# LinkPro™



## Application

- Data center & Networking Equipment
- Servers/Storage Devices
- High Performance Computing (HPC)
- Switches/Routers
- Telecom Central Offices (CO)
- Test and Measurement Equipment

## Standards Compliance

- Compliant with QSFP56 MSA
- Compliant with SFP-DD MSA
- Compliant with IEEE 802.3cd
- Compliant with IEEE 802.3bj
- Compliant with InfiniBand HDR
- Compliant with CMIS 5.0 and SFF-8636
- Compliant with SFF-TA-1031,FF-8665, SFF-8661, SFF-8679,SFF-8417,SFF-8432, SFF-8071, SFF-8433

## Highlight

- Support 4x53.125G PAM4
- 200G to 4*50G Data Rate
- 3.3V Power Supply
- Hot Pluggable
- Excellent SI performance
- RoHS Compliance
- I2C for EEPROM communication
- Max. power consumption 1.5W

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## 1.0  General Description

This datasheet pertains to the **QSFP56 200G to 4*SFP56 50G Active Redriver Cable Assembly**, meticulously designed for application in the telecommunications and data center sectors. It facilitates bi-directional transmission of 200G traffic per cable, accommodating 4 lanes of 56G PAM4. The cable adheres to the standardized QSFP28(56) and SFP28(56) form factor and complies rigorously with Multi-Source Agreement (MSA) specifications.

## 2.0  Product Specification

### 2.1  Absolute Maximum Ratings

| Parameter | Unit | Min. | Max. | Notes |
|---|---|---|---|---|
| Supply Voltage | V | -0.3 | 3.6 | |
| Data Input Voltage | V | -0.3 | 3.6 | |
| Control Input Voltage | V | -0.3 | 3.6 | |
| Operating Temperature | °C | 0 | 70 | |
| Storage Temperature | °C | -40 | +85 | |
| Relative Humidity (Non-Condensing) | % | 5 | 85 | |

### 2.2  Operational Specification

| Parameter | Unit | Min | Typical | Max | Notes |
|---|---|---|---|---|---|
| Supply Voltage (Vcc) | V | 3.135 | 3.3 | 3.465 | Per End |
| Power Consumption | W | | | 1.5 | Per End |
| Operating Case Temperature | °C | 0 | | 70 | |
| Operating Relative Humidity | % | 0 | | 85 | |
| Modulation Format | | 56G PAM-4 | | | |
| Bit Rate | Gbps | 200G to 4*50G | | | |

### 2.3  Electrical Characteristics

| Parameter | Unit | Min | Typical | Max | Notes |
|---|---|---|---|---|---|
| Characteristic Impedance | ohm | 90 | 100 | 110 | |
| Time Propagation Delay (Informative) | ns | ..... | ..... | 4.9 | |

