

**Specification**

**Quad Small Form-factor Pluggable**

**Optical Transceiver Module**

**100GBASE-SR4**



**Ordering Information**

**TQS-Qx4H9-J85**

**Ordering Information:**

| Model Name  | TQS-Q14H9-J85 | TQS-QJ4H9-J85 | TQS-QG4H9-J85 | Note |
|-------------|---------------|---------------|---------------|------|
| Voltage     | 3.3V          | 3.3V          | 3.3V          |      |
| Device type | 850 nm VCSEL  | 850 nm VCSEL  | 850 nm VCSEL  |      |
| Temperature | 0°C~+70°C     | 0°C~+85°C     | -20°C~+85°C   |      |
| Distance    | 100m (OM4)    |               |               |      |
| Latch Color | Beige         |               |               |      |

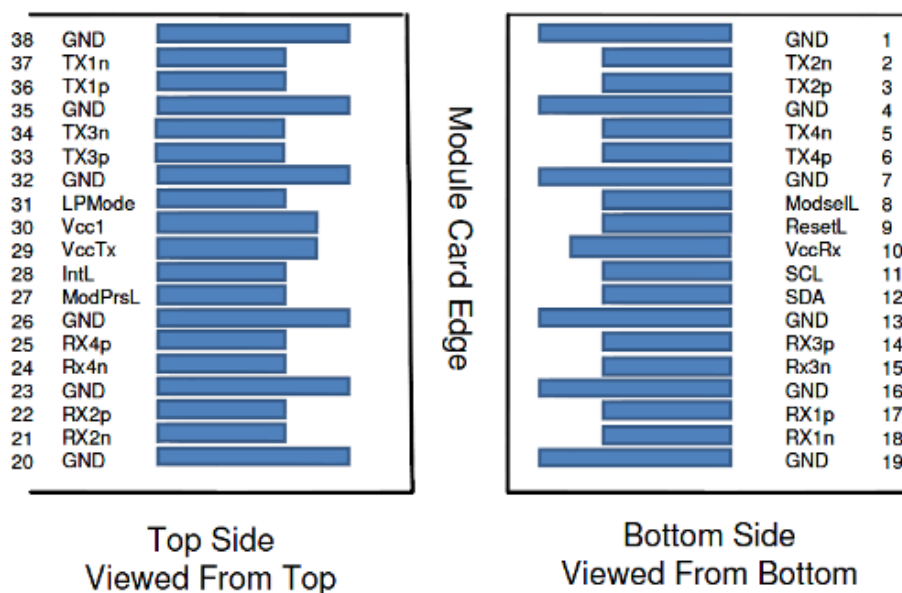
## Features

- Supports 103.1Gb/s data rate links of 70m/100m via OM3/OM4, respectively
- Low power consumption <1.9W (Typ. 1.7W)
- Hot pluggable electrical interface
- Single 3.3V power supply
- Using standard 12 or 8 lane optical fiber with MPO pluggable optical connector
- Case temperature operating range
  - 0°C to +70°C: TQS-Q14H9-J85
  - 0°C to +85°C: TQS-QJ4H9-J85
  - 20°C to +85°C: TQS-QG4H9-J85
- 4x25Gb/s 850nm VCSEL-based transmitter
- RoHS Compliant
- Compliant with 100G Ethernet IEEE 802.3bm 100GBASE-SR4
- Compliant with SFF-8665 (QSFP28 Solution)

## Applications

- 100GBASE-SR4 Ethernet links.
- Infiniband EDR.
- HPC Interconnects.
- Proprietary Interconnections.

