

QSFP+

EQ314X-3MCD10

40Gb/s QSFP+ PSM4 MPO 10KM Optical Transceiver

- Four-channel full-duplex transceiver modules
- Transmission data rate up to 11.2Gbit/s per channel
- Up to 10km transmission of single mode fiber
- Low power consumption <2.5W, meet class 3
- Operating case temperature: 0 to 70°C
- 3.3V power supply voltage
- Hot Pluggable QSFP form factor
- RoHS 6 compliant
- Single MPO connector receptacle
- Built-in digital diagnostic function



Applications

- Infiniband QDR and DDR interconnects
- 40G Ethernet
- Proprietary High Speed Interconnections
- Data center

Description

EQ314X-3MCD10 is a Four-Channel, Pluggable, Parallel, Fiber-Optic QSFP+ Transceiver for InfiniBand QDR/DDR/SDR, 10G/8G/4G/2G fiber channel, PCIe and SAS Applications. The QSFP full-duplex optical module offers 4 independent transmit and receive channels, each capable of 10.3Gbps operation for an aggregate data rate of 40Gbps 10km using single mode fiber. These modules are designed to operate over single mode fiber systems using 1310nm DFB laser array. An optical fiber ribbon cable with an MPO/MTP™ connector can be plugged into the QSFP module receptacle. QSFP+ PSM LR4 is one kind of parallel transceiver which provides increased port density and total system cost savings.

Digital Diagnostic Functions

Digital diagnostics monitoring function is available on all QSFP+ PSM LR4. A 2-wire serial interface provides user to contact with module. The structure of the memory is shown in Figure 3. The memory space is arranged into a lower, single page, address space of 128 bytes and multiple upper address space pages. This structure permits timely access to addresses in the lower page, such as Interrupt Flags and Monitors. Less time critical time entries such as serial ID information and threshold settings, are available with the Page Select function. The interface address used is A0xh and is mainly used for time critical data like interrupt handling in order to enable a one-time-read for all data related to an interrupt situation. After an interrupt, IntL, has been asserted, the host can read out the flag field to determine the affected channel and type of flag.

| Parameter | Symbol | Min | Max | Unit | Notes |
|---|--------------|------|------|------|----------------------------------|
| Temperature monitor absolute error | DMI_Temp | -3 | +3 | °C | Over operating temperature range |
| Supply voltage monitor absolute error | DMI_VCC | -0.1 | +0.1 | V | Over full operating range |
| Channel RX power monitor absolute error | DMI_RX_Ch | -3 | +3 | dB | 1 |
| Channel Bias current monitor | DMI_Ibias_Ch | -10% | +10% | mA | |
| Channel TX power monitor absolute error | DMI_TX_Ch | -3 | +3 | dB | 1 |

Regulatory Compliance

| Feature | Standard | Performance |
|--------------------------------------|--|---------------------------------------|
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN 55022:2010, Class B | Compatible with standards |
| Electromagnetic susceptibility (EMS) | EN 55024:2010 | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2 | Compatible with Class I laser product |

Absolute Maximum Ratings

The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

| Parameter | Symbol | Min | Max | Unit | Notes |
|--------------------------------------|-----------------|------|----------------------|------|-------|
| Storage Temperature | T _S | -40 | 85 | °C | |
| Operating Case Temperature | T _{OP} | 0 | 70 | °C | |
| Power Supply Voltage | V _{CC} | -0.3 | 3.6 | V | |
| Relative Humidity (non-condensation) | RH | 0 | 85 | % | |
| Input Voltage | V _{in} | -0.3 | V _{CC} +0.3 | V | |

Recommended Operating Conditions and Power Supply Requirements

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|----------------------------|-----------------|-------|---------|-------|------|-------|
| Operating Case Temperature | T _{OP} | 0 | | 70 | °C | |
| Power Supply Voltage | V _{CC} | 3.135 | 3.3 | 3.465 | V | |
| Power Consumption | | | 1.7 | 2.5 | W | |
| Data Rate, each Lane | DR | | 10.3 | | Gb/s | |
| Data Speed Tolerance | ΔDR | -100 | | +100 | ppm | |
| Link Distance with G.652 | D | 0 | | 10 | km | |

