

Product Features

- ✧ 4 CWDM lanes MUX/DEMUX design
- ✧ 4 independent full-duplex channels Up to 11.2Gbps data rate per wavelength
- ✧ 4 CWDM channels are 1271, 1291, 1311 and 1331 nm
- ✧ Up to 10km transmission
- ✧ Single +3.3V power supply
- ✧ Maximum 3.5W operation power
- ✧ Operating case temperature: 0~70C



Applications

- ✧ 40G Ethernet
- ✧ Infiniband 4X SDR DDR QDR
- ✧ 40G TELECOM connections
- ✧ Compliant with IEEE802.3ba
- ✧ Compliant with QSFP+ MSA: SFF-8436
- ✧ RoHS compliant

Ordering Information

| Part Number | Output Power | Rec. Sens | Data Rate | Wavelength | Distance |
|-----------------------|--------------|-----------|-----------|-----------------------|----------|
| <i>FH-QSFP4TCDL10</i> | -7 ~ +3.5db | -11.5db | 40G | 1270/1290/1310/1330nm | 10KM |

General

FH-QSFP4TCDL10 Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings will cause permanent damage and/or adversely affect device reliability.

Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit | Note |
|---------------------|--------|------|-----|------|------|
| Storage Temperature | TS | -40 | 85 | °C | |
| Relative Humidity | RH | 0 | 85 | % | |
| Supply Voltage | Vcc | -0.5 | 4.0 | V | |

Recommended Operating Conditions

| Parameter | Symbol | Min | Typ | Max | Unit | Note. |
|----------------------------|--------|------|------|------|------|-------|
| Power Supply Voltage | Vcc | 3.13 | 3.30 | 3.47 | V | |
| Power Supply Current | Icc | - | - | 1000 | mA | |
| Case Operating Temperature | Tc | -5 | - | +70 | °C | |

Electrical Input/Output Chara

| Parameter | Symbol | Min. | Typical | Max | Unit | Notes |
|--|--------|---------------------------|----------------------|------|----------|---------------------------|
| Power Consumption (XLPP1) | | - | | 3.5 | W | |
| Supply Current | ICC | | 0.75 | 1.0 | A | |
| Control I/O Voltage, High | VIH | 2.0 | | VCC | V | |
| Control I/O Voltage, Low | VIL | 0 | | 0.7 | V | |
| Inter-Channel Skew | TSK | | | 150 | ps | |
| RESETL Duration | | 2 | 10 | | us | |
| RESETL De-assert time | | | | 2000 | ms | |
| Power on time | | | | 2000 | ms | |
| Transmitter (XLPP1) | | | | | | |
| Single Ended Output Voltage Tolerance | | -0.3 | - | 4 | V | Referred to signal common |
| AC Common mode Voltage Tolerance (RMS) | | 15 | - | - | mV | |
| Tx Input Diff Voltage | VI | 100 | | 1000 | mV | |
| Tx Input Diff Impedance | ZIN | 80 | 100 | 120 | Ω | |
| Differential Input Return Loss | | See IEEE 802.3ba 86A.4.11 | | | dB | 10MHz-11.1GHz |
| J2 Jitter Tolerance | Jt2 | | | 0.18 | UI | |
| J9 Jitter Tolerance | Jt9 | | | 0.26 | UI | |
| Data Dependent Pulse Width Shrinkage | DDPWS | | | 0.07 | UI | |
| Eye Mask Coordinates {X1, X2, Y1, Y2} | | | 0.1, 0.31 95, 350 | | UI mV | |
| Receiver (XLPP1) | | | | | | |
| Single Ended Output Voltage Tolerance1 | | -0.3 | - | 4 | V | Referred to TP1 signal |

