# USFPP-ER

# 10Gb/s 1550nm SFP+ Transceiver

## PRODUCT FEATURES


- Hot-pluggable SFP+ footprint
- Supports 8.5Gb/s to 11.32Gb/s Multi-Rate
- Power dissipation < 1.5W
- Single 3.3V power supply
- Maximum link length of 40km
- 1550nm EML transmitter, PIN photo-detector
- Single mode, Duplex LC connector
- Power dissipation < 1.5W
- Built-in digital diagnostic functions
- Case temperature range ： 0°C to 70°C

## APPLICATIONS

- 10GBASE-ER/EW 10G Ethernet

## STANDARD

- Compliant with SFF-8472 SFP+ MSA.
- Compliant to SFP+ SFF-8431 and SFF-8432.
- Compliant to 802.3ae 10GBASE-ER.

## PRODUCT DESCRIPTION

USFPP-ER is designed for use in 10-Gigabit Ethernet links up to 40km over single mode fiber. The module consists of 1550 EML Laser, InGaAs PIN and Preamplifier in a high-integrated optical sub-assembly. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. The module data link up to 40km in 9/125um single mode fiber.

## 1. Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Storage Temperature | Ts | -40 | | 85 | ºC | |
| Storage Ambient Humidity | HA | 5 | | 85 | % | |
| Power Supply Voltage | VCC | -0.5 | | 4 | V | |
| Signal Input Voltage | | -0.3 | | Vcc+0.3 | V | |
| Receiver Damage Threshold | | +4 | | | dBm | |

## 2. Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Operating Case Temperature | Tcase | 0 | | 70 | ºC | Note (1) |
| Ambient Humidity | HA | 5 | | 85 | % | |
| Power Supply Voltage | VCC | 3.14 | 3.3 | 3.46 | V | |
| Power Supply Current | ICC | | | 450 | mA | |
| Power Supply Noise Rejection | | | | 100 | mVp-p | 100Hz to 1MHz |
| Transmission Distance | | | | 40 | km | 16:1 split |
| Coupled fiber | Single mode fiber | | | | | ITU-T G.653 |

Note: -10 to 60degC with 1.5m/s airflow

## 3. Optical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Average Launched Power | PO | -1 | | +4 | dBm | Note (1) |
| Extinction Ratio | ER | 6 | | | dB | |
| Center Wavelength | λc | 1530 | 1550 | 1565 | nm | |
| Spectrum Band Width (RMS) | σ | | | 1.0 | nm | |
| SMSR | | 30 | | | dB | |
| Transmitter OFF Output Power | POff | | | -40 | dBm | |
| Optical Rise/Fall Time | tr/tf | | 100 | 260 | ps | Note (2) |
| Transmitter and Dispersion Penalty | TDP | | | 3.0 | dB | |
| Output Eye Mask | Compliant with IEEE 0802.3ae | | | | | |
| **Receiver** | | | | | | |
| Input Optical Wavelength | λ | 1270 | | 1610 | nm | |
| Receiver Sensitivity | | | | -16 | dBm | Note (3) |
| Input Saturation Power (Overload) | Psat | 0.5 | | | dBm | |
| LOS Detect -Assert Power | PA | -28 | | | dBm | |
| LOS Detect - Deassert Power | PD | | | -17 | dBm | |
| LOS Detect Hysteresis | PHYS | 0.5 | | | dB | |

Note：

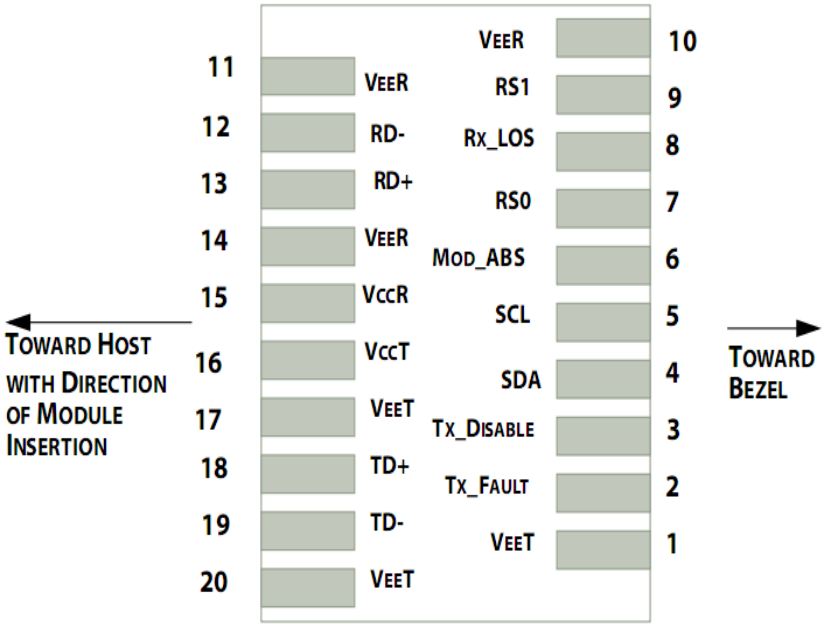
1. Launched power (avg.) is power coupled into a single mode fiber with master connector.（Before of Life）
2. These are unfiltered 20-80% values.
3. Measured with conformance test signal for BER < 10^–12.@10.3125Gbps, PRBS=2^31-1,NRZ

## 4. Electrical Interface Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Differential line input Impedance | RIN | | 100 | | Ohm | |
| Differential Data Input Swing | VDT | 300 | | 700 | mVp-p | |
| Transmit Disable Voltage | Vdis | 2 | | Vcc | V | LVTTL |
| Transmit Enable Voltage | Ven | Vee | | Vee+0.8 | V | |
| **Receiver** | | | | | | |
| Differential Data Output Swing | VDR | 400 | | 850 | mVp-p | Note (1) |
| LOS Output Voltage-High | VLOSH | Vee | | Vee+0.8 | V | LVTTL |
| LOS Output Voltage-Low | VLOSL | 2 | | VccHOST | V | |

Note: Into 100Ω differential termination.

