



Active Optical Cable QSFP+ 40Gbps, 7m, MSA Compatible

Active Optical Cables Technical Data Sheet

AOCQP40-007

Features

- Full-Duplex 4 channel parallel active optical cable, supporting 42 Gbps links
- Up to 10.5 Gbps Data rate per channel
- Maximum link length of 100m available
- High Reliability 850nm VCSEL technology
- Electrically hot-puggable
- Electrical interface compliant to SFF-8431
- Case operating temperature range: 0°C to 70°C
- Power dissipation < 1.5W per cable end

Applications

- 40G Ethernet Data Center Intra-Rack and Inter-Rack links
- InfiniBand QDR
- 10G Fibre Channel
- HPC Interconnections

Description

The AOCQP40-007 is an active optical cable designed for use in 40Gigabit Ethernet links. They are electrically compliant and mechanically compliant with the QSFP+ MSA. The AOCQP40-007 allows for greater link length than direct attach cables, with a lower total power consumption than transceiver solutions.

QSFP+ Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|----------------------|--------|---------|------|---------|------|------|
| Storage Temperature | Ts | -40 | - | 85 | °C | |
| Relative Humidity | RH | 5 | - | 95 | % | |
| Power Supply Voltage | VCC | -0.3 | - | 4 | V | |
| Signal Input Voltage | | Vcc-0.3 | - | Vcc+0.3 | V | |

QSFP+ Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|----------------------------|--------|------|---------|------|------|------------------|
| Case Operating Temperature | Tcase | 0 | - | 70 | °C | Without air flow |
| Power Supply Voltage | VCC | 3.14 | 3.3 | 3.46 | V | |
| Power Supply Current | ICC | - | | 450 | mA | per cable end |
| Data Rate | BR | | 10.3125 | | Gbps | Each channel |

Click the following link (or enter part number in "SEARCH" on website) to obtain additional part information including price, inventory and certifications: [Active Optical Cable QSFP+ 40Gbps, 7m, MSA Compatible AOCQP40-007](#)



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QSFP+ General Product Characteristics

| Parameter | Value | Unit | Notes |
|-----------------------------------|--|--------|-------------------------------------|
| Module Form Factor | QSFP+ | | |
| Number of Lanes | 4 Tx /Rx | | |
| Maximum Aggregate Data Rate | 42.0 | Gb/s | |
| Maximum Data Rate per Lane | 10.5 | Gb/s | |
| Standard Cable Lengths | 3, 5, 7, 10, 50, 100 | meters | Other lengths, please contact sales |
| Protocols Supported | Typical applications include Infiniband, Fiber Channel, 40G Ethernet | | |
| Electrical Interface and Pin-out | 38-pin edge connector | | Pin-out as defined by the QSFP+ MSA |
| Standard Optical Cable Type | Multimode ribbon fiber cable assembly, riser-rated | | |
| Maximum Power Consumption per End | 1.5 | W | |
| Management Interface | Serial, I2C-based, 400 kHz maximum frequency | | As defined by the QSFP+ MSA |

QSFP+ Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | NOTE |
|--------------------------------------|---------------------|------|-----|------|------|------|
| Supply Voltage | Vcc1, VccTx, VccRx | 3.14 | 3.3 | 3.46 | V | |
| Supply Current | Icc | | | 450 | mA | |
| Transmitter | | | | | | |
| Differential data input swing | V _{in,pp} | 180 | | 1000 | mV | 1 |
| Single ended input voltage tolerance | V _{inT} | -0.3 | | 4.0 | V | |
| Receiver | | | | | | |
| Differential data output swing | V _{out,pp} | 300 | | 850 | mV | 2 |
| Single-ended output voltage | | -0.3 | | 4.0 | V | |

Notes:

1. AC coupled internally. See Figure 1 for input eye mask requirements. Self-biasing 100Ω differential input.
2. AC coupled with 100Ω differential output impedance. See Figure 2 for output eye mask.

