

## **10GBASE-T Copper SFP+ Transceiver**

### **ASF-10G-T**

#### **Features**

- Support 10GBASE-T Operation in Host Systems
- Support RX\_LOS as Link indication function
- Hot-Pluggable SFP Footprint
- Compact RJ-45 Connector Assembly
- Compliant with SFP MSA
- Operating Case Temperature:
  - Standard: 0°C~70°C



#### **Applications**

- 10G BASE-T IEEE 802.3an
- 1000BASE-T IEEE 802.3ab
- 100BASE-TX IEEE 802.3u
- 5G MGBASE-T
- 2.5G MGBASE-T

#### **Product Description**

ASF-10G-T 10G BASE-T Copper Small Form Pluggable (SFP) modules are based on the SFP Multi Source Agreement (MSA). It is compliant with the 10G BASE-T, 1000BASE-T, 100BASE-TX standards as specified in IEEE STD 802.3an, 802.3ab and 802.3au.

**Absolute Maximum Ratings\***

| Parameter              | Symbol | Min  | Typ | Max | Units |
|------------------------|--------|------|-----|-----|-------|
| Maximum Supply Voltage | Vcc    | -0.5 |     | 4.0 | V     |
| Storage Temperature    | TS     | -40  |     | 85  | °C    |

\*Exceeding any one of these values may destroy the device permanently.

**Normal operating condition**

| Parameter                  | Symbol |           | Min  | Typ | Max  | Units |
|----------------------------|--------|-----------|------|-----|------|-------|
| Operating Case Temperature | Tc     | ASF-10G-T | 0    |     | 70   | °C    |
| Supply Voltage             | Vcc    |           | 3.14 | 3.3 | 3.46 | V     |

**Regulatory Compliance\*Note1**

| Product Certificate | Certificate Number | Applicable Standard           |
|---------------------|--------------------|-------------------------------|
| TUV                 | R50135086          | EN 60950-1:2006+A11+A1+A12+A2 |
|                     |                    | EN 60825-1:2014               |
|                     |                    | EN 60825-2:2004+A1+A2         |
| UL                  | E317337            | UL 60950-1                    |
|                     |                    | CSA C22.2 No. 60950-1-07      |
| EMC CE              | AE 50285865 0001   | EN 55022:2010                 |
|                     |                    | EN 55024:2010                 |
| FCC                 | WTF14F0514417E     | 47 CFR PART 15 OCT., 2013     |
| FDA                 | /                  | CDRH 1040.10                  |
| ROHS                | /                  | 2011/65/EU                    |

Note1: The above certificate number updated to June 2014, because some certificate will be updated every year, such as FDA and ROHS. For the latest certification information, please check with 10Gtek.

## Electrical Characteristics

| Parameter                                                     | Symbol                         | Min                           | Typ | Max                           | Units | Notes/Conditions                                                                       |
|---------------------------------------------------------------|--------------------------------|-------------------------------|-----|-------------------------------|-------|----------------------------------------------------------------------------------------|
| <b>+3.3 Volt Electrical Power Interface</b>                   |                                |                               |     |                               |       |                                                                                        |
| Supply Current                                                | I <sub>cc</sub>                |                               |     | 800                           | mA    |                                                                                        |
| Input Voltage                                                 | V <sub>cc</sub>                | 3.13                          | 3.3 | 3.47                          | V     |                                                                                        |
| <b>Low-Speed Signals, Electronic Characteristics</b>          |                                |                               |     |                               |       |                                                                                        |
| SFP Output LOW                                                | V <sub>OL</sub>                | 0                             |     | 0.5                           | V     | 4.7k to 10k pull-up to host_V <sub>cc</sub> ,<br>measured at<br>host side of connector |
| SFP Output HIGH                                               | V <sub>OH</sub>                | host_V <sub>cc</sub> –<br>0.5 |     | host_V <sub>cc</sub> +<br>0.3 | V     | 4.7k to 10k pull-up to host_V <sub>cc</sub> ,<br>measured at<br>host side of connector |
| SFP Input LOW                                                 | V <sub>IL</sub>                | 0                             |     | 0.8                           | V     | 4.7k to 10k pull-up to V <sub>cc</sub> ,<br>measured at SFP<br>side of connector       |
| SFP Input HIGH                                                | V <sub>IH</sub>                | 2                             |     | V <sub>cc</sub> +<br>0.3      | V     | 4.7k to 10k pull-up to V <sub>cc</sub> ,<br>measured at SFP<br>side of connector       |
| <b>High-Speed Electrical Interface, Transmission Line-SFP</b> |                                |                               |     |                               |       |                                                                                        |
| Tx Output impedance                                           | Z <sub>out,TX</sub>            |                               | 100 |                               | Ohm   | Differential, for all frequencies<br>between<br>1MHz and 125MHz                        |
| Rx Input Impedance                                            | Z <sub>in,RX</sub>             |                               | 100 |                               | Ohm   | Differential, for all frequencies<br>between<br>1MHz and 125MHz                        |
| <b>High-Speed Electrical Interface, Host-SFP</b>              |                                |                               |     |                               |       |                                                                                        |
| Single ended data<br>input swing                              | V <sub>in</sub>                | 250                           |     | 1200                          | mV    | Single ended                                                                           |
| Single ended data<br>output swing                             | V <sub>out</sub>               | 350                           |     | 800                           | mV    | Single ended                                                                           |
| Rise/Fall Time                                                | T <sub>r</sub> ,T <sub>f</sub> |                               | 20  |                               | psec  | 20%-80%                                                                                |
| Tx Input<br>Impedance                                         | Z <sub>in</sub>                |                               | 50  |                               | Ohm   | Single ended                                                                           |

