

# 1.25G ETHERNET MULTI-RATE 10/100/1000BASE-T COPPER SFP TRANSCEIVER

TRPRG1VA1x000E2G



## Product Description

TRPRG1VA1x000E2G Copper Small Form Pluggable (SFP) transceivers are high performance, cost effective and compliant with the Gigabit Ethernet and 1000BASE-T standards as specified in IEEE 802.3-2002 and IEEE 802.3ab.

The module has two interfaces: the host interface and the MDI interface. The MDI interface provides 1000Base-T connectivity over the Category-5 cable. The host interface provides the data transfer over the 1.25 GHz PECL differential interface to the host board and control and configuration functions through the serial management interface. The module supports 1000Mbps full duplex with 5-level Pulse Amplitude Modulation (PAM) signals. The default mode of operation after power-up is 1000Base-T, full duplex, over SERDES Interface. 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 bus interface. The physical IC can also be accessed via 2-wire serial bus at address ACh.

The transceivers operate from a single +3.3V power supply over an operating case temperature range of 0°C to +70°C (Commercial) , -40°C to +85°C (Industrial) or -5°C to +85°C (Extended). The housing is made of metal for EMI immunity.



## Features

- ☑ Compatible with IEEE 802.3z, IEEE 802.3u, IEEE 802.3ab
- ☑ Compatible with SFP MSA
- ☑ Hot-pluggable SFP footprint
- ☑ RJ-45 connector assembly
- ☑ Access to physical layer IC via 2-wire serial bus
- ☑ TX Disable
- ☑ Auto MDI/MDIX
- ☑ TDR functionality support
- ☑ 1000Base-T,full duplex default operating mode over SERDES interface
- ☑ 10/100/1000Base-T operation on platforms supporting SGMII
- ☑ Metallic enclosure for low EMI
- ☑ Rohs6 compliance
- ☑ Unshielded cable support;
- ☑ FCC Class B compliant

## Absolute Maximum Ratings

Parameter		Symbol	Minimum	Maximum	Units
Storage Temperature		$T_{ST}$	- 40	+ 85	°C
Case Operating Temperature <sup>1</sup>	Commercial	$T_{OP}$	0	+ 70	°C
	Extended		- 5	+ 85	
	Industrial		- 40	+ 85	

<sup>1</sup> Measured on top side of SFP module at the front center vent hole of the cage

## General Specifications

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate	$B$	10	-	1000	Mb/s
Cable Length <sup>1</sup>	$L$	-	-	100	m
<sup>1</sup> Category 5 UTP					

## Electrical Power Supply Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input Voltage	$V_{CC}$	3.13	3.3	3.47	V
Supply Current	$I_{CC}$	-	-	375	mA
Power Consumption	$P_W$	-	-	1.2	W
Inrush Current <sup>1</sup>	$I_{in-rush}$	-	-	30	mA
<sup>1</sup> The maximum inrush current during the hot plugging shall not exceed 30 mA.					

## Input Characteristics

Parameter		Symbol	Minimum	Typical	Maximum	Units
Input differential impedance		$R_{IN}$	90	100	110	ohm
Single ended data input swing		$V_{in, pp}$	250	-	1200	mV
TX Disable	Disable	$V_{IH}$	2.0	-	$V_{cc}$	V
	Enable	$V_{IL}$	Vee	-	$V_{ee} + 0.8$	V
MOD_DEF1	High	$V_{ihmin}$	2	-	$V_{cc}$	V
	Low	$V_{ilmax}$	Vee	-	$V_{ee} + 0.8$	V
MOD_DEF2 (when host drives)	High	$V_{ihmin}$	2	-	$V_{cc}$	V
	Low	$V_{ilmax}$	Vee	-	$V_{ee} + 0.8$	V