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AOCQP40-007

QSFP+ High-speed Electrical Characteristics per Lane

| Parameter-Inputs | Symbol | Min | Typ | Max | Unit | NOTE |
|--|--------|-----|-----|------|----------|-------------------|
| Reference Differential Input Impedance | Zd | | 100 | | Ω | |
| Termination Mismatch | ΔZM | | | 5 | % | 1 |
| Input AC Common Mode Voltage | | | | 25 | mV (RMS) | |
| Differential Input Return Loss | SDD11 | | | | dB | 2, 0.01-4.1 GHz |
| | | | | | dB | 3, 4.1 – 11.1 GHz |
| Differential to Common Mode Loss | SCD11 | | | -10 | dB | 0.01-11.1 GHz |
| Jitter Tolerance (Total) | TJ | | | 0.40 | UI | |
| Jitter Tolerance (Deterministic) | DJ | | | 0.15 | UI | |

Notes:

1. See SFF-8431 section D.15 Termination Mismatch for definition & test recommendations
2. Reflection coefficient given by equation $SDD11(dB) < -12 + 2 * \sqrt{f}$, with f in GHz. See Figure 3.
3. Reflection coefficient given by equation $SDD11(dB) < -6.3 + 13 \log_{10}(f/5.5)$, with f in GHz. See Figure 3

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AOCQP40-007

QSFP+ High-speed Electrical Characteristics per Lane

| Parameter-Outputs | Symbol | Min | Typ | Max | Unit | NOTE |
|---|----------|-----|-----|------|----------|--------------------|
| Reference Differential Output Impedance | Zd | | 100 | | Ω | |
| Termination Mismatch | ΔZM | | | 5 | % | |
| Output AC Common Mode Voltage | | | | 15 | mV (RMS) | |
| Differential Output Return Loss | SDD22 | | | | dB | 4 , 0.01-4.1 GHz |
| | | | | | dB | 5 , 4.1 – 11.1 GHz |
| Common Mode Output Return Loss | SCC22 | | | | dB | 6, 0.01-2.5 GHz |
| | | | | | dB | 2.5-11.1 GHz |
| Output Rise and Fall time (20% to 80%) | tRH, tFH | 24 | | | ps | |
| Deterministic Jitter | DJOUT | | | 0.38 | UI | 7 |
| Total Jitter | TJOUT | | | 0.64 | UI | 7 |

Notes:

4. Reflection coefficient given by equation $SDD22(dB) < -12 + 2 * \sqrt{f}$, with f in GHz. See Figure 3.
5. Reflection coefficient given by equation $SDD22(dB) < -6.3 + 13 \log_{10}(f/5.5)$, with f in GHz. See Figure 3.
6. Reflection coefficient given by equation $SCC22(dB) < -7 + 1.6 * f$, with f in GHz.
7. When transmitter input jitter specs are met.

