



## QDD-400G-SR8-SKY

Juniper Networks® QDD-400G-SR8 Compatible 400GBase-SR8 QSFP-DD Transceiver (MMF, 850nm, MPO-16, 70m, DOM)

### Product Description

This Juniper Networks® QDD-400G-SR8 compatible QSFP-DD transceiver provides 400GBase-SR8 throughput up to 70m over multi-mode fiber (MMF) using a wavelength of 850nm via an MPO-16 connector. It is guaranteed to be 100% compatible with the equivalent Juniper Networks® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. 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 Form Factor
- 8x50G PAM4 Retimed 400GUA1-8 Electrical Interface Aligned with IEEE 802.3bs
- 8x50G PAM4 VCSEL Transmitter
- Power Dissipation: 9W
- Maximum Link Length of 100M on OM4 Fiber with KP4 FEC
- I2C Management Interface
- Single 3.3V Power Supply
- MPO-16 APC Connector
- RoHS Compliant and Lead-Free
- Operating Temperature: 0 to 70 Celsius



### Applications:

- 400GBase Ethernet
- Access, Metro 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. | Max.               | Unit | Notes |
|-------------------------------------|------------------|------|--------------------|------|-------|
| Power Supply Voltage                | V <sub>cc</sub>  | -0.5 | 4.0                | V    |       |
| Storage Temperature                 | T <sub>stg</sub> | -40  | 85                 | °C   |       |
| Operating Temperature               | T <sub>c</sub>   | 0    | 70                 | °C   |       |
| Relative Humidity                   | RH               | 15   | 85                 | %    | 1     |
| Receiver Damage Threshold Per Lane  | TH <sub>d</sub>  | 5    |                    | dBm  |       |
| Bit Error Ratio                     | BER              |      | 2.4E <sup>-4</sup> |      | 2     |
| Bit Rate (All Wavelengths Combined) | BR               |      | 425                | Gbps | 3     |

### Notes:

1. Non-condensing.
2. As defined by IEEE P802.3cm.
3. Supports 400GBase-SR8 per IEEE P802.3cm.

## Electrical Characteristics

| Parameter                                      | Symbol             | Min.                             | Typ. | Max.  | Unit | Notes |
|------------------------------------------------|--------------------|----------------------------------|------|-------|------|-------|
| Supply Voltage                                 | V <sub>cc</sub>    | 3.135                            | 3.3  | 3.465 | V    |       |
| Supply Current                                 | I <sub>cc</sub>    |                                  |      | 2.87  | A    |       |
| Module Total Power                             | P                  |                                  |      | 9     | W    | 1     |
| Transmitter (Per Lane)                         |                    |                                  |      |       |      |       |
| Signaling Rate Per Lane                        | TP1                | 26.5625 ± 100ppm                 |      |       | GBd  |       |
| Differential Data Input Voltage Per Lane       | V <sub>IN,pp</sub> | 900                              |      |       | mV   | 2     |
| Differential Input Return Loss                 |                    | Per Equation (83E-5) IEEE802.3bm |      |       |      |       |
| Differential- to Common-Mode Input Return Loss |                    | Per Equation (83E-6) IEEE802.3bm |      |       |      |       |
| Differential Termination Mismatch              |                    |                                  |      | 10    |      |       |
| Module Stressed Input Test                     |                    | Per 120E.3.4.1 IEEE802.3bs       |      |       |      | 3     |
| Single-Ended Voltage Tolerance Range           |                    | -0.4                             |      | 3.3   |      |       |
| DC Common-Mode Voltage                         |                    | -350                             |      | 2850  | mV   | 4     |
| Receiver (Per Lane)                            |                    |                                  |      |       |      |       |
| Signaling Rate Per Lane                        |                    | 26.5625 ± 100ppm                 |      |       | Gbd  |       |
| AC Common-Mode Output Voltage (RMS)            |                    |                                  |      | 17.5  | mV   |       |
| Differential Output Voltage                    |                    |                                  |      | 900   | mV   |       |
| Near-End ESMW (Eye Symmetry Mask Width)        |                    | 0.265                            |      |       | UI   |       |
| Differential Near-End Eye Height (Minimum)     |                    | 30                               |      |       | mV   |       |
| Far-End Pre-Cursor ISI Ratio                   |                    | -4.5                             |      | 2.5   | %    |       |
| Differential Output Return Loss                |                    | Per Equation (83E-2) IEEE802.3bm |      |       |      |       |

