



## QDD-400G-DCO-ZRP-SKY

MSA Compliant 400GBase-ZR+ QSFP-DD Transceiver (SMF, Coherent, LC, DOM, OpenZR+)

### Product Description

This MSA compliant QSFP-DD transceiver provides 400GBase-ZR Open ZR+ throughput over Single-mode fiber (SMF) using a coherent wavelength and using an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. 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:

- Hot pluggable QSFP-DD footprint (Type 2A)
- Coherent Receivers
- Tunable C-band Transmitter
- Supports 400/300/200/100Gbps Payload
- Operating Temperature -5 to 80 Celsius
- Duplex LC connector
- 8x 26.5625GBd PAM4 Serial Electrical Interface
- O-FEC (15%) with 11.6dB Net Coding Gain
- 2x 26.5625GBd PAM4 Serial Electrical Interface
- 4x 25.78125GBd NRZ Serial Electrical Interface
- RoHS Compliant and Lead-Free



### Applications:

- 400GBase Ethernet
- Access and Enterprise

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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 | Notes   |
|------------------------------------|--------|-------|----------|-------|------|---------|
| Power Supply Voltage               | VCC    | 3.135 | 3.3      | 3.465 | V    |         |
| Storage Temperature                | Ts     | -40   |          | 85    | °C   |         |
| Case Operating Temperature         | Top    | -5    |          | 80    | °C   |         |
| Relative Humidity (non-condensing) | RH     |       |          | 85    | %    |         |
| Optical Receiver Overload          |        |       |          | 1     | dBm  | 1       |
| Line Baud Rate                     |        |       | 60.13855 |       | GBd  | 2, 3, 4 |
| Line Baud Rate                     |        |       | 30.06927 |       | GBd  | 5       |

### Notes:

1. The optical input to the receiver should not exceed this value. Transmitters must never be directly connected to receivers before ensuring that proper optical attenuation is used
2. ZR400-OFEC-16QAM
3. ZR300-OFEC-8QAM
4. ZR200-OFEC-QPSK
5. ZR100-OFEC-QPSK

### Electrical Characteristics

| Parameter            | Symbol | Min.  | Typ. | Max.  | Unit | Notes |
|----------------------|--------|-------|------|-------|------|-------|
| Power Supply Voltage | Vcc    | 3.135 | 3.3  | 3.465 | V    |       |
| Power Supply Current | Icc    |       |      | 6     | A    |       |
| Power Consumption    | PD     |       | 18.4 | 21.3  | W    |       |
| Power Consumption    | PD     |       |      | 1.5   | W    | 1     |

### Notes:

1. Low power mode

## Optical Characteristics

| Parameter                           | Symbol          | Minimum          | Typical     | Maximum          | Unit     | Notes      |
|-------------------------------------|-----------------|------------------|-------------|------------------|----------|------------|
| Transmitter                         |                 |                  |             |                  |          |            |
| Average Output Power                | P <sub>o</sub>  | -10              | -8.5        | -6               | dBm      | 1, 2       |
| Laser Linewidth                     |                 |                  |             | 300              | kHz      |            |
| Transmitter VOA Dynamic Range       |                 | 10               |             |                  | dB       | 3          |
| Output Power Stability              |                 | -1               |             | 1                | dB       |            |
| In-Band OSNR                        |                 | 40               |             |                  | dB/0.1nm |            |
