# TSSP-1325G-LR Optical Transceiver

1310nm SFP28 Single-Mode Transceiver, With DDM and Dual CDR
Duplex SFP28 10km Transceiver

## Features

- Compliant with MSA SFP+ Specification SFF-8402
- Data Rate up to 25.78 Gb/s
- Operating Data Rate Support 24.33Gbps and 25.78Gbps with CDR Engaged mode
- Operating Data Rate Support 9.95Gbps and 10.31Gbps with CDR Bypassed mode
- 1310nm DFB-LD Transmitter
- Distance up to 10km over SMF
- Single 3.3V Power Supply and Power Dissipation < 1.5W
- Duplex LC Connector Interface, Hot Pluggable
- Built-in Dual CDR
- Case operation temperature range:
  Standard temperature: 0°C to 70°C
  Extended temperature: -20°C to 85°C
- RoHS6 compliant (lead free)


## Applications

- 25GE LR
- eCPRI & CPRI

## Description

The TSSP-1325G-LR single-mode transceiver is SFP28 module for duplex optical data communications support 24.33Gb/s and 25.78Gb/s with CDR engaged, while, 10G Ethernet optical data communication can be supported when CDR is bypassed.

It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I2C. It has built-in clock and data recovery (CDR). This module is designed for single-mode fiber and operates at a nominal wavelength of 1310nm.

The transmitter section uses a 1310nm multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.



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## Absolute Maximum Ratings

| Parameters | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Power Supply Voltage | VCC | 0 | +3.6 | V |
| Storage Temperature | Tc | -40 | +85 | °C |
| Relative Humidity | RH | 0 | 85 | % |

## Recommended Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| Power Supply Voltage | VCC | 3.15 | 3.30 | 3.45 | V |
| Supply current | Icc | - | - | 435 | mA |
| Operating Case Temperature(standard) | Tca | 0 | - | 70 | °C |
| Operating Case Temperature(industrial) | Tca | -40 | - | 85 | °C |

## Electrical Characteristics

| Parameter | Symbol | Min. | Typical | Max | Unit |
|---|---|---|---|---|---|
| Power Consumption | - | - | - | 1500 | mW |
| **Transmitter** | | | | | |
| Input differential impedance[2] | Rin | - | 100 | - | Ω |
| Differential Input Voltage swing | Vin | 300 | - | 1100 | mV |
| Transmit Disable Voltage | VD | VCC -1.3 | - | VCC | V |
| Transmit Enable Voltage[3] | VEN | Vee | - | Vee+0.8 | V |
| **Receiver** | | | | | |
| Output differential impedance[2] | Rout | - | 100 | - | Ω |
| Differential Output Swing[4] | Vout | 500 | - | 800 | mV |
| Loss of Signal –Asserted[5] | - | 2.0 | - | VCC+0.3 | V |
| Loss of Signal –Negated[5] | - | Vee | - | Vee+0.8 | V |

**Notes:**

[1] Connected directly to TX data input pins. AC coupled thereafter.

[2] Or open circuit.

[3] Into 100 ohms differential termination.

[4] Loss Of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.



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## Optical Characteristics

| Parameter | Symbol | Min. | Typical | Max | Unit |
|---|---|---|---|---|---|
| **Transmitter** | | | | | |
| Center Wavelength | λ | 1295 | 1310 | 1325 | nm |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB |
| Average Optical Power[2] | Po | -7.0 | - | 2 | dBm |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP) | - | -5 | - | - | dBm |
| Extinction Ratio[3] | ER | 3.5 | - | - | dB |
| Transmitter Dispersion Penalty | TDP | - | - | 2.7 | dB |
| Optical Return Loss Tolerance | ORL | - | - | 12 | dB |
| Eye Mask {X1, X2, X3, Y1, Y2,Y3} | - | {0.31, 0.4, 0.45, 0.34, 0.38, 0.4} | | | |
| **Receiver** | | | | | |
| Center Wavelength | λ | 1260 | - | 1350 | nm |
| Damage Threshold | DT | 3.5 | - | - | dBm |
| Receiver Sensitivity (OMA)[3] | Rsen | - | - | -11.3 | dBm |
| Receiver Overload | Pmax | 2.2 | - | - | dBm |
| Stressed Receiver Sensitivity (OMA) | RXSRS | - | - | -8.8 | dBm |
| Vertical Eye Closure Penalty, each Lane | VECP | - | 1.9 | - | dB |
| Stressed Eye J2 Jitter | J2 | - | 0.27 | - | UI |
| Stressed Eye J4 Jitter | J4 | - | 0.39 | - | UI |
| SRS Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3} Hit ratio 5x10-5 per sample | - | {0.24, 0.5, 0.5, 0.24, 0.24, 0.4} | | | |

**Notes:**

[1] Trade-offs are available between spectral width, center wavelength and minimum OMA.

