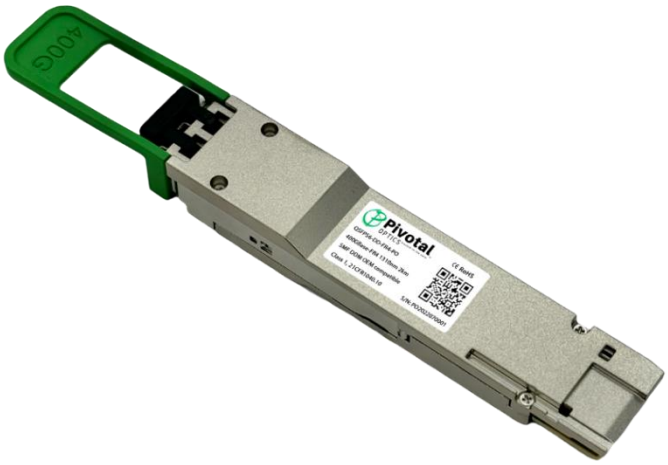
# QSFP56-DD-FR4

## 400G, QSFP56-DD, FR4, SMF TRANSCEIVER

## 1271-1331nm, 2km REACH, DUPLEX LC CONNECTOR

### Product Features

- Compliant with 400G-FR4 Technical Specification rev 2.0 (100G Lambda MSA)
- Compliant with QSFP-DD MSA HW with duplex LC connector
- Compliant with IEEE 802.3bs standard: 400GAUI-8 electrical interface
- Compliant with QSFP-DD CMIS Rev 4.0
- Maximum power consumption 10W
- Operating Distance up to 2km
- Two wire serial Interface with digital diagnostic monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant), and
- Class 1 Laser
- Case operating temperature:
  - Commercial: 0 ~ 70°C



### Product Applications

- 400G Ethernet
- Data Center

## I. Maximum Ratings

Exceeding the limits below may damage the transceiver module permanently.

| Parameter | Symbol | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Storage Temperature | Ts | -40 | | +85 | ℃ |
| Supply Voltage | Vcc | -0.5 | | 3.6 | V |
| Relative Humidity (non-condensing) | RH | 5 | | 95 | % |
| Data Input Voltage Differential | IVDIP-VDINI | | | 1 | V |
| Control Input Voltage | VI | -0.3 | | Vcc+0.5 | V |
| Control Output Voltage | IO | -20 | | 20 | mA |

## II. Operating Specifications

| Parameter | Symbol | Min. | Typ. | Max. | Units | Notes |
|---|---|---|---|---|---|---|
| Case Operating Temperature | TC | 0 | | +70 | °C | Commercial |
| Power Supply Voltage | Vcc | 3.135 | 3.3 | 3.465 | V | |
| Instantaneous peak current at hot plug | Icc_IP | | | 4800 | mA | |
| Sustained peak current at hot plug | Icc_SP | | | 3960 | mA | |
| Max Power Dissipation | PD | | | 10 | W | |
| Maximum Power Dissipation, Low Power Mode | PDLP | | | 1.5 | W | |
| Signalling Rate per Lane | SRL | | 53.125 | | Gbd | |
| Two Wire Serial Interface Clock Rate | | | | 400 | kHz | |
| Module power supply noise tolerance 10 Hz - 10 MHz (ptp) | | | | 66 | mVpp | |
| Rx Differential Data Output Load | | | 100 | | Ohm | |
| Operating Distance | | 2 | | 2000 | m | |

## III. Optical Characteristics

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Wavelength L0 | λC0 | 1264.5 | 1271 | 1277.5 | nm | |
| Wavelength L1 | λC1 | 1284.5 | 1291 | 1297.5 | nm | |
| Wavelength L2 | λC2 | 1304.5 | 1311 | 1317.5 | nm | |
| Wavelength L3 | λC3 | 1324.5 | 1331 | 1337.5 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Average Launch Power, each lane | AOPL | -3.3 | | 3.5 | dBm | 1 |
| Outer Optical Modulation Amplitude (OMAouter), each lane | TOMA | -0.3 | | 3.7 | dBm | 2 |
| Difference in launch power between any two lanes (OMAouter) | DP | | | 4 | dB | |
| Launch Power in OMAouter minus TDECQ for ER ≥4.5dB, each lane | TOMA-TDECQ | -1.7 | | | dBm | |
| Launch Power in OMAouter minus TDECQ for ER <4.5dB, each lane | TOMA-TDECQ | -1.6 | | | dBm | |
| Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane | TDECQ | | | 3.4 | dB | |
| TDECQ – 10*log10(Ceq), each lane | | | | 3.4 | dB | |
| Average Launch Power of OFF Transmitter, each lane | TOFF | | | -20 | dBm | |
| Extinction Ratio, each lane | ER | 3.5 | | | dB | |
| Transmitter transition time | TT | | | 17 | ps | |
| RIN17.1OMA | RIN | | | -136 | dB/Hz | |
| Optical Return Loss Tolerance | ORL | | | 17.1 | dB | |
| Transmitter Reflectance | TR | | | -26 | dB | |

