

**Preliminary DATA SHEET**

**CFORTH-QSFP/4SFP+-AOCxM**

**40Gb/s QSFP+ to 4xSFP+ Active Optical Cable Transceiver**

**CFORTH-QSFP/4SFP+-AOCxM Overview**

CFORTH-QSFP/4SFP+-AOCxM QSFP+ to 4xSFP+ active optical cable transceivers are suitable for 1 to 100 meters MMF OM3 distances to connect QSFP+ and SFP+ equipments. This interconnect system is fully compliant with QSFP+ MSA and SFP+ MSA.

**Product Features**

- QSFP+ End: Compliant with QSFP+ MSA specifications
- SFP+ End: Compliant with SFP+ MSA specifications
- 4 independent duplex channels operating at 10Gbps
- Cable length up to 100 meters
- RoHS Compliant
- Operating temperature range: 0°C to 70°C.

**Applications**

- 4x10G Ethernet

**Ordering Information**

| <b>Part Number</b>       | <b>Description</b>  |
|--------------------------|---|
| CFORTH-QSFP/4SFP+-AOC1M  | 40G QSFP+ to 4xSFP+ Breakout Active Optical Cable up to 1m  |
| CFORTH-QSFP/4SFP+-AOC2M  | 40G QSFP+ to 4xSFP+ Breakout Active Optical Cable up to 2m  |
| CFORTH-QSFP/4SFP+-AOC3M  | 40G QSFP+ to 4xSFP+ Breakout Active Optical Cable up to 3m  |
| CFORTH-QSFP/4SFP+-AOC5M  | 40G QSFP+ to 4xSFP+ Breakout Active Optical Cable up to 5m  |
| CFORTH-QSFP/4SFP+-AOC7M  | 40G QSFP+ to 4xSFP+ Breakout Active Optical Cable up to 7m  |
| CFORTH-QSFP/4SFP+-AOC10M | 40G QSFP+ to 4xSFP+ Breakout Active Optical Cable up to 10m |

**General Specifications**

| Parameter             | Symbol           | Min   | Typ | Max        | Unit | Remarks |
|-----------------------|------------------|-------|-----|------------|------|---------|
| Bit Error Rate        | BER              |       |     | $10^{-12}$ |      |         |
| Operating Temperature | T <sub>OP</sub>  | 0     |     | 70         | °C   | 1       |
| Storage Temperature   | T <sub>STO</sub> | - 10  |     | 75         | °C   | 2       |
| Input Voltage         | V <sub>CC</sub>  | 3.14  | 3.3 | 3.46       | V    |         |
| Maximum Voltage       | V <sub>MAX</sub> | - 0.5 |     | 3.6        | V    | 3       |

**Notes:**

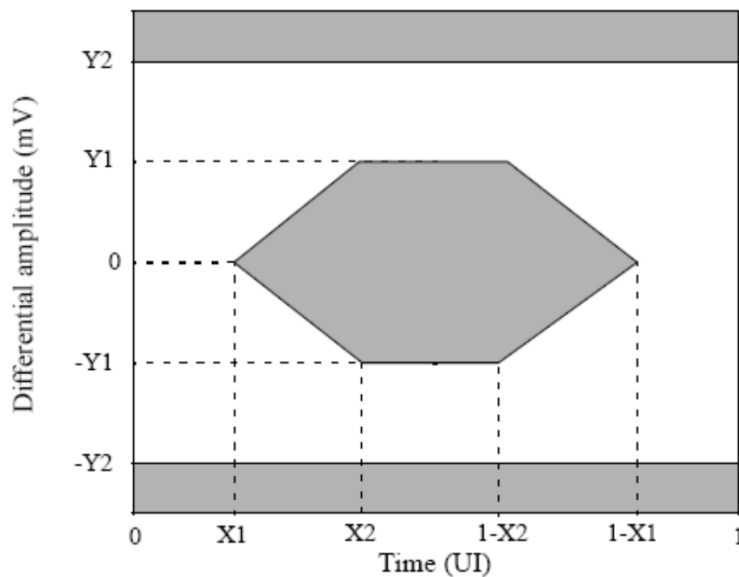
1. Case temperature
2. Ambient temperature
3. For electrical power interface

