

## Gigabit Ethernet SFF Transceiver TSx83SX series



- 850nm Transceiver for MMF
- 1.25/2.5Gbps Gigabit Ethernet
- Single +3.3V Power Supply
- 2X5 or 2X10 Duplex LC Connector

### Family Model

TS883SX

TSG83SX

### Features

- Compliant with IEEE 802.3z Gigabit Ethernet and Fibre Channel Standards
- Industry standard 2X5 package with duplex LC connector
- 850nm Vertical Cavity Surface Emitting Laser (VCSEL) and APC for constant output power
- High sensitive InGaAs PIN photodiode
- +3.3V Power Supply Operation with PECL data inputs and outputs
- Operating temperature ; 0 to +70°C
- Rugged package design by metal die-casting case
- Link distance options are
  - Up to 500m with 50/125µm MMF @1.25Gbps
  - Up to 220m with 62.5/125µm MMF @ 1.25Gbps

### Description

The TSx83xx series SFF optical transceivers are designed to meet the Gigabit Ethernet specifications and to run up to 2.5Gbps with multimode fiber. The transceivers are manufactured in 2x5 Pin Through Hole(PTH) package with duplex LC connector interface and made of metallized housing to obtain excellent EMI shielding.

The transmitter consists of an 850nm Vertical Cavity Surface Emitting Laser (VCSEL) in an optical subassembly (OSA). The OSA is driven by a custom IC, which converts differential logic signals into an analog laser diode drive current. The receiver includes a high sensitive GaAs PIN photodiode mounted with a transimpedance preamplifier IC in an OSA. The OSA is mated to a custom limiting-amplifier, which provides post-amplification and signal detect function (active high). The package is made of metal for excellent EMI shielding & ESD protection.

The transceivers have been designed to meet Class I Laser Safety requirements in accordance with the US FDA/CDRH and international IEC-825 standards.

The transceivers operates from a single power supply +3.3V power supply over an operating

temperature range of 0°C to +70°C.

## Applications

- Gigabit Ethernet / LAN switches, Hubs, Routers,
- Metro Ethernet
- High speed digital transmission.
- Storage area network

## Absolute Maximum Ratings

| Parameters                      | Symbol                           | Unit   | Min. | Max.   | Remarks    |
|---------------------------------|----------------------------------|--------|------|--------|------------|
| Ambient Operating Temperature   | T <sub>op</sub>                  | °C     | 0    | 70     | Indoor use |
| Storage Temperature             | T <sub>stg</sub>                 | °C     | -40  | 85     |            |
| Supply Voltage                  | V <sub>CC</sub> -V <sub>EE</sub> | V      | -0.3 | 3.8    |            |
| Lead Soldering Temperature/Time |                                  | °C/sec |      | 260/10 |            |
| Relative Humidity               | RH                               | %      | -    | 95     |            |

## Electrical Characteristics

| Parameters                                  | Symbol                            | Unit | Min. | Typ. | Max. | Remarks |
|---|-----------------------------------|------|------|------|------|---------|
| DC Power Supply Voltage                     | V <sub>CC</sub> -V <sub>EE</sub>  | V    | 3.1  | 3.3  | 3.5  |         |
| DC Power Supply Current                     | I <sub>CC,TX</sub>                | mA   |      | 60   | 70   |         |
|   | I <sub>CC,RX</sub>                | mA   |      | 90   | 100  |         |
| Input Data Voltage Swing<br>(Single-ended)  | V <sub>IH</sub> - V <sub>IL</sub> | mV   | 200  |      | 800  |         |
| Output Data Voltage Swing<br>(Single-ended) | V <sub>OH</sub> - V <sub>OL</sub> | mV   | 600  |      | 800  |         |
| Transmit Disable<br>Input Voltage           | V <sub>TDIS</sub>                 | V    | Low  |      | 0.8  | TTL     |
|   |                                   |      | High | 2.0  |      |         |
| Signal Detect Output<br>Voltage             | V <sub>SD</sub>                   | V    | Low  | -    | 0.4  | TTL     |
|   |                                   |      | High | 2.4  |      |         |