Electrical Characteristics

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|---------------------------------------|-------------------|----------------------|---------|-----------------|-------|-------|
| Differential input impedance | Z _{in} | 90 | 100 | 110 | ohm | |
| Differential Output impedance | Z _{out} | 90 | 100 | 110 | ohm | |
| Differential input voltage amplitude | ΔV _{in} | 300 | | 1100 | mVp-p | |
| Differential output voltage amplitude | ΔV _{out} | 500 | | 800 | mVp-p | |
| Bit Error Rate | BR | | | E-12 | | |
| Input Logic Level High | V _{IH} | 2.0 | | V _{CC} | V | |
| Input Logic Level Low | V _{IL} | 0 | | 0.8 | V | |
| Output Logic Level High | V _{OH} | V _{CC} -0.5 | | V _{CC} | V | |
| Output Logic Level Low | V _{OL} | 0 | | 0.4 | V | |

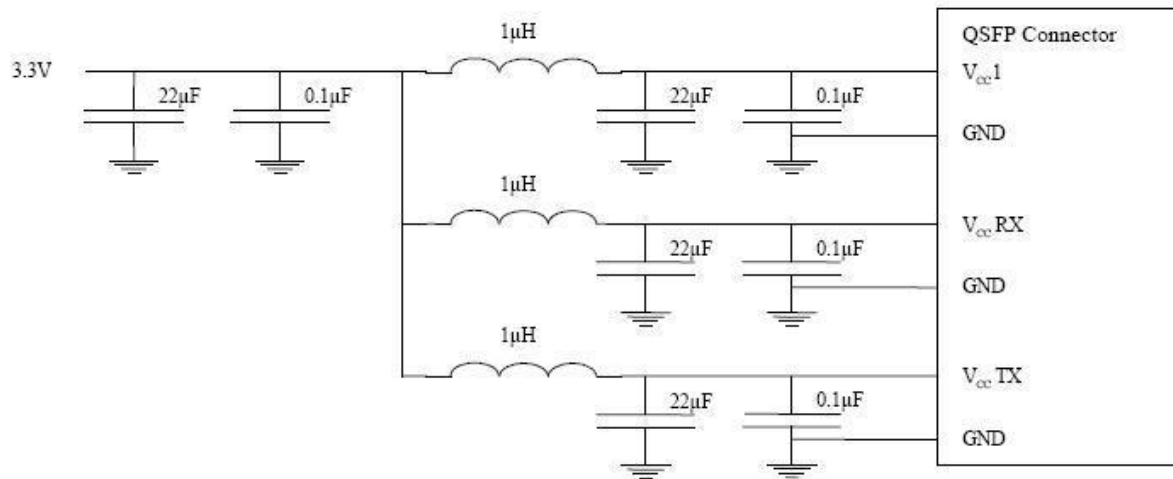
Optical Characteristics

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|---|----------------------|------------------------------------|---------|-------|-------|-------|
| Transmitter | | | | | | |
| Center Wavelength | λ_C | 1270 | 1310 | 1350 | nm | 1 |
| RMS Spectral Width | λ_{rms} | | | 3.5 | nm | 1 |
| Average Launch Power, each lane | PAVG | -5.5 | -0.5 | +1.5 | dBm | |
| Optical Modulation Amplitude (OMA) | POMA | -4.5 | -0.5 | +2.0 | dBm | 1 |
| Difference in Launch Power between any two lanes | P _{tx,diff} | | | 5.0 | dB | |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane | OMA-TD P | -9.7 | | | dBm | 1 |
| Rise/Fall Time | Tr/Tf | | | 50 | ps | |
| Extinction Ratio | ER | 3.5 | | | dB | |
| Relative Intensity Noise | Rin | | | -128 | dB/Hz | |
| Optical Return Loss Tolerance | TOL | | | 12 | dB | |
| Transmitter Reflectance | RT | | | -12 | dB | |
| Transmitter Eye Mask Margin | EMM | 10 | | | % | 2 |
| Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3} | | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} | | | | |
| Average Launch Power OFF Transmitter, each Lane | Poff | | | -30 | dBm | |
| Receiver | | | | | | |
| Center Wavelength | λ_C | 1270 | 1310 | 1350 | nm | |
| Damage Threshold | THd | +3 | | | dBm | |
| Overload, each lane | OVL | +1 | | | dBm | |
| Receiver Sensitivity in OMA, each Lane | SEN | | | -12.5 | dBm | |
| Difference in Receive Power between any two Lanes (OMA) | P _{rx,diff} | | | 5.0 | dB | |
| Signal Loss Assert Threshold | LOSA | -30 | | | dBm | |
| Signal Loss Deassert Threshold | LOSD | | | -15 | dBm | |
| LOS Hysteresis | LOSH | 0.5 | | 6 | dB | |
| Optical Return Loss | ORL | | | -12 | dBm | |
| Receive Electrical 3 dB upper Cutoff Frequency, each Lane | Fc | | | 12 | GHz | |

