

### TRML-5101G / TRML-5101AG

(RoHS Compliant)

### 622 Mbps / 1310 nm 3.3V SFF LC MULTI-MODE TRANSCEIVER

#### FEATURES

- Duplex LC Multi- Mode Transceiver
- ATM Form 622.08Mb/s Physical Layer Compliant
- SONET OC-12 / SDH STM-4 Compliant
- Small Form Factor 2X5 pin Package
- 0 to 1000 m Transmission Distance
- LVPECL Signal Input / Output
- LVTTTL Transmitter Disable Input
- LVPECL Signal Detect Output
- Single +3.3 V Power Supply
- RoHS Compliant
- 0 to 70°C Operation: TRML-5101G
- -40 to 85°C Operation: TRML-5101AG
- Wave Solderable and Aqueous Washable
- Class 1 Laser International Safety Standard IEC-60825 Compliant

#### APPLICATIONS

- ATM 622 Mbps Links
- SONET/SDH Equipment Interconnect
- Fibre Channel Links

#### DESCRIPTION

The TRML-5101G series multi-mode transceivers are small form factor, low power, high performance module for bi-directional serial optical data communications such as SONET OC-12 / SDH STM-4 and Fiber Channel. This module is designed for multi-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 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.

#### ORDER INFORMATION

P/No.	Bit Rate (Mb/s)	SONET/SDH	Distance (m)	Wavelength (nm)	Package	Temp. (°C)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
TRML-5101G	622		0 to 1000	1310	2X5 LC	0 to 70	-12 to -19	-26	Yes
TRML-5101AG	622		0 to 1000	1310	2X5 LC	-40 to 85	-12 to -19	-26	Yes

#### Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Operating Temperature	Topr	0 -40	70 85	°C	TRML-5101G TRML-5101AG
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 / Notes
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Operating Temperature	Topr	0 -40		70 85	°C / TRML-5101G °C / TRML-5101AG
Data Rate		100	622		Mb/s

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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	-19	---	-12	dBm	1
Output Center Wavelength	$\lambda$	1260	1310	1360	nm	
Output Spectrum Width	$\Delta\lambda$	---	---	10	nm	RMS( $\sigma$ )
Extinction Ratio	E <sub>R</sub>	10	---	---	dB	
Output Eye	Compliant with Bellcore GR-253-CORE and ITU recommendation G.957					
Optical Rise Time	t <sub>r</sub>			1.2	ns	10% to 90% Values
Optical Fall Time	t <sub>f</sub>			1.2	ns	10% to 90% Values
Relative Intensity Noise	RIN			-116	dB/Hz	
Total Jitter	TJ			0.55	ns	2
<b>Electrical</b>						
Power Supply Current	I <sub>cc</sub>			140	mA	3
Data Input Current – Low	I <sub>IL</sub>	-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	4
Data Input Voltage -- High	V <sub>IH</sub> - V <sub>CC</sub>	-1.1		-0.74	V	4
Disable Input Voltage -- Low	V <sub>TDISL</sub>	0		0.5	V	TX Output Enabled
Disable Input Voltage -- High	V <sub>TDISH</sub>	V <sub>cc</sub> - 1.3		V <sub>cc</sub>	V	TX Output Disabled
Shut Off Time for TxDis	t <sub>DIS</sub>			1	Ms	

- Notes: 1. Output power is power coupled into a 62.5/125  $\mu$ m MM fiber.  
 2. Measured with a 2<sup>23</sup>-1 PRBS with 72 ones and 72 zeros.  
 3. Maximum current is specified at V<sub>cc</sub> = Maximum @ maximum temperature  
 4. 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	---	---	---	-26	dBm	1
Maximum Input Power	P <sub>in</sub>	-8		---	dBm	
Signal Detect -- Asserted	P <sub>a</sub>	---	---	-26	dBm	Transition: low to high
Signal Detect -- Deasserted	P <sub>d</sub>	-47	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1100	---	1600	nm	
<b>Electrical</b>						
Power Supply Current	I <sub>cc</sub>			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>OL</sub>	-2.0		-1.58	V	
Signal Detect Output Voltage -- High	V <sub>OH</sub>	-1.1		-0.74	V	

- Notes: 1. Minimum sensitivity and saturation levels at BER=1E-12 for a 2<sup>23</sup>-1 PRBS with 72 ones and 72 zeros.  
 2. The current excludes the output load current.  
 3. These outputs are compatible with 10K, 10KH and 100K ECL and PECL outputs.