| Out-of-Band OSNR                    |                 | 35               |             |                  | dB/0.1nm |            |
| Frequency Range                     |                 | 191.275          |             | 196.125          | THz      | 4          |
| Centre Frequency                    |                 | $\nu_T - 1.5$    | $\nu_T$     | $\nu_T + 1.5$    | GHz      | 5          |
| Channel Spacing                     |                 | 6.25             |             |                  | GHz      |            |
| Centre Wavelength Range             | T $\lambda$     | 1528.58          |             | 1567.34          | nm       |            |
| Centre Wavelength                   | T $\lambda$     | $\lambda_T - 15$ | $\lambda_T$ | $\lambda_T + 15$ | pm       |            |
| Receiver                            |                 |                  |             |                  |          |            |
| Receiver Operating Wavelength       | R $\lambda$     | 1528.58          |             | 1567.34          | nm       |            |
| Receiver Sensitivity                | S               |                  |             | -23              | dBm      | 6, 7       |
|                                     | S               |                  |             | -30              | dBm      | 8          |
|                                     | S               |                  |             | -32              | dBm      | 9          |
| Receiver Overload                   | P <sub>OL</sub> | 1                |             |                  | dBm      | 10         |
| Receiver Input Power Range          |                 | -12              |             | 1                | dBm      | 11, 12     |
|                                     |                 | -15              |             | 1                | dBm      | 11, 13     |
|                                     |                 | -17              |             | 1                | dBm      | 11, 14     |
|                                     |                 | -20              |             | 1                | dBm      | 11, 15     |
| Extended Receiver Input Power Range |                 | -15              |             | 1                | dBm      | 16         |
| Acquisition Range                   |                 | -3.6             |             | 3.6              | GHz      | 17         |
| Upstream Tx Linewidth               |                 |                  |             | 500              | kHz      |            |
| OSNR Tolerance                      |                 |                  | 21.7        | 22.7             | dB       | 12         |
|                                     |                 |                  | 18.3        | 19.3             | dB       | 13         |
|                                     |                 |                  | 14          | 15               | dB       | 14         |
|                                     |                 |                  | 10.5        | 11               | dB       | 15         |
| Crosstalk Tolerance                 |                 |                  |             | 7                | dB       | 18         |
| Chromatic Dispersion Tolerance      |                 |                  |             | 26000            | ps/nm    | 12, 19     |
|                                     |                 |                  |             | 50000            | ps/nm    | 13, 14, 19 |
|                                     |                 |                  |             | 80000            | ps/nm    | 15, 19     |

