

## **SFP-25G-SR**

### **25Gbps SFP28 MMF Optical Transceiver, 850nm, 100m**

#### **Features**

- ✓ Hot-pluggable SFP28 form factor
- ✓ Supports 25Gbps data rate
- ✓ Maximum link length of 70m on OM3 MMF and 100m on OM4 MMF
- ✓ 850nm VCSEL laser and PIN photo-detector
- ✓ Internal CDR on both Transmitter and Receiver channel
- ✓ Single 3.3V power supply
- ✓ Power dissipation < 1W
- ✓ RoHS compliant
- ✓ Case temperature range: -40°C to 85°C



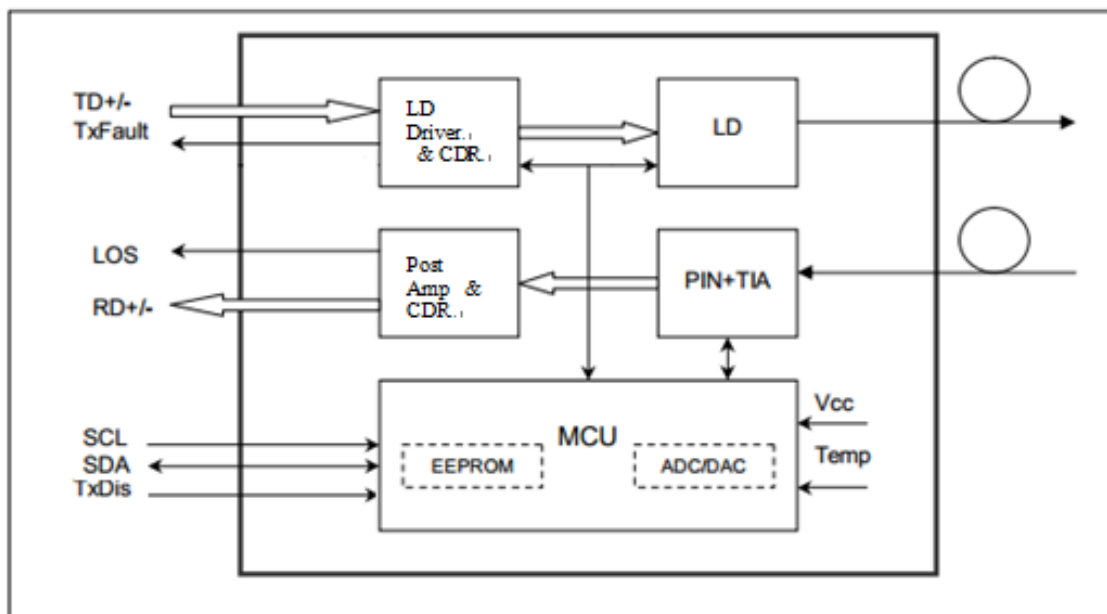
#### **Applications**

- ✓ 25GBASE-SR Ethernet

#### **Description**

This SFP28 transceiver is a single-Channel, Pluggable, Fiber-Optic SFP28 for 25 Gigabit Ethernet Applications. It is a high performance module for data communication and interconnect applications for operation at 25.78125 Gbps up to 70 m using OM3 fiber or 100 m using OM4 fiber. This module is designed to operate over multimode fiber systems using a nominal wavelength of 850nm.

## Block Diagram



## Absolute Maximum Ratings

**Table 1 - Absolute Maximum Ratings**

| Parameter           | Symbol | Min | Max | Unit |
|---------------------|--------|-----|-----|------|
| Supply Voltage      | Vcc    | 0   | 3.6 | V    |
| Storage Temperature | Ts     | -40 | +85 | °C   |
| Operating Humidity  | -      | 5   | 85  | %    |

