



## QBP13002E0PFGUW

Infinera® Compatible 400GBase-DR4 QSFP-DD Transceiver (SMF, 1310nm, 2km, MPO, DOM)

### Product Description

This Infinera® compatible QSFP-DD transceiver provides 400GBase-DR4 throughput up to 2km over single-mode fiber (SMF) using a wavelength of 1310nm via an MPO connector. Our transceiver is built to meet or exceed OEM specifications and is guaranteed to be 100% compatible with Infinera®. It has been programmed, uniquely serialized, and tested for data-traffic and application to ensure that it will initialize and perform identically. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

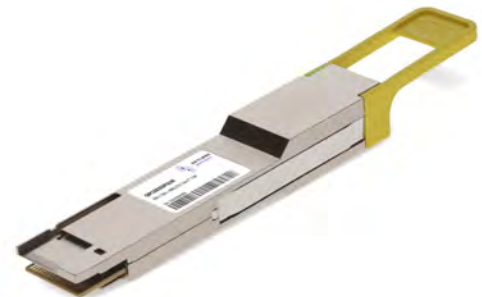
Skylane's transceivers are RoHS compliant and lead-free.

### Features:

- Compliant with IEEE 802.3bs Standard: 400GAUI-8 Electrical Interface
- Compliant with QSFP-DD MSA HW Rev. 5.1 Type 2 Housing with MPO-12 Connector
- Compliant with IEEE 802.3cu Standard: 4x100GBASE-FR1 Optical Interface
- Maximum Power Consumption: 9W
- 2-Wire Serial Interface with Digital Diagnostic Monitoring
- Compliant with QSFP-DD CMIS Rev. 4.0
- Class 1 Laser
- Complies with EU Directive 2011/65/EU
- RoHS Compliant and Lead-Free
- Operating Temperature: 0 to 70 Celsius
- RoHS Compliant and Lead Free

### Applications:

- 400GBASE-DR4+



*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.*

## Absolute Maximum Ratings

| Parameter                                  | Symbol | Min. | Typ.   | Max. | Unit | Notes |
|--------------------------------------------|--------|------|--------|------|------|-------|
| Storage Temperature                        | Tstg   | -40  |        | 85   | °C   |       |
| Operating Case Temperature                 | Tc     | 0    |        | 70   | °C   |       |
| Power Supply Voltage                       | Vcc    | -0.5 |        | 3.6  | V    |       |
| Relative Humidity                          | RH     | 5    |        | 95   | %    |       |
| Operating Distance                         | D      | 2    |        | 2000 | m    |       |
| Signaling Rate Per Lane                    | SRL    |      | 53.125 |      | GBd  | 1     |
| Maximum Power Dissipation                  | PD     |      |        | 9    | W    |       |
| Maximum Power Dissipation (Low-Power Mode) | PDLP   |      |        | 1.5  | W    |       |

