

QSFP-40G-AOCXM-AO

MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, Up to 15m)

Features

- Full duplex 4 channel 850nm parallel active optical cable
- Transmission data rate up to 10.3Gbit/s per channel
- SFF-8436 QSFP+ compliant
- Hot pluggable electrical interface
- Differential AC-coupled high-speed data interface
- 4 channels 850nm VCSEL array
- 4 channels PIN photo detector array
- Low power consumption <1.5W
- Operating case temperature 0°C to +70°C
- 3.3V power supply voltage
- RoHS 6 compliant

Applications

- InfiniBand transmission at 4ch SDR, DDR and QDR
- 40GBASE-SR4 Ethernet
- Data Centers

Product Description

This is an MSA compliant 40GBase-AOC QSFP+ to QSFP+ active optical cable that operates over multi-mode fiber with a maximum reach up to 15.0m (49.2ft). 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.

AddOn's QSFP+ active optical cables 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."



Order Information

| Part Number | Description |
|--------------------|--|
| QSFP-40G-AOC1M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 1m) |
| QSFP-40G-AOC2M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 2m) |
| QSFP-40G-AOC3M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 3m) |
| QSFP-40G-AOC4M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 4m) |
| QSFP-40G-AOC5M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 5m) |
| QSFP-40G-AOC6M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 6m) |
| QSFP-40G-AOC7M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 7m) |
| QSFP-40G-AOC8M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 8m) |
| QSFP-40G-AOC9M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 9m) |
| QSFP-40G-AOC10M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 10m) |
| QSFP-40G-AOC15M-AO | MSA and TAA Compliant 40GBase-AOC QSFP+ Active Optical Cable (850nm, MMF, 15m) |

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------------------|--------|------|------|---------|------|
| Supply Voltage | Vcc | -0.5 | | 4.0 | V |
| Input Voltage | Vin | -0.3 | | Vcc+0.3 | V |
| Storage Temperature | Ts | -20 | | 85 | °C |
| Case Operating Temperature | Top | 0 | | 70 | °C |
| Humidity (non-condensing) | RH | 5 | | 95 | % |

Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------------------|--------|------|------|------|------|
| Supply Voltage | Vcc | 3.13 | 3.3 | 3.47 | V |
| Operating Case Temperature | Tca | -5 | | 70 | °C |
| Data Rate Per Lane | fd | 2.5 | | 10.3 | Gbps |
| Humidity | Rh | 5 | | 85 | % |
| Power Dissipation | Pm | | | 1.5 | W |
| Fiber Band Radius | Rb | 3 | | | cm |

Specifications

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---------------------------------------|------------------|----------------------|------|-----------------|-------|-------|
| Differential input impedance | Zin | 90 | 100 | 110 | ohm | 2 |
| Differential Output impedance | Zout | 90 | 100 | 110 | ohm | 3 |
| Differential input voltage amplitude | ΔV_{in} | 300 | | 1100 | mVp-p | |
| Differential output voltage amplitude | ΔV_{out} | 500 | | 800 | mVp-p | |
| Skew | Sw | | | 300 | ps | |
| Bit Error Rate | BR | | | E-12 | | |
| Input Logic Level High | V _{IH} | 2.0 | | V _{cc} | V | |
| Input Logic Level Low | V _{IL} | 0 | | 0.8 | V | |
| Output Logic Level High | V _{OH} | V _{cc} -0.5 | | V _{cc} | V | |
| Output Logic Level Low | V _{OL} | 0 | | 0.4 | V | |

Notes:

1. BER=10⁻¹²; PRBS 2³¹-1@10.3125Gbps.
2. Differential input voltage amplitude is measured between TxnP and TxnN.
3. Differential output voltage amplitude is measured between RxNP and RxnN.

Optical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|--|-----------------|-----------------------------------|------|------|------|--------------------|
| Transmitter | | | | | | |
| Center Wavelength | λ_C | 840 | 850 | 860 | nm | |
| RMS Spectral Width | $\Delta\lambda$ | | | 0.65 | nm | |
| Average Launch Power per Channel | Pout | -7.5 | | -2.5 | dBm | |
| Difference in launch power between any two lanes (OMA) | | | | | dB | |
| Extinction Ratio | ER | 3 | | | dB | |
| Peak power, each lane | | | | 4 | dBm | |
| Transmitter and dispersion penalty (TDP), each lane | TDP | | | 3.5 | dB | |
| Average launch power of OFF transmitter, each lane | | | | -30 | dB | |
| Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3} | | 0.23, 0.34, 0.43, 0.27, 0.33, 0.4 | | | | Hit Ratio = 5x10-5 |
| Receiver | | | | | | |
| Center Wavelength | λ_C | 840 | 850 | 860 | nm | |
| Stressed receiver sensitivity in OMA, each lane | | | | -5.4 | | 1 |
| Maximum Average power at receiver input, each lane | | | | 2.4 | | |
| Receiver Reflectance | | | | -12 | | |
| Peak power, each lane | | | | 4 | | |
| LOS Assert | | -30 | | | | |
| LOS De-Assert – OMA | | | | 7.5 | | |
| LOS Hysteresis | | 0.5 | | | | |