## 2.4 SI performance

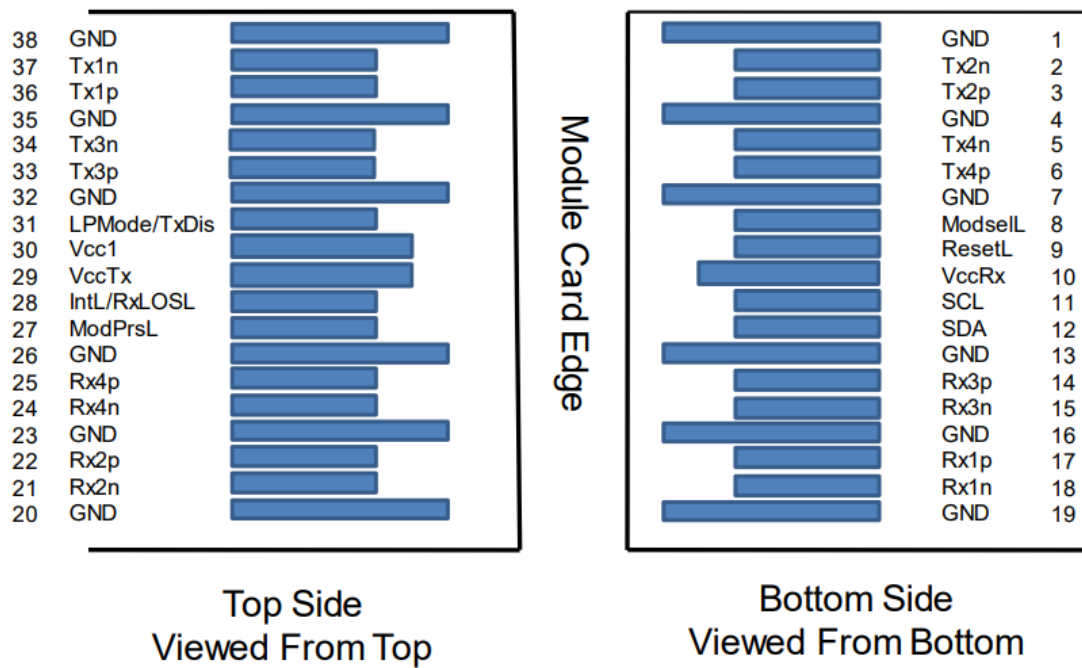| Item | Parameter | Require | Reference |
|---|---|---|---|
| 1 | ILdd<br>Insertion loss at 13.28 GHz | 17.16 dB (Max.) | IEEE 802.3cd Section<br>Section 136.11.2 |
| 2 | ILdd<br>Insertion loss at 13.28 GHz | 8 dB (Min.) | IEEE 802.3cd Section<br>Section 136.11.2 |
| 3 | ERL<br>Minimum cable assembly | >11 dB*. | IEEE 802.3cd Section<br>Section 136.11.3 |
| 4 | RLcd<br>Differential-mode to common-mode<br>return loss | 0.01GHz – 19GHz<br>Equation (92–28) | IEEE 802.3cd Section<br>136.11.4 |
| 5 | ILcd<br>Differential-mode to common-mode<br>insertion loss | 0.01GHz – 19GHz<br>Equation (92–29) | IEEE 802.3cd Section<br>136.11.5 |
| 6 | RLcc<br>Common-mode to common-mode<br>return loss | 0.01GHz – 19GHz<br>Equation (92–30) | IEEE 802.3cd Section<br>Section 136.11.6 |
| 7 | COM | 3dB (Min.) | IEEE 802.3cd Section<br>Section 136.11.7 |
| *Cable assemblies with a com greater than 4 dB are not required to meet minimum ERL | | | |

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## 2.5  Pin Assignments

| Pin | Top Side | | Bottom Side | Pin |
|-----|----------|---|-------------|-----|
| 38 | GND | | GND | 1 |
| 37 | Tx1n | | Tx2n | 2 |
| 36 | Tx1p | | Tx2p | 3 |
| 35 | GND | | GND | 4 |
| 34 | Tx3n | | Tx4n | 5 |
| 33 | Tx3p | | Tx4p | 6 |
| 32 | GND | | GND | 7 |
| 31 | LPMode/TxDis | | ModselL | 8 |
| 30 | Vcc1 | | ResetL | 9 |
| 29 | VccTx | | VccRx | 10 |
| 28 | IntL/RxLOSL | | SCL | 11 |
| 27 | ModPrsL | | SDA | 12 |
| 26 | GND | | GND | 13 |
| 25 | Rx4p | | Rx3p | 14 |
| 24 | Rx4n | | Rx3n | 15 |
| 23 | GND | | GND | 16 |
| 22 | Rx2p | | Rx1p | 17 |
| 21 | Rx2n | | Rx1n | 18 |
| 20 | GND | | GND | 19 |

