

25G SFP28-DWDM 2Km GSS-Dxx250-02C

Features

- ✓ Hot-pluggable SFP28 form factor
- ✓ Supports 25Gb/s aggregate bit rate
- ✓ Transmitter: cooled DWDM EML TOSA
- ✓ Compliant to ITU-T 694.1
- ✓ Receiver: PIN ROSA
- ✓ Internal CDR circuits on both receiver and transmitter channels
- ✓ 1.5W maximum power dissipation
- ✓ Maximum link length of 2Km over SMF
- ✓ Duplex LC receptacle
- ✓ Operating case temperature range: 0 to 70°C
- ✓ Single 3.3V power supply



Applications

- ✓ 25GBASE-LR Ethernet
- ✓ CPRI Option 10
- ✓ Support 10G CPRI option 8 by CDR bypass

Description

This product is a 25G SFP28 DWDM transceiver designed for optical communication compliant with 25G standard. Its high performance cooled DWDM EML transmitter and high sensitivity PIN receiver provide superior performance for 25G application up to 2km Links.

The product is designed with SFP28 form factor, which is the optical/electrical connection according to the SFP+ Multi-Source Agreement (MSA).

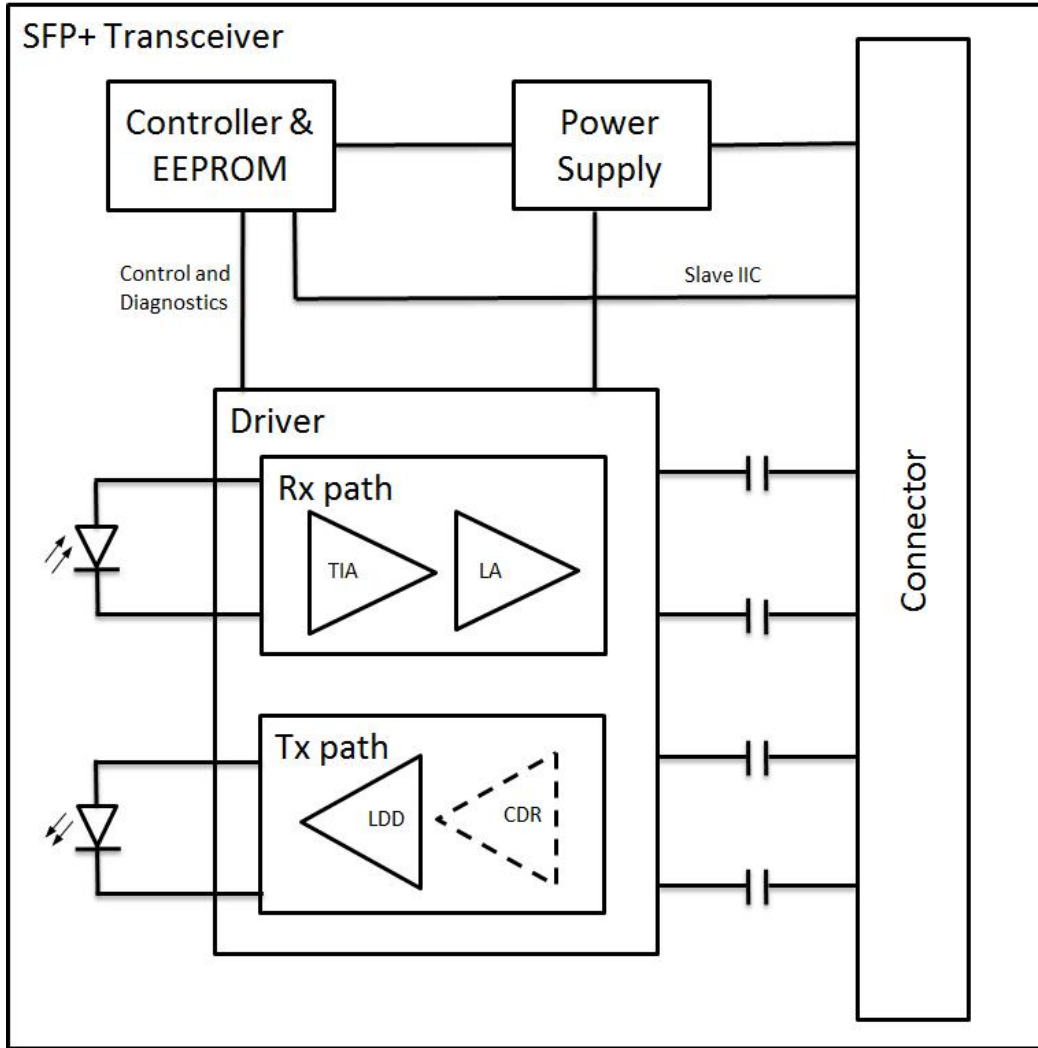


Figure 1. Module Block Diagram

The SFP28 is an Enhanced Small Form Factor Pluggable SFP+ transceiver, and can be contacted through I2C system.

Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|----------------------------|----------|------|--------------|------|
| Supply Voltage | V_{cc} | -0.3 | 3.6 | V |
| Input Voltage | V_{in} | -0.3 | $V_{cc}+0.3$ | V |
| Storage Temperature | T_s | -40 | 85 | °C |
| Case Operating Temperature | T_c | 0 | 70 | °C |
| Humidity (non-condensing) | Rh | 0 | 85 | % |

Recommended Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit |
|----------------------------|----------|------|----------|------|------|
| Supply Voltage | V_{cc} | 3.13 | 3.3 | 3.47 | V |
| Operating Case Temperature | T_c | 0 | | 70 | °C |
| Data Rate Per Lane | fd | | 25.78125 | | Gb/s |
| Humidity | Rh | 0 | | 85 | % |
| Power Dissipation | P_m | | | 1.5 | W |