## 5. Pin Description



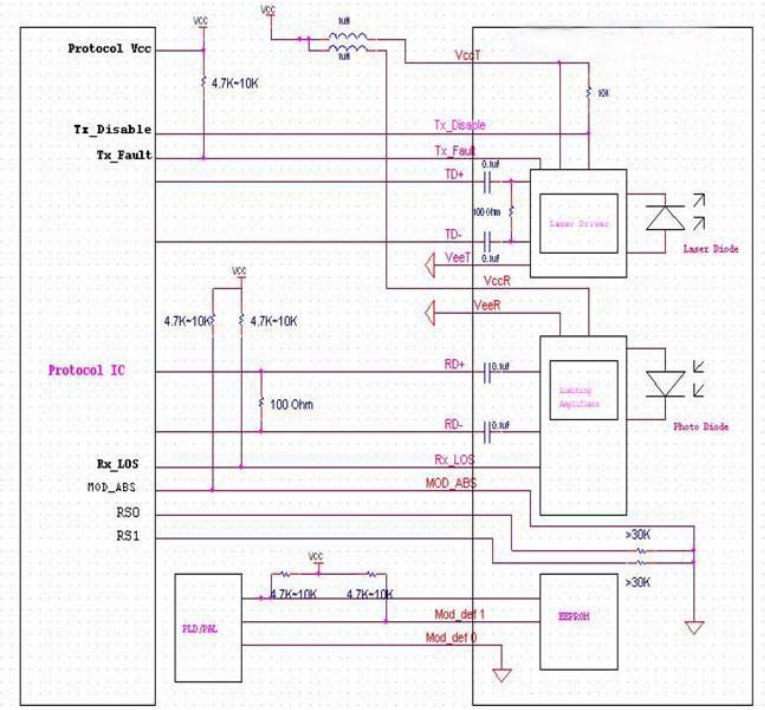

**Pin out of Connector Block on Host Board**

| Pin | Symbol | Name/Description | Ref. |
|---|---|---|---|
| 1 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |
| 2 | $T_{FAULT}$ | Transmitter Fault. | 2 |
| 3 | $T_{DIS}$ | Transmitter Disable. Laser output disabled on high or open. | 3 |
| 4 | SDA | 2-wire Serial Interface Data Line | 4 |
| 5 | SCL | 2-wire Serial Interface Clock Line | 4 |
| 6 | MOD_ABS | Module Absent. Grounded within the module | 4 |
| 7 | RS0 | Rate Select 0 | 5 |
| 8 | LOS | Loss of Signal indication. Logic 0 indicates normal operation. | 6 |
| 9 | RS1 | No connection required | 1 |
| 10 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 11 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 12 | RD- | Receiver Inverted DATA out. AC Coupled | |
| 13 | RD+ | Receiver Non-inverted DATA out. AC Coupled | |
| 14 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 15 | $V_{CCR}$ | Receiver Power Supply | |
| 16 | $V_{CCT}$ | Transmitter Power Supply | |
| 17 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |
| 18 | TD+ | Transmitter Non-Inverted DATA in. AC Coupled. | |
| 19 | TD- | Transmitter Inverted DATA in. AC Coupled. | |
| 20 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |

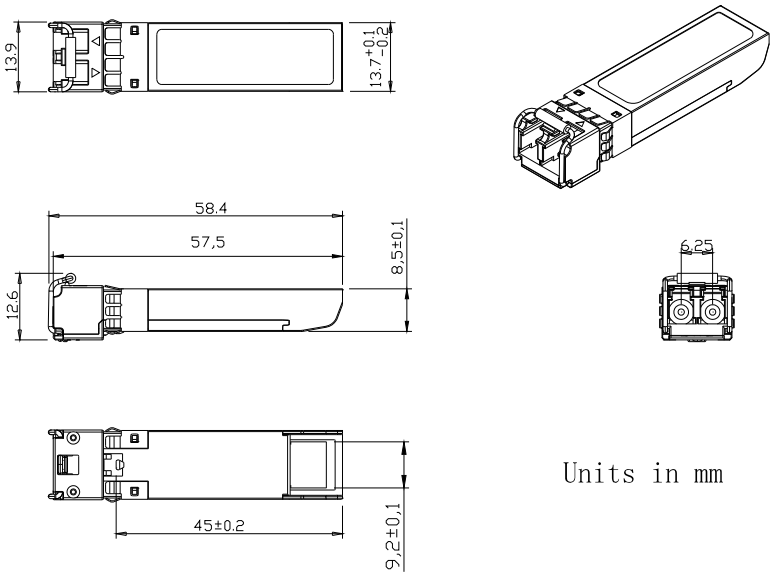
**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. $T_{FAULT}$ is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V.A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on $T_{DIS}$ >2.0V or open, enabled on $T_{DIS}$ <0.8V.
4. Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

## 6. Recommended Interface Circuit




## 7. Outline Dimensions




Units in mm