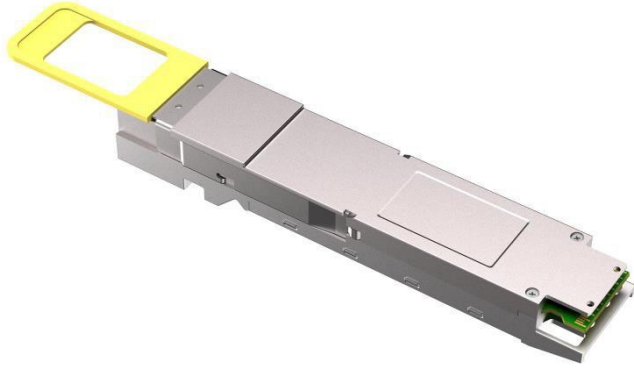


## **800G OSFP800 2xDR4 LPO Optical Transceiver (STC-40026) Datasheet**



- ▶ Maximum link length of 500m on Single Mode Fiber(SMF)
- ▶ Dual MP0-12connectors
- ▶ I2C management interface
- ▶ RoHS compliant

### **Applications:**

- ▶ Ethernet
- ▶ Data Center Interconnect

### **Features:**

- ▶ Compliant with LPOMSA 100G-DRLPO Draft
- ▶ Revision 0.5 optical specifications
- ▶ Compliant with CEI-112GUNEAR-PM14 electrical specifications
- ▶ Compliant with Ov1IS Rev 4.0
- ▶ Commercial case temperature range of 0°C to 70°C
- ▶ Hot-pluggable 03FP form factor
- ▶ Power dissipation <8W

### **Standards**

- ▶ Compliant to OSFP MSA 5.0
- ▶ Compliant with CMIS 4.0
- ▶ Compliant to IEEE P802.3db
- ▶ 8x106.25Gb/s electrical interface (800GAUI-8)
- ▶ Maximum power consumption 5.5W
- ▶ Single +3.3V power supply
- ▶ Case temperature range: 0 ~ +70°C
- ▶ RoHS 2.0 complaint

### **Description:**

SWEDISH TELECOM OPTO's STC-40026 is a 800Gb/s OSFP800 2xDR4 optical module designed for 500m optical communication applications. The module converts 8 channels of 100Gb/s (PAM4) electrical input data to 8 channels of parallel optical signals, each capable of 100Gb/s operation for an aggregate data rate of 800Gb/s. On the receiver side, the module converts 8 channels of parallel optical

signals of 100Gb/s each channel for an aggregate data rate of 800Gb/s into 8 channels of 100Gb/s (PAM4) electrical output data. The OSFP800 2xDR4 transceiver is designed for 800GBASE Ethernet throughput up to 500m over single mode fiber (SMF) with dual MPO-12 connectors.

## ► Absolute Maximum Ratings

| Parameter                 | Symbol | Min                       | Max | Units |
|---------------------------|--------|---------------------------|-----|-------|
| Storage Temperature Range | TSTG   | -40                       | +85 | °C    |
| Supply Voltage            | VCC    | -0.5                      | 3.6 | V     |
| Relative Humidity         | RH     | 10% to 90% non-condensing |     |       |

## ► Operating Conditions

| Parameter                   | Symbol            | Min.  | Max.                 | Unit |
|-----------------------------|-------------------|-------|----------------------|------|
| Case Temperature- Operating | T <sub>CASE</sub> | 0     | 70                   | °C   |
| Supply Voltage              | V <sub>CC</sub>   | 3.135 | 3.465                | V    |
| Power Consumption           | P <sub>DISS</sub> |       | 8                    | W    |
| Pre-FEC Bit Error Ratio     |                   |       | 2.4x10 <sup>-4</sup> |      |
| Link Distance over SMF      |                   |       | 500                  | m    |