|                     |      |  |    |  |     |              |
|---------------------|------|--|----|--|-----|--------------|
| Rx Output Impedance | Zout |  | 50 |  | Ohm | Single ended |
|---------------------|------|--|----|--|-----|--------------|

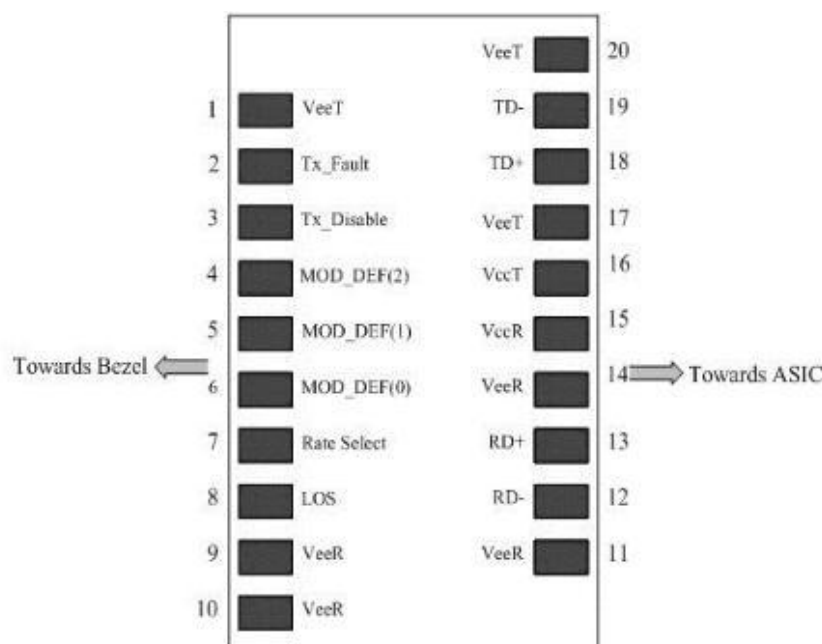
## Pin Descriptions

| Pin No. | Name       | Function                     | Plug Seq. | Notes    |
|---------|------------|------------------------------|-----------|----------|
| 1       | VeeT       | Transmitter Ground           | 1         |          |
| 2       | TX Fault   | Transmitter Fault Indication | 3         | Not used |
| 3       | TX Disable | Transmitter Disable          | 3         | 1        |
| 4       | MOD-DEF2   | Module Definition 2          | 3         | 2        |
| 5       | MOD-DEF1   | Module Definition 1          | 3         | 2        |
| 6       | MOD-DEF0   | Module Definition 0          | 3         | 2        |
| 7       | RS0        | No Connection required       | 3         |          |
| 8       | LOS        | Loss of Signal               | 3         | RX_LOSS  |
| 9       | RS1        | No Connection required       | 1         |          |
| 10      | VeeR       | Receiver Ground              | 1         |          |
| 11      | VeeR       | Receiver Ground              | 1         |          |
| 12      | RD-        | Inv. Received Data Out       | 3         |          |
| 13      | RD+        | Received Data Out            | 3         |          |
| 14      | VeeR       | Receiver Ground              | 1         |          |
| 15      | VccR       | Receiver Power               | 2         |          |
| 16      | VccT       | Transmitter Power            | 2         |          |
| 17      | VeeT       | Transmitter Ground           | 1         |          |
| 18      | TD+        | Transmit Data In             | 3         |          |
| 19      | TD-        | Inv. Transmit Data In        | 3         |          |
| 20      | VeeT       | Transmitter Ground           | 1         |          |