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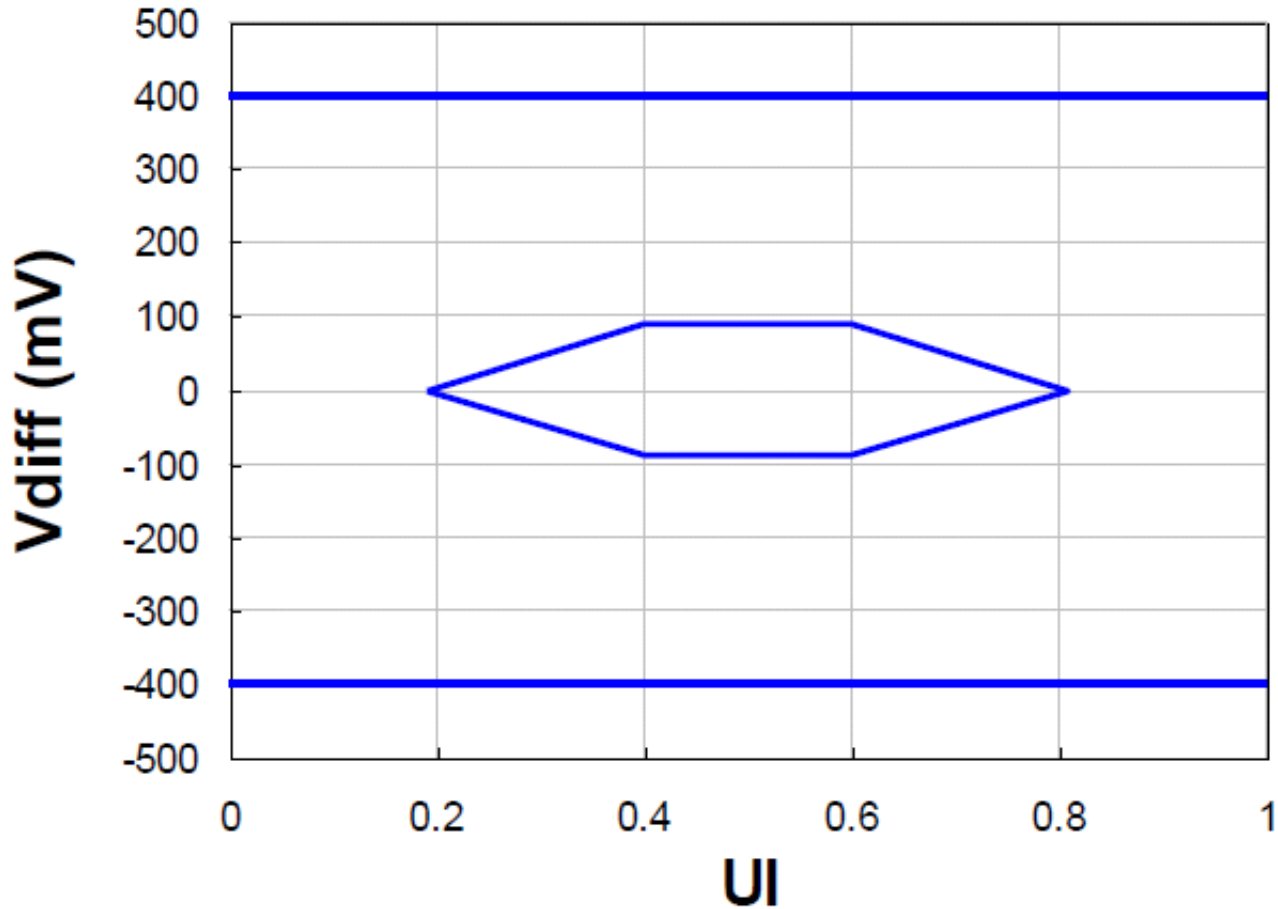


