

## SFP-FES-TC Copper SFP Transceiver

### Product Features

- 100BASE-FX converter
- 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
- Compatible with IEEE802.3u



### Applications

- 100Base-FX Ethernet over Cat 5 cable

### Description

SFP-FES-TC Copper Small Form Pluggable (SFP) transceivers are high performance, cost effective module compliant with the Fast Ethernet and 100-BASE-T standards as specified in IEEE802.3u, which supporting 100Mbps data-rate up to 100 meters reach over unshielded twisted-pair category 5 cables. The module supports 100Mbps full duplex data-links with 5-level Pulse Amplitude Modulation (PAM) signals. 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 A0h.

### +3.3V Volt Electrical Power Interface

The SFP-FES-TC has an input voltage range of +3.3V +/- 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	I <sub>s</sub>		320	375	mA	1.2W max power over full range of voltage and temperature. See caution note below
Input Voltage	V <sub>cc</sub>	3.13	3.3	3.47	V	Referenced to GND
Maximum Voltage	V <sub>max</sub>			4	V	
Surge Current	I <sub>surge</sub>			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 GBIC MSA

## 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

## 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
GBIC Output LOW	VOL	0	0.5	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector
GBIC 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
GBIC Input LOW	VIL	0	0.8	V	4.7k to 10k pull-up to Vcc, measured at GBIC side of connector
GBIC Input HIGH	VIH	2	Vcc + 0.3	V	4.7k to 10k pull-up to Vcc, measured at GBIC side of connector

## High-Speed Electrical Interface

All high-speed signals are AC-coupled internally.

High-Speed Electrical Interface Transmission Line-GBIC						
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-GBIC

High-Speed Electrical Interface, Host-GBIC						
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

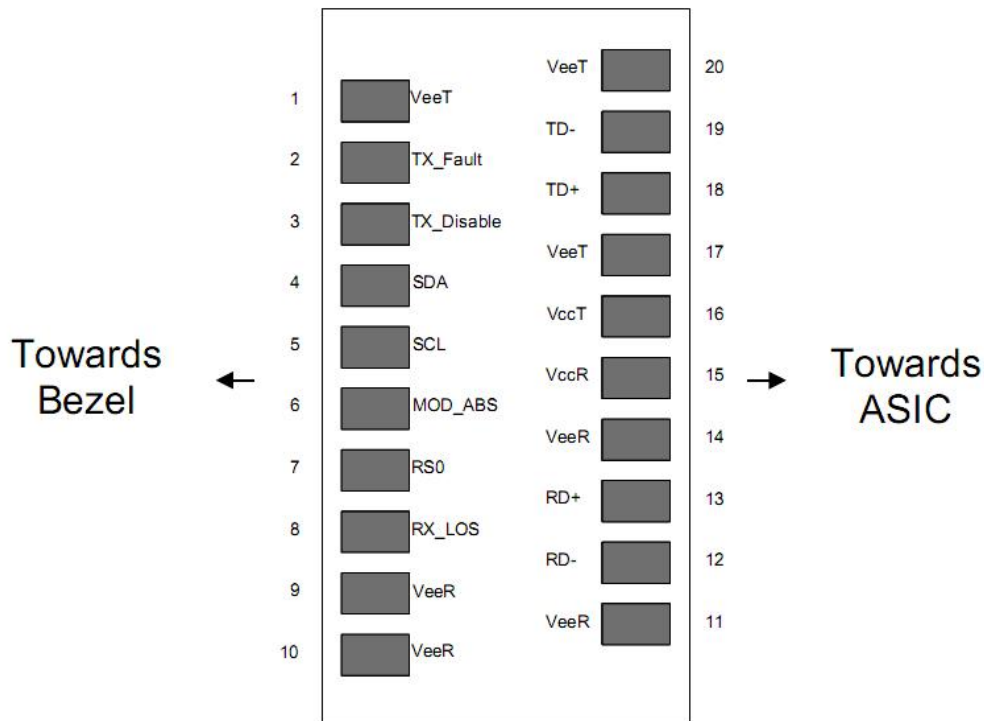
**Note:**

1. Clock tolerance is +/- 50 ppm
2. By default, the SFP-FES-TC is a full duplex device in preferred master mode
3. Automatic crossover detection is enabled. External crossover cable is not required

