

## 1.25Gbps 1310nm Optical Transceiver

(TN3SFPSMLCG)



### PRODUCT DESCRIPTION

The TN3SFPSMLCG, SFP transceivers are high performance, cost effective modules supporting dual data-rate of 1.25Gbps/1.0625Gbps and 20km transmission distance with SMF. The transceiver consists of three sections: a FP laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements. The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

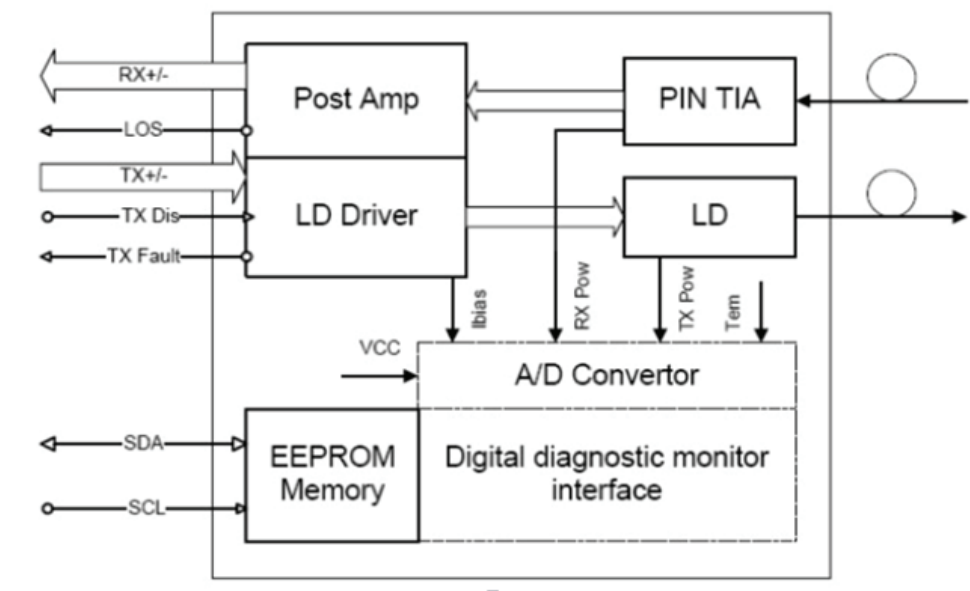
### PRODUCT FEATURE

- Duplex LC connector
- Hot pluggable SFP footprint
- Low power consumption < 0.8W
- Operating temperature: 0~+70
- Digital Diagnostic Monitor Interface
- Applicable for 20Km SMF connection
- Support 1.25Gbps/1.0625Gbps bit rates
- Compliant with SFP MSA and SFF-8472
- Very low EMI and excellent ESD protection
- 1310nm FP laser transmitter and PIN photo-detector

### APPLICATIONS

- Fiber Channel
- Gigabit Ethernet
- Router/Server interface
- Switch to Switch interface
- Switched backplane applications
- Other optical transmission systems

## DIMENSION



## ABSOLUTE MAXIMUM RATING

| Parameter           | Symbol | Min. | Max. | Unit |
|---------------------|--------|------|------|------|
| Supply Voltage      | Vcc    | -0.5 | 4.0  | V    |
| Storage Temperature | TS     | -40  | 85   | °C   |
| Relative Humidity   | RH     | 0    | 85   | %    |

Note: Stress in excess of the maximum absolute ratings can cause permanent damage to the transceiver.

## GENERAL OPERATING CHARACTERISTIC

| Parameter      | Symbol | Min.   | Typ  | Max. | Unit |
|----------------|--------|--------|------|------|------|
| Data Rate      | DR     | 1.0625 | 1.25 |      | Gb/s |
| Supply Voltage | Vcc    | 3.13   | 3.3  | 3.47 | V    |
| Supply Current | Icc5   |        |      | 220  | mA   |

## ELECTRICAL CHARACTERISTIC

| Parameter                      | Symbol   | Min. | Typ | Max.    | Unit | Note |
|--------------------------------|----------|------|-----|---------|------|------|
| <b>Transmitter</b>             |          |      |     |         |      |      |
| Differential data input swing  | VIN, PP  | 120  |     | 820     | mVpp | 1    |
| Tx Disable Input-High          | VIH      | 2.0  |     | Vcc+0.3 | V    |      |
| Tx Disable Input-Low           | VIL      | 0    |     | 0.8     | V    |      |
| Tx Fault Output-High           | VOH      | 2.0  |     | Vcc+0.3 | V    | 2    |
| Tx Fault Output-Low            | VOL      | 0    |     | 0.5     | V    | 2    |
| Input differential impedance   | Rin      |      | 100 |         | Ω    |      |
| <b>Receiver</b>                |          |      |     |         |      |      |
| Differential data output swing | Vout, pp | 300  | 650 | 800     | mVpp | 3    |
| Rx LOS Output-High             | VROH     | 2.0  |     | Vcc+0.3 | V    | 2    |
| Rx LOS Output-Low              | VROL     | 0    |     | 0.8     | V    | 2    |

Notes:

1. TD+/- are internally AC coupled with 100Ω differential termination inside the module.
2. Tx Fault and Rx LOS are open collector outputs, which should be pulled up with 4.7k to 10kΩ resistors on the host board. Pull up voltage between 2.0V and Vcc+0.3V.
3. RD+/- outputs are internally AC coupled, and should be terminated with 100Ω (differential) at the user SERDES.