Figure 1 – QSFP+ Transmitter Input Differential Signal Mask

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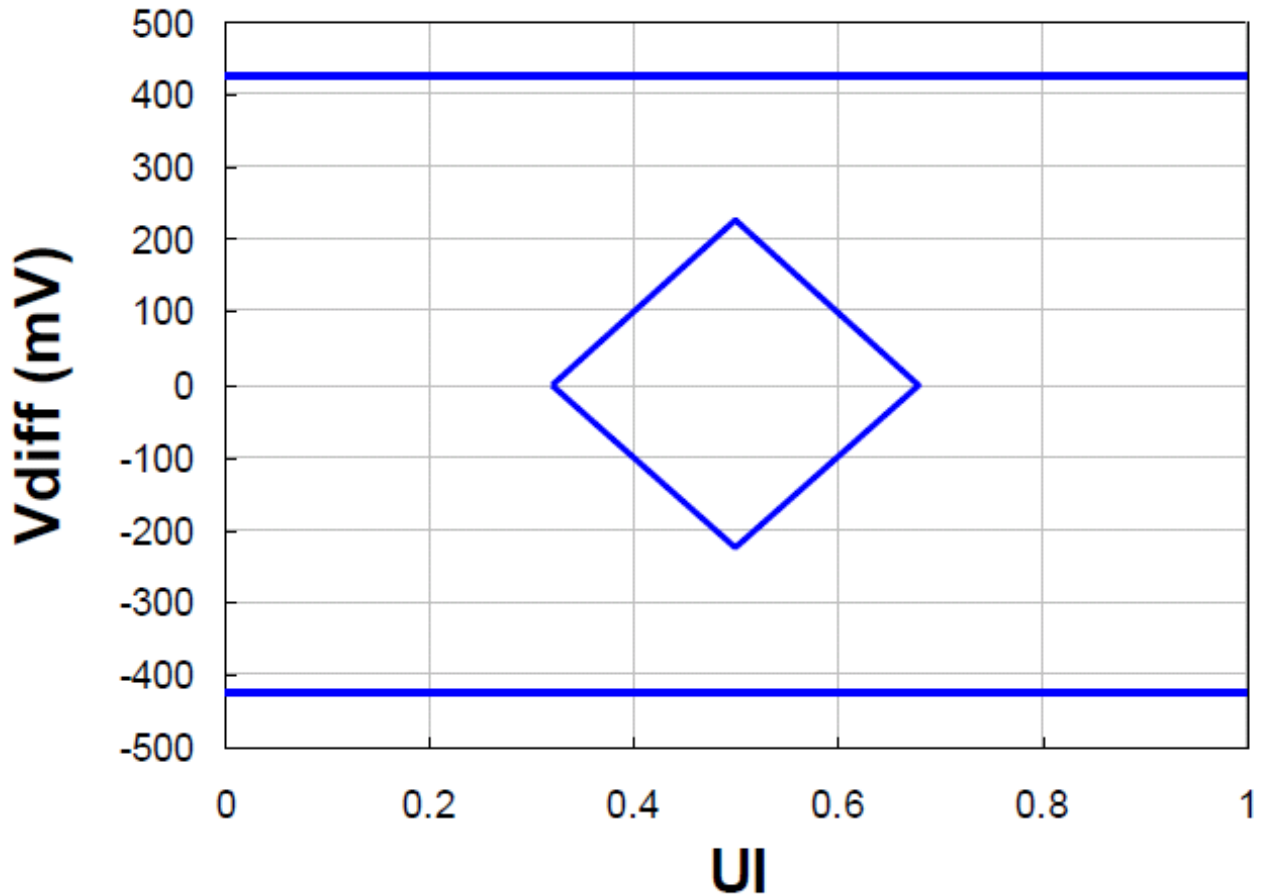


Figure 2 – QSFP+ Receiver Output Differential Signal Mask

Mechanical Specifications

Length 275.59 in [700 cm]

Environmental Specifications

QSFP+
 Temperature (Operational) +0C to +70C
 Temperature (Storage) -40C to +85C
 Relative Humidity 5% to 95%

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Compliance Certifications

RoHS Compliant

Yes

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Our portfolio includes cable assemblies, connectors, adapters and custom products, as well as their wireless product line which includes antennas, RF amplifiers, coaxial lightning and surge protectors, and NEMA rated enclosures.

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URL: <https://www.l-com.com/active-optical-cable-qsfp-40gbps-7m-msa-compatible-aocqp40-007-p.aspx>

