Document History

Date	Status	Author	Remarks
2011/12/06	Version 01	Yingying Cai	Preliminary Specifications

Features

- ☑ Up to 1.25Gb/s bi-directional data links
- ☑ Lead Free Design & Compliant with RoHS Directive 2002/95/EC
- ☑ Compatible with SFP MSA
- ☑ Compatible with IEEE 802.3-2002 and IEEE 802.3ab Gigabit Ethernet and 1000BASE-T Specifications
- ☑ Hot-pluggable SFP footprint
- ☑ TX Disable and RX Los/without Los function
- ☑ Fully metallic enclosure for low EMI
- ☑ Low power dissipation (1.05W 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
- ☑ Operating case temperature range of 0°C to +70°C (Commercial) or -40°C to +85°C (Industrial)

Description

TRPRG1-G Copper Small Form Pluggable (SFP) transceivers is high performance, cost effective module compliant with the Gigabit Ethernet and 1000BASE-T standards as specified in IEEE 802.3-2002 and IEEE 802.3ab, which supports 1000Mbps data-rate up to 100 meters reach over unshielded twisted-pair category 5 cable. The module supports 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 2-wire serial bus at address ACh.

All modules satisfy Class I Laser Safety requirements in accordance with the U.S. FDA/CDRH and international IEC-60825 standards.

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

Absolute Maximum Ratings

Parameters		Symbol	Min	Max	Units
Storage Temperature		T_{ST}	- 40	+ 85	°C
Operating Case Temperature[1]	Commercial	T_{OP}	0	+ 70	°C
	Industrial		- 40	+ 85	
[1]Measured on top side of SFP module at the front center vent hole of the cage.					

General specifications

Parameter	Symbol	Min	Typ	Max	Units
Operating Data Rate[1.2.]	*B*	10	-	1000	Mb/s
Cable Length[3]	*L*	-	-	100	m

[1]Clock tolerance is +/- 50 ppm.
[2]Automatic cross over detection is enabled. External crossover cable is not required.
[3]Category 5 UTP. BER<10-12.

+3.3V Volt Electrical Power Interface

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Supply Voltage	V_{CC}	3.13	3.3	3.47	V	Referenced to GND
Supply Current	*Icc*	-	320	375	mA	-
Maximum Voltage	V_{max}	-	-	4	V	-

High-speed electrical interface, transmission line-SFP

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Line Frequency	f_L	-	125	-	MHz	5-level encoding, per IEEE 802.3
Tx Output Impedance	Z_{out}, TX	-	100	-	Ohm	Differential, for all Frequencies between 1MHz and 125MHz
Rx Input Impedance	Z_{in}, RX	-	100	-	Ohm	Differential, for all Frequencies between 1MHz and 125MHz

