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**TRS-9002CG / TRS-9002CTG / TRS-9002CFG**

**5V / 1310 nm / 2.5 Gbps **RoHS Compliant** Optical Single-Mode Transceiver**

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**FEATURES**

- | Duplex SC Single Mode Transceiver: TRS-9002CG
- | Duplex ST Single Mode Transceiver: TRS-9002CTG
- | Duplex FC Single Mode Transceiver: TRS-9002CFG
- | SONET OC-48 SR / SDH STM-16 (I-16) Compliant
- | Fiber Channel 2X/1X SM-LC-L FC-PI Compliant
- | IEEE 802.3z Gigabit Ethernet 1000BASE-LX Compliant
- | Industry Standard 1 x 9 Footprint
- | 0 to 70°C Operating : TRS-9002CG
- | -40 to 85°C Operating : TRS-9002CAG
- | Single +5 V Power Supply
- | **RoHS Compliant**
- | TTL Signal Detect Output
- | Wave Solderable and Aqueous Washable
- | Class 1 Laser International Safety Standard IEC 60825 Compliant

**DESCRIPTION**

The TRS-9002CG series single mode transceivers is low power, high performance module for bi-directional serial optical data communications such as SONET OC-48 SR / SDH STM-16 (I-16), Gigabit Ethernet and 1X/2X Fiber channel. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a multiple quantum well laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A LVPECL logic interface simplifies interface to external circuitry.

**LASER SAFETY**

This single mode transceiver is a Class 1 laser product. It complies with IEC 60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

**APPLICATIONS**

- | Switch to Switch Interface
- | High Speed Interface for File Servers
- | High Performance Desktops

**ORDER INFORMATION**

P/No.	Bit Rate (Mb/s)	SONET /SDH	Distance (km)	Wavelength (nm)	Voltage (V)	Package	Temp. (°C)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
TRS-9002CG	2488	SR/I-16	2	1310	5	1X9 SC/ST/FC	0 to 70	-3 to -9.5	-18	Y
<b>TRS-9002CAG</b>	2488	SR/I-16	2	1310	5	1X9 SC/ST/FC	<b>-40 to 85</b>	-3 to -9.5	-18	Y

Note: TRS-XXXXXFG for FC duplex transceiver, TRS-XXXXXTG for ST duplex transceiver, TRS-XXXXX-EMG for SC duplex transceiver with extended EMI shielding,

Absolute Maximum Ratings					
Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Operating Temperature	Topr	0	70	°C	TRS-9002CG
		-40	85		TRS-9002CAG
Soldering Temperature	---		260	°C	10 seconds on leads only
Power Supply Voltage	Vcc	0	6	V	
Input Voltage	---	GND	Vcc	V	
Output Current	Iout	0	30	mA	

Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units
Power Supply Voltage	Vcc	4.75	5	5.25	V
Operating Temperature	Topr	0		70	°C / TRS-9002CG
		-40		85	°C / TRS-9002CAG
Data Rate		622	2488	2670	Mb/s
Power Supply Current	Icc		180	240	mA

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Transmitter Specifications (0°C < Topr < 70°C, 4.75V < Vcc < 5.25V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Optical Transmit Power	Po	-9.5	---	-3	dBm	1
Output Center Wavelength	$\lambda$	1270	1310	1360	nm	
Output Spectrum Width	$\Delta\lambda$	---	---	3	nm	RMS ( $\sigma$ )
Extinction Ratio	E <sub>R</sub>	8.2	---	---	dB	
Output Eye	Compliant with IEEE 802.3z					
Optical Rise Time	t <sub>r</sub>			150	ps	20% to 80% Values
Optical Fall Time	t <sub>f</sub>			150	ps	20% to 80% Values
Relative Intensity Noise	RIN			-120	dB/Hz	
<b>Electrical</b>						
Data Input Current – Low	I <sub>IL</sub>	-350			μA	
Data Input Current – High	I <sub>IH</sub>			350	μA	
Differential Input Voltage	V <sub>IH</sub> - V <sub>IL</sub>	300		1600	mV	
Data Input Voltage – Low	V <sub>IL</sub> - V <sub>CC</sub>	-2.0		-1.58	V	2
Data Input Voltage -- High	V <sub>IH</sub> - V <sub>CC</sub>	-1.1		-0.74	V	2

- Notes: 1. Output power is power coupled into a 9/125 μm single mode fiber.  
 2. These inputs are compatible with 10K, 10KH and 100K ECL and PECL inputs.

Receiver Specifications (0°C < Topr < 70°C, 4.75 V < Vcc < 5.25V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Sensitivity	---	---	---	-18	dBm	1
Maximum Input Power	Pin	-3		---	dBm	
Signal Detect -- Asserted	Pa	---	---	-18	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-30	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1260	---	1600	nm	
<b>Electrical</b>						
Data Output Voltage – Low	V <sub>OL</sub> - V <sub>CC</sub>	-2.0		-1.58	V	2
Data Output Voltage – High	V <sub>OH</sub> - V <sub>CC</sub>	-1.1		-0.74	V	2
Signal Detect Output Voltage -- Low	V <sub>SDL</sub>			0.5	V	
Signal Detect Output Voltage -- High	V <sub>SDH</sub>	2.0			V	

- Notes: 1. Minimum sensitivity and saturation levels at BER=1E-10 for a 2<sup>23</sup>-1 PRBS.  
 2. These outputs are compatible with 10K, 10KH and 100K ECL and PECL outputs.