|                                                     |  |                                  |  |      |    |  |
|-----------------------------------------------------|--|----------------------------------|--|------|----|--|
| Common- to Differential-Mode Conversion Return Loss |  | Per Equation (83E-3) IEEE802.3bm |  |      |    |  |
| Differential Termination Mismatch                   |  |                                  |  | 10   | %  |  |
| Transition Time (20-80%)                            |  | 9.5                              |  |      | ps |  |
| DC Common-Mode Voltage Minimum                      |  | -350                             |  | 2850 | mV |  |

**Notes:**

1. The maximum total power value is specified across the full temperature and voltage range.
2. With the exception to 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
3. Meets specified BER.
4. DC common-mode voltage is generated by the host. Specification includes the effects of ground offset voltage.

**Optical Characteristics**

| Parameter                                                           | Symbol      | Min.                          | Typ. | Max. | Unit  | Notes |
|---------------------------------------------------------------------|-------------|-------------------------------|------|------|-------|-------|
| Transmitter                                                         |             |                               |      |      |       |       |
| Center Wavelength                                                   | $\lambda_C$ | 840                           | 850  | 860  | nm    |       |
| Data Rate Per Lane                                                  |             | 26.5625 ± 100ppm              |      |      | GBd   |       |
| Modulation Format                                                   |             | PAM4                          |      |      |       |       |
| RMS Spectral Width                                                  |             |                               |      | 0.6  | nm    | 1     |
| Average Launch Power Per Lane                                       |             | -6.5                          |      | 4    | dBm   |       |
| Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ) Per Lane |             | -4.5                          |      |      | dBm   | 2     |
| Launch Power in OMA <sub>outer</sub> Minus TDECQ Per Lane           |             | -5.9                          |      |      | dBm   |       |
| Transmitter and Dispersion Eye Closure for PAM4 (TDECQ) Per Lane    |             |                               |      | 4.5  | dB    |       |
| TDECQ -10Log <sub>10</sub> (Ceq) Per Lane                           |             |                               |      | 4.5  | dB    | 3     |
| Average Launch Power of Off Transmitter Per Lane                    |             |                               |      | -30  | dBm   |       |
| Extinction Ratio                                                    |             | 3                             |      |      | dB    |       |
| Transmitter Transition Time Per Lane                                |             |                               |      | 34   | ps    |       |
| RIN <sub>12OMA</sub>                                                |             |                               |      | -128 | dB/Hz |       |
| Optical Return Loss Tolerance                                       |             |                               |      | 12   | dB    |       |
| Encircle Flux                                                       |             | ≥86% at 19μm<br>≤30% at 4.5μm |      |      |       | 4     |
| Receiver                                                            |             |                               |      |      |       |       |
| Center Wavelength                                                   | $\lambda_C$ | 840                           | 850  | 860  | nm    |       |
| Data Rate Per Lane                                                  |             | 26.5625 ± 100ppm              |      |      | GBd   |       |
| Modulation Format                                                   |             | PAM4                          |      |      |       |       |
| Damage Threshold Per Lane                                           |             | 5                             |      |      | dBm   | 1     |
| Average Receive Power Per Lane                                      |             | -8.4                          |      | 4    | dBm   | 2     |
| Receive Power (OMA <sub>outer</sub> ) Per Lane                      |             |                               |      | 3    | dBm   |       |

