

## TSQM4-NAAGA1 Optical Transceiver

### Multi-Mode QSFP+ SR4 Optical Transceiver, With Diagnostic Monitoring

#### Features

- Support 40GBASE-SR4 application
- Compliant to QSFP+ Electrical MSA SFF-8436
- Data Rate up to 10.3125 Gb/s per lane
- Transmission distance up to 100m (OM3)/ 150m (OM4)
- +3.3V single power supply
- Low power consumption: <1.4W
- Hot Pluggable
- Built-in digital diagnostic functions
- MPO-12 connector
- Operating case temperature:  
Standard: 0°C to 70°C  
Industrial: -40°C to 85°C
- RoHS compliant (lead free) 

#### Applications

- 40GBASE-SR4 Ethernet

#### Product Description

This Optical Transceiver is a 4-Channel, Pluggable, Fiber-Optic QSFP+ for 40Gbps SR4 Applications. It is a high performance module for short-range data communication and interconnect applications which operate at 10.3125Gbps per lane up to 150m using OM4 fiber. The optical interface uses MPO receptacles.

This module is designed to operate over multimode fiber systems using a nominal wavelength of 850nm. The electrical interface uses a 38 contact edge type connector.

#### Absolute Maximum Rating

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

| Parameters | Symbol | Min. | Max. | Unit |
|------------|--------|------|------|------|
|------------|--------|------|------|------|

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|                      |     |      |      |    |
|----------------------|-----|------|------|----|
| Power Supply Voltage | VCC | -0.5 | +3.6 | V  |
| Storage Temperature  | Tc  | -40  | +85  | °C |
| Relative Humidity    | RH  | 0    | 85   | %  |

## Recommended Operating Conditions

| Parameter                               | Symbol | Min  | Typical | Max  | Unit | Notes    |
|-----------------------------------------|--------|------|---------|------|------|----------|
| Supply Voltage                          | VCC    | 3.15 | 3.3     | 3.45 | V    | --       |
| Operating Case Temperature (Standard)   | Tca    | 0    | -       | 70   | °C   | -        |
| Operating Case Temperature (Industrial) | Tca    | -40  | -       | 85   | °C   | -        |
| Data Rate                               | DR     | -    | 10.3125 | -    | Gbps | per lane |

## Transmitter Specifications

| Parameter                     | Symbol | Min | Typical | Max     | Unit |
|-------------------------------|--------|-----|---------|---------|------|
| Input differential impedance  | Rin    | -   | 100     | -       | Ω    |
| Differential Data Input Swing | Vin    | 200 | -       | 1000    | mV   |
| Transmit Disable Voltage      | VD     | 2.0 | -       | VCC+0.3 | V    |
| Transmit Enable Voltage       | Ven    | Vee | -       | Vee+0.8 | V    |

## Receiver Specifications

| Parameter                      | Symbol | Min | Typical | Max               | Unit |
|--------------------------------|--------|-----|---------|-------------------|------|
| Output Differential Impedance  | Rout   | -   | 100     | -                 | Ω    |
| Differential Data Output Swing | Vout   | 200 | -       | 1000              | mV   |
| Bit Error Rate                 | BER    | -   | -       | 10 <sup>-12</sup> | -    |
| Loss of Signal –Asserted       | -      | 2.0 | -       | VCC+0.3           | V    |
| Loss of Signal –Negated        | -      | Vee | -       | Vee+0.8           | V    |

## Optical Characteristics

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

| Parameter                     | Symbol | Min. | Typical | Max  | Unit | Notes |
|-------------------------------|--------|------|---------|------|------|-------|
| <b>Transmitter</b>            |        |      |         |      |      |       |
| Center Wavelength             | λ      | 840  | 850     | 860  | nm   | -     |
| Average Optical Power         | Po     | -7.6 | -       | 2.4  | dBm  | 1     |
| Extinction Ratio              | ER     | 3    | -       | -    | dB   | 2     |
| RMS spectral width            | Δλ     | -    | -       | 0.65 | nm   | -     |
| Optical Return Loss Tolerance | ORL    | -    | -       | 12   | dB   | -     |
| <b>Receiver</b>               |        |      |         |      |      |       |
| Sensitivity                   | Rsens  | -    | -       | -9.5 | dBm  | 3     |

