# EQP274X-2D

## 40G QSFP+ LR4 Optical Transceiver

## PRODUCT FEATURES

- Support line rates for 41.25 Gb/s
- Lane bit rate 10.3125 Gb/s
- CWDM DML laser and PIN ROSA
- Up to 2km transmission on SMF
- Support Multi-Pin function with IntL/RxLOSL and LPMode/TxDIS
- I2C interface with integrated Digital Diagnostic monitoring;
- Digital Diagnostics Monitoring Interface
- Compliant with QSFP+ MSA with LC connector
- Single +3.3V power supply
- Power dissipation:

  Commercial：< 3.5W
- Complies with EU Directive 2015/863/EU

## APPLICATIONS

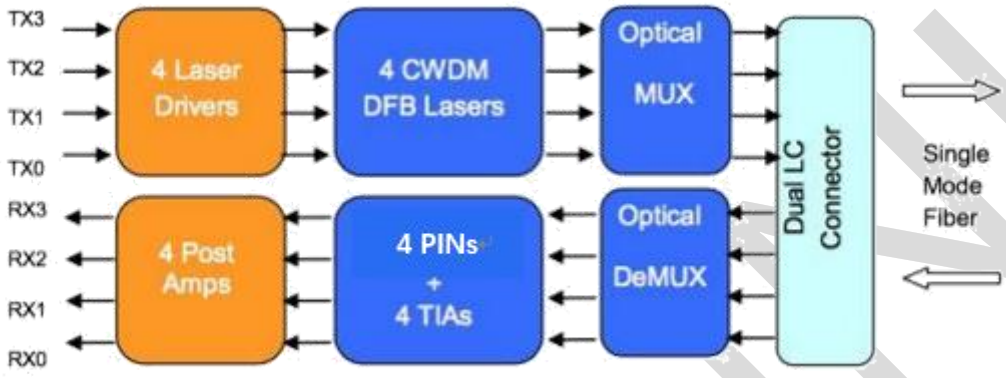
- 40G Ethernet
- InfiniBand QDR, DDR and SDR

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## DESCRIPTIONS

40G QSFP+ LR4 Transceiver is designed for 2km optical communication applications. This module contains 4-lane optical transmitter, 4-lane optical receiver and module management block including 2 wire serial inter-face. The optical signals are multiplexed to a single-mode fiber through an industry standard LC connector.

## Module Block Diagram




## Ordering Information

| Part No. | Data Rate(optical) | Laser | Fiber Type | Distance | Optical Interface | Temp | DDMI | Latch Color |
|---|---|---|---|---|---|---|---|---|
| EQP274X-2D | 41.25Gbps | DFB | SMF | 2km | LC | 0~70℃ | Yes | Blue |

## Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

| Parameter | Symbol | Min | Max | Unit | Notes |
|---|---|---|---|---|---|
| Storage Temperature | TS | -40 | 85 | degC | |
| Operating Case Temperature | TOP | 0 | 70 | degC | |
| Power Supply Voltage | VCC | -0.5 | 3.6 | V | |
| Relative Humidity (non-condensation) | RH | 0 to 85% non-condensing | | % | |

## Recommended Operating Conditions

| Parameter | Symbol | Min | Typ | Max | Unit | Notes |
|---|---|---|---|---|---|---|
| Operating Case Temperature | Top | 0 | | +70 | °C | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Operating Case Temperature | VCC | 3.14 | 3.3 | 3.47 | V | |
| Maximum Power Dissipation | $P_D$ | | | 3.5 | W | |
| Lane Bit Rate | | | 10.3125 | | Gb/s | |
| Transmission Distance | TD | | | 2 | km | |
| Coupled fiber | Single mode fiber | | | | | 1 |

Notes:

1.Optical fiber use 9/125um SMF。

## Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

| Parameter | Test Point | Min | Typ | Max | Unit | Notes |
|---|---|---|---|---|---|---|
| **Transmitter (Module Input)** | | | | | | |
| Data Rate, each lane | | | 10.3125 | | Gbps | |
| Differential Voltage pk-pk | Vpp | | | 900 | mV | 1 |
| Common Mode Voltage | Vcm | -350 | | 2850 | mV | |
| Transition time | Trise/Tfall | 10 | | | ps | 2 |
| **Receiver (Module Output)** | | | | | | |
| Data Rate, each lane | | 10.3125 | | | Gbps | |
| Common Mode Noise, RMS | Vrms | | | 17.5 | mV | |
| Differential output voltage swing | Vout, pp | | | 900 | mV | |
| Eye width | EW15 | 0.57 | | | UI | |
| Eye height | EH15 | 228 | | | mV | |
| Differential Termination Resistance Mismatch | | | | 10 | % | 1 |
| Transition time | Trise/Tfall | 12 | | | ps | |
| Data Rate, each lane | | | 10.3125 | | Gbps | |
| Common Mode Noise, RMS | Vrms | | | 17.5 | mV | |

Notes:

1. At 1 MHz.

2. 20%~80%.