|                                                                |  |     |     |     |     |   |
|----------------------------------------------------------------|--|-----|-----|-----|-----|---|
| Receiver Reflectance                                           |  |     |     | -12 | dBm |   |
| Receiver Sensitivity (OMA <sub>outer</sub> ) Per Lane          |  |     |     | -3  | dBm | 3 |
| Stressed Receiver Sensitivity (OMA <sub>outer</sub> ) Per Lane |  |     |     | -12 | dB  | 4 |
| Stressed Eye Closure for PAM4 (SECQ) Per Lane Under Test       |  |     | 4.5 |     |     | 5 |
| SECQ-10Log <sub>10</sub> (Ceq)f Per Lane (Maximum)             |  |     | 4.5 |     |     | 5 |
| OMA <sub>outer</sub> of Each Aggressor Lane                    |  |     | 3   |     |     |   |
| LOS De-Assert                                                  |  |     |     | -9  | dBm |   |
| LOS Assert                                                     |  | -30 |     | -10 | dBm |   |
| LOS Hysteresis                                                 |  | 0.5 |     |     | dB  |   |
| Conditions of Stressed Receiver Sensitivity Test               |  |     |     |     |     | 6 |

**Notes:**

1. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level on one lane. The receiver does not have to operate correctly at this input power.
2. Average receive power, each lane (minimum), is informative and not the principal indicator of signal strength.
3. Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 4.5dB.
4. Measured with conformance test signal at TP3 (see 138.8.10) for the BER specified in 138.1.1.
5. Ceq is a coefficient defined in 121.8.5.3, which accounts for the reference equalizer noise enhancement.
6. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

## Pin Descriptions

| Pin | Logic       | Symbol   | Name/Description                                                                     | Plug Sequence | Notes |
|-----|-------------|----------|--------------------------------------------------------------------------------------|---------------|-------|
| 1   |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 2   | CML-I       | Tx2-     | Transmitter Inverted Data Input.                                                     | 3B            |       |
| 3   | CML-I       | Tx2+     | Transmitter Non-Inverted Data Input.                                                 | 3B            |       |
| 4   |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 5   | CML-I       | Tx4-     | Transmitter Inverted Data Input.                                                     | 3B            |       |
| 6   | CML-I       | Tx4+     | Transmitter Non-Inverted Data Input.                                                 | 3B            |       |
| 7   |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 8   | LVTTL-I     | ModSelL  | Module Select.                                                                       | 3B            |       |
| 9   | LVTTL-I     | ResetL   | Module Reset.                                                                        | 3B            |       |
| 10  |             | VccRx    | +3.3V Receiver Power Supply.                                                         | 2B            | 2     |
| 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      | Module Ground.                                                                       | 1B            | 1     |
| 14  | CML-O       | Rx3+     | Receiver Non-Inverted Data Output.                                                   | 3B            |       |
| 15  | CML-O       | Rx3-     | Receiver Inverted Data Output.                                                       | 3B            |       |
| 16  |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 17  | CML-O       | Rx1+     | Receiver Non-Inverted Data Output.                                                   | 3B            |       |
| 18  | CML-O       | Rx1-     | Receiver Inverted Data Output.                                                       | 3B            |       |
| 19  |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 20  |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 21  | CML-O       | Rx2-     | Receiver Inverted Data Output.                                                       | 3B            |       |
| 22  | CML-O       | Rx2+     | Receiver Non-Inverted Data Output.                                                   | 3B            |       |
| 23  |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 24  | CML-O       | Rx4-     | Receiver Inverted Data Output.                                                       | 3B            |       |
| 25  | CML-O       | Rx4+     | Receiver Non-Inverted Data Output.                                                   | 3B            |       |
| 26  |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 27  | LVTTL-O     | ModPrsL  | Module Present.                                                                      | 3B            |       |
| 28  | LVTTL-O     | IntL     | Interrupt.                                                                           | 3B            |       |
| 29  |             | VccTx    | +3.3V Transmitter Power Supply.                                                      | 2B            | 2     |
| 30  |             | Vcc1     | +3.3V Power Supply.                                                                  | 2B            | 2     |
| 31  | LVTTL-I     | InitMode | Initialization Mode. In legacy QSFP applications, the InitMode pad is called LPMODE. | 3B            |       |
| 32  |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 33  | CML-I       | Tx3+     | Transmitter Non-Inverted Data Input.                                                 | 3B            |       |
| 34  | CML-I       | Tx3-     | Transmitter Inverted Data Input.                                                     | 3B            |       |
| 35  |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 36  | CML-I       | Tx1+     | Transmitter Non-Inverted Data Input.                                                 | 3B            |       |
| 37  | CML-I       | Tx1-     | Transmitter Inverted Data Input.                                                     | 3B            |       |
| 38  |             | GND      | Module Ground.                                                                       | 1B            | 1     |
| 39  |             | GND      | Module Ground.                                                                       | 1A            | 1     |

