# GPC-XX4G-08xD

## 4G CWDM SFP 80km Transceiver

### Features

- Single 3.3 V supply
- Supports 1.06/2.125/4.25Gb/s Fiber Channel Operation
- Gigabit Ethernet compatible
- 18 CWDM DFB Laser and APD photo detector
- SFP MSA SFF-8074i compliant
- Digital Diagnostic SFF-8472 compliant
- Distance up to 80 km Transmission
- Compatible with RoHS
- Operating case temperature:

  Standard : 0 to +70°C

  Industrial : -40 to +85°C

### Applications

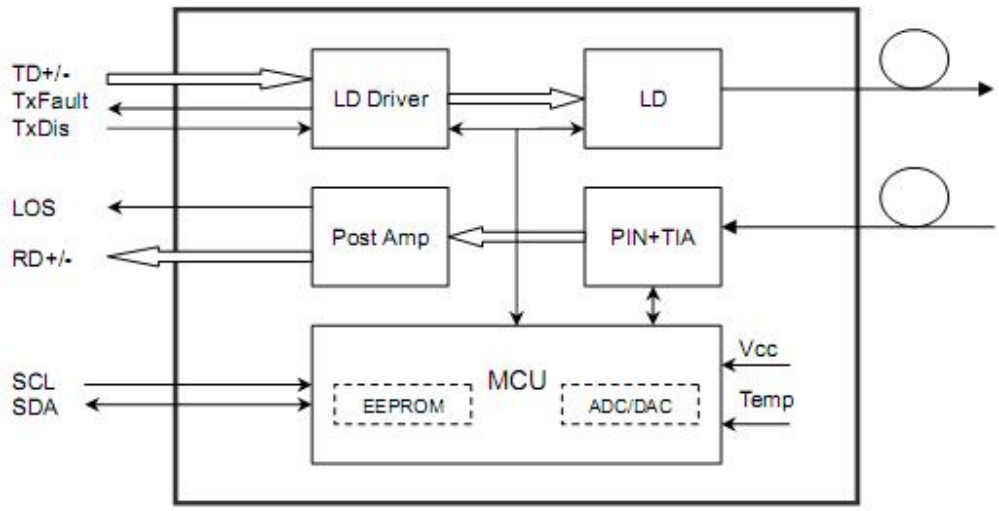
• Tri Rate 1.0625 / 2.125 / 4.25Gbp/s Fiber Channel

• 1.25 Gb/s 1000 BASE Ethernet

### Description

The transceiver consists of three sections: a DFB laser transmitter, a APD photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA)1. They are compatible with Fiber Channel per FC-PI-2 Rev. 10.0. Also simultaneously compatible with Gigabit Ethernet as specified in IEEE Std 802.3.




## Absolute Maximum Ratings

**Table 1 - Absolute Maximum Ratings**

| Parameter | Symbol | Min. | Max. | Units | Notes |
|---|---|---|---|---|---|
| Power Supply Voltage | Vcc-Vee | 0 | 3.6 | V | - |
| Storage Temperature | Tst | -40 | +85 | °C | - |
| Operating Humidity | RH | 5 | 90 | % | Non-condensing |

## Recommended Operating Conditions

**Table 2 - Recommended Operating Conditions**

| Parameter | | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|---|
| Operating Case Temperature | Standard | Tc | 0 | | +70 | °C |
| | Industrial | | -40 | | +85 | °C |
| Power Supply Voltage | | Vcc | 3.13 | 3.3 | 3.47 | V |
| Power Supply Current | | Icc | | | 300 | mA |