**AOC Electrical Input Requirements**

| Parameter                    | Symbol             | Conditions | Min | Typ     | Max         | Unit | Remarks |
|------------------------------|--------------------|------------|-----|---------|-------------|------|---------|
| Data Rate Per Channel        | Dr                 |            |     | 10.3125 | 10.5        | Gb/s |         |
| Differential Input Amplitude | V <sub>IN_PP</sub> |            | 180 |         | 1200 (QSFP) | mV   |         |
|                              |                    |            | 180 |         | 700 (SFP+)  | mV   |         |
| Input AC Common Mode Voltage | V <sub>CM</sub>    |            |     |         | 25          | mV   | 1       |
| Eye Mask Coordinates         | X1, X2             | 0.29, 0.5  |     |         |             | UI   | 2       |
|                              | Y1, Y2             | 150, 425   |     |         |             | mV   | 2       |

**Notes:**

1. RMS
2. Hit ratio  $5 \times 10^{-5}$ . See Figure 1 for transmitter input eye mask definitions.



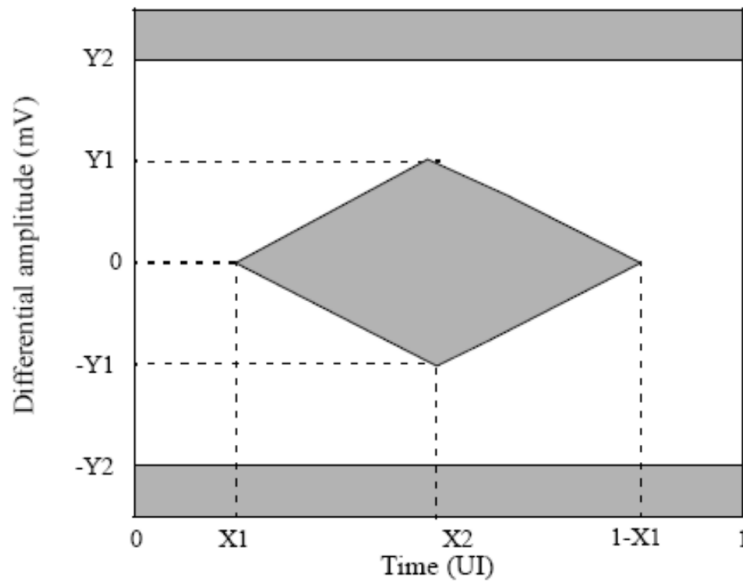
**Figure 1**

**AOC Electrical Output Requirements**

| Parameter                            | Symbol                          | Conditions | Min | Typ     | Max  | Unit | Remarks |
|--------------------------------------|---------------------------------|------------|-----|---------|------|------|---------|
| Data Rate Per Channel                | DR                              |            |     | 10.3125 | 10.5 | Gb/s |         |
| Differential Output Amplitude        | Vout_pp                         |            | 0   |         | 850  | mV   |         |
| Output AC Common Mode Voltage        | Vcm                             |            |     |         | 15   | mV   | 1       |
| Data output Rise/Fall Time (20%-80%) | T <sub>R</sub> , T <sub>F</sub> |            | 24  |         |      | ps   |         |
| Total Jitter (p-p)                   | TJ                              |            |     |         | 0.7  | UI   |         |
| Deterministic Jitter (p-p)           | DJ                              |            |     |         | 0.4  | UI   |         |
| Eye Mask Coordinates                 | X1, X2                          | 0.29, 0.5  |     |         |      | UI   | 2       |
|                                      | Y1, Y2                          | 150, 425   |     |         |      | mV   | 2       |

