

TRML-9100G / TRML-9100AG

3.3V / 850 nm / 2.5 Gbps **RoHS Compliant** SFF LC MULTI-MODE TRANSCEIVER

FEATURES

- | Duplex LC Multi-Mode Transceiver
- | Compliant with Fibre Channel FC-PH-2 for 200-M5-SN-1 and 200-M6-SN-1
- | Compliant with IEEE 802.3z 1000BASE-SX
- | Link Distance at 2.5 Gbd
150 m links with 62.5/125 μm MMF Cables
300 m links with 50/125 μm MMF Cables
- | Link Distance at 1.25 Gbd
300 m links with 62.5/125 μm MMF Cables
500 m links with 50/125 μm MMF Cables
- | Small Form Factor, RJ-45 size, 2X5 pin Package
- | AC/AC Coupled Signal Input / Output
- | LVTTTL Transmitter Disable Input
- | LVTTTL Signal Detection Output
- | Single +3.3 V Power Supply
- | RoHS Compliant
- | 0 to 70°C Operating: TRML-9100G
- | -20 to 85°C Operating: TRML-9100AG
- | Wave Solderable and Aqueous Washable
- | Class 1 Laser International Safety Standard IEC-60825 Compliant

DESCRIPTION

The TRML-9100G series multi-mode transceivers is small form factor, low power, high performance module for bi-directional serial optical data communications such as SONET/SDH, Fibre Channel 2x/1x and Gigabit Ethernet 1000BASE-SX. This module is designed for multi-mode fiber and operates at a nominal wavelength of 850 nm. The transmitter section uses a multiple quantum well 850 nm VCSEL and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated GaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A PECL logic interface simplifies interface to external circuitry.

LASER SAFETY

This multi-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

- | SONET/SDH Equipment Interconnect
- | Gigabit Ethernet 1.25 Gb/s Links

ORDER INFORMATION

| P/No. | Bit Rate (Gb/s) | SONET /SDH | Distance (m) | Wavelength (nm) | Package | Temp. (°C) | TX Power (dBm) | RX Sens. (dBm) | RoHS Compliant |
|-------------|-----------------|------------|--------------|-----------------|---------|------------|----------------|----------------|----------------|
| TRML-9100G | 2.5 | | 150/300* | 850 | 2X5 LC | 0 to 70 | -4 to -9 | -15 | Yes |
| TRML-9100AG | 2.5 | | 150/300* | 850 | 2X5 LC | -20 to 85 | -4 to -9 | -15 | Yes |

Note: 150 m links with 62.5/125 μm MMF Cables and 300 m links with 62.5/125 μm MMF Cables.

| Absolute Maximum Ratings | | | | | |
|--------------------------|--------|-----|-----|-------|--------------------------|
| Parameter | Symbol | Min | Max | Units | Notes |
| Storage Temperature | Tstg | -40 | 85 | °C | |
| Operating Temperature | Topr | 0 | 70 | °C | TRML-9100G |
| | | -20 | 85 | | TRML-9100AG |
| Soldering Temperature | --- | | 260 | °C | 10 seconds on leads only |
| Power Supply Voltage | Vcc | 0 | 4.5 | V | |
| Input Voltage | --- | GND | Vcc | V | |

| Recommended Operating Conditions | | | | | |
|----------------------------------|--------|------|-------------|------|------------------|
| Parameter | Symbol | Min | Typ | Max | Units / Notes |
| Power Supply Voltage | Vcc | 3.13 | 3.3 | 3.47 | V |
| Operating Temperature | Topr | 0 | | 70 | °C / TRML-9100G |
| | | -20 | | 85 | °C / TRML-9100AG |
| Data Rate | | 1000 | 2125 / 2500 | 2700 | Mb/s |
| Power Supply Current | Icc | | 180 | 240 | mA |

| Transmitter Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V) | | | | | | |
|---|-----------------------------------|-----------------------|-----|-----------------|-------|--------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Optical | | | | | | |
| Optical Transmit Power | P _o | -9 | --- | -4 | dBm | 1 |
| Output Center Wavelength | λ | 830 | 850 | 860 | nm | |
| Output Spectrum Width | Δλ | --- | --- | 0.85 | nm | RMS (σ) |
| Optical Modulation Amplitude | OMA | 196 | | | μW | 2 |
| Extinction Ratio | E _R | | 9 | --- | dB | |
| Output Eye | Compliant with IEEE 802.3z | | | | | |
| Optical Rise Time | t _r | | | 150 | ps | 20% to 80% |
| Optical Fall Time | t _f | | | 150 | ps | 20% to 80% |
| Relative Intensity Noise | RIN | | | -117 | dB/Hz | |
| Electrical | | | | | | |
| Data Input Current – Low | I _{IL} | -350 | | | μA | |
| Data Input Current – High | I _{IH} | | | 350 | μA | |
| Differential Input Voltage | V _{IH} - V _{IL} | 300 | | | mV | |
| Data Input Voltage – Low | V _{IL} - V _{CC} | -2.0 | | -1.58 | V | 3 |
| Data Input Voltage -- High | V _{IH} - V _{CC} | -1.1 | | -0.74 | V | 3 |
| Disable Input Voltage -- Low | V _{TDIS,L} | 0 | | 0.5 | V | TX Output Enabled |
| Disable Input Voltage -- High | V _{TDIS,H} | V _{CC} - 1.3 | | V _{CC} | V | TX Output Disabled |
| Shut Off Time for TxDis | t _{DIS} | | | 1 | ms | |

Notes: 1. Output power is power coupled into a 62.5/125 μm MM fiber.