## ► Transmitter Optical Specifications

| Parameters                                                | Min                          | Max    | Units | Conditions |
|-----------------------------------------------------------|------------------------------|--------|-------|------------|
| Signaling rate, each lane (range)                         | 53.125                       | 53.125 | GBd   |            |
|                                                           | - 50ppm                      | +50ppm |       |            |
| Modulation format                                         | PAM4                         |        |       |            |
| Lane Wavelength Range                                     | 1304.5                       | 1317.5 | nm    |            |
| Operating link reach                                      | dB                           | 2.5    |       |            |
| Average launch power, each lane                           | -2.9                         | 4      | dBm   |            |
| Optical Modulation Amplitude (OMA), each lane             | -1.8                         | 4.2    | dBm   |            |
| Launch power in OMA, each lane                            | -3.2+<br>max(TECQ,<br>TDECQ) |        | dBm   | See Note 1 |
| Transmitter dispersion and eye closure (TIECQ), each lane |                              | 3.4    | dB    | See Note 1 |
| Transmitter eye closure (TECO), each lane                 |                              | 3.4    | dB    | See Note 1 |
| Ceq                                                       | -0.5                         | 2.5    | dB    | See Note 2 |
| TX Overshoot/Undershoot                                   |                              | 25     | %     |            |
| Average launch power of OFF transmitter each lane         |                              | -15    | dBm   |            |
| Extinction ratio                                          | 2.5                          |        | dB    |            |
| RINxxOMA                                                  |                              | -138   | dB/Hz | See Note 3 |

| Parameters                                                                                                                                                                                                                                                                                                                                                                            | Min | Max  | Units | Conditions |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-------|------------|
| Optical return loss tolerance single lane, $n = 1$                                                                                                                                                                                                                                                                                                                                    |     | 15.5 | dB    |            |
| Optical return loss tolerance multiple lanes, $n > 1$                                                                                                                                                                                                                                                                                                                                 |     | 21.4 | dB    |            |
| Transmitter reflectance                                                                                                                                                                                                                                                                                                                                                               |     | -26  | dB    |            |
| NOTES:<br>1. Even, if the $TDEQ < 1.4\text{dB}$ , the OMA (min) must exceed the min value. A mask for the launch power is 6 illustrated in Figure 4.<br>2. $Ceq$ is a coefficient defined in IEEE std 802.3-2022 Clause 121.8.5.3 which accounts for reference equalizer 8 noise enhancement.<br>3. $RIN_{xx}OMA$ with "xx" referring to the value for Optical return loss tolerance. |     |      |       |            |

## ► Receiver Optical Specifications

| Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Min      | Max            | Units | Conditions |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------|-------|------------|
| Signaling rate, each lane (range)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 53.125   | 53.125         | GBd   |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | - 100ppm | +100ppm        |       |            |
| Modulation format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | PAM4     |                |       |            |
| Damage threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5        | 4              | dBm   | See Note 1 |
| Average receive power, each lane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -5.9     | 4              | dBm   | See Note 2 |
| Receive power, each lane (OMA outer)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          | 4.2            | dBm   |            |
| Receiver reflectance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          | -26            | dB    |            |
| Receiver sensitivity (OMA outer) for $1.4 \leq TDECQ \leq 3.4\text{dB}$ , each lane <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                   |          | -6.5<br>+TDECQ | dBm   | See Note 3 |
| Stressed receiver sensitivity (OMA outer), each lane <sup>4</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          | -3.1           | dBm   | See Note 4 |
| Conditions of stressed receiver sensitivity test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |                |       |            |
| Stressed eye closure for PAM4 (SECQ), lane under test                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          | 3.4            | dB    |            |
| OMA outer of each aggressor lane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 4.2      |                | dBm   |            |
| NOTES:<br>1. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.<br>2. Average receive power, each lane (min) is informative and not the principal indicator of signal strength.<br>A received power below this value cannot be compliant; however, a value above this does not ensure compliance.<br>3. A mask for the receiver sensitivity is illustrated in Figure 4.<br>4. Measured with conformance test signal at 1P3. See section 9.10. |          |                |       |            |

## ► Receiver Thresholds for Loss of Signal (LOS)

| Parameter                | Min | Typical | Max  | Unit |
|--------------------------|-----|---------|------|------|
| RX_LOS_Assert Min/Max    |     | -15.0   |      | dBm  |
| RX_LOS_De-Assert Min/Max |     |         | -8.9 | dBm  |
| RX_LOS_Hysteresis        |     | 1.5     |      | dB   |