### Eye Diagram

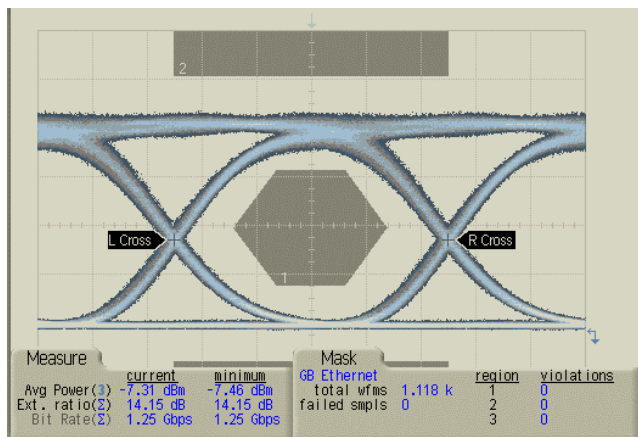


Fig. 1 Back-to-back(1.25Gbps)

### Optical Characteristics

(T<sub>op</sub> = 25°C)

| Parameters  | Symbol                          | Condition   | Unit  | Min. | Typ.     | Max.         | Remark         |
|---|---------------------------------|---|-------|------|----------|--------------|----------------|
| Data Bit Rate                                     |                                 | NRZ   | Gbps  |      | 1.25/2.5 |              |                |
| Fiber Length<br>50 or 62.5µm core MMF             |                                 | 10 <sup>-12</sup> BER,<br>1.25Gbps                      |       |      |          | 500<br>220   | 50um<br>62.5um |
| <b>TRANSMITTER</b>                                |                                 |   |       |      |          |              |                |
| Average Power Output                              | P <sub>OUT</sub>                | I <sub>f</sub> =I <sub>BIAS</sub> + I <sub>mod</sub> /2 | dBm   | -9.5 |          | -4.0         |                |
| Extinction Ratio                                  | ER                              |   | dB    | 9    |          |              |                |
| Center Wavelength                                 | λ <sub>C</sub>                  | CW, @ P <sub>OUT</sub>                                  | nm    | 840  | 850      | 860          |                |
| Spectral Width                                    | Δλ                              | RMS   | nm    |      |          | 0.85         | ≤10km<br>20km  |
| Optical Rise/Fall Time                            | t <sub>r</sub> /t <sub>f</sub>  | 20 - 80%  | nsec  |      |          | 0.26<br>0.13 | 1.25G<br>2.5G  |
| Coupled Power Ratio <sup>1</sup>                  | CPR                             |   | dB    | 9    |          |              |                |
| Relative Intensity Noise                          | RIN                             |   | dB/Hz |      |          | -117         |                |
| <b>RECEIVER</b>                                   |                                 |   |       |      |          |              |                |
| Sensitivity<br>(Average Input Power)              | P <sub>IN,MIN</sub>             | PRBS 2 <sup>7</sup> -1,<br>10 <sup>-12</sup> BER        | dBm   |      | -21      | -17          |                |
| Receiver Overload                                 | P <sub>IN,MAX</sub>             |   | dBm   | -3.0 |          |              |                |
| Return Loss                                       |                                 |   | dB    | 12   |          |              |                |
| Signal Detect Threshold<br>Decreasing light input | P <sub>D</sub>                  |   | dBm   | -30  |          |              |                |
| Increasing light input                            | P <sub>A</sub>                  |   | dBm   |      |          | -18          |                |
| Signal Detect Hysteresis                          | P <sub>A</sub> - P <sub>D</sub> |   | dB    | 0.5  | 2.0      |              |                |

1. CPR measured per TIA/EIA OFSTP-14A with valid 8B/10B data pattern

2. Return loss is defined as the minimum attenuation (dB) of received optical power for energy reflected back into the optical fiber