## Recommended Operating Conditions

**Table 2 - Recommended Operating Conditions**

| Parameter                                         | Symbol | Min  | Typical | Max  | Unit |
|---------------------------------------------------|--------|------|---------|------|------|
| Operating Case Temperature                        | Tc     | -40  |         | 85   | °C   |
| Power Supply Voltage                              | Vcc    | 3.13 | 3.3     | 3.47 | V    |
| Power Supply Current                              | Icc    |      |         | 300  | mA   |
| Fiber Length on 50/125µm high-bandwidth (OM3) MMF |        |      |         | 70   | m    |
| Fiber Length on 50/125µm high-bandwidth (OM4) MMF |        |      |         | 100  | m    |

## Optical and Electrical Characteristics

**Table 3 - Optical and Electrical Characteristics**

| Parameter                      |         | Symbol              | Min  | Typical | Max             | Unit     | Notes |
|--------------------------------|---------|---------------------|------|---------|-----------------|----------|-------|
| <b>Transmitter</b>             |         |                     |      |         |                 |          |       |
| Data rate                      |         | BR                  |      | 25.78   |                 | Gbps     |       |
| Centre Wavelength              |         | $\lambda_c$         | 840  | 850     | 860             | nm       |       |
| Spectral Width (-20dB)         |         | $\sigma$            |      |         | 0.6             | nm       |       |
| Average Output Power           |         | P <sub>avg</sub>    | -8.4 |         | 2.4             | dBm      |       |
| Optical Power OMA              |         | P <sub>OMA</sub>    | -6.4 |         | 3               | dBm      |       |
| Extinction Ratio               |         | ER                  | 2    |         |                 | dB       |       |
| Differential data input swing  |         | V <sub>IN,PP</sub>  | 40   |         | 1000            | mV       |       |
| Input Differential Impedance   |         | Z <sub>IN</sub>     | 90   | 100     | 110             | $\Omega$ |       |
| TX Disable                     | Disable |                     | 2.0  |         | V <sub>cc</sub> | V        |       |
|                                | Enable  |                     | 0    |         | 0.8             | V        |       |
| TX Fault                       | Fault   |                     | 2.0  |         | V <sub>cc</sub> | V        |       |
|                                | Normal  |                     | 0    |         | 0.8             | V        |       |
| <b>Receiver</b>                |         |                     |      |         |                 |          |       |
| Data rate                      |         | BR                  |      | 24.33   | 25.78           | Gbps     |       |
| Centre Wavelength              |         | $\lambda_c$         | 840  | 850     | 860             | nm       |       |
| Stressed Sensitivity (OMA)     |         |                     | -    | -       | -5.2            | dBm      |       |
| Receiver Power (OMA)           |         |                     |      |         | 3               | dBm      |       |
| LOS De-Assert                  |         | LOS <sub>D</sub>    |      |         | -13             | dBm      |       |
| LOS Assert                     |         | LOS <sub>A</sub>    | -30  |         |                 | dBm      |       |
| LOS Hysteresis                 |         |                     | 0.5  |         |                 | dB       |       |
| Differential data output swing |         | V <sub>out,PP</sub> | 300  |         | 850             | mV       |       |
| LOS                            | High    |                     | 2.0  |         | V <sub>cc</sub> | V        |       |
|                                | Low     |                     |      |         | 0.8             | V        |       |

**Notes:**

Receive Sensitivity measured with a prbs31 pattern @25.78125Gb/s, BER 5E-5; ;