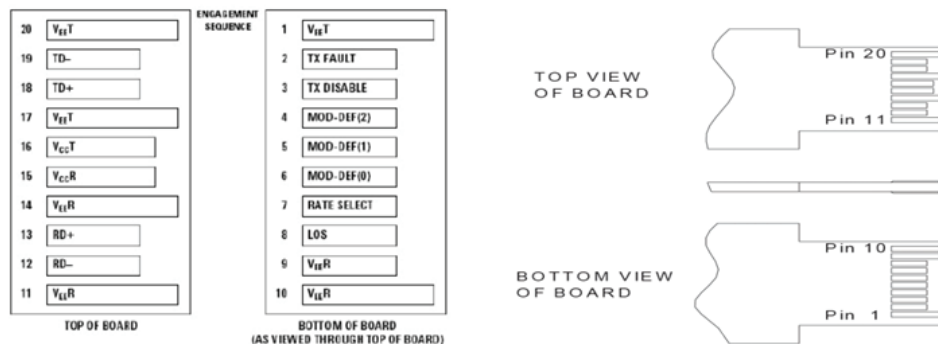
## OPTICAL CHARACTERISTIC

| Parameter                   | Symbol   | Min. | Typ  | Max. | Unit | Note |
|-----------------------------|--|------|------|------|------|------|
| Transmitter                 |  |      |      |      |      |      |
| Operating Wavelength        | $\lambda$  | 1270 | 1310 | 1360 | nm   |      |
| Ave. output power (Enabled) | PAVE   | -9   |      | -3   | dBm  | 1    |
| Extinction Ratio            | ER   | 9    |      |      | dB   | 1    |
| RMS spectral width          | $\Delta\lambda$                                  |      |      | 0.65 | nm   |      |
| Rise/Fall time (20%~80%)    | Tr/Tf  |      |      | 0.26 | ns   | 2    |
| Dispersion penalty          | TDP  |      |      | 3.9  | dB   |      |
| Output Optical Eye          | Compliant with IEEE802.3 z (class 1 aser safety) |      |      |      |      |      |
| Receiver                    |  |      |      |      |      |      |
| Operating Wavelength        | $\lambda$  | 1260 |      | 1610 | nm   |      |
| Receiver Sensitivity        | PSEN1  |      |      | -22  | dBm  | 3    |
| Overload                    | PAVE   | -3   |      |      | dBm  | 3    |
| LOS Assert                  | Pa   | -35  |      |      | dBm  |      |
| LOS De-assert               | Pd   |      |      | -24  | dBm  |      |
| LOS Hysteresis              | Pd-Pa  | 0.5  |      |      | dB   |      |

## Notes:

1. Measured at 1250Mb/s with PRBS 2 223-1NRZ test pattern.
2. Unfiltered, measured with a PRBS223-1 test pattern @1.25Gbps
3. Measured at 1250Mb/s with PRBS 223-1 NRZ test pattern for BER<1x10-12

## PIN DEFINITION AND FUNCTION



| Pin | Symbol      | Name/Description                                       | Notes |
|-----|-------------|--|-------|
| 1   | VeeT        | Tx ground  |       |
| 2   | Tx Fault    | Tx fault indication, Open Collector Output, active "H" | 1     |
| 3   | Tx Disable  | LVTTTL Input, internal pull-up, Tx disabled on "H"     | 2     |
| 4   | MOD-DEF2    | 2 wire serial interface data input/output (SDA)        | 3     |
| 5   | MOD-DEF1    | 2 wire serial interface clock input (SCL)              | 3     |
| 6   | MOD-DEF0    | Model present indication                               | 3     |
| 7   | Rate select | No connection  |       |
| 8   | LOS         | Rx loss of signal, Open Collector Output, active "H"   | 4     |
| 9   | VeeR        | Rx ground  |       |
| 10  | VeeR        | Rx ground  |       |
| 11  | VeeR        | Rx ground  |       |
| 12  | RD-         | Inverse received data out                              | 5     |
| 13  | RD+         | Received data out                                      | 5     |
| 14  | VeeR        | Rx ground  |       |
| 15  | VccR        | Rx power supply  |       |
| 16  | VccT        | Tx power supply  |       |
| 17  | VeeT        | Tx ground  |       |
| 18  | TD+         | Transmit data in                                       | 6     |
| 19  | TD-         | Inverse transmit data in                               | 6     |
| 20  | VeeT        | Tx ground  |       |