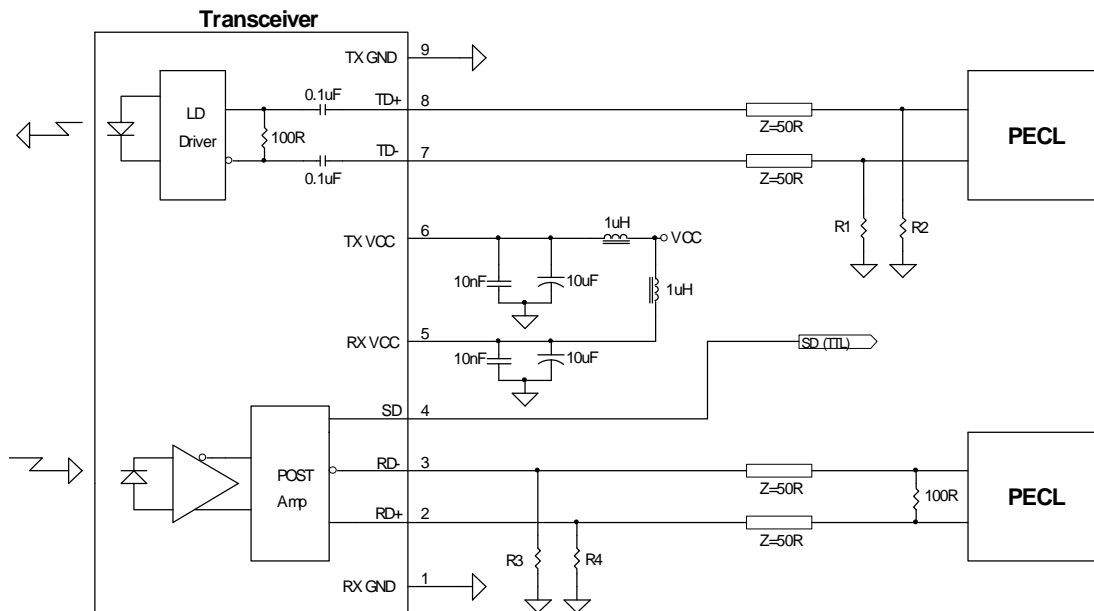
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## CONNECTION DIAGRAM

Receiver Signal Ground	1 (Rx GND)	○
Receiver Data Out	2 (RD+)	N/C
Receiver Data Out Bar	3 (RD-)	
Signal Detect	4 (SD)	
Receiver Power Supply	5 (Rx Vcc)	TOP VIEW
Transmitter Power Supply	6 (Tx Vcc)	
Transmitter Data In Bar	7 (TD-)	
Transmitter Data In	8 (TD+)	N/C
Transmitter Signal Ground	9 (Tx GND)	○

PIN	Symbol	Notes
1	Rx GND	Directly connect this pin to the receiver ground plane
2	RD+	See recommended circuit schematic
3	RD-	See recommended circuit schematic
4	SD	Active high on this indicates a received optical signal
5	Rx Vcc	+5V dc power for the receiver section
6	Tx Vcc	+5V dc power for the transmitter section
7	TD-	See recommended circuit schematic
8	TD+	See recommended circuit schematic
9	Tx GND	Directly connect this plan to the transmitter ground plane

## RECOMMENDED CIRCUIT SCHEMATIC



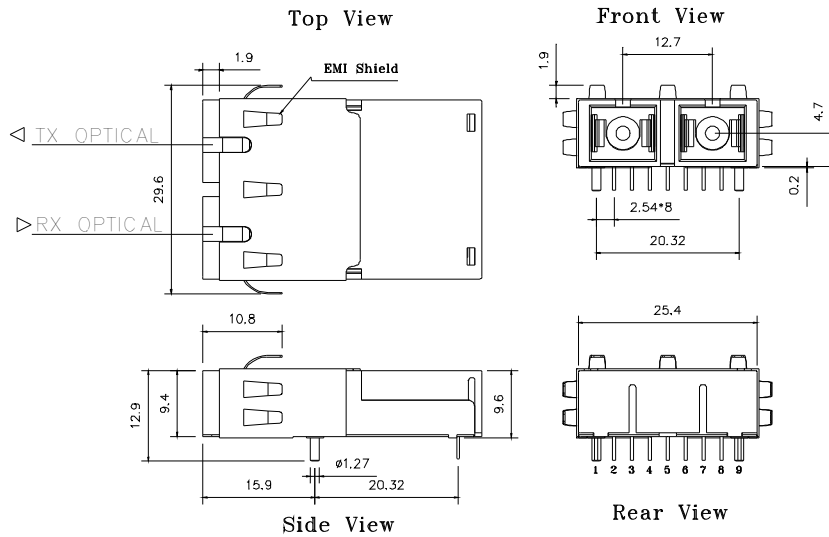
For Vcc=5V, R1=R2=R3=R4= 330R

The split-load terminations for ECL signals need to be located at the input of devices receiving those ECL signals. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module Rx Vcc and Tx Vcc. A GND plane under the module is required for good EMI and sensitivity performance.