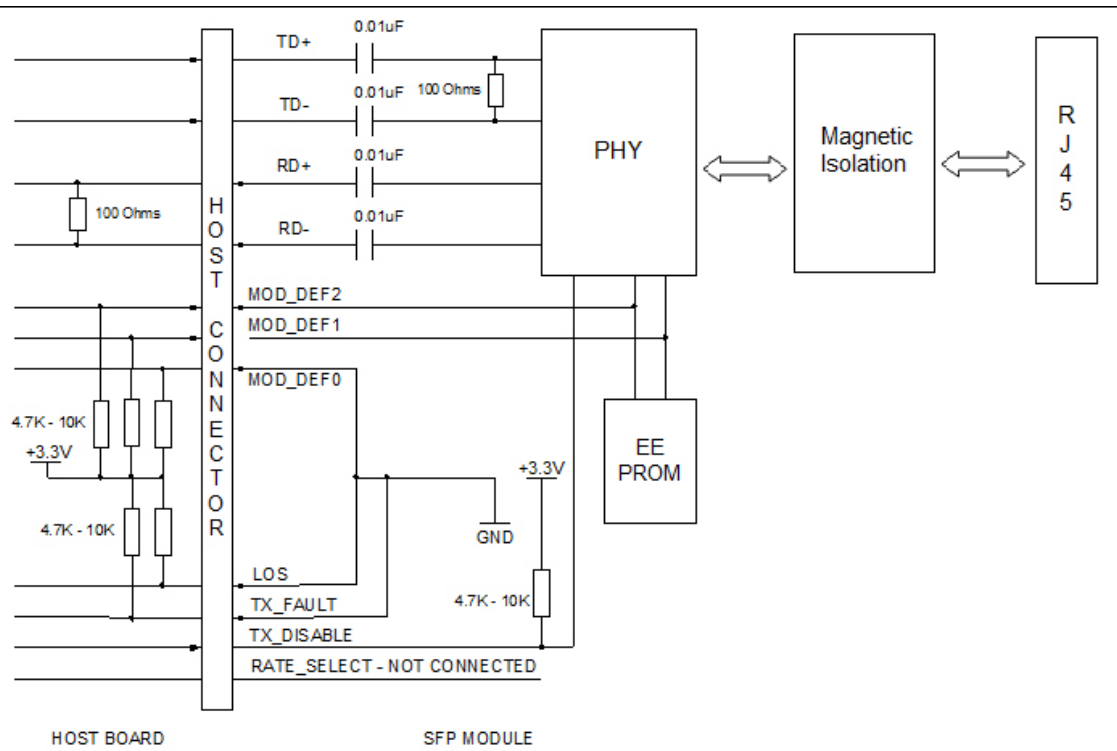
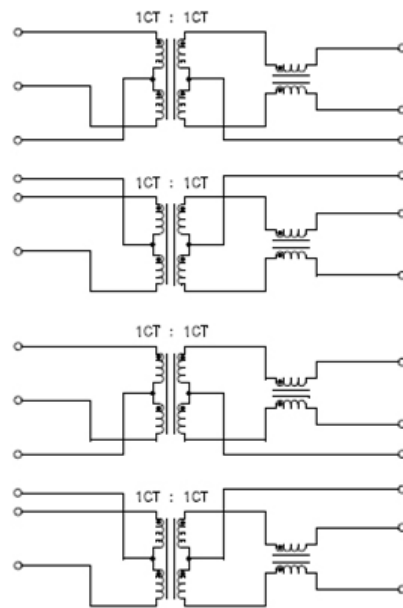
## Output Characteristics

Parameter		Symbol	Minimum	Typical	Maximum	Units
Single ended data output swing <sup>1,2</sup>		$V_{out, pp}$	185	-	600	mV
Data output rise time (20%-80%)		$T_R$	-	-	300	ps
Data output fall time (20%-80%)		$T_F$	-	-	300	ps
TX Fault <sup>3</sup>	Fault	$V_{Fault}$	N/A	-	N/A	V
	Normal	$V_{Normal}$	Vee	-	Vee +0.5	V
LOS <sup>3</sup>	Fault	$V_{losFault}$	N/A	-	N/A	V
	Normal	$V_{losNormal}$	Vee	-	Vee +0.5	V
MOD_DEF0 <sup>3</sup>	High	$V_{ihmin}$	N/A	-	N/A	V
	Low	$V_{ilmax}$	Vee	-	Vee +0.5	V
MOD_DEF2 (when SFP drives)	High	$V_{ihmin}$	2.3	-	Vcc	V
	Low	$V_{ilmax}$	Vee	-	Vee +0.5	V

<sup>1</sup> Measured with 100 Ohms differential termination.

<sup>2</sup> Old requirement were 350/800 mV. Changed to be compliant with SFF-8431 standard for 10G port EDC applications (1G support in 10G capable SFP+ ports).

<sup>3</sup> The signal is grounded on the SFP module.