## ► Digital Diagnostic Monitoring Specifications

| Parameter                                  | Unit | Specification |
|--------------------------------------------|------|---------------|
| Temperature Monitor absolute error         | °C   | ±3            |
| Supply Voltage Monitor absolute error      | %    | ±5            |
| I_bias Monitor absolute error              | %    | ±10           |
| Received Power (Rx) Monitor absolute error | dB   | ±3.00         |
| Transmit Power (Tx) Monitor absolute error | dB   | ±3.00         |

## ► Low Speed Electrical signal

| Parameter                                 | Symbol | Min                  | Max                  | Units | Condition                                              |
|-------------------------------------------|--------|----------------------|----------------------|-------|--------------------------------------------------------|
| SCL and SDA                               | VOL    | 0                    | 0.4                  | V     | IOL (max)=3.0mA for fast mode, 20mA for Fast-mode plus |
|                                           | VOH    | V <sub>cc</sub> -0.5 | V <sub>cc</sub> +0.3 | V     |                                                        |
| SCL and SDA                               | VIL    | -0.3                 | V <sub>cc</sub> *0.3 | V     |                                                        |
|                                           | VIH    | V <sub>cc</sub> *0.7 | V <sub>cc</sub> +0.5 | V     |                                                        |
| Capacitance for SCL and SDA I/O pin       | Ci     |                      | 14                   | pF    |                                                        |
| Total bus capacitive load for SCL and SDA | Cb     |                      | 100                  | pF    | 3.0k Ohms Pull up resistor, max                        |
|                                           |        |                      | 200                  | pF    | 1.6k Ohms Pull up resistor, max                        |
| V_INT/RSTn_1                              |        | 0                    | 1                    | V     | for No Module                                          |
| V_INT/RSTn_2                              |        | 0                    | 1                    | V     | for Module installed, H_RSTn=Low                       |
| V_INT/RSTn_3                              |        | 1.5                  | 2.25                 | V     | for Module installed, H_RSTn=High, M_INT=Low           |
| V_INT/RSTn_4                              |        | 2.75                 | 3.465                | V     | for Module installed, H_RSTn=High, M_INT=High          |
| V_LPWn/PRSn_1                             |        | 0                    | 1.1                  | V     | for Module installed, H_LPWn=Low                       |
| V_LPWn/PRSn_2                             |        | 1.4                  | 2.25                 | V     | for Module installed, H_LPWn=High                      |
| V_LPWn/PRSn_3                             |        | 2.75                 | 3.465                | V     | for No Module                                          |