## Timing and Electrical

**Table 4 - Timing and Electrical**

| <i>Parameter</i>                                                                        | <i>Symbol</i>         | <i>Min.</i> | <i>Max.</i> | <i>Unit</i> | <i>Conditions</i>                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------|-----------------------|-------------|-------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tx_Disable assert time                                                                  | t_off                 |             | 100         | μs          | Rising edge of Tx_Disable to fall of output signal below 10% of nominal                                                                                                                                                                                                                                                                                  |
| Tx_Disable negate time                                                                  | t_on                  |             | 2           | ms          | Falling edge of Tx_Disable to rise of output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery.                                                                                                                                                                                                  |
| Time to initialize 2-wire interface                                                     | t_2w_start_up         |             | 300         | ms          | From power on or hot plug after the supply meeting <a href="#">Table 8</a> .                                                                                                                                                                                                                                                                             |
| Time to initialize                                                                      | t_start_up            |             | 300         | ms          | From power supplies meeting <a href="#">Table 8</a> or hot plug or Tx disable negated during power up, or Tx_Fault recovery, until non-cooled power level I part (or non-cooled power level II part already enabled at power level II for Tx_Fault recovery) is fully operational.                                                                       |
| Time to initialize cooled module and time to power up a cooled module to Power Level II | t_start_up_cooled     |             | 90          | s           | From power supplies meeting <a href="#">Table 8</a> or hot plug, or Tx disable negated during power up or Tx_Fault recovery, until cooled power level I part (or cooled power level II part during fault recovery) is fully operational. Also, from stop bit low-to-high SDA transition enabling Power Level II until cooled module is fully operational |
| Time to Power Up to Level II                                                            | t_power_level2        |             | 300         | ms          | From stop bit low-to-high SDA transition enabling power level II until non-cooled module is fully operational                                                                                                                                                                                                                                            |
| Time to Power Down from Level II                                                        | t_power_down          |             | 300         | ms          | From stop bit low-to-high SDA transition disabling power level II until module is within power level I requirements                                                                                                                                                                                                                                      |
| Tx_Fault assert                                                                         | Tx_Fault_on           |             | 1           | ms          | From occurrence of fault to assertion of Tx_Fault                                                                                                                                                                                                                                                                                                        |
| Tx_Fault assert for cooled module                                                       | Tx_Fault_on_cooled    |             | 50          | ms          | From occurrence of fault to assertion of Tx_Fault                                                                                                                                                                                                                                                                                                        |
| Tx_Fault Reset                                                                          | t_reset               | 10          |             | μs          | Time Tx_Disable must be held high to reset Tx_Fault                                                                                                                                                                                                                                                                                                      |
| RS0, RS1 rate select timing for FC                                                      | t_RS0_FC,<br>t_RS1_FC |             | 500         | μs          | From assertion till stable output                                                                                                                                                                                                                                                                                                                        |
| RS0, RS1 rate select timing non FC                                                      | t_RS0, t_RS1          |             | 24          | ms          | From assertion till stable output                                                                                                                                                                                                                                                                                                                        |
| Rx_LOS assert delay                                                                     | t_los_on              |             | 100         | μs          | From occurrence of loss of signal to assertion of Rx_LOS                                                                                                                                                                                                                                                                                                 |
| Rx_LOS negate delay                                                                     | t_los_off             |             | 100         | μs          | From occurrence of presence of signal to negation of Rx_LOS                                                                                                                                                                                                                                                                                              |