**Block Diagram****Magnetic Isolation Schematic**

## Host Board Interface

Signal Name	Function	I/O	Connector Pin #
Vee	Ground		1, 9, 10, 11, 14, 17, 20
Vcc	+3.3V	Input	15, 16
RX-	Receive Data, Differential	Output	12
RX+	Receive Data, Differential	Output	13
LOS	Grounded on the SFP	Output	8
TX+	Transmit Data, Differential	Input	18
TX-	Transmit Data, Differential	Input	19
TX_DISABLE	Transmitter Disable, Active High (on 1000Base-T SFP module used as reset)	Input	3
TX_FAULT	Grounded on the SFP Module	Output	2
MOD_DEF(0)	Grounded on the SFP Module	Output	6
MOD_DEF(1)	Serial Clock	Input	5
MOD_DEF(2)	Serial Data	BiDir	4
RATE SELECT	Unused	NC	7

## Application Notes

**Loss of Signal (LOS):** LVTTTL compatible with a maximum voltage of 2.5V. LOS pin can enabled or disabled (Refer to Ordering information).

**TX\_Fault:** TX\_Fault pin is not supported, and is always connected to ground.

**TX\_Disable:** It is an input used to reset the transceiver module. This pin is pulled up within the module with a 4.7 K $\Omega$  resistor. Low (0 – 0.8 V): Transceiver on; Between 0.8 V and 2.0 V: Undefined; High (2.0 - 3.465 V): Transceiver in reset state; Open: Transceiver in reset state.

**Serial Identification and Monitoring:** The module definition of SFP is indicated by the three module definition pins, MOD\_DEF(0), MOD\_DEF(1) and MOD\_DEF(2).

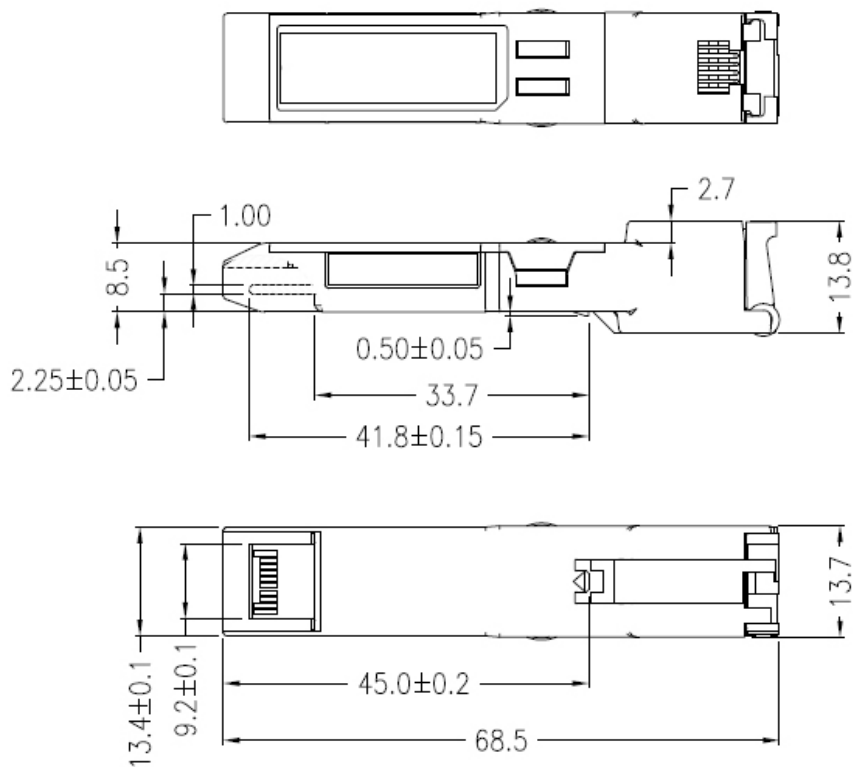
They should be pulled up with a 4.7K~10K resistor on the host board. The pull-up voltage shall be VccT or VccR. MOD\_DEF(0)

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.

**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.

**TD-/+: These are the differential transmitter inputs.** They are AC-coupled, differential lines with 100 differential terminations inside the module.

## Module Outline



Dimensions in mm

## Ordering Information

Part Number	Speed Mode	MAC Interface	TX Disable function	Link Indicator on RX_LOS Pin	Operating Temperature
TRPRG1VA1C000E2G	10/100/1000Mbps	SGMII	Yes	No	0°C to +70°C
TRPRG1VA1E000E2G	10/100/1000Mbps	SGMII	Yes	No	- 5°C to +85°C
TRPRG1VA1I000E2G	10/100/1000Mbps	SGMII	Yes	No	- 40°C to +85°C

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