## Optical and Electrical Characteristics

### Table 3 - Optical and Electrical Characteristics

| Parameter | | Symbol | Min | Typical | Max | Unit | Notes |
|---|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | | |
| Data Rate | | | | 4.25 | | Gb/S | |
| Centre Wavelength | | λc | -6.5nm | 1XXX | +6.5nm | nm | |
| Spectral Width (-20dB) | | Δλ | | | 1 | nm | |
| Side Mode Suppression Ratio | | SMSR | 20 | | | dB | |
| Average Output Power(BOL) | | Pout | 2 | | 5 | dBm | 1 |
| Extinction Ratio | | ER | 5 | | | dB | |
| Average Launch Power-OFF Transmitter | | Pout | | | -40 | dBm | |
| Optical Eye Diagram | | Fiber Channel Compliant | | | | | |
| Optical Rise/Fall Time (20%~80%) | | $t_r/t_f$ | | | 130 | ns | |
| Data Input Swing Differential | | $V_{IN}$ | 200 | | 2400 | mV | 2 |
| Input Differential Impedance | | $Z_{IN}$ | 90 | 100 | 120 | Ω | |
| TX Disable | Disable | | 2.0 | | Vcc | V | |
| | Enable | | 0 | | 0.8 | V | |
| TX Fault | Fault | | 2.0 | | Vcc | V | |
| | Normal | | 0 | | 0.8 | V | |
| **Receiver** | | | | | | | |
| Centre Wavelength | | λc | 1260 | | 1360 | nm | |
| Receiver Sensitivity(BOL) | | Sen@4FC | | | -24 | dBm | 3 |
| | | Sen@2FC | | | -26 | | |
| | | Sen@FC | | | -28 | | |
| LOS De-Assert | | $LOS_D$ | | | -25 | dBm | |
| LOS Assert | | $LOS_A$ | -28 | | | dBm | |
| LOS Hysteresis | | | 0.5 | | 6 | dB | |
| Receiver Reflectance | | | | | -20 | dB | |
| Data Output Swing Differential | | $V_{out}$ | 400 | | 820 | mV | 4 |
| Loss of Signal (LOS) Assert Time | | $T_{Assert}$ | | | 500 | nS | |
| Loss of Signal (LOS) Deassert Time | | $T_{Deassert}$ | | | 500 | nS | |
| LOS | | High | 2.0 | | Vcc | V | |
| | | Low | | | 0.8 | V | |

**Notes:**
1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.

3. Measured with a PRBS $2^7$-1 test pattern @4250Mbps, BER ≤$1\times10^{-12}$.
4. CML Output,internally AC-coupled.

## Timing and Electrical

### Table 4 - Timing and Electrical

| Parameter | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| Tx Disable Negate Time | t_on | | | 1 | ms |
| Tx Disable Assert Time | t_off | | | 10 | μs |
| Time To Initialize, including Reset of Tx Fault | t_init | | | 300 | ms |
| Tx Fault Assert Time | t_fault | | | 100 | μs |
| Tx Disable To Reset | t_reset | 10 | | | μs |
| LOS Assert Time | t_loss_on | | | 100 | μs |
| LOS De-assert Time | t_loss_off | | | 100 | μs |
| Serial ID Clock Rate | f_serial_clock | | | 400 | KHz |
| MOD_DEF (0:2)-High | $V_H$ | 2 | | Vcc | V |
| MOD_DEF (0:2)-Low | $V_L$ | | | 0.8 | V |

## Diagnostics

### Table 5 – Diagnostics Specification

| Parameter | Range | Unit | Accuracy | Calibration |
|---|---|---|---|---|
| Temperature | 0 to +70 | °C | ±3°C | Internal / External |
| | -40 to +85 | | | |
| Voltage | 3.0 to 3.6 | V | ±3% | Internal / External |
| Bias Current | 0 to 100 | mA | ±10% | Internal / External |
| TX Power | 2 to 5 | dBm | ±3dB | Internal / External |
| RX Power | -26 to -3 | dBm | ±3dB | Internal / External |