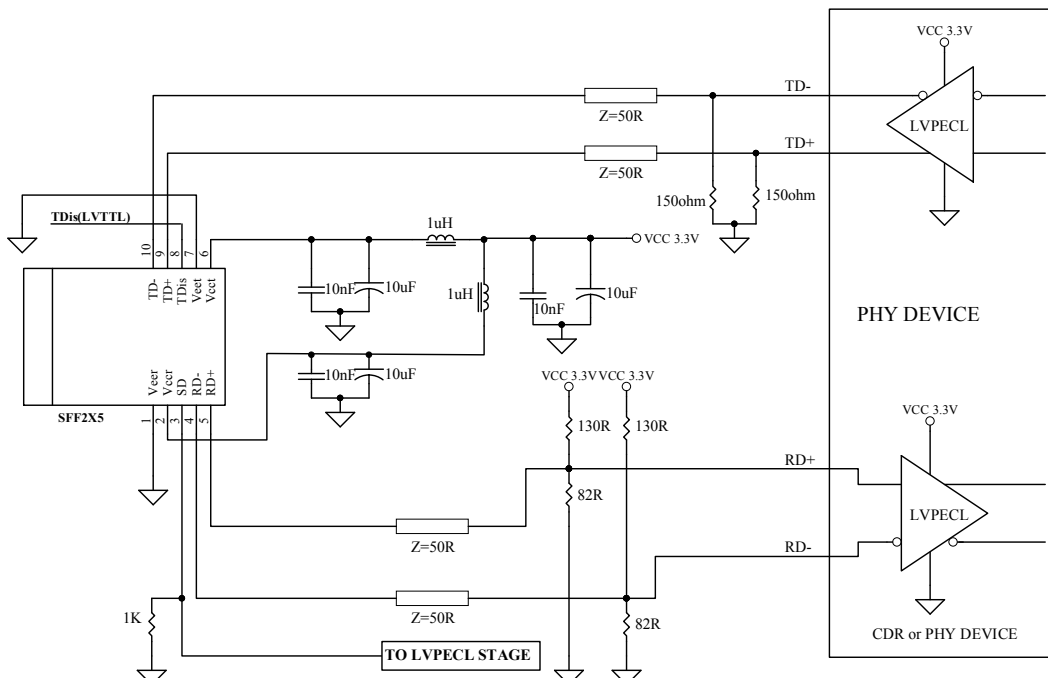
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### CONNECTION DIAGRAM



PIN	Symbol	Notes
1	$V_{EEr}$	Directly connect this pin to the receiver ground plane
2	$V_{CCr}$	+3.3V dc power for the receiver section
3	SD	Active high on this indicates a received optical signal.
4	RD-	Receiver Data out Bar. See recommended circuit schematic
5	RD+	Receiver Data out. See recommended circuit schematic
6	$V_{CCt}$	+3.3V dc power for the transmitter section
7	$V_{EEt}$	Directly connect this pin to the transmitter ground plane
8	TDis	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

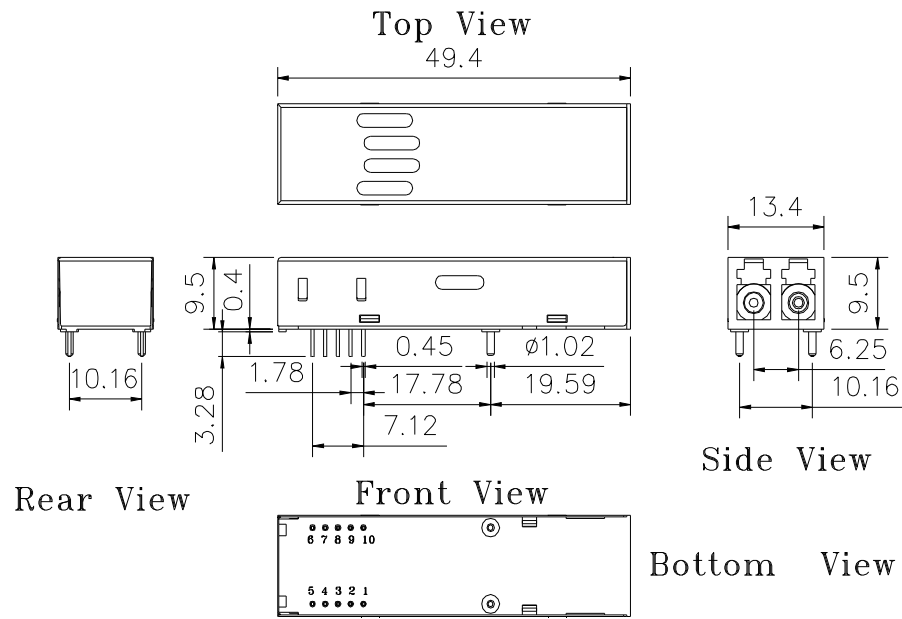
### RECOMMENDED CIRCUIT SCHEMATIC



- Note: 1. 1000  $\Omega$  SD output pull-down resistor required for TRML-5010G / TRML-5010AG (LVPECL SD Output)  
 2.  $V_{eer}$  and  $V_{eet}$  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



TRML-5101G / TRML-5101AG

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