### Notes:

1. PAM4.

## Electrical Characteristics

| Parameter                                  | Symbol | Min.  | Typ. | Max.    | Unit | Notes |
|--------------------------------------------|--------|-------|------|---------|------|-------|
| Supply Voltage                             | Vcc    | 3.135 | 3.3  | 3.465   | V    |       |
| Control Input Voltage                      | VI     | -0.3  |      | Vcc+0.5 | V    |       |
| Instantaneous Peak Current at Hot Plug     | Icc_IP |       |      | 3600    | mA   |       |
| Sustained Peak Current at Hot Plug         | Icc_SP |       |      | 2970    | mA   |       |
| Power Supply Noise Tolerance (10Hz-10MHz)  |        |       |      | 66      | mV   |       |
| Rx Differential Data Output Load           |        |       | 100  |         | Ω    |       |
| 2-Wire Serial Interface Clock Rate         |        |       |      | 400     | kHz  |       |
| Transmitter (Module Input)                 |        |       |      |         |      |       |
| Differential Pk-Pk Input Voltage Tolerance |        | 900   |      |         | mV   |       |
| Differential Termination Mismatch          |        |       |      | 10      | %    |       |
| Single-Ended Voltage Tolerance Range       |        | -0.4  |      | 3.3     | V    |       |
| DC Common-Mode Voltage                     |        | -350  |      | 2850    | mV   |       |
| Receiver (Module Output)                   |        |       |      |         |      |       |
| AC Common-Mode Output Voltage (RMS)        |        |       |      | 17.5    | mV   |       |
| Differential Output Voltage                |        |       |      | 900     | mV   |       |
| Near-End Eye Height (Differential)         |        | 70    |      |         | mV   |       |
| Far-End Eye Height (Differential)          |        | 30    |      |         | mV   |       |
| Far-End Pre-Cursor Ratio                   |        | -4.5  |      | 2.5     | %    |       |
| Differential Termination Mismatch          |        |       |      | 10      | %    |       |
| Transition Time (Minimum, 20-80%)          |        | 9.5   |      |         | ps   |       |
| DC Common-Mode Voltage                     |        | -350  |      | 2850    | mV   |       |
| Low-Speed Signal                           |        |       |      |         |      |       |
| Module Output SCL and SDA                  | VOL    | 0     |      | 0.4     | V    |       |

|                               |     |         |  |         |   |  |
|-------------------------------|-----|---------|--|---------|---|--|
| Module Input SCL and SDA      | VIL | -0.3    |  | Vcc*0.3 | V |  |
|                               | VIH | Vcc*0.7 |  | Vcc+0.5 | V |  |
| InitMode, ResetL, and ModSelL | VIL | -0.3    |  | 0.8     | V |  |
|                               | VIH | 2       |  | Vcc+0.3 | V |  |
| IntL                          | VOL | 0       |  | 0.4     | V |  |
|                               | VOH | Vcc-0.5 |  | Vcc+0.3 | V |  |

## Optical Characteristics

| Parameter                                                           |                       | Symbol      | Min.       | Typ. | Max.      | Unit  | Notes |
|---------------------------------------------------------------------|-----------------------|-------------|------------|------|-----------|-------|-------|
| Transmitter                                                         |                       |             |            |      |           |       |       |
| Wavelength                                                          |                       | $\lambda_C$ | 1304.5     | 1311 | 1317.5    | nm    |       |
| Side-Mode Suppression Ratio                                         |                       | SMSR        | 30         |      |           | dB    |       |
| Average Launch Power Per Lane                                       |                       | AOPL        | -3.1       |      | 4         | dBm   | 1     |
| Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ) Per Lane |                       | TOMA        |            |      | 4.2       | dBm   |       |
| Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ) Per Lane | TDECQ < 1.4dB         | TOMA        | -0.1       |      |           | dBm   |       |
|                                                                     | 1.4dB ≤ TDECQ ≤ 3.4dB |             | -1.5+TDECQ |      |           |       |       |
| Transmitter and Dispersion Eye Closure for PAM4 (TDECQ) Per Lane    |                       | TDECQ       |            |      | 3.4       | dB    |       |
| Transmitter Eye Closure for PAM4 (TECQ)                             |                       | TECQ        |            |      | 3.4       | dB    |       |
| TDECQ - TECQ                                                        |                       |             |            |      | 2.5       | dB    |       |
| Over/Under-Shoot                                                    |                       |             |            |      | 22        | %     |       |
| Transmitter Power Excursion                                         |                       |             |            |      | 2         | dBm   |       |
| Average Launch Power of Off Transmitter Per Lane                    |                       | Poff        |            |      | -15       | dBm   |       |
| Extinction Ratio Per Lane                                           |                       | ER          | 3.5        |      |           | dB    |       |
| RIN <sub>17.1</sub> OMA                                             |                       | RIN         |            |      | -136      | dB/Hz |       |
| Optical Return Loss Tolerance                                       |                       | ORL         |            |      | 17.1      | dB    |       |
| Transmitter Reflectance                                             |                       | TR          |            |      | -26       | dB    |       |
| Transmitter Transition Time                                         |                       |             |            |      | 17        | ps    |       |
| Receiver                                                            |                       |             |            |      |           |       |       |
| Wavelength                                                          |                       | $\lambda_C$ | 1304.5     | 1311 | 1317.5    | nm    |       |
| Damage Threshold Per Lane                                           |                       | AOPD        | 5          |      |           | dBm   |       |
| Average Receive Power Per Lane                                      |                       | AOPR        | -7.1       |      | 4         | dBm   | 2     |
| Receive Power (OMA <sub>outer</sub> ) Per Lane                      |                       | OMAR        |            |      | 4.2       | dBm   |       |
| Receiver Reflectance                                                |                       | RR          |            |      | -26       | dB    |       |
| Receiver Sensitivity (OMA <sub>outer</sub> ) Per Lane               | TECQ < 1.4dB          | SOMA        |            |      | -4.5      | dBm   |       |
|                                                                     | 1.4dB ≤ TECQ ≤ 3.4dB  |             |            |      | -5.9+TECQ |       |       |
| Stressed Receiver Sensitivity (OMA <sub>outer</sub> ) Per Lane      |                       | SRS         |            |      | -2.5      | dBm   | 3     |
| Conditions of Stressed Receiver Sensitivity Test                    |                       |             |            |      |           |       |       |
| Stressed Eye Closure for PAM4 (SECQ)                                |                       |             |            | 3.4  |           | dB    |       |