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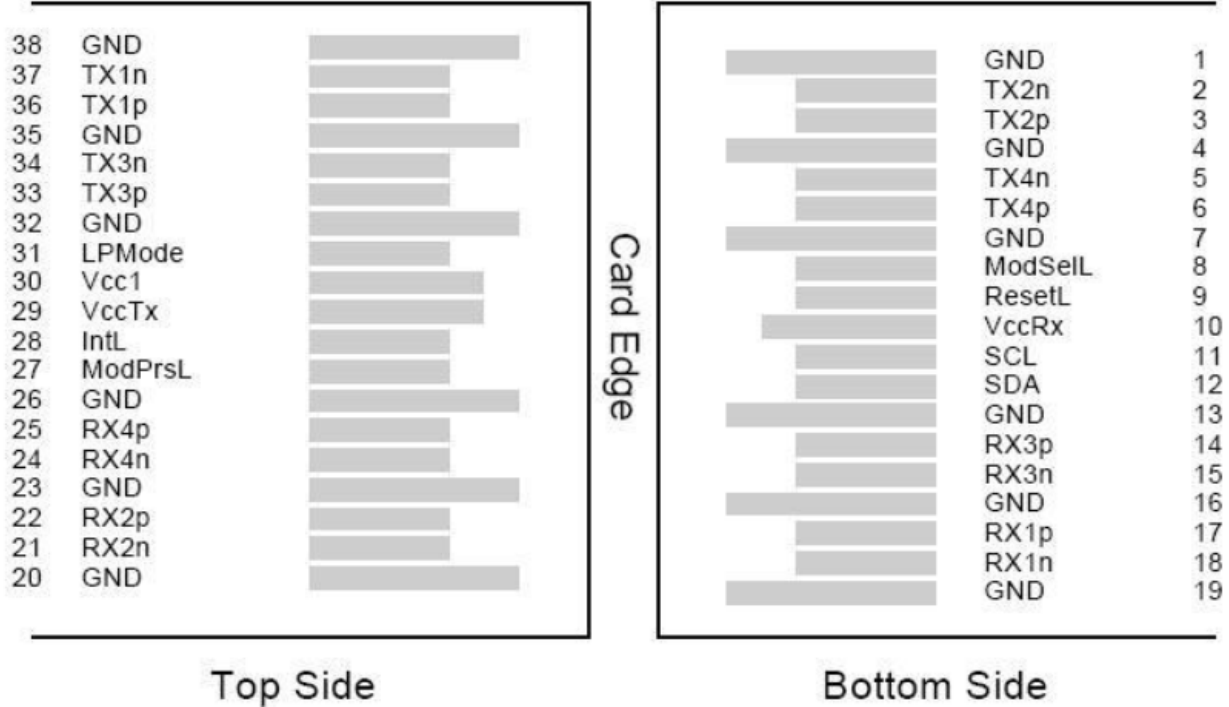


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QSFP+ Pin Assignment



Pin out of Connector Block on Host Board

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AOCQP40-007

QSFP+ Pin Assignment Table

| Pin | Symbol | Name/Description | NOTE |
|-----|---------|--|------|
| 1 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 2 | Tx2n | Transmitter Inverted Data Input | |
| 3 | Tx2p | Transmitter Non-Inverted Data output | |
| 4 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 5 | Tx4n | Transmitter Inverted Data Input | |
| 6 | Tx4p | Transmitter Non-Inverted Data output | |
| 7 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 8 | ModSelL | Module Select | |
| 9 | ResetL | Module Reset | |
| 10 | VccRx | 3.3V Power Supply Receiver | 2 |
| 11 | SCL | 2-Wire serial Interface Clock | |
| 12 | SDA | 2-Wire serial Interface Data | |
| 13 | GND | Transmitter Ground (Common with Receiver Ground) | |
| 14 | Rx3p | Receiver Non-Inverted Data Output | |
| 15 | Rx3n | Receiver Inverted Data Output | |
| 16 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 17 | Rx1p | Receiver Non-Inverted Data Output | |
| 18 | Rx1n | Receiver Inverted Data Output | |
| 19 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 20 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 21 | Rx2n | Receiver Inverted Data Output | |
| 22 | Rx2p | Receiver Non-Inverted Data Output | |
| 23 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 24 | Rx4n | Receiver Inverted Data Output | 1 |
| 25 | Rx4p | Receiver Non-Inverted Data Output | |
| 26 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 27 | ModPrsl | Module Present | |
| 28 | IntL | Interrupt | |
| 29 | VccTx | 3.3V power supply transmitter | 2 |
| 30 | Vcc1 | 3.3V power supply | 2 |
| 31 | LPMODE | Low Power Mode, not connect | |
| 32 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 33 | Tx3p | Transmitter Non-Inverted Data Input | |
| 34 | Tx3n | Transmitter Inverted Data Output | |
| 35 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |
| 36 | Tx1p | Transmitter Non-Inverted Data Input | |
| 37 | Tx1n | Transmitter Inverted Data Output | |
| 38 | GND | Transmitter Ground (Common with Receiver Ground) | 1 |

