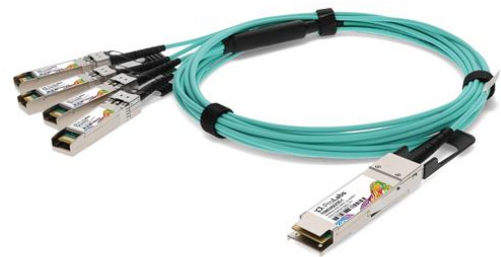


## FCBN510QE2C05-C

Finisar® FCBN510QE2C05 Compatible TAA Compliant 40GBase-AOC QSFP+ to 4xSFP+ Direct Attach Cable (850nm, MMF, 5m)

### Features:

- Compliant to Standard SFF-8436 for QSFP+ and Standard SFF-8431 for SFP+
- High-Speed/High-Density: Supports up to 4x100Gbps Bi-Directional Operation
- Reliable VCSEL and PIN Photonic Devices
- I2C Standard Management Interface
- Excellent High-Speed Signal Integrity
- Operating Case Temperature: 0 to 70 Celsius
- RoHS Compliant and Lead-Free



### Applications:

- 10G/40G Ethernet
- Proprietary High-Speed/High-Density Data
- High Performance Computing, Server and Data Storage

### Product Description

This is a Finisar® FCBN510QE2C05 compatible 40GBase-AOC QSFP+ to 4xSFP+ active optical cable that operates over multi-mode fiber with a maximum reach of 5.0m (16.4ft). 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 TAA (Trade Agreements Act) compliant, and 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.

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 Temperature    | Tstg   | -40  |      | 85   | °C   |       |
| Operating Temperature  | Tc     | 0    | 25   | 70   | °C   |       |
| Relative Humidity      | RH     | 5    |      | 85   | %    |       |
| Maximum Supply Voltage | Vcc    | 0    |      | 3.6  | V    |       |

### Electrical Specifications

| Parameter                                                            | Symbol | Min.  | Typ. | Max.   | Unit | Notes |
|----------------------------------------------------------------------|--------|-------|------|--------|------|-------|
| Power Supply Voltage                                                 | Vcc    | 3.135 | 3.3  | 3.465  | V    |       |
| Data Rate per Channel                                                |        |       |      | 4*10.3 | Gbps |       |
| LowSpeed Output: Transmitter Fault (Tx_Fault)/Loss of Signal (LOS)   | VhH    | 2.0   |      | Vcc    | V    | 1     |
|                                                                      | VhL    | 0     |      | 0.8    | V    | 1     |
| LowSpeed Input: Transmitter Disable (Tx_Disable), Mh5_D9C1, Mh5_D9C2 | VlH    | 2.0   |      | Vcc    | V    | 2     |
|                                                                      | VlL    | 0     |      | 0.8    | V    | 2     |
| Clock Rate - I2C                                                     | f      |       |      | 400    | kHz  | 3     |
| Module Turn On Time                                                  |        |       |      | 2000   | ms   | 4     |

### Notes:

1. For all control input pins: LPMode, Reset, and ModSelL.
2. For all status output pins: ModPrsL and IntL.
3. For the management interface.
4. Time from module power on/insertion/ResetL de-assert to module fully functional.

## Optical Characteristics

| Parameter                                     | Symbol | Min. | Typ.   | Max. | Unit | Notes |
|-----------------------------------------------|--------|------|--------|------|------|-------|
| <b>Transmitter</b>                            |        |      |        |      |      |       |
| Reference Differential Input Impedance        | Zd     |      | 100    |      | Ω    | 1     |
| Optical Return Loss Tolerance                 |        |      |        | 12   | dB   |       |
| Differential Data Input Swing                 | VIN,pp | 180  |        | 1200 | mV   |       |
| Differential Data Input Threshold             |        |      | 50     |      | mV   | 2     |
| <b>Receiver</b>                               |        |      |        |      |      |       |
| Reference Differential Input Impedance        | Zd     |      | 100    |      | Ω    | 1     |
| Differential Data Output Swing                | VOU,pp | 0    |        | 800  | mV   |       |
| Pre-Emphasis Pulse Amplitude Percentage       |        | 0    |        |      | %    | 3     |
|                                               |        | 10   |        |      | %    |       |
|                                               |        | 20   |        |      | %    |       |
|                                               |        | 40   |        |      | %    |       |
| Pre-Emphasis Pulse Duration                   |        |      | 30     |      | ps   |       |
| Signal Speed                                  |        |      | 4*10.3 |      | Gbps |       |
| Differential Data Output Swing                |        | 150  |        | 850  | mV   |       |
| Differential Data Output Swing When Squelched |        |      |        | 50   | mV   |       |
| Rise/Fall Time                                |        | 24   |        |      | ps   |       |

### Notes:

1. AC coupled inside the AOC module.
2. Input swing to trigger Tx\_Squelch.
3. User-selectable. Percentage is the ratio of pre-emphasis amplitude to output swing.

