



## QSFP28-100GB-ZR4P-SKY

MSA Compliant 100GBase-ZR4+ QSFP28 Transceiver (SMF, 1295nm to 1309nm, 80/95km, LC, DOM)

### Product Description

This MSA compliant QSFP28 transceiver provides 100GBase-ZR4+ throughput up to 80/95km over single-mode fiber (SMF) using a wavelength of 1295nm to 1309nm via an LC connector. It can operate at temperatures between 0 and 70C. All of our transceivers are built to comply with Multi-Source Agreement (MSA) standards and are uniquely serialized and tested for data-traffic and application to ensure seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

Skylane's transceivers are RoHS compliant and lead-free.

### Features:

- Supports up to 103Gbps
- Power Dissipation 5.5W
- Single 3.3V Power Supply
- Receiver: 4x25Gbps SOA+PIN ROSA
- 4x25Gbps Electrical Interface
- Four 25Gbps EML LAN-WDM lasers on the transmitter side
- Duplex LC Connector
- Hot-pluggable QSFP28 MSA form factor
- Commercial Temperature 0 to 70 Celsius
- I2C interface with integrated Digital Diagnostic Monitoring
- RoHS Compliant and Lead Free



### Applications:

- 100GBase Ethernet

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*For your product safety, please read the following information carefully before any manipulation of the transceiver:*



#### **ESD**

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883G, Method 3015.4 / JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module.



#### **LASER SAFETY**

This is a Class1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

*The optical ports of the module need to be terminated with an optical connector or with a dust plug in order to avoid contamination.*

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## Absolute Maximum Ratings

| Parameter                   | Symbol           | Min. | Typ. | Max. | Unit |
|-----------------------------|------------------|------|------|------|------|
| Maximum Supply Voltage      | V <sub>CC</sub>  | -0.5 |      | 3.6  | V    |
| Storage Temperature         | T <sub>stg</sub> | -40  |      | 85   | °C   |
| Operating Case Temperature  | T <sub>c</sub>   | 0    |      | 70   | °C   |
| Operating Relative Humidity | RH               | 5    |      | 85   | %    |

### Notes:

- Exceeding any one of these values may destroy the device immediately.

## Electrical Characteristics

| Parameter                              | Symbol            | Min.                     | Typ. | Max.  | Unit  | Notes |
|----------------------------------------|-------------------|--------------------------|------|-------|-------|-------|
| Power Supply Voltage                   | V <sub>CC</sub>   | 3.135                    | 3.3  | 3.465 | V     |       |
| Power Dissipation                      | P <sub>DISS</sub> |                          |      | 5.5   | W     |       |
| Transmitter                            |                   |                          |      |       |       |       |
| Differential Data Input Swing Per Lane |                   |                          |      | 900   | mVp-p |       |
| Input Differential Impedance           | Z <sub>IN</sub>   | 85                       | 100  | 115   | Ω     |       |
| Stressed Input Parameters              |                   |                          |      |       |       |       |
| Eye Width                              |                   | 0.46                     |      |       | UI    |       |
| Applied Pk-Pk Sinusoidal Jitter        |                   | IEEE 802.3bm Table 88-13 |      |       |       |       |
| Eye Height                             |                   | 95                       |      |       | mV    |       |
| DC Common-Mode Voltage                 |                   | -350                     |      | 2850  | mV    |       |
| Receiver                               |                   |                          |      |       |       |       |
| Differential Output Amplitude          |                   | 200                      |      | 900   | mVp-p |       |
| Output Differential Impedance          | Z <sub>OUT</sub>  | 85                       | 100  | 115   | Ω     |       |
| Eye Width                              |                   | 0.57                     |      |       | UI    |       |
| Eye Height Differential                |                   | 228                      |      |       | mV    |       |
| Vertical Eye Closure                   |                   |                          |      | 5.5   | dB    |       |