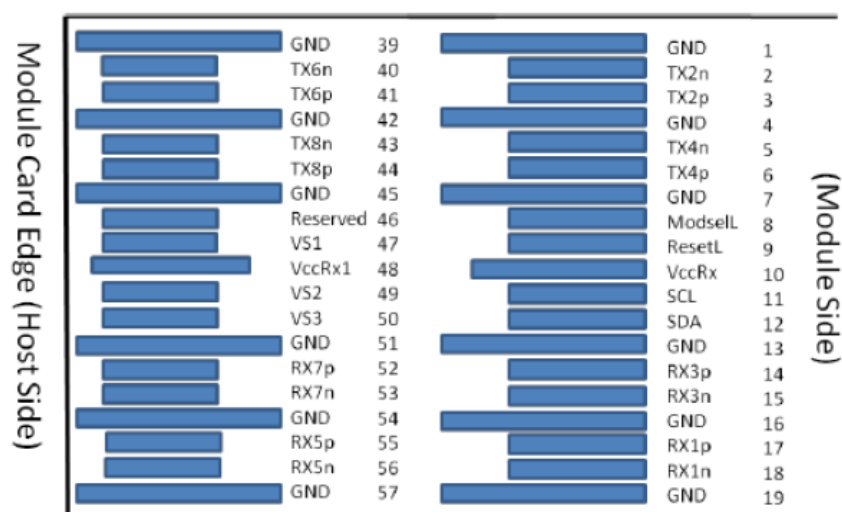
|    |       |          |                                      |    |   |
|----|-------|----------|--------------------------------------|----|---|
| 40 | CML-I | Tx6-     | Transmitter Inverted Data Input.     | 3A |   |
| 41 | CML-I | Tx6+     | Transmitter Non-Inverted Data Input. | 3A |   |
| 42 |       | GND      | Module Ground.                       | 1A | 1 |
| 43 | CML-I | Tx8-     | Transmitter Inverted Data Input.     | 3A |   |
| 44 | CML-I | Tx8+     | Transmitter Non-Inverted Data Input. | 3A |   |
| 45 |       | GND      | Module Ground.                       | 1A | 1 |
| 46 |       | Reserved | For Future Use.                      | 3A | 3 |
| 47 |       | VS1      | Module Vendor-Specific 1.            | 3A | 3 |
| 48 |       | VccRx1   | +3.3V Receiver Power Supply.         | 2A | 2 |
| 49 |       | VS2      | Module Vendor-Specific 2.            | 3A | 3 |
| 50 |       | VS3      | Module Vendor-Specific 3.            | 3A | 3 |
| 51 |       | GND      | Module Ground.                       | 1A | 1 |
| 52 | CML-O | Rx7+     | Receiver Non-Inverted Data Output.   | 3A |   |
| 53 | CML-O | Rx7-     | Receiver Inverted Data Output.       | 3A |   |
| 54 |       | GND      | Module Ground.                       | 1A | 1 |
| 55 | CML-O | Rx5+     | Receiver Non-Inverted Data Output.   | 3A |   |
| 56 | CML-O | Rx5-     | Receiver Inverted Data Output.       | 3A |   |
| 57 |       | GND      | Module Ground.                       | 1A | 1 |
| 58 |       | GND      | Module Ground.                       | 1A | 1 |
| 59 | CML-O | Rx6-     | Receiver Inverted Data Output.       | 3A |   |
| 60 | CML-O | Rx6+     | Receiver Non-Inverted Data Output.   | 3A |   |
| 61 |       | GND      | Module Ground.                       | 1A | 1 |
| 62 | CML-O | Rx8-     | Receiver Inverted Data Output.       | 3A |   |
| 63 | CML-O | Rx8+     | Receiver Non-Inverted Data Output.   | 3A |   |
| 64 |       | GND      | Module Ground.                       | 1A | 1 |
| 65 |       | NC       | Not Connected.                       | 3A | 3 |
| 66 |       | Reserved | For Future Use.                      | 3A | 3 |
| 67 |       | VccTx1   | +3.3V Transmitter Power Supply.      | 2A | 2 |
| 68 |       | Vcc2     | +3.3V Power Supply.                  | 2A | 2 |
| 69 |       | Reserved | For Future Use.                      | 3A | 3 |
| 70 |       | GND      | Module Ground.                       | 1A | 1 |
| 71 | CML-I | Tx7+     | Transmitter Non-Inverted Data Input. | 3A |   |
| 72 | CML-I | Tx7-     | Transmitter Inverted Data Input.     | 3A |   |
| 73 |       | GND      | Module Ground.                       | 1A | 1 |
| 74 | CML-I | Tx5+     | Transmitter Non-Inverted Data Input. | 3A |   |
| 75 | CML-I | Tx5-     | Transmitter Inverted Data Input.     | 3A |   |
| 76 |       | GND      | Module Ground.                       | 1A | 1 |