**Pin Descriptions (QSFP+ End)**

| Pin | Symbol  | Name/Description                                  | Notes |
|-----|---------|---------------------------------------------------|-------|
| 1   | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 2   | Tx2-    | Transmitter Inverted Data Input.                  |       |
| 3   | Tx2+    | Transmitter Non-Inverted Data Input.              |       |
| 4   | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 5   | Tx4-    | Transmitter Inverted Data Input.                  |       |
| 6   | Tx4+    | Transmitter Non-Inverted Data Input.              |       |
| 7   | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 8   | ModSelL | Module Select.                                    | 2     |
| 9   | ResetL  | Module Reset.                                     | 2     |
| 10  | VccRx   | +3.3V Receiver Power Supply.                      |       |
| 11  | SCL     | 2-Wire Serial Interface Clock.                    | 2     |
| 12  | SDA     | 2-Wire Serial Interface Data.                     | 2     |
| 13  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 14  | Rx3+    | Receiver Non-Inverted Data Output.                |       |
| 15  | Rx3-    | Receiver Inverted Data Output.                    |       |
| 16  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 17  | Rx1+    | Receiver Non-Inverted Data Output.                |       |
| 18  | Rx1-    | Receiver Inverted Data Output.                    |       |
| 19  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 20  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 21  | Rx2-    | Receiver Inverted Data Output.                    |       |
| 22  | Rx2+    | Receiver Non-Inverted Data Output.                |       |
| 23  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 24  | Rx4-    | Receiver Inverted Data Output.                    | 1     |
| 25  | Rx4+    | Receiver Non-Inverted Data Output.                |       |
| 26  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 27  | ModPrs1 | Module Present.                                   |       |
| 28  | IntL    | Interrupt.                                        | 2     |
| 29  | VccTx   | +3.3V Transmitter Power Supply.                   |       |
| 30  | Vcc1    | +3.3V Power Supply.                               |       |
| 31  | LPMode  | Low-Power Mode.                                   | 2     |
| 32  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 33  | Tx3+    | Transmitter Non-Inverted Data Input.              |       |
| 34  | Tx3-    | Transmitter Inverted Data Input.                  |       |
| 35  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |
| 36  | Tx1+    | Transmitter Non-Inverted Data Input.              |       |
| 37  | Tx1-    | Transmitter Inverted Data Input.                  |       |
| 38  | GND     | Transmitter Ground (Common with Receiver Ground). | 1     |

**Notes:**

- 1. The module signal grounds are isolated from the module case.
- 2. This is an open collector/drain output that, on the host board, requires a 4.7kΩ to 10kΩ pull-up resistor to the Host\_Vcc.

**Electrical Pin-Out Details (QSFP+ End)**



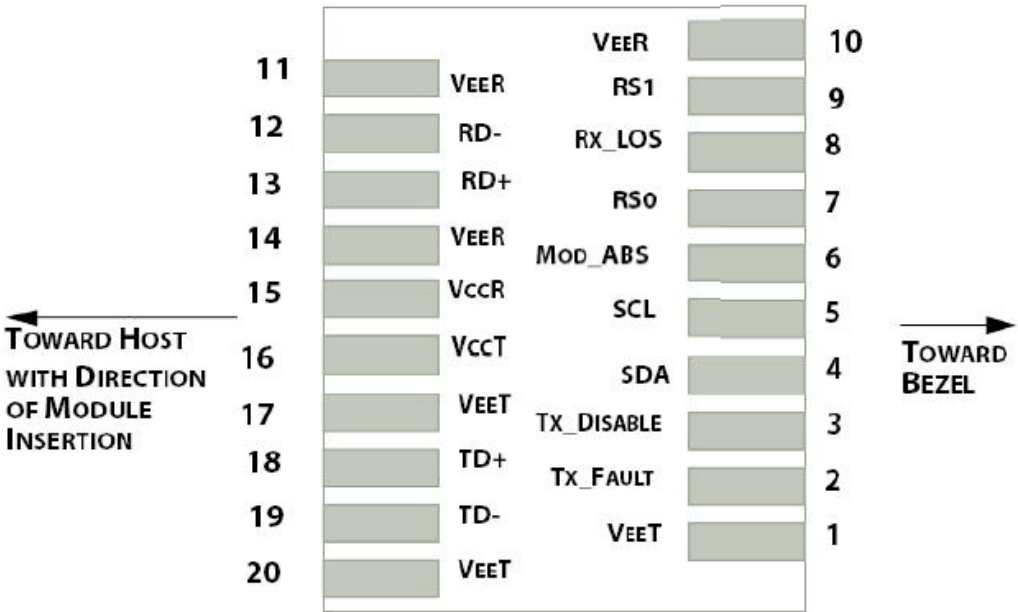
### Pin Descriptions (SFP+ End)

