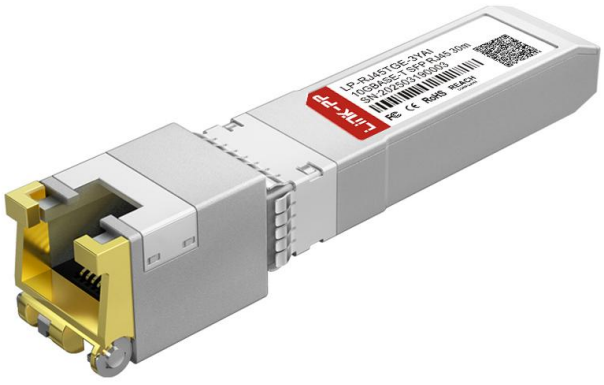
LP-RJ45TGE-3YAI

10GBase-T Copper SFP+ RJ45 30m Transceiver

Product Features

- Supports 10G Ethernet transmission up to 30 meters via Cat6A and above twisted pair cables
- Complies with SFF-8431 and SFF-8432 MSA standard protocols
- Adheres to IEEE 802.3az and 802.3an protocols
- Complies with 2.5G and 5G Ethernet IEEE 802.3bz standards
- Hot-swappable SFP+ package
- TX Disable and RX Los functions
- Full metal shell packaging with low electromagnetic interference emissions
- +3.3V single power supply
- Low power consumption (maximum power of 2.5W for 30m transmission)
- Compact RJ45 connector for cost-effective twisted pair copper cabling
- Access to physical layer chip via 2-wire serial bus
- Automatic negotiation for XFI/5GBASE-R/2500BASE-X on SGMII interface host systems
- Automatic negotiation with other 10GBASE-T PHYs
- Supports 100/1000M rate transmission over Cat5E cables
- MDI/MDIX conversion
- Multiple loopback modes for testing and fault diagnosis
- Built-in cable monitoring and link diagnostics
- Supports both unshielded and shielded cables
- Operating temperature range: -40°C to +85°C



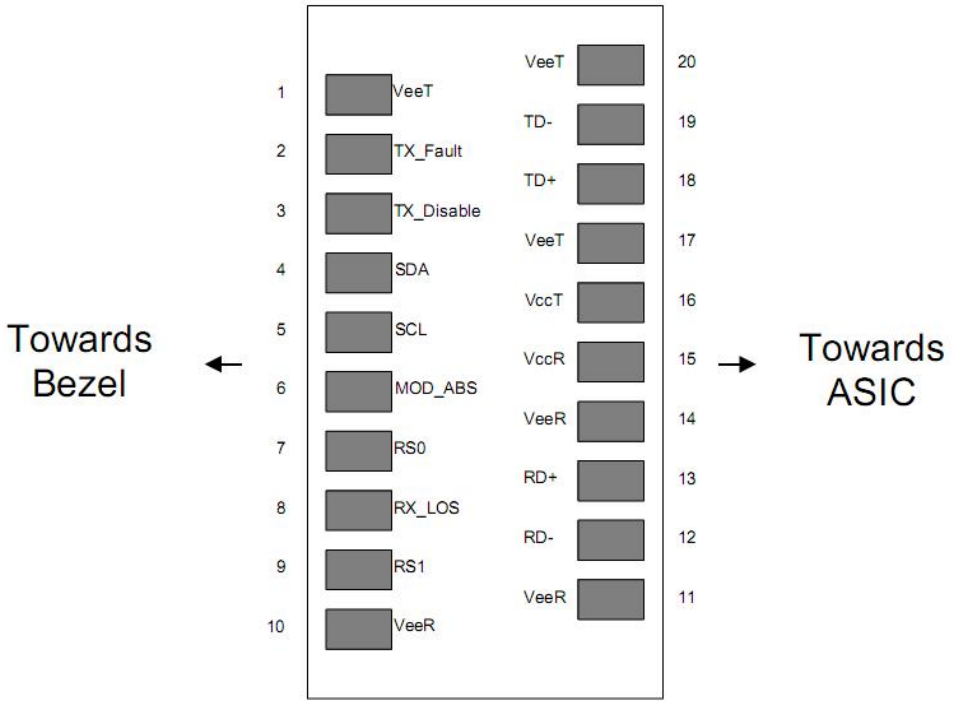
Applications

- Supports 10G Ethernet over Cat 6A/7 cables
- Supports 5G Ethernet over Cat 6A/7 cables
- Supports 2.5G Ethernet over Cat 6A/7 cables
- Supports 1G Ethernet over Cat 5e cables