Electrical Specifications

| Parameter | Symbol | Min | Typical | Max | Unit |
|--|------------------|--------------|---------|----------|-------|
| Differential Input Impedance | Z_{in} | 90 | 100 | 110 | ohm |
| Differential Output Impedance | Z_{out} | 90 | 100 | 110 | ohm |
| Differential Input Voltage Amplitude ¹ | ΔV_{in} | 300 | | 1100 | mVp-p |
| Differential Output Voltage Amplitude ² | ΔV_{out} | 500 | | 800 | mVp-p |
| Skew | Sw | | | 300 | ps |
| Input Logic Level High | V_{IH} | 2.0 | | V_{cc} | V |
| Input Logic Level Low | V_{IL} | 0 | | 0.8 | V |
| Output Logic Level High | V_{OH} | $V_{cc}-0.5$ | | V_{cc} | V |
| Output Logic Level Low | V_{OL} | 0 | | 0.4 | V |

Note:

1. Differential input voltage amplitude is measured between TxnP and TxnN.
2. Differential output voltage amplitude is measured between RxnP and RxnN.

Optical Characteristics

| Parameter | Symbol | Min | Typical | Max | Unit |
|---|-------------|-----------------|---------|-----|------|
| Transmitter | | | | | |
| Optical Wavelength | λ_c | per ITU-T 694.1 | | | nm |
| Center Wavelength Deviation (End of Life) | λ_d | ±100 | | | pm |
| Side-Mode Suppression Ratio | SMSR | 25 | | | dB |
| Average Launch Power | P_{out} | -2 | | 4 | dBm |

| | | | | | |
|---|-------------|------|--|------|-------|
| Optical Modulation Amplitude | OMA | -2 | | | dBm |
| Extinction Ratio | ER | 7 | | | dB |
| Average Launch Power of OFF Transmitter | P_{off} | | | -30 | dB |
| $R_{in20OMA}$ | | | | -130 | dB/HZ |
| Optical return loss tolerance | ORL | | | 20 | dB |
| Receiver | | | | | |
| Center Wavelength | λ_c | 1260 | | 1600 | nm |
| Receiver Sensitivity in OMA ¹ | RSoma | | | -8 | dBm |
| Average Power at Receiver Input (each lane) | P_{in} | | | 2 | dBm |
| Receiver Reflectance | R_R | | | -26 | dB |
| LOS Assert | LOS_A | -30 | | | dBm |
| LOS De-Assert | LOS_D | | | -13 | dBm |
| LOS Hysteresis | LOS_H | 0.5 | | | dB |

