

**Alpha Bridge**  
**AQSFP28-100G-ZR4**  
**Datasheet**



### Features

- QSFP28 MSA-compliant
- Hot pluggable 38 p-in electrical interface
- 4 LAN-WDM lanes MUX/DEMUX design
- 4x25G electrical interface
- Maximum power consumption 6.5W
- LC duplex connector
- Supports 103.125Gb/s aggregate bit rate
- Up to 80km transmission on single mode fiber
- Operating case temperature: 0°C to 70°C
- Single 3.3V power supply
- RoHS 2.0 compliant

### Application

- 100GBASE-ZR4 100G Ethernet
- Telecom networking

### Absolute Maximum Ratings

| Parameter                            | Symbol     | Min. | Max. | Units | Note |
|--------------------------------------|------------|------|------|-------|------|
| Storage Temperature                  | <i>TS</i>  | -40  | 85   | °C    |      |
| Power Supply Voltage                 | <i>VCC</i> | 0    | 3.6  | V     |      |
| Relative Humidity (non-condensation) | <i>RH</i>  | 15   | 85   | %     | 1    |
| Damage Threshold, each Lane          | <i>THd</i> | 6.5  |      | dBm   |      |

### Recommended Operating Conditions

| Parameter                | Symbol     | Min.  | Typ. | Max.  | Units | Note |
|--------------------------|------------|-------|------|-------|-------|------|
| Power Supply Voltage     | <i>VCC</i> | 3.135 | 3.3  | 3.465 | V     |      |
| Case Temperature         | <i>Top</i> | 0     |      | 70    | °C    |      |
| Link Distance with G.652 |            |       |      | 80    | km    |      |

### Diagnostics Monitoring

| Performance Item          | Related Bytes(A0[00] memory) | Monitor Error | Notes |
|---------------------------|------------------------------|---------------|-------|
| Module temperature        | 22 to 23                     | +/-3°C        | 1, 2  |
| Module voltage            | 26 to 27                     | < 3%          | 2     |
| LD Bias current           | 42 to 49                     | < 10%         | 2     |
| Transmitter optical power | 50 to 57                     | < 3dB         | 2     |
| Receiver optical power    | 34 to 41                     | < 3dB         | 2     |

#### Notes:

1. Actual temperature test point is fixed on module case around Laser.
2. Full operating temperature range

**Transmitter Electro-optical Characteristics**

| Parameter  | Symbol                     | Min.                               | Typ.     | Max.    | Units | Note         |
|--|----------------------------|------------------------------------|----------|---------|-------|--------------|
| Power Consumption  |                            |                                    |          | 6.5     | W     |              |
| Supply Current   | <i>I<sub>cc</sub></i>      |                                    |          | 1.8759  | A     | Steady state |
| Data Rate, each lane   |                            |                                    | 25.78125 |         | Gbps  |              |
| Differential Voltage pk-pk   | <i>V<sub>pp</sub></i>      |                                    |          | 900     | mV    | At 1MHz      |
| Common Mode Voltage  | <i>V<sub>cm</sub></i>      | -350                               |          | 2850    | mV    |              |
| Transition time  | <i>Trise/Tfall</i>         | 10                                 |          |         | ps    | 20%~80%      |
| Differential Termination Resistance Mismatch                       |                            |                                    |          | 10      | %     |              |
| Eye width  | EW15                       | 0.46                               |          |         | UI    |              |
| Eye height   | EH15                       | 95                                 |          |         | mV    |              |
| Signaling Speed per Lane   |                            | 25.78125 ± 100 ppm                 |          |         | Gb/s  |              |
| Transmit Wavelength  |                            | 1294.53                            |          | 1296.59 | nm    |              |
|  |                            | 1299.02                            |          | 1301.09 | nm    |              |
|  |                            | 1303.54                            |          | 1305.63 | nm    |              |
|  |                            | 1308.09                            |          | 1310.19 | nm    |              |
| Side-Mode Suppression Ratio  | <i>SMSR</i>                | 30                                 |          |         | dB    |              |
| Total Average Launch Power   | <i>PT</i>                  | 8                                  |          | 12.5    | dBm   |              |
| Average Launch Power, each Lane                                    | <i>PAVG</i>                | 2                                  |          | 6.5     | dBm   |              |
| Extinction Ratio   | <i>ER</i>                  | 6                                  |          |         | dB    |              |
| Difference in Launch Power between any Two Lanes (Average and OMA) | <i>P<sub>tx,diff</sub></i> |                                    |          | 3       | dBm   |              |
| Average launch power of OFF transmitter, each lane                 | <i>P<sub>off</sub></i>     |                                    |          | -30     | dBm   |              |
| RIN20OMA   | <i>RIN</i>                 |                                    |          | -130    | dB/Hz |              |
| Optical Return Loss Tolerance                                      | <i>TOL</i>                 |                                    |          | 20      | dB    |              |
| Transmitter Reflectance  | <i>RT</i>                  |                                    |          | -12     | dB    |              |
| Mask margin  |                            | 5                                  |          |         | %     |              |
| Eye Mask{X1, X2, X3, Y1, Y2, Y3}                                   |                            | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} |          |         |       | 1            |

