

TSQ4-E11JD3~ Optical Transceiver

Single-Mode CPRI/100GBASE Transceiver, With Diagnostic Monitoring

Duplex QSFP28 CWDM4 2km Transceiver

Features

- Electrical interface: retimed CAUI-4 per 100G Ethernet IEEE 802.3bm Annex 83E
- Hot pluggable
- Link budget assumes the use of KR4 FEC by the host
- Uncooled CWDM DFB lasers, directly modulated
- User controllable Transmit Input Equalization and Receiver Output Amplitude
- Fiber connector: SMF LC duplex connector
- Power dissipation <3.5W
- Distance up to 2km
- 2-wire interface with integrated Digital Diagnostic monitoring
- Operating case temperature: 0°C~+70°C
- RoHS6 compliant (lead free)

Applications

- Data Center Interconnect
- 100G CWDM4 applications with FEC

Description

The QSFP28 100G-CWDM4-2km module is a highly integrate

Recommended Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit |
|----------------------------|--------|------|---------|------|------|
| Power Supply Voltage | VCC | 3.15 | 3.30 | 3.45 | V |
| Operating Case Temperature | Tca | 0 | | 70 | °C |

Electrical Characteristics

| Parameter | Symbol | Min. | Typical | Max | Unit | Ref. |
|--|--------|------|---------|------|------|------|
| Transmitter | | | | | | |
| Input differential impedance | Rin | - | 100 | - | Ω | 1 |
| Single-ended Input Voltage Tolerance | | -0.3 | - | 4.0 | V | |
| AC Common Mode Input Voltage Tolerance | | 15 | | - | mV | |
| Differential Input Voltage | | 50 | - | - | mV | |
| Differential Input Voltage swing, per lane | Vin | 190 | | 1000 | mV | |
| Receiver | | | | | | |
| Output differential impedance | Rout | | 100 | | Ω | 1 |
| Differential Output Swing, per lane | Vout | 300 | | 900 | mV | 2 |
| AC Common Mode Output Voltage Tolerance | | | | 7.5 | mV | |
| Single-ended Output Voltage | | -0.3 | | 4.0 | V | |

Notes:

[1] AC coupled.

[2] Into 100 ohm differential termination.

Transmitter Specifications – Optical

| Parameter | Symbol | Min | Typical | Max | Unit | |
|--|---------|---------------|---------|------|--------|----|
| Center Wavelength | Ch0 | λ0 | 1264.5 | 1271 | 1277.5 | nm |
| | Ch1 | λ1 | 1284.5 | 1291 | 1297.5 | nm |
| | Ch2 | λ2 | 1304.5 | 1311 | 1317.5 | nm |
| | Ch3 | λ3 | 1324.5 | 1331 | 1337.5 | nm |
| Bit Rate per Channel | DR | 25.78125±100p | | Gbps | | 1 |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB | |
| Average launch power each lane | | -6.5 | | 2.5 | dBm | 7 |
| Optical Modulation Amplitude (each lane) | OMA | -4.0 | | 2.5 | dBm | |
| Transmit OMA per Lane @TDP max | | -2.0 | | | dBm | 2 |
| Launch power in OMA minus TDP, each lane | OMA-TDP | -5.0 | | | dBm | |
| Transmission & dispersion penalty, each lane | TDP | | | 3.0 | dB | 3 |

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| | | | | | | |
|--|--|-----|--|-----|-----|--|
| Transmitter Reflectance | | | | -12 | dB | |
| Extinction Ratio | ER | 3.5 | | | dB | |
| Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3} | {0.31, 0.4, 0.45, 0.34, 0.38, 0.4} | | | | | |
| | CWDM4 MSA Technical Specifications Rev 1.1 | | | | | |
| Total average launch power | Po | | | 8.5 | dBm | |
| Average launch power of OFF transmitter, each lane | Poff | | | -30 | dBm | |
| Optical return loss tolerance | ORL | | | 20 | dB | |

Receiver Specifications – Optical

| Parameter | Symbol | Min | Typical | Max | Unit | | |
|--|--|-----------------|---------|------|--------|----|--|
| Center Wavelengths | Ch0 | λ_0 | 1264.5 | 1271 | 1277.5 | nm | |
| | Ch1 | λ_1 | 1284.5 | 1291 | 1297.5 | nm | |
| | Ch2 | λ_2 | 1304.5 | 1311 | 1317.5 | nm | |
| | Ch3 | λ_3 | 1324.5 | 1331 | 1337.5 | nm | |
| Bit Rate per Channel | DR | 25.78125±100ppm | | | Gbps | 4 | |
| Unstressed Sensitivity (OMA) | OMAIN | - | - | -10 | dBm | 5 | |
| Receiver Overload | PMAX | 2.5 | | | | | |
| Stressed Sensitivity (OMA) | OMAIN,STR | - | | -7.3 | dBm | 6 | |
| Optical Return Loss | ORL | | | -26 | dB | | |
| Vertical eye closure penalty, each lane | VECP | | | 1.9 | dB | | |
| Stressed eye J2 Jitter, each lane | J2 | | | 0.3 | UI | | |
| Stressed eye J9 Jitter, each lane | J9 | | | 0.5 | UI | | |
| Stressed eye J4 Jitter, each lane | J4 | | | 0.48 | UI | | |
| SRS eye mask definition {X1, X2, X3, Y1, Y2, Y3} | {0.39, 0.5, 0.5, 0.39, 0.39, 0.4} | | | | | | |
| | CWDM4 MSA Technical Specifications Rev 1.1 | | | | | | |
| Damage threshold, each lane | | 3.5 | | | dB | | |