Note:

1. BER Level $E \times 10^{-12}$

C-band λ_c Wavelength Grid

| ITU Channel Product Code | Frequency (THz) | Wavelength | ITU Channel Product Code | Frequency (THz) | Wavelength |
|--------------------------|-----------------|------------|--------------------------|-----------------|------------|
| 17 | 191.7 | 1563.86 | 40 | 194.0 | 1545.32 |
| 18 | 191.8 | 1563.05 | 41 | 194.1 | 1544.53 |
| 19 | 191.9 | 1562.23 | 42 | 194.2 | 1543.73 |
| 20 | 192.0 | 1561.42 | 43 | 194.3 | 1542.94 |
| 21 | 192.1 | 1560.61 | 44 | 194.4 | 1542.14 |
| 22 | 192.2 | 1559.79 | 45 | 194.5 | 1541.35 |
| 23 | 192.3 | 1558.98 | 46 | 194.6 | 1540.56 |
| 24 | 192.4 | 1558.17 | 47 | 194.7 | 1539.77 |
| 25 | 192.5 | 1557.36 | 48 | 194.8 | 1538.98 |
| 26 | 192.6 | 1556.55 | 49 | 194.9 | 1538.19 |
| 27 | 192.7 | 1555.75 | 50 | 195.0 | 1537.40 |
| 28 | 192.8 | 1554.94 | 51 | 195.1 | 1536.61 |
| 29 | 192.9 | 1554.13 | 52 | 195.2 | 1535.82 |

| | | | | | |
|----|-------|---------|----|-------|---------|
| 30 | 193.0 | 1553.33 | 53 | 195.3 | 1535.04 |
| 31 | 193.1 | 1552.52 | 54 | 195.4 | 1534.25 |
| 32 | 193.2 | 1551.72 | 55 | 195.5 | 1533.47 |
| 33 | 193.3 | 1550.92 | 56 | 195.6 | 1532.68 |
| 34 | 193.4 | 1550.12 | 57 | 195.7 | 1531.90 |
| 35 | 193.5 | 1549.32 | 58 | 195.8 | 1531.12 |
| 36 | 193.6 | 1548.51 | 59 | 195.9 | 1530.33 |
| 37 | 193.7 | 1547.72 | 60 | 196.0 | 1529.55 |
| 38 | 193.8 | 1546.92 | 61 | 196.1 | 1528.77 |
| 39 | 193.9 | 1546.12 | | | |

Table 1. Product ordering codes: the central wavelength is defined as per ITU-T 694.1

Pin Description

| 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 |

Note:

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.