### Notes:

1. PHY disabled on TDIS > 2.0V or open, enabled on TDIS < 0.8V, used to reset the module.
2. Should be pulled up with 4.7k – 10k Ohm 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.

The following is the Diagram of host board connector block pin numbers and names



## Serial Communication Protocol

10Gtek Copper SFPs support the 2-wire serial communication protocol outlined in the SFP MSA. These SFP use a 128 byte EEPROM with an address of A0H.

## EEPROM Serial ID Memory Contents

Accessing Serial ID Memory uses the 2 wire address 1010000X (A0H). Memory Contents of Serial ID are shown in Table 1.

**Table 1 Serial ID Memory Contents**

| Addr.                 | Size (Bytes) | Name of Field   | Hex | Description                               |
|-----------------------|--------------|-----------------|-----|-------------------------------------------|
| <b>BASE ID FIELDS</b> |              |                 |     |                                           |
| 0                     | 1            | Identifier      | 03  | SFP                                       |
| 1                     | 1            | Ext. Identifier | 04  | SFP function is defined by serial ID only |
| 2                     | 1            | Connector       | 07  | -LC                                       |

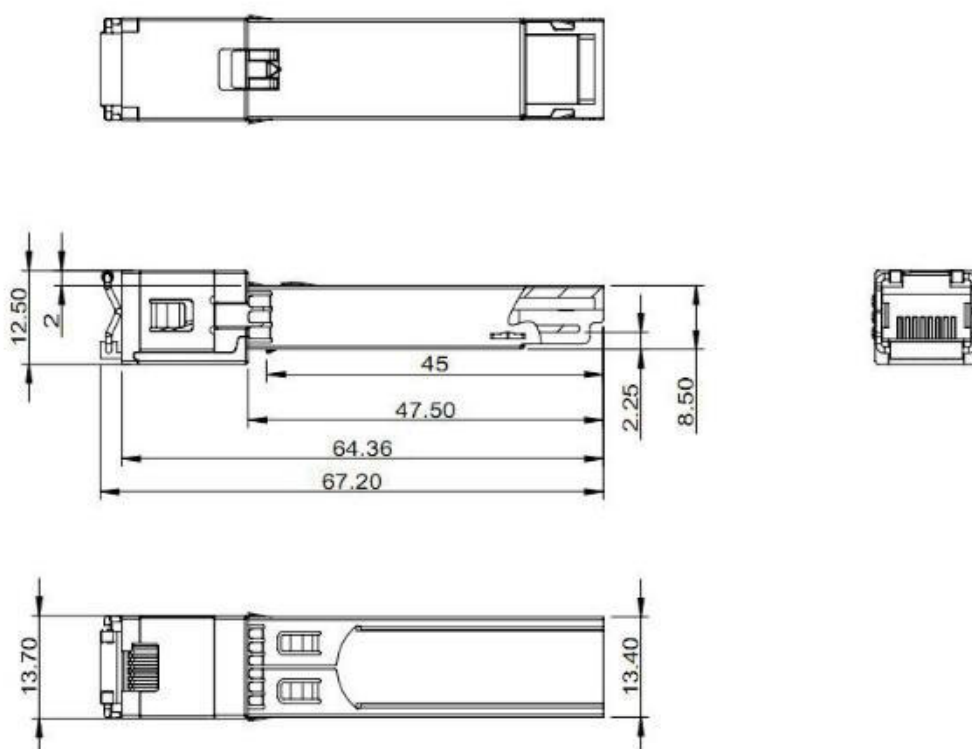
|                           |    |                               |                                                                 |                                                                 |
|---------------------------|----|-------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
| 3-10                      | 8  | Transceiver                   | 10 00 00 00 00 00<br>00 00                                      | Transmitter Code                                                |
| 11                        | 1  | Encoding                      | 06                                                              | 64B/66B                                                         |
| 12                        | 1  | BR, Nominal                   | 67                                                              | 10.3G                                                           |
| 13                        | 1  | Reserved                      | 00                                                              | -                                                               |
| 14                        | 1  | Length (9μm)km                | 00                                                              |                                                                 |
| 15                        | 1  | Length(9μm)100m               | 00                                                              |                                                                 |
| 16                        | 1  | Length (50μm) 10m             | 08                                                              | 80m                                                             |
| 17                        | 1  | Length(62.5μm)10m             | 02                                                              | 20m                                                             |
| 18                        | 1  | Length (Copper)               | 00                                                              |                                                                 |
| 19                        | 1  | Reserved                      | 1E                                                              | 300m                                                            |
| 20-35                     | 16 | Vendor name                   | XX XX XX XX XX<br>XX XX XX(note2)20<br>20                       | Vendor name (ASCII)                                             |
| 36                        | 1  | Reserved                      | 00                                                              | -                                                               |
| 37-39                     | 3  | Vendor OUI                    | XX XX XX(note2)                                                 | -                                                               |
| 40-55                     | 16 | Vendor PN                     | XX XX XX XX XX<br>XX XX XX XX XX<br>XX XX XX XX XX<br>XX(note2) | Transceiver part number                                         |
| 56-59                     | 4  | Vendor rev                    | XX XX XX<br>XX(note2)                                           | -                                                               |
| 60-61                     | 2  | Wavelength                    | 03 52                                                           | -850nm                                                          |
| 62                        | 1  | Reserved                      | 00                                                              | -                                                               |
| 63                        | 1  | CC_BASE                       | Check Sum<br>(Variable)                                         | Check code for Base ID Fields                                   |
| <b>EXTENDED ID FIELDS</b> |    |                               |                                                                 |                                                                 |
| 64-65                     | 2  | Options                       | 00 1A                                                           | TX_DISABLE, TX_FAULT and<br>Loss of Signal implemented.         |
| 66                        | 1  | BR,max                        | 00                                                              |                                                                 |
| 67                        | 1  | BR,min                        | 00                                                              |                                                                 |
| 68-83                     | 16 | Vendor SN                     | XX XX XX XX XX<br>XX XX XX<br>20 20 20 20 20 20<br>20 20(note2) | Serial Number of transceiver (ASCII).<br>For example "B000822". |
| 84-91                     | 8  | Date code                     | XX XX XX XX XX<br>XX XX XX(note2)                               | Manufactory date code.<br>For example "080405".                 |
| 92                        | 1  | Diagnostic<br>Monitoring Type | XX(note2)                                                       | Digital diagnostic monitoring<br>implemented                    |