## Diagnostics

**Table 5 – Diagnostics Specification**

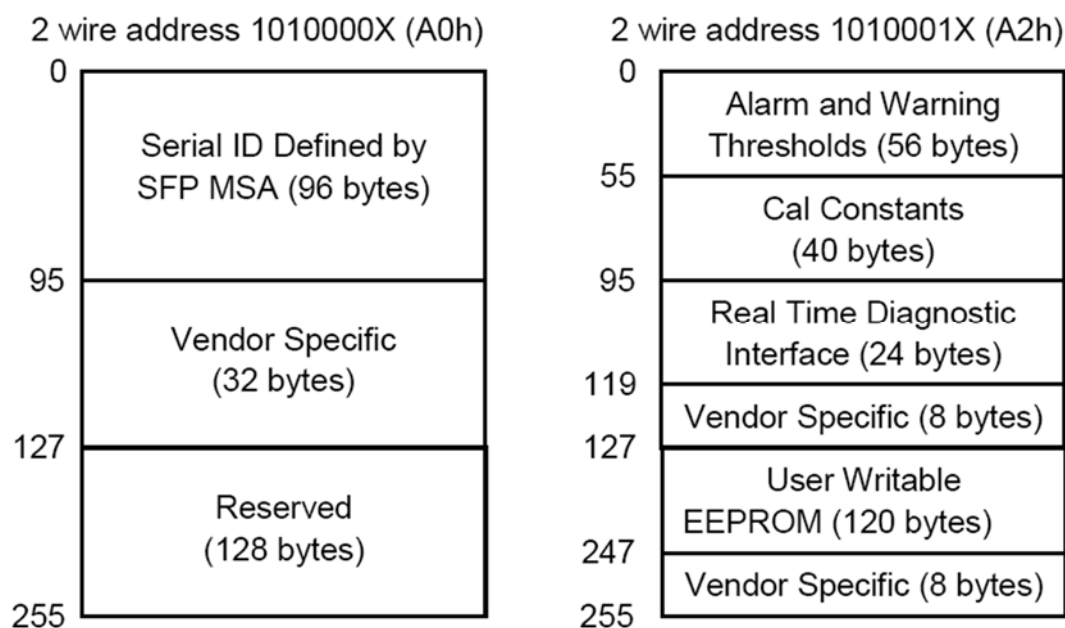
| Parameter    | Range      | Unit | Accuracy | Calibration         |
|--------------|------------|------|----------|---------------------|
| Temperature  | -40 to +85 | °C   | ±3°C     | Internal / External |
| Voltage      | 3.0 to 3.6 | V    | ±3%      | Internal / External |
| Bias Current | 0 to 20    | mA   | ±10%     | Internal / External |
| TX Power     | -8 to 3    | dBm  | ±3dB     | Internal / External |
| RX Power     | -14 to 0   | dBm  | ±3dB     | Internal / External |

## Digital Diagnostic Memory Map

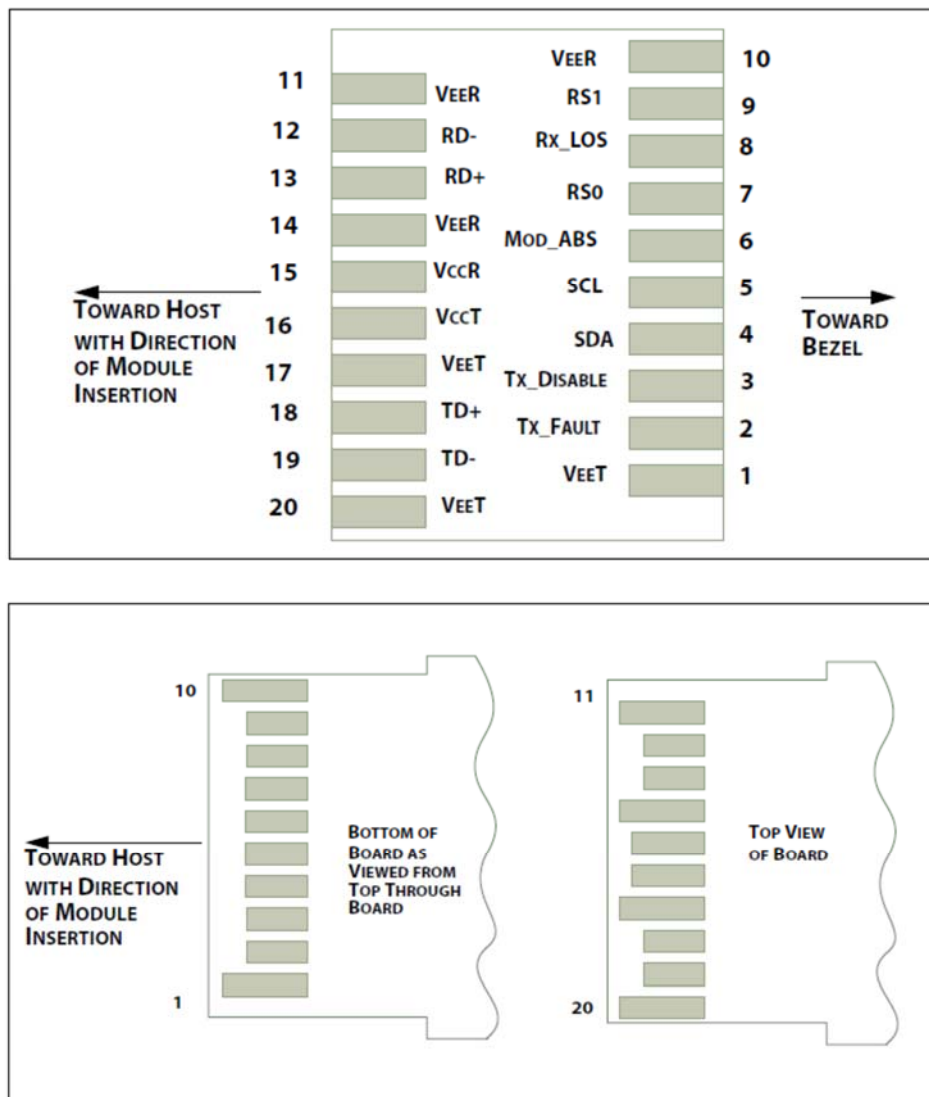
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