**CWDM Wavelength (0~70°C)**

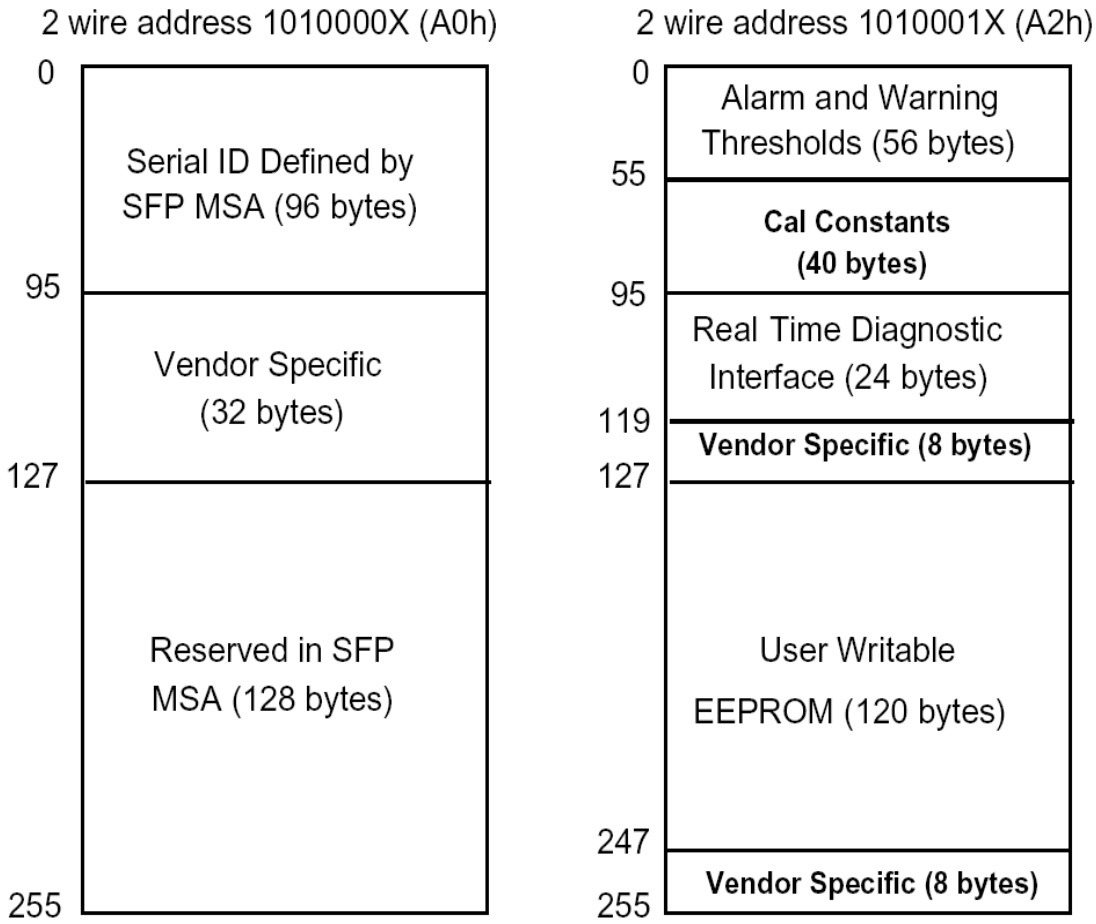
| Band | Suffix | Wavelength (nm) |
|---|---|---|
| O-band Original | A | 1270 |
| | B | 1290 |
| | C | 1310 |
| | D | 1330 |
| | E | 1350 |
| E-band Extended | F | 1370 |
| | G | 1390 |
| | H | 1410 |
| | I | 1430 |
| | J | 1450 |
| S-band Short Wavelength | K | 1470 |
| | L | 1490 |
| | M | 1510 |
| | N | 1530 |
| C-band Conventional | O | 1550 |
| L-band Long Wavelength | P | 1570 |
| | Q | 1590 |
| | R | 1610 |