Notes:

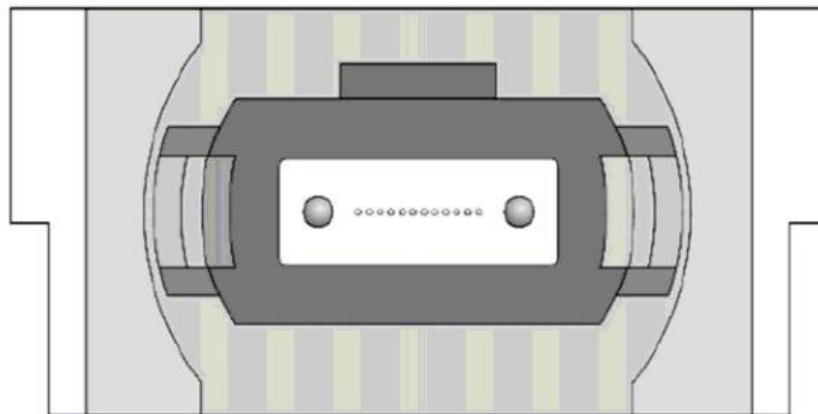
1. Transmitter wavelength, RMS spectral width and power need to meet the OMA minus TDP specs to guarantee link performance.
2. The eye diagram is tested with 1000 waveform.

Recommended Power Supply Filter



Optical Interface Lanes and Assignment

The optical interface port is a male MPO connector. The four fiber positions on the left as shown in Figure 2, with the key up, are used for the optical transmit signals (Channel 1 through 4). The fiber positions on the right are used for the optical receive signals (Channel 4 through 1). The central four fibers are physically present.

