



## **125M / 1.25G 2x5 SFF 100BASE-LX10 / 1000BASE-LX Transceiver** **Duplex LC, 1310nm FP, SMF 10KM**

**Part Number: FSF1-C7-S13-10TR**



### **Overview**

FSF1-C7-S13-10TR is a 2x5 SFF package transceiver with duplex LC connector, compliant with the industrial standard specification. The high performance uncooled 1310nm FP transmitter and high sensitivity PIN receiver provide superior performance for Fast Ethernet 100BASE-LX10, Gigabit Ethernet 1000BASE-LX and Fiber Channel 1GFC application up to SMF 10km optical links.

### **Applications**

- Fast Ethernet 100BASE-LX10 @125M
- Gigabit Ethernet 1000BASE-LX @1.25G
- Fiber Channel 1GFC @1.0625G

### **Features**

- Compatible with IEEE802.3ah Fast Ethernet
- Compliant with IEEE802.3z Gigabit Ethernet
- Compliant with Fiber Channel 100-SM-LC-L
- Compliant with SFF MSA-2000
- Industry Standard 2x5 SFF Footprint
- Support 125Mb/s and 1.25Gb/s Dual-Rate
- 1310nm FP laser transmitter
- Duplex LC connector
- AC-coupled LVPECL Differential inputs and outputs
- LVTTTL Signal Detection Output
- Single +3.3V power supply
- Link distance 10km over SM fiber
- RoHS Compliant

### **Laser Safety**

- This is a Class 1 Laser Product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
- Caution: Use of control or adjustments or performance of procedure other than those specified herein may result in hazardous radiation exposure.



## Absolute Maximum Ratings

| Parameters                | Symbol          | Min. | Max. | Unit |
|---------------------------|-----------------|------|------|------|
| Storage Temperature       | T <sub>ST</sub> | -40  | +85  | °C   |
| Storage Relative Humidity | RH              | 5    | 95   | %    |
| Supply Voltage            | V <sub>CC</sub> | -0.5 | +4.0 | V    |

## Recommended Operating Conditions

| Parameters                               | Symbol            | Min.  | Typ. | Max.   | Unit   |
|------------------------------------------|-------------------|-------|------|--------|--------|
| Case Operating Temp. (FSF1-C7-S13-10TR)  | T <sub>OP</sub>   | 0     | -    | +70    | °C     |
| Case Operating Temp. (FSF1-C7-S13-10TRi) | T <sub>OP</sub>   | -40   | -    | +85    | °C     |
| Supply Voltage                           | V <sub>CC</sub>   | +3.13 | +3.3 | +3.47  | V      |
| Supply Current (FSF1-C7-S13-10TR)        | I <sub>CC</sub>   |       |      | 270    | mA     |
| Supply Current (FSF1-C7-S13-10TRi)       | I <sub>CC</sub>   |       |      | 300    | mA     |
| Power Consumption (3.3V)                 | P                 |       |      | 1      | W      |
| Lead Soldering Limits                    | T <sub>Sold</sub> |       |      | 260/10 | °C/Sec |

## Transmitter Electro-optical Characteristics

V<sub>CC</sub> = 3.13V~3.47V, T<sub>OP</sub> = 0 °C to 70 °C(FSF1-C7-S13-10TR); T<sub>OP</sub> = -40 °C to 85 °C(FSF1-C7-S13-10TRi)

| Parameters                             | Symbol             | Min.                 | Typ. | Max.            | Unit | Note |
|----------------------------------------|--------------------|----------------------|------|-----------------|------|------|
| Operating Data Rate                    | DR                 | 125                  | 1250 |                 | Mb/s |      |
| Optical Launch Power                   | P <sub>o</sub>     | -9                   |      | -3              | dBm  | 1    |
| Optical Center Wavelength              | λ <sub>c</sub>     | 1260                 | 1310 | 1360            | nm   |      |
| Spectral Width (RMS)                   | Δλ                 |                      |      | 4               | nm   |      |
| Optical Extinction Ratio               | ER                 | 9                    |      |                 | dB   |      |
| Optical Eye Mask                       |                    | IEEE802.3ah / 802.3z |      |                 |      |      |
| Differential Data Input Swing          | V <sub>IN</sub>    | 500                  |      | 2400            | mV   |      |
| Tx Disable Input Voltage-Low (Tx ON)   | TDISV <sub>L</sub> | GND                  |      | 0.8             | V    |      |
| Tx Disable Input Voltage-High (Tx OFF) | TDISV <sub>H</sub> | 2.0                  |      | V <sub>CC</sub> | V    |      |