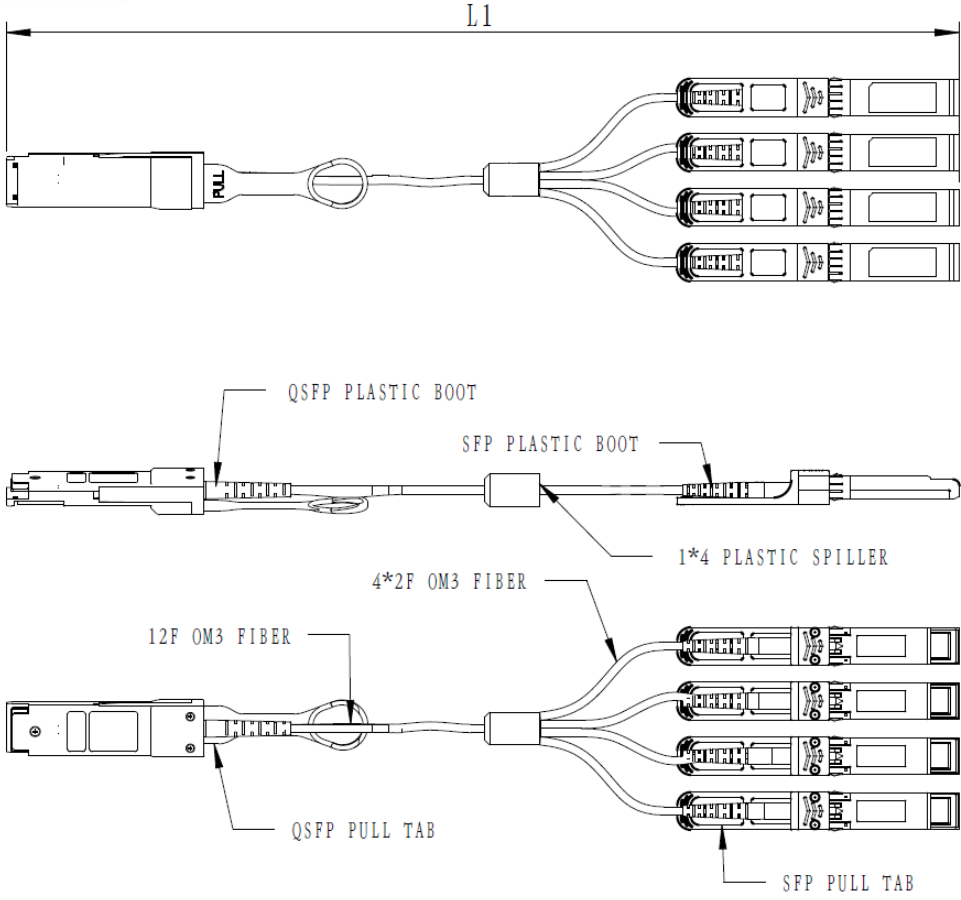
**Note:**

1. RMS
2. Hit ratio  $5 \times 10^{-5}$ . See Figure 2 for receiver output eye mask definitions.

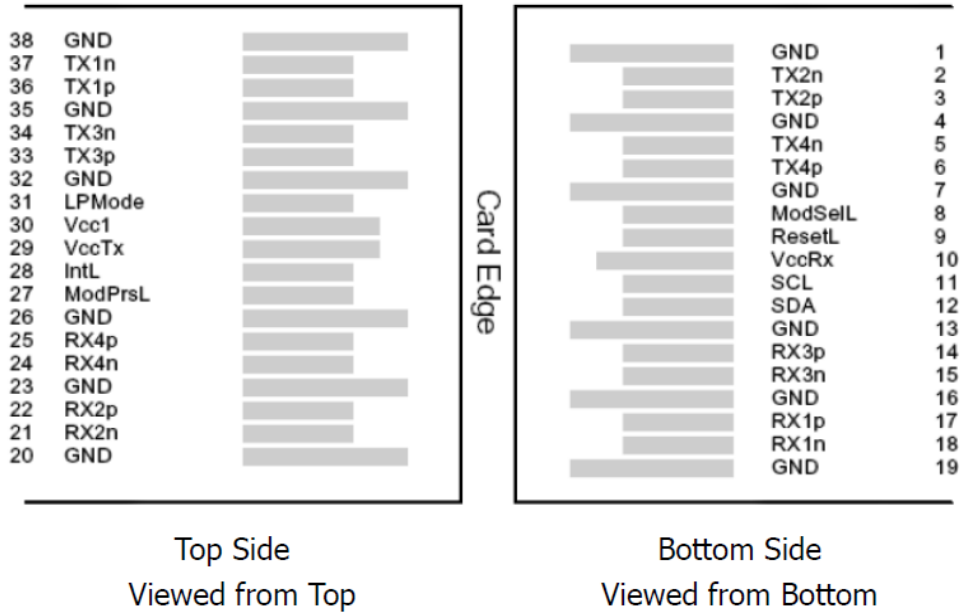


**Figure 2**

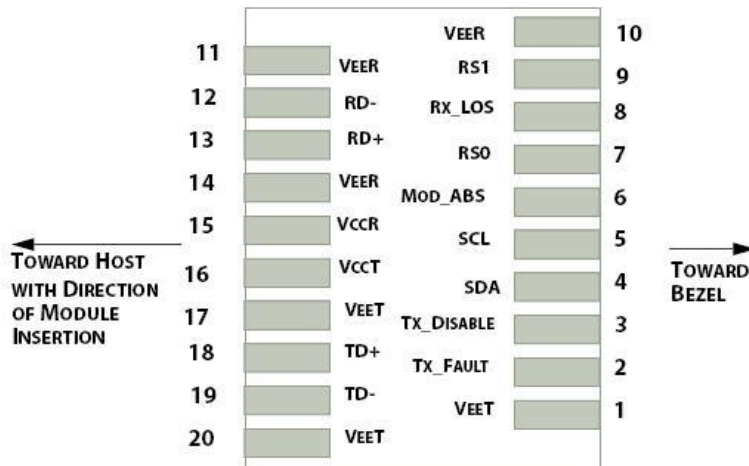
Dimensions



**Electrical Pad Layout for QSFP+ end**



**Electrical Pad Layout for SFP+ end**



**Pin Assignment for QSFP+ end**

| PIN # | Symbol | Description                         | Remarks |
|-------|--------|-------------------------------------|---------|
| 1     | GND    | Ground                              |         |
| 2     | Tx2n   | Transmitter Inverted Data Input     |         |
| 3     | Tx2p   | Transmitter Non-Inverted Data Input |         |
| 4     | GND    | Ground                              |         |
| 5     | Tx4n   | Transmitter Inverted Data Input     |         |
| 6     | Tx4p   | Transmitter Non-Inverted Data Input |         |
| 7     | GND    | Ground                              |         |

