# Arpers

# E1GSFPT-A-COM

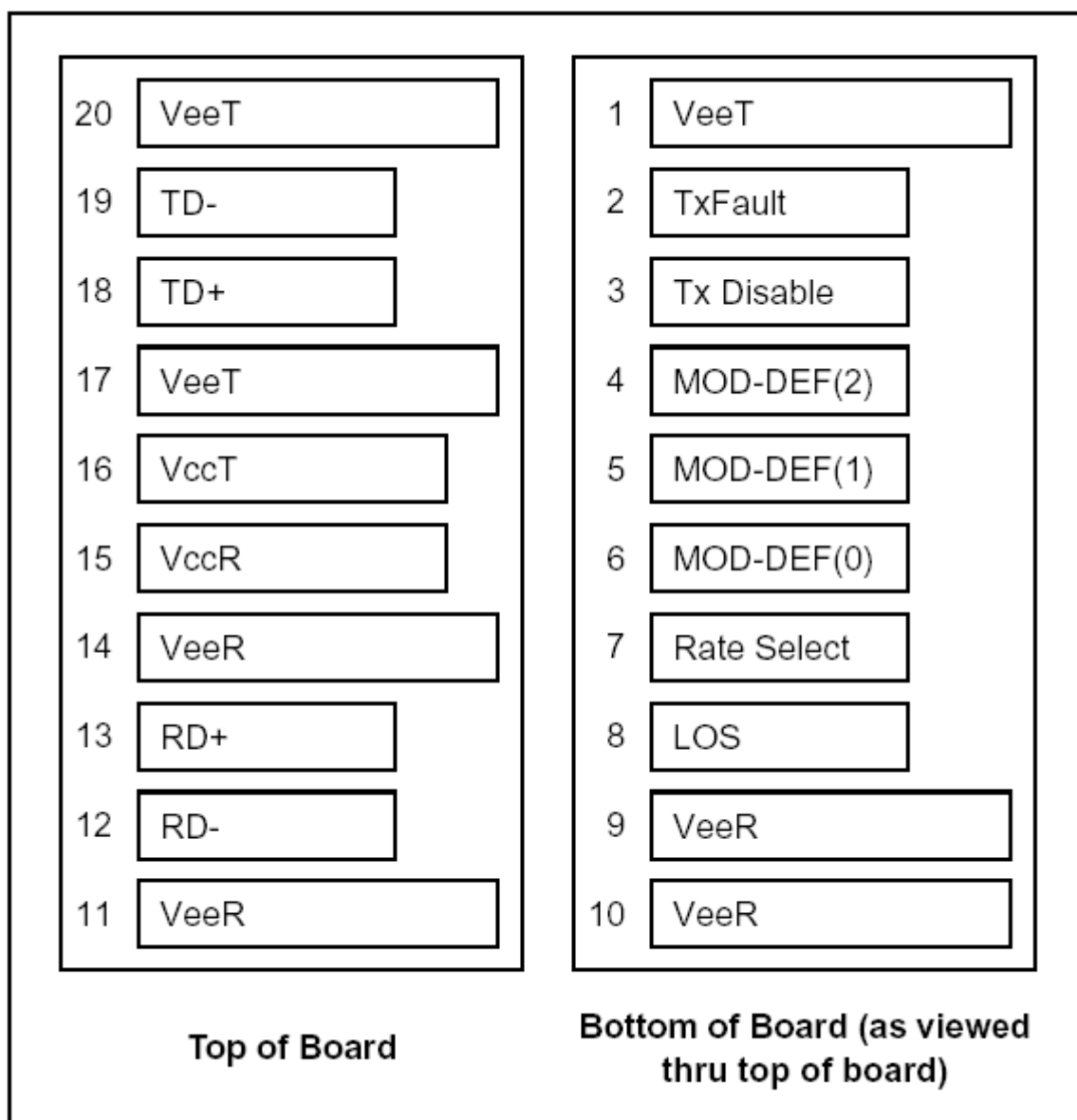## Copper SFP Transceiver

## Features

- Up to 1.25Gb/s bi-directional data links

- Hot-pluggable SFP footprint

- Extended 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

- 1000 BASE-T operation in host systems with SERDES interface

- 10/100/1000Mbps compliant in host systems with SGMII interface

## Applications

- 1.25 Gigabit Ethernet over Cat 5 cable

## Description

**E1GSFPT-A-COM** Copper Small Form Pluggable (SFP) transceivers are high performance, cost effective module compliant with the Gigabit Ethernet and 10/100/1000BASE-T standards as specified in IEEE 802. 3-2002 and IEEE 802.3ab, which supporting 10/100/1000Mbps data- rate up to 100 meters reach over unshielded twisted-pair category 5 cables. The module supports 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. The physical IC can also be accessed via 2wire serial bus at address ACh.

**Top of Board**

| Pin | Signal |
|-----|--------|
| 20 | VeeT |
| 19 | TD- |
| 18 | TD+ |
| 17 | VeeT |
| 16 | VccT |
| 15 | VccR |
| 14 | VeeR |
| 13 | RD+ |
| 12 | RD- |
| 11 | VeeR |

**Bottom of Board (as viewed thru top of board)**

| Pin | Signal |
|-----|--------|
| 1 | VeeT |
| 2 | TxFault |
| 3 | Tx Disable |
| 4 | MOD-DEF(2) |
| 5 | MOD-DEF(1) |
| 6 | MOD-DEF(0) |
| 7 | Rate Select |
| 8 | LOS |
| 9 | VeeR |
| 10 | VeeR |