## Optical Characteristics

| Parameter                                               | Symbol                             | Min.    | Typ.    | Max.    | Unit | Notes |
|---------------------------------------------------------|------------------------------------|---------|---------|---------|------|-------|
| Transmitter                                             |                                    |         |         |         |      |       |
| Signaling Speed Per Lane                                | BRAVE                              |         | 25.78   |         | Gbps |       |
| Data Rate Variation                                     |                                    | -100    |         | 100     | ppm  |       |
| Lane 0 Center Wavelength                                | $\lambda_{C0}$                     | 1294.53 | 1295.56 | 1296.59 | nm   |       |
| Lane 1 Center Wavelength                                | $\lambda_{C1}$                     | 1299.02 | 1300.05 | 1301.09 | nm   |       |
| Lane 2 Center Wavelength                                | $\lambda_{C2}$                     | 1303.54 | 1304.58 | 1305.63 | nm   |       |
| Lane 3 Center Wavelength                                | $\lambda_{C3}$                     | 1308.09 | 1309.14 | 1310.19 | nm   |       |
| Spectral Width (-20dB)                                  | $\Delta\lambda$                    |         |         | 1       | nm   |       |
| Total Average Output Power                              | POUT                               |         |         | 13      | dBm  |       |
| Average Launch Power Per Lane                           | P <sub>each</sub>                  | 3       |         | 7       | dBm  | 1     |
| Optical Modulation Amplitude Per Lane                   | POMA                               | 3.7     |         | 7.8     | dBm  |       |
| Average Launch Power of Off Transmitter Per Lane        | P <sub>off</sub>                   |         |         | -30     | dBm  |       |
| Side-Mode Suppression Ratio                             | SMSR                               | 30      |         |         | dB   |       |
| Transmitter Dispersion Penalty Per Lane                 | TDP                                |         |         | 3       | dB   | 4     |
| Difference in Launch Power Between Any Two Lanes        |                                    |         |         | 3.6     | dB   |       |
| Optical Return Loss Tolerance                           |                                    |         |         | 20      | dB   |       |
| Transmitter Reflectance                                 |                                    |         |         | -26     |      |       |
| Extinction Ratio                                        | ER                                 | 6       | 8       |         | dB   |       |
| Transmitter Eye Mask Definition: X1, X2, X3, Y1, Y2, Y3 | (0.25, 0.4, 0.45, 0.25, 0.28, 0.4) |         |         |         |      |       |
| Receiver                                                |                                    |         |         |         |      |       |
| Signaling Speed Per Lane                                | BRAVE                              |         | 25.78   |         | Gbps |       |
| Data Rate Variation                                     |                                    | -100    |         | 100     | ppm  |       |
| Damage Threshold Per Lane (Minimum)                     | THd                                |         |         | 5.5     | dBm  | 3     |
| Lane 0 Center Wavelength                                | $\lambda_{C0}$                     | 1294.53 | 1295.56 | 1296.59 | nm   |       |
| Lane 1 Center Wavelength                                | $\lambda_{C1}$                     | 1299.02 | 1300.05 | 1301.09 | nm   |       |
| Lane 2 Center Wavelength                                | $\lambda_{C2}$                     | 1303.54 | 1304.58 | 1305.63 | nm   |       |
| Lane 3 Center Wavelength                                | $\lambda_{C3}$                     | 1308.09 | 1309.14 | 1310.19 | nm   |       |
| Average Receive Power Per Lane                          | Rx_pow                             | -31     |         | 4.5     | dBm  | 2     |
| Receiver Overload Per Lane                              | Psat                               | 4.5     |         |         | dBm  |       |
| Receive Sensitivity Average Per Lane                    | Rx_sens                            |         |         | -29     | dBm  | 4     |
| Stressed Sensitivity Per Lane                           | SRS                                |         |         | -25.1   | GHz  | 4     |
| Receiver Reflectance                                    |                                    |         |         | -26     | dBm  |       |
| LOS Assert                                              | LOSA                               | -40     |         |         | dBm  |       |
| LOS De-Assert                                           | LOSD                               |         |         | -31.5   | dBm  |       |
| LOS Hysteresis                                          |                                    | 0.5     |         |         | dB   |       |

**Notes:**

1. Average launch power, per lane (minimum), is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Average receive power, per lane (minimum), 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.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.
4. Measured with conformance test signal for BER=5E<sup>-5</sup> @25.78Gbps and PRBS<sup>31</sup>-1.