## CFORTH-QSFP/4SFP+-AOCxM Specifications Rev. D00A

|    |                    |                                     |
|----|--------------------|-------------------------------------|
| 8  | ModSelL            | Module Select                       |
| 9  | ResetL             | Module Reset                        |
| 10 | V <sub>cc Rx</sub> | +3.3V Power Supply Receiver         |
| 11 | SCL                | 2-wire serial interface clock       |
| 12 | SDA                | 2-wire serial interface data        |
| 13 | GND                | Ground                              |
| 14 | Rx3p               | Receiver Non-Inverted Data Output   |
| 15 | Rx3n               | Receiver Inverted Data Output       |
| 16 | GND                | Ground                              |
| 17 | Rx1p               | Receiver Non-Inverted Data Output   |
| 18 | Rx1n               | Receiver Inverted Data Output       |
| 19 | GND                | Ground                              |
| 20 | GND                | Ground                              |
| 21 | Rx2n               | Receiver Inverted Data Output       |
| 22 | Rx2p               | Receiver Non-Inverted Data Output   |
| 23 | GND                | Ground                              |
| 24 | Rx4n               | Receiver Inverted Data Output       |
| 25 | Rx4p               | Receiver Non-Inverted Data Output   |
| 26 | GND                | Ground                              |
| 27 | ModPrsL            | Module Present                      |
| 28 | IntL               | Interrupt                           |
| 29 | V <sub>cc Tx</sub> | +3.3V Power Supply transmitter      |
| 30 | V <sub>cc1</sub>   | +3.3V Power Supply                  |
| 31 | LPMODE             | Low Power Mode                      |
| 32 | GND                | Ground                              |
| 33 | Tx3p               | Transmitter Non-Inverted Data Input |
| 34 | Tx3n               | Transmitter Inverted Data Input     |
| 35 | GND                | Ground                              |
| 36 | Tx1p               | Transmitter Non-Inverted Data Input |
| 37 | Tx1n               | Transmitter Inverted Data Input     |
| 38 | GND                | Ground                              |

### Pin Assignment for SFP+ end

| PIN # | Symbol             | Description                                      | Remarks |
|-------|--------------------|--|---------|
| 1     | V <sub>EET</sub>   | Transmitter ground (common with receiver ground) | 1       |
| 2     | T <sub>FAULT</sub> | Transmitter Fault.                               |         |

## CFORTH-QSFP/4SFP+-AOCxM Specifications Rev. D00A

|    |                  |   |   |
|----|------------------|---|---|
| 3  | T <sub>DIS</sub> | Transmitter Disable. Laser output disable on high or open     | 2 |
| 4  | SDA              | Data line for serial ID                                       | 3 |
| 5  | SCL              | Clock line for serial ID                                      | 3 |
| 6  | MOD_ABS          | Module Absent. Grounded within the module                     | 3 |
| 7  | RS0              | No connection required  |   |
| 8  | LOS              | Loss of Signal indication. Logic 0 indicates normal operation | 4 |
| 9  | RS1              | No connection required  | 1 |
| 10 | V <sub>EER</sub> | Receiver ground (common with transmitter ground)              | 1 |
| 11 | V <sub>EER</sub> | Receiver ground (common with transmitter ground)              | 1 |
| 12 | RD-              | Receiver Inverted DATA out. AC coupled                        |   |
| 13 | RD+              | Receiver Non-inverted DATA out. AC coupled                    |   |
| 14 | V <sub>EER</sub> | Receiver ground (common with transmitter ground)              | 1 |
| 15 | V <sub>CCR</sub> | Receiver power supply   |   |
| 16 | V <sub>CCT</sub> | Transmitter power supply                                      |   |
| 17 | V <sub>EET</sub> | Transmitter ground (common with receiver ground)              | 1 |
| 18 | TD+              | Transmitter Non-Inverted DATA in. AC coupled                  |   |
| 19 | TD-              | Transmitter Inverted DATA in. AC coupled                      |   |
| 20 | V <sub>EET</sub> | Transmitter ground (common with receiver ground)              | 1 |

### Notes:

1. Circuit ground is isolated from chassis ground
2. Disabled: T<sub>DIS</sub>>2V or open, Enabled: T<sub>DIS</sub><0.8V
3. Should Be pulled up with 4.7k – 10k ohm on host board to a voltage between 2V and 3.6V
4. LOS is open collector output

### References

1. IEEE standard 802.3ba. IEEE Standard Department, 2010.
2. QSFP+ 10Gbs 4X PLUGGABLE TRANSCEIVER – SFF-8436
3. Enhanced 8.5 and 10 Gigabit Small Form Factor Pluggable Module “SFP+” – SFF-8431
4. Digital Diagnostics Monitoring Interface for Optical Transceivers – SFF-8472.