**Notes:**

1. Average launch power, per lane (minimum), is informative and not the principal indicator of signal strength.
2. Average receive power, per lane (minimum), is informative and not the principal indicator of signal strength.
3. Measured with conformance test signal at TP3 for the BER =  $2.4 \times 10^{-4}$ .

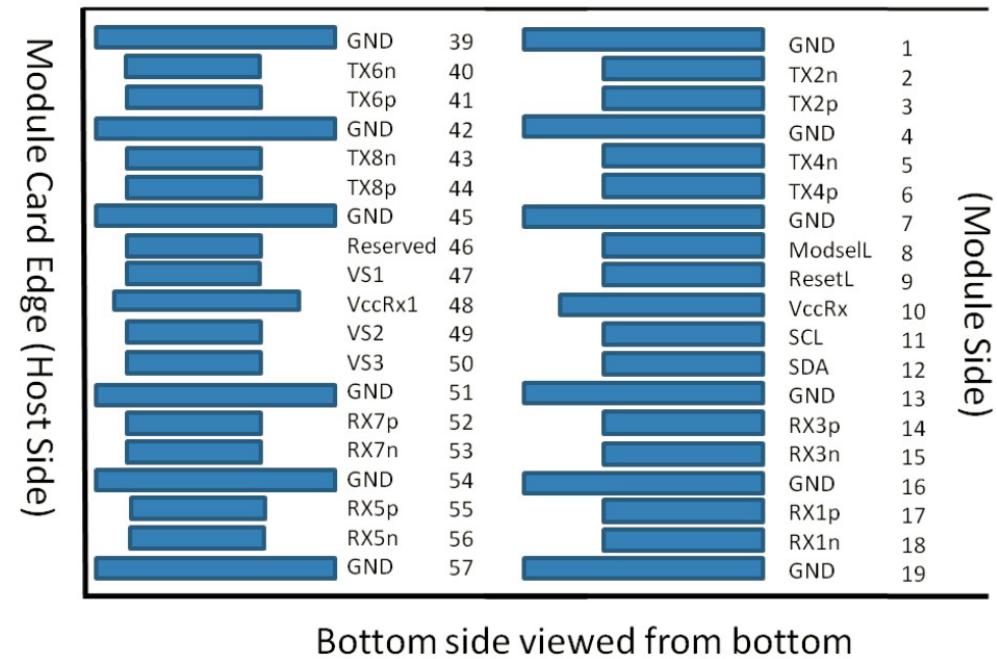
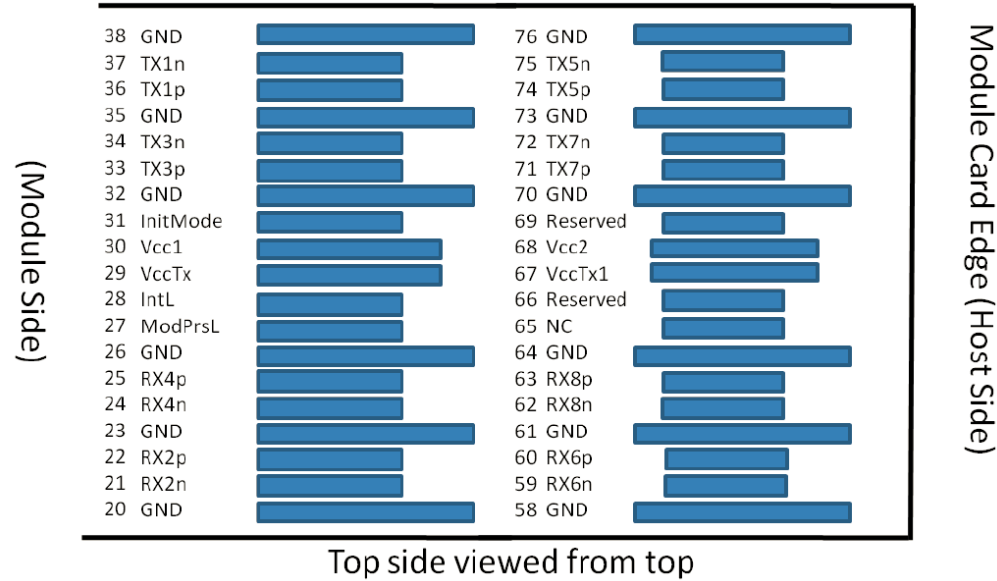
**Pin Description**

