

## TRSL-9140G / TRSL-9140AG

### 3.3V / 1310 nm / 2.5 Gbps **RoHS Compliant** SFF LC SINGLE-MODE TRANSCEIVER

#### FEATURES

- I Duplex LC Single Mode Transceiver
- I SONET OC-48 LR-1 / SDH STM-16 (L-16.1) Compliant
- I Fibre Channel 2X/1X SM-LC-L FC-PI Compliant
- I IEEE 802.3z Gigabit Ethernet Compliant
- I Small Form Factor, RJ-45 size, 2X5 pin Package
- I 1310 nm DFB LD Transmitter
- I APD High Sensitivity Receiver
- I 26 dB Link Budget at Least
- I AC/AC Coupled Signal Input / Output
- I LVTTTL Transmitter Disable Input
- I LVTTTL Signal Detection Output
- I Single +3.3 V Power Supply
- I RoHS Compliant
- I 0 to 70°C Operating : TRSL-9140G
- I -20 to 85°C Operating : TRSL-9140AG
- I Wave Solderable and Aqueous Washable
- I Class 1 Laser International Safety Standard IEC-60825 Compliant

#### DESCRIPTION

The TRSL-9140G series single mode transceivers is small form factor, low power, high performance module for bi-directional serial optical data communications such as SONET OC-48 / SDH STM-16, gigabit Ethernet and Fiber channel. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. A guaranteed minimum optical link budget of 26 dB is offered which can correspond to a link distance of over 40 km (assuming worst case fiber loss of 0.45 dB/km). The transmitter section uses a multiple quantum well 1310 nm DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs Avalanche photodetector preamplifier mounted in an optical header and a limiting post-amplifier IC. A PECL 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

- I Switch to Switch Interface
- I OC-48 ATM Links
- I High Speed Interface for File Servers

#### ORDER INFORMATION

P/No.	Bit Rate (Mb/s)	SONET /SDH	Distance (km)	Wavelength (nm)	Package	Temp. (°C)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
TRSL-9140G	2488	LR-1/L-16.1	40	1310 DFB	2X5 LC	0 to 70	3 to -2	-28	Yes
TRSL-9140AG	2488	LR-1/L-16.1	40	1310 DFB	2X5 LC	-20 to 85	3 to -2	-28	Yes

#### Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Operating Temperature	Topr	0 -20	70 85	°C	TRSL-9140G TRSL-9140AG air flow 1m/sec
Soldering Temperature	---		260	°C	10 seconds on leads only
Power Supply Voltage	Vcc	0	4.5	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	3.13	3.3	3.47	V
Operating Temperature	Topr	0 -20		70 85	°C / TRSL-9140G °C / TRSL-9140AG air flow 1m/sec
Data Rate		622	2488	2700	Mb/s

Transmitter Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Optical Transmit Power	Po	-2	---	3	dBm	1
Output Center Wavelength	$\lambda$	1280		1335	nm	
Output Spectrum Width	$\Delta\lambda$	---	0.2	1	nm	-20 dB Width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	8.2	---	---	dB	
Output Eye	Compliant with Bellcore TR-NWT-000253 and ITU recommendation G.957					
Optical Rise Time	tr			150	ps	20% to 80% Values
Optical Fall Time	tf			150	ps	20% to 80% Values
Relative Intensity Noise	RIN			-120	dB/Hz	
<b>Electrical</b>						
Power Supply Current	Icc			180	mA	2
Data Input Current – Low	IL	-350			$\mu$ A	
Data Input Current – High	I <sub>IH</sub>			350	$\mu$ A	
Differential Input Voltage	V <sub>IH</sub> - V <sub>IL</sub>	300			mV	
Data Input Voltage – Low	V <sub>IL</sub> - V <sub>CC</sub>	-2.0		-1.58	V	3
Data Input Voltage -- High	V <sub>IH</sub> - V <sub>CC</sub>	-1.1		-0.74	V	3

- Notes: 1. Output power is power coupled into a 9/125  $\mu$ m single mode fiber.  
 2. Maximum current is specified at Vcc = Maximum @ maximum temperature.  
 3. These inputs are compatible with 10K, 10KH and 100K ECL and PECL inputs.