Note:

1. Measured with conformance test signal at TP3 for BER = 10e-12

Pin Descriptions

| Pin | Logic | Symbol | Name/Descriptions | Ref. |
|-----|-------------|---------|--|------|
| 1 | | GND | Module Ground | 1 |
| 2 | CML-I | Tx2- | Transmitter inverted data input | |
| 3 | CML-I | Tx2+ | Transmitter non-inverted data input | |
| 4 | | GND | Module Ground | 1 |
| 5 | CML-I | Tx4- | Transmitter inverted data input | |
| 6 | CML-I | Tx4+ | Transmitter non-inverted data input | |
| 7 | | GND | Module Ground | 1 |
| 8 | LVTTTL-I | MODSEIL | Module Select | 2 |
| 9 | LVTTTL-I | ResetL | Module Reset | 2 |
| 10 | | VCCRx | +3.3v Receiver Power Supply | |
| 11 | LVC MOS-I/O | SCL | 2-wire Serial interface clock | 2 |
| 12 | LVC MOS-I/O | SDA | 2-wire Serial interface data | 2 |
| 13 | | GND | Module Ground | 1 |
| 14 | CML-O | RX3+ | Receiver non-inverted data output | |
| 15 | CML-O | RX3- | Receiver inverted data output | |
| 16 | | GND | Module Ground | 1 |
| 17 | CML-O | RX1+ | Receiver non-inverted data output | |
| 18 | CML-O | RX1- | Receiver inverted data output | |
| 19 | | GND | Module Ground | 1 |
| 20 | | GND | Module Ground | 1 |
| 21 | CML-O | RX2- | Receiver inverted data output | |
| 22 | CML-O | RX2+ | Receiver non-inverted data output | |
| 23 | | GND | Module Ground | 1 |
| 24 | CML-O | RX4- | Receiver inverted data output | |
| 25 | CML-O | RX4+ | Receiver non-inverted data output | |
| 26 | | GND | Module Ground | 1 |
| 27 | LVTTTL-O | ModPrsL | Module Present, internal pulled down to GND | |
| 28 | LVTTTL-O | IntL | Interrupt output should be pulled up on host board | 2 |
| 29 | | VCCTx | +3.3v Transmitter Power Supply | |
| 30 | | VCC1 | +3.3v Power Supply | |
| 31 | LVTTTL-I | LPMode | Low Power Mode | 2 |
| 32 | | GND | Module Ground | 1 |
| 33 | CML-I | Tx3+ | Transmitter non-inverted data input | |
| 34 | CML-I | Tx3- | Transmitter inverted data input | |
| 35 | | GND | Module Ground | 1 |
| 36 | CML-I | Tx1+ | Transmitter non-inverted data input | |
| 37 | CML-I | Tx1- | Transmitter inverted data input | |

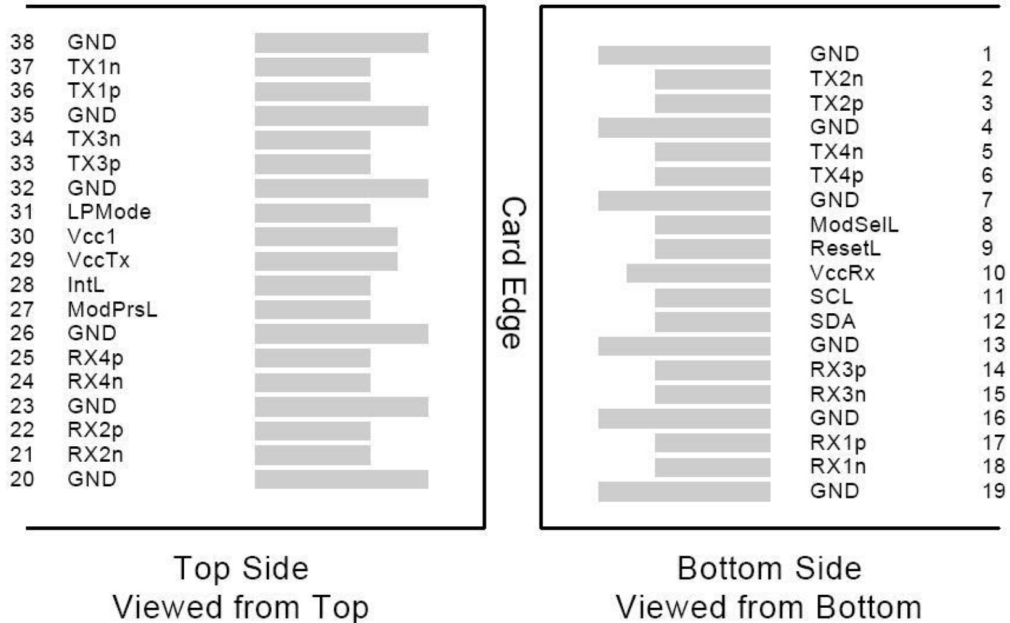
Notes:

1. GND is the symbol for signal and supply (power), Connect these directly to the host board signal

common ground plane

- VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+. The connector pins are each rated for a maximum current of 500mA.

Pin Assignment and Pin Description



ModSelL Pin

The ModSelL is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP modules on a single 2-wire interface bus. When the ModSelL is “High”, the module will not respond to any 2-wire interface communication from the host. ModSelL has an internal pull-up in the module.

ResetL Pin

Reset. LPMODE_Reset has an internal pull-up in the module. A low level on the ResetL pin for longer than the minimum pulse length (t_{Reset_init}) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time (t_{init}) starts on the rising edge after the low level on the ResetL pin is released. During the execution of a reset (t_{init}) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL signal with the Data_Not_Ready bit negated. Note that on power up (including hot insertion) the module will post this completion of reset interrupt without requiring a reset.

LPMoDe Pin

Operate in the low power mode (less than 1.5 W power consumption) This pin active high will decrease power consumption to less than 1W.

ModPrsL Pin

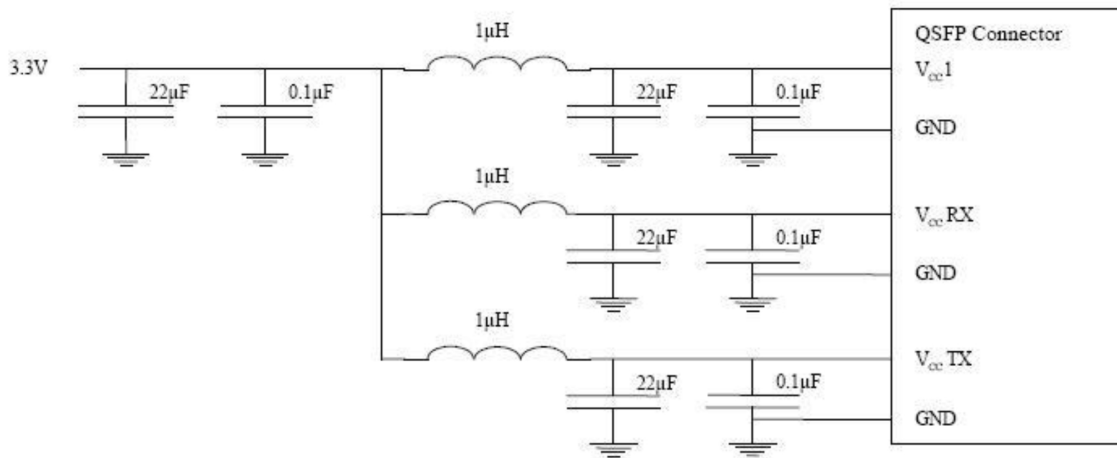
ModPrsL is pulled up to Vcc on the host board and grounded in the module. The ModPrsL is asserted “Low” when the module is inserted and de-asserted “High” when the module is physically absent from the host connector.

IntL Pin

IntL is an output pin. When “Low”, it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt by using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled up to Vcc on the host board.