## ► High Speed Electrical signal

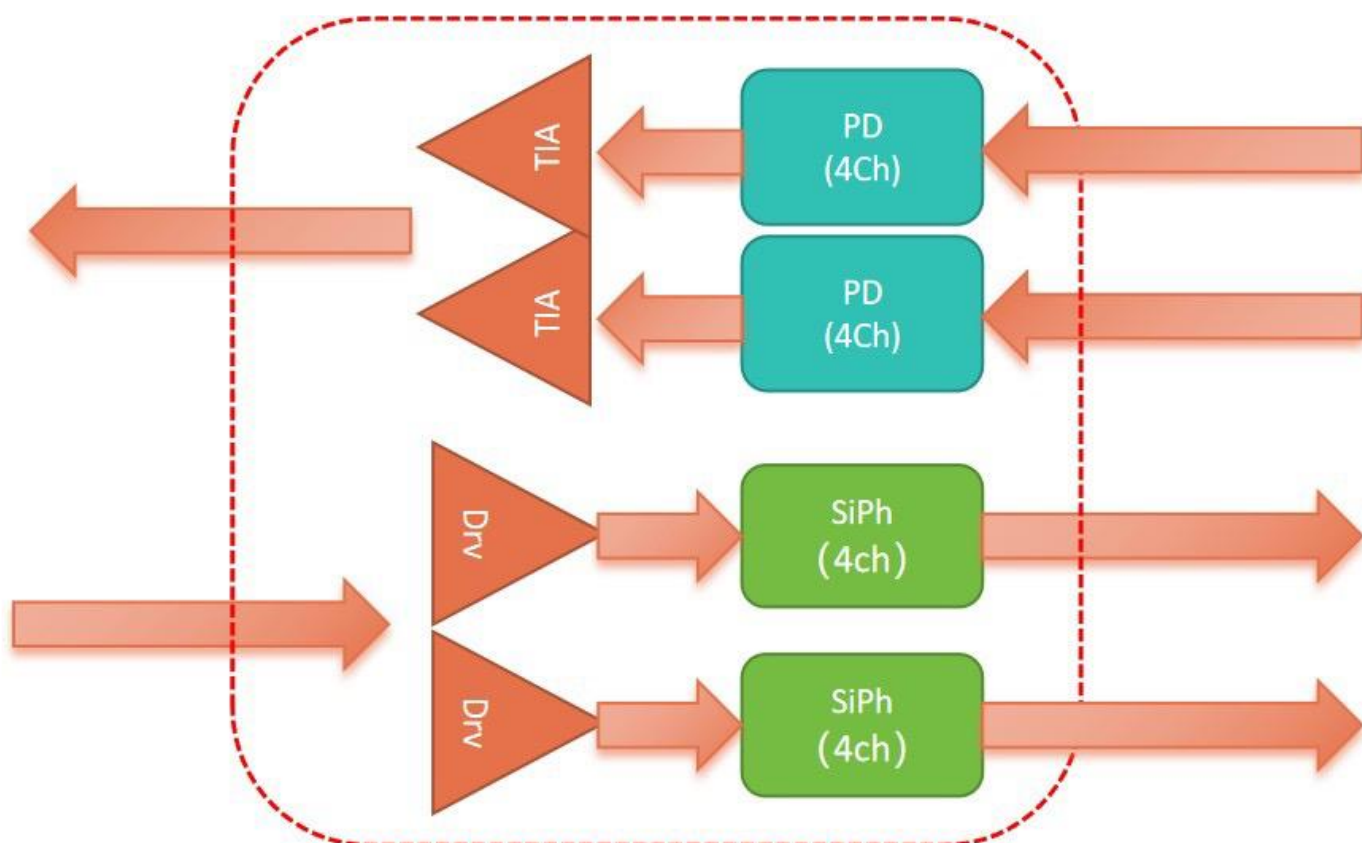
| Parameter                                                                                                                                                                   | Min  | Max           | Units | Condition                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|-------|--------------------------------------------------------------------------|
| <b>Receiver electrical output characteristics at TP4</b>                                                                                                                    |      |               |       |                                                                          |
| Differential Voltage, pk-pk                                                                                                                                                 | 300  | 700           | mV    | Host can request voltage level within these values. initialization value |
|                                                                                                                                                                             | 300  | 600           | mV    |                                                                          |
| VMA                                                                                                                                                                         | 250  | 500           | mV    | See Section 29.3.6                                                       |
| Common Mode Voltage (Vern)                                                                                                                                                  | -350 | 2850          | mV    | See Note 1                                                               |
| Peak to Peak AC Common Mode Voltage Low Frequency (VCMLF)                                                                                                                   | -    | 30            | mV    | See Note 1                                                               |
| Peak to Peak AC Common Mode Voltage Full Band (VCMFB)                                                                                                                       | -    | 80            | mV    | See Section 29.3.7                                                       |
| Differential Termination Resistance Mismatch                                                                                                                                | -    | 10            | %     | At 1 MHz See Section 13.3.6                                              |
| Common Mode to Differential Mode Conversion (SDC22)                                                                                                                         | -    | Equation 29-2 | dB    | See Note 2                                                               |
| Effective Return Loss (ERL)                                                                                                                                                 | 9    | -             | dB    | See Section 29.3.9                                                       |
| Common Mode Return Loss (SCC22)                                                                                                                                             | -    | -2            | dB    | From 250 MHz to min (0.8*fb, 43 GHz)<br>See Note 2                       |
| EEOO (SMF)                                                                                                                                                                  |      | 8             | dB    | See Section 29.4.1.2<br>See Note 3                                       |
| EECQ (MMF)                                                                                                                                                                  |      | 10            | dB    | See Section 29.4.1.2<br>See Note 3                                       |
| <b>NOTES:</b>                                                                                                                                                               |      |               |       |                                                                          |
| 1. Van is generated by the host. Specification includes effects of ground offset voltage.                                                                                   |      |               |       |                                                                          |
| 2. S-parameter specifications are based on a differential reference impedance of 100Ω and a common mode reference impedance of 25Ω.                                         |      |               |       |                                                                          |
| 3. Open eye is generated through the use of a reference Continuous Time Linear Equalizer (CTL.E), 22 tap FFE and 1 tap DFE applicable to all three PAM4 eyes (See 29.4.1.2) |      |               |       |                                                                          |
| <b>Transmitter electrical input characteristics at TP1</b>                                                                                                                  |      |               |       |                                                                          |
| Overload Differential Voltage                                                                                                                                               | 525  | -             | mV    | See 29.4.2                                                               |
| Common Mode Voltage (Vern)                                                                                                                                                  | -0.3 | 2.8           | V     | See Notes 1, 2                                                           |
| Differential Termination Resistance Mismatch                                                                                                                                | -    | 10            | %     | At 1 MHz. See 29.3.8                                                     |
| Differential Mode to Common Mode Conversion (SCD11)                                                                                                                         | -    | Equation 29-1 | dB    | See Note2                                                                |