#### Notes:

- When high, this output indicates a laser fault of some kind. Low indicates normal operation. And should be pulled up with a 4.7-10KΩ resistor on the host board.
- TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7-10KΩ resistor. Its states are: Low (0-0.8V): Transmitter on  
(>0.8, < 2.0V): Undefined . High (2.0V~Vcc+0.3V): Transmitter Disabled Open: Transmitter Disabled
- Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K -10KΩ resistor on the host board. The pull-up voltage shall be between 2.0V~Vcc+0.3V.
- Mod-Def 0 has been 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
- When high, this output indicates loss of signal (LOS). Low indicates normal operation.
- RD+/-: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
- TD+/-: These are the differential transmitter inputs. They are AC-coupled, differential lines with 1000 differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

## PIN DEFINITION AND FUNCTION

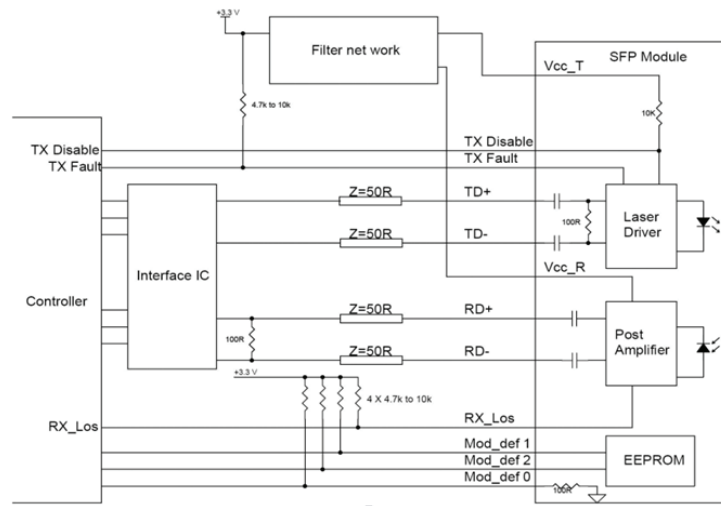
The TN3SFPSMLCG transceivers can be used in host systems that require either internally or externally calibrated digital diagnostics.

| Parameter                    | Symbol    | Units | Min. | Max. | Accuracy | Note |
|------------------------------|-----------|-------|------|------|----------|------|
| Transceiver temperature      | DTemp-E   | °C    | -5   | +75  | ±5°C     |      |
| Transceiver supply voltage   | DVoltage  | V     | 2.8  | 4.0  | ±3%      |      |
| Transmitter bias current     | DBias     | mA    | 2    | 15   | ±10%     | 1    |
| Transmitter output power     | DTx-Power | dBm   | -12  | -1   | ±3dB     |      |
| Receiver average input power | DRx-Power | dBm   | -25  | 0    | ±3dB     |      |

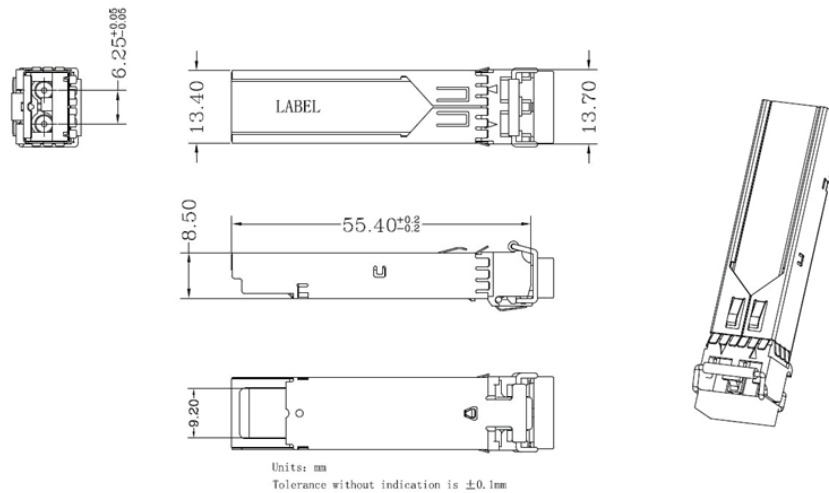
#### Notes:

1. The accuracy of the Tx bias current is 10% of the actual current from the laser driver to the laser.
2. Internal/ External Calibration compatible.

## TYPICAL INTERFACE CIRCUIT



## PACKAGE DIMENSION



## ORDERING INFORMATION

| Part Number | Description                                 |
|-------------|---|
| TN3SFPSMLCG | SFP, 1.25G, 1310nm, 20Km, 0~+70°C, with DDM |