| Parameter | Symbol | Min. | Typical | Max | Unit | Notes |
|--|--------|----------------------------|-----------------------|------|----------|---------------|
| | | | | | | common |
| AC Common mode Voltage Tolerance (RMS) | | - | - | 7.5 | mV | |
| Termination Mismatch at 1MHz | | | | 5 | % | |
| Differential Output Return Loss | | See IEEE 802.3ba 86A.4.2.1 | | | dB | 10MHz-11.1GHz |
| Common-mode Output Return Loss | | See IEEE 802.3ba 86A.4.2.2 | | | dB | 10MHz-11.1GHz |
| Rx Output Diff Voltage | Vo | | 600 | 800 | mV | |
| Rx Output Rise and Fall Time | Tr/Tf | | | 35 | ps | 20% to 80% |
| J2 Jitter Tolerance | Jr2 | | | 0.46 | UI | |
| J9 Jitter Tolerance | Jr9 | | | 0.63 | UI | |
| Eye Mask Coordinates {X1, X2, Y1, Y2} | | | 0.29, 0.5 150, 425 | | UI mV | |

Notes: [1]The single ended input voltage tolerance is the allowable range of the instantaneous input signals

Optical Characteristics

| Parameter | Symbol | Min. | Typical | Max | Unit | Notes |
|---|-----------------|-------------------------------|---------|--------|-------|-----------------|
| Wavelength Assignment | L0 | 1264.5 | 1271 | 1277.5 | nm | |
| | L1 | 1284.5 | 1291 | 1297.5 | nm | |
| | L2 | 1304.5 | 1311 | 1317.5 | nm | |
| | L3 | 1324.5 | 1331 | 1337.5 | nm | |
| Transmitter | | | | | | |
| Side-mode Suppression Ratio | SMSR | 30 | - | - | dB | |
| Total Average Launch Power | P _T | - | - | 8.3 | dBm | |
| Average Launch Power, each Lane | | -7 | - | 2.3 | dBm | |
| Optical Modulation Amplitude, each Lane | OMA | -4 | - | +3.5 | dBm | |
| Difference in Launch Power between any two Lanes (OMA) | | - | - | 6.5 | dB | |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane | | -4.8 | - | | dBm | |
| TDP, each Lane | TDP | | | 2.3 | dB | |
| Extinction Ratio | ER | 3.5 | - | - | dB | |
| Relative Intensity Noise | R _{in} | - | - | -128 | dB/Hz | 12dB reflection |
| Optical Return Loss Tolerance | | - | - | 20 | dB | |
| Transmitter Reflectance | R _T | | | -12 | dB | |
| Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3} | | {0.25,0.4,0.45,0.25,0.28,0.4} | | | | |

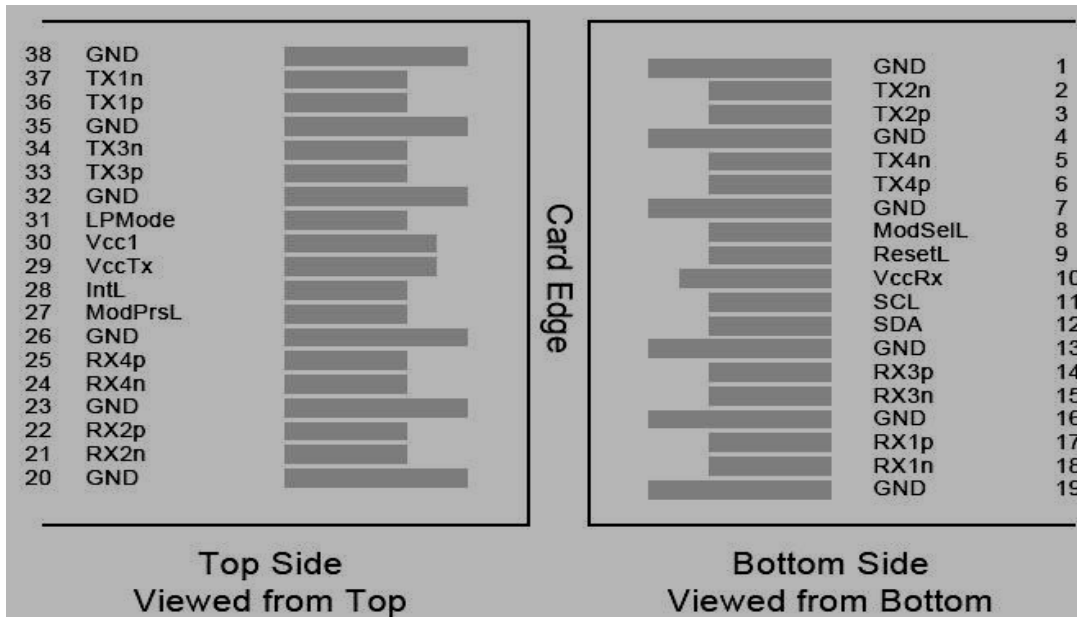
| | | | | | | |
|---|-----------|-------|-----|-------|-----|---|
| Average Launch Power OFF Transmitter, each Lane | P_{off} | | | -30 | dBm | |
| Receiver | | | | | | |
| Damage Threshold | TH_d | 3.3 | | | dBm | 1 |
| Average Power at Receiver Input, each Lane | | -13.7 | | 2.3 | dBm | |
| Receiver Reflectance | R_R | - | - | -26 | dB | |
| Receiver Power (OMA), each Lane | | - | - | 3.5 | dBm | |
| Stressed Receiver Sensitivity in OMA, each Lane | | - | - | -9.9 | dBm | |
| Receiver Sensitivity, each Lane | S_R | - | - | -11.5 | dBm | |
| Difference in Receive Power between any two Lanes (OMA) | | | | 7.5 | dB | |
| Conditions of Stress Receiver Sensitivity Test² | | | | | | |
| Vertical Eye Closure Penalty, each Lane | | | 1.6 | | dB | |
| Stressed Eye Jitter, each Lane | | | 0.3 | | UI | |

