

|                                                          |                                    |                                                      |
|----------------------------------------------------------|------------------------------------|------------------------------------------------------|
| <b>TITLE</b><br><br><b>1G SFP CWDM 80KM Transceivers</b> | <b>DOC No. RFD-20241226001-001</b> |                                                      |
|                                                          | <b>REVISION:</b><br><b>02</b>      | <b>AUTHORIZED BY:</b><br><b>Hawk Rong</b>            |
|                                                          | <b>DATE:</b><br><b>2025.01.09</b>  | <b>CLASSIFICATION:</b><br><b>Optical Transceiver</b> |

## **1. Features and Benefits**

- Compliant with SFF-8074i and SFF-8472
- Compliant with SFP MSA Specification
- Digital Diagnostic Monitoring available
- Uncooled CWDM DFB Laser
- Up to 1.25Gb/s data links
- Up to 80km on 9/125µm SMF
- Duplex LC connector compliant
- Single +3.3V DC power supply
- Hot-pluggable SFP footprint
- Class 1 laser safety certified
- Low power dissipation
- Operating temperature Options:

0 ~ +70°C

- RoHS compliance

## **2. Product Applications**

- 1000BASE Ethernet
- Switch to Switch Interface
- Other Optical Links

## **3. Product Description**

1G SFP CWDM Transceiver is a high performance, cost effective modules, which is transmission distance up to 80km on SMF.

The transceiver consists of two sections:

The transmitter section incorporates an CWDM DFB driver.

The receiver section consists of a APD photodiode integrated with a transimpedance preamplifier (TIA).

The module is hot pluggable into the 20-pin connector.

All modules satisfy class I laser safety requirements. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage.

|                                                          |                                    |                                                      |
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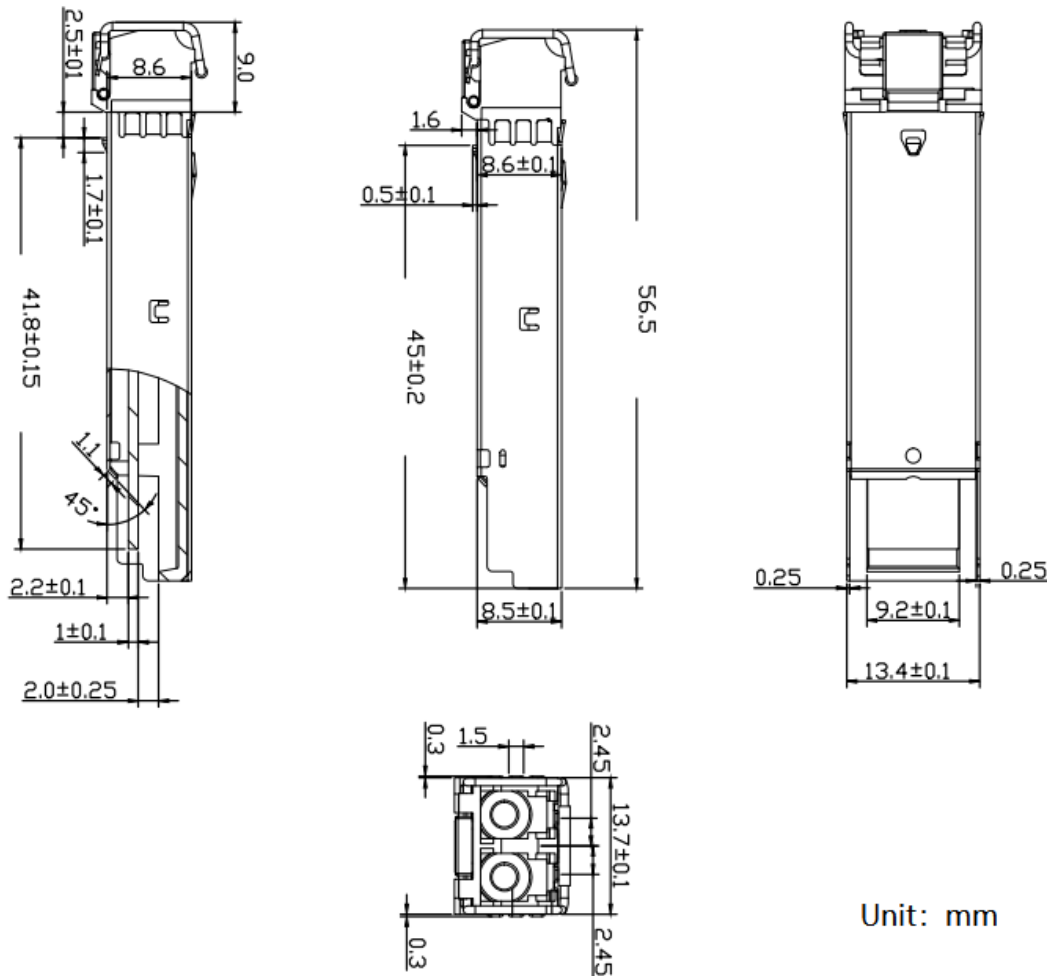
### 3.1 Product Name