PACKAGE DIAGRAM

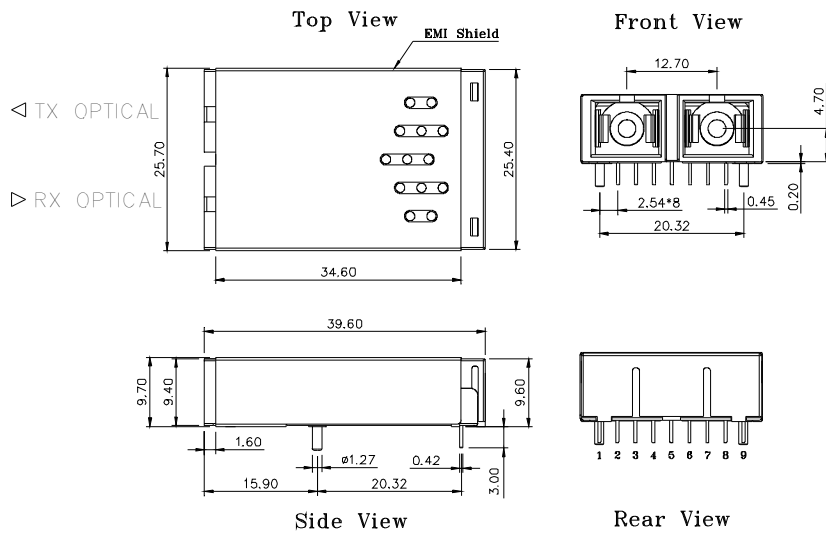
Units in mm

1) SC Type With Extended Shielding



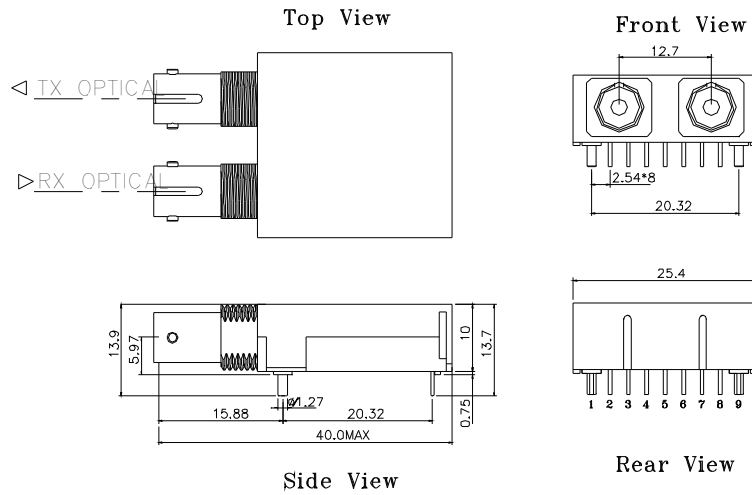
TRS-9002C-EMG / TRS-9002AC-EMG

2) SC Type With Flat Extended Shielding



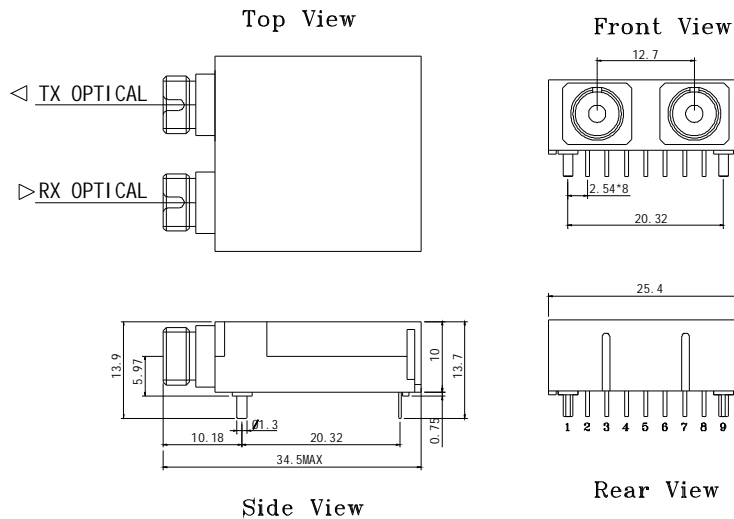
TRS-9002C-EM1G / TRS-9002AC-EM1G

### 3) ST Type



TRS-9002CTG / TRS-9002ACTG

### 4) FC Type



TRS-9002CFG / TRS-9002ACFG

**Note:** Specifications subject to change without notice.