**Notes:**

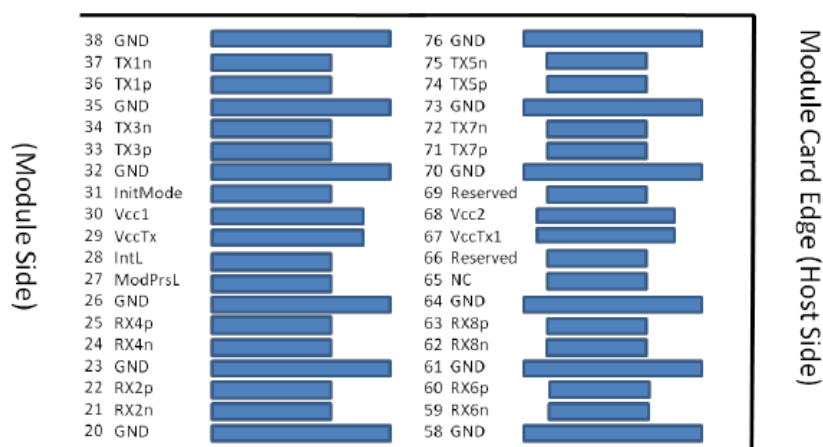
1. QSFP-DD uses common ground (GND) for all signals and supply power. All are common within the QSFP-DD module, and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.

2. VccRx, VccRx1, Vcc1, Vcc2, VccTx, and VccTx1 shall be applied concurrently. Requirements defined for the host side of the Host Card Edge Connector are listed in the Optical Characteristics. VccRx, VccRx1, Vcc1, Vcc2, VccTx, and VccTx1 may be internally connected within the module in any combination. The connector Vcc pins are each rated for a maximum current of 1000mA.
3. All Vendor-Specific, Reserved, and Not Connected pins may be terminated with 50Ω to ground on the host. Pad 65 (Not Connected) shall be left unconnected within the module. Vendor-Specific and Reserved pads shall have an impedance to GND that is greater than 10kΩ and less than 100pF.
4. Plug Sequence specifies the mating sequence of the host connector and module. The sequence is 1A, 2A, 3A, 1B, 2B, and 3B. Contact sequence A will make, then break contact with additional QSFP-DD pads. Sequence 1A, 1B will then occur simultaneously, followed by 2A, 2B, followed by 3A, 3B.