#### 1G SFP 80km Transceivers

| Specification |       |            |            |     |         |          |       |          |
|---------------|-------|------------|------------|-----|---------|----------|-------|----------|
| Pack          | Rate  | Tx         | Pout       | Rx  | Sen     | Temp     | Reach | Others   |
| SFP           | 1.25G | 1271nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1291nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1311nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1331nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1351nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1371nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1391nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1411nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1431nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1451nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1471nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1491nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1511nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1531nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1551nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1571nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1591nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |
| SFP           | 1.25G | 1611nm DFB | +0 ~ +5dBm | APD | ≤-29dbm | 0 ~ +70℃ | 80km  | DDM/RoHS |

|                                                          |                                    |                                                      |
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### 3.2 Mechanical Specifications



Unit: mm

|                                                          |                                    |                                                      |
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#### 4. Absolute Maximum Ratings

| Parameter                         | Symbol           | Min. | Max. | Unit |
|-----------------------------------|------------------|------|------|------|
| Storage Temperature               | T <sub>S</sub>   | -40  | +85  | °C   |
| Supply Voltage                    | V <sub>CC3</sub> | -0.5 | 4.0  | V    |
| Relative Humidity(Non-condensing) | RH               | 5    | 85   | %    |

#### 5. Recommended Operating Conditions

| Parameter             | Symbol           | Min.  | Typical | Max.  | Unit |
|-----------------------|------------------|-------|---------|-------|------|
| Temperature           | T <sub>C</sub>   | 0     |         | 70    | °C   |
| Power Supply Voltage  | V <sub>CC3</sub> | 3.135 | 3.3     | 3.465 | V    |
|                       | I <sub>CC3</sub> |       |         | 330   | mA   |
| Power Dissipation     | P <sub>D</sub>   |       |         | 1.1   | W    |
| Data Rate             | DR               |       | 1.25    |       | Gbps |
| Transmission Distance | L                |       |         | 80    | km   |

#### 6. Transmitter Operating Characteristic-Optical, Electrical

| Parameter                   |         | Symbol           | Min.  | Typical | Max.    | Unit | Note |
|-----------------------------|---------|------------------|-------|---------|---------|------|------|
| Center Wavelength           |         | λ <sub>C</sub>   | λ-6.5 | λ       | λ+6.5   | nm   |      |
| Laser Off Power             |         | P <sub>off</sub> |       |         | -30     | dBm  |      |
| Average Optical Power       |         | P <sub>avg</sub> | +0    |         | +5      | dBm  |      |
| Spectral Width (-20dB)      |         | SW               |       |         | 1       | nm   |      |
| Side Mode Suppression Ratio |         | SMSR             | 30    |         |         | dB   |      |
| Extinction Ratio            |         | ER               | 9     |         |         | dB   |      |
| Tx Input Diff Swing         |         | V <sub>I</sub>   | 300   |         | 1600    | mV   |      |
| Tx_Disable                  | Disable |                  | 2     |         | VCC     | V    |      |
|                             | Enable  |                  | VEE   |         | VEE+0.8 | V    |      |

|                                                          |                                    |                                                      |
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## **7. Receiver Operating Characteristic-Optical, Electrical**

| Parameter                  | Symbol      | Min. | Typ. | Max. | Unit | Note  |
|----------------------------|-------------|------|------|------|------|-------|
| Center Wavelength          | $\lambda_r$ | 1260 |      | 1650 | nm   |       |
| Receiver Sensitivity (OMA) | S           |      |      | -29  | dBm  | Note1 |
| LOS Assert                 | LOS A       | -45  |      |      | dBm  |       |
| LOS Dessert                | LOS D       |      |      | -30  | dBm  |       |
| LOS Hysteresis             | LOSH        | 0.5  |      | 6    | dB   |       |
| Overload                   | Pov         | -8   |      | —    | dBm  |       |
| Rx Output Diff Swing       | Vo          | 500  |      | 1600 | mV   |       |

## **8. Control and Status I/O Timing Characteristics**

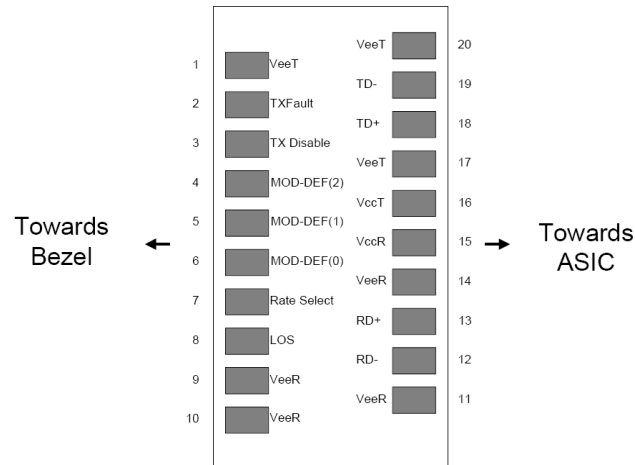
| Parameter                                      | Symbol         | Min. | Max. | Unit    | Note  |
|------------------------------------------------|----------------|------|------|---------|-------|
| TX Disable Assert Time                         | t_off          |      | 100  | $\mu$ s | Note1 |
| TX Disable Negate Time                         | t_on           |      | 2    | ms      | Note2 |
| Time to initialize including reset of TX_Fault | t_init         |      | 300  | ms      | Note3 |
| TX Fault Assert Time                           | t_fault        |      | 1    | ms      | Note4 |
| Tx_Fault Reset                                 | t_reset        | 10   |      | $\mu$ s | Note5 |
| LOS Assert Time                                | t_loss_on      |      | 100  | $\mu$ s | Note6 |
| LOS Deassert Time                              | t_loss_off     |      | 100  | $\mu$ s | Note7 |
| Serial ID Clock Rate                           | f_serial_clock | 100  | 400  | kHz     | Note8 |

