

# QSFPDD-400G-FR4-XXO

400GBase QSFP-DD  
CWDM4  
2km Reach

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## Features

- QSFP DD MSA rev5.0 compliant with CMIS4.0 Management interface
- Compliant to 100G Lambda MSA
- Compliant to 802.3cu
- 400G FR4 specification compliant
- 4 CWDM lanes MUX/DEMUX design
- 8x 26.5625 GBd PAM4 electrical interface (400GAUI 8)
- Data Rate 106.25Gbps (PAM4) per channel
- Maximum power consumption 8 W
- LC duplex connector
- Supports 425 Gbit /s aggregate bit rate
- Up to 2 km transmission on single mode fiber with FEC
- Single 3.3 V power supply
- RoHS 2 compliant



## Applications

- Data center interconnect

| Part number         | Product description   |
|---------------------|---|
| QSFPDD-400G-FR4-XXO | 400GBase SMF QSFP-DD CWDM4 2km 0°C to 70°C LC Duplex DDM (8W) |

# PIN Description

| Pin |         | Function/Description                             | Notes |
|-----|---------|--|-------|
| 1   | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 2   | Tx2-    | Transmitter Inverted Data Input                  |       |
| 3   | Tx2+    | Transmitter Non-Inverted Data output             |       |
| 4   | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 5   | Tx4-    | Transmitter Inverted Data Input                  |       |
| 6   | Tx4+    | Transmitter Non-Inverted Data output             |       |
| 7   | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 8   | ModSelL | Module Select                                    |       |
| 9   | ResetL  | Module Reset                                     |       |
| 10  | VccRx   | 3.3V Power Supply Receiver                       | 2     |
| 11  | SCL     | 2-Wire serial Interface Clock                    |       |
| 12  | SDA     | 2-Wire serial Interface Data                     |       |
| 13  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 14  | Rx3+    | Receiver Non-Inverted Data Output                |       |
| 15  | Rx3-    | Receiver Inverted Data Output                    |       |
| 16  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 17  | Rx1+    | Receiver Non-Inverted Data Output                |       |
| 18  | Rx1-    | Receiver Inverted Data Output                    |       |
| 19  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 20  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 21  | Rx2-    | Receiver Inverted Data Output                    |       |
| 22  | Rx2+    | Receiver Non-Inverted Data Output                |       |
| 23  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 24  | Rx4-    | Receiver Inverted Data Output                    |       |
| 25  | Rx4+    | Receiver Non-Inverted Data Output                |       |
| 26  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 27  | ModPrsL | Module Present                                   |       |
| 28  | IntL    | Interrupt  |       |
| 29  | VccTx   | 3.3V power supply transmitter                    | 2     |
| 30  | Vcc1    | 3.3V power supply                                | 2     |
| 31  | LPMODE  | Low Power Mode                                   |       |
| 32  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 33  | Tx3+    | Transmitter Non-Inverted Data Input              |       |
| 34  | Tx3-    | Transmitter Inverted Data Output                 |       |
| 35  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 36  | Tx1+    | Transmitter Non-Inverted Data Input              |       |
| 37  | Tx1-    | Transmitter Inverted Data Output                 |       |
| 38  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |

| Pin |          | Function/Description                             | Notes |
|-----|----------|--|-------|
| 39  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 40  | Tx6-     | Transmitter Inverted Data Input                  |       |
| 41  | Tx6+     | Transmitter Non-Inverted Data output             |       |
| 42  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 43  | Tx8-     | Transmitter Inverted Data Input                  |       |
| 44  | Tx8+     | Transmitter Non-Inverted Data output             |       |
| 45  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 46  | Reserved | For future use                                   | 3     |
| 47  | VS1      | Module Vendor Specific                           | 3     |
| 48  | VccRx1   | 3.3V Power Supply Receiver                       | 2     |
| 49  | VS2      | Module Vendor Specific 2                         | 3     |
| 50  | VS3      | Module Vendor Specific 3                         | 3     |
| 51  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 52  | Rx7+     | Receiver Non-Inverted Data Output                |       |
| 53  | Rx7-     | Receiver Inverted Data Output                    |       |
| 54  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 55  | Rx5+     | Receiver Non-Inverted Data Output                |       |
| 56  | Rx5-     | Receiver Inverted Data Output                    |       |
| 57  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 58  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 59  | Rx6-     | Receiver Inverted Data Output                    |       |
| 60  | Rx6+     | Receiver Non-Inverted Data Output                |       |
| 61  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 62  | Rx8-     | Receiver Inverted Data Output                    |       |
| 63  | Rx8+     | Receiver Non-Inverted Data Output                |       |
| 64  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 65  | NC       | No Connect                                       |       |
| 66  | Reserved | For future use                                   |       |
| 67  | VccTx1   | 3.3V power supply transmitter                    | 2     |
| 68  | Vcc2     | 3.3V power supply                                | 2     |
| 69  | Reserved | For future use                                   | 3     |
| 70  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 71  | Tx7+     | Transmitter Non-Inverted Data Input              |       |
| 72  | Tx7-     | Transmitter Inverted Data Output                 |       |
| 73  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |
| 74  | Tx5+     | Transmitter Non-Inverted Data Input              |       |
| 75  | Tx5-     | Transmitter Inverted Data Output                 |       |
| 76  | GND      | Transmitter Ground (Common with Receiver Ground) | 1     |

