## **Technical Datasheet**

## MA-SFP-10GB-T-C

### Meraki® Compatible 10GBase-T SFP+ Transceiver

Hot Pluggable, +3.3V, Cat 6a/7 Cable, up to 30m, Commercial Temperature

### FEATURES

- Supports 10GBase-T / 5GBase-T / 2.5GBase-T / 1000base-T
- Hot-pluggable SFP footprint
- Supports Links up to 30m using Cat 6a/7 Cable
- SFF-8431 and SFF-8432 MSA Compliant
- IEEE 802.3az Compliant
- Low Power Consumption (2.5W MAX at 30m)
- Commercial Operating Temperature Range: 0 to 70°C
- Fast Retrain EMI Cancellation Algorithm
- Low EMI Emissions
- I2C 2-Wire Interface for Serial ID and PHY Register Access
- Auto-negotiates with other 10GBase-T PHYs
- Supports 100/1000Base-T using Cat 5e cable or better
- MDI/MDIX Crossover
- Multiple Loopback Modes for Testing and Troubleshooting
- Built-in Cable Monitoring and Link
- Cable Length Measurements
- Robust Die Cast Housing
- Bail Latch Style ejector mechanism
- Unshielded and Shielded cable support

#### DESCRIPTION

ATGBICS® Compatible MA-SFP-10GB-T-C copper transceiver module is a high-performance integrated duplex data link for bi-directional communication over copper cable. It is specifically designed for high-speed communication links that require 10 Gigabit Ethernet over Cat 6a/7.

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 pin for link indication. If pull up SFP's TX\_DISABLE pin, PHY IC be reset.

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### **CABLE LENGTH**

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

### 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<sub>DIS</sub> >2.0V or open, enabled on T<sub>DIS</sub> <0.8V

3. Should be pulled up with 4.7k - 10k Ohms on host board to a voltage between 2.0V and 3.6V.

MOD\_DEF(0) pulls line low to indicate module is plugged in.

4. LVTTL compatible with a maximum voltage of 2.5V.

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## **Technical Datasheet**

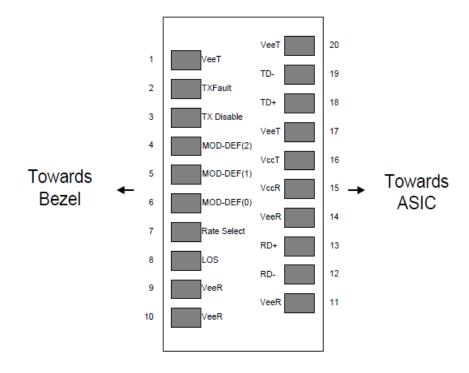


Figure 1. Diagram of host board connector block pin numbers and names

### +3.3V VOLT ELECTRICAL POWER INTERFACE

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

|                 | +3.3 Volt Electrical Power Interface |      |     |      |      |  |  |  |  |  |  |
|-----------------|--------------------------------------|------|-----|------|------|--|--|--|--|--|--|
| Parameter       | Symbol                               | Min  | Тур | Max  | unit | Notes/Conditions   |  |  |  |  |  |
| Supply Current  | ls                                   |      | 700 | 900  | mA   | 3.0W max power over<br>full range of voltage<br>and temperature.<br>See caution note below |  |  |  |  |  |
| Input Voltage   | Vcc                                  | 3.13 | 3.3 | 3.47 | V    | Referenced to GND  |  |  |  |  |  |
| Maximum Voltage | Vmax                                 |      |     | 4    | V    |  |  |  |  |  |  |
| Surge Current   | lsurge                               |      | TBD |      | mA   | Hot plug above steady state<br>current. See caution note<br>below                          |  |  |  |  |  |

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

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## **Technical Datasheet**

#### 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           | Мах           | unit | Notes/Conditions  |
|-----------------|--------|---------------|---------------|------|---|
| SFP Output LOW  | VOL    | 0             | 0.5           | V    | 4.7k to 10k pull-up to host_Vcc,<br>measured at host side of<br>connector |
| SFP Output HIGH | VOH    | host_Vcc -0.5 | host_Vcc +0.3 | V    | 4.7k to 10k pull-up to host_Vcc,<br>measured at host side of<br>connector |
| SFP Input LOW   | VIL    | 0             | 0.8           | V    | 4.7k to 10k pull-up to Vcc,<br>measured at SFP side of<br>connector       |
| SFP Input HIGH  | VIH    | 2             | Vcc +0.3      | V    | 4.7k to 10k pull-up to Vcc,<br>measured at SFP side of<br>connector       |

#### HIGH-SPEED ELECTRICAL INTERFACE

All high-speed signals are AC-coupled internally.

| High                | High-Speed Electrical Interface, Transmission Line-SFP |     |     |     |      |   |  |  |  |  |  |
|---------------------|--|-----|-----|-----|------|---|--|--|--|--|--|
| Parameter           | Symbol   | Min | Тур | Max | unit | Notes/Conditions  |  |  |  |  |  |
| Line Frequency      | fL   |     | 125 |     | MHz  | 5-level encoding, per<br>IEEE 802.3                             |  |  |  |  |  |
| Tx Output Impedance | Zout,TX  |     | 100 |     | Ohm  | Differential, for all<br>frequencies between<br>1MHz and 125MHz |  |  |  |  |  |
| Rx Input Impedance  | Zin,RX   |     | 100 |     | Ohm  | Differential, for all<br>frequencies between<br>1MHz and 125MHz |  |  |  |  |  |

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## **Technical Datasheet**

| High-Speed Electrical Interface, Host-SFP |                                 |     |     |      |      |                  |  |  |  |  |
|---|---------------------------------|-----|-----|------|------|------------------|--|--|--|--|
| Parameter                                 | Symbol                          | Min | Тур | Max  | unit | Notes/Conditions |  |  |  |  |
| Single ended data input<br>swing          | Vinsing                         | 250 |     | 1200 | mV   | Single ended     |  |  |  |  |
| Single ended data<br>output<br>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     |  |  |  |  |

### **GENERAL SPECIFICATIONS**

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

Notes:

1. Clock tolerance is ± 50 ppm

#### **ENVIRONMENTAL SPECIFICATIONS**

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

| Parameter             | Symbol | Min | Тур | Max | unit | <b>Notes/Conditions</b> |
|-----------------------|--------|-----|-----|-----|------|-------------------------|
| Operating Temperature | Тор    | 0   |     | 70  | °C   | Case temperature        |
| Storage Temperature   | Tsto   | -40 |     | 85  | °C   | Ambient<br>temperature  |

#### 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.

| Parameter                   | Symbol | Min | Тур | Max | unit | Notes/Conditions |
|-----------------------------|--------|-----|-----|-----|------|------------------|
| I <sup>2</sup> C Clock Rate |        | 0   |     | 200 | kHz  |                  |

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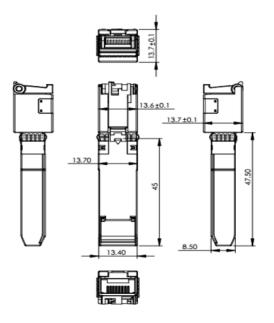
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# **Technical Datasheet**

**MECHANICAL SPECIFICATIONS (UNIT: mm)** 



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