## Optical and Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Signaling Speed per Lane | | | 10.3125 | | Gbps | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Center Wavelength Lane 0 | λ0 | 1264.5 | 1271 | 1277.5 | nm | |
| Center Wavelength Lane 1 | λ1 | 1284.5 | 1291 | 1297.5 | nm | |
| Center Wavelength Lane 2 | λ2 | 1304.5 | 1311 | 1317.5 | nm | |
| Center Wavelength Lane 3 | λ3 | 1324.5 | 1331 | 1337.5 | nm | |
| Total Launch Power | $P_T$ | | | 8.3 | dBm | 1 |
| Average Launch Power per Lane, | Pavg | -7 | | 2.3 | dBm | 1 |
| Difference in launch power between any two lanes(Average and OMA) between any Two Lanes (OMA) | Ptx,diff | | | 6.5 | dB | |
| Average Output Power (Laser Turn off) | $P_{off}$ | | | -30 | dBm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Extinction Ratio, | ER | 3.5 | | | dB | |
| RIN20OMA | RIN | | | -128 | Db/Hz | |
| Optical Return Loss Tolerance | TOL | | | 20 | dB | |
| Transmitter Reflectance | $R_T$ | | | -12 | dB | |
| Optical Eye Mask | {0.25,0.4, 0.45, 0.25, 0.28, 0.4} | | | | % | 2 |
| **Receiver** | | | | | | |
| Signaling rate, each lane | | | 10.3125 | | Gbps | |
| Center Wavelength Lane 0 | λ0 | 1264.5 | 1271 | 1277.5 | nm | |
| Center Wavelength Lane 1 | λ1 | 1284.5 | 1291 | 1297.5 | nm | |
| Center Wavelength Lane 2 | λ2 | 1304.5 | 1311 | 1317.5 | nm | |
| Center Wavelength Lane 3 | λ3 | 1324.5 | 1331 | 1337.5 | nm | |
| Damage threshold , each lane | Pdamage | 3.3 | | | dBm | |
| Receiver sensitivity Average, each lane | SEN | | | -11.5 | dBm | 2 |
| Los Assert | LosA | -30 | | | dBm | |
| Los De-assert | LosDA | | | -14 | dBm | |

Notes:

1.The optical power is launched into SMF。

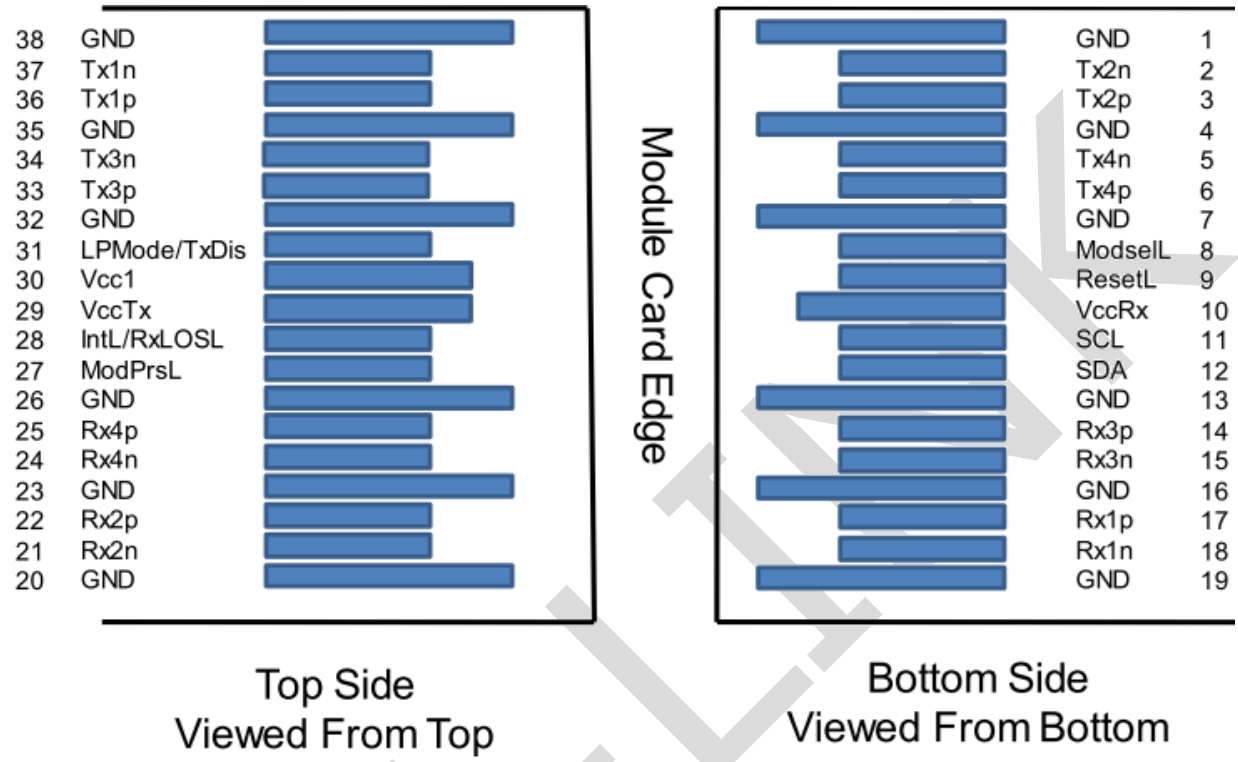
2.Measured with a PRBS 231-1 test pattern @10.3125 Gb/s, BER≤1E-12

