


TSSP-31192-LR Optical Transceiver

1310nm SFP+ Single-mode Transceiver, With Diagnostic Monitoring
Duplex SFP+ 10km Transceiver, RoHS 6 Compliant

Features

- Optical interface compliant to IEEE 802.3ae 10GBASE-LR
- Electrical interface compliant to SFF-8431
- Hot Pluggable
- 1310nm DFB transmitter, PIN photo-detector
- Operating case temperature: 0 to 70 °C
- Low power consumption
- Applicable for 10km SMF connection
- All-metal housing for superior EMI performance
- Advanced firmware allows customer system encryption information to be stored in transceiver
- Cost effective SFP+ solution, enables higher port densities and greater bandwidth
- RoHS6 compliant (lead free) 



Applications

- 10GBASE-LR at 10.3125Gbps
- Other optical links

Absolute maximum rating

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

| Parameters | Symbol | Min. | Max. | Unit |
|----------------------------|------------------|------|------|------|
| Power Supply Voltage | V _{CC} | 0 | +3.6 | V |
| Storage Temperature | T _c | -40 | +85 | °C |
| Operating Case Temperature | T _c | 0 | +70 | °C |
| Relative Humidity | RH | 5 | 95 | % |
| RX Input Average Power | P _{max} | - | 0 | dBm |

Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit |
|----------------------------|--------|------|---------|------|------|
| Supply Voltage | Vcc | 3.13 | 3.3 | 3.46 | V |
| Supply current[1] | Icc | - | 360 | 450 | mA |
| Operating Case temperature | Tca | -5 | - | 70 | °C |
| Module Power Dissipation | Pm | - | 1.2 | 1.5 | W |

Transmitter Specifications – Optical

| Parameter | Symbol | Min | Typical | Max | Unit |
|-----------------------------------|----------------------|------|---------|------|-------|
| Center Wavelength | λ_c | 1530 | | 1565 | nm |
| Spectral Width (-20dB) | $\Delta\lambda_{20}$ | - | - | 0.3 | nm |
| Average Optical Power | Po | -8.2 | - | +1 | dBm |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB |
| Optical Transmit Power (disabled) | PTX_DISABLE | - | - | -30 | dBm |
| Extinction Ratio | ER | 3.5 | - | - | dB |
| Relative Intensity Noise | RIN | - | - | -128 | dB/Hz |
| Optical Return Loss Tolerance | Orl | - | - | 21 | dB |

Receiver Specifications – Optical

| Parameter | Symbol | Min | Typical | Max | Unit |
|--|-----------|-------|---------|-------|------|
| Input Operating Wavelength | λ | 1260 | - | 1600 | nm |
| Average receive power | Pavg | -15.8 | - | -1.0 | dBm |
| Receiver sensitivity in 10.3Gbps(OMA) | Rsen1 | - | - | -14.1 | dBm |
| Stressed receiver sensitivity in 10.3Gbps(OMA) | Rsen2 | - | - | -11.3 | dBm |
| Reflectance | Rrx | - | - | -26 | dB |
| LOS Asserted | Lsa | -28 | - | - | dBm |
| LOS De-Asserted | Lda | - | - | -16 | dBm |
| LOS Hysteresis | Lh | 0.5 | - | - | dB |

Notes:

[1] Measured with conformance test signal for BER = 10^{-12} . The stressed sensitivity values in the table are for system level BER measurements which include the effects of CDR circuits. It is recommended that at least 0.4 dB additional margin be allocated if component level measurements are made without the effects of CDR circuits.

Transmitter Specifications – Electrical

| Parameter | Symbol | Min | Typical | Max | Unit |
|------------------------------|---------|-----|---------|----------|----------|
| Data Rate | Mra | 1.0 | 10.3 | 11.3 | Gbps |
| Input differential impedance | Rim | - | 100 | - | Ω |
| Differential data Input | VtxDIFF | 120 | - | 850 | mV |
| Transmit Disable Voltage | VD | 2.0 | - | Vcc3+0.3 | V |
| Transmit Enable Voltage | Ven | 0 | - | +0.8 | V |
| Transmit Disable Assert Time | Vn | - | - | 100 | us |

Receiver Specifications – Electrical

| Parameter | Symbol | Min | Typical | Max | Unit |
|---------------------------|----------|-----|---------|-----------|------|
| Data Rate | Mra | - | 10.3 | 11.3 | Gbps |
| Differential Output Swing | Vout P-P | 350 | - | 850 | mV |
| Rise/Fall Time | Tr / Tf | 24 | - | - | ps |
| Loss of Signal –Asserted | VOH | 2 | - | Vcc3+0.3- | V |
| Loss of Signal –Negated | VOL | 0 | - | +0.4 | V |

Digital Diagnostic Functions

| Parameter | Symbol | Min. | Max | Unit | Notes |
|-------------------------------|-----------|-------|-------|------|-----------------------|
| Accuracy | | | | | |
| Transceiver Temperature | DMI_Temp | -3 | +3 | degC | Over operating temp |
| TX Output optical power | DMI_TX | -3 | +3 | dB | |
| RX Input optical power | DMI_RX | -3 | +3 | dB | -3dBm to -12dBm range |
| Transceiver Supply voltage | DMI_VCC | -0.08 | +0.08 | V | Full operating range |
| Bias current monitor | DMI_Ibias | -10% | 10% | mA | - |
| Dynamic Range Accuracy | | | | | |
| Transceiver Temperature | DMI_Temp | -5 | 70 | degC | - |
| TX Output optical power | DMI_TX | -1 | +2 | dBm | - |
| RX Input optical power | DMI_RX | -18 | 0 | dBm | - |
| Transceiver Supply voltage | DMI_VCC | 3.0 | 3.6 | V | - |
| Bias current monitor | DMI_Ibias | 0 | 100 | mA | - |