**Notes:**

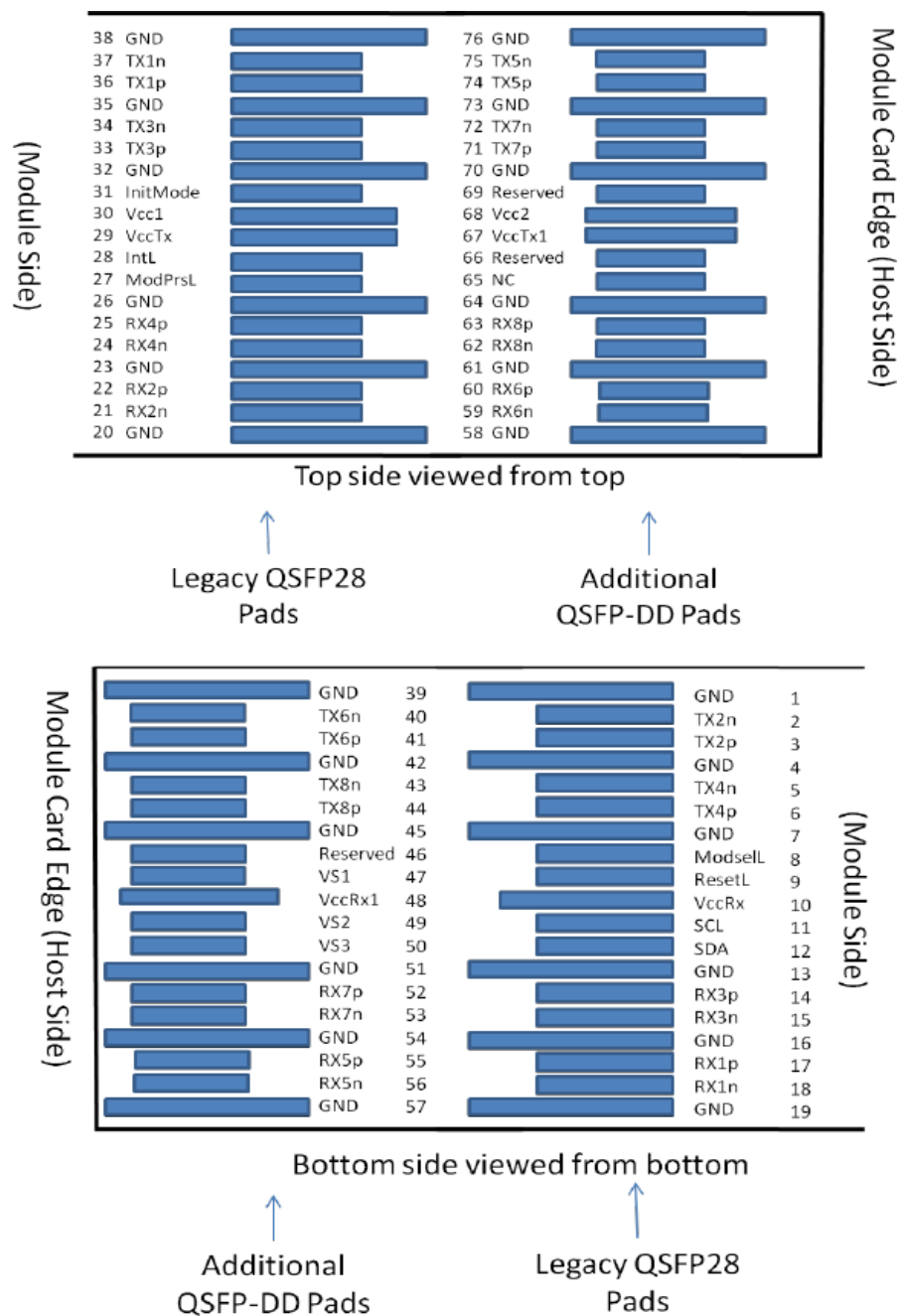
1. Output power coupled into a 9/125  $\mu\text{m}$  single mode fibre
2. The output power is settable in steps of 0.1 dB within the specified wavelength range
3. With Tx VOA attenuation set to minimum
4. Per ITU-T G.694.1 DWDM grid definition
5. Applies also to LO
6. Minimum input power needed to achieve post-FEC BER  $\leq 10^{-15}$ , ZR400-OFEC-16QAM, OSNR > 35dB
7. Minimum input power needed to achieve post-FEC BER  $\leq 10^{-15}$ , ZR300-OFEC-8QAM, OSNR > 35dB
8. Minimum input power needed to achieve post-FEC BER  $\leq 10^{-15}$ , ZR200-OFEC-QPSK, OSNR > 35dB
9. Minimum input power needed to achieve post-FEC BER  $\leq 10^{-15}$ , ZR100-OFEC-QPSK, OSNR > 35dB
10. The optical input to the receiver should not exceed this value. Transmitters must never be directly connected to receivers before ensuring that proper optical attenuation is used
11. An input power in this range guarantees optimum OSNR performance
12. ZR400-OFEC-16QAM
13. ZR300-OFEC-8QAM
14. ZR200-OFEC-QPSK
15. ZR100-OFEC-QPSK
16. With  $\leq 1\text{dB}$  OSNR tolerance degradation
17. Frequency offset between received carrier and LO
18. Ratio of accumulated crosstalk channels to signal power
19. Less than 0.5dB receiver sensitivity penalty compared to OSNR > 35dB