Power Supply Filtering

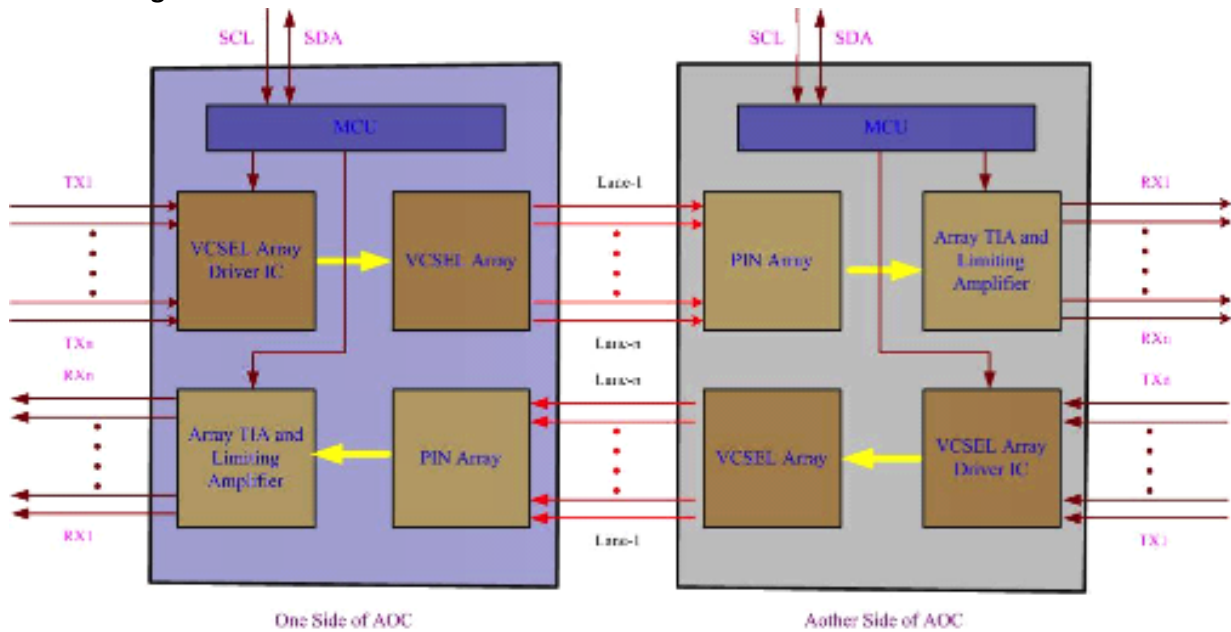
The host board should use the power supply filtering shown below.



DIAGNOSTIC MONITORING INTERFACE

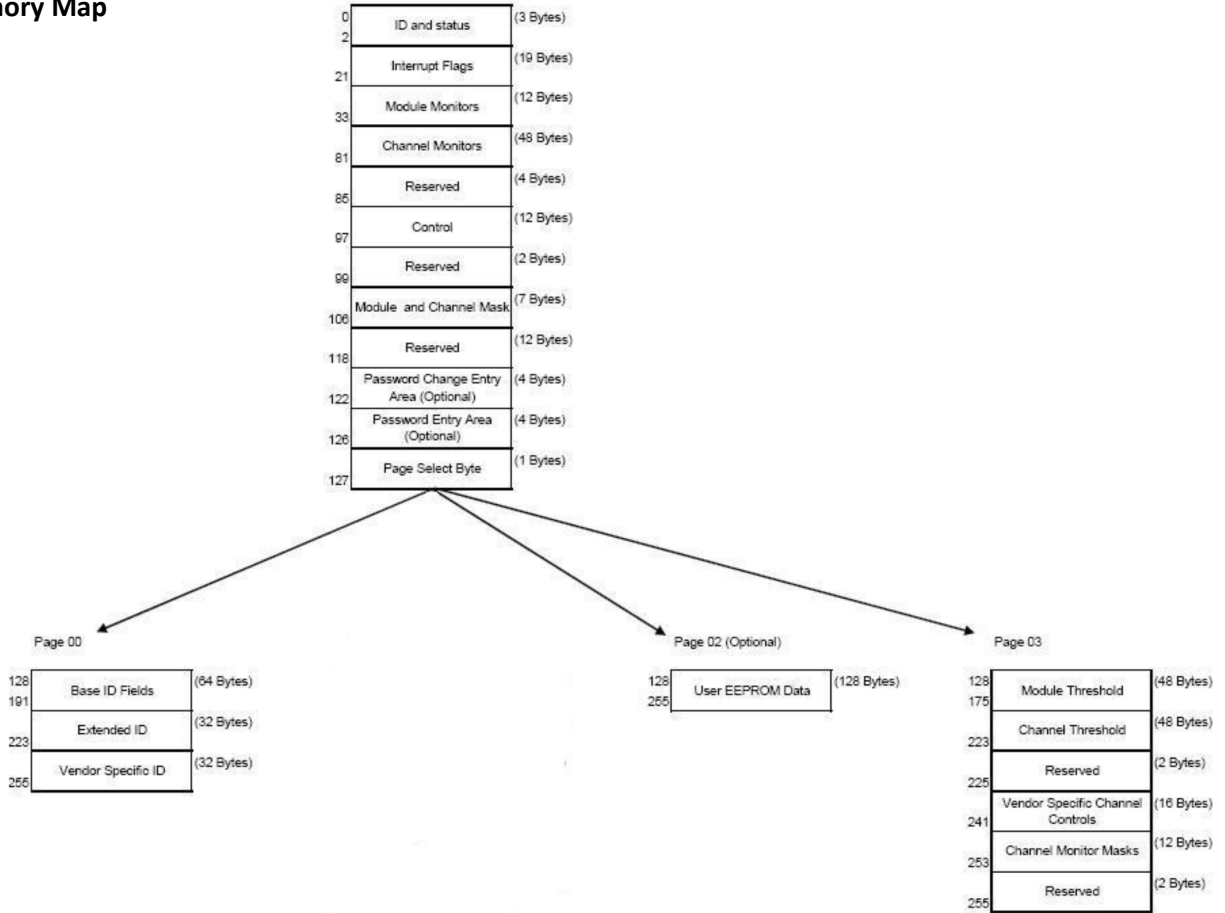
Digital diagnostics monitoring function is available on all QSFP AOCs. A 2-wire serial interface provides user to contact with module. The structure of the memory is shown in Figure 4. The memory space is arranged into a lower, single page, address space of 128 bytes and multiple upper address space pages. This structure permits timely access to addresses in the lower page, such as Interrupt Flags and Monitors. Less time critical time entries, such as serial ID information and threshold settings, are available with the Page Select function. The interface address used is A0xh and is mainly used for time critical data like interrupt handling in order to enable a one-time-read for all data related to an interrupt situation. After an interrupt, IntL, has been asserted, the host can read out the flag field to determine the affected channel and type of flag.