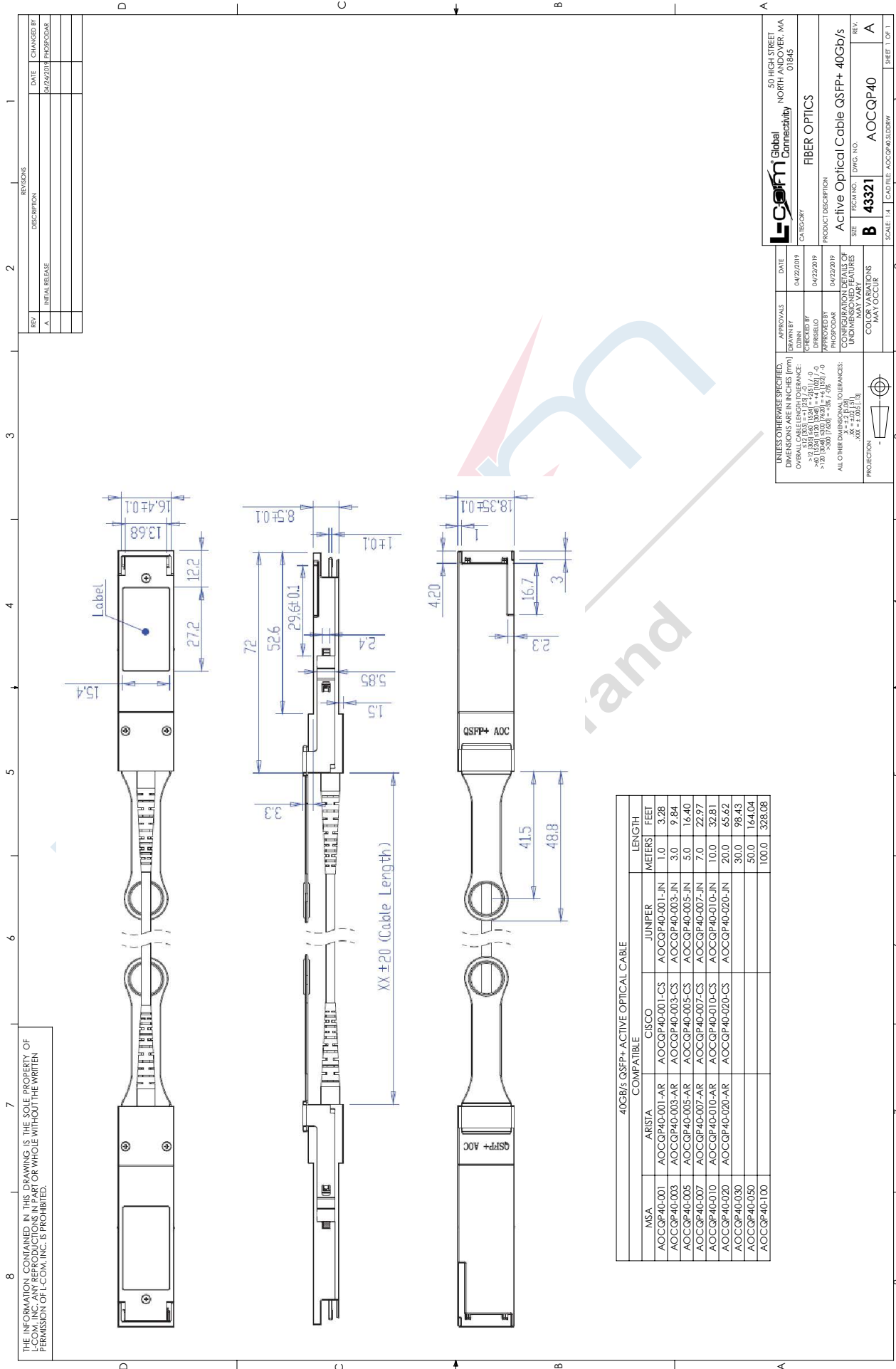
Notes:

1. GND is the symbol for signal and supply (power) common for QSFP+ modules. All are common within the QSFP+ 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, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