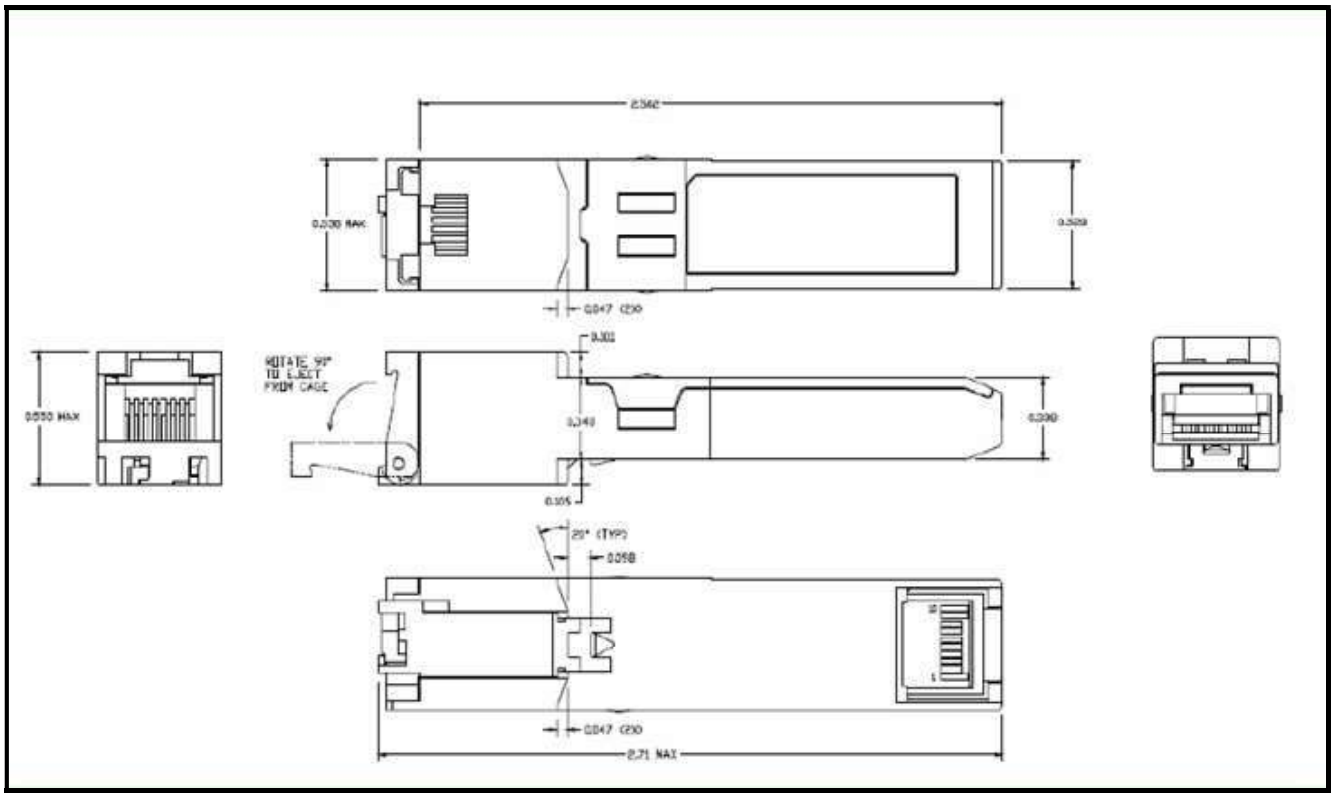
High-speed electrical interface, host-SFP

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Single ended data input swing	V_{insing}	250	-	1200	mV	Single ended
Single ended data output swing	$V_{outsing}$	350	-	800	mV	Single ended
Rise/Fall Time	T_r, T_f	-	175	-	psec	20%-80%
Tx Input Impedance	Z_{in}	-	50	-	Ohm	Single ended
Rx Output Impedance	Z_{out}	-	50	-	Ohm	Single ended

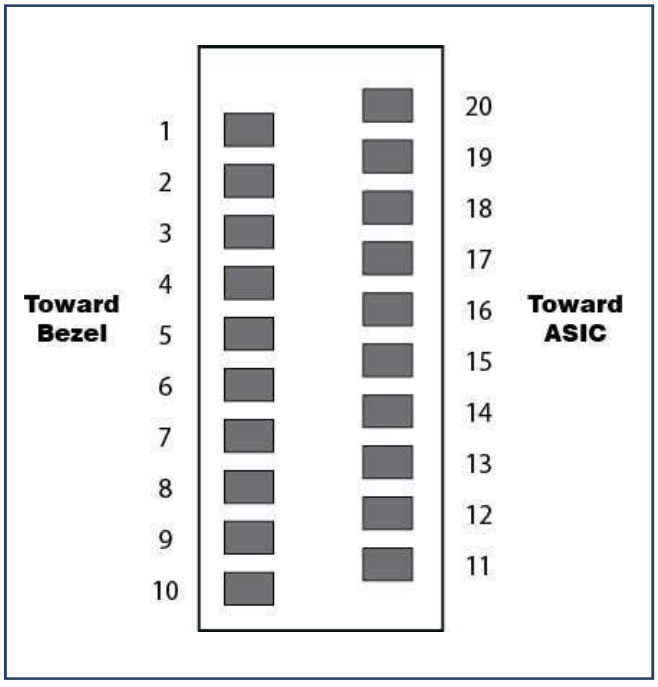
Low-speed signals, electronic characteristics