**Pin Descriptions**

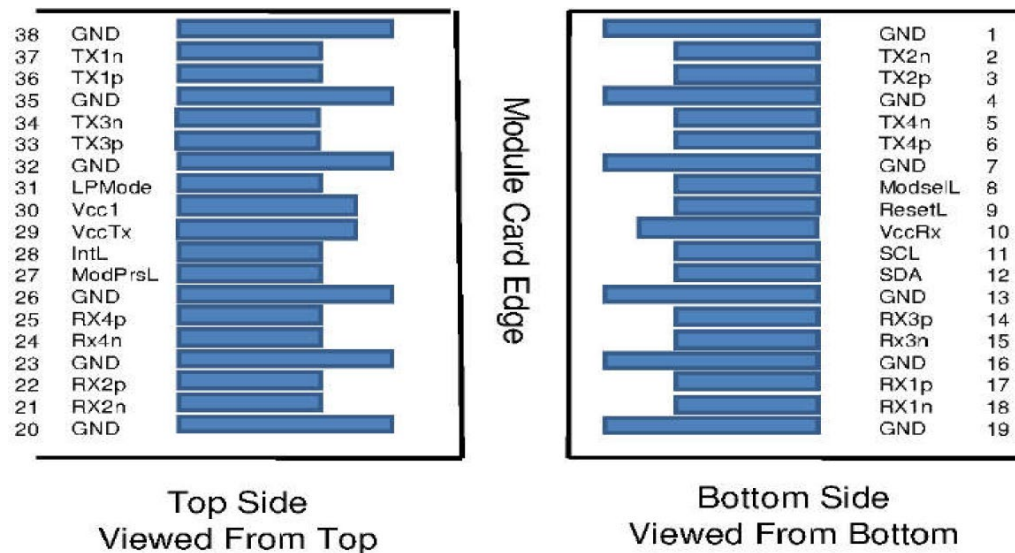
| Pin | Logic       | Symbol  | Name/Description                     | Plug Sequence | Notes |
|-----|-------------|---------|--------------------------------------|---------------|-------|
| 1   |             | GND     | Module Ground.                       | 1             | 1     |
| 2   | CML-I       | Tx2-    | Transmitter Inverted Data Input.     | 3             |       |
| 3   | CML-I       | Tx2+    | Transmitter Non-Inverted Data Input. | 3             |       |
| 4   |             | GND     | Module Ground.                       | 1             | 1     |
| 5   | CML-I       | Tx4-    | Transmitter Inverted Data Input.     | 3             |       |
| 6   | CML-I       | Tx4+    | Transmitter Non-Inverted Data Input. | 3             |       |
| 7   |             | GND     | Module Ground.                       | 1             | 1     |
| 8   | LVTTL-I     | ModSelL | Module Select.                       | 3             |       |
| 9   | LVTTL-I     | ResetL  | Module Reset.                        | 3             |       |
| 10  |             | VccRx   | +3.3V Receiver Power Supply.         | 2             | 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     | Module Ground.                       | 1             | 1     |
| 14  | CML-O       | Rx3+    | Receiver Non-Inverted Data Output.   | 3             |       |
| 15  | CML-O       | Rx3-    | Receiver Inverted Data Output.       | 3             |       |
| 16  |             | GND     | Module Ground.                       | 1             | 1     |
| 17  | CML-O       | Rx1+    | Receiver Non-Inverted Data Output.   | 3             |       |
| 18  | CML-O       | Rx1-    | Receiver Inverted Data Output.       | 3             |       |
| 19  |             | GND     | Module Ground.                       | 1             | 1     |
| 20  |             | GND     | Module Ground.                       | 1             | 1     |
| 21  | CML-O       | Rx2-    | Receiver Inverted Data Output.       | 3             |       |
| 22  | CML-O       | Rx2+    | Receiver Non-Inverted Data Output.   | 3             |       |
| 23  |             | GND     | Module Ground.                       | 1             | 1     |
| 24  | CML-O       | Rx4-    | Receiver Inverted Data Output.       | 3             |       |
| 25  | CML-O       | Rx4+    | Receiver Non-Inverted Data Output.   | 3             |       |
| 26  |             | GND     | Module Ground.                       | 1             | 1     |