**Notes:**

- Sensitivity is specified at BER@5E-5 with FEC

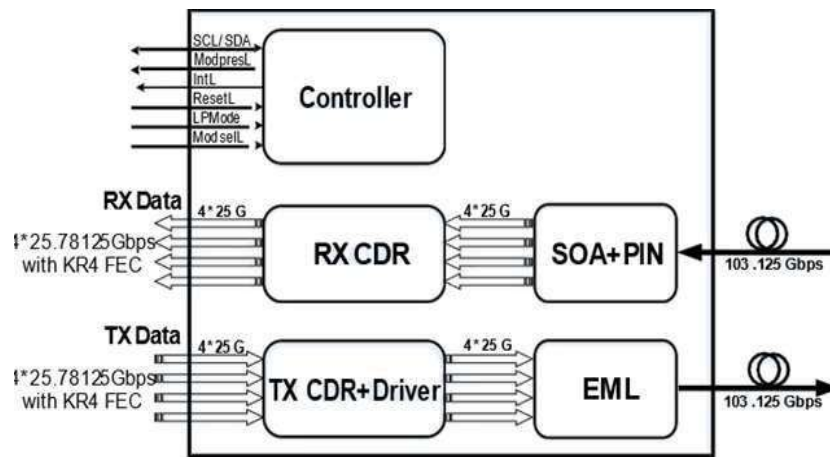
**Receiver Electro-optical Characteristics**

| Parameter                                    | Symbol                     | Min.    | Typ.     | Max.   | Units | Note     |
|--|----------------------------|---------|----------|--------|-------|----------|
| Data Rate, each lane                         |                            |         | 25.78125 |        | Gbps  |          |
| Differential Termination Resistance mismatch |                            |         |          | 10     | %     | At 1 MHz |
| Differential output voltage swing            | <i>V<sub>out, pp</sub></i> |         |          | 900    | mV    |          |
| Common Mode Noise, RMS                       | <i>V<sub>rms</sub></i>     |         |          | 17.5   | mV    |          |
| Transition time                              | <i>Trise/Tfall</i>         | 12      |          |        | ps    | 20%~80%  |
| Eye width                                    | EW15                       | 0.57    |          |        | UI    |          |
| Eye height                                   | EH15                       | 228     |          |        | mV    |          |
| Signaling Speed per Lane                     |                            |         | 25.78125 |        | Gbps  |          |
| Receive wavelength                           |                            | 1294.53 |          | 1296.6 | nm    |          |
|  |                            | 1299.02 |          | 1301.1 | nm    |          |
|  |                            | 1303.54 |          | 1305.6 | nm    |          |
|  |                            | 1308.09 |          | 1310.2 | nm    |          |

|  |      |     |     |      |     |   |
|--|------|-----|-----|------|-----|---|
| Average Receive Power, each Lane                           |      | -28 |     | -3.5 | dBm |   |
| Receive Power (OMA), each Lane                             |      |     |     | -3.5 | dBm |   |
| Receiver reflectance                                       |      |     |     | -26  | dB  |   |
| Receiver Sensitivity Average, each Lane                    |      |     |     | -28  | dBm | 1 |
| Receiver 3 dB electrical upper cutoff frequency, each lane |      |     |     | 31   | GHz |   |
| Damage Threshold, each Lane                                | THd  | 6.5 |     |      | dBm |   |
| LOS Assert   | LOSA | -40 |     |      | dBm |   |
| LOS Deassert   | LOSD |     | -29 |      | dBm |   |
| LOS Hysteresis   | LOSH | 0.5 |     |      | dBm |   |

**Notes:**

Sensitivity is specified at BER@5E-5 with FEC

**Block Diagram of Transceiver**


This product is designed for 80km optical communication applications. This module contains 4-lane optical transmitter, 4-lane optical receiver and module management block including 2-wire serial interface. The optical signals are multiplexed to a single-mode fiber through an industry standard LC connector.