## Pin Descriptions



| Pin | Logic       | Symbol  | Description                         | Plug Sequence | Notes |
|-----|-------------|---------|-------------------------------------|---------------|-------|
| 1   |             | GND     | Ground                              | 1             |       |
| 2   | CML-I       | Tx2n    | Transmitter Inverted Data Input     | 3             |       |
| 3   | CML-I       | Tx2p    | Transmitter Non-Inverted Data Input | 3             |       |
| 4   |             | GND     | Ground                              | 1             |       |
| 5   | CML-I       | Tx4n    | Transmitter Inverted Data Input     | 3             |       |
| 6   | CML-I       | Tx4p    | Transmitter Non-Inverted Data Input | 3             |       |
| 7   |             | GND     | Ground                              | 1             |       |
| 8   | LVTTL-I     | ModSelL | Module Select                       | 3             |       |
| 9   | LVTTL-I     | ResetL  | Module Reset                        | 3             |       |
| 10  |             | VCC Rx  | +3.3V Power Supply Receiver         | 2             |       |
| 11  | LVC MOS-I/O | SCL     | 2-wire serial interface clock       | 3             |       |
| 12  | LVC MOS-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             |       |
| 17  | CML-O       | Rx1p    | Receiver Non-Inverted Data Output   | 3             |       |
| 18  | CML-O       | Rx1n    | Receiver Inverted Data Output       | 3             |       |
| 19  |             | GND     | Ground                              | 1             |       |
| 20  |             | GND     | Ground                              | 1             |       |
| 21  | CML-O       | Rx2n    | Receiver Inverted Data Output       | 3             |       |
| 22  | CML-O       | Rx2p    | Receiver Non-Inverted Data Output   | 3             |       |
| 23  |             | GND     | Ground                              | 1             |       |
| 24  | CML-O       | Rx4n    | Receiver Inverted Data Output       | 3             |       |
| 25  | CML-O       | Rx4p    | Receiver Non-Inverted Data Output   | 3             |       |
| 26  |             | GND     | Ground                              | 1             |       |
| 27  | LVTTL-O     | ModPrsL | Module Present                      | 3             |       |
| 28  | LVTTL-O     | IntL    | Interrupt                           | 3             |       |

|    |          |        |                                     |   |  |
|----|----------|--------|-------------------------------------|---|--|
| 29 |          | VccTx  | +3.3V Power supply transmitter      | 2 |  |
| 30 |          | Vcc1   | +3.3V Power supply                  | 2 |  |
| 31 | LVTTTL-I | LPMode | Low Power Mode                      | 3 |  |
| 32 |          | GND    | Ground                              | 1 |  |
| 33 | CML-I    | Tx3p   | Transmitter Non-Inverted Data Input | 3 |  |
| 34 | CML-I    | Tx3n   | Transmitter Inverted Data Input     | 3 |  |
| 35 |          | GND    | Ground                              | 1 |  |
| 36 | CML-I    | Tx1p   | Transmitter Non-Inverted Data Input | 3 |  |
| 37 | CML-I    | Tx1n   | Transmitter Inverted Data Input     | 3 |  |
| 38 |          | GND    | Ground                              | 1 |  |

## ■ Absolute Maximum Rating

Not necessarily applied together. Exceeding these values may cause permanent damage. Functional operation under these conditions is not implied.

| Parameter                          | Symbol | Min  | Typ. | Max | Unit | Note |
|------------------------------------|--------|------|------|-----|------|------|
| Storage Temperature                |        | -40  |      | 85  | °C   |      |
| 3.3V Power Supply Voltage          | VCC    | -0.5 |      | 3.6 | V    |      |
| Relative Humidity                  | RH     | 5    |      | 85  | %    |      |
| Rx Optical Damage Threshold / Lane |        | 3.4  |      |     | dBm  |      |

Notes : Non-condensing.

## ■ Recommended Operating Conditions

| Parameter                  | Min   | Typical  | Max   | Unit | Note          |
|----------------------------|-------|----------|-------|------|---------------|
| Case Operating Temperature | 0     |          | 70    | °C   | TQS-Q14H9-J85 |
|                            | 0     |          | 85    | °C   | TQS-QJ4H9-J85 |
|                            | -20   |          | 85    | °C   | TQS-QG4H9-J85 |
| Power Supply Voltage       | 3.135 | 3.3      | 3.465 | V    |               |
| Data Rate per Channel      |       | 25.78125 |       | Gb/s |               |