|                             |   |   |    |                      |
|-----------------------------|---|---|----|----------------------|
| Effective Return Loss (ERL) | 9 | - | dB | See Section 29.3.9   |
| Stressed In put Test        |   |   |    | See Section 29.4.1.3 |

**NOTES:**

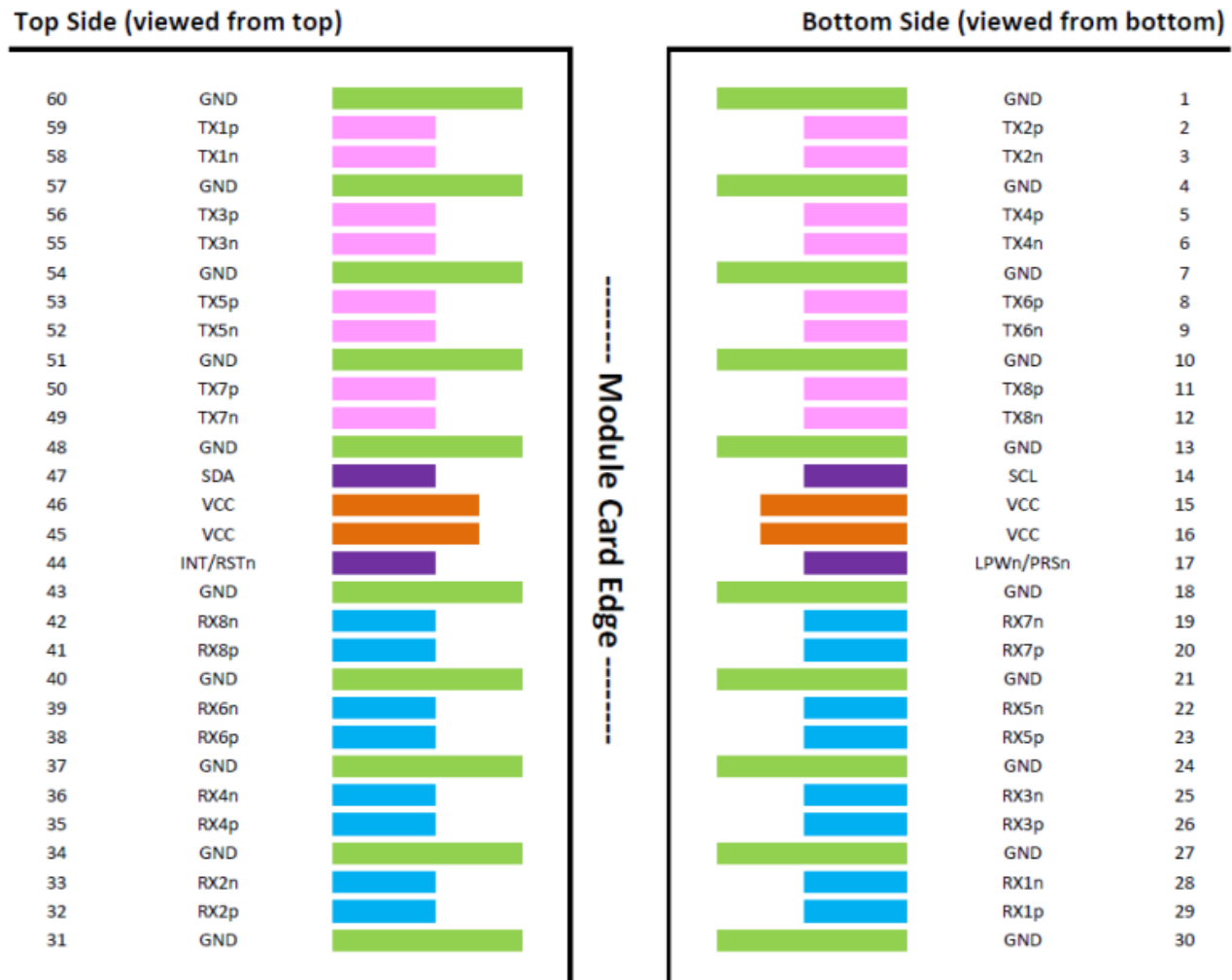
1. Vern is defined in Table 1-2 General Definitions of Section 1.6
2. Van is generated by the host. Specification induces effects of ground offset voltage
- 3.S-parameter specifications are based on a differential reference impedance of 100Ω and a common mode reference impedance of 25Ω.