Notes:

1. QSFP-DD uses common ground (GND) for all signals and supply (power). All are common within the QSFP-DD module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. VccRx, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 shall be applied concurrently. Requirements defined for the host side of the Host Card Edge Connector are listed in the table. VccRx, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 may be internally connected within the module in any combination. The connector Vcc pins are each rated for a maximum current of 1000 mA.
3. All Vendor Specific, Reserved and No Connect pins may be terminated with 50  $\Omega$  to ground on the host. Pad 65 (No Connect) shall be left unconnected within the module. Vendor specific and Reserved pads shall have an impedance to GND that is greater than 10 k $\Omega$  and less than 100 pF.
4. Plug Sequence specifies the mating sequence of the host connector and module.

# Pin Assignment and Description



Top Side Viewed from Top



Bottom Side Viewed from Bottom

## Absolute Maximum Ratings

| Parameter                            | Symbol | Min  | Max | Units | Notes |
|--------------------------------------|--------|------|-----|-------|-------|
| Storage Temperature                  | Ts     | -40  | 85  | °C    |       |
| Power Supply Voltage                 | Vcc    | -0.5 | 3.6 | V     |       |
| Relative Humidity (non-condensation) | RH     | 5    | 95  | %     |       |

Notes:  
Exceeding any of these values may be harmful for the device

## Recommended Operating Conditions

| Parameter                  | Symbol | Min  | Typical | Max  | Units  |
|----------------------------|--------|------|---------|------|--------|
| Operating Case Temperature | Tc     | 0    | -       | 70   | °C     |
| Supply Voltage             | Vcc    | 3.13 | 3.3     | 3.47 | V      |
| Data Rate each Lane        | -      | -    | 106.25  | -    | Gbit/s |
| Data Rate Accuracy         | -      | -100 | -       | 100  | ppm    |
| Link Distance              | -      | -    | -       | 2000 | m      |

## Transceiver Electrical Characteristics

| Parameter                                  | Min  | Typical | Max  | Units | Notes |
|--|--|---------|------|-------|-------|
| Power Dissipation                          | -  | -       | 8.0  | W     | -     |
| Supply Current                             | -  | -       | 3.63 | A     | -     |
| Transmitter (each lane)                    |  |         |      |       |       |
| Differential pk-pk Input Voltage Tolerance | 900  | -       | -    | mVpp  | 1     |
| Differential Termination Mismatch          | -  | -       | 10   | %     | -     |
| Common Mode Voltage                        | -350                                       | -       | 2850 | mV    | 2     |
| Module Stressed Input Test                 | See IEEE 802.3bs 120E.3.4.1                |         |      |       | 3     |
| Receiver (each lane)                       |  |         |      |       |       |
| Differential pk-pk Input Voltage Tolerance | -  | -       | 900  | mVpp  | -     |
| Differential Termination Mismatch          | -  | -       | 10   | %     | -     |
| Common Mode Voltage                        | -350                                       | -       | 2850 | mV    | 3     |
| Module Stressed Input Test                 | See OIF-CEI-56G-VSR-PAM4 Section 16.3.10.3 |         |      |       |       |

Notes:

1. With the exception to IEEE 802.3bs 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
2. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.
3. Meets BER specified in IEEE 802.3bs 120E.1.1.