**Note1:** The optical power is launched into a 9/125μm single mode fiber.

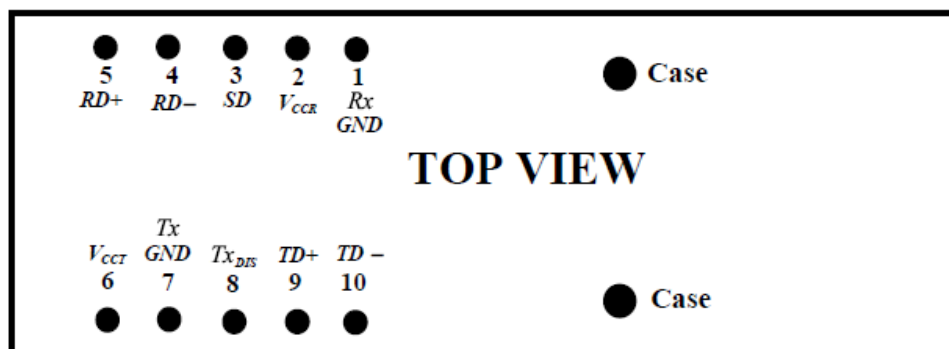
## Receiver Electro-optical Characteristics

$V_{CC} = 3.13V \sim 3.47V$ ,  $T_{OP} = 0\text{ }^{\circ}C \text{ to } 70\text{ }^{\circ}C$  (FSF1-C7-S13-10TR);  $T_{OP} = -40\text{ }^{\circ}C \text{ to } 85\text{ }^{\circ}C$  (FSF1-C7-S13-10TRi)

| Parameters                        | Symbol            | Min. | Typ. | Max.            | Unit | Note |
|-----------------------------------|-------------------|------|------|-----------------|------|------|
| Operating Data Rate               | DR                | 125  | 1250 |                 | Mb/s |      |
| Receiver Sensitivity @1250Mbps    | SEN               |      |      | -23             | dBm  | 1    |
| Receiver Sensitivity @125Mbps     |                   |      |      | -24             |      |      |
| Maximum Receive Power             | PRX-MAX           | -3   |      |                 | dBm  | 1    |
| Optical Center Wavelength         | $\lambda_c$       | 1260 |      | 1600            | nm   |      |
| Signal Detect De-Assert           | SD <sub>D</sub>   | -45  |      |                 | dBm  |      |
| Signal Detect Assert              | SD <sub>A</sub>   |      |      | -23             | dBm  |      |
| Signal Detect LOS Hysteresis      | SD <sub>HY</sub>  | 0.5  |      | 5               | dB   |      |
| Differential Data Output Swing    | V <sub>OUT</sub>  | 370  |      | 2000            | mV   |      |
| Signal Detect Output Voltage Low  | LOSV <sub>L</sub> | GND  |      | 0.8             | V    |      |
| Signal Detect Output Voltage High | LOSV <sub>H</sub> | 2.0  |      | V <sub>CC</sub> | V    |      |

**Note1:** Measured with a PRBS 2<sup>7</sup>-1 test pattern @1.25Gbps & 125Mbps BER<10<sup>-12</sup>.

## Pin Assignment



## Pin Description

| Pin | Name   | Function / Description                                      |
|-----|--------|-------------------------------------------------------------|
| 1   | Rx GND | Receiver Signal Ground                                      |
| 2   | VCCR   | Receiver Power Supply                                       |
| 3   | SD     | Signal Detect Output. H--Normal Operation; L--Los Of Signal |