Notes:

1. Average launch power, each lane (min) is informative and not the principal indicator of signal strength.
2. Even if the TDECQ < 1.4 dB for an extinction ratio of ≥ 4.5 dB or TDECQ < 1.3 dB for an extinction ratio of < 4.5 dB, the OMAouter (min) must exceed this value.
3. Transmitter reflectance is defined looking into the transmitter.

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|---|---|---|---|---|---|---|
| **Receiver** | | | | | | |
| Wavelength L0 | λC0 | 1264.5 | 1271 | 1277.5 | nm | |
| Wavelength L1 | λC1 | 1284.5 | 1291 | 1297.5 | nm | |
| Wavelength L2 | λC2 | 1304.5 | 1311 | 1317.5 | nm | |
| Wavelength L3 | λC3 | 1324.5 | 1331 | 1337.5 | nm | |
| Damage Threshold, each lane | AOPD | 4.5 | | | dBm | |
| Average Receive Power, each lane | AOPR | -7.3 | | 3.5 | dBm | 1 |
| Receive Power (OMAouter), each lane | OMAR | | | 3.7 | dBm | |
| Difference in receive power between any two lanes (OMAouter) | DR | | | 4.1 | dB | |
| Receiver Reflectance | RR | | | -26 | dB | |
| Receiver Sensitivity (OMAouter), each lane | SOMA | | | Max (-4.6, SECQ-6) | dBm | 2 |
| Stressed Receiver Sensitivity (OMAouter), each lane | SRS | | | -2.6 | dBm | 3 |
| Conditions of stressed receiver sensitivity test | | | | | | |
| Stressed eye closure for PAM4 (SECQ) | | | 3.4 | | d**B** | |
| SECQ – 10*log10(Ceq), lane under test (max) | | | | 3.4 | dB | |
| OMAouter of each aggressor lane | | | 1.5 | | dBm | |

Notes:

1. Average receive power, each lane (min) is informative and not the principal indicator of signal strength.
2. Receiver sensitivity (OMAouter), each lane (max) is informative and is defined for a transmitter with a value of SECQ up to 3.4dB.
3. Measured with conformance test signal at TP3 for the BER = $2.4 \times 10^{-4}$

## IV. Electrical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Differential pk-pk input Voltage tolerance | | 900 | | | mV | |
| Differential termination mismatch | | | | 10 | % | |
| Single-ended voltage tolerance range | | -0.4 | | 3.3 | V | |
| DC common mode Voltage | | -350 | | 2850 | mV | |
| **Receiver** | | | | | | |
| AC common-mode output Voltage (RMS) | | | | 17.5 | mV | |
| Differential output Voltage | Zout | | | 900 | mV | |
| Near-end Eye height, differential | | 70 | | | mV | |
| Far-end Eye height, differential | | 30 | | | mV | |
| Far end pre-cursor ISI ratio | | -4.5 | | 2.5 | % | |
| Differential Termination Mismatch | | | | 10 | % | |
| Transition Time (min, 20% to 80%) | | 9.5 | | | ps | |
| DC common mode Voltage | | -350 | | 2850 | mV | |
| **Low Speed Signal** | | | | | | |
| Module output SCL and SDA | VOL | 0 | | 0.4 | V | |
| Module Input SCL and SDA | VIL | -0.3 | | Vcc*0.3 | V | |
| | VIH | Vcc*0.7 | | Vcc+0.5 | V | |
| LPMode, ResetL, ModSelL and ePPS | VIL | -0.3 | | 0.8 | V | |
| | VIH | 2 | | Vcc+0.3 | V | |
| IntL | VOL | 0 | | 0.4 | V | |
| | VOH | Vcc-0.5 | | Vcc+0.3 | V | |

# V. Ordering Information

| Pivotal Part Number | Description |
|---|---|
| **QSFP56-DD-FR4** | QSFP56-DD, CMIS 4.0, 1310nm, FR4 SMF 2km, 400G DDM, C-Temp |

Notes:

1. Please contact sales for specific OEM Platform part numbers to fit your network.

**Warranty**
https://pivotaloptics.com/warranty/

**Disclaimer**
External physical characteristics are subject to variation. This may include, but is not limited to, external case designs, pull tab colors and/or shapes, removal latch styles or colors, and label sizes and placement. These variations do not affect the function or characteristics of the transceivers.