## Digital Diagnostics

| Parameter | Range | Unit | Accuracy | Calibration |
|---|---|---|---|---|
| Temperature | -40 to +85 | °C | ±3°C | Internal / External |
| Voltage | 3.0 to 3.6 | V | ±3% | Internal / External |
| Bias Current | 30 to 100 | mA | ±10% | Internal / External |
| TX Power | -7 to 2.3 | dBm | ±3dB | Internal / External |

| | | | | |
|---|---|---|---|---|
| RX Power | -11.5 to 2.3 | dBm | ±3dB | Internal / External |

## Pin Diagram




## Pin Definitions

| PIN | Logic | Symbol | Description | Plug Seq. | Notes |
|---|---|---|---|---|---|
| 1 | | GND | Ground | 1 | 1 |
| 2 | CML-I | Tx2n | Transmitter Inverted Data Input | 3 | |
| 3 | CML-I | Tx2p | Transmitter Non-Inverted Data output | 3 | |
| 4 | | GND | Ground | 1 | 1 |
| 5 | CML-I | Tx4n | Transmitter Inverted Data Input | 3 | |
| 6 | CML-I | Tx4p | Transmitter Non-Inverted Data output | 3 | |
| 7 | | GND | Ground | 1 | 1 |
| 8 | LVTLL-I | ModSelL | Module Select | 3 | |
| 9 | LVTLL-I | ResetL | Module Reset | 3 | |
| 10 | | VccRx | + 3.3V Power Supply Receiver | 2 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| 11 | LVCMOS-I/O | SCL | 2-Wire Serial Interface Clock | 3 | |
| 12 | LVCMOS-I/O | SDA | 2-Wire Serial Interface Data | 3 | |
| 13 | | GND | Ground | 1 | |
| 14 | CML-O | Rx3p | Receiver Non-Inverted Data Output | 3 | |
| 15 | CML-O | Rx3n | Receiver Inverted Data Output | 3 | |
| 16 | | GND | Ground | 1 | 1 |
| 17 | CML-O | Rx1p | Receiver Non-Inverted Data Output | 3 | |
| 18 | CML-O | Rx1n | Receiver Inverted Data Output | 3 | |
| 19 | | GND | Ground | 1 | 1 |
| 20 | | GND | Ground | 1 | 1 |
| 21 | CML-O | Rx2n | Receiver Inverted Data Output | 3 | |
| 22 | CML-O | Rx2p | Receiver Non-Inverted Data Output | 3 | |
| 23 | | GND | Ground | 1 | 1 |
| 24 | CML-O | Rx4n | Receiver Inverted Data Output | 3 | 1 |
| 25 | CML-O | Rx4p | Receiver Non-Inverted Data Output | 3 | |
| 26 | | GND | Ground | 1 | 1 |
| 27 | LVTTL-O | ModPrsL | Module Present | 3 | |
| 28 | LVTTL-O | IntL/Rx_LOS | Interrupt/Rx_LOS | 3 | |
| 29 | | VccTx | +3.3 V Power Supply transmitter | 2 | 2 |
| 30 | | Vcc1 | +3.3 V Power Supply | 2 | 2 |
| 31 | LVTTL-I | LPMode/TxDIS | Low Power Mode/Tx_Disable | 3 | |
| 32 | | GND | Ground | 1 | 1 |
| 33 | CML-I | Tx3p | Transmitter Non-Inverted Data Input | 3 | |
| 34 | CML-I | Tx3n | Transmitter Inverted Data Output | 3 | |
| 35 | | GND | Ground | 1 | 1 |
| 36 | CML-I | Tx1p | Transmitter Non-Inverted Data Input | 3 | |
| 37 | CML-I | Tx1n | Transmitter Inverted Data Output | 3 | |
| 38 | | GND | Ground | 1 | 1 |

Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ 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. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in MSA. The connector pins are each rated for a maximum current of 1000 mA.

