

### **QSFPDD4-400GB-AOC70MLP-C**

MSA and TAA 400GBase-AOC QSFP-DD to QSFP-DD Low Power Active Optical Cable (850nm, MMF, 70m)

#### **Features:**

- QSFP-DD MSA HW Rev. 5.0 compliant
- CMIS 4.0 compliant
- 8x26.56GBaud optical links with integrated CDR
- OM3 multi-mode fiber
- CML compatible electrical I/O
- PAM4 & NRZ compatible
- OFNP jacket
- Operating Temperature 0 to 70 Celsius
- Hot pluggable
- RoHS compliant and lead-free



#### **Applications:**

- 400GBase Ethernet

#### **Product Description**

This is a MSA Compliant 400GBase-AOC QSFP28 to QSFP28 active optical cable that operates over active fiber with a maximum reach of 70m. It has been programmed, uniquely serialized, and data-traffic and application tested to ensure it is 100% compliant and functional. We stand behind the quality of our products and proudly offer a limited lifetime warranty. This cable is TAA (Trade Agreements Act) compliant and is built to comply with MSA (Multi-Source Agreement) standards.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products."



## Absolute Maximum Ratings

| Parameter                     | Symbol            | Min. | Typ.  | Max. | Unit  | Notes |
|-------------------------------|-------------------|------|-------|------|-------|-------|
| Storage Ambient Temperature   | T <sub>stg</sub>  | -40  |       | 85   | °C    |       |
| Operating Case Temperature    | T <sub>c</sub>    | 0    | 25    | 70   | °C    | 1     |
| Module Supply Voltage         | V <sub>cc</sub>   | 3.14 | 3.3   | 3.46 | V     |       |
| Module Supply Voltage         | V <sub>cc</sub>   | -0.5 |       | 3.6  | V     |       |
| Single Module Supply Current  | I <sub>IN</sub>   |      | 2100  |      | mA    |       |
| Relative Humidity – Storage   | RH <sub>stg</sub> | 0    |       | 95   | %     | 2     |
| Relative Humidity – Operating | RH <sub>op</sub>  | 0    |       | 85   | %     | 2     |
| Signaling Speed Per Channel   | S                 |      | 26.56 |      | GBaud |       |

### Notes:

1. Commercial temperature range.
2. RH is a non-condensing condition.
3. Exceeding the Absolute Maximum Ratings may cause irreversible damage to the device. The device is not intended to be operated under the conditions of simultaneous Absolute Maximum Ratings, a condition which may cause irreversible damage to the device.

## Cable Specifications

| Parameter           | Value      | Unit |
|---------------------|------------|------|
| Cable Diameter      | 3.0 ± 0.15 | mm   |
| Minimum Bend Radius | 30         | mm   |

## Electrical Characteristics

| Parameter                             | Symbol           | Min. | Typ. | Max.               | Unit | Notes |
|---------------------------------------|------------------|------|------|--------------------|------|-------|
| Transmitter                           |                  |      |      |                    |      |       |
| Tx_Data Differential Input Voltage    | V <sub>IN</sub>  | 400  |      | 900                | mV   |       |
| Tx_Data Differential Input Impedance  | Z <sub>IN</sub>  |      | 100  |                    | Ω    |       |
| Receiver                              |                  |      |      |                    |      |       |
| Rx_Data Differential Output Voltage   | V <sub>OUT</sub> |      |      | 900                | mV   |       |
| Rx_Data Differential Output Impedance | Z <sub>OUT</sub> | 90   | 100  | 110                | Ω    |       |
| Link BER                              | BER              |      |      | 2.4E <sup>-4</sup> |      | 1     |