Notes:

- [1] Transmitter consists of 4 lasers operating at 25.78Gb/s each.
- [2] At maximum TDP.
- [3] TDP value is provided as a reference only.
- [4] Receiver consists of 4 photodetectors operating at 25.78Gb/s each.
- [5] Sensitivity is specified at 5x10⁻⁵ BER.
- [6] Measured with CWDM4 MSA2 conformance test signal at TP3 for 5x10⁻⁵ BER.
- [7] Power value and power accuracy are with all channels on.

General Specifications

| Parameter | Symbol | Min | Typical | Max | Unit | Ref. |
|-------------------------------------|----------|-----|---------|--------------------|------|------|
| Bit Rate (all wavelengths combined) | BR | | | 103.1 | Gb/s | |
| Bit Error Ratio @25.78Gb/s | BER | | | 5x10 ⁻⁵ | | 1 |
| Maximum Supported Distances | | | | | | |
| Fiber Type | | | | | | |
| SMF per G.652 | LossBdgt | | | 5 | dB | 2 |

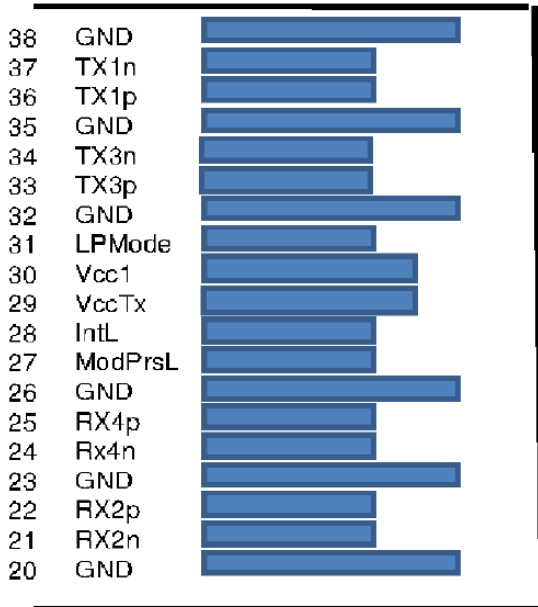
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Notes:

[1] Tested with a 231 – 1 PRBS.

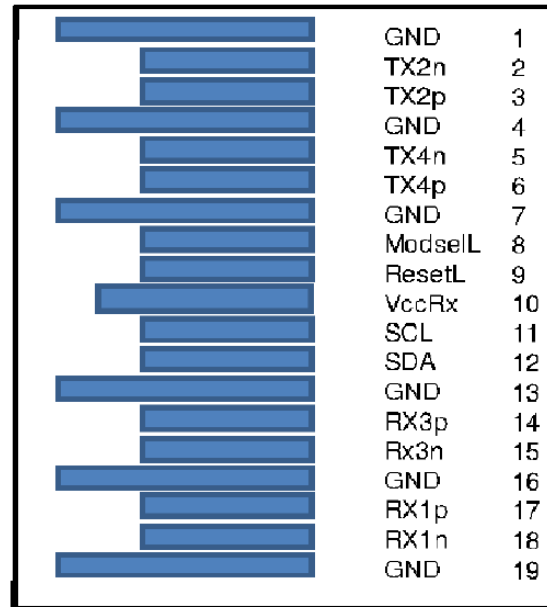
[2] This 5 dB loss budget includes 2.5dB optical coding gain from FEC on the host [RS-FEC (528,514) per Clause 91]. The maximum length is 2km. The option to bypass RS-FEC is not supported. Loss budget may include up to 1dB MPI loss penalty with worse case Transmitter and worst case connector MPI.