|    |         |         |                                      |   |   |
|----|---------|---------|--------------------------------------|---|---|
| 27 | LVTTL-O | ModPrsL | Module Present.                      | 3 |   |
| 28 | LVTTL-O | IntL    | Interrupt.                           | 3 |   |
| 29 |         | VccTx   | +3.3V Transmitter Power Supply.      | 2 | 2 |
| 30 |         | Vcc1    | +3.3V Power Supply.                  | 2 | 2 |
| 31 | LVTTL-I | LPMode  | Low-Power Mode.                      | 3 |   |
| 32 |         | GND     | Module Ground.                       | 1 | 1 |
| 33 | CML-I   | Tx3+    | Transmitter Non-Inverted Data Input. | 3 |   |
| 34 | CML-I   | Tx3-    | Transmitter Inverted Data Input.     | 3 |   |
| 35 |         | GND     | Module Ground.                       | 1 | 1 |
| 36 | CML-I   | Tx1+    | Transmitter Non-Inverted Data Input. | 3 |   |
| 37 | CML-I   | Tx1-    | Transmitter Inverted Data Input.     | 3 |   |
| 38 |         | GND     | Module Ground.                       | 1 | 1 |

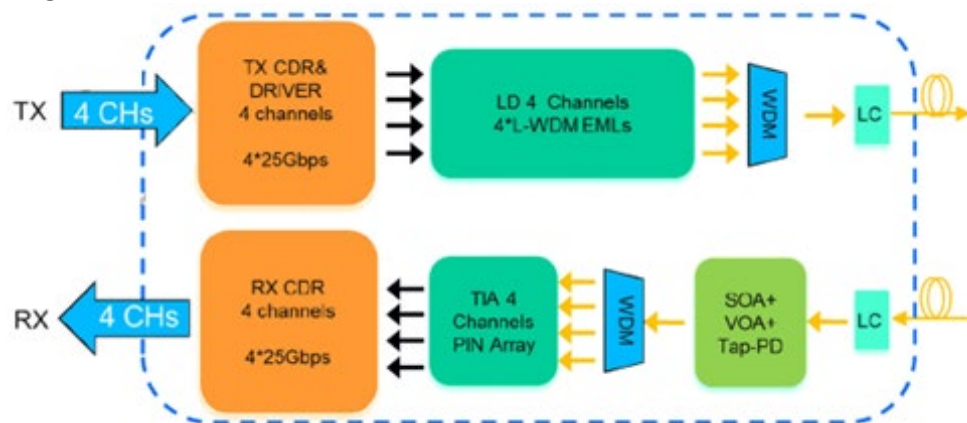
#### Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 module, and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. VccRx, Vcc1, and VccTx are the receiver and transmitter power supplies and shall be applied concurrently. VccRx, Vcc1, and VccTx may be internally connected within the QSFP28 module in any combination. The connector pins are each rated for a maximum current of 1000mA.