## Pin Definitions



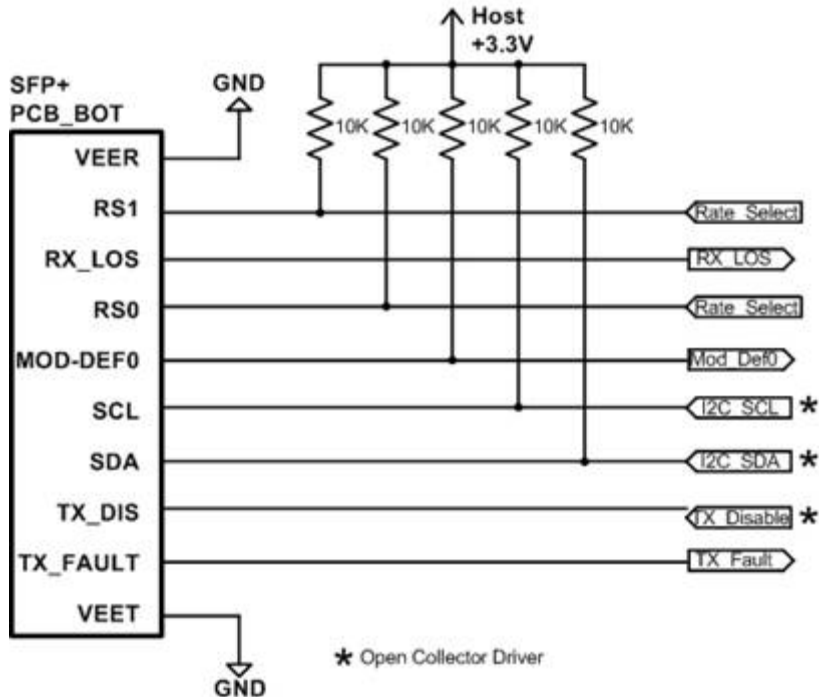
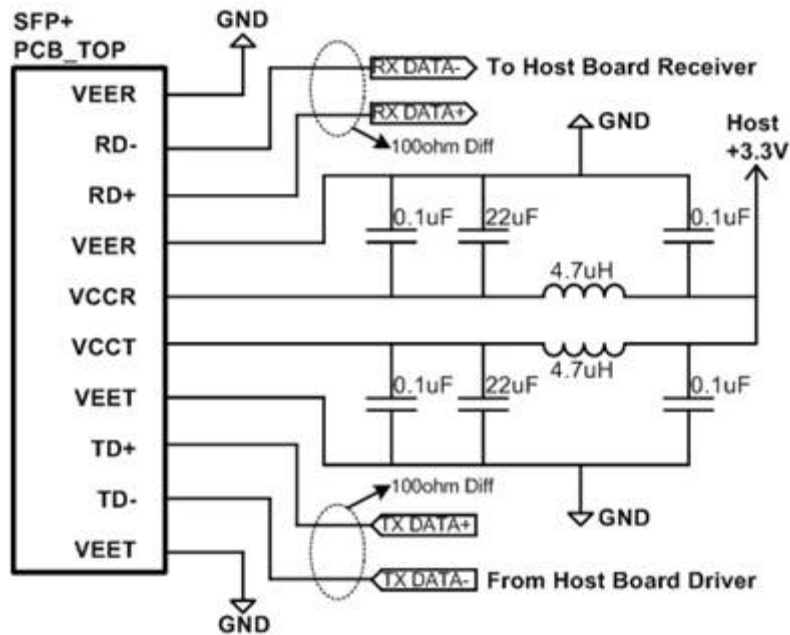
## Pin Descriptions