## Pin Descriptions

| Pin<br>(2×10) | Pin<br>(2×5) | Symbol             | Function   | Logic<br>Family |
|---------------|--------------|--------------------|--|-----------------|
| 1             |              | V <sub>PD</sub>    | Photodetector(PD) Bias; optional feature<br>If not use the input power monitoring function,<br>connect this pin to power supply. |                 |
| 2             |              | V <sub>EE,RX</sub> | Receiver(RX) Signal Ground   |                 |
| 3             |              | V <sub>EE,RX</sub> | Receiver Signal Ground   |                 |
| 4             |              | N/C                |  |                 |
| 5             |              | N/C                |  |                 |
| 6             | 1            | V <sub>EE,RX</sub> | Receiver Signal Ground   |                 |
| 7             | 2            | V <sub>CC,RX</sub> | Receiver Power Supply  |                 |
| 8             | 3            | SD                 | Signal Detect  | TTL             |
| 9             | 4            | RD-                | Received Data Out Bar  | LVPECL          |
| 10            | 5            | RD+                | Received Data Out  | LVPECL          |
| 11            | 6            | V <sub>CC,TX</sub> | Transmitter(TX) Power Supply   |                 |
| 12            | 7            | V <sub>EE,TX</sub> | Transmitter Signal Ground  |                 |
| 13            | 8            | TDis               | Transmitter Disable<br>(Logic LOW for normal operation)  | TTL             |
| 14            | 9            | TD+                | Transmitter Data In  | LVPECL          |
| 15            | 10           | TD-                | Transmitter Data In Bar  | LVPECL          |
| 16            |              | V <sub>EE,TX</sub> | Transmitter Signal Ground  |                 |
| 17            |              | Bmon(-)            | Laser Diode Bias Current Monitor – Negative End  | Analog          |
| 18            |              | Bmon(+)            | Laser Diode Bias Current Monitor – Positive End  | Analog          |
| 19            |              | Pmon(-)            | Laser Diode Optical Power Monitor – Negative End   | Analog          |
| 20            |              | Pmon(+)            | Laser Diode Optical Power Monitor – Positive End   | Analog          |

## Recommended Interface Circuit

The transceiver can operate with LVPECL logic level. The interface circuit with DC-coupled PECL interface is recommended as shown in Figure. The power supply filters are required for good EMI performance and should be as close to the transceiver as possible.

The Signal Detect circuit monitors the incoming optical signal and generates a logic LOW signal when the optical signal is lower than a predefined level. The transmitter is normally enabled except when the TX DISABLE control input is level HIGH. The transmitter offers the functions of monitoring the laser diode bias current and the laser diode optical power. The voltage measured between pins 17 and 18 is proportional to the bias current through an internal 10Ω resistor. Similarly voltage between pins 19 and 20 is measured across an internal 200Ω resistor, which is proportional to the laser diode optical power.

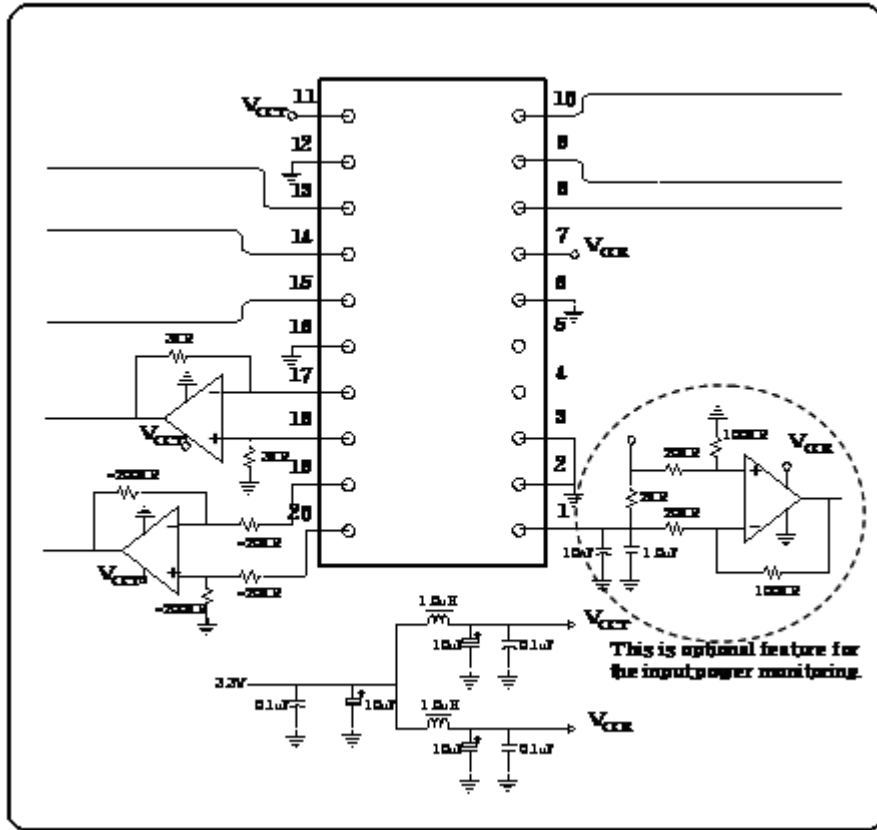


Fig. 2 DC-Coupled PECL Interface (2x5 or 2x10)