Notes:

[1] The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.

[2] Vertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Pin Definitions And Functions



| Pin | Logic | Symbol | Name/Description | Note |
|-----|-------------|---------|--------------------------------------|------|
| 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 | |

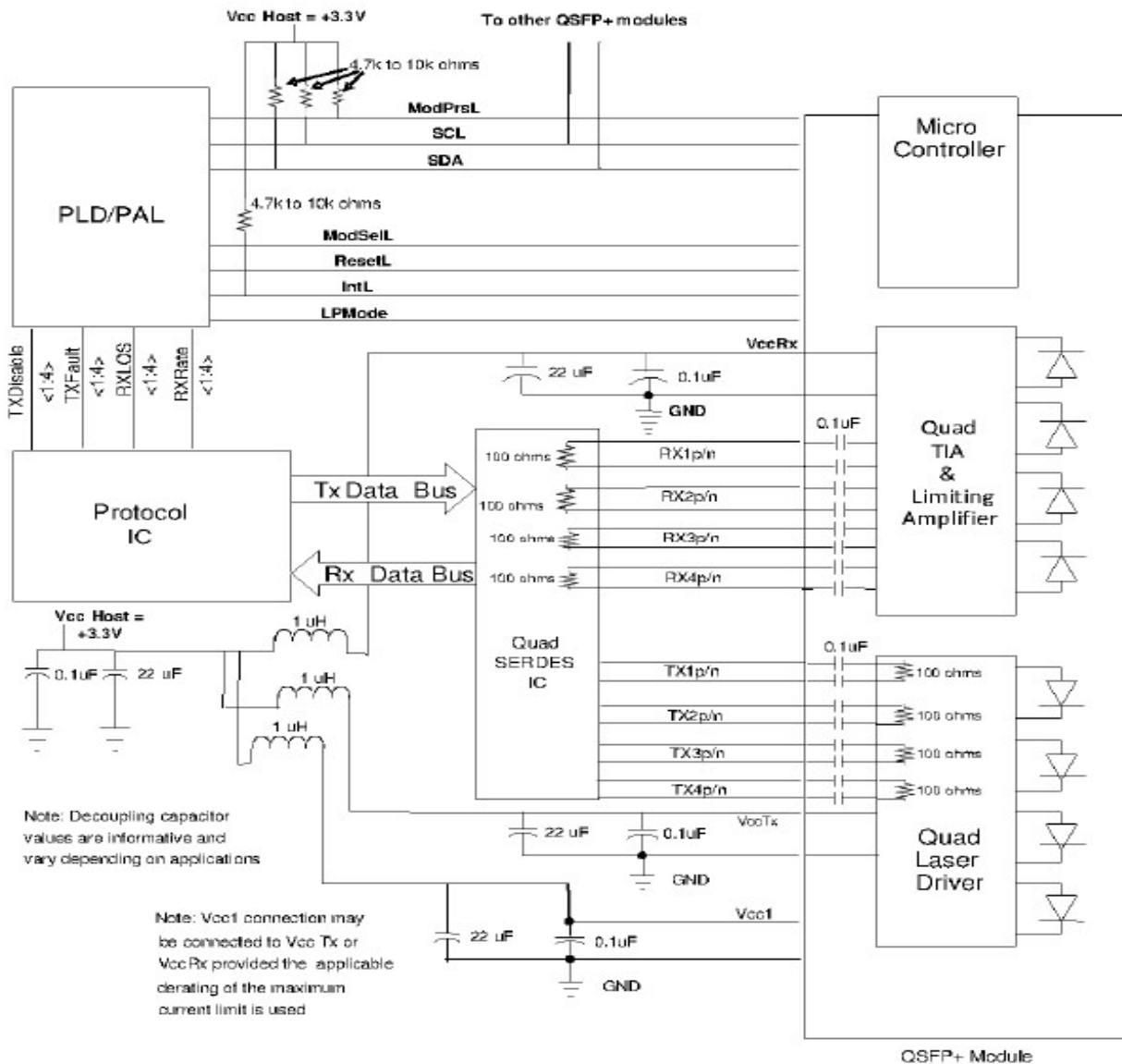
| | | | | |
|----|---------|---------|-------------------------------------|---|
| 16 | | GND | Ground | 1 |
| 17 | CML-O | Rx1p | Receiver Non-Inverted Data Output | |
| 18 | CML-O | Rx1n | Receiver Inverted Data Output | |
| 19 | | GND | Ground | 1 |
| 20 | | GND | Ground | 1 |
| 21 | CML-O | Rx2n | 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:

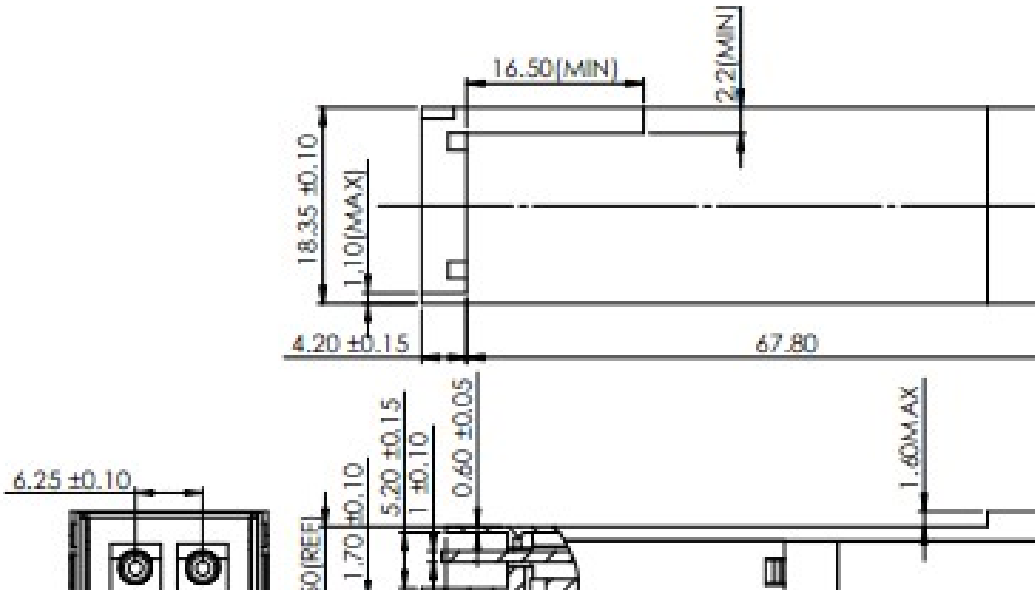
[1] GND is the symbol for signal and supply (power), Connect these directly to the host board signal common ground plane

[2] VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+, The connector pins are each rated for a maximum current of 500mA.

Digital Diagnostic Functions



Package Dimensions



For More Information

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