## ► Module Block Diagram



**Figure 1. Module Block Diagram**

## ► OSFP800 Edge Connector and Pinout Description



**Figure 2. OSFP800 contact assignment**

## ► Module contact definition

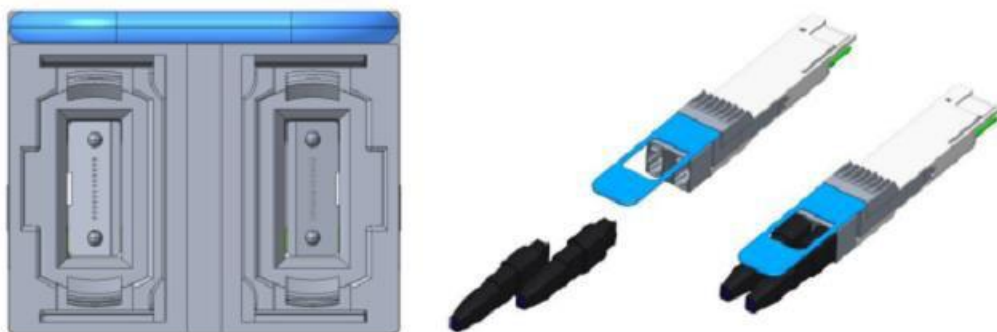
| Pin# | Symbol    | Description                     | Logic       | Direction       | Plug Sequence | Notes                                    |
|------|-----------|---------------------------------|-------------|-----------------|---------------|------------------------------------------|
| 1    | GND       | Ground                          |             |                 | 1             |                                          |
| 2    | TX2p      | Transmitter Data Non-Inverted   | CML-I       | Input from Host | 3             |                                          |
| 3    | TX2n      | Transmitter Data Inverted       | CML-I       | Input from Host | 3             |                                          |
| 4    | GND       | Ground                          |             |                 | 1             |                                          |
| 5    | TX4p      | Transmitter Data Non-Inverted   | CML-I       | Input from Host | 3             |                                          |
| 6    | TX4n      | Transmitter Data Inverted       | CML-I       | Input from Host | 3             |                                          |
| 7    | GND       | Ground                          |             |                 | 1             |                                          |
| 8    | TX6p      | Transmitter Data Non-Inverted   | CML-I       | Input from Host | 3             |                                          |
| 9    | TX6n      | Transmitter Data Inverted       | CML-I       | Input from Host | 3             |                                          |
| 10   | GND       | Ground                          |             |                 | 1             |                                          |
| 11   | TX8p      | Transmitter Data Non-Inverted   | CML-I       | Input from Host | 3             |                                          |
| 12   | TX8n      | Transmitter Data Inverted       | CML-I       | Input from Host | 3             |                                          |
| 13   | GND       | Ground                          |             |                 | 1             |                                          |
| 14   | SCL       | 2-wire Serial interface clock   | LVC MOS-I/O | Bi-directional  | 3             | Open-Drain with pull-up resistor on Host |
| 15   | VCC       | +3.3V Power                     |             | Power from Host | 2             |                                          |
| 16   | VCC       | +3.3V Power                     |             | Power from Host | 2             |                                          |
| 17   | LPWn/PRSn | Low-Power Mode / Module Present | Multi-Level | Bi-directional  | 3             | See pin description for required circuit |
| 18   | GND       | Ground                          |             |                 | 1             |                                          |
| 19   | RX7n      | Receiver Data Inverted          | CML-O       | Output to Host  | 3             |                                          |
| 20   | RX7p      | Receiver Data Non-Inverted      | CML-O       | Output to Host  | 3             |                                          |
| 21   | GND       | Ground                          |             |                 | 1             |                                          |
| 22   | RX5n      | Receiver Data Inverted          | CML-O       | Output to Host  | 3             |                                          |
| 23   | RX5p      | Receiver Data Non-Inverted      | CML-O       | Output to Host  | 3             |                                          |
| 24   | GND       | Ground                          |             |                 | 1             |                                          |
| 25   | RX3n      | Receiver Data Inverted          | CML-O       | Output to Host  | 3             |                                          |
| 26   | RX3p      | Receiver Data Non-Inverted      | CML-O       | Output to Host  | 3             |                                          |
| 27   | GND       | Ground                          |             |                 | 1             |                                          |
| 28   | RX1n      | Receiver Data Inverted          | CML-O       | Output to Host  | 3             |                                          |
| 29   | RX1p      | Receiver Data Non-Inverted      | CML-O       | Output to Host  | 3             |                                          |
| 30   | GND       | Ground                          |             |                 | 1             |                                          |