## Electrical Characteristics

| Parameter                                                    | Min                                 | Typical | Max  | Unit | Note |
|--------------------------------------------------------------|-------------------------------------|---------|------|------|------|
| <b>Transceiver Electrical Characteristics</b>                |                                     |         |      |      |      |
| TRX Power Consumption                                        |                                     | 1.7     | 1.9  | W    |      |
| TRX Power-on Initialization Time                             |                                     |         | 2000 | ms   |      |
| <b>CAUI-4 Module Electrical Input Characteristics (TP1)</b>  |                                     |         |      |      |      |
| Signaling Rate per Lane                                      | 25.78125+/- 100ppm                  |         |      | Gb/s |      |
| Differential PK-PK input voltage                             |                                     |         | 900  | mVpp |      |
| Module stressed input test                                   | Per Section 83E.3.4.1, IEEE 802.3bm |         |      |      | 1    |
| Single Ended Input Voltage Tolerance                         | -0.4                                |         | 3.3  | V    |      |
| <b>CAUI-4 Module Electrical Output Characteristics (TP4)</b> |                                     |         |      |      |      |
| Signaling Rate per Lane                                      | 25.78125+/- 100ppm                  |         |      | Gb/s |      |
| Differential Data Output Swing                               | 400                                 | 600     | 900  | mVpp |      |
| Eye Width                                                    | 0.57                                |         |      | UI   |      |
| Eye Height, Differential                                     | 228                                 |         |      | mV   |      |
| Vertical Eye Closure                                         |                                     |         | 5.5  | dB   |      |
| Transition Time (20% to 80%)                                 | 12                                  |         |      | PS   |      |

### Notes:

- The module stressed input tolerance is measured using the procedure defined in 83E.3.4.1.1, IEEE802.3bm. Module stressed input parameters include.
  - Eye width of 0.46 UI.
  - Applied PK-PK sinusoidal jitter is per Table 88-13 per IEEE802.3bm
  - Eye height of 95mV

## Optical Characteristics

| Parameter                                                | Symbol          | Min                                                                | Typical | Max | Unit | Note |
|----------------------------------------------------------|-----------------|--------------------------------------------------------------------|---------|-----|------|------|
| <b>Transmitter Optical Characteristics</b>               |                 |                                                                    |         |     |      |      |
| Signaling Rate per Lane                                  |                 | 25.78125+/-100ppm                                                  |         |     | Gb/s |      |
| Center Wavelength                                        | $\lambda$       | 840                                                                | 850     | 860 | nm   |      |
| Spectral Width – RMS                                     | $\sigma\lambda$ |                                                                    | 0.55    | 0.6 | nm   |      |
| Average Launch Optical Power, each lane                  | TXPX            | -8.4                                                               |         | 2.4 | dBm  |      |
| OMA, each lane                                           | OMA             | -6.4                                                               |         | 3   | dBm  |      |
| Launch power in OMA minus TDEC                           |                 | -7.3                                                               |         |     | dBm  | 1    |
| Transmitter and dispersion eye closure (TDEC), each lane | TDEC            |                                                                    |         | 4.3 | dB   | 1    |
| Average launch power of OFF transmitter, each lane       |                 |                                                                    |         | -30 | dBm  |      |
| Extinction Ratio                                         | ER              | 2                                                                  |         |     | dB   |      |
| Optical return loss tolerance                            |                 |                                                                    |         | 12  | dB   |      |
| Encircled Flux                                           |                 | $\geq 86\%$ @ 19 $\mu$ m,<br>$\leq 30\%$ at 4.5 $\mu$ m            |         |     |      | 1    |
| Transmitter eye mask definition                          |                 | $(X1, X2, X3, Y1, Y2, Y3) =$<br>(0.3, 0.38, 0.45, 0.35, 0.41, 0.5) |         |     |      | 2    |