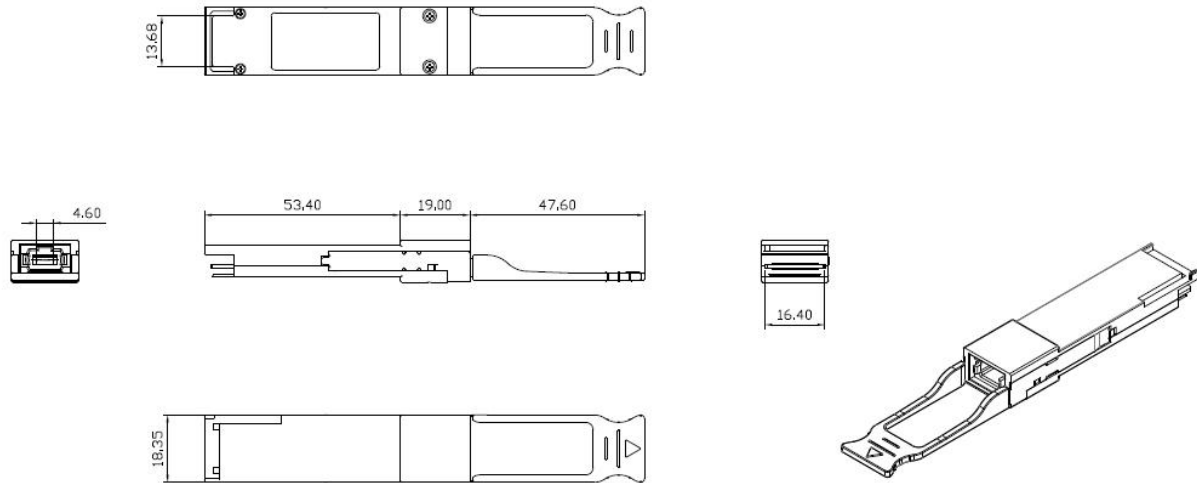


Transmit Channels: 1 2 3 4

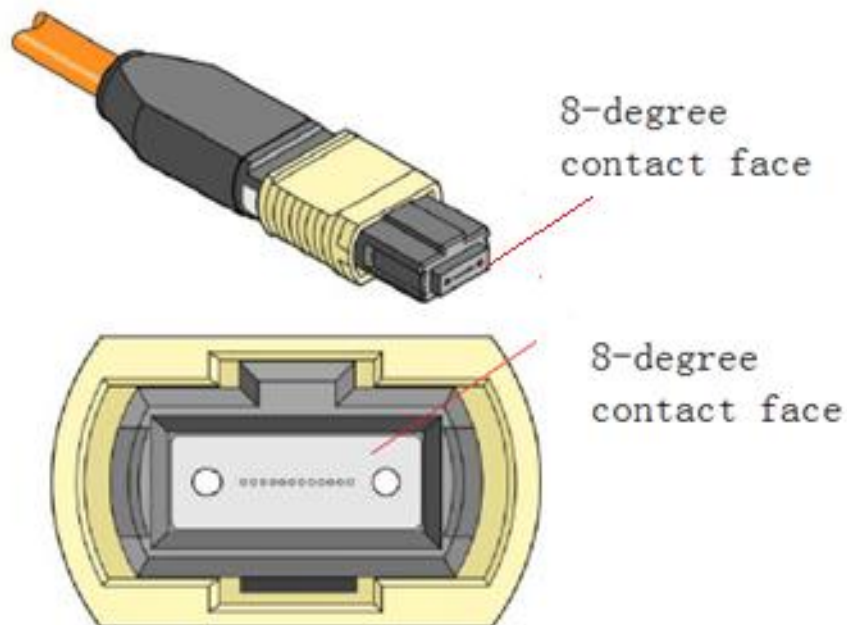
Unused positions: x x x x

Receive Channels: 4 3 2 1

Mechanical Dimensions



Attention: To minimize MPO connection induced reflections, an MPO receptacle with 8-degree angled end-face is utilized for this product. A male MPO connector with 8-degree end-face should be used with this product as illustrated in Figure below.



ESD

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Pin Assignment and Description

| | |
|----|---------|
| 38 | GND |
| 37 | TX1n |
| 36 | TX1p |
| 35 | GND |
| 34 | TX3n |
| 33 | TX3p |
| 32 | GND |
| 31 | LPMode |
| 30 | Vcc1 |
| 29 | VccTx |
| 28 | IntL |
| 27 | ModPrsL |
| 26 | GND |
| 25 | RX4p |
| 24 | RX4n |
| 23 | GND |
| 22 | RX2p |
| 21 | RX2n |
| 20 | GND |

Card Edge

| | |
|---------|----|
| GND | 1 |
| TX2n | 2 |
| TX2p | 3 |
| GND | 4 |
| TX4n | 5 |
| TX4p | 6 |
| GND | 7 |
| ModSelL | 8 |
| ResetL | 9 |
| VccRx | 10 |
| SCL | 11 |
| SDA | 12 |
| GND | 13 |
| RX3p | 14 |
| RX3n | 15 |
| GND | 16 |
| RX1p | 17 |
| RX1n | 18 |
| GND | 19 |

Top Side
Viewed from Top

Bottom Side
Viewed from Bottom

ModSelL Pin

The ModSelL is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP modules on a single 2-wire interface bus. When the ModSelL is "High", the module will not respond to any 2-wire interface communication from the host. ModSelL has an internal pull-up in the module.

ResetL Pin

Reset. LPMode_Reset has an internal pull-up in the module. A low level on the ResetL pin for longer than the minimum pulse length ($t_{\text{Reset_init}}$) initiates a complete module reset, returning all user module settings to their

default state. Module Reset Assert Time (t_{init}) starts on the rising edge after the low level on the ResetL pin is released. During the execution of a reset (t_{init}) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL signal with the Data_Not_Ready bit negated. Note that on power up (including hot insertion) the module will post this completion of reset interrupt without requiring a reset.

LPMODE Pin

Rayoptek PSM IR4 operate in the low power mode (less than 1.5 W power consumption) This pin active high will decrease power consumption to less than 1W.

ModPrsL Pin

ModPrsL is pulled up to Vcc on the host board and grounded in the module. The ModPrsL is asserted “Low” when the module is inserted and deasserted “High” when the module is physically absent from the host connector.

IntL Pin

IntL is an output pin. When “Low”, it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt by using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled up to Vcc on the host board.