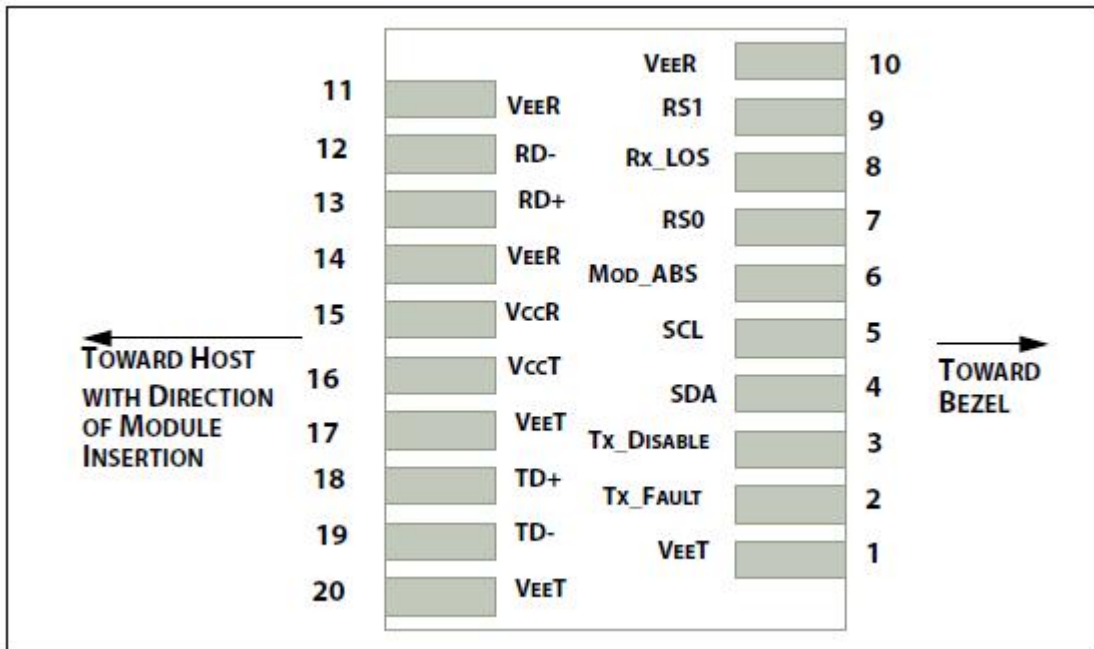


Figure 2. Electrical Pin-out Details

TX_FAULT Pin

Tx_Fault is a module output that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The Tx_Fault output is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7 kΩ to 10 kΩ.

TX_DISABLE Pin

When Tx_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off unless the module is a passive cable assembly. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor in modules and cable assemblies. Tx_Disable is a module input contact.

RS0/RS1 Pin

RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module. RS0 optionally selects the optical receive signaling rate coverage. RS1 optionally selects the optical transmit signaling rate coverage.

MOD_ABS Pin

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 k Ω to 10 k Ω . Mod_ABS is asserted "High" when the SFP+ module is physically absent from a host slot. In the SFP MSA (INF-8074i) this contact has the same function but is called MOD_DEF0.

RX_LOS Pin

Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. Rx_LOS is an open drain/collector output, but may also be used as an input by supervisory circuitry in the module. For a nominally 3.3 V Vcc_Host using a resistive pull up to Vcc_Host the resistor value shall be in the range 4.7 k Ω to 10 k Ω . For a nominally 2.5 V Vcc_Host using a resistive pull up to Vcc_Host the resistor value shall be in the range 4.7 k Ω to 7.2 k Ω .