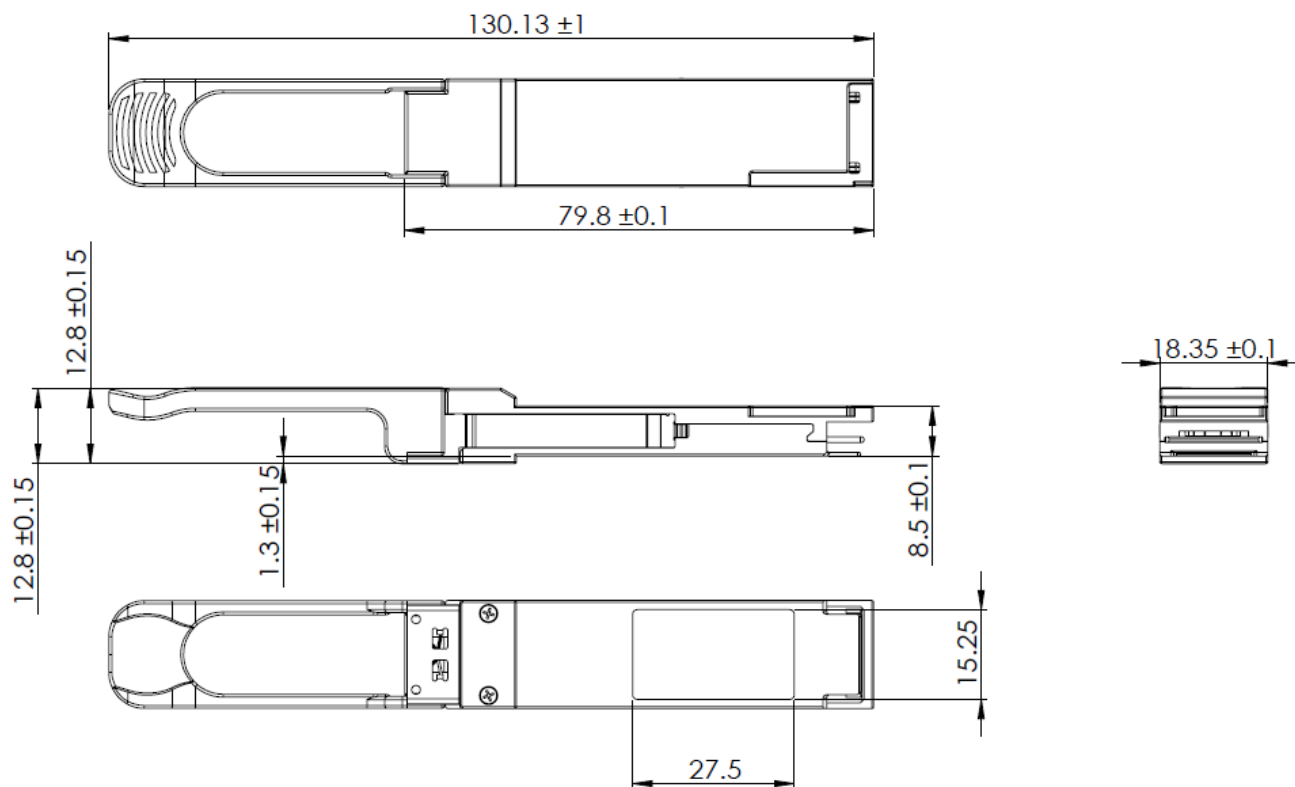
### Notes:

1. Designed target and belonging to TDP for further confirmation.
2. Hit ratio  $1.5 \times 10^{-3}$  hits per sample

| Parameter                                            | Symbol    | Min                | Typical | Max   | Unit | Note |
|------------------------------------------------------|-----------|--------------------|---------|-------|------|------|
| Receiver Optical Characteristics                     |           |                    |         |       |      |      |
| Signaling Rate per Lane                              |           | 25.78125+/- 100ppm |         |       | Gb/s |      |
| Center wavelength, each lane                         | $\lambda$ | 840                | 850     | 860   | nm   |      |
| Damage Threshold                                     |           | 3.4                |         |       | dBm  |      |
| Average power at receiver input, each lane           |           | -10.3              |         | 2.4   | dBm  | 1    |
| Receiver Power, each lane (OMA)                      |           |                    |         | 3     | dBm  |      |
| Receiver Reflectance                                 |           |                    |         | -12   | dB   |      |
| Unstressed Receiver Sensitivity (OMA)<br>at BER 5E-5 |           |                    |         | -10.3 | dBm  |      |