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|                      |      |     |   |     |     |   |
|----------------------|------|-----|---|-----|-----|---|
| Receiver Overload    | Pmax | 2.4 | - | -   | dBm | 3 |
| Los function         | Los  | -30 | - | -12 | dBm | - |
| Receiver Reflectance | -    | -   | - | -12 | dB  | - |

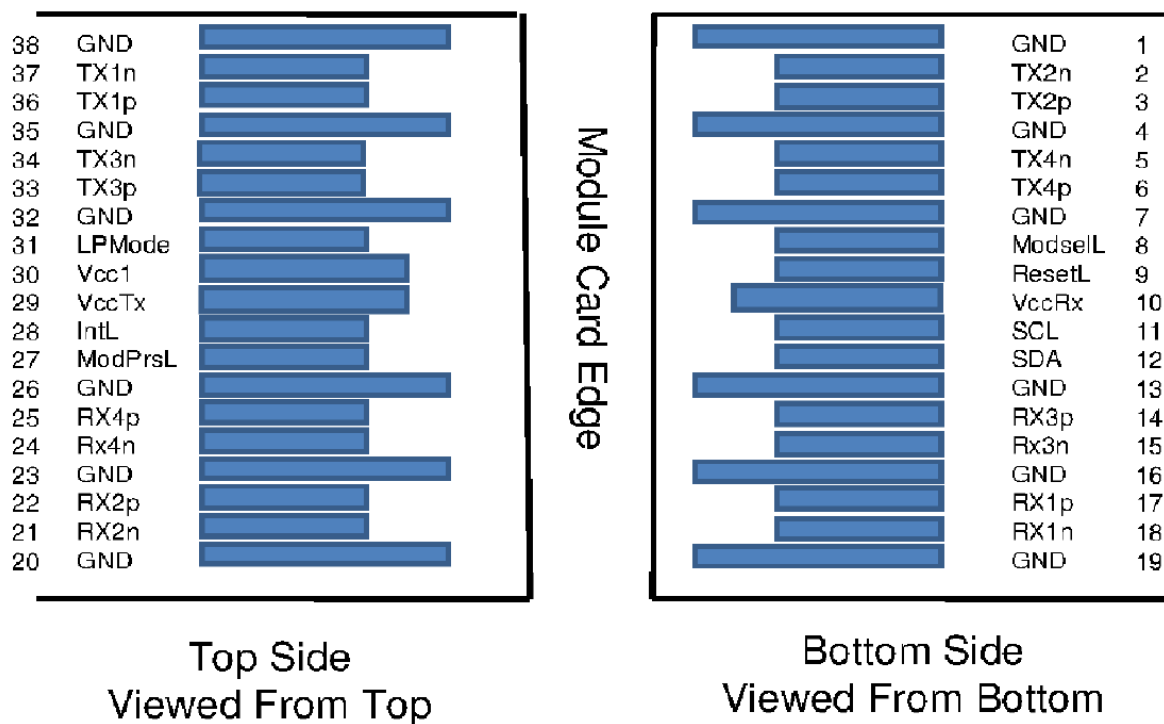
**Note:**

[1] The optical power is launched into MMF

[2] Measured with a PRBS 231-1 test pattern @10.3125Gbps

[3] Measured with a PRBS 231-1 test pattern @10.3125Gbps, BER $\leq 10^{-12}$ .**Low Speed Characteristics**

| Parameter       | Symbol | Min.         | Typical | Max          | Unit |
|-----------------|--------|--------------|---------|--------------|------|
| TX_Fault,RX_LOS | VOL    | 0            | -       | 0.4          | V    |
|                 | VOH    | Host_VCC-0.5 | -       | Host_VCC+0.3 | V    |
| TX_DIS          | VIL    | -0.3         | -       | 0.8          | V    |
|                 | VIH    | 2.0          | -       | VCCT+0.3     | V    |
| RS0,RS1         | VIL    | -0.3         | -       | 0.8          | V    |
|                 | VIH    | 2.0          | -       | VCCT+0.3     | V    |