Receiver Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Sensitivity	---	---	---	-28	dBm	1
Maximum Input Power	Pin	-8		---	dBm	
Signal Detect -- Asserted	Pa	---	---	-28	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-40	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1100	---	1600	nm	
<b>Electrical</b>						
Power Supply Current	Icc		100		mA	2
Data Output Voltage – Low	V <sub>OL</sub> - V <sub>CC</sub>	-2.0		-1.58	V	3
Data Output Voltage – High	V <sub>OH</sub> - V <sub>CC</sub>	-1.1		-0.74	V	3
Signal Detect Output Voltage -- Low	V <sub>SDL</sub>			0.5	V	
Signal Detect Output Voltage -- High	V <sub>SDH</sub>	2.0			V	

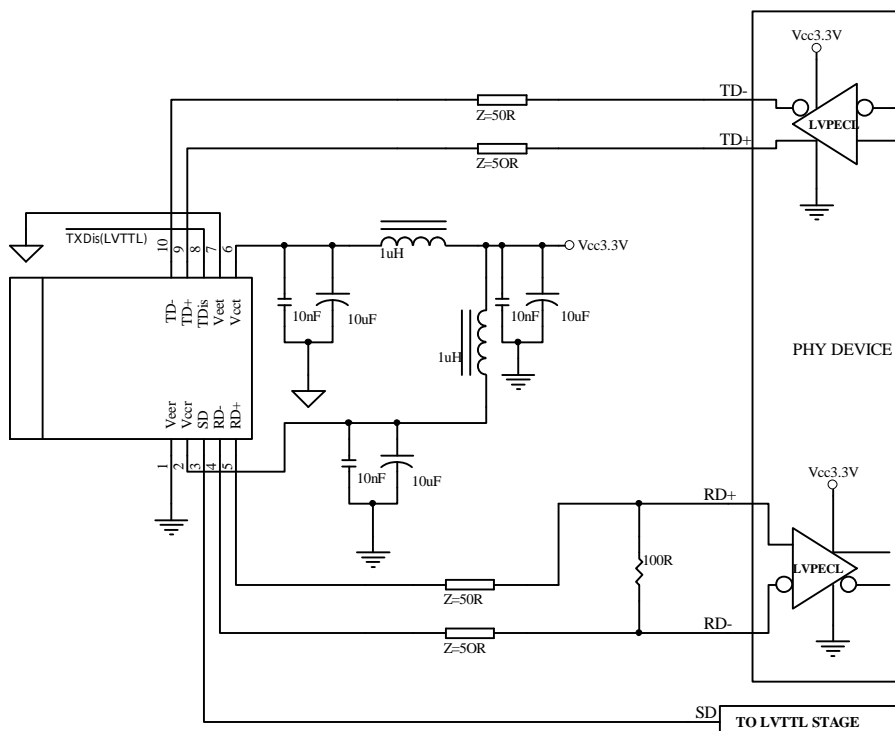
- Notes: 1. Minimum sensitivity and saturation levels at BER=1E-10 for a 2<sup>23</sup>-1 PRBS.  
 2. The current excludes the output load current.  
 3. These outputs are compatible with 10K, 10KH and 100K ECL and PECL outputs.

## CONNECTION DIAGRAM



PIN	Symbol	Notes
1	$V_{EE}^r$	Directly connect this pin to the receiver ground plane
2	$V_{CC}^r$	+3.3V dc power for the receiver section
3	SD	Active high on this indicates a received optical signal.
4	RD-	Receiver Dataout Bar. See recommended circuit schematic
5	RD+	Receiver Dataout. See recommended circuit schematic
6	$V_{CC}^t$	+3.3V dc power for the transmitter section
7	$V_{EE}^t$	Directly connect this plan to the transmitter ground plane
8	TxDis	Transmitter Disable. Connect this pin to +3.3V TTL logic "1" to disable module To enable module connect to TTL logic low "0"
9	TD+	Transmitter Data In. See recommended circuit schematic
10	TD-	Transmitter Data In Bar. See recommended circuit schematic
MS	MS	Mounting Studs. Connect to Chassis Ground