### **Notes:**

- [1] Time from rising edge of TX Disable to when the optical output falls below 10% of nominal
- [2] Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal
- [3] From power on or negation of TX Fault using TX Disable
- [4] Time from fault to TX fault on
- [5] Time TX Disable must be held high to reset TX\_fault
- [6] Time from LOS state to RX LOS assert
- [7] Time from non-LOS state to RX LOS deassert.
- [8] Time from rising or falling edge of Rate Select input until receiver bandwidth is in conformance with appropriate specification

|                                                          |                                    |                                                      |
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## 9. Pin Assignment



## Pin Description

| Pin | Logic     | Symbol     | Name/Description                                                                                                                         | Note  |
|-----|-----------|------------|------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1   |           | VeeT       | Module Transmitter Ground                                                                                                                | Note1 |
| 2   | LVTTL-O   | TX_Fault   | Module Transmitter Fault                                                                                                                 | Note2 |
| 3   | LVTTL-I   | TX_Disable | Transmitter Disable; Turns off transmitter laser output                                                                                  | Note3 |
| 4   | LVTTL-I/O | SDA        | 2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i)                                                         | Note4 |
| 5   | LVTTL-I/O | SCL        | 2-wire Serial Interface Clock (Same as MOD-DEF1 as defined in the INF-8074i)                                                             | Note4 |
| 6   |           | MOD_ABS    | Module Absent, connected to VeeT or VeeR in the module                                                                                   | Note5 |
| 7   | LVTTL-I   | RS         | Rate Select, optionally controls SFP module receiver.                                                                                    | Note6 |
| 8   | LVTTL-O   | RX_LOS     | Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated at Signal Detect) | Note2 |
| 9   |           | VeeR       | Module Receiver Ground                                                                                                                   | Note1 |
| 10  |           | VeeR       | Module Receiver Ground                                                                                                                   | Note1 |
| 11  |           | VeeR       | Module Receiver Ground                                                                                                                   | Note1 |
| 12  | CML-O     | RD-        | Receiver Inverted Data Output                                                                                                            |       |
| 13  | CML-O     | RD+        | Receiver Non-Inverted Data Output                                                                                                        |       |
| 14  |           | VeeR       | Module Receiver Ground                                                                                                                   | Note1 |
| 15  |           | VccR       | Module Receiver 3.3 V Supply                                                                                                             |       |
| 16  |           | VccT       | Module Transmitter 3.3 V Supply                                                                                                          |       |
| 17  |           | VeeT       | Module Transmitter Ground                                                                                                                | Note1 |
| 18  | CML-I     | TD+        | Transmitter Non-Inverted Data Input                                                                                                      |       |
| 19  | CML-I     | TD-        | Transmitter Inverted Data Input                                                                                                          |       |
| 20  |           | VeeT       | Module Transmitter Ground                                                                                                                | Note1 |

|                                                          |                                    |                                                      |
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**Notes:**

- [1] The module signal ground pins, VeeR and VeeT, shall be isolated from the module case.
- [2] This pin is an open collector/drain output pin and shall be pulled up with 4.7k-10kohms to Host\_Vcc on the host board. Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module pin has voltage exceeding module VccT/R + 0.5 V.
- [3] This pin is an open collector/drain input pin and shall be pulled up with 4.7k-10kohms to VccT in the module.
- [4] See sff-8472 4.2 2-wire Electrical Specifications.
- [5] This pin shall be pulled up with 4.7k-10kohms to Host\_Vcc on the host board.
- [6] If implementing SFF-8079 pin 7 are used for RS0. Not use

## **10. Digital Diagnostic Specification**

The following characteristics are defined over recommended operating conditions

| Parameter                                      | Accuracy | Unit  |
|------------------------------------------------|----------|-------|
| Internally measured transceiver temperature    | +/-3     | deg.C |
| Internally measured transceiver supply voltage | +/-3     | %     |
| Measured Tx bias current                       | +/-10    | %     |
| Measured Tx output power                       | +/-3     | dB    |
| Measured Rx received average optical power     | +/-3     | dB    |

## **11. Modification History**

| Rev. | Comments            | Date       | Originator | Approval |
|------|---------------------|------------|------------|----------|
| 01   | Initial             | 2023.11.22 | Albert Lin | Mike Sun |
| 01   | Modify ADP Solution | 2025.01.09 | Hawk Rong  | Mike Sun |
|      |                     |            |            |          |