Outline Diagram( 2X5 Pin)

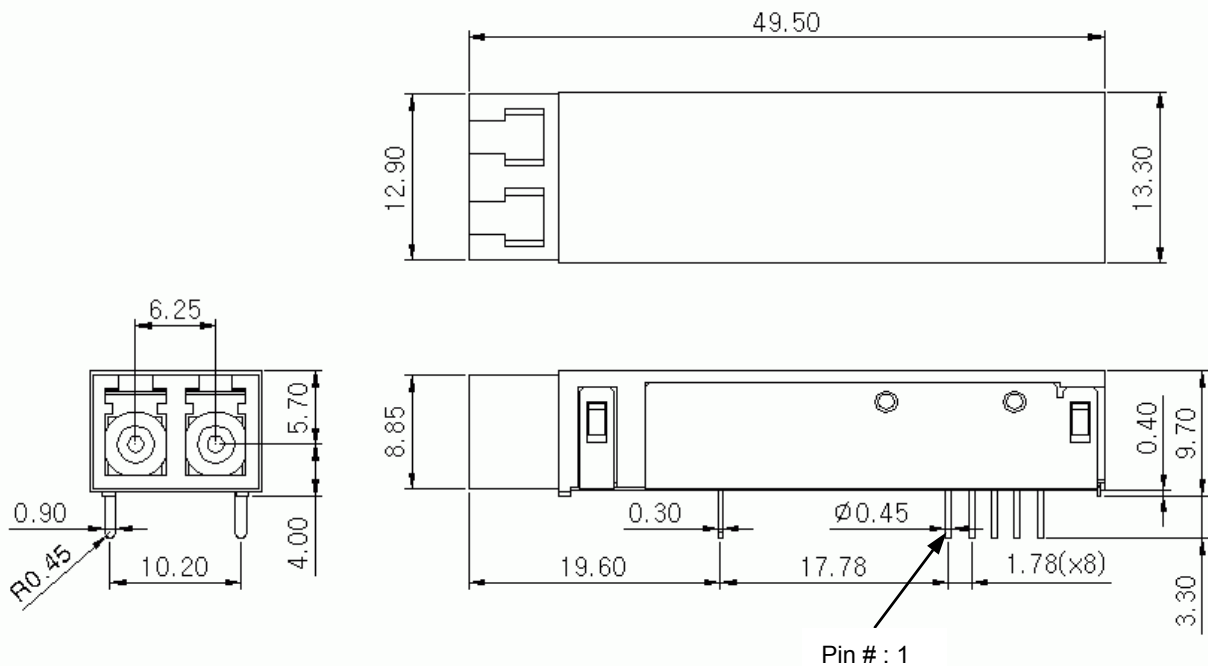


Fig.3 SFF Transceiver 2x5 Package Dimensions [unit: mm]