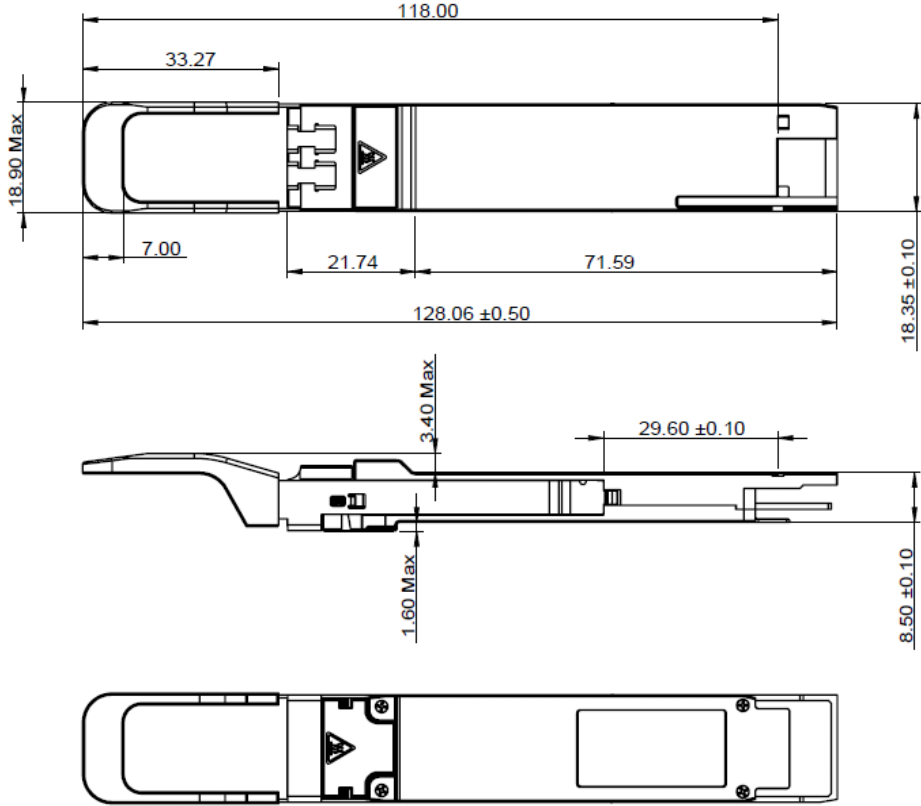
# Transceiver Optical Characteristics

| Parameter   | Min  | Typical | Max     | Units   | Notes |   |
|---|------|---------|---------|---------|-------|---|
| <b>Transmitter</b>  |      |         |         |         |       |   |
| Average Launch Power each Lane                                | -3.3 | -       | 3.5     | dBm     | 1     |   |
| Total Launch Optical Power                                    | -    | -       | 9.3     | dBm     | -     |   |
| Outer Optical Modulation Amplitude, each lane                 | -0.3 | -       | 3.7     | dBm     | 2     |   |
| Difference in Launch Power between any two Lanes (OMA outer)  | -    | -       | 4.0     | dB      | 2     |   |
| Launched Outer OMA minus TDECQ, each Lane                     | -1.6 | -       | -       | dB      | 3     |   |
| Center Wavelength Range                                       | L1   | 1264.50 | 1271.00 | 1277.50 | nm    | - |
|   | L2   | 1284.50 | 1291.00 | 1297.50 | nm    | - |
|   | L3   | 1304.50 | 1311.00 | 1317.50 | nm    | - |
|   | L4   | 1324.50 | 1331.00 | 1337.50 | nm    | - |
| Extinction Ratio each Lane                                    | 3.5  | -       | -       | dB      | -     |   |
| Transmitter and Dispersion Eye Closure (TDECQ), each Lane     | -    | -       | 3.4     | dB      | -     |   |
| <b>Receiver</b>   |      |         |         |         |       |   |
| Center Wavelength Range                                       | L1   | 1264.50 | 1271.00 | 1277.50 | nm    | - |
|   | L2   | 1284.50 | 1291.00 | 1297.50 | nm    | - |
|   | L3   | 1304.50 | 1311.00 | 1317.50 | nm    | - |
|   | L4   | 1324.50 | 1331.00 | 1337.50 | nm    | - |
| Damage Threshold, each Lane                                   | 4.5  | -       | -       | dBm     | -     |   |
| Average Receive Power each Lane                               | -7.3 | -       | 3.5     | dBm     | 4     |   |
| Receive Power (OMA), each Lane                                | -    | -       | 3.7     | dBm     | -     |   |
| Difference in Receive Power between any two Lanes (OMA outer) | -    | -       | 4.1     | dB      | -     |   |
| Receiver Sensitivity (OMA outer) each Lane                    | -    | -       | -4.6    | dBm     | -     |   |
| Stressed Receiver Sensitivity (OMA outer) each Lane           | -    | -       | -2.6    | dBm     | 5     |   |

Notes:

1. Average launch power, each lane(min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance
2. Even if the TDECQ < 1.4dB for an extinction ratio of ≥ 4.5dB or TDECQ < 1.3dB for an extinction ratio of < 4.5dB the minimum OMA outer must exceed the specified minimum value
3. Extinction ratio ≥ 4.5dB
4. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance
5. Measured with conformance test signal with BER ≤ 2.4 x 10<sup>-4</sup>

# Mechanical specifications



Unit : mm

# Revision history

| Revision | Date       | Author | Description      |
|----------|------------|--------|------------------|
| V1.1     | 12-09-2022 | JGN    | Initial Document |

Note : Nexgen A/S reserves the right to change this document without notice.