## Recommended Interface Circuit

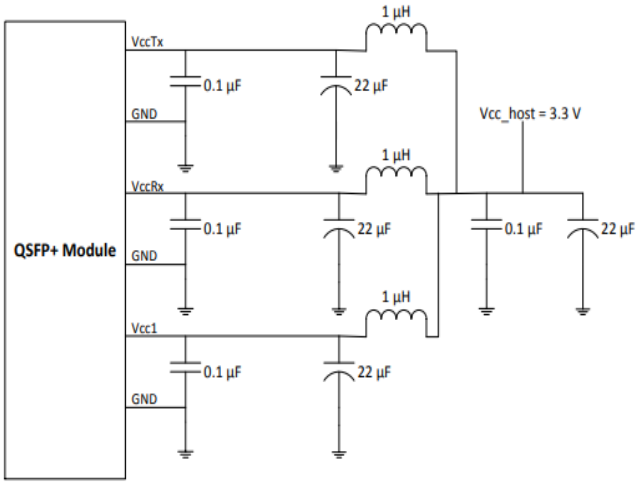
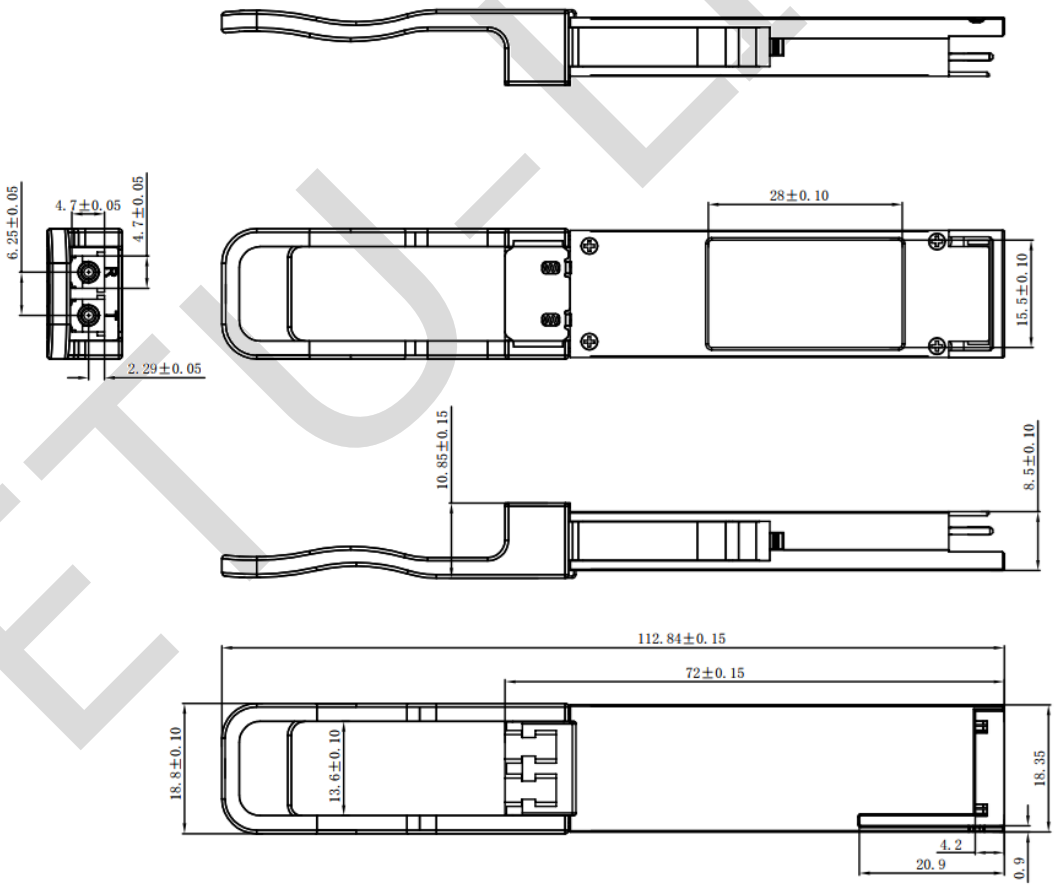



FIGURE 5-4 RECOMMENDED HOST BOARD POWER SUPPLY FILTERING

## Mechanical Diagram



## Revision History

| Version No. | Date | Description |
|---|---|---|
| 1.0 | Aug 24, 2021 | Preliminary datasheet |
| 2.0 | October 11,2023 | Product upgrades |
| 2.1 | Aug 06,2024 | Format change |

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