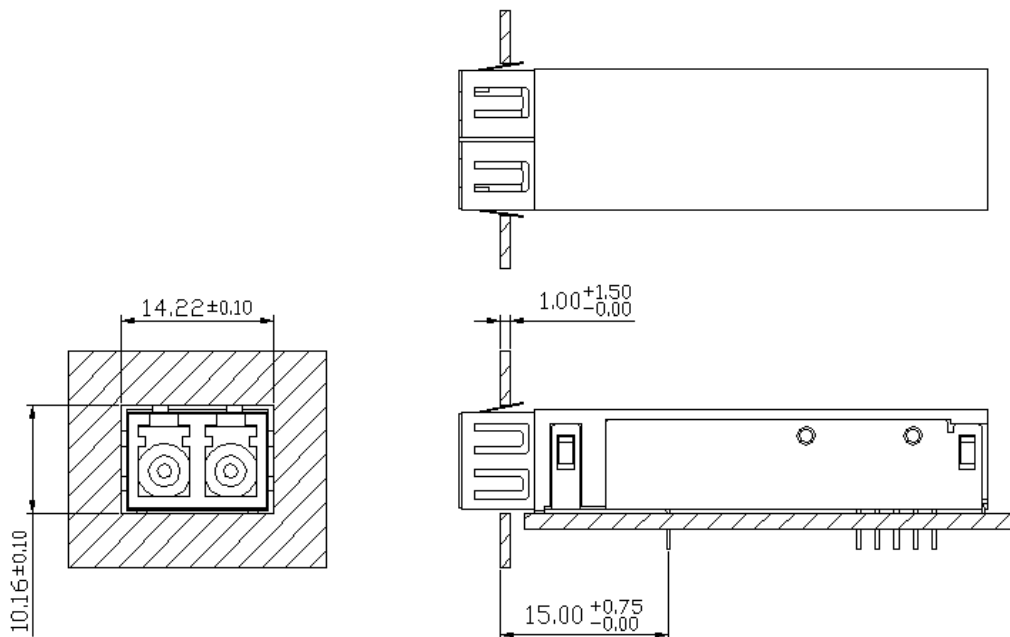


Fig.4 Bezel Opening Dimensions [unit: mm]

## ! Handling Caution

The transceiver can be damaged by overvoltage and current surges. Precautions should be taken for transient power supply.

This device is susceptible to damage as a result of electrostatic discharge(ESD). Take proper precautions during both handling and testing

## ! Caution

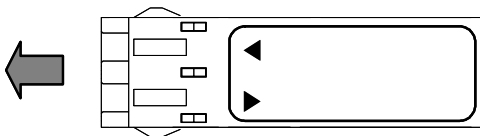
- All adjustments are made at the factory before shipment to our customers. No maintenance and alteration to device is required.
- Tampering with or modifying the performance of the modules will result in voided product warranty. It may also result in improper operation of the circuitry, and possible overstress of the semiconductor components. Device degradation or product failure may result.
- Use of controls or adjustments or procedures other than those specified herein (ex : Connection of the modules to a non-approved optical source, operating above the recommended absolute maximum conditions, operating in a manner inconsistent with unit design and function) may result in hazardous radiation exposure and may be considered an act of modifying or manufacturing a laser product. The person(s) performing such an act is required by law to recertify the laser product under the provisions of US 21CFR (Subchapter J).
- The use of optical instruments with this product will increase eye hazard.

### Notice

**On operation, If optical connectors are unterminated, modules can emit invisible laser radiation. Avoided eye exposure to direct or indirect radiation**

**Laser Emission**

Indication of laser aperture and beam



**Ordering Information**

| Com-pany  | Func-tion                                       | Data Rate   | Wavelength   | Supply Voltage | Distance         | Pin   | Temp. Range   | Shielding                                       |          |
|-----------|---|---|--|----------------|------------------|---|---|---|----------|
| <b>T</b>  | <b>S</b>  | <b>8</b>  | <b>3</b>   | <b>3</b>       | <b>SX</b>        | -   | <b>1</b>  | <b>I</b>  | <b>M</b> |
| Tera-dian | <b>V</b> ;TRV<br><b>S</b> ;SFF<br><b>F</b> ;SFP | <b>1</b> ;155Mbps<br><b>4</b> ;622Mbps<br><b>F</b> ;1.06Gbps<br><b>8</b> ;1.25Gbps<br><b>S</b> ;2.12Gbps<br><b>G</b> ;2.5Gbps | <b>3</b> ;1.3μm<br><b>5</b> ;1.55μm<br><b>6</b> ;Bi-Di<br>T1.3/R1.5<br><b>7</b> ;Bi-Di<br>T1.5/R1.3<br><b>8</b> ;850nm | <b>3</b> ;3.3V | <b>SX</b> ;Note1 | <b>1</b> ;2X5<br>(10 pin)<br><b>2</b> ;2X10<br>(20 pin)<br><b>9</b> ;1X9<br>(9 pin) | <b>I</b> ;Indoor<br>Use<br>(0~70℃)<br><b>O</b> ;Outdoor<br>Use<br>(-40~85℃) | <b>N</b> ;No Shield<br><b>M</b> ;Metal<br>shell |          |

\*Note 1 ;  
 - 220m with 62.5/125μm MMF @1.25Gbps  
 - 500m with 50/125μm MMF @1.25Gbps  
 - 200m with 62.5/125μm MMF @2.125Gbps

**More Information**

**Teradian Inc.**

Address 946, Dunsan-dong, Seo-gu, Daejeon, 302-120, Korea  
 Tel +82-42-476-4800, 4803(Oversea Sales Team)  
 Fax +82-42-476-4805  
 Homepage <http://www.teradian.com>  
 e-mail [sales@teradian.com](mailto:sales@teradian.com)