Module Card Edge

Top Side Viewed From Top

Bottom Side Viewed From Bottom

**Figure 1 QSFP28(56) Module Contact Assignment**

TOWARD HOST WITH DIRECTION OF MODULE INSERTION

BOTTOM OF BOARD AS VIEWED FROM TOP THROUGH BOARD

TOP VIEW OF BOARD

**Figure 2 SFP28(56) Module Contact Assignment**

**QSFP56 200G to 4*SFP56 50G Active Redriver Cable Assembly**

### 2.6  Pin Description

#### Table 1 QSFP28(56) Module Pin Description

| Pin | Logic | Symbol | Description | Plug Sequence | Notes |
|-----|-------|--------|-------------|---------------|-------|
| 1 | | GND | Ground | 1 | 1 |
| 2 | CML-I | Tx2n | Transmitter Inverted Data Input | 3 | |
| 3 | CML-I | Tx2p | Transmitter Non-Inverted Data Input | 3 | |
| 4 | | GND | Ground | 1 | 1 |
| 5 | CML-I | Tx4n | Transmitter Inverted Data Input | 3 | |
| 6 | CML-I | Tx4p | Transmitter Non-Inverted Data Input | 3 | |
| 7 | | GND | Ground | 1 | 1 |
| 8 | LVTTL-1 | ModseIL | Module Select | 3 | |
| 9 | LVTTL-1 | ResetL | Module Reset | 3 | |
| 10 | | Vcc Rx | +3.3V Power supply receiver | 2 | 2 |
| 11 | LVCMOS-I/O | SCL | 2-wire serial interface clock | 3 | |
| 12 | LVCMOS-I/O | SDA | 2-wire serial interface clock | 3 | |
| 13 | | GND | Ground | 1 | 1 |
| 14 | CML-O | Rx3p | Receiver Non-Inverted Data Output | 3 | |
| 15 | CML-O | Rx3n | Receiver Inverted Data Output | 3 | |
| 16 | | GND | Ground | 1 | 1 |
| 17 | CML-O | Rx1p | Receiver Non-Inverted Data Output | 3 | |
| 18 | CML-O | Rx1n | Receiver Inverted Data Output | 3 | |
| 19 | | GND | Ground | 1 | 1 |
| 20 | | GND | Ground | 1 | 1 |
| 21 | CML-O | Rx2n | Receiver Inverted Data Output | 3 | |
| 22 | CML-O | Rx2p | Receiver Non-Inverted Data Output | 3 | |
| 23 | | GND | Ground | 1 | |
| 24 | CML-O | Rx4n | Receiver Inverted Data Output | 3 | |
| 25 | CML-O | Rx4p | Receiver Non-Inverted Data Output | 3 | |
| 26 | | GND | Ground | 1 | 1 |
| 27 | LVTTL-O | ModPrsL | Present | 3 | |
| 28 | LVTTL-O | Int/RxLos | Interrupt/optional RxLOS | 3 | |
| 29 | | Vcc Tx | +3.3 V Power supply transmitter | 2 | 2 |
| 30 | | Vcc1 | 3.3 V Power supply | 2 | 2 |
| 31 | LVTTL-I | LPMode/TxDis | Low Power Mode/optional TX Disable | 3 | |
| 32 | | GND | Ground | 1 | 1 |
| 33 | CML-I | Tx3p | Transmitter Non-Inverted Data Input | 3 | |
| 34 | CML-I | Tx3n | Transmitter Inverted Data Input | 3 | |
| 35 | | GND | Ground | 1 | 1 |
| 36 | CML-I | Tx1p | Transmitter Non-Inverted Data Input | 3 | |
| 37 | CML-I | Tx1n | Transmitter Inverted Data Input | 3 | |
| 38 | | GND | Ground | 1 | 1 |

Note 1:

GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

Note 2:

VccRx, Vcc1 and VccTx are applied concurrently and may be internally connected within the module in any combination. Vcc contacts in SFF-8662 and SFF-8672 each have a steady state current rating of 1 A.