## RECOMMENDED CIRCUIT SCHEMATIC

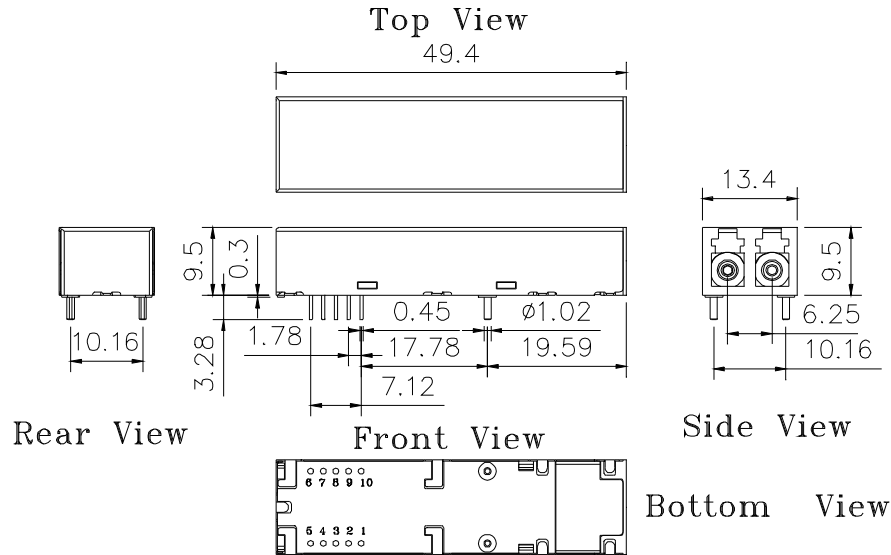


- Note: 1. TX input is terminated inside the module.  
 2. Veer and Veet are not internally connected to each other.  
 3. 50  $\Omega$  line pattern and component placements on TD+/TD- and RD+/RD- lines shall be symmetrical for better impedance matching.

PACKAGE DIAGRAM

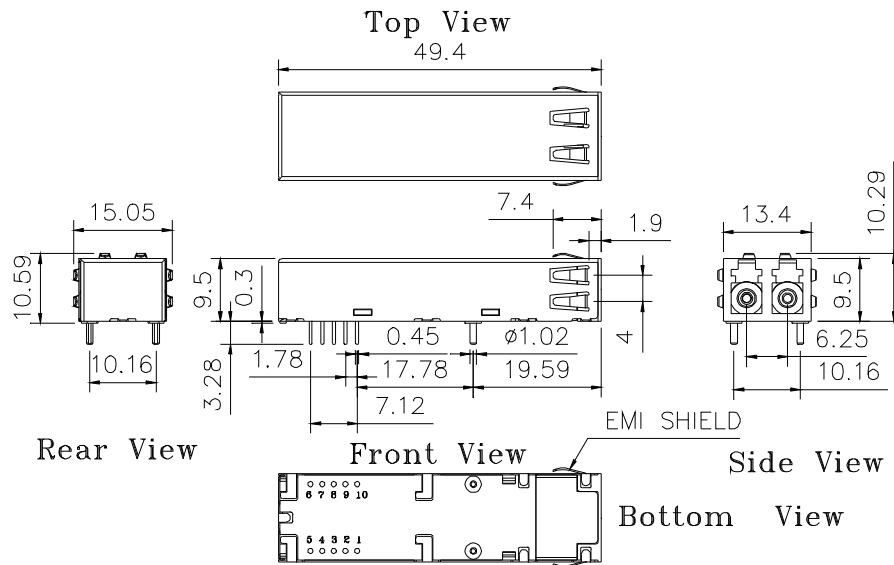
Units in mm

1) Standard Case



TRSL-9140G / TRSL-9140AG

2) Extended Case



TRSL-9140EG/TRSL-9140AEG

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