Module Block Diagram

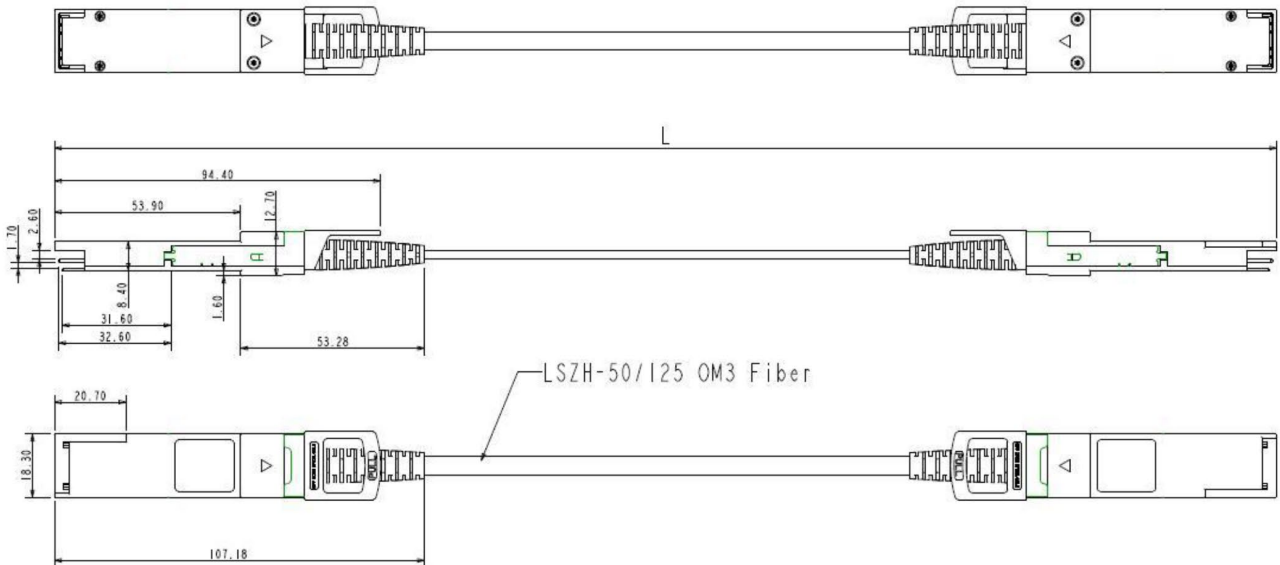


Memory Map

2-wire serial address, 1010000x (A0h)[™]



Mechanical Specifications



Contact Information

Founded in 1999, AddOn Networks is North America's leading provider of transceivers and high speed cabling. With a reputation for high quality products as well as an extensive custom design portfolio, AddOn has the connectivity solution regardless of the requirement.

At AddOn, 100% of the products we ship every day are tested in the specific application for which they are intended—never batch or spec tested only. We run bandwidth, distance and IOS network tests. We have documented an impressive 0.03% failure rate over the last 10 years. To continue this rate of success we invest millions annually in our own on-site testing lab.

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