|                                  |     |                     |            |                                       |
|----------------------------------|-----|---------------------|------------|---------------------------------------|
| 93                               | 1   | Enhanced Options    | XX(note2)  | Optional flags                        |
| 94                               | 1   | SFF_8472 Compliance | XX(note2)  | 01 for diagnostics (Rev9.3 SFF-8472). |
| 95                               | 1   | CC_EXT              | Check Sum  | Check sum for Extended ID             |
|                                  |     |                     | (Variable) | Field.                                |
| <b>VENDOR SPECIFIC ID FIELDS</b> |     |                     |            |                                       |
| 96-127                           | 32  | Vendor Specific     | Read only  | Depends on customer information       |
| 128-255                          | 128 | Reserved            | Read only  | -                                     |

Note2: The "XX" byte should be filled in according to practical case. For more information, please refer to the related document of SFP Multi-Source Agreement (MSA).

## Mechanical Specifications

10Gtek's Copper SFP transceivers are compliant with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



\*This 2D drawing only for reference, please check with 10Gtek before ordering.

## Notice

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## Order Information

| Part No.         | Data Rate | Media type | Distance | Connector | Temperature |
|------------------|-----------|------------|----------|-----------|-------------|
| ASF-10G-T* Note3 | 10G       | CAT6A/CAT7 | 20m      | RJ45      | Standard    |

Note3: Standard version.

\*The product image only for reference purpose.

## Revision History

| Revision | Initiated | Approved | content  | Release Date |
|----------|-----------|----------|----------|--------------|
| Ver1.0   | Jacky     | Nicky    | Released | Dec/2016     |
| Ver1.1   | QR.HUANG  | Nicky    | Released | July/2017    |

## Further Information

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