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

| Parameter | Symbol | Min. | Typical | Max | Unit | Notes |
|---------------------------------------|--------|------|---------|------|------|------------|
| Data Rate | - | - | 10.3125 | - | Gbps | - |
| Power Consumption | - | - | 1200 | 1500 | mW | - |
| Transmitter | | | | | | |
| Single Ended Output Voltage Tolerance | - | -0.3 | - | 4.0 | V | - |
| C common mode voltage tolerance | - | 15 | - | - | mV | - |
| Tx Input Diff Voltage | VI | 400 | - | 1600 | mV | - |
| Tx Fault | VoL | -0.3 | - | 0.4 | V | At 0.7mA |
| Data Dependent Input Jitter | DDJ | - | - | 0.10 | UI | - |
| Data Input Total Jitter | TJ | - | - | 0.28 | UI | - |
| Receiver | | | | | | |
| Single Ended Output Voltage Tolerance | - | -0.3 | - | 4.0 | V | - |
| Rx Output Diff Voltage | Vo | 300 | - | 850 | mV | - |
| Rx Output Rise and Fall Time | Tr/Tf | 30 | - | - | ps | 20% to 80% |
| Total Jitter | TJ | - | - | 0.70 | UI | - |
| Deterministic Jitter | DJ | - | - | 0.42 | UI | - |

Recommended Operating Environment

Recommended Operating Environment specifies parameters for which the electrical and optical characteristics hold unless otherwise noted.

| Parameter | Symbol | Min | Typical | Max | Unit |
|----------------------------|-----------------|-------|---------|-------|------|
| Power Supply Voltage | V _{CC} | 3.135 | 3.300 | 3.465 | V |
| Operating Case Temperature | T _C | 0 | 25 | 70 | °C |

Low Speed Characteristics

| Parameter | Symbol | Min | Typical | Max | Unit |
|-------------------|--------|--------------|---------|--------------|------|
| Power Consumption | - | - | - | 1 | W |
| TX_Fault,RX_LOS | VOL | 0 | - | 0.4 | V |
| | VOH | Host_Vcc-0.5 | - | Host_Vcc+0.3 | V |
| TX_DIS | VIL | -0.3 | - | 0.8 | V |
| | VIH | 2.0 | - | VCCT+0.3 | V |
| RS0,RS1 | VIL | -0.3 | - | 0.8 | V |
| | VIH | 2.0 | - | VCCT+0.3 | V |

Pin Definition

| Pin | Symbol | Name/Description |
|-----|--------------|---|
| 1 | VEET [1] | Transmitter Ground |
| 2 | Tx_FAULT [2] | Transmitter Fault |
| 3 | Tx_DIS [3] | Transmitter Disable. Laser output disabled on high or open |
| 4 | SDA [2] | 2-wire Serial Interface Data Line |
| 5 | SCL [2] | 2-wire Serial Interface Clock Line |
| 6 | MOD_ABS [4] | Module Absent. Grounded within the module |
| 7 | RS0 [5] | Rate Select 0 |
| 8 | RX_LOS [2] | Loss of Signal indication. Logic 0 indicates normal operation |
| 9 | RS1 [5] | Rate Select 1 |
| 10 | VEER [1] | Receiver Ground |
| 11 | VEER [1] | Receiver Ground |
| 12 | RD- | Receiver Inverted DATA out. AC Coupled |
| 13 | RD+ | Receiver DATA out. AC Coupled |
| 14 | VEER [1] | Receiver Ground |
| 15 | VCCR | Receiver Power Supply |
| 16 | VCCT | Transmitter Power Supply |
| 17 | VEET [1] | Transmitter Ground |
| 18 | TD+ | Transmitter DATA in. AC Coupled |
| 19 | TD- | Transmitter Inverted DATA in. AC Coupled |
| 20 | VEET [1] | Transmitter Ground |

Notes:

[1] Module circuit ground is isolated from module chassis ground within the module.

[2].should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.

[3]Tx_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.

[4]Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc_Host with a resistor in the range 4.7 kΩ to 10 kΩ. Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.

[5] RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module.

Regulatory Compliance

T&S SFP+ transceiver is designed to be Class I Laser safety compliant and is certified per the following standards:

| Feature | Agency | Standard | Certificate / Comments |
|--------------------------|--------|---|------------------------|
| Laser Safety | FDA | CDRH 21 CFR 1040 annd Laser Notice No. 50 | 1120292-000 |
| Product Safety | UL | UL and CUL EN60950-2:2007 | E347511 |
| Environmental protection | SGS | RoHS Directive 2002/95/EC | GZ1001008918/CHEM |
| EMC | WALTEK | EN 55022:2006+A1:2007 EN 55024:1998+A1+A2:2003 | WT10093759-D-E-E |

Ordering Information

| Part Number | Product Description |
|---------------|-------------------------------------|
| TSSP-31192-LR | 10Gbps SFP+ 1310nm 10km 0°C ~ +70°C |

References

1. "Specifications for Enhanced Small Form Factor Pluggable Module SFP+", SFF-8431, Rev 4.1, July 6, 2009.
2. "Improved Pluggable Formfactor", SFF-8432, Rev 4.2, Apr 18, 2007
3. IEEE802.3ae – 2002
4. "Diagnostic Monitoring Interface for Optical Transceivers" SFF-8472, Rev 10.3, Dec 1,2007

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