| PIN | Logic     | Symbol   | Name / Description                                      | Note |
|-----|-----------|----------|---------------------------------------------------------|------|
| 1   |           | VeeT     | Module Transmitter Ground                               | 1    |
| 2   | LVTTL-O   | TX_Fault | Module Transmitter Fault                                | 2    |
| 3   | LVTTL-I   | TX_Dis   | Transmitter Disable; Turns off transmitter laser output |      |
| 4   | LVTTL-I/O | SDA      | 2-Wire Serial Interface Data Line                       | 2    |
| 5   | LVTTL-I   | SCL      | 2-Wire Serial Interface Clock                           | 2    |
| 6   |           | MOD_ABS  | Module Definition, Grounded in the module               |      |
| 7   | LVTTL-I   | RS0      | Receiver Rate Select                                    |      |
| 8   | LVTTL-O   | RX_LOS   | Receiver Loss of Signal Indication Active LOW           |      |
| 9   | LVTTL-I   | RS1      | Transmitter Rate Select (not used)                      |      |
| 10  |           | VeeR     | Module Receiver Ground                                  | 1    |
| 11  |           | VeeR     | Module Receiver Ground                                  | 1    |
| 12  | CML-O     | RD-      | Receiver Inverted Data Output                           |      |
| 13  | CML-O     | RD+      | Receiver Data Output                                    |      |
| 14  |           | VeeR     | Module Receiver Ground                                  | 1    |
| 15  |           | VccR     | Module Receiver 3.3 V Supply                            |      |
| 16  |           | VccT     | Module Receiver 3.3 V Supply                            |      |
| 17  |           | VeeT     | Module Transmitter Ground                               | 1    |
| 18  | CML-I     | TD+      | Transmitter Non-Inverted Data Input                     |      |
| 19  | CML-I     | TD-      | Transmitter Inverted Data Input                         |      |
| 20  |           | VeeT     | Module Transmitter Ground                               | 1    |

