

# Technical Datasheet

## DAC-QSFP-56G-2M-AT

Universally Coded MSA Compliant 56Gb/s, QSFP+, Direct Attach Cable, Copper, Passive, 2m

### FEATURES

- Compliant with SFF- 8436, SFF-8431, SFF-8432 and SFF-8472
- Up to 14.025Gbps data per channel at InfiniBand FDR 56Gb.
- Operating temperature: 0°C to +70°C
- Single 3.3V power supply
- RoHS compliant
- Cost-effective copper solution
- Lowest total system power solution
- Lowest total system EMI solution
- Optimized design for Signal Integrity

### APPLICATIONS

#### Data

- Servers
- Networked storage systems
- Routers
- External storage systems
- Data Centre networking

#### Communications

- Switches
- Routers

### INDUSTRIAL STANDARDS

- InfiniBand Trade Association (IBTA)
- IEEE802.3ba
- 56Gigabit Ethernet (56G BASE – CR4) & 56G FDR

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## DESCRIPTION

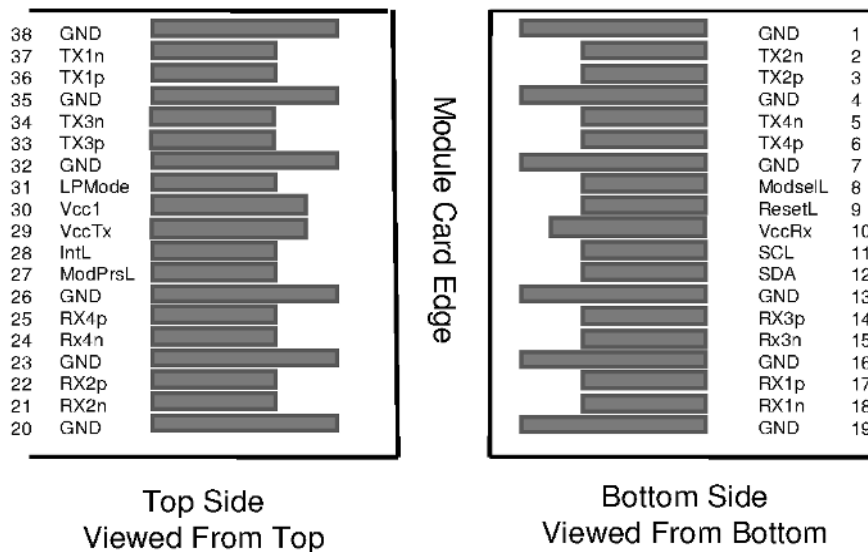
ATGBICS Universally Coded MSA Compliant QSFP+ (Quad Small Form-factor Pluggable Plus) copper direct-attach cables are suitable for very short distances and offer a highly cost-effective way to establish a 56-Gigabit link between QSFP+ ports of QSFP+ switches within racks and across adjacent racks. These cables are used for 56GbE and Infiniband standards, to maximize performance. QSFP+ are designed to meet emerging data center and high-performance computing application needs for a high-density cabling interconnect system capable of delivering an aggregate data bandwidth of 56Gb/s. This interconnect system is fully compliant with existing industry standard specifications such as the QSFP MSA and IBTA (InfiniBand Trade Association). The QSFP+ cables support the bandwidth transmission requirements as defined by IEEE 802.3ba (56 Gb/s) and Infiniband QDR (4x14 Gb/s per channel) specifications.

## QSFP+ Pin Function Definition

| Pin | Logic       | Symbol  | Description                         |
|-----|-------------|---------|-------------------------------------|
| 1   |             | GND     | Ground                              |
| 2   | CML-I       | Tx2n    | Transmitter Inverted Data Input     |
| 3   | CML-I       | Tx2p    | Transmitter Non-Inverted Data Input |
| 4   |             | GND     | Ground                              |
| 5   | CML-I       | Tx4n    | Transmitter Inverted Data Input     |
| 6   | CML-I       | Tx4p    | Transmitter Non-Inverted Data Input |
| 7   |             | GND     | Ground                              |
| 8   | LVTTL-I     | ModSelL | Module Select                       |
| 9   | LVTTL-I     | ResetL  | Module Reset                        |
| 10  |             | Vcc Rx  | +3.3V Power Supply Receiver         |
| 11  | LVC MOS-I/O | SCL     | 2-wire serial interface clock       |
| 12  | LVC MOS-I/O | SDA     | 2-wire serial interface data        |
| 13  |             | GND     | Ground                              |
| 14  | CML-O       | Rx3p    | Receiver Non-Inverted Data Output   |
| 15  | CML-O       | Rx3n    | Receiver Inverted Data Output       |
| 16  |             | GND     | Ground                              |