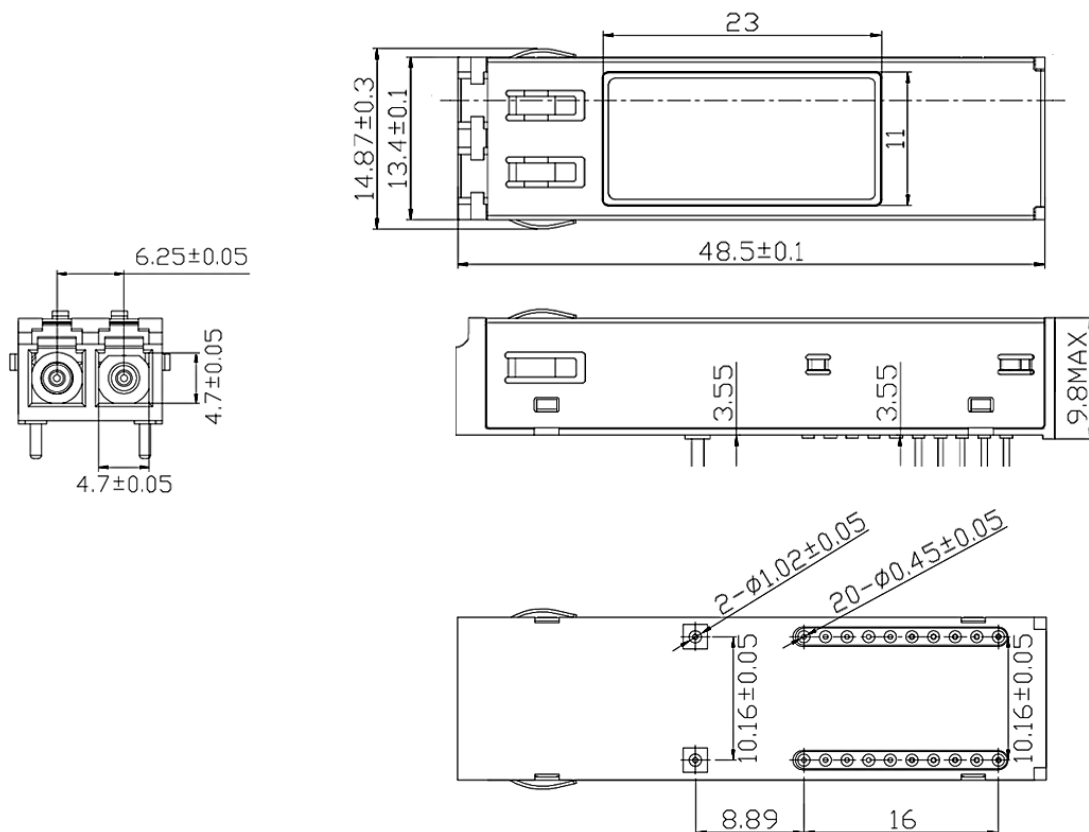


|    |        |                                                 |
|----|--------|-------------------------------------------------|
| 4  | RD-    | Receiver Data Out Bar                           |
| 5  | RD+    | Receiver Data Out                               |
| 6  | VcCT   | Transmitter Power Supply                        |
| 7  | Tx GND | Transmitter Signal Ground                       |
| 8  | TXDIS  | Transmitter Disable Control. High level Tx off. |
| 9  | TD+    | Transmitter Data In                             |
| 10 | TD-    | Transmitter Data In Bar                         |

**Note1:** Signal Detect is a basic fiber failure indicator. This is a single-ended LVTTTL output. As the input optical power is decreased, Signal Detect will switch from high to low (de-assert point) somewhere between sensitivity and the no light input level. As the input optical power is increased from very low levels, Signal Detect will switch back from low to high (assert point).

**Note2:** Transmitter Disabled:  $(V_{ccT}-1.3V) < V < V_{ccT}$  ; Transmitter Enabled:  $TX\ GND < V < (TX\ GND+0.8V)$  or open circuit.

## Mechanical Dimensions



(All Dimensions are  $\pm 0.20\text{mm}$  Unless Otherwise Specified, Unit: mm)



## Ordering Information

| Part No.          | Tx     | Rx                    | Conn.        | I/O   | SD    | Link        | Voltage | Temp.    |
|-------------------|--------|-----------------------|--------------|-------|-------|-------------|---------|----------|
| FSF1-C7-S13-10TR  | 1310nm | 1260nm<br>~<br>1600nm | Duplex<br>LC | AC/AC | LVTTL | SMF<br>10km | 3.3V    | 0~70°C   |
| FSF1-C7-S13-10TRi |        |                       |              |       |       |             |         | -40~85°C |

**Note:** Distances are indicative only. To calculate a more precise link budget based on specific conditions in your application, please refer to the optical characteristics.