## Description

MTRS-1E31-01 is a high performance, cost effective modules, which is supporting Multi Rate4.9152Gbps to 10.3125Gbps, and transmission distance up to 10km on SM fiber. The transceiver consists of two sections: The transmitter section incorporates a laser driver and a 1310nm DFB laser. The receiver section consists of a PIN photodiode integrated with a transimpedance preamplifier (TIA) and a Limitting Amplifier. The module is hot pluggable into the 20-pin connector. The high-speed electrical interface is base on low voltage logic, with nominal 100 Ohms differential impedance and AC coupled in the module.

The optical output can be disabled by LVTTL logic high-level input of TX_DIS. Transmit Fault (Tx_Fault) is provided to indicate that the module transmitter has detecteda fault condition related to laser operation or safety. Loss of signal (RX_LOS) output is provided to indicate the loss of an input optical signal of receiver. A serial EEPROM inthe transceiver allows the user to access transceiver monitoring and configuration data via the 2-wire SFP Management Interface. This interface uses a single address,A0h, with a memory map divided into a lower and upper area. Basic digital diagnostic (DD) data is held in the lower area while specific data is held in a series oftables in the high memory area.

## Features

- Up to 10km transmission distance
- Support Multi Rate 4.9152 Gbps to 10.3125 Gbps
- 1310nm DFB Laser Transmitter and PIN Receiver
- SFI electrical interface
- 2-wire interface for integrated Digital Diagnostic monitoring
- SFP+ MSA package with duplex LC connector
- Hot pluggable
- Very low EMI and excellent ESD protection
- +3.3V power supply
- Power consumption less than 1.0W
- Operating case temperature: -40~+85°C

## Applications

- High-speed storage area networks
- Computer cluster cross-connect
- Custom high-speed data pipes

- LTE optical repeater application

## Compliance

- Compliant with Fiber Channel(FC)-Standard INCITS 352
- Compliant with IEEE 802.3ae-2002
- Compliant with SFF-8431

## Specification

**Absolute Maximum Ratings**

| Parameter | Symbol | Min. | Max. | Unit | Notes |
|---|---|---|---|---|---|
| Storage Temperature | $T_S$ | -40 | +85 | ℃ | |
| Supply Voltage | $V_{CC3}$ | -0.4 | 3.6 | V | |
| Relative Humidity | RH | 5 | +95 | % | Note1 |
| Rx Input Average Power | Pmax | - | +1.5 | dBm | |

Notes:

[1] Non-condensing state.

**Recommended Operating Conditions**

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|---|---|---|---|---|---|
| Operating Case Temperature | $T_C$ | -40 | 25 | +85 | ℃ |
| Power Supply Voltage | $V_{CC3}$ | 3.13 | 3.3 | 3.47 | V |
| | $I_{CC3}$ | - | - | 300 | mA |
| Power Dissipation | $P_D$ | - | - | 1.0 | W |

| | | | | | |
|---|---|---|---|---|---|
| Data Rate | | 4.9152 | 9.8304 | 10.3125 | Gbps |
| Transmission Distance | | - | - | 10 | Km |

## Transmitter Operating Characteristic-Optical, Electrical

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Center Wavelength | $\lambda_c$ | 1260 | | 1355 | nm | |
| Spectral Width(-20dB) | Pm | - | - | 1 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | - | | dBm | |
| Laser Off Power | Poff | - | - | -30 | dBm | |
| Average Optical Power | Pavg | -8.2 | - | 0.5 | dBm | |
| Extinction Ratio | ER | 3.5 | - | - | dB | |
| Transmitter Dispersion Penalty | TDP | - | - | 3.2 | dB | |
| Relative Intensity Noise | Rin | - | - | -128 | dB/Hz | |
| Optical Return Loss Tolerance | | - | - | 12 | dB | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Operating Data Rate | | 4.9152 | 9.8304 | 10.3125 | Gbps | |
| Optical Eye Mask | | 5 | - | - | % | Note1 |
| Tx Input Diff. Voltage | VI | 180 | 450 | 700 | mV | |
| Tx Fault | VoL | 0 | - | 0.8 | V | At 0.7mA |
| | VoH | 2 | - | 3.3 | V | |

Notes:

[1] Eye Mask Margin(1000 consecutive snapshots at typical rate and room temperature)

**Receiver Operating Characteristic-Optical, Electrical**

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Center Wavelength | λr | 1260 | - | 1355 | nm | |
| Receiver Sensitivity (Average Power) | Psens | - | - | -14.4 | dBm | |
| Receiver Sensitivity (OMA) | | - | - | -12.6 | dBm | |
| Los Assert | LosA | -30 | - | - | dBm | |
| Los Dessert | LosD | - | - | -15 | dBm | |
| Los Hysteresis | LosH | 0.5 | - | 6 | dB | |
| Overload | Pin | 0.5 | - | - | dBm | |
| Receive electrical 3dB upper cutoff frequency | | - | - | 12.3 | GHz | |
| Receiver Reflectance | | - | - | -12 | dB | |
| Operating Data Rate | | 4.9152 | 9.8304 | 10.3125 | Gbps | |
| Rx Output Diff Voltage | Vo | 550 | - | 850 | mV | |

| Digital Diagnostic Functions | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Min.** | **Max.** | **Unit** | **Note** |
| Temperature monitor absolute error | DMI_Temp | -3 | 3 | ℃ | Over operating temp |
| Laser power monitor absolute error | DMI_TX | -2 | 2 | dB | |
| RX power monitor absolute error | DMI_RX | -2 | 2 | dB | |
| Supply voltage monitor absolute error | DMI_VCC | -0.1 | 0.1 | V | |
| Bias current monitor absolute error | DMI_Ibias | -10% | 10% | mA | |

## Control and Status I/O Timing Characteristics

| Parameter | Symbol | Min. | Max. | Unit | Note |
|---|---|---|---|---|---|
| TX Disable Assert Time | t_off | - | 100 | μs | Note1 |
| TX Disable Negate Time | t_on | - | 2 | ms | Note2 |
| Time to initialize including reset of TX_Fault | t_init | - | 300 | ms | Note3 |
| TX Fault Assert Time | t_fault | - | 1 | ms | Note4 |
| TX Disable to Reset | t_reset | 10 | - | μs | Note5 |
| LOS Assert Time | t_loss_on | - | 100 | μs | Note6 |
| LOS Deassert Time | t_loss_off | - | 100 | μs | Note7 |
| Serial ID Clock Rate | f_serial_clock | 100 | 400 | kHz | |

Notes:

[1] Time from rising edge of TX Disable to when the optical output falls below 10% of nominal

[2] Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal

[3] From power on or negation of TX Fault using TX Disable

[4] Time from fault to TX fault on

[5] Time TX Disable must be held high to reset TX_fault

[6] Time from LOS state to RX LOS assert

[7] Time from non-LOS state to RX LOS deassert.