Recommended Interface Circuit

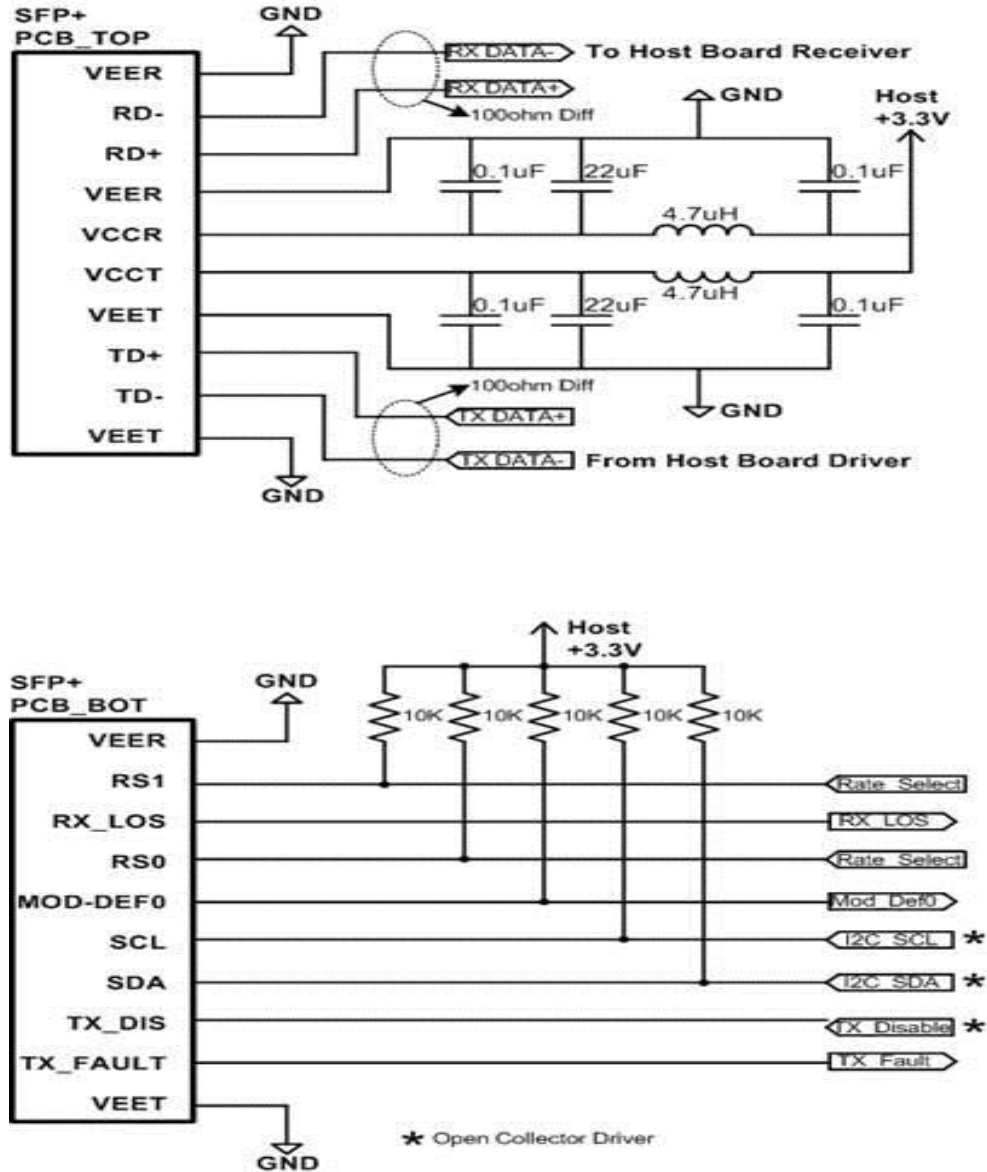


Figure 3. Recommended Interface Circuit

Memory Organization

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA). The memory map specific data field defines as following.