2. An OMA of 196 μW is approximately equal to an average power of -9 dBm assuming an Extinction Ratio of 9 dB.

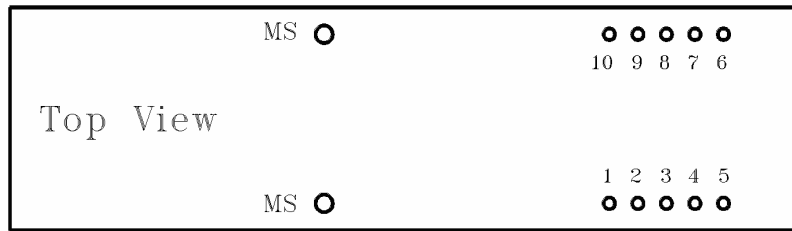
3. These inputs are compatible with 10K, 10KH and 100K ECL and PECL inputs.

| Receiver Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V) | | | | | | |
|--|-----------------------------------|------|-----|-------|-------|-------------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Optical | | | | | | |
| Sensitivity | --- | --- | --- | -15 | dBm | 1 |
| Maximum Input Power | P _{in} | 0 | | --- | dBm | |
| Signal Detect -- Asserted | P _a | --- | --- | -15 | dBm | Transition: low to high |
| Signal Detect -- Deasserted | P _d | -31 | --- | --- | dBm | Transition: high to low |
| Signal detect -- Hysteresis | | 1.0 | --- | | dB | |
| Wavelength of Operation | | 1100 | --- | 1600 | nm | |
| Electrical | | | | | | |
| Data Output Voltage – Low | V _{OL} - V _{CC} | -2.0 | | -1.58 | V | 2 |
| Data Output Voltage – High | V _{OH} - V _{CC} | -1.1 | | -0.74 | V | 2 |
| Signal Detect Output Voltage -- Low | V _{OL} | | | 0.5 | V | |
| Signal Detect Output Voltage -- High | V _{OH} | 2.0 | | | V | |

Notes: 1. Minimum sensitivity and saturation levels at BER=1E-12 for a 2⁷-1 PRBS.

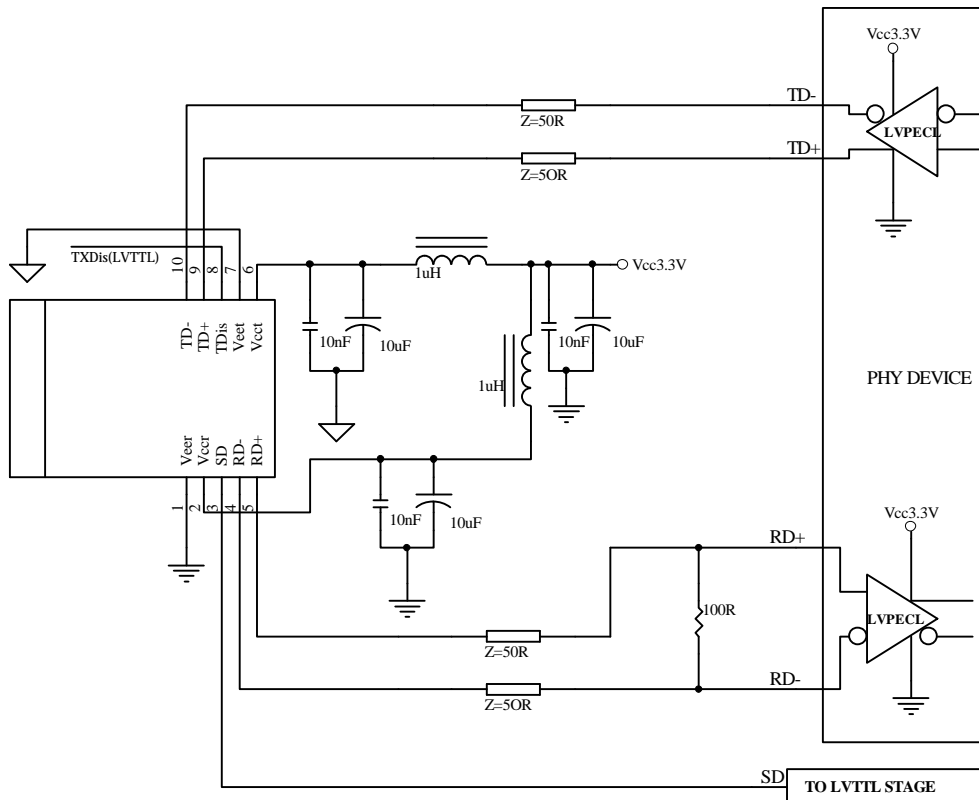
2. These outputs are compatible with 10K, 10KH and 100K ECL and PECL outputs.