### Notes:

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board

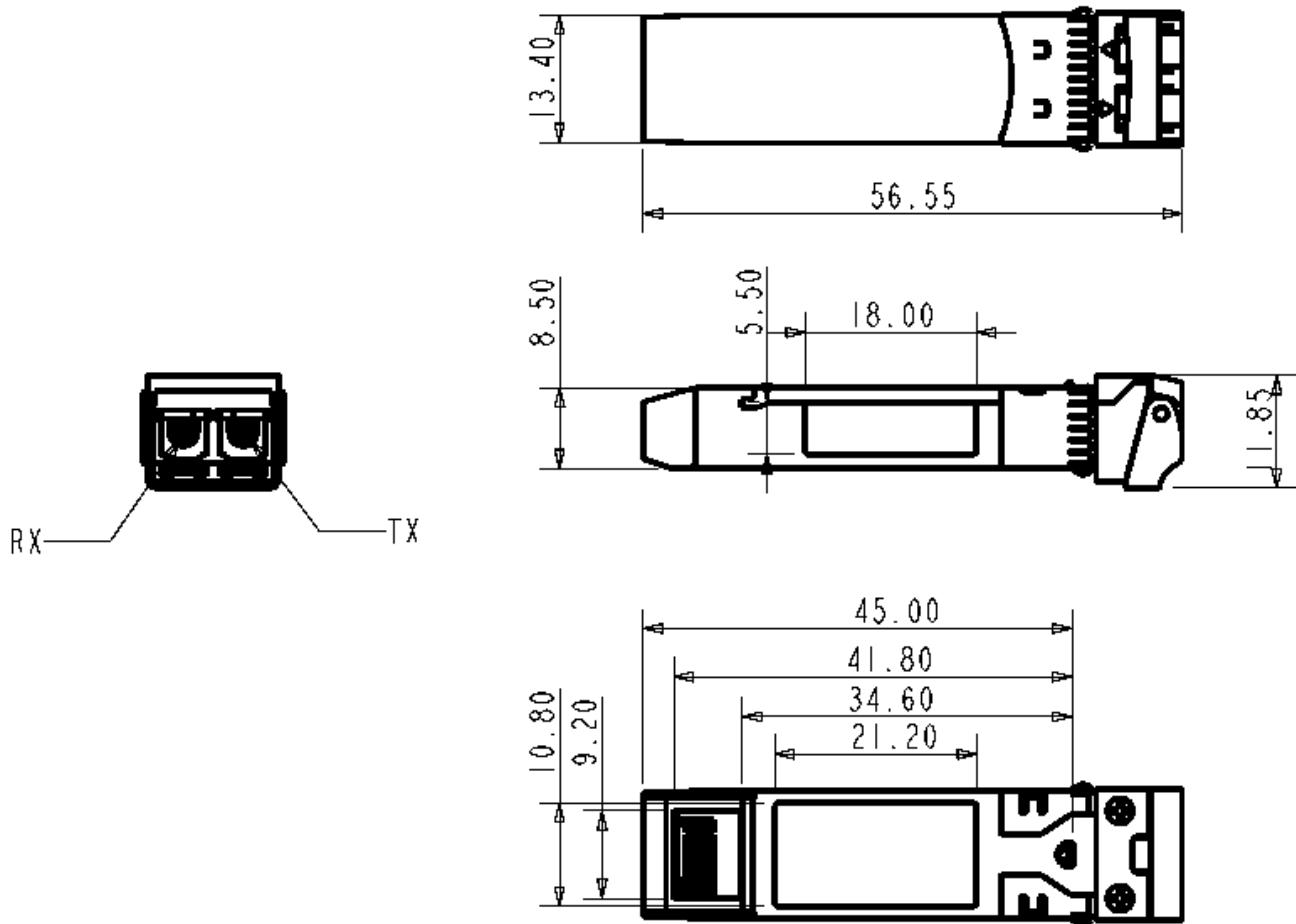
## Recommended Interface Circuit



\* Open Collector Driver



## Mechanical Dimensions



## Regulatory Compliance

This SFP28 transceiver is designed to be Class 1 Laser safety compliant and is certified per the following standards:

| Feature                  | Standard                                                               |
|--------------------------|------------------------------------------------------------------------|
| Laser Safety             | IEC 60825-1:2014 (Third Edition)                                       |
| Environmental protection | 2011/65/EU                                                             |
| CE EMC                   | EN55032: 2015<br>EN55035: 2017<br>EN61000-3-2:2014<br>EN61000-3-3:2013 |
| FCC                      | FCC Part 15, Subpart B; ANSI C63.4-2014                                |

## References

1. SFP MSA
2. eCPRI
3. 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.

### **CAUTION:**

Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**Ordering Information**

| Part Number | Product Description                               |                |
|-------------|---------------------------------------------------|----------------|
| SFP-25G-SR  | 25Gbps SFP28 MMF Optical Transceiver, 850nm, 100m | -45°C to +85°C |

**Important Notice**

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