## 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).

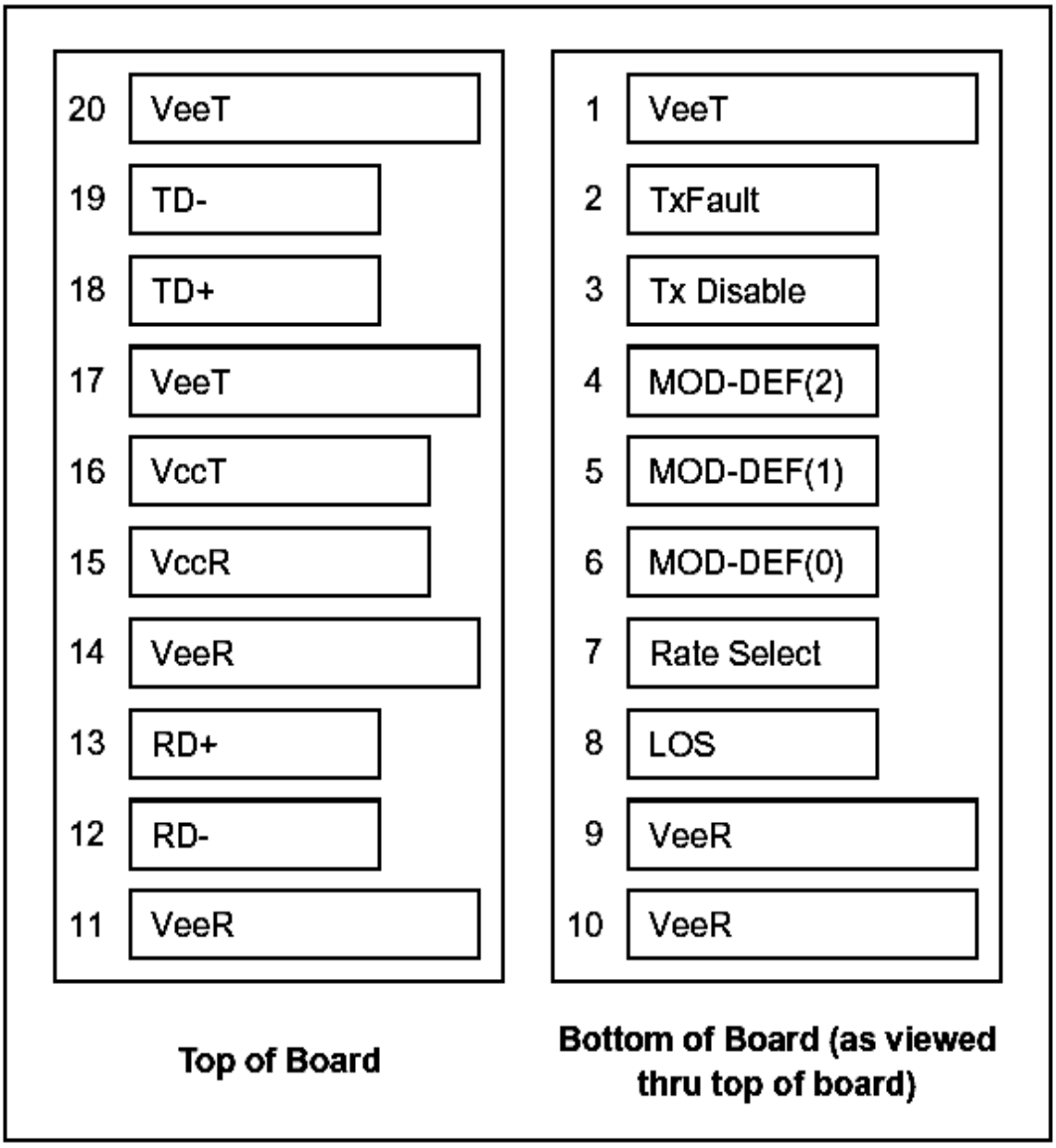
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

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



## Pin Definitions

Pin Diagram



## Pin Descriptions

| Pin | Signal Name | Description | Plug Seq. | Notes |
|---|---|---|---|---|
| 1 | $V_{EET}$ | Transmitter Ground | 1 | |
| 2 | TX FAULT | Transmitter Fault Indication | 3 | Note 1 |
| 3 | TX DISABLE | Transmitter Disable | 3 | Note 2 |
| 4 | MOD_DEF(2) | SDA Serial Data Signal | 3 | Note 3 |
| 5 | MOD_DEF(1) | SCL Serial Clock Signal | 3 | Note 3 |
| 6 | MOD_DEF(0) | TTL Low | 3 | Note 3 |
| 7 | Rate Select | Not Connected | 3 | |
| 8 | LOS | Loss of Signal | 3 | Note 4 |
| 9 | $V_{EER}$ | Receiver ground | 1 | |
| 10 | $V_{EER}$ | Receiver ground | 1 | |
| 11 | $V_{EER}$ | Receiver ground | 1 | |
| 12 | RD- | Inv. Received Data Out | 3 | Note 5 |
| 13 | RD+ | Received Data Out | 3 | Note 5 |
| 14 | $V_{EER}$ | Receiver ground | 1 | |
| 15 | $V_{CCR}$ | Receiver Power Supply | 2 | |
| 16 | $V_{CCT}$ | Transmitter Power Supply | 2 | |
| 17 | $V_{EET}$ | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | Note 6 |
| 19 | TD- | Inv. Transmit Data In | 3 | Note 6 |
| 20 | $V_{EET}$ | Transmitter Ground | 1 | |

**Notes:**

Plug Seq.: Pin engagement sequence during hot plugging.