**ModSell:**

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 modules on a single 2-wire interface bus. When the ModSell is "High", the module shall not respond to or acknowledge any 2-wire interface communication from the host. ModSell signal input node shall be biased to the "High" state in the module. In order to avoid conflicts, the host system shall not attempt 2-wire interface communications within the ModSell de-assert time after any modules are deselected. Similarly, the host shall wait at least for the period of the ModSell assert time before communicating with the newly selected module. The assertion and de-asserting periods of different modules may overlap as long as the above timing requirements are met.

**ResetL :**

The ResetL pin shall be pulled to Vcc in the module. A low level on the ResetL pin for longer than the minimum pulse length ( $t_{Reset\_init}$ ) 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 asserting "low" an IntL signal with the Data\_Not\_Ready bit negated. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset.

**LPMode:**

The LPMode pin shall be pulled up to Vcc in the module. The pin is a hardware control used to put modules into low power mode when high. By using the LPMode pin and a combination of the Power override, Power\_set and High\_Power\_Class\_Enable software control bits (Address A0h, byte 93 bits 0,1,2).

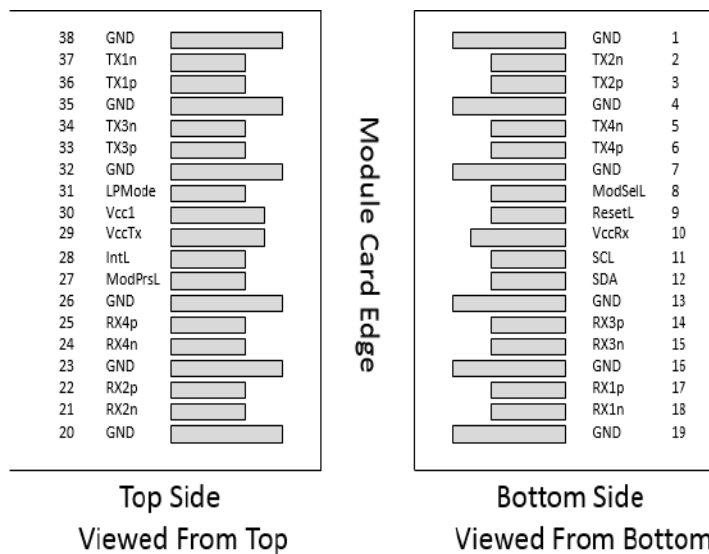
**ModPrsL:**

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

**IntL:**

IntL is an output pin. When IntL is "Low", it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and shall be pulled to host supply voltage on the host board. The INTL pin is deasserted "High" after completion of reset, when byte 2 bit 0 (Data Not Ready) is read with a value of '0' and the flag field is read.

**Pin Assignment (MSA compliant connector)**



**Pin Descriptions**

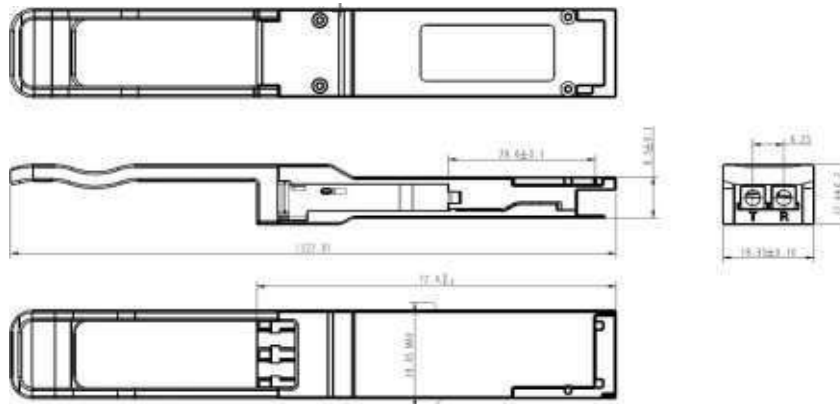
| Pin | Symbol  | Description                         | Notes |
|-----|---------|-------------------------------------|-------|
| 1   | GND     | Ground                              | 1     |
| 2   | Tx2n    | Transmitter Inverted Data Input     |       |
| 3   | Tx2p    | Transmitter Non-Inverted Data Input |       |
| 4   | GND     | Ground                              | 1     |
| 5   | Tx4n    | Transmitter Inverted Data Input     |       |
| 6   | Tx4p    | Transmitter Non-Inverted Data Input |       |
| 7   | GND     | Ground                              | 1     |
| 8   | ModSelL | Module Select                       |       |
| 9   | ResetL  | Module Reset                        |       |
| 10  | Vcc Rx  | +3.3V Power Supply Receiver         |       |
| 11  | SCL     | 2-wire serial interface clock       |       |
| 12  | SDA     | 2-wire serial interface data        |       |
| 13  | GND     | Ground                              | 1     |
| 14  | Rx3p    | Receiver Non-Inverted Data Output   |       |
| 15  | Rx3n    | Receiver Inverted Data Output       |       |

