voltage range of 3.3 V +/- 5%. The 4V maximum voltage is not allowed for continuous operation.

| +3.3 Volt Electrical Power Interface |        |      |     |      |      |   |
|--------------------------------------|--------|------|-----|------|------|---|
| Parameter                            | Symbol | Min  | Typ | Max  | unit | Notes/Conditions  |
| Supply Current                       | Is     |      | 700 | 900  | mA   | 3.0W 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    |   |
| Surge Current                        | Isurge |      | TBD |      | mA   | Hot plug above steady state current. See caution note below                       |

Caution: Power consumption and surge current are higher than the specified values in the SFP MSA

## 6. 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

| Low-Speed Signals, Electronic Characteristics |        |               |                |      |   |
|---|--------|---------------|----------------|------|---|
| Parameter                                     | Symbol | Min           | Max            | unit | 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       |

## 7.High-Speed Electrical Interface

All high-speed signals are AC-coupled internally.

| High-Speed Electrical Interface, Transmission Line-SFP |         |     |     |     |      |   |
|--|---------|-----|-----|-----|------|---|
| Parameter  | Symbol  | Min | Typ | Max | unit | 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  | unit | Notes/Conditions |
| Single ended data input swing             | Vinsing                         | 250 |     | 1200 | mV   | Single ended     |
| Single ended data output swing            | Voutsing                        | 350 |     | 800  | mV   | Single ended     |
| Rise/Fall Time                            | T <sub>r</sub> , T <sub>f</sub> |     | 175 |      | psec | 20%-80%          |
| Tx Input Impedance                        | Zin                             |     | 50  |      | Ohm  | Single ended     |
| Rx Output Impedance                       | Zout                            |     | 50  |      | Ohm  | Single ended     |

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## 8.General Specifications

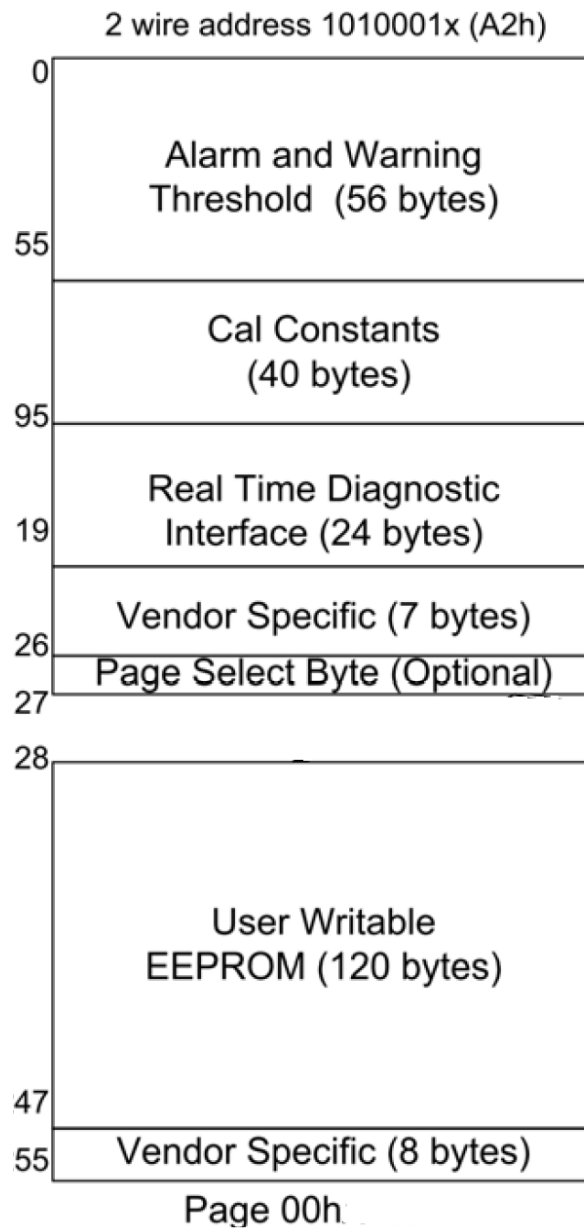
| General   |        |     |     |     |        |   |
|-----------|--------|-----|-----|-----|--------|---|
| Parameter | Symbol | Min | Typ | Max | unit   | Notes/Conditions                              |
| Data Rate | BR     | 1   |     | 10  | Gb/sec | IEEE 802.3 compatible.<br>See Notes 1,2 below |