## Table 2 SFP28(56) Module Pin Description

| Contacts | Logic [1] | Symbol | Power Sequence Order | Name/Description | Note |
|---|---|---|---|---|---|
| case | | case | See2 | Module case | |
| 1 | | VeeT | 1st | Module Transmitter Ground | 3 |
| 2 | LVTTL-O | Tx_Fault | 3rd | Module Transmitter Fault | 4 |
| 3 | LVTTL-I | Tx_Disable | 3rd | Transmitter Disable; Turns off transmitter laser output | 5 |
| 4 | LVTTL-I/O | SDA | 3rd | 2-wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i) | 6 |
| 5 | LVTTL-I/O | SCL | 3rd | 2-wire Serial Interface Clock (Same as MOD-DEF1 in INF-8074i) | 6 |
| 6 | | Mod_ABS | 3rd | Module Absent, connected to VeeT or VeeR in the module | 7 |
| 7 | LVTTL-I | RS0 | 3rd | Rate Select 0, optionally controls SFP+ module receiver. | 8 |
| 8 | LVTTL-O | Rx_LOS | 3rd | Receiver Loss of Signal Indication (In FC designated as Rx_LOS and in Ethernet designated as Signal Detect) | 4 |
| 9 | LVTTL-I | RS1 | 3rd | Rate Select 1, optionally controls SFP+ module transmitter | 8 |
| 10 | | VeeR | 1st | Module Receiver Ground | 3 |
| 11 | | VeeR | 1st | Module Receiver Ground | 3 |
| 12 | CML-O | RD- | 3rd | Receiver Inverted Data Output | |
| 13 | CML-O | RD+ | 3rd | Receiver Non-Inverted Data Output | |
| 14 | | VeeR | 1st | Module Receiver Ground | 3 |
| 15 | | VccR | 2nd | Module Receiver 3.3 V Supply | |
| 16 | | VccT | 2nd | Module Transmitter 3.3 V Supply | |
| 17 | | VeeT | 1st | Module Transmitter Ground | 3 |
| 18 | CML-I | TD+ | 3rd | Transmitter Non-Inverted Data Input | |

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| 19 | CML-I | TD- | 3rd | Transmitter Inverted Data Input | |
|----|-------|-----|-----|---------------------------------|---|
| 20 | | VeeT | 1st | Module Transmitter Ground | 3 |

Note1:

Labeling as inputs (I) and outputs (O) are from the perspective of the module

Note2:

The case makes electrical contact to the cage before any of the board edge contacts are made.

Note3:

The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.

Note4:

Tx_Fault is a module output that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. If Tx_Fault is not implemented, the Tx_Fault contact signal shall be held low by the module and may be connected to Vee within the module.

Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. Rx_LOS is an open drain/collector output, but may also be used as an input by supervisory circuitry in the module.

Note5:

Tx Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.

Note6:

The SFP+ 2-wire interface specifications are given in 4.2 2-WIRE ELECTRICAL SPECIFICATIONS. This specification ensures compatibility between host masters and SFP+ SCL/SDA lines and compatibility with I2C. All voltages are referenced to VeeT.

Note7:

Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc_Host with a resistor in the range 4.7 kΩ to10 kΩ. Mod_ABS is asserted "High" when the SFP+ module is physically absent from a host slot. In the SFP MSA (INF-8074i) this contact has the same function but is called MOD_DEF0.

Note8:

RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module. RS0 optionally selects the optical receive signaling rate coverage. RS1 optionally selects the optical transmit signaling rate coverage.

The SFP+ module provides two inputs RS0 and RS1 that can optionally be used for rate selection. RS0 controls the receive path signaling rate capability, and RS1 controls the transmit path signaling rate capability
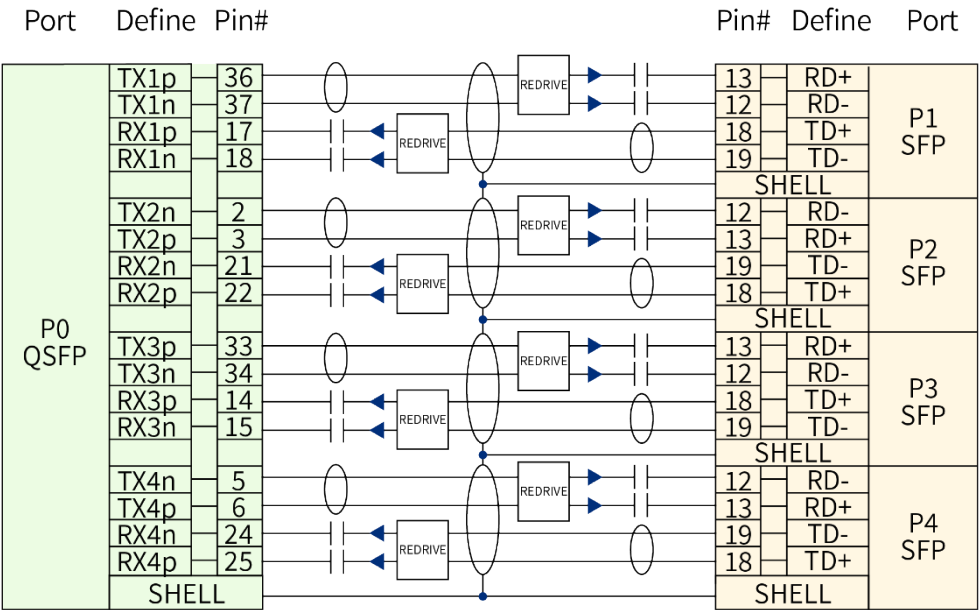
**2.7 Cable Wiring**