| Pin | Logic       | Symbol   | Name/Description                     | Notes |
|-----|-------------|----------|--------------------------------------|-------|
| 1   |             | GND      | Module Ground.                       |       |
| 2   | CML-I       | Tx2n     | Transmitter Inverted Data Input.     |       |
| 3   | CML-I       | Tx2p     | Transmitter Non-Inverted Data Input. |       |
| 4   |             | GND      | Module Ground.                       |       |
| 5   | CML-I       | Tx4n     | Transmitter Inverted Data Input.     |       |
| 6   | CML-I       | Tx4p     | Transmitter Non-Inverted Data Input. |       |
| 7   |             | GND      | Module Ground.                       |       |
| 8   | LVTTL-I     | ModSelL  | Module Select.                       |       |
| 9   | LVTTL-I     | ResetL   | Module Reset.                        |       |
| 10  |             | VccRx    | +3.3V Receiver Power Supply.         |       |
| 11  | LVC MOS-I/O | SCL      | 2-Wire Serial Interface Clock.       |       |
| 12  | LVC MOS-I/O | SDA      | 2-Wire Serial Interface Data.        |       |
| 13  |             | GND      | Module Ground.                       |       |
| 14  | CML-O       | Rx3p     | Receiver Non-Inverted Data Output.   |       |
| 15  | CML-O       | Rx3n     | Receiver Inverted Data Output.       |       |
| 16  |             | GND      | Module Ground.                       |       |
| 17  | CML-O       | Rx1p     | Receiver Non-Inverted Data Output.   |       |
| 18  | CML-O       | Rx1n     | Receiver Inverted Data Output.       |       |
| 19  |             | GND      | Module Ground.                       |       |
| 20  |             | GND      | Module Ground.                       |       |
| 21  | CML-O       | Rx2n     | Receiver Inverted Data Output.       |       |
| 22  | CML-O       | Rx2p     | Receiver Non-Inverted Data Output.   |       |
| 23  |             | GND      | Module Ground.                       |       |
| 24  | CML-O       | Rx4n     | Receiver Inverted Data Output.       |       |
| 25  | CML-O       | Rx4p     | Receiver Non-Inverted Data Output.   |       |
| 26  |             | GND      | Module Ground.                       |       |
| 27  | LVTTL-O     | ModPrsL  | Module Present.                      |       |
| 28  | LVTTL-O     | IntL     | Interrupt.                           |       |
| 29  |             | VccTx    | +3.3V Transmitter Power Supply.      |       |
| 30  |             | Vcc1     | +3.3V Power Supply.                  |       |
| 31  | LVTTL-I     | InitMode | Initialization Mode.                 |       |
| 32  |             | GND      | Module Ground.                       |       |