Description

The LP-RJ45TGE-3YAI small form-factor pluggable 10GBASE-T SFP+ electrical module is a high-performance, high-reliability, and cost-effective 10G connectivity solution. It is compatible with the 10G Ethernet and 10GBASE-T/5GBASE-T/2.5GBASE-T/1000BASE-T standards specified by IEEE 802.3az-2015 and 802.3a, supporting 30 meters of data rate transmission at 10Gbps over shielded twisted pair Cat 6A cables. It supports 10Gbps full-duplex data links with 16-level pulse amplitude modulation (PAM) signals. The module provides serial ID information compliant with the SFP+ MSA standard, accessible via a 2-wire serial bus at address A0h. The physical chip is accessed via the 2-wire serial bus at address ACh.

Pin Descriptions



Pin	Signal Name	Description	Notes
1	VEET	Transmitter Ground	1
2	TX FAULT	Transmitter Fault Indication	2
3	TX DISABLE	Transmitter Disable	3
4	Mod_DEF(2)/SDA	SDA Serial Data Signal	4
5	Mod_DEF(1)/SCL	SCL Serial Clock Signal	4
6	Mod_DEF(0)/MOD_ABS	Module Absent. Grounded within the module	4

7	RS0	Not Connected	
8	LOS	Loss of Signal	2
9	RS1	Not Connected	1
10	V_{EER}	Receiver ground	1
11	V_{EER}	Receiver ground	1
12	RD-	Inv. Received Data Out	
13	RD+	Received Data Out	
14	V_{EER}	Receiver ground	1
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground	1
18	TD+	Transmit Data In	
19	TD-	Inv. Transmit Data In	
20	V_{EET}	Transmitter Ground	1

Notes:

1.The module signal ground pins VeeR and VeeT should be isolated from the module casing.

2.This pin is an open-collector/drain output contact that can be pulled up to any power supply potential of the host.

3.Tx_Disable is a pin that is pulled up to the internal VccT pin of the module through a current-limiting resistor of 4.7kΩ to 10kΩ.

4.The voltage at the end of the 4.7kΩ to 10kΩ resistor on the host board should be pulled down to 2.0V-3.6V, and Mod_DEF(0) pulled low indicates that the module is inserted.

+3.3V Volt Electrical Power Interface

Table 1. +3.3V Volt electrical power interface

+3.3V volt Electrical Power Interface						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Supply Current	Is		500	750	mA	2.5W 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			3.6	V	

Table 2. Low-speed signals, electrical characteristics

Low-speed signals, electrical characteristics					
Parameter	**Symbol**	**Min**	**Max**	**Units**	**Notes/Conditions**
SFP+ Output Low Level	VOL	0	0.5	V	Pulled up to host_Vcc with 4.7k to 10k, measured on the host side of the connector
SFP+ Output High Level	VOH	host_Vcc-0.5	host_Vcc+0.3	V	Pulled up to host_Vcc with 4.7k to 10k, measured on the host side of the connector
SFP+ Input Low Level	VIL	0	0.8	V	Pulled up to Vcc with 4.7k to 10k, measured on the SFP side of the connector
SFP+ Input High Level	VIH	2	Vcc+0.3	V	Pulled up to Vcc with 4.7k to 10k, measured on the SFP side of the connector

Notes:MOD_DEF(1) (SCL) and MOD_DEF(2) (SDA) are open-drain CMOS signals and must be pulled up to the host side Vcc (host_Vcc).

Table 3. High-Speed Electrical Interface, Transmission Line - SFP+

High-Speed Electrical Interface, Transmission Line - SFP+						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Line Frequency	FL		800		MHz	16-level encoding, compliant with IEEE 802.3
Tx Output Impedance	ZOUT,TX		100		Ω	Differential, applicable for all frequencies between 1MHz and 800MHz
Rx Input Impedance	ZIN,RX		100		Ω	Differential, applicable for all frequencies between 1MHz and 800MHz

Notes:All high-speed signals are internally AC coupled.