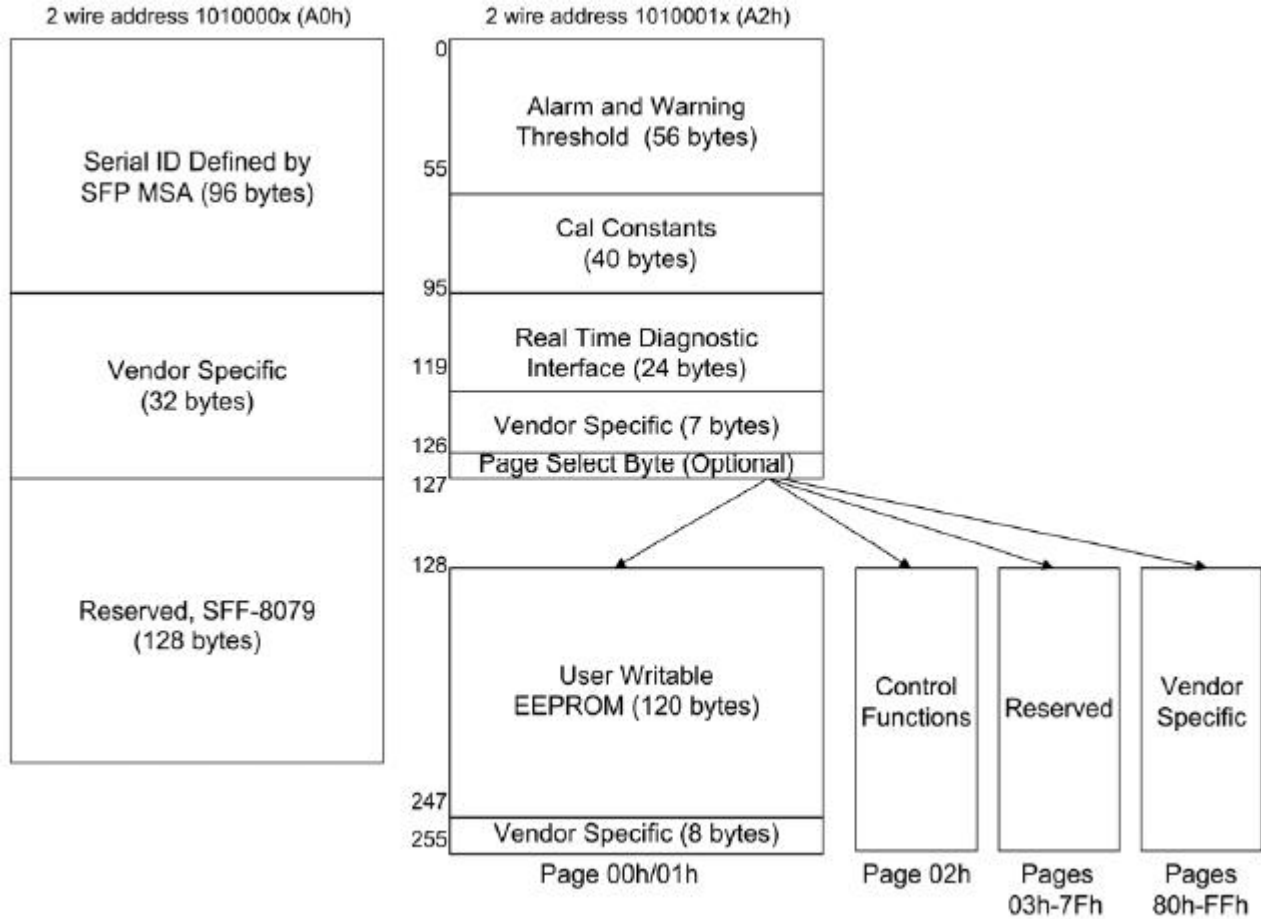


Figure 4. SFP28 Memory Map

Timing and Electrical

| Parameter | Symbol | Min. | Max. | Unit | Conditions |
|---|-----------------------|------|------|------|--|
| 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 Table 8 . |
| Time to initialize | t_start_up | | 300 | ms | From power supplies meeting Table 8 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 Table 8 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, 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 |