## Pin Descriptions

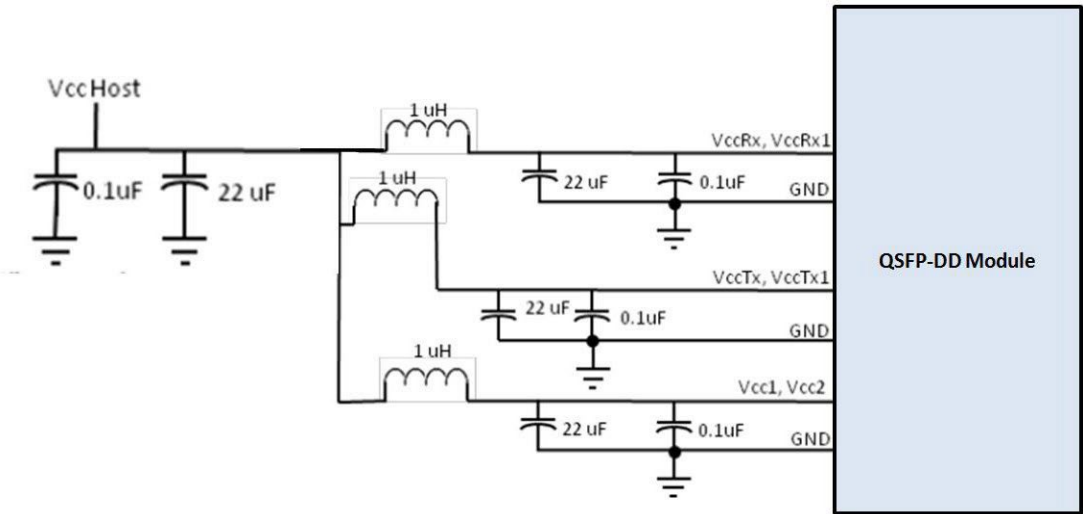
| Pin | Logic       | Symbol   | Name/Descriptions                                                                   | Plug Sequence |
|-----|-------------|----------|-------------------------------------------------------------------------------------|---------------|
| 1   |             | GND      | Ground                                                                              | 1B            |
| 2   | CML-I       | Tx2n     | Transmitter Inverted Data Input                                                     | 3B            |
| 3   | CML-I       | Tx2p     | Transmitter Non-Inverted Data Input                                                 | 3B            |
| 4   |             | GND      | Ground                                                                              | 1B            |
| 5   | CML-I       | Tx4n     | Transmitter Inverted Data Input                                                     | 3B            |
| 6   | CML-I       | Tx4p     | Transmitter Non-Inverted Data Input                                                 | 3B            |
| 7   |             | GND      | Ground                                                                              | 1B            |
| 8   | LVTTL-I     | ModSelL  | Module Select                                                                       | 3B            |
| 9   | LVTTL-I     | ResetL   | Module Reset                                                                        | 3B            |
| 10  |             | VccRx    | +3.3V Power Supply Receiver                                                         | 2B            |
| 11  | LVC MOS-I/O | SCL      | 2-wire serial interface clock                                                       | 3B            |
| 12  | LVC MOS-I/O | SDA      | 2-wire serial interface data                                                        | 3B            |
| 13  |             | GND      | Ground                                                                              | 1B            |
| 14  | CML-O       | Rx3p     | Receiver Non-Inverted Data Output                                                   | 3B            |
| 15  | CML-O       | Rx3n     | Receiver Inverted Data Output                                                       | 3B            |
| 16  | GND         | Ground   | 1B                                                                                  |               |
| 17  | CML-O       | Rx1p     | Receiver Non-Inverted Data Output                                                   | 3B            |
| 18  | CML-O       | Rx1n     | Receiver Inverted Data Output                                                       | 3B            |
| 19  |             | GND      | Ground                                                                              | 1B            |
| 20  |             | GND      | Ground                                                                              | 1B            |
| 21  | CML-O       | Rx2n     | Receiver Inverted Data Output                                                       | 3B            |
| 22  | CML-O       | Rx2p     | Receiver Non-Inverted Data Output                                                   | 3B            |
| 23  |             | GND      | Ground                                                                              | 1B            |
| 24  | CML-O       | Rx4n     | Receiver Inverted Data Output                                                       | 3B            |
| 25  | CML-O       | Rx4p     | Receiver Non-Inverted Data Output                                                   | 3B            |
| 26  |             | GND      | Ground                                                                              | 1B            |
| 27  | LVTTL-O     | ModPrsL  | Module Present                                                                      | 3B            |
| 28  | LVTTL-O     | IntL     | Interrupt                                                                           | 3B            |
| 29  |             | VccTx    | +3.3V Power supply transmitter                                                      | 2B            |
| 30  |             | Vcc1     | +3.3V Power supply                                                                  | 2B            |
| 31  | LVTTL-I     | InitMode | Initialization mode; In legacy QSFP applications, the InitMode pad is called LPMODE | 3B            |
| 32  |             | GND      | Ground                                                                              | 1B            |
| 33  | CML-I       | Tx3p     | Transmitter Non-Inverted Data Input                                                 | 3B            |
| 34  | CML-I       | Tx3n     | Transmitter Inverted Data Input                                                     | 3B            |
| 35  |             | GND      | Ground                                                                              | 1B            |
| 36  | CML-I       | Tx1p     | Transmitter Non-Inverted Data Input                                                 | 3B            |
| 37  | CML-I       | Tx1n     | Transmitter Inverted Data Input                                                     | 3B            |
| 38  |             | GND      | Ground                                                                              | 1B            |
| 39  |             | GND      | Ground                                                                              | 1A            |
| 40  | CML-I       | Tx6n     | Transmitter Inverted Data Input                                                     | 3A            |