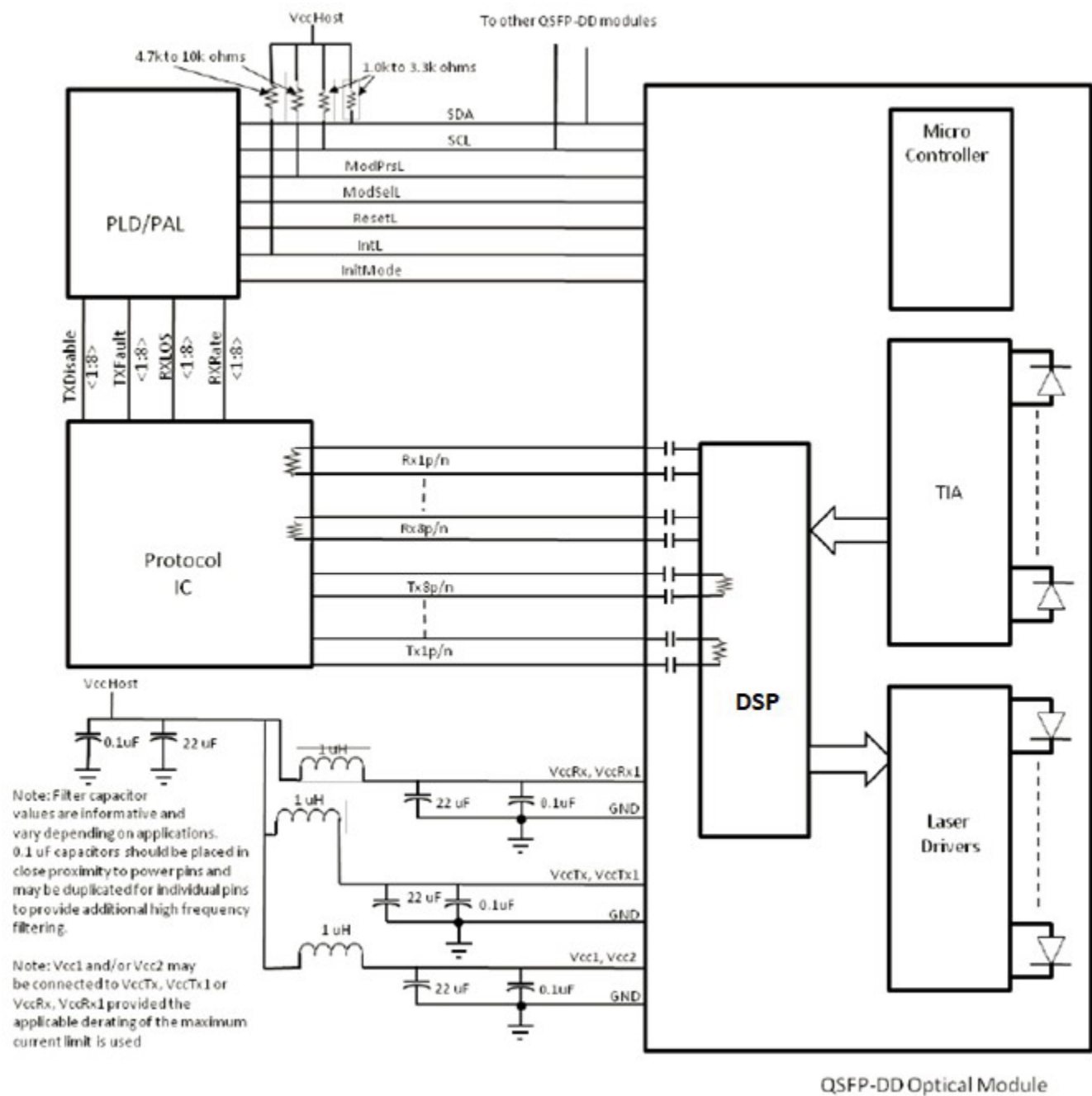
|    |       |          |                                      |  |
|----|-------|----------|--------------------------------------|--|
| 33 | CML-I | Tx3p     | Transmitter Non-Inverted Data Input. |  |
| 34 | CML-I | Tx3n     | Transmitter Inverted Data Input.     |  |
| 35 |       | GND      | Module Ground.                       |  |
| 36 | CML-I | Tx1p     | Transmitter Non-Inverted Data Input. |  |
| 37 | CML-I | Tx1n     | Transmitter Inverted Data Input.     |  |
| 38 |       | GND      | Module Ground.                       |  |
| 39 |       | GND      | Module Ground.                       |  |
| 40 | CML-I | Tx6n     | Transmitter Inverted Data Input.     |  |
| 41 | CML-I | Tx6p     | Transmitter Non-Inverted Data Input. |  |
| 42 |       | GND      | Module Ground.                       |  |
| 43 | CML-I | Tx8n     | Transmitter Inverted Data Input.     |  |
| 44 | CML-I | Tx8p     | Transmitter Non-Inverted Data Input. |  |
| 45 |       | GND      | Module Ground.                       |  |
| 46 |       | Reserved |                                      |  |
| 47 |       | VS1      | Module Vendor-Specific 1.            |  |
| 48 |       | VccRx1   | +3.3V Receiver Power Supply.         |  |
| 49 |       | VS2      | Module Vendor-Specific 2.            |  |
| 50 |       | VS3      | Module Vendor-Specific 3.            |  |
| 51 |       | GND      | Module Ground.                       |  |