| Pin# | Symbol   | Description                     | Logic       | Direction       | Plug Sequence | Notes                                    |
|------|----------|---------------------------------|-------------|-----------------|---------------|------------------------------------------|
| 31   | GND      | Ground                          |             |                 | 1             |                                          |
| 32   | RX2p     | Receiver Data Non-Inverted      | CML-O       | Output to Host  | 3             |                                          |
| 33   | RX2n     | Receiver Data Inverted          | CML-O       | Output to Host  | 3             |                                          |
| 34   | GND      | Ground                          |             |                 | 1             |                                          |
| 35   | RX4p     | Receiver Data Non-Inverted      | CML-O       | Output to Host  | 3             |                                          |
| 36   | RX4n     | Receiver Data Inverted          | CML-O       | Output to Host  | 3             |                                          |
| 37   | GND      | Ground                          |             |                 | 1             |                                          |
| 38   | RX6p     | Receiver Data Non-Inverted      | CML-O       | Output to Host  | 3             |                                          |
| 39   | RX6n     | Receiver Data Inverted          | CML-O       | Output to Host  | 3             |                                          |
| 40   | GND      | Ground                          |             |                 | 1             |                                          |
| 41   | RX8p     | Receiver Data Non-Inverted      | CML-O       | Output to Host  | 3             |                                          |
| 42   | RX8n     | Receiver Data Inverted          | CML-O       | Output to Host  | 3             |                                          |
| 43   | GND      | Ground                          |             |                 | 1             |                                          |
| 44   | INT/RSTn | Module Interrupt / Module Reset | Multi-Level | Bi-directional  | 3             | See pin description for required circuit |
| 45   | VCC      | +3.3V Power                     |             | Power from Host | 2             |                                          |
| 46   | VCC      | +3.3V Power                     |             | Power from Host | 2             |                                          |
| 47   | SDA      | 2-wire Serial interface data    | LVC MOS-I/O | Bi-directional  | 3             | Open-Drain with pull-up resistor on Host |
| 48   | GND      | Ground                          |             |                 | 1             |                                          |
| 49   | TX7n     | Transmitter Data Inverted       | CML-I       | Input from Host | 3             |                                          |
| 50   | TX7p     | Transmitter Data Non-Inverted   | CML-I       | Input from Host | 3             |                                          |
| 51   | GND      | Ground                          |             |                 | 1             |                                          |
| 52   | TX5n     | Transmitter Data Inverted       | CML-I       | Input from Host | 3             |                                          |
| 53   | TX5p     | Transmitter Data Non-Inverted   | CML-I       | Input from Host | 3             |                                          |
| 54   | GND      | Ground                          |             |                 | 1             |                                          |
| 55   | TX3n     | Transmitter Data Inverted       | CML-I       | Input from Host | 3             |                                          |
| 56   | TX3p     | Transmitter Data Non-Inverted   | CML-I       | Input from Host | 3             |                                          |
| 57   | GND      | Ground                          |             |                 | 1             |                                          |
| 58   | TX1n     | Transmitter Data Inverted       | CML-I       | Input from Host | 3             |                                          |
| 59   | TX1p     | Transmitter Data Non-Inverted   | CML-I       | Input from Host | 3             |                                          |
| 60   | GND      | Ground                          |             |                 | 1             |                                          |