|    |       |          |                                     |    |
|----|-------|----------|-------------------------------------|----|
| 41 | CML-I | Tx6p     | Transmitter Non-Inverted Data Input | 3A |
| 42 |       | GND      | Ground                              | 1A |
| 43 | CML-I | Tx8n     | Transmitter Inverted Data Input     | 3A |
| 44 | CML-I | Tx8p     | Transmitter Non-Inverted Data Input | 3A |
| 45 |       | GND      | Ground                              | 1A |
| 46 |       | Reserved | For future use                      | 3A |
| 47 |       | VS1      | Module Vendor Specific 1            | 3A |
| 48 |       | VccRx1   | 3.3V Power Supply                   | 2A |
| 49 |       | VS2      | Module Vendor Specific 2            | 3A |
| 50 |       | VS3      | Module Vendor Specific 3            | 3A |
| 51 |       | GND      | Ground                              | 1A |
| 52 | CML-O | Rx7p     | Receiver Non-Inverted Data Output   | 3A |
| 53 | CML-O | Rx7n     | Receiver Inverted Data Output       | 3A |
| 54 |       | GND      | Ground                              | 1A |
| 55 | CML-O | Rx5p     | Receiver Non-Inverted Data Output   | 3A |
| 56 | CML-O | Rx5n     | Receiver Inverted Data Output       | 3A |
| 57 |       | GND      | Ground                              | 1A |
| 58 |       | GND      | Ground                              | 1A |
| 59 | CML-O | Rx6n     | Receiver Inverted Data Output       | 3A |
| 60 | CML-O | Rx6p     | Receiver Non-Inverted Data Output   | 3A |
| 61 |       | GND      | Ground                              | 1A |
| 62 | CML-O | Rx8n     | Receiver Inverted Data Output       | 3A |
| 63 | CML-O | Rx8p     | Receiver Non-Inverted Data Output   | 3A |
| 67 |       | GND      | Ground                              | 1A |
| 68 |       | NC       | No Connect                          | 3A |
| 69 |       | Reserved | For future use                      | 3A |
| 70 |       | VccTx1   | 3.3V Power Supply                   | 2A |
| 71 |       | Vcc2     | 3.3V Power Supply                   | 2A |
| 72 |       | Reserved | For Future Use                      | 3A |
| 73 |       | GND      | Ground                              | 1A |
| 74 | CML-I | Tx7p     | Transmitter Non-Inverted Data Input | 3A |
| 75 | CML-I | Tx7n     | Transmitter Inverted Data Input     | 3A |
| 76 |       | GND      | Ground                              | 1A |

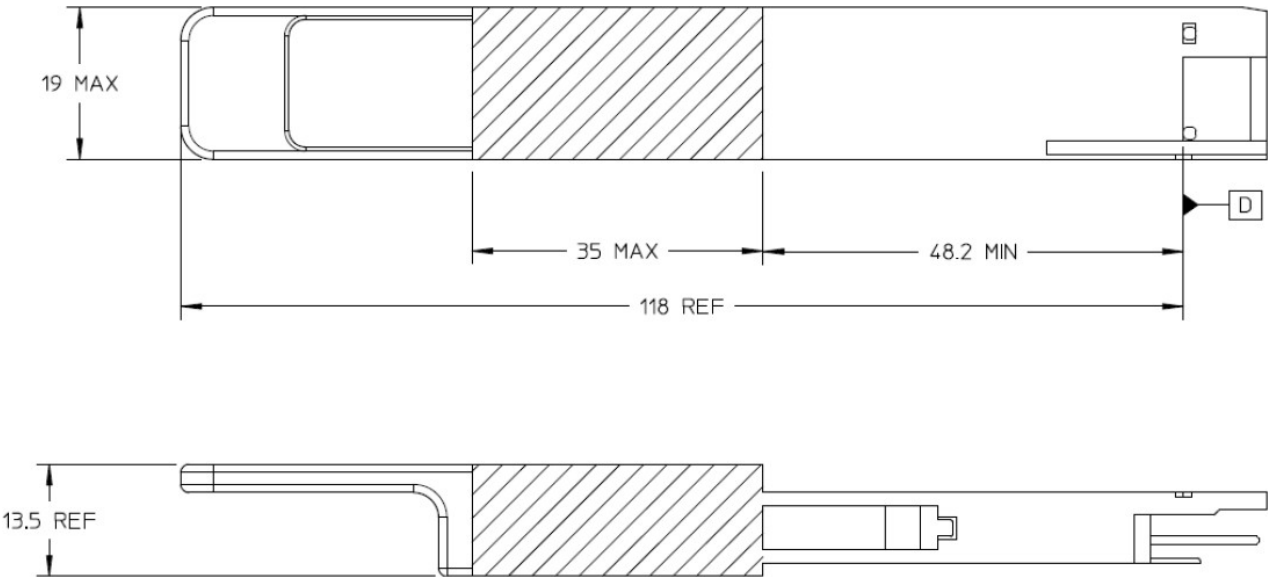
Electrical Pad Layout



Recommended Power Supply Filter



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.