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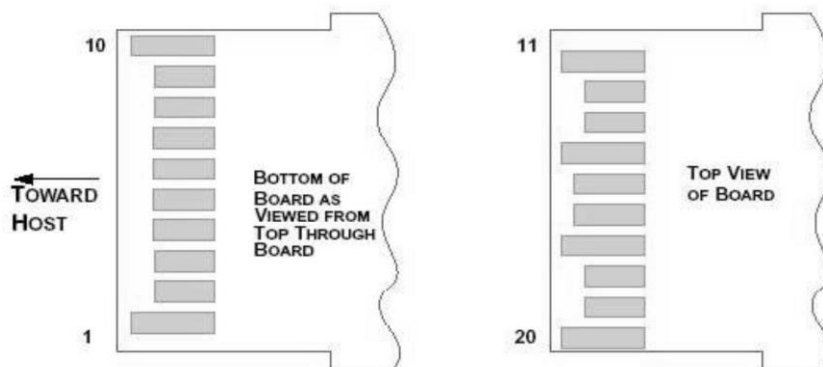
|    |         |         |                                     |
|----|---------|---------|-------------------------------------|
| 17 | CML-O   | Rx1p    | Receiver Non-Inverted Data Output   |
| 18 | CML-O   | Rx1n    | Receiver Inverted Data Output       |
| 19 |         | GND     | Ground                              |
| 20 |         | GND     | Ground                              |
| 21 | CML-O   | Rx2n    | Receiver Inverted Data Output       |
| 22 | CML-O   | Rx2p    | Receiver Non-Inverted Data Output   |
| 23 |         | GND     | Ground                              |
| 24 | CML-O   | Rx4n    | Receiver Inverted Data Output       |
| 25 | CML-O   | Rx4p    | Receiver Non-Inverted Data Output   |
| 26 |         | GND     | Ground                              |
| 27 | LVTTL-O | ModPrsL | Module Present                      |
| 28 | LVTTL-O | IntL    | Interrupt                           |
| 29 |         | Vcc Tx  | +3.3V Power supply transmitter      |
| 30 |         | Vcc1    | +3.3V Power supply                  |
| 31 | LVTTL-I | LPMode  | Low Power Mode                      |
| 32 |         | GND     | Ground                              |
| 33 | CML-I   | Tx3p    | Transmitter Non-Inverted Data Input |
| 34 | CML-I   | Tx3n    | Transmitter Inverted Data Input     |
| 35 |         | GND     | Ground                              |
| 36 | CML-I   | Tx1p    | Transmitter Non-Inverted Data Input |
| 37 | CML-I   | Tx1n    | Transmitter Inverted Data Input     |
| 38 |         | GND     | Ground                              |



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## QSFP+ Pin Function Definition

| Pin | Logic     | Symbol     | Description   |
|-----|-----------|------------|---|
| 1   |           | VeeT       | Module Transmitter Ground   |
| 2   | LVTTL-O   | Tx_Fault   | Module Transmitter Fault  |
| 3   | LVTTL-I   | Tx_Disable | Transmitter disable; Turns off transmitter laser output   |
| 4   | LVTTL-I/O | SDA        | 2-wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i)   |
| 5   | LVTTL-I/O | SCL        | 2-wire Serial Interface Clock (Same as MOD-DEF1 in INF-8074i)   |
| 6   |           | Mod_ABS    | Module Absent, connected to VeeT or VeeR in the module  |
| 7   | LVTTL-I   | RS0        | Rate Select 0, optionally controls SFP+ module receiver   |
| 8   | LVTTL-O   | Rx_LOS     | Receiver Loss of Signal Indication (In FC designated as Rx_LOS and in Ethernet designated as Signal Detect) |
| 9   | LVTTL-I   | RS1        | Rate Select 1, optionally controls SFP+ module transmitter  |
| 10  |           | VeeR       | Module Receiver Ground  |
| 11  |           | VeeR       | Module Receiver Ground  |
| 12  | CML-O     | RD-        | Receiver Inverted Data Output   |
| 13  | CML-O     | RD+        | Receiver Non-Inverted Data Output   |
| 14  |           | VeeR       | Module Receiver Ground  |
| 15  |           | VccR       | Module Receiver 3.3 V Supply  |
| 16  |           | VccT       | Module Transmitter 3.3 V Supply   |
| 17  |           | VeeT       | Module Transmitter Ground   |
| 18  | CML-I     | TD+        | Transmitter Non-Inverted Data Input   |
| 19  | CML-I     | TD-        | Transmitter Inverted Data Input   |
| 20  |           | VeeT       | Module Transmitter Ground   |