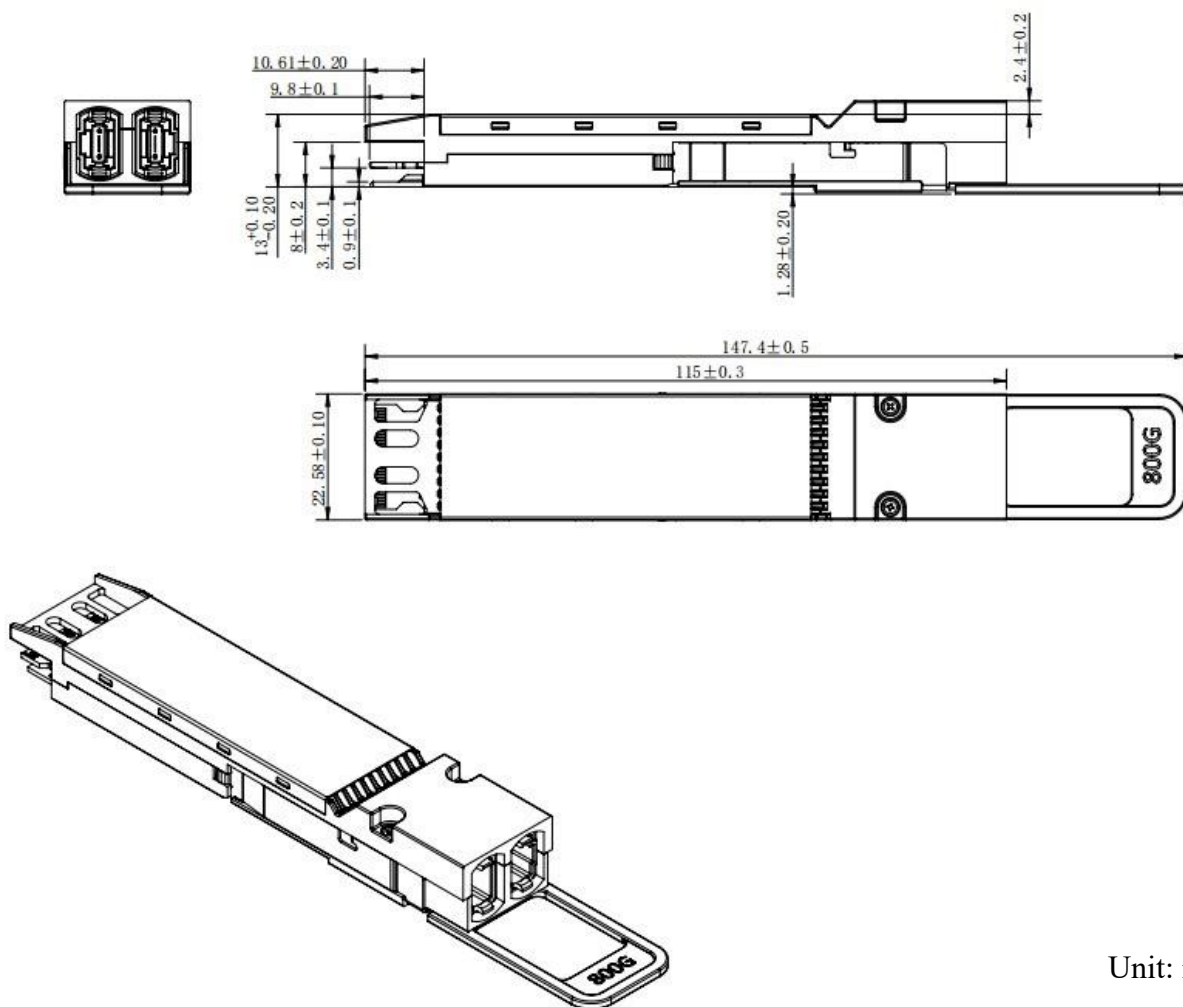
## ► Optical interface

The dual MP0-12 APC connectors for OSFP800 2xDR4.



**Figure 3. Optical lane assignments**

## ► Mechanical Specifications



**Figure 4. Mechanical Dimensions**

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