## WIRING TABLE



**Figure 3 QSFP28(56) to 4*SFP28(56) Active Redriver Cable Assembly Wiring**

**QSFP56 200G to 4*SFP56 50G Active Redriver Cable Assembly**

## 2.8 Memory Map information (SFF-8636 Version)

### Table 3 SFF-8636 Memory Map

| From | To | Content | No. of bytes | Type |
|---|---|---|---|---|
| | | **2-Wire Serial Address 1010000x** | | |
| | | Lower Page 00h | | |
| 0 | 2 | ID and Status | 3 | Read-Only |
| 3 | 21 | Interrupt Flags (Clear on read) | 19 | Read-Only |
| 22 | 33 | Free Side Device Monitors | 12 | Read-Only |
| 34 | 81 | Channel Monitors | 48 | Read-Only |
| 82 | 85 | Reserved | 4 | Read-Only |
| 86 | 99 | Control | 14 | Read/Write |
| 100 | 106 | Free Side Interrupt Masks | 7 | Read/Write |
| 107 | 110 | Free Side Device Properties | 4 | Read-Only |
| 111 | 112 | Assigned to PCI Express | 2 | Read/Write |
| 113 | 117 | Free Side Device Properties | 5 | Read-Only |
| 118 | 118 | Reserved | 1 | Read/Write |
| 119 | 122 | Optional Password Change | 4 | Write-Only |
| 123 | 126 | Optional Password Entry | 4 | Write-Only |
| 127 | 127 | Page Select Byte | 1 | Read/Write |
| | | Upper Page 00h | | |
| 128 | 128 | Identifier | 1 | Read-Only |
| 129 | 191 | Base ID Fields | 63 | Read-Only |
| 192 | 223 | Extended ID | 32 | Read-Only |
| 224 | 255 | Vendor Specific ID | 32 | Read-Only |