CONNECTION DIAGRAM



| PIN | Symbol | Notes |
|-----|-------------------|---|
| 1 | V _{EEF} | Directly connect this pin to the receiver ground plane |
| 2 | V _{CC F} | +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 _{EEt} | Directly connect this plan to the transmitter ground plane |
| 8 | TD _{is} | 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

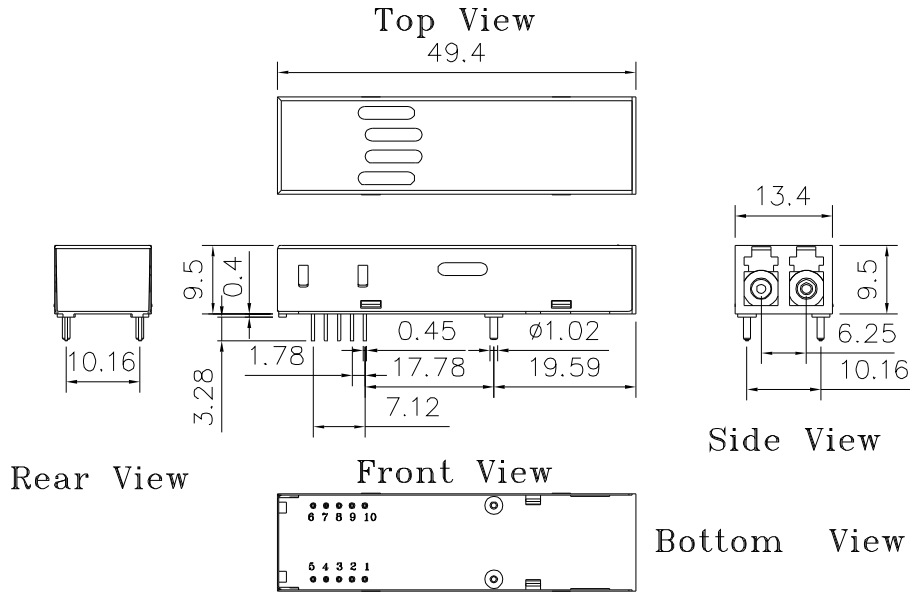


Note: 1. Veer and Veet are not internally connected to each other.
 2. 50 Ω line pattern and component placements on TD+/TD- and RD+/RD- lines shall be symmetrical for better impedance matching.

PACKAGE DIAGRAM

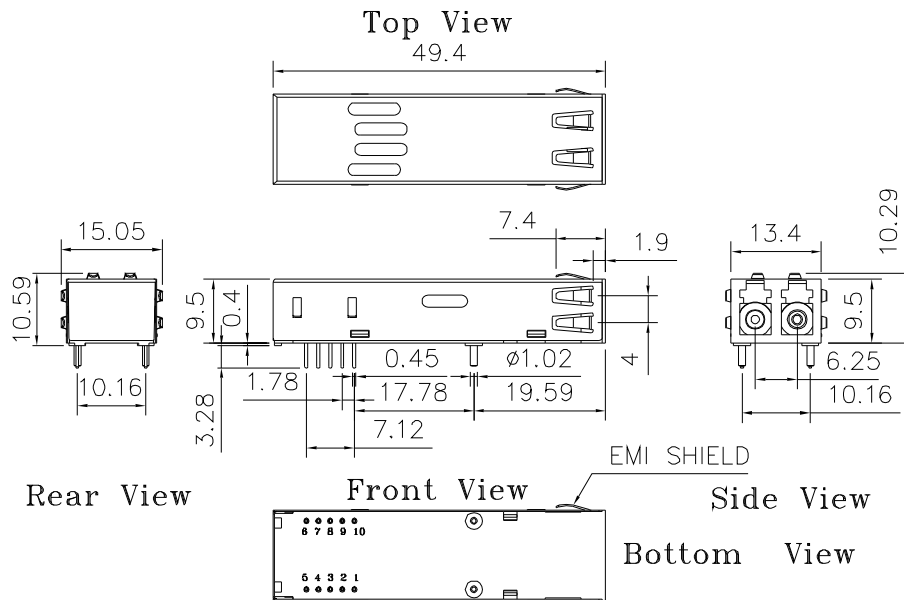
Units in mm

1) Standard Case



TRML-9100G / TRML-9100AG

2) Extended Case



TRML-9100EG / TRML-9100AEG

Note: Specifications subject to change without notice.