Pin Assignment

| PIN # | Logic | Symbol | Description | Notes |
|-------|-------------|---------|--------------------------------------|-------|
| 1 | | GND | Ground | 1 |
| 2 | CML-I | Tx2n | Transmitter Inverted Data Input | |
| 3 | CML-I | Tx2p | Transmitter Non-Inverted Data output | |
| 4 | | GND | Ground | 1 |
| 5 | CML-I | Tx4n | Transmitter Inverted Data Input | |
| 6 | CML-I | Tx4p | Transmitter Non-Inverted Data output | |
| 7 | | GND | Ground | 1 |
| 8 | LVTLL-I | ModSelL | Module Select | |
| 9 | LVTLL-I | ResetL | Module Reset | |
| 10 | | VccRx | +3.3V Power Supply Receiver | 2 |
| 11 | LVC MOS-I/O | SCL | 2-Wire Serial Interface Clock | |
| 12 | LVC MOS-I/O | SDA | 2-Wire Serial Interface Data | |
| 13 | | GND | Ground | |
| 14 | CML-O | Rx3p | Receiver Non-Inverted Data Output | |
| 15 | CML-O | Rx3n | Receiver Inverted Data Output | |
| 16 | | GND | Ground | 1 |
| 17 | CML-O | Rx1p | Receiver Non-Inverted Data Output | |
| 18 | CML-O | Rx1n | Receiver Inverted Data Output | |
| 19 | | GND | Ground | 1 |

| | | | | |
|----|---------|---------|-------------------------------------|---|
| 20 | | GND | Ground | 1 |
| 21 | CML-O | Rx2n | Receiver Inverted Data Output | |
| 22 | CML-O | Rx2p | Receiver Non-Inverted Data Output | |
| 23 | | GND | Ground | 1 |
| 24 | CML-O | Rx4n | Receiver Inverted Data Output | 1 |
| 25 | CML-O | Rx4p | Receiver Non-Inverted Data Output | |
| 26 | | GND | Ground | 1 |
| 27 | LVTTL-O | ModPrsL | Module Present | |
| 28 | LVTTL-O | IntL | Interrupt | |
| 29 | | VccTx | +3.3 V Power Supply transmitter | 2 |
| 30 | | Vcc1 | +3.3 V Power Supply | 2 |
| 31 | LVTTL-I | LPMode | Low Power Mode | |
| 32 | | GND | Ground | 1 |
| 33 | CML-I | Tx3p | Transmitter Non-Inverted Data Input | |
| 34 | CML-I | Tx3n | Transmitter Inverted Data Output | |
| 35 | | GND | Ground | 1 |
| 36 | CML-I | Tx1p | Transmitter Non-Inverted Data Input | |
| 37 | CML-I | Tx1n | Transmitter Inverted Data Output | |
| 38 | | GND | Ground | 1 |

Notes:

1. Module circuit ground is isolated from module chassis ground within the module. GND is the symbol for signal and supply (power) common for QSFP modules.

2. The connector pins are each rated for a maximum current of 500mA.

Compatibility Test

In order to ensure the product compatibility, our products will be tested on the switch before shipment. Our modules can be compatible with many mainstream brand switches, such as Cisco, Juniper, Extreme, Brocade, IBM, H3C, HP, Huawei, D-Link, Mikrotik, ZTE, TP-Link...

Our test equipment: VOLKTEK MEN-4110, HP 2530-8G, CRS226-24G-25+RM, Catalyst 2960G Series, Catalyst 3850 XS 10G SFP+, Catalyst 3750-E Series, HUAWEI S5700Series, H3C S3100V2 Series, Juniper-EX4200, etc.



Cisco Catalyst 3850



HUAWEI S5700



H3C S3100V2



HP J9264AR



Juniper EX 4200



Alcatel 6850E-U24X



Mikrotik CR5226-24G-25+RM



Cisco Catalyst 2960G



Volktek MEN-4110

Product Production Process

Quality Assurance

Continuous introduction of new equipment, produced by strict standards, strict quality inspection, to guarantee the high quality standard of each product.



**Standardized
Production Line**



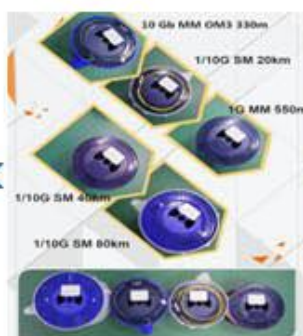
**Professional
Welding**



Assembling



Aging Testing



Distance Testing



Cleaning end face



Product Initial Test



Switch Testing



Product Final Test

Company: ETU-Link Technology Co., LTD

Address: 4th Floor, C Building, JinBoLong Industrial Park, QingQuan Road, LongHua District,
Shenzhen city, GuangDong

Tel: +86-755 2328 4603

Addresses and phone number also have been listed at www.etulinktechnology.com.

Please e-mail us at sales@etulinktechnology.com or call us for assistance.