Note: For the above refer to **SFF-8636 Management Interface for 4-lane Modules and Cables Rev 2.10.2**
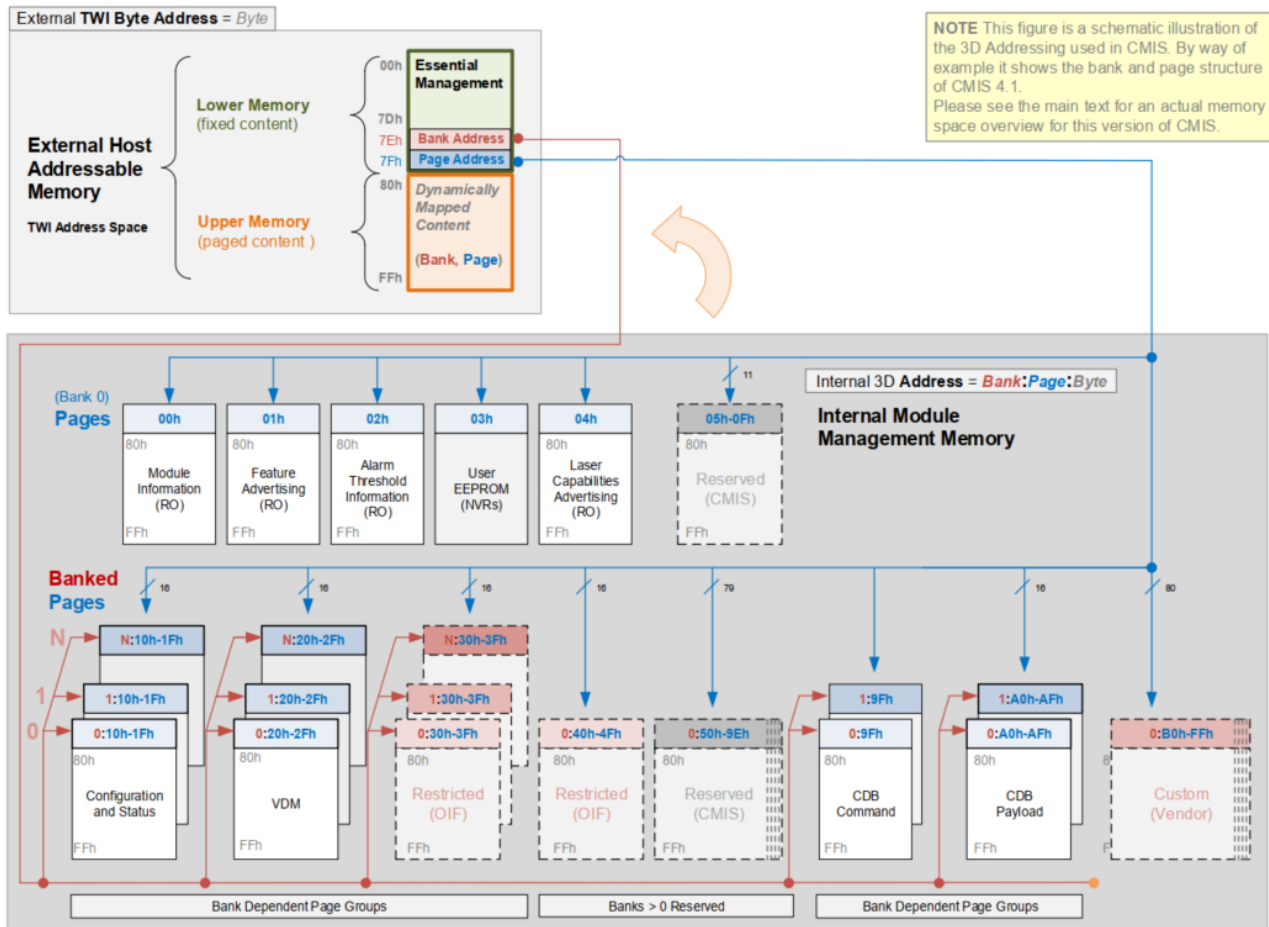
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## 2.9 Memory Map information (CMIS Version)



**Figure 4 CMIS Module Memory Map (Conceptual View)**

**Table 4 CMIS Memory Map**

■ Lower Memory Overview

| Address | Size | Subject Area | Description |
|---|---|---|---|
| 0-3 | 4 | ID and Status Area | Module ID from SFF-8024 list, version number, Type and status |
| | | | Flat mem indication, CLEI present indicator, Maximum TWI speed, Current state of Module, Current state of the Interrupt signal |
| 4-7 | 4 | Lane Flag Summary | Flag summary of all lane flags on pages 10h-1Fh |
| 8-13 | 6 | Module-Level Flags | All flags that are not lane or data path specific |
| 14-25 | 12 | Module-Level Monitors | Monitors that are not lane or data path specific |
| 26-3 | 5 | Module Global Controls | Controls applicable to the module as a whole |
| 31-36 | 6 | Module-Level Flag Masks | Masking bits for the Module-Level flags |
| 37-38 | 2 | CDB Status Area | Status of most recent CDB command |
| 39-40 | 2 | Module Firmware Version | Module Firmware Version |
| 41-63 | 23 | Reserved Area | Reserved for future standardization |
| 64-82 | 19 | Custom Area | Vendor or module type specific use |

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| Address | Size (bytes) | Name | Description |
|---|---|---|---|
| 83-84 | 2 | Inactive Firmware Version | Version Number of Inactive Firmware. Values of 00h indicates module supports only a single image. |
| 85-117 | 33 | Application Advertising | Combinations of host and media interfaces that are supported by module data path(s) |
| 118-125 | 8 | Password Entry and Change | |
| 126 | 1 | Bank Select Byte | Bank address of currently visible Page |
| 127 | 1 | Page Select Byte | Page address of currently visible Page |