Electrical Pad Layout



**Top Side
Viewed From Top**

Module Card Edge



**Bottom Side
Viewed From Bottom**

Pin Definition

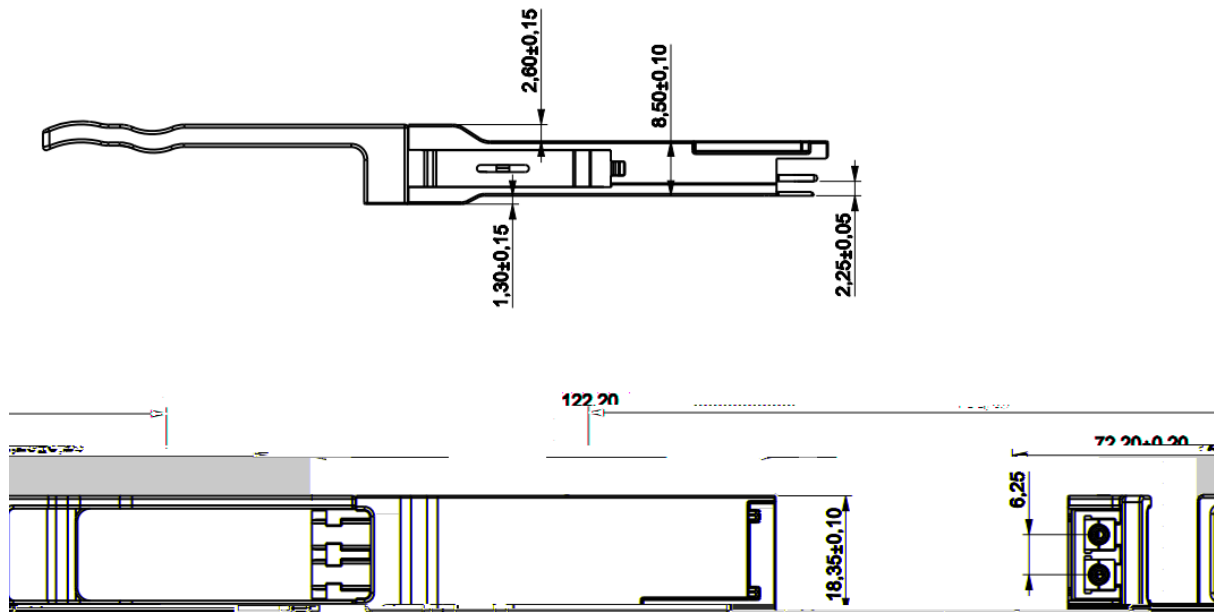
| Pin | Symbol | Name/Description |
|-----|---------|-------------------------------------|
| 1 | GND | Ground |
| 2 | Tx2n | Transmitter Inverted Data Input |
| 3 | Tx2p | Transmitter Non-Inverted Data Input |
| 4 | GND | Ground |
| 5 | Tx4n | Transmitter Inverted Data Input |
| 6 | Tx4p | Transmitter Non-Inverted Data Input |
| 7 | GND | Ground |
| 8 | ModSelL | Module Select |
| 9 | ResetL | Module Reset |
| 10 | VCC Rx | +3.3 V Power supply receiver |
| 11 | SCL | 2-wire serial interface clock |
| 12 | SDA | 2-wire serial interface data |
| 13 | GND | Ground |
| 14 | Rx3p | Receiver Non-Inverted Data Output |

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| | | |
|----|---------|-------------------------------------|
| 15 | Rx3n | Receiver Inverted Data Output |
| 16 | GND | Ground |
| 17 | Rx1p | Receiver Non-Inverted Data Output |
| 18 | Rx1n | Receiver Inverted Data Output |
| 19 | GND | Ground |
| 20 | GND | Ground |
| 21 | Rx2n | Receiver Inverted Data Output |
| 22 | Rx2p | Receiver Non-Inverted Data Output |
| 23 | GND | Ground |
| 24 | Rx4n | Receiver Inverted Data Output |
| 25 | Rx4p | Receiver Non-Inverted Data Output |
| 26 | GND | Ground |
| 27 | ModPrsL | Module Present |
| 28 | IntL | Interrupt |
| 29 | VCC Tx | +3.3 V Power supply transmitter |
| 30 | VCC1 | +3.3 V Power Supply |
| 31 | LPMODE | Low Power Mode |
| 32 | GND | Ground |
| 33 | Tx3p | Transmitter Non-Inverted Data Input |
| 34 | Tx3n | Transmitter Inverted Data Input |
| 35 | GND | Ground |
| 36 | Tx1p | Transmitter Non-Inverted Data Input |
| 37 | Tx1n | Transmitter Inverted Data Input |
| 38 | GND | Ground |

Mechanical



Unit: mm

Ordering Information

| Part Number | Product Description |
|----------------------------|--------------------------------------|
| TSQL4- XXXXXX C | 100Gbps QSFP28 CWDM4 2km 0°C ~ +70°C |

References

1. SFF-8665: "QSFP+ 28Gb/s 4X Pluggable Transceiver Solution (QSFP28)" Rev 1.9, June 29, 100G CWDM4 MSA.
2. "100G CWDM4 MSA Technical Specifications: 2km Optical Specifications" Rev 1.1, November 23, 2015.
3. IEEE 802.3bm.
4. IEEE 802.3ba.

Important Notice

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