1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.

2) TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:
   Low (0 to 0.8V): Transmitter on
   (>0.8V, < 2.0V): Undefined
   High (2.0 to 3.465V): Transmitter Disabled
   Open: Transmitter Disabled

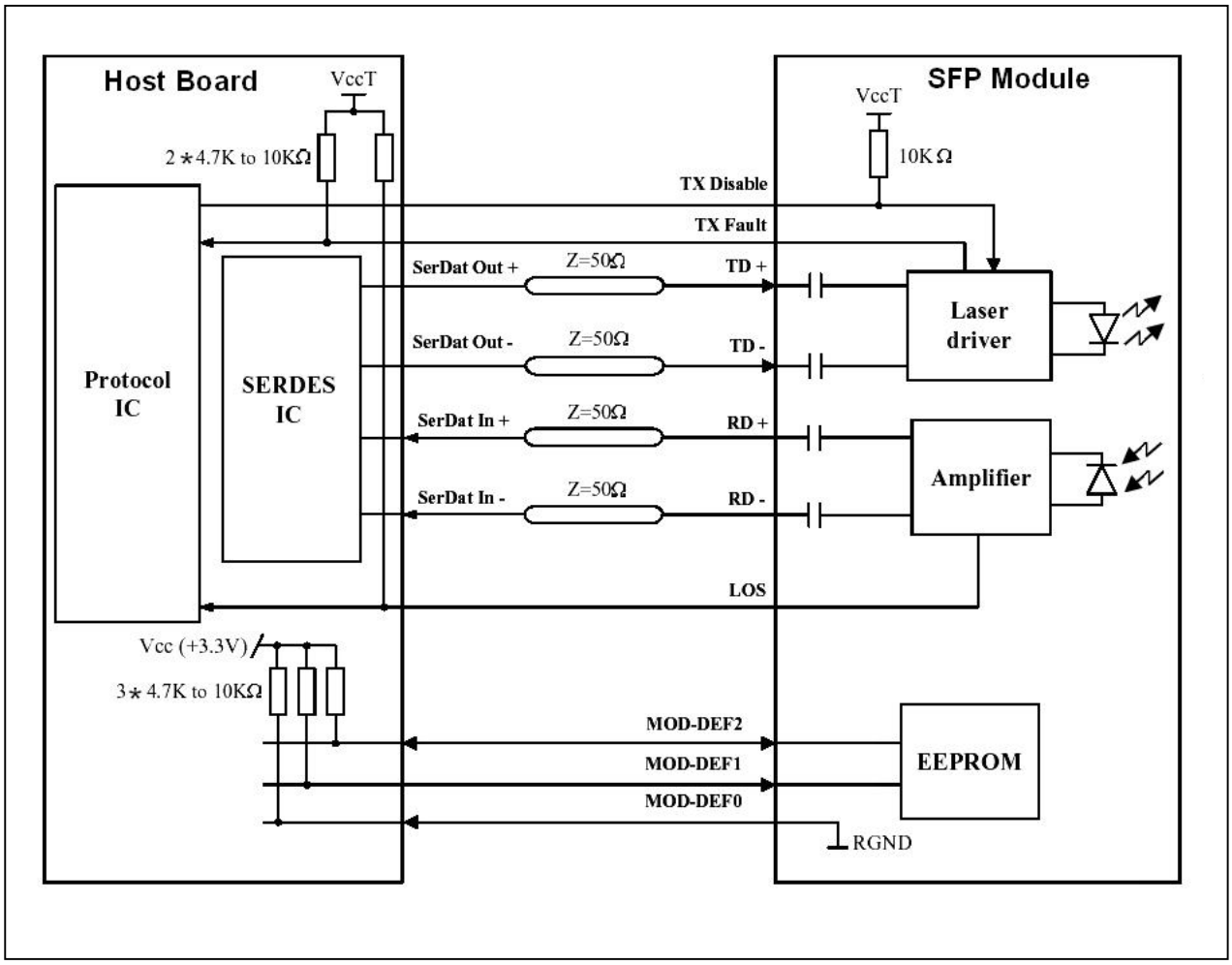
3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
   Mod-Def 0 is grounded by the module to indicate that the module is present
   Mod-Def 1 is the clock line of two wire serial interface for serial ID
   Mod-Def 2 is the data line of two wire serial interface for serial ID

4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.