## Pin Descriptions

| Pin | Signal Name | Description | Plug Seq. | Notes |
|-----|-------------|-------------|-----------|-------|
| 1 | $V_{EET}$ | Transmitter Ground | 1 | |
| 2 | TX FAULT | Transmitter Fault Indication | 3 | Note1 |
| 3 | TX DISABLE | Transmitter Disable | 3 | Note2 |
| 4 | MOD_DEF(2) | SDA Serial Data Signal | 3 | Note3 |
| 5 | MOD_DEF(1) | SCL Serial Clock Signal | 3 | Note3 |
| 6 | MOD_DEF(0) | TTL Low | 3 | Note3 |
| 7 | Rate Select | Not Connected | 3 | |

| 8 | LOS | Loss of Signal | 3 | Note 4 |
|---|---|---|---|---|
| 9 | V$_{EER}$ | Receiver ground | 1 | |
| 10 | V$_{EER}$ | Receiver ground | 1 | |
| 11 | V$_{EER}$ | Receiver ground | 1 | |
| 12 | RX- | Inv. Received Data Out | 3 | Note 5 |
| 13 | RX+ | Received Data Out | 3 | Note 5 |
| 14 | V$_{EER}$ | Receiver ground | 1 | |
| 15 | V$_{CCR}$ | Receiver Power Supply | 2 | |
| 16 | V$_{CCT}$ | Transmitter Power Supply | 2 | |
| 17 | V$_{EET}$ | Transmitter Ground | 1 | |
| 18 | TX+ | Transmit Data In | 3 | Note 6 |
| 19 | TX- | Inv. Transmit Data In | 3 | Note 6 |
| 20 | V$_{EET}$ | Transmitter Ground | 1 | |

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

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

2) TX Disable is not supported.

3) Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7K to 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): LVTTL 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 terminations inside the module.

## +3.3V Volt Electrical Power Interface

The E1GSFPT-A-COM has an input voltage range of +5V +/- 5%. The 3.3V maximum voltage is not allowed for continuous operation.

| +3.3V volt Electrical Power Interface | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Supply Current | Is | | 320 | 375 | mA | 1.2W 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 | | | 30 | 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

## 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 | Units | 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 |

## High-Speed Electrical Interface

All high-speed signals are AC-coupled internally.

| High-Speed Electrical Interface Transmission Line-SFP | | | | | |
|---|---|---|---|---|---|
| Parameter | Symbol | Min | Typ | Max | Units | 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

| High-Speed Electrical Interface, Host-SFP | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Symbol | Min | Typ | Max | Units | 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 | Tr,Tf | | 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 | Typ | Max | Units | Notes/Conditions |
| Data Rate | BR | 10 | | 1,000 | Mb/sec | IEEE 802.3 compatible. See Notes 2 through 4 below |
| Cable Length | L | | | 100 | m | Category 5 UTP. BER <10-12 |

Notes:

1. Clock tolerance is +/- 50 ppm.

2. By default, the E1GSFPT-A-COM is a full duplex device in preferred master mode.

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

## Environmental Specifications

| Environmental Specifications | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Operating Temperature | Top | 0 | | 70 | °C | Case temperature |
| Storage Temperature | Tsto | -40 | | 85 | °C | Ambient temperature |

## Mechanical Specifications

The host-side of the E1GSFPT-A-COM 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.
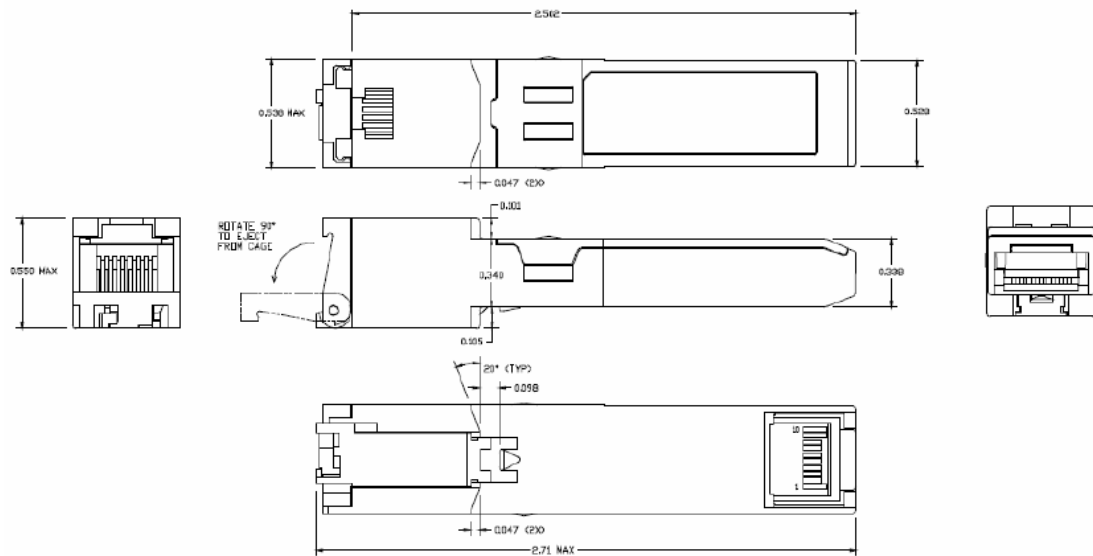
Figure2. GLC-T mechanical dimensions

## References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA).
2. IEEE Std 802.3, 2002 Edition. IEEE Standards Department, 2002.
3. "AT24C01A/02/04/08/16 2-Wire Serial CMOS E2PROM", Atmel Corporation.

## Ordering information

| Part number | Operating Case temperature |
|---|---|
| E1GSFPT-A-COM | 1000Mbps only, SERDES interface, Copper SFP with spring latch |