### Notes:

1. Better than 2.4E<sup>-4</sup> @26.56GBaud PRBS31.

## Pin Descriptions

| Pin | Symbol    | Name/Description                           |
|-----|-----------|--|
| 1   | GND       | Module Ground.                             |
| 2   | Tx2-      | Transmitter Inverted Data Input.           |
| 3   | Tx2+      | Transmitter Non-Inverted Data Input.       |
| 4   | GND       | Module Ground.                             |
| 5   | Tx4-      | Transmitter Inverted Data Input.           |
| 6   | Tx4+      | Transmitter Non-Inverted Data Input.       |
| 7   | GND       | Module Ground.                             |
| 8   | ModSelL   | Module Select.                             |
| 9   | ResetL    | Module Reset.                              |
| 10  | VccRx     | +3.3V Receiver DC Power Supply.            |
| 11  | SCL       | I <sup>2</sup> C Serial Clock.             |
| 12  | SDA       | I <sup>2</sup> C Serial Data.              |
| 13  | GND       | Module Ground.                             |
| 14  | Rx3+      | Receiver Non-Inverted Differential Output. |
| 15  | Rx3-      | Receiver Inverted Differential Output.     |
| 16  | GND       | Module Ground.                             |
| 17  | Rx1+      | Receiver Non-Inverted Differential Output. |
| 18  | Rx1-      | Receiver Inverted Differential Output.     |
| 19  | GND       | Module Ground.                             |
| 20  | GND       | Module Ground.                             |
| 21  | Rx2-      | Receiver Inverted Differential Output.     |
| 22  | Rx2+      | Receiver Non-Inverted Differential Output. |
| 23  | GND       | Module Ground.                             |
| 24  | Rx4-      | Receiver Inverted Differential Output.     |
| 25  | Rx4+      | Receiver Non-Inverted Differential Output. |
| 26  | GND       | Module Ground.                             |
| 27  | ModPrsL   | Module Present.                            |
| 28  | IntL      | Interrupt.                                 |
| 29  | VccTx     | +3.3V Transmitter DC Power Supply.         |
| 30  | Vcc1      | +3.3V DC Power Supply.                     |
| 31  | Init Mode | Initialization Mode.                       |
| 32  | GND       | Module Ground.                             |
| 33  | Tx3+      | Transmitter Non-Inverted Data Input.       |
| 34  | Tx3-      | Transmitter Inverted Data Input.           |

|    |           |  |
|----|-----------|--|
| 35 | GND       | Module Ground.                             |
| 36 | Tx1+      | Transmitter Non-Inverted Data Input.       |
| 37 | Tx1-      | Transmitter Inverted Data Input.           |
| 38 | GND       | Module Ground.                             |
| 39 | GND       | Module Ground.                             |
| 40 | Tx6-      | Transmitter Inverted Data Input.           |
| 41 | Tx6+      | Transmitter Non-Inverted Data Input.       |
| 42 | GND       | Module Ground.                             |
| 43 | Tx8-      | Transmitter Inverted Data Input.           |
| 44 | Tx8+      | Transmitter Non-Inverted Data Input.       |
| 45 | GND       | Module Ground.                             |
| 46 | Reserved. | Not Connected.                             |
| 47 | NC        | Not Connected.                             |
| 48 | VccRx1    | +3.3V DC Power Supply.                     |
| 49 | NC        | Not Connected.                             |
| 50 | NC        | Not Connected.                             |
| 51 | GND       | Module Ground.                             |
| 52 | Rx7+      | Receiver Non-Inverted Differential Output. |
| 53 | Rx7-      | Receiver Inverted Differential Output.     |
| 54 | GND       | Module Ground.                             |
| 55 | Rx5+      | Receiver Non-Inverted Differential Output. |
| 56 | Rx5-      | Receiver Inverted Differential Output.     |
| 57 | GND       | Module Ground.                             |
| 58 | GND       | Module Ground.                             |
| 59 | Rx6-      | Receiver Inverted Differential Output.     |
| 60 | Rx6+      | Receiver Non-Inverted Differential Output. |
| 61 | GND       | Module Ground.                             |
| 62 | Rx8-      | Receiver Inverted Differential Output.     |
| 63 | Rx8+      | Receiver Non-Inverted Differential Output. |
| 64 | GND       | Module Ground.                             |
| 65 | NC        | Not Connected.                             |
| 66 | Reserved. | Not Connected.                             |
| 67 | VccTx1    | +3.3V DC Power Supply.                     |
| 68 | Vcc2      | +3.3V DC Power Supply.                     |
| 69 | Reserved  | Not Connected.                             |
| 70 | GND       | Module Ground.                             |

|    |      |                                      |
|----|------|--------------------------------------|
| 71 | Tx7+ | Transmitter Non-Inverted Data Input. |
| 72 | Tx7- | Transmitter Inverted Data Input.     |
| 73 | GND  | Module Ground.                       |
| 74 | Tx5+ | Transmitter Non-Inverted Data Input. |
| 75 | Tx5- | Transmitter Inverted Data Input.     |
| 76 | GND  | Module Ground.                       |

# Electrical Pin-Out Details



# Block Diagram



Electrical Interface



## Mechanical Specifications



### Notes:

1. Tolerance  $\pm 0.1$  mm.
2. Others according with QSFP-DD MSA or customer specifications.
3. Light Port according with fiber connector specifications.
4. For cable lengths greater than 5m, the cable length tolerance is  $+4\%/-0\%$ .

## About ProLabs

Our experience comes as standard; for over 15 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with over 90 optical switching and transport platforms.

## Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 400G while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



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