Table 4. 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	Input	500	800	1100	mV	Differential
Single-ended Data Output Swing	Output	500	800	1100	mV	Differential
Rise/Fall Time	Tr	20		47	ps	20% to 80%
Tx Input Impedance	Zin		100		Ω	Differential
Rx Output Impedance	Zout		100		Ω	Differential

Notes:All high-speed signals are internally AC coupled.

General Specifications

Table 5. General specifications

General						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Data Rate	BR	1		10	Gb/sec	IEEE 802.3 compatible.
Cable Length	L			30	m	Category 6a/7 UTP. BER <10-12

Notes:

1. The clock tolerance is +/-50 ppm.
2. By default, the LP-RJ45TGE- is a full-duplex module in preferred master mode.
3. Automatic crossover detection, no external crossover cable is required.

Environmental Specifications

Table 6. Environmental specifications

Environmental Specifications						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Operating Temperature	Top	-40		85	°C	Case temperature

Serial Communication Protocol

Table 7. Serial Communication Protocol

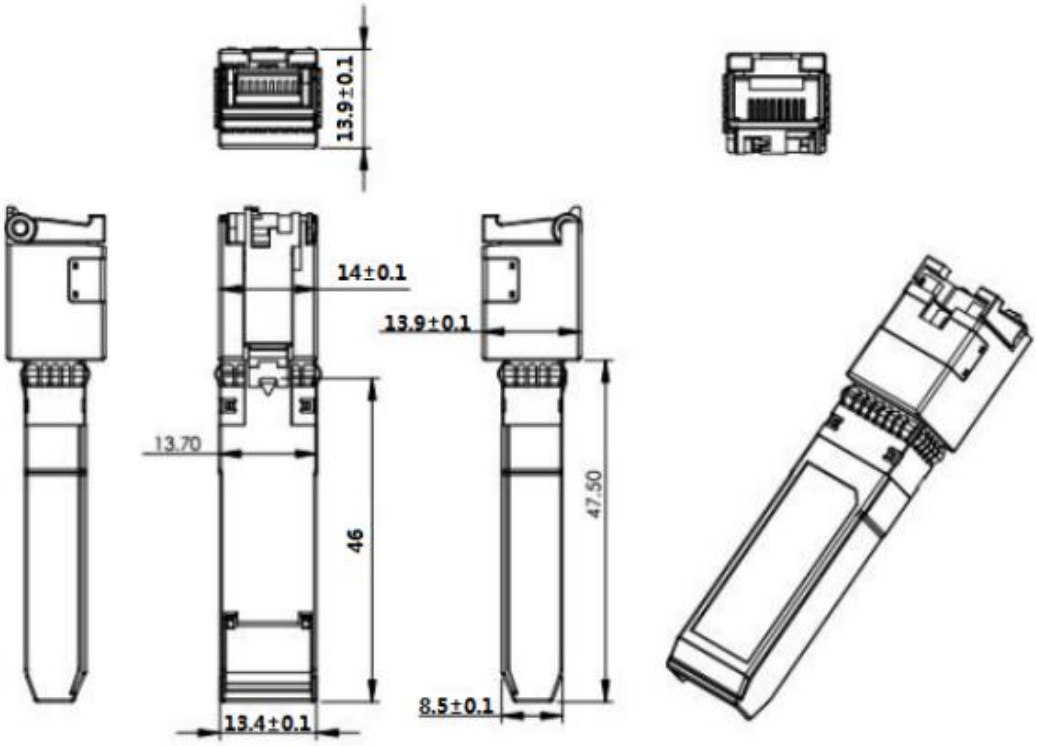
All SFPs support the 2-wire serial communication protocol outlined in the SFP MSA, and these SFPs can be accessed via the MCU's I2C bus at address A0h.

Serial Clock Bus Requirements						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
I2C Clock Rate	Top	0		200,000	Hz	

Mechanical Specifications

Mechanical Appearance and Dimensions (Unit: mm):

The LP-RJ45TGE-3YAI product complies with the mechanical specifications in the SFP MSA1, with the front part of the SFP (the portion extending beyond the host panel) being larger to accommodate the RJ-45 connector.



Ordering information

Part Number	Tx_DIS	Link Indicator on Rx_LOS Pin	Data rate	Distance	Chip	Temp.
LP-RJ45TGE-3YAI	Yes	Yes	10M/100M/1.25G/ 2.5G/5G/10G	30m	Marvell AQR113I	-40~85 °C