AOCQP40-007 CAD Drawing

Active Optical Cable QSFP+ 40Gbps, 7m, MSA Compatible



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| REV. | DESCRIPTION | DATE | CHANGED BY |
|------|-----------------|------------|------------|
| A | INITIAL RELEASE | 03/24/2019 | PHOSPODAR |

| APPROVALS | DATE |
|--------------------------|------------|
| DRAWN BY: [Signature] | 04/22/2019 |
| CHECKED BY: [Signature] | 04/22/2019 |
| APPROVED BY: [Signature] | 04/22/2019 |

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES (mm)

OVERALL DIMENSION TOLERANCES:

- 0.125 (3.175) ± 0.005
- 0.1875 (4.7625) ± 0.005
- 0.25 (6.35) ± 0.005
- 0.3125 (7.9375) ± 0.005
- 0.375 (9.525) ± 0.005
- 0.4375 (11.1125) ± 0.005
- 0.5 (12.7) ± 0.005
- 0.5625 (14.2875) ± 0.005
- 0.625 (15.875) ± 0.005
- 0.6875 (17.4625) ± 0.005
- 0.75 (19.05) ± 0.005
- 0.8125 (20.6375) ± 0.005
- 0.875 (22.225) ± 0.005
- 0.9375 (23.8125) ± 0.005
- 1.0 (25.4) ± 0.005
- 1.0625 (27.0) ± 0.005
- 1.125 (28.575) ± 0.005
- 1.1875 (30.1625) ± 0.005
- 1.25 (31.75) ± 0.005
- 1.3125 (33.3375) ± 0.005
- 1.375 (34.925) ± 0.005
- 1.4375 (36.5125) ± 0.005
- 1.5 (38.1) ± 0.005
- 1.5625 (39.6875) ± 0.005
- 1.625 (41.275) ± 0.005
- 1.6875 (42.8625) ± 0.005
- 1.75 (44.45) ± 0.005
- 1.8125 (46.0375) ± 0.005
- 1.875 (47.625) ± 0.005
- 1.9375 (49.2125) ± 0.005
- 2.0 (50.8) ± 0.005

ALL OTHER DIMENSIONAL TOLERANCES:

- X ± 0.005
- Y ± 0.005
- Z ± 0.005
- .XXX ± 0.001

CONFIGURATION DETAILS OF UNUSUAL FEATURES MAY VARY

COLOR VARIATIONS MAY OCCUR

PROJECTION:

GLOBAL CONNECTIVITY
FIBER OPTICS
Active Optical Cable QSFP+ 40Gb/s
REV. B 43321
SCALE: 1:1
SHEET 1 OF 1

| 40GB/s QSFP+ ACTIVE OPTICAL CABLE | | | | LENGTH | |
|-----------------------------------|----------------|----------------|----------------|--------|--------|
| MSA COMPATIBLE | ARISTA | CISCO | JUNIPER | METERS | FEET |
| AOCQP40-001 | AOCQP40-001-AR | AOCQP40-001-CS | AOCQP40-001-JN | 1.0 | 3.28 |
| AOCQP40-003 | AOCQP40-003-AR | AOCQP40-003-CS | AOCQP40-003-JN | 3.0 | 9.84 |
| AOCQP40-005 | AOCQP40-005-AR | AOCQP40-005-CS | AOCQP40-005-JN | 5.0 | 16.40 |
| AOCQP40-007 | AOCQP40-007-AR | AOCQP40-007-CS | AOCQP40-007-JN | 7.0 | 22.97 |
| AOCQP40-010 | AOCQP40-010-AR | AOCQP40-010-CS | AOCQP40-010-JN | 10.0 | 32.81 |
| AOCQP40-020 | AOCQP40-020-AR | AOCQP40-020-CS | AOCQP40-020-JN | 20.0 | 65.62 |
| AOCQP40-030 | | | | 30.0 | 98.43 |
| AOCQP40-050 | | | | 50.0 | 164.04 |
| AOCQP40-100 | | | | 100.0 | 328.08 |