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## General Product Characteristics

| Q/4SFP+ DAC Specifications |   |
|----------------------------|---|
| Number of Lanes            | Tx & Rx   |
| Channel Data Rate          | 10.3125 Gbps  |
| Operating Temperature      | 0 to + 70°C   |
| Storage Temperature        | -40 to + 85°C   |
| Supply Voltage             | 3.3 V nominal   |
| Electrical Interface       | 38 pins edge connector (QSFP+)<br>20 pins edge connector (SFP+) |
| Management Interface       | Serial, I2C   |

## High Speed Characteristics

| Parameter                                     | Symbol         | Min    | Typical | Max   | Unit | Note                |
|---|----------------|--------|---------|-------|------|---------------------|
| Differential Impedance                        | TDR            | 90     | 100     | 110   | Ω    |                     |
| Insertion loss                                | SDD21          | -17.04 |         |       | dB   | At 5.15625 GHz      |
| Differential Return Loss                      | SDD11          |        |         | See 1 | dB   | At 0.05 to 4.1 GHz  |
|   | SDD22          |        |         | See 2 | dB   | At 4.1 to 11.1 GHz  |
| Differential to common mode return loss       | SCD11<br>SCD22 |        |         | -10   | dB   | At 0.2 to 11.1 GHz  |
| Common-mode to common-mode output return loss | SCC11<br>SCC22 |        | -3      |       | dB   | At 0.01 to 11.1 GHz |

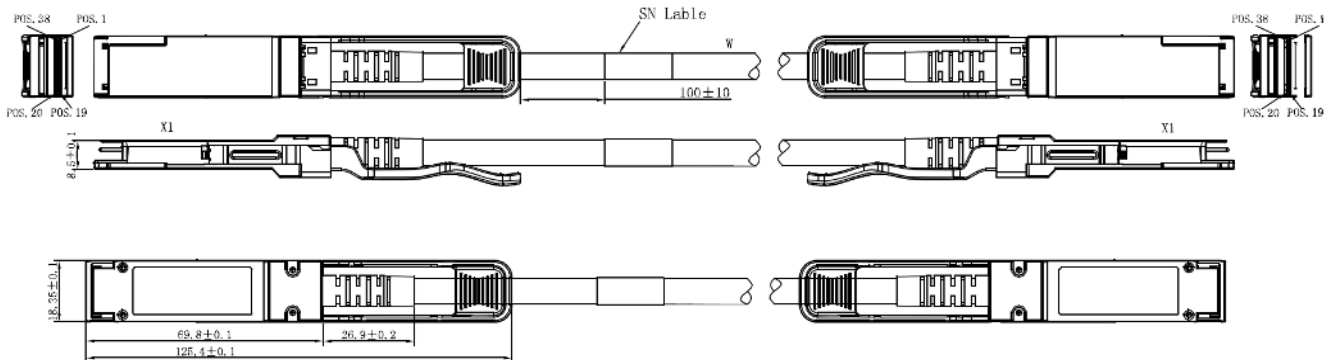
### Notes:

1. Reflection Coefficient given by equation  $SDD11(\text{dB}) < -12 + 2 \times \text{SQRT}(f)$ , with f in GHz
2. Reflection Coefficient given by equation  $SDD11(\text{dB}) < -6.3 + 13 \times \log_{10}(f/5.5)$ , with f in GHz

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## Mechanical Information

The connector is compatible with the SFF-8436 to SFF-8432 specification



## Regulatory Compliance

| Feature   | Test Method   | Performance   |
|---|---|---|
| <b>Electrostatic Discharge (ESD) to the Electrical Pins</b> | MIL-STD-883C Method 3015.7  | Class 1(>2000 Volts)  |
| <b>Electromagnetic Interference (EMI)</b>                   | FCC Class B   | Compliant with Standards  |
|   | CENELEC EN55022 Class B   |   |
|   | CISPR22 ITE Class B   |   |
| <b>RF Immunity (RFI)</b>                                    | IEC61000-4-3  | Typically Show no Measurable Effect from a 10V/m Field Swept from 80 to 1000MHz |
| <b>RoHS Compliance</b>                                      | RoHS Directive 2011/65/EU and it's Amendment Directives (EU) 2015/863 | RoHS (EU) 2015/863 compliant  |
| <b>REACH Compliance</b>                                     | REACH Regulation (EC) No 1907/2006                                    | REACH (EC) No 1907/2006 compliant   |

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## AWG Information

| Cable Length (m) | AWG   |
|------------------|-------|
| 0.5              | 30    |
| 1                | 30    |
| 2                | 30    |
| 3                | 28/30 |
| 4                | 28    |
| 5                | 24    |
| 7                | 24    |