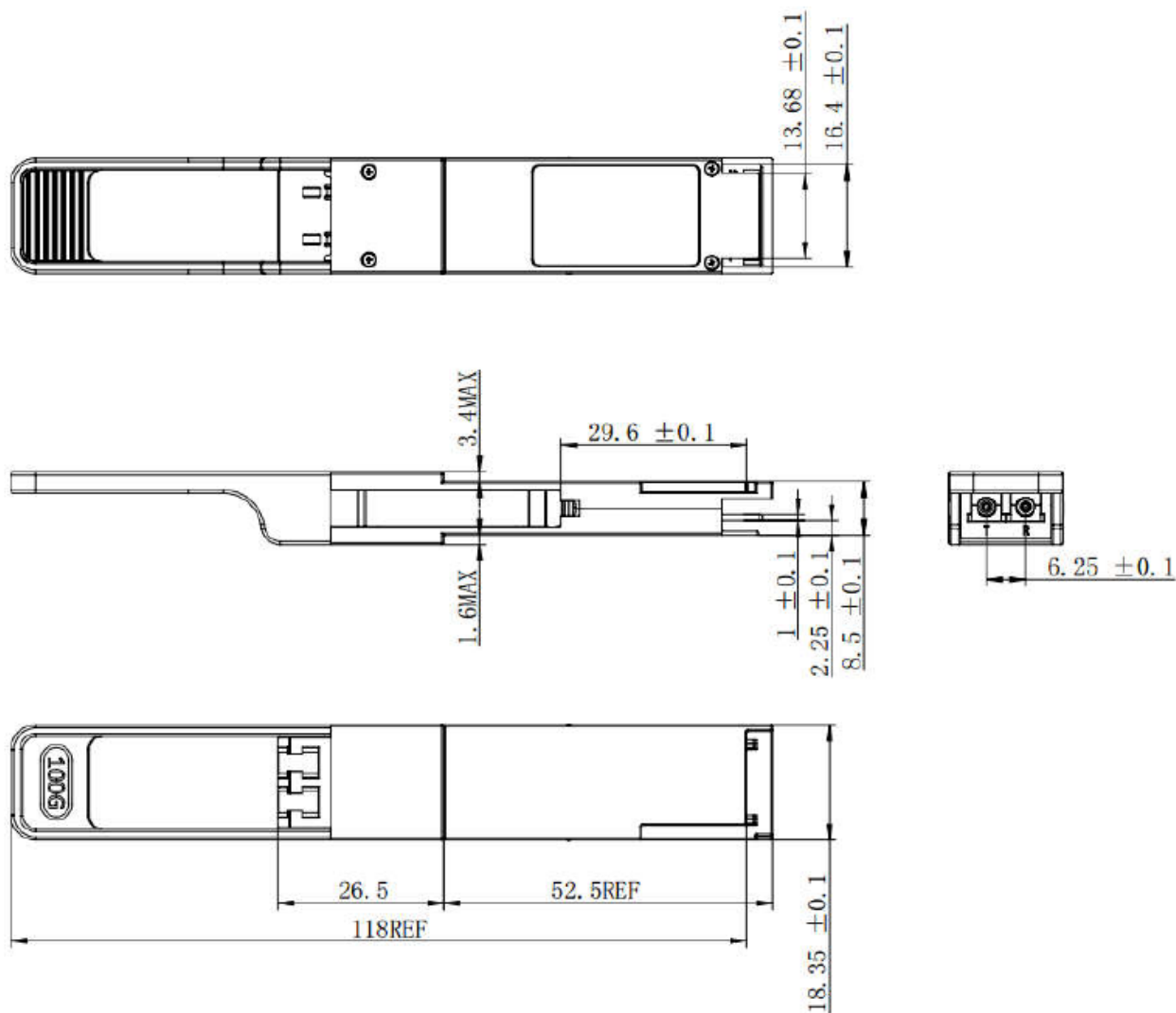
#### Electrical Pin-Out Details



Function Block Diagram



Mechanical Specifications



# About Skylane Optics

Skylane is a leading provider of transceivers for optical communication.

We offer an extensive portfolio for the enterprise, access, datacenter and metropolitan fiber optical market as well as for smart home applications and home networks.

We cover the European, South American and North American market with a strong partner network and have offices in Belgium, Brazil, Sweden and USA.

Our offerings are characterized by high quality and performance. In combination with our strong technical support, we enable our customers to build cost optimized network solutions.

We offer an extensive range of high-quality products including transceivers (Optical and copper), Active Optical Cable (AOC), Direct Attach Cable (DAC), Mux/Demux, Coding Box.