**Qsfp+ Electrical Pad Layout**

## 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   |
| 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     |

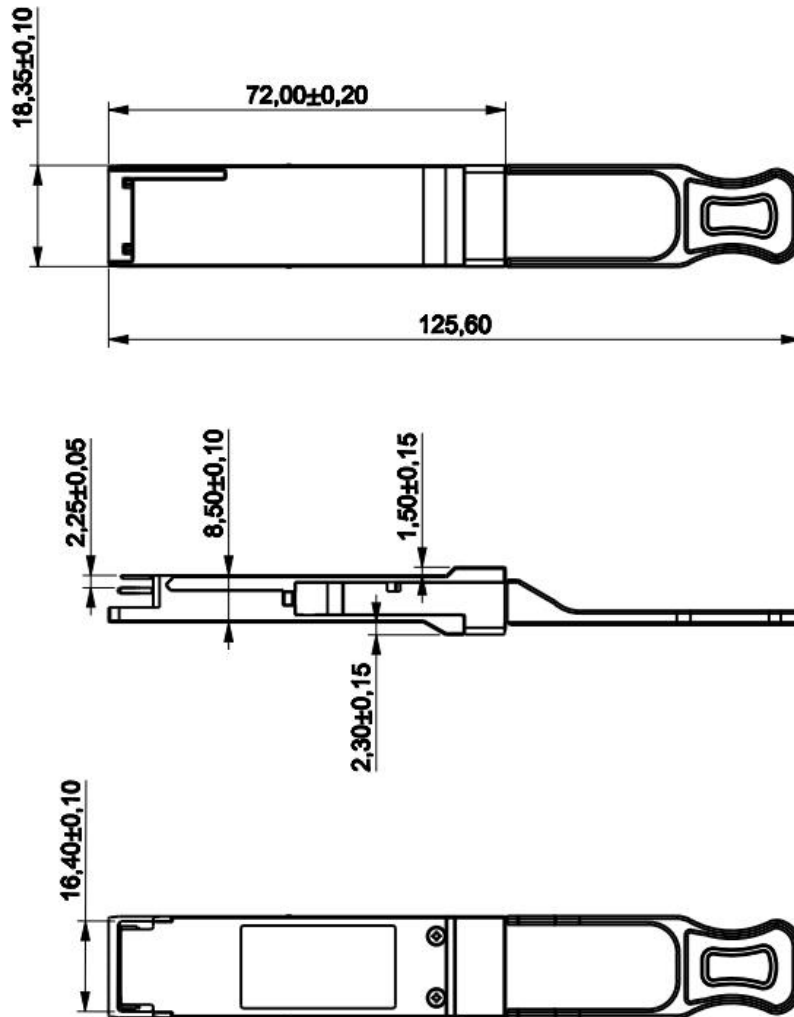
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|    |     |        |
|----|-----|--------|
| 38 | GND | Ground |
|----|-----|--------|

## Mechanical



Unit: mm

## Ordering Information

| Part Number   | Product Description                                                                  |
|---------------|--------------------------------------------------------------------------------------|
| TSQM4-NAAGA1C | 40Gbps QSFP+ SR4 Optical Transceiver, 850nm 100m@OM3 and 150m@OM4 MMF, 0°C ~ +70°C   |
| TSQM4-NAAGA1T | 40Gbps QSFP+ SR4 Optical Transceiver, 850nm 100m@OM3 and 150m@OM4 MMF, -40°C ~ +85°C |

## Important Notice

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