|    |         |                                     |   |
|----|---------|-------------------------------------|---|
| 16 | GND     | Ground                              | 1 |
| 17 | Rx1p    | Receiver Non-Inverted Data Output   |   |
| 18 | Rx1n    | Receiver Inverted Data Output       |   |
| 19 | GND     | Ground                              | 1 |
| 20 | GND     | Ground                              | 1 |
| 21 | Rx2n    | Receiver Inverted Data Output       |   |
| 22 | Rx2p    | Receiver Non-Inverted Data Output   |   |
| 23 | GND     | Ground                              | 1 |
| 24 | Rx4n    | Receiver Non-Inverted Data Output   |   |
| 25 | Rx4p    | Receiver Inverted Data Output       |   |
| 26 | GND     | Ground                              | 1 |
| 27 | ModPrsL | Module Present                      |   |
| 28 | IntL    | Interrupt                           |   |
| 29 | Vcc Tx  | +3.3V Power supply transmitter      |   |
| 30 | Vcc1    | +3.3V Power supply                  |   |
| 31 | LPMODE  | Low Power Mode                      |   |
| 32 | GND     | Ground                              | 1 |
| 33 | Tx3p    | Transmitter Non-Inverted Data Input |   |
| 34 | Tx3n    | Transmitter Inverted Data Input     |   |
| 35 | GND     | Ground                              | 1 |
| 36 | Tx1p    | Transmitter Non-Inverted Data Input |   |
| 37 | Tx1n    | Transmitter Inverted Data Input     |   |
| 38 | GND     | Ground                              | 1 |

**Notes:**

1. Circuit ground is internally isolated from chassis ground

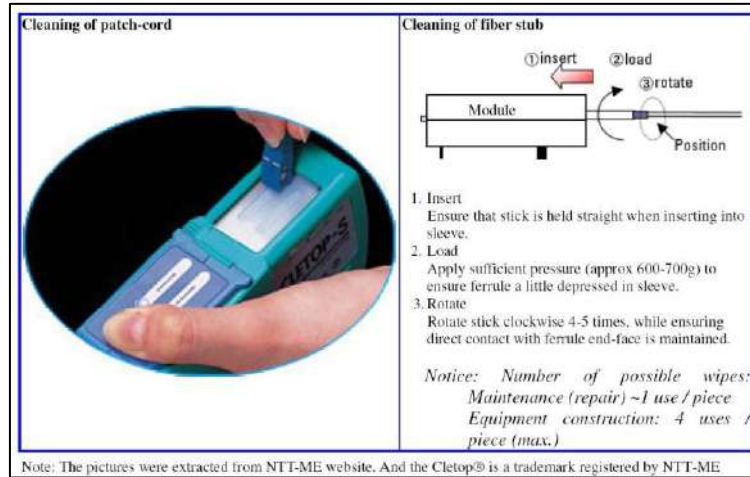
**Dimensions**



Note: Dimensions are in mm, All Dimensions are 0.2mm unless otherwise specified

**Optical Receptacle Cleaning Recommendations:**

All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop<sup>®</sup> stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop<sup>®</sup> cleaning cassette.



**Ordering information:**

| Model Number    | Part Number   | Voltage | Temperature  |
|-----------------|---------------|---------|--------------|
| QSFP28-100G-ZR4 | OPCW-S80-13-C | 3.3V    | 0°C to 70 °C |

Note: All information contained in this document is subject to change without notice.

**Copyright @ Alpha Bridge Technologies Private Limited**

This document is ABTPL Public Information. ABTPL reserves the right to alter, update and otherwise change the information contained in the document from time to time. [www.alphabridge.tech](http://www.alphabridge.tech)