| 52 | CML-O | Rx7p     | Receiver Non-Inverted Data Output.   |  |
| 53 | CML-O | Rx7n     | Receiver Inverted Data Output.       |  |
| 54 |       | GND      | Module Ground.                       |  |
| 55 | CML-O | Rx5p     | Receiver Non-Inverted Data Output.   |  |
| 56 | CML-O | Rx5n     | Receiver Inverted Data Output.       |  |
| 57 |       | GND      | Module Ground.                       |  |
| 58 |       | GND      | Module Ground.                       |  |
| 59 | CML-O | Rx6n     | Receiver Inverted Data Output.       |  |
| 60 | CML-O | Rx6p     | Receiver Non-Inverted Data Output.   |  |
| 61 |       | GND      | Module Ground.                       |  |
| 62 | CML-O | Rx8n     | Receiver Inverted Data Output.       |  |
| 63 | CML-O | Rx8p     | Receiver Non-Inverted Data Output.   |  |
| 64 |       | GND      | Module Ground.                       |  |
| 65 |       | NC       | Not Connected.                       |  |
| 66 |       | Reserved |                                      |  |
| 67 |       | VccTx1   | +3.3V Transmitter Power Supply.      |  |
| 68 |       | Vcc2     | +3.3V Power Supply.                  |  |
| 69 |       | Reserved |                                      |  |
| 70 |       | GND      | Module Ground.                       |  |
| 71 | CML-I | Tx7p     | Transmitter Non-Inverted Data Input. |  |
| 72 | CML-I | Tx7n     | Transmitter Inverted Data Input.     |  |
| 73 |       | GND      | Module Ground.                       |  |