Parameter	Symbol	Min	Max	Units	Notes/Conditions
SFP Output LOW	V_{OL}	0	0.5	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector
SFP Output HIGH	V_{OH}	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	V_{IL}	0	0.8	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector
SFP Input HIGH	V_{IH}	2	Vcc + 0.3	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector

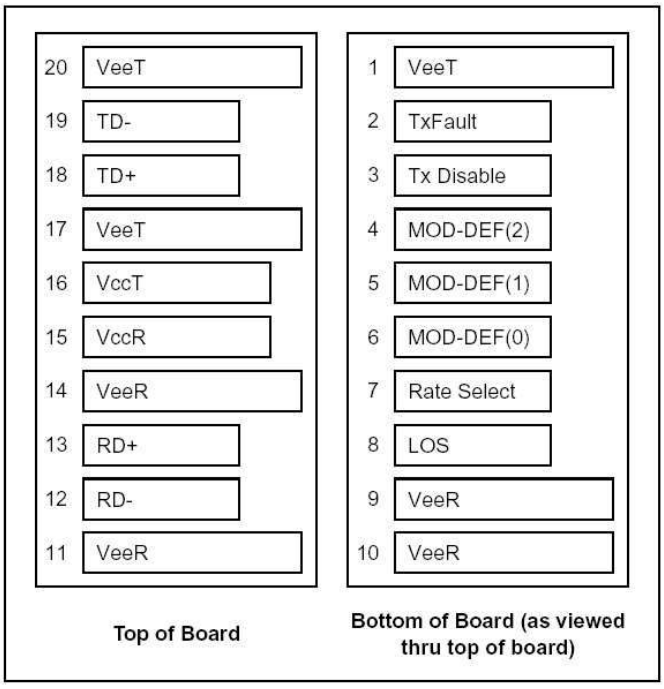
Package Outline



Electrical Pad Layout



Host Board Connector Pad Layout



Pin Descriptions

Pin	Signal Name	Description	Plug Seq.
1	VEET	Transmitter Ground	1
2	TX FAULT	Transmitter Fault Indication	3
3	TX DISABLE	Transmitter Disable	3
4	MOD_DEF(2)	SDA Serial Data Signal	3
5	MOD_DEF(1)	SCL Serial Clock Signal	3
6	MOD_DEF(0)	TTL Low	3
7	Rate Select	Not Connected	3
8	LOS	Loss of Signal	3
9	VEER	Receiver ground	1
10	VEER	Receiver ground	1
11	VEER	Receiver ground	1
12	RD-	Inv. Received Data Out	3
13	RD+	Received Data Out	3
14	VEER	Receiver ground	1
15	VCCR	Receiver Power Supply	2
16	VCCT	Transmitter Power Supply	2
17	VEET	Transmitter Ground	1
18	TD+	Transmit Data In	3
19	TD-	Inv. Transmit Data In	3
20	VEET	Transmitter Ground	1

Notes:
Plug Seq.: Pin engagement sequence during hot plugging.

Application Notes

Loss of Signal (LOS): LVTTL 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 KΩ 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.

Ordering Information

Oplink Part Number	Speed Mode	MAC interface	TX Disable function	Link Indicator on RX_LOS Pin	Operating Temperature
TRPRG1VA2C000E2G	10/100/1000Mbps	SGMII	Yes	Yes	0°C to +70°C
TRPRG1VA1C000E2G	10/100/1000Mbps	SGMII	Yes	No	0°C to +70°C
TRPRG1NA2C000E2G	1000Mbps	SERDES	Yes	Yes	0°C to +70°C
TRPRG1NA1C000E2G	1000Mbps	SERDES	Yes	No	0°C to +70°C
TRPRG1VA2I000E2G	10/100/1000Mbps	SGMII	Yes	Yes	- 40°C to +85°C
TRPRG1VA1I000E2G	10/100/1000Mbps	SGMII	Yes	No	- 40°C to +85°C
TRPRG1NA2I000E2G	1000Mbps	SERDES	Yes	Yes	- 40°C to +85°C
TRPRG1NA1I000E2G	1000Mbps	SERDES	Yes	No	- 40°C to +85°C

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