| Pin | Symbol     | Name/Description                                                          | Notes |
|-----|------------|---------------------------------------------------------------------------|-------|
| 1   | VeeT       | Transmitter Ground.                                                       | 1     |
| 2   | Tx_Fault   | Transmitter Fault. LVTTTL-O. "High" indicates a fault condition.          | 2     |
| 3   | Tx_Disable | Transmitter Disable. LVTTTL-I. "High" or "open" disables the transmitter. | 3     |
| 4   | SDA        | 2-Wire Serial Interface Data. LVCMOS-I/O. MOD_DEF2.                       | 4     |
| 5   | SCL        | 2-Wire Serial Interface Clock. LVCMOS-I/O. MOD_DEF1.                      | 4     |
| 6   | MOD_ABS    | Module Absent. Output. Connected to the VeeT or VeeR in the module.       | 5     |
| 7   | RS0        | Rate Select 0. Not used. Presents high input impedance.                   |       |
| 8   | Rx_LOS     | Receiver Loss of Signal. LVTTTL-O.                                        | 2     |
| 9   | RS1        | Rate Select 1. Not used. Presents high input impedance.                   |       |
| 10  | VeeR       | Receiver Ground.                                                          | 1     |
| 11  | VeeR       | Receiver Ground.                                                          | 1     |
| 12  | RD-        | Inverse Received Data Out. CML-O.                                         |       |
| 13  | RD+        | Receiver Data Out. CML-O.                                                 |       |
| 14  | VeeR       | Receiver Ground.                                                          |       |
| 15  | VccR       | +3.3V Receiver Power.                                                     |       |
| 16  | VccT       | +3.3V Transmitter Power.                                                  |       |
| 17  | VeeT       | Transmitter Ground.                                                       | 1     |
| 18  | TD+        | Transmitter Data In. CML-I.                                               |       |
| 19  | TD-        | Inverse Transmitter Data In. CML-I.                                       |       |
| 20  | VeeT       | Transmitter Ground.                                                       | 1     |

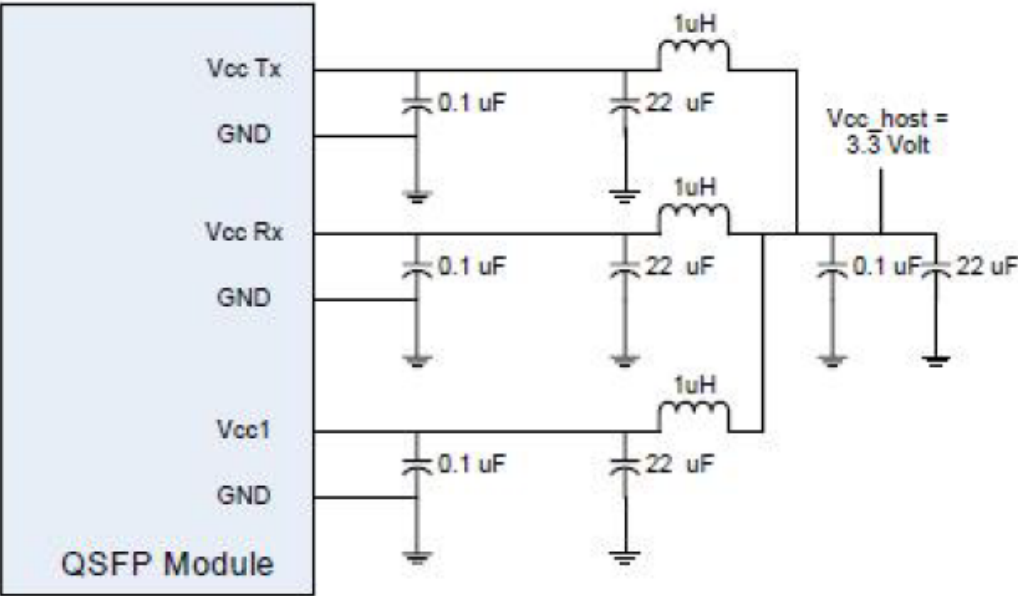
### Notes:

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that, on the host board, requires a 4.7k $\Omega$  to 10k $\Omega$  pull-up resistor to the Host\_Vcc.
3. This input is internally biased high with a 4.7k $\Omega$  to 10k $\Omega$  pull-up resistor to the VccT.
4. 2-wire serial interface clock and data lines require an external pull-up resistor dependent on the capacitance load.
5. This is a ground return that, on the host board, requires a 4.7k $\Omega$  to 10k $\Omega$  pull-up resistor to the Host\_Vcc.

Electrical Pin-Out Details (SFP+ End)



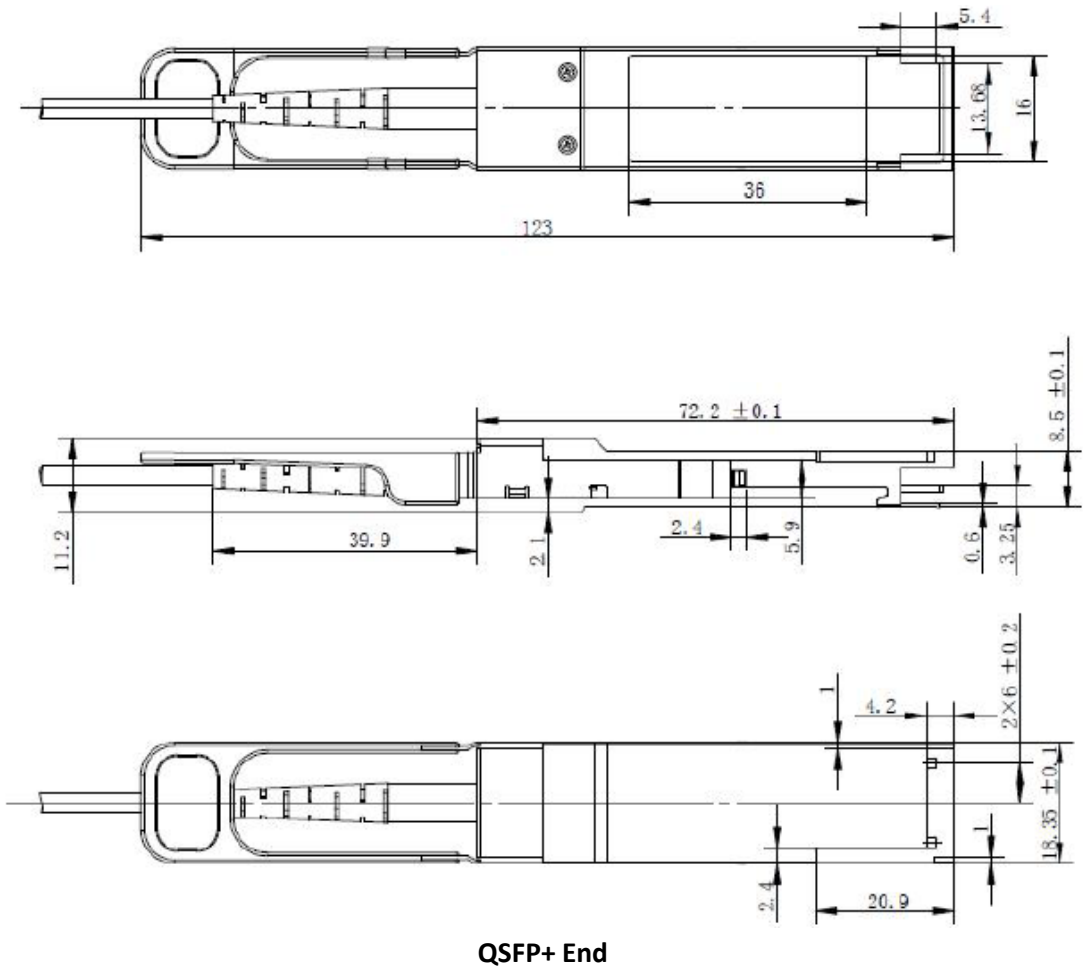
Application Interface Circuit



Active Optical Cable Specifications

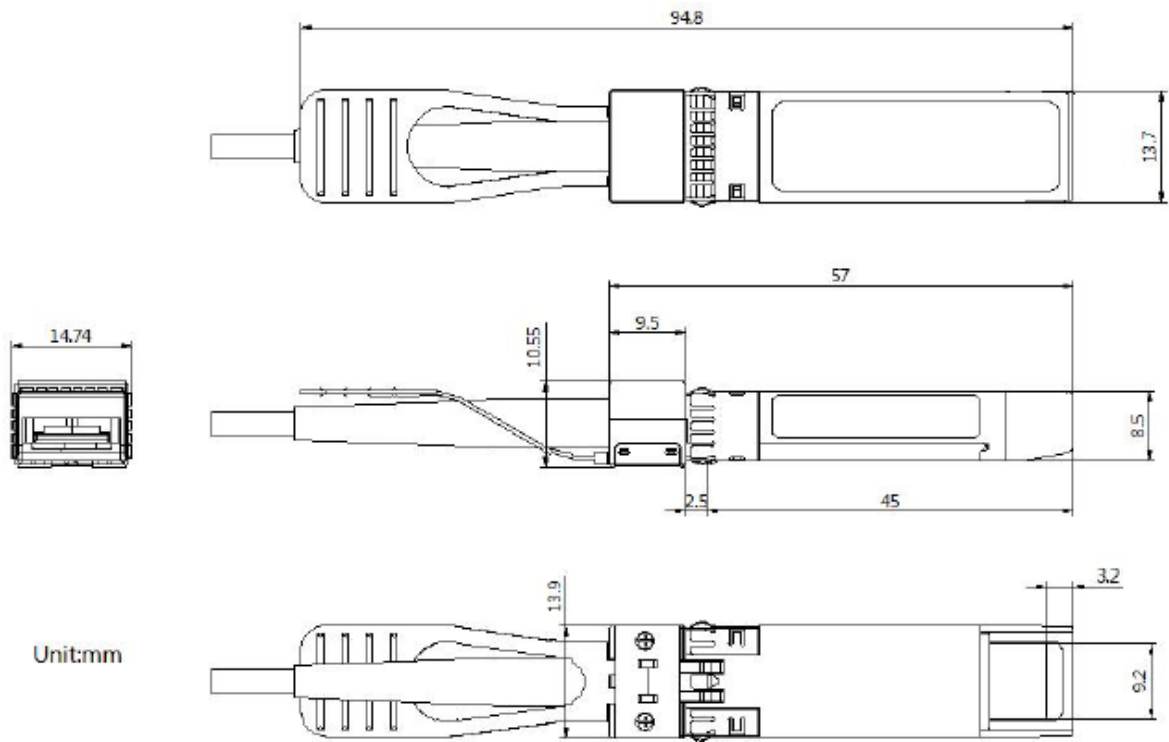
| Parameter                                   | Symbol | Min.       | Typ. | Max.        | Unit   |
|---------------------------------------------|--------|------------|------|-------------|--------|
| AOC Cable Length ( $L1 \leq 5m$ )           | L1     | $L - 0.06$ | L    | $L + 0.06$  | M      |
| AOC Cable Length ( $L1 > 5m$ )              | L1     | $L * 95\%$ | L    | $L * 105\%$ | M      |
| AOC Cable Length of Branch ( $L2 \leq 3m$ ) | L2     | $L - 0.06$ | L    | $L + 0.06$  | M      |
| Module Retention                            |        | 90         |      | 170         | N      |
| Module Insertion                            |        | 0          |      | 18          | N      |
| Module Extraction                           |        | 0          |      | 25          | N      |
| Cable Pull Strength - Apply Load at 0°      |        | 25         |      |             | N      |
| Cable Pull Strength - Apply Load at 90°     |        | 20         |      |             | N      |
| Cable Bending Radius                        |        | 30         |      |             | mm     |
| Insertion/Removal Cycles                    |        | 50         |      |             | cycles |

Mechanical Specifications



QSFP+ End





**SFP+ End**

## About ProLabs

Our extensive experience comes as standard. For over 20 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 more than 100 optical switching and transport platforms.

## A 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 1.6T 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.

## The Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure compatible products, and immediate answers to your questions. 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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