



## 160-9660-010-SKY

Ciena® 160-9660-010 Compatible 400GBase-AOC QSFP-DD to QSFP-DD Active Optical Cable (850nm, MMF, 10m)

### Product Description

This is a Ciena® 160-9660-010 compatible 400GBase-AOC QSFP-DD to QSFP-DD active optical cable that operates over active fiber with a maximum reach of 10m. At a wavelength of 850nm, it has been programmed, uniquely serialized, and data-traffic and application tested to ensure it is 100% compliant and functional. This active optical cable is built to comply with MSA (Multi-Source Agreement) standards. 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 to QSFP-DD MSA Standards
- Compliant to IEEE802.3bs
- 8 Parallel Full-Duplex Channels
- Operating Temperature: 0 to 70 Celsius
- CMIS 4.0
- Up to 100m OM3 MMF Transmission
- Data Rate 53.125Gbps (PAM4) Per Channel
- 8x53.125Gbps Electrical Interface (400GAUI-8)
- RoHS Compliant and Lead-Free
- Maximum Power Consumption: 10.5W



### Applications:

- 400GBase 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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## General Specifications

| Parameter                   | Symbol | Min. | Typ.    | Max. | Unit | Notes |
|-----------------------------|--------|------|---------|------|------|-------|
| Storage Temperature         | Tstg   | -40  |         | 85   | °C   |       |
| Operating Case Temperature  | Tc     | 0    |         | 70   | °C   |       |
| Supply Voltage              | Vcc    | -0.5 |         | 3.6  | V    |       |
| Relative Operating Humidity | RH     | 0    |         | 85   | %    |       |
| Data Rate Per Lane          |        |      | 26.5625 |      |      | PAM4  |
| Data Rate Accuracy          |        | -100 |         | 100  | ppm  |       |
| Link Distance with OM3      | D      | 0.5  |         | 100  | M    | 1     |

### Notes:

1. FEC is required on the host system to support the maximum distance.

## Electrical Specifications

| Parameter                                           | Symbol | Min.                             | Typ.  | Max.                 | Unit  | Notes |
|-----------------------------------------------------|--------|----------------------------------|-------|----------------------|-------|-------|
| Power Supply Voltage                                | Vcc    | 3.135                            | 3.3   | 3.465                | V     |       |
| Pre-FEC Bit Error Ratio                             |        |                                  |       | 2.4x10 <sup>-4</sup> |       |       |
| Post-FEC Bit Error Ratio                            |        |                                  |       | 1x10 <sup>-12</sup>  |       | 1     |
| Power Consumption                                   |        |                                  |       | 10.5                 | W     |       |
| Supply Current                                      | Icc    |                                  |       | 3.18                 | A     |       |
| <b>Transmitter</b>                                  |        |                                  |       |                      |       |       |
| Signaling Rate Per Lane                             | TP1    | 26.5625 ± 100ppm                 |       |                      | GBd   |       |
| Differential Pk-Pk Input Voltage Tolerance          | TP1a   | 900                              |       |                      | mVp-p | 2     |
| Differential Termination Mismatch                   | TP1    |                                  |       | 10                   | %     |       |
| Differential Input Return Loss                      | TP1    | IEEE 802.3-2015 Equation (83E-5) |       |                      | dB    |       |
| Differential to Common-Mode Input Return Loss       | TP1    | IEEE 802.3-2015 Equation (83E-6) |       |                      | dB    |       |
| Module Stressed Input Test                          | TP1a   | See IEEE 802.3bs 120E.3.4.1      |       |                      |       | 3     |
| Single-Ended Voltage Tolerance Range (Minimum)      | TP1a   | -0.4 to 3.3                      |       |                      | V     |       |
| DC Common-Mode Input Voltage                        | TP1    | -350                             |       | 2850                 | mV    | 4     |
| <b>Receiver</b>                                     |        |                                  |       |                      |       |       |
| Signaling Rate Per Lane                             | TP4    | 26.5625 ± 100ppm                 |       |                      | GBd   |       |
| Differential Pk-Pk Output Voltage                   | TP4    |                                  |       | 900                  | mVp-p |       |
| AC Common-Mode Output Voltage (RMS)                 | TP4    |                                  |       | 17.5                 | mV    |       |
| Differential Termination Mismatch                   | TP4    |                                  |       | 10                   | %     |       |
| Differential Output Return Loss                     | TP4    | IEEE 802.3-2015 Equation (83E-2) |       |                      |       |       |
| Common- to Differential-Mode Conversion Return Loss | TP4    | IEEE 802.3-2015 Equation (83E-3) |       |                      |       |       |
| Transition Time (20-80%)                            | TP4    | 9.5                              |       |                      | ps    |       |
| Near-End Eye Symmetry Mask Width (ESMW)             | TP4    |                                  | 0.265 |                      | UI    |       |
| Near-End Eye Height (Differential)                  | TP4    | 70                               |       |                      | mV    |       |
| Far-End Eye Symmetry Mask Width (ESMW)              | TP4    |                                  | 0.2   |                      | UI    |       |
| Far-End Eye Height (Differential)                   | TP4    | 30                               |       |                      | mV    |       |
| Far-End Pre-Cursor ISI Ratio                        | TP4    | -4.5                             |       | 2.5                  | %     |       |
| Common-Mode Output Voltage (Vcm)                    | TP4    | -350                             |       | 2850                 | mV    | 4     |