Mechanical Dimensions

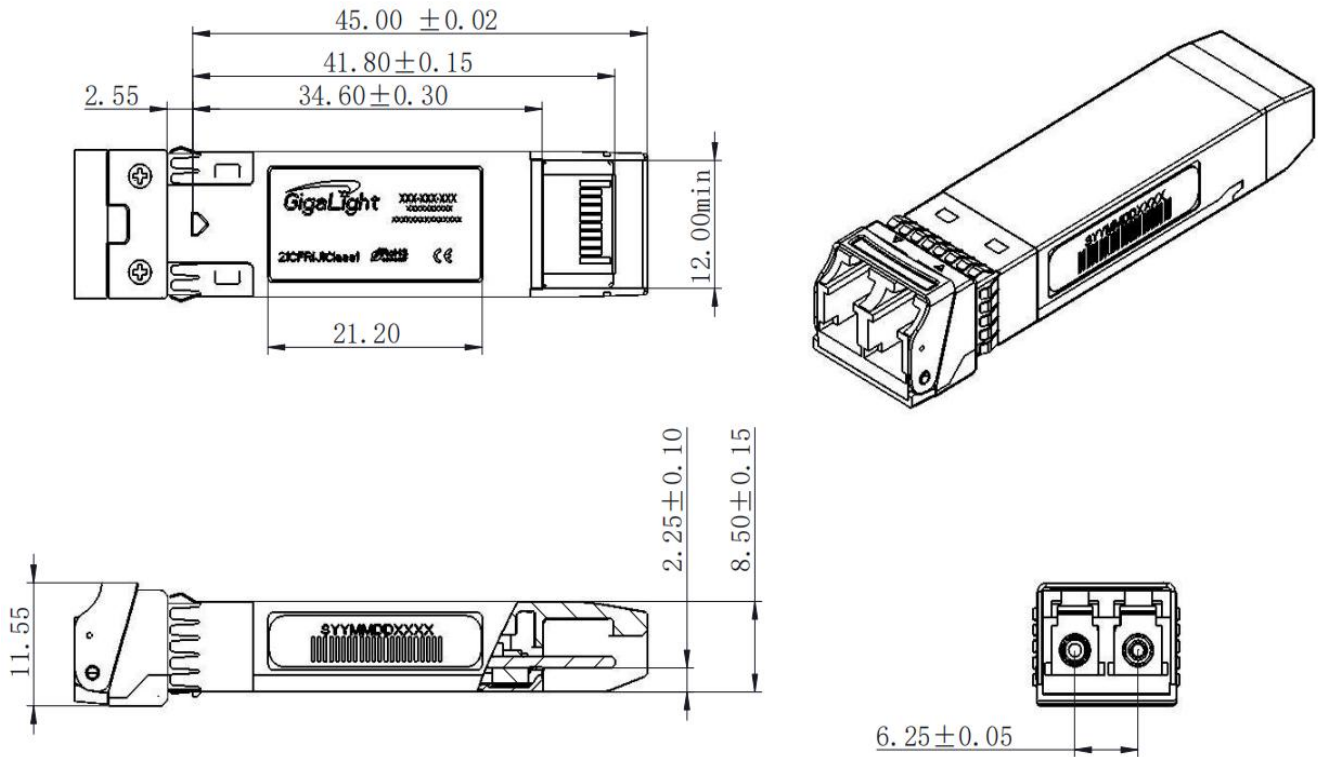


Figure 5. Mechanical Specifications

Regulatory Compliance

Gigalight GSS-Dxx250-02C transceivers are Class 1 Laser Products. They meet the requirements of the following standards:

| Feature | Standard |
|--------------------------|--|
| Laser Safety | IEC 60825-1:2014 (3 rd Edition) IEC 60825-2:2004/AMD2:2010 EN 60825-1-2014 EN 60825-2:2004+A1+A2 |
| Electrical Safety | EN 62368-1: 2014 IEC 62368-1:2014 UL 62368-1:2014 |
| Environmental protection | Directive 2011/65/EU with amendment(EU)2015/863 |
| CE EMC | EN55032: 2015 EN55035: 2017 EN61000-3-2:2014 EN61000-3-3:2013 |
| FCC | FCC Part 15, Subpart B; ANSI C63.4-2014 |

References

- 1.SFP28 MSA
2. Fibre Channel – Physical Interfaces -5, INCITS 479-2011

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 |
|----------------|--|
| GSS-Dxx250-02C | 25G, SFP28 DWDM, 2km, 0°C ~ +70°C xx : DWDM Channel NO.17~61. |

Important Notice

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Revision History

| Revision | Date | Description |
|----------|---------------|-------------------------------------|
| V0 | Sep-11-2021 | Advance Release. |
| V1 | April-11-2022 | Side-Mode Suppression Ratio > 25 dB |