## Pin-Out Details

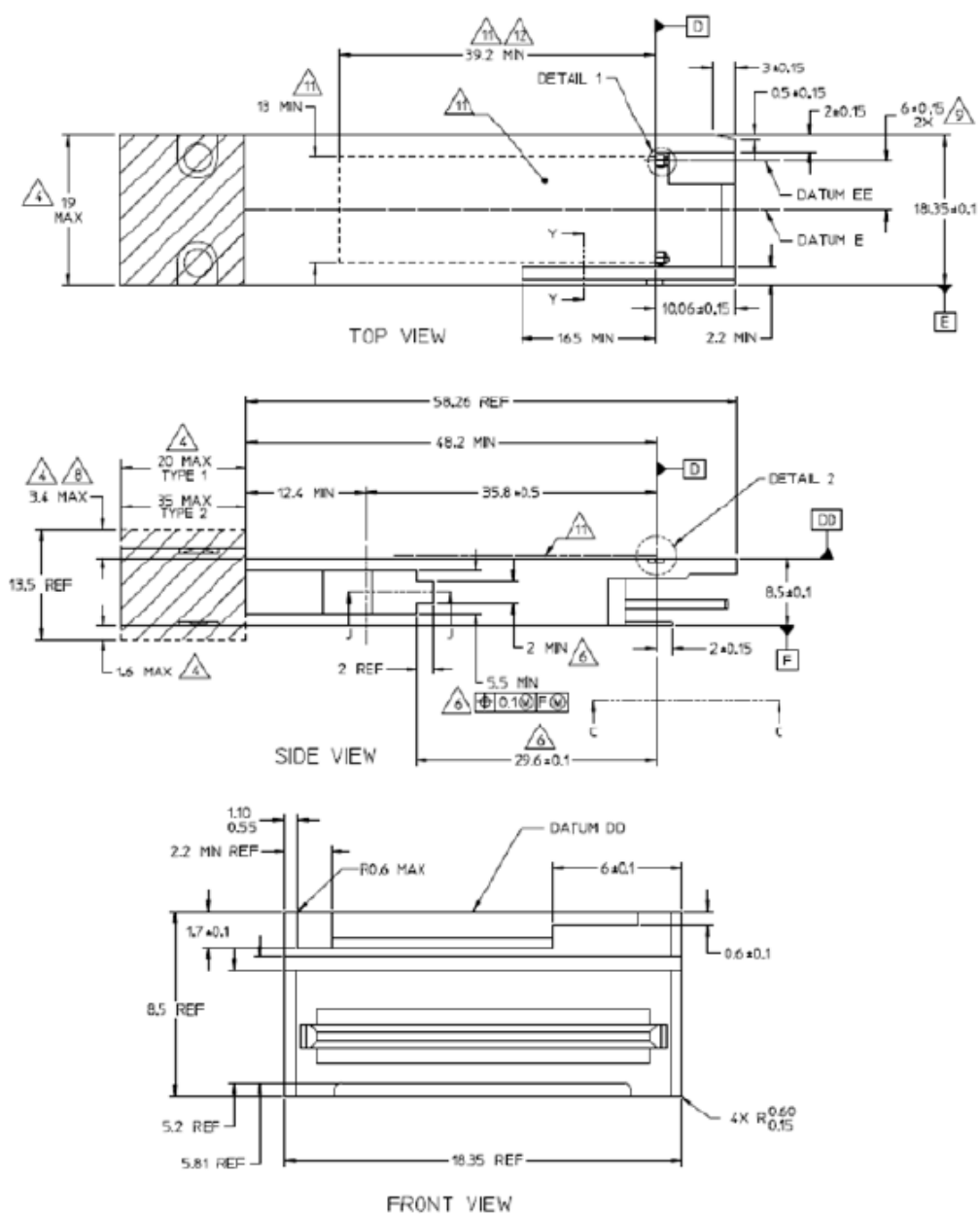


Bottom side viewed from bottom



Top side viewed from top

## 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.