### Notes:

1. FEC is provided by the host system.
2. With the exception to IEEE 802.3bs 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
3. Meets BER specified in IEEE 802.3bs 120E.1.1.
4. DC common-mode voltage generated by the host. Specification includes effects of ground offset voltage.

## Pin Descriptions

| Pin | Logic       | Symbol   | Name/Description                                                                     | Plug Sequence | Notes |
|-----|-------------|----------|--------------------------------------------------------------------------------------|---------------|-------|
| 1   |             | GND      | Module Ground.                                                                       | 1B            |       |
| 2   | CML-I       | Tx2-     | Transmitter Inverted Data Input.                                                     | 3B            |       |
| 3   | CML-I       | Tx2+     | Transmitter Non-Inverted Data Input.                                                 | 3B            |       |
| 4   |             | GND      | Module Ground.                                                                       | 1B            |       |
| 5   | CML-I       | Tx4-     | Transmitter Inverted Data Input.                                                     | 3B            |       |
| 6   | CML-I       | Tx4+     | Transmitter Non-Inverted Data Input.                                                 | 3B            |       |
| 7   |             | GND      | Module Ground.                                                                       | 1B            |       |
| 8   | LVTTTL-I    | ModSelL  | Module Select.                                                                       | 3B            |       |
| 9   | LVTTTL-I    | ResetL   | Module Reset.                                                                        | 3B            |       |
| 10  |             | VccRx    | +3.3V Receiver Power Supply.                                                         | 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      | Module Ground.                                                                       | 1B            |       |
| 14  | CML-O       | Rx3+     | Receiver Non-Inverted Data Output.                                                   | 3B            |       |
| 15  | CML-O       | Rx3-     | Receiver Inverted Data Output.                                                       | 3B            |       |
| 16  |             | GND      | Module Ground.                                                                       | 1B            |       |
| 17  | CML-O       | Rx1+     | Receiver Non-Inverted Data Output.                                                   | 3B            |       |
| 18  | CML-O       | Rx1-     | Receiver Inverted Data Output.                                                       | 3B            |       |
| 19  |             | GND      | Module Ground.                                                                       | 1B            |       |
| 20  |             | GND      | Module Ground.                                                                       | 1B            |       |
| 21  | CML-O       | Rx2-     | Receiver Inverted Data Output.                                                       | 3B            |       |
| 22  | CML-O       | Rx2+     | Receiver Non-Inverted Data Output.                                                   | 3B            |       |
| 23  |             | GND      | Module Ground.                                                                       | 1B            |       |
| 24  | CML-O       | Rx4-     | Receiver Inverted Data Output.                                                       | 3B            |       |
| 25  | CML-O       | Rx4+     | Receiver Non-Inverted Data Output.                                                   | 3B            |       |
| 26  |             | GND      | Module Ground.                                                                       | 1B            |       |
| 27  | LVTTTL-O    | ModPrsL  | Module Present.                                                                      | 3B            |       |
| 28  | LVTTTL-O    | IntL     | Interrupt.                                                                           | 3B            |       |
| 29  |             | VccTx    | +3.3V Transmitter Power Supply.                                                      | 2B            |       |
| 30  |             | Vcc1     | +3.3V Power Supply.                                                                  | 2B            |       |
| 31  | LVTTTL-I    | InitMode | Initialization Mode. In legacy QSFP applications, the InitMode pad is called LPMODE. | 3B            |       |
| 32  |             | GND      | Module Ground.                                                                       | 1B            |       |
| 33  | CML-I       | Tx3+     | Transmitter Non-Inverted Data Input.                                                 | 3B            |       |
| 34  | CML-I       | Tx3-     | Transmitter Inverted Data Input.                                                     | 3B            |       |
| 35  |             | GND      | Module Ground.                                                                       | 1B            |       |
| 36  | CML-I       | Tx1+     | Transmitter Non-Inverted Data Input.                                                 | 3B            |       |
| 37  | CML-I       | Tx1-     | Transmitter Inverted Data Input.                                                     | 3B            |       |
| 38  |             | GND      | Module Ground.                                                                       | 1B            |       |
| 39  |             | GND      | Module Ground.                                                                       | 1A            |       |
| 40  | CML-I       | Tx6-     | Transmitter Inverted Data Input.                                                     | 3A            |       |

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

Electrical Pin-Out Details



Recommended Power Supply Filter



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.