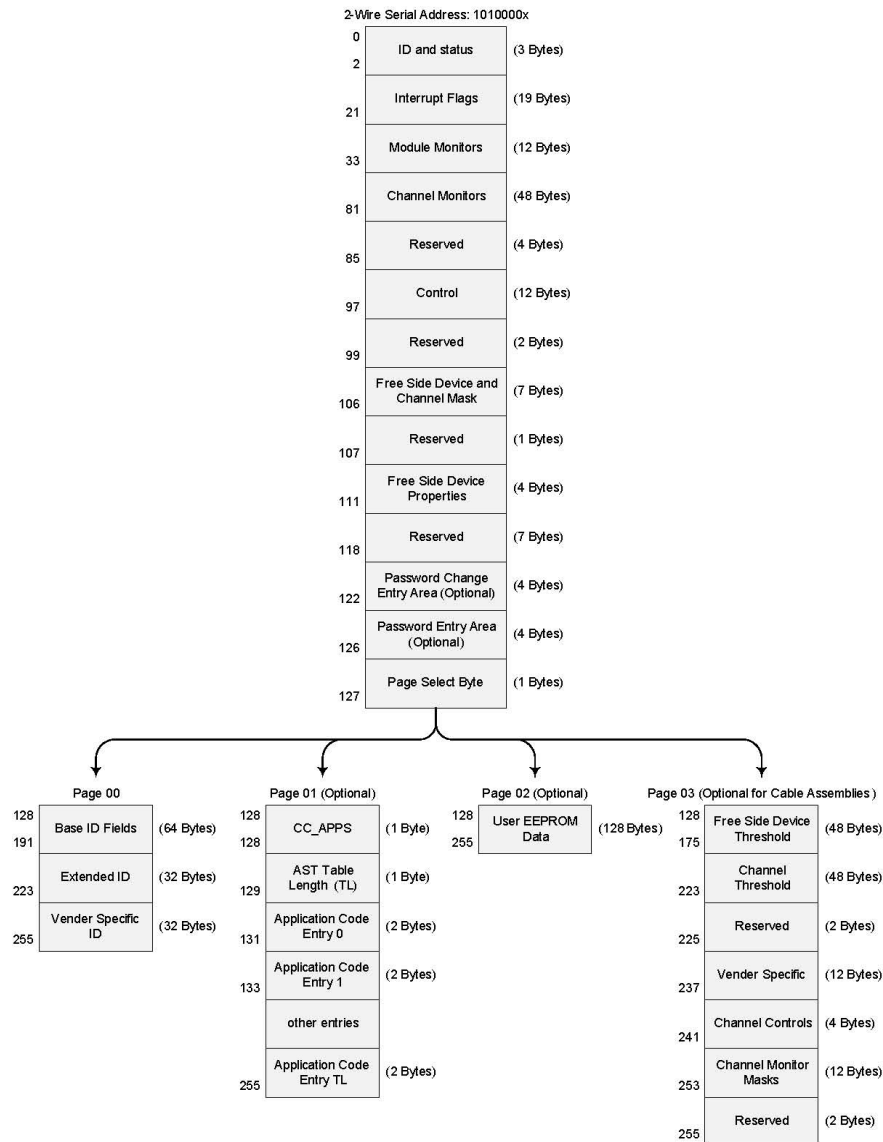
**Notes:**

1. 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.

**■ Mechanical Design Diagram (Unit: mm)**

## Memory Map

The memory map is structured as a single address and multiple page approaches, according to the QSFP28 SFF-8636 MSA specification as shown in the below.



## ■ ESD

Normal ESD precautions are 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 laser class 1M product according to IEC/EN60825-1:2014 (Third Edition). This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 56, dated MAY 8, 2019.

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Attention: L'utilisation de commandes ou de réglages ou l'exécution de procédures autres que celles spécifiées dans le document peut entraîner une exposition à des radiations dangereuses.

## ■ Contact Information

|                                                                                                                                                             |                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
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## ■ Revision History

| Date       | Version | Description                                                |
|------------|---------|------------------------------------------------------------|
| 09/13/2021 | 1.0     | Initial release                                            |
| 01/26/2022 | 1.1     | Add the option of extended temperature range (0~85°C) type |