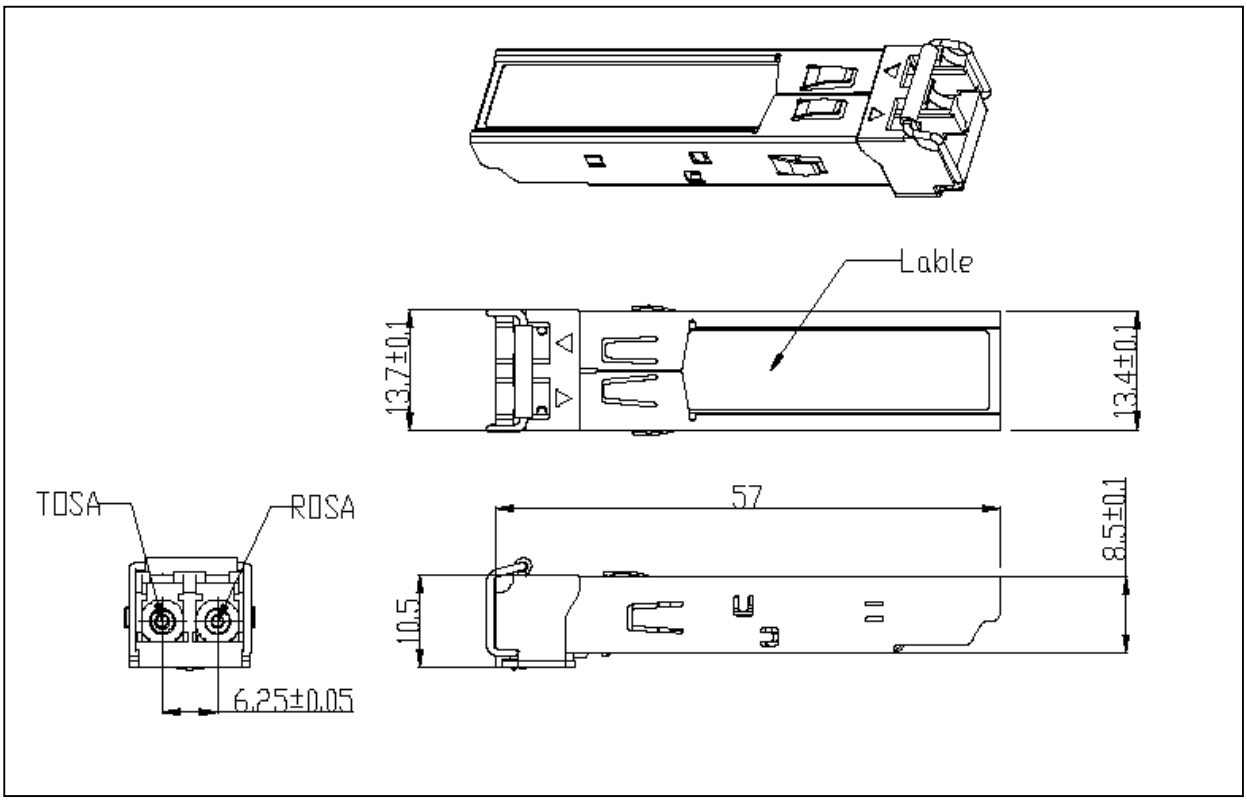
5) RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

6) TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

## Recommended Interface Circuit



## Mechanical Dimensions




## Regulatory Compliance

Gigalight 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 | 1120295-000 |
| Product Safety | BST | EN 60825-1：2007<br>EN 60825-2：2004<br>EN 60950-1：2006 | BT0905142001 |
| Environmental protection | SGS | RoHS Directive 2002/95/EC | GZ0902007478/CHEM |
| EMC | CCIC | EN 55022：2006+A1：2007<br>EN 55024：1998+A1：2001+A2：2003 | CTE09020023 |

## Ordering information

| Part Number | Product Description |
|---|---|
| GPC-XX4G-08CD | XX=27~61, 4.25Gbps, 80km, 0ºC ~ +70ºC, With Digital Diagnostic Monitoring |

## References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA),September 2000.
2. Telcordia GR-253-CORE and ITU-T G.957 Specifications.

## Important Notice

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sales@gigalight.com.cn
http://www.gigalight.com.cn