**Notes:** Clock tolerance is +/- 50 ppm

## 9. EEPROM INFORMATION (A0)

| Addr   | Field Size (Bytes) | Name of Field    | HEX  | Description                  |
|--------|--------------------|------------------|--|------------------------------|
| 0      | 1                  | Identifier       | 03   | SFP                          |
| 1      | 1                  | Ext. Identifier  | 04   | MOD4                         |
| 2      | 1                  | Connector        | 22   | RJ45                         |
| 3-10   | 8                  | Transceiver      | 00 00 00 00 00 00 00 00                            | Transmitter Code             |
| 11     | 1                  | Encoding         | 06   | 64B66B                       |
| 12     | 1                  | BR, nominal      | 67   | 10000M bps                   |
| 13     | 1                  | Reserved         | 00   |                              |
| 14     | 1                  | Length (9um)-km  | 00   |                              |
| 15     | 1                  | Length (9um)     | 00   |                              |
| 16     | 1                  | Length (50um)    | 00   |                              |
| 17     | 1                  | Length (62.5um)  | 00   |                              |
| 18     | 1                  | Length (copper)  | 1E   | 30m                          |
| 19     | 1                  | Reserved         | 00   |                              |
| 20-35  | 16                 | Vendor name      | 57 49 4E 54 4F 50 20 20<br>20 20 20 20 20 20 20 20 |                              |
| 36     | 1                  | Reserved         | 00   |                              |
| 37-39  | 3                  | Vendor OUI       | 00 00 00   |                              |
| 40 55  | 16                 | Vendor PN        | xx xx xx xx xx xx xx xx<br>xx xx xx xx xx xx xx xx | ASC II                       |
| 56-59  | 4                  | Vendor rev       | 31 2E 30 20  | V1.0                         |
| 60-61  | 2                  | Wavelength       | 00 00  | 850nm                        |
| 62     | 1                  | Reserved         | 00   |                              |
| 63     | 1                  | CC BASE          | XX   | Check sum of byte 0~62       |
| 64-65  | 2                  | Options          | 00 1A  | LOS, TX_DISABLE,<br>TX_FAULT |
| 66     | 1                  | BR, max          | 00   |                              |
| 67     | 1                  | BR, min          | 00   |                              |
| 68-83  | 16                 | Vendor SN        | 00 00 00 00 00 00 00 00<br>00 00 00 00 00 00 00 00 | Unspecified                  |
| 84-91  | 8                  | Vendor date code | XX XX XX 20  | Year, Month, Day             |
| 92-94  | 3                  | Reserved         | 00   |                              |
| 95     | 1                  | CC_EXT           | XX   | Check sum of byte 64~94      |
| 96-255 | 160                | Vendor specific  |  |                              |

## 10. EEPROM INFORMATION (A2) , optional



## 11.Environmental Specifications

Automatic crossover detection is enabled. External crossover cable is not required

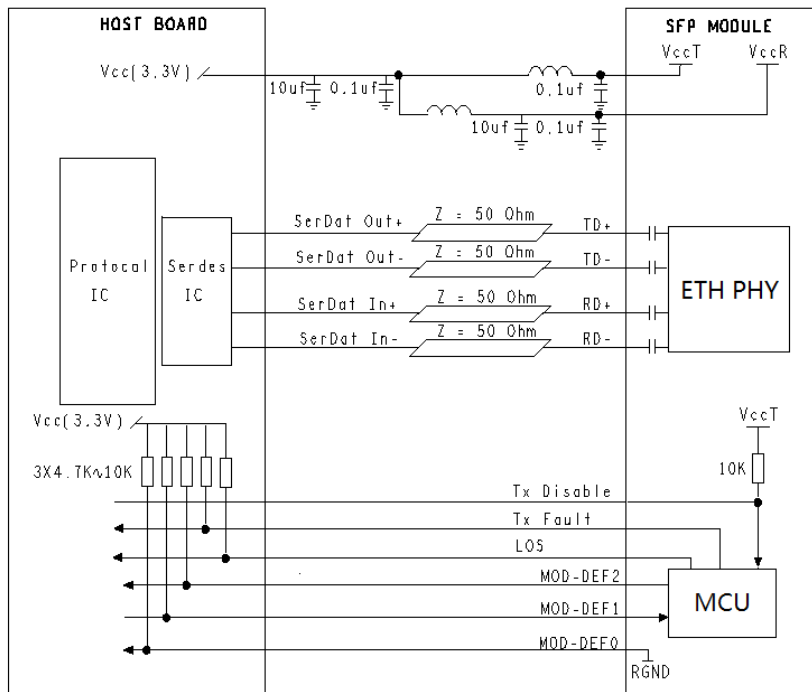
| Environmental Specifications |        |     |     |     |      |                     |
|------------------------------|--------|-----|-----|-----|------|---------------------|
| Parameter                    | Symbol | Min | Typ | Max | unit | Notes/Conditions    |
| Operating Temperature        | Top    | 0   |     | 65  | °C   | Case temperature    |
| Storage Temperature          | Tsto   | -40 |     | 85  | °C   | Ambient temperature |

## 12. Serial Communication Protocol

All SFPs support the 2-wire serial communication protocol outlined in the SFP MSA. These SFPs use an MCU, can be accessed with address of A0h.

| Serial Bus Timing, Requirements |        |     |     |         |      |                  |
|---------------------------------|--------|-----|-----|---------|------|------------------|
| Parameter                       | Symbol | Min | Typ | Max     | unit | Notes/Conditions |
| I <sup>2</sup> C Clock Rate     |        | 0   |     | 200,000 | Hz   |                  |

## 13. Recommended Application Circuit





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## 14. Mechanical Specifications (Unit: mm)