## References

1. Gigabit Interface Converter (GBIC) 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.
4. "Alaska Ultra 88E1111 Integrated 10/100/1000 Gigabit Ethernet Transceiver", Marvell Corporation.

## Pin Descriptions



Pin	Signal Name	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	Note 3
9	V <sub>EER</sub>	Receiver ground	1	
10	V <sub>EER</sub>	Receiver ground	1	
11	V <sub>EER</sub>	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	V <sub>EER</sub>	Receiver ground	1	
15	V <sub>CCR</sub>	Receiver Power Supply	2	
16	V <sub>CCT</sub>	Transmitter Power Supply	2	
17	V <sub>EET</sub>	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5
19	TD-	Inv. Transmit Data In	3	Note 5
20	V <sub>EET</sub>	Transmitter Ground	1	

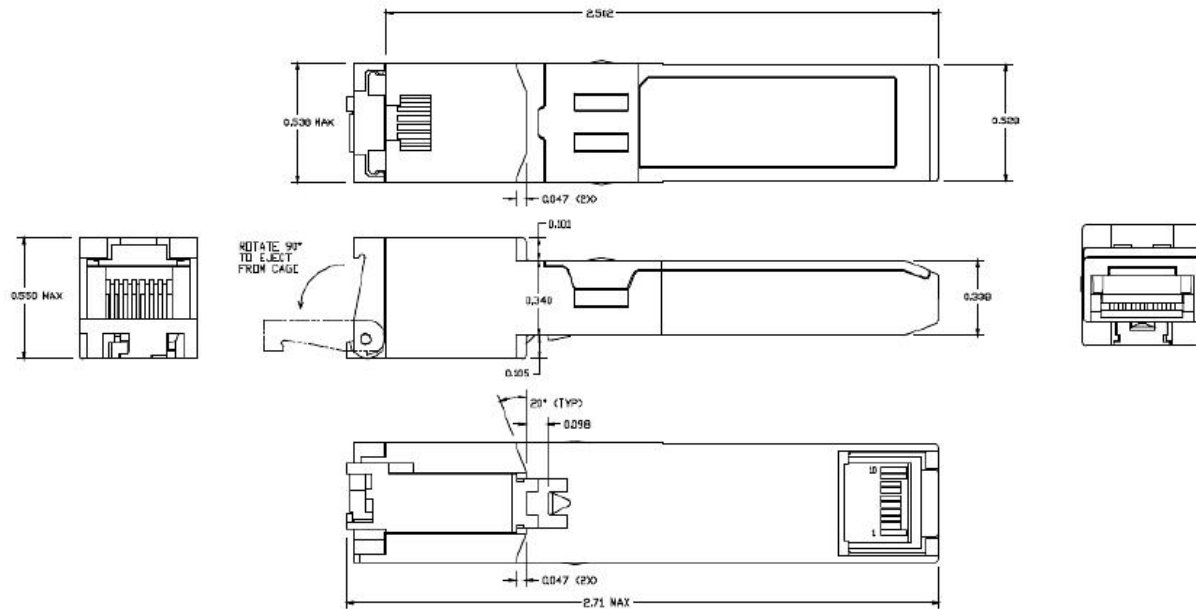
**Notes:**

Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V<sub>cc</sub>+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 3) LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- 4) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential).
- 5) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

## Mechanical Specifications

The host-side of the SFP-FES-TC 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.



## Ordering information

Part Number	Product Description
SFP-FES-TC	100Mbps only, Copper SFP with spring latch

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