[2] The optical power is launched into MMF

[3] Measured with a PRBS $2^{31}$-1 test pattern @25.78125Gbps; BER=$5x10^{-5}$



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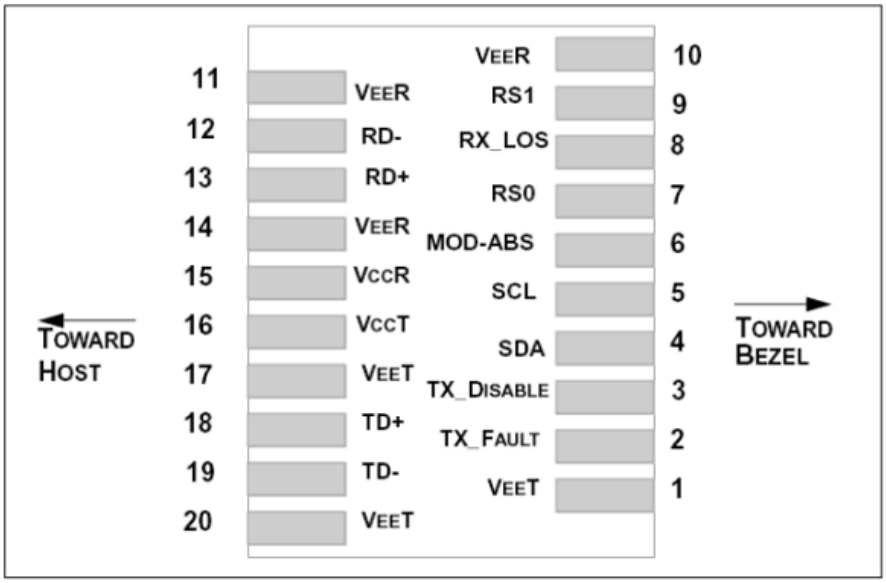
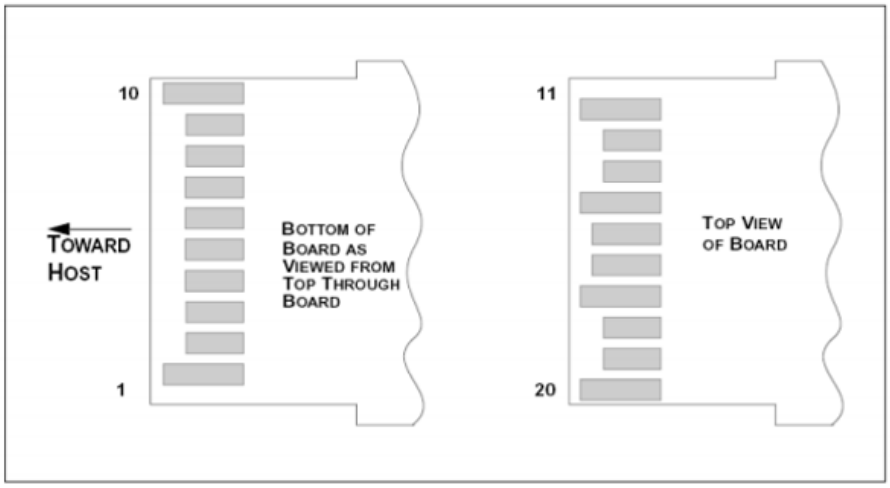
## Electrical Pad Layout




## 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 3.15Vand 3.6V.

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

[4] Mod_ABS is connected to VeeT or VeeR in the SFP28 module. The host may pull this contact up to VCC _Host with a resistor in the range 4.7 kΩ to10 kΩ.Mod_ABS is asserted "High" when the SFP28 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.

## Ordering Information

| Part Number | Product Description |
|---|---|
| TSSP-1325G-LRC | 25.78125Gbps SFP28 10km 0°C ~ +70°C |
| TSSP-1325G-LRT | 25.78125Gbps SFP28 10km -40°C ~ +85°C |

## References

1. SFP28 MSA
2. Directive 2011/65/EU of the European Parliament and of the Council, "on the restriction of the use of certain hazardous substances in electrical and electronic equipment," July 1, 2011.

## Important Notice

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