|    |       |      |                                      |  |
|----|-------|------|--------------------------------------|--|
| 74 | CML-I | Tx5p | Transmitter Non-Inverted Data Input. |  |
| 75 | CML-I | Tx5n | Transmitter Inverted Data Input.     |  |
| 76 |       | GND  | Module Ground.                       |  |

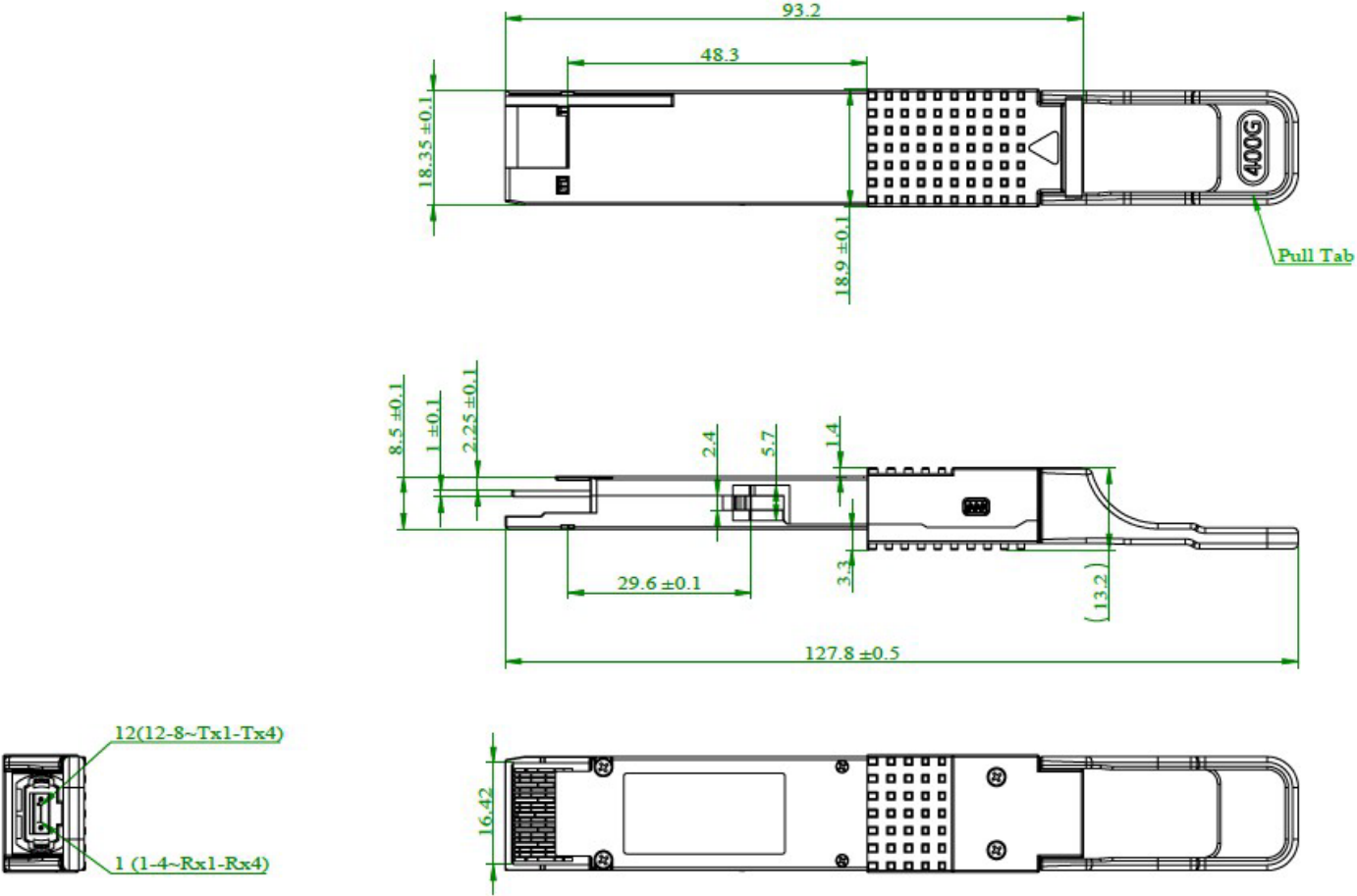
# Electrical Pin-Out Details



Recommended QSFP-DD Host Board Schematic



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.