■ Page 00h Overview

| Address | Size (bytes) | Name | Description |
|---|---|---|---|
| 128 | 1 | Identifier | Identifier Type of module |
| 129-144 | 16 | Vendor name | Vendor name (ASCII) |
| 145-147 | 3 | Vendor OUI | Vendor IEEE company ID |
| 148-163 | 16 | Vendor PN | Part number provided by vendor (ASCII) |
| 164-165 | 2 | Vendor rev | Revision level for part number provided by vendor (ASCII) |
| 166-181 | 16 | Vendor SN | Vendor Serial Number (ASCII) |
| 182-189 | 8 | Date Code | |
| 190-199 | 10 | CLEI code | Common Language Equipment Identification code |
| 200-201 | 2 | Module power characteristics | |
| 202 | 1 | Cable assembly length | |
| 203 | 1 | Media Connector Type | |
| 204-209 | 6 | Copper Cable Attenuation | |
| 210-211 | 2 | Cable Assembly Lane Information | |
| 212 | 1 | Media Interface Technology | |
| 213-220 | 8 | Reserved | |
| 221 | 1 | Custom | |
| 222 | 1 | Checksum | Includes bytes 128-221 |
| 223-255 | 33 | Custom Info NV | |

Note: For the above, refer to **Common Management Interface Specification Rev5.0.**
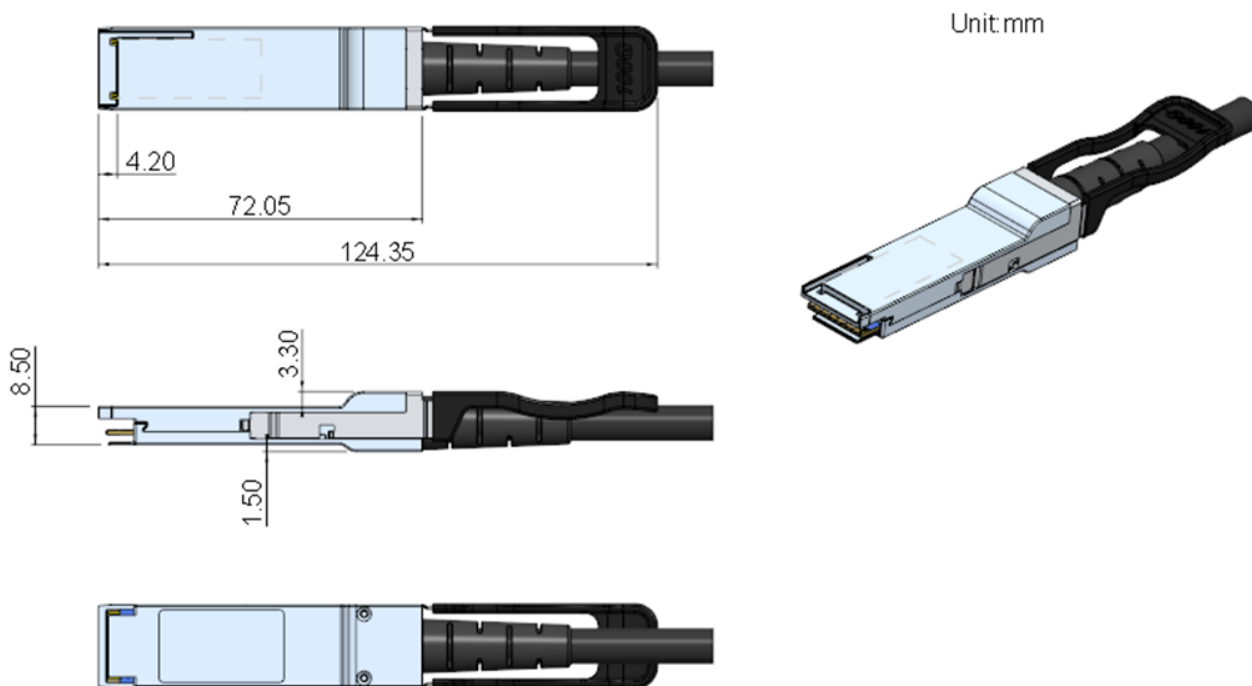
## 2.10 Mechanical Specifications
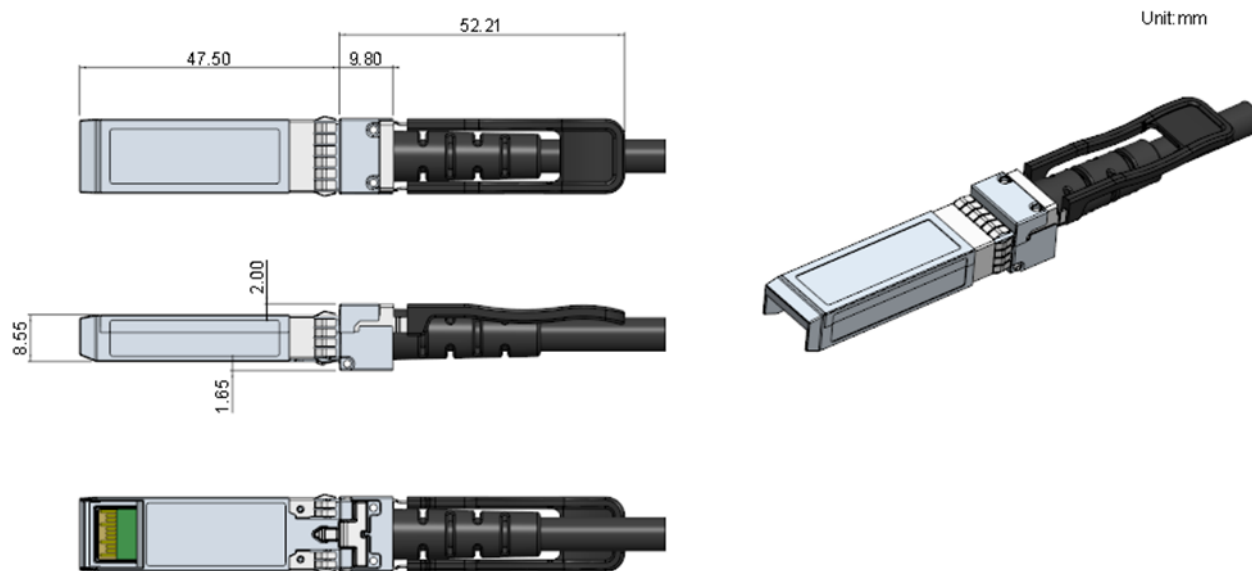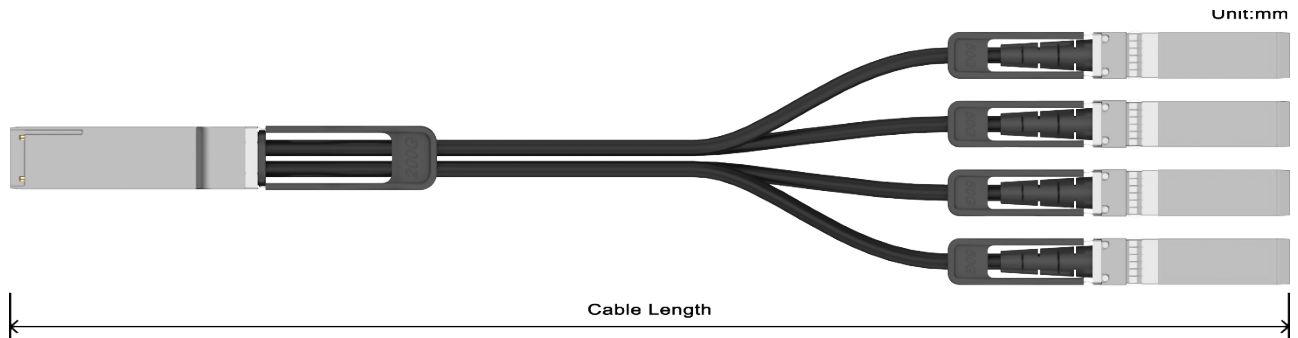


Unit:mm

**Figure 5 QSFP28(56) Form Factor**



Unit:mm

**Figure 6 SFP28(56) Form Factor**

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## 3.0  Product Information

Unit:mm



Cable Length

| Product ID | Product Description | Tolerance | AWG |
|---|---|---|---|
| Q56-200G-4*S56 100G ACC-3025 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 30AWG-2.5M | ±50 | 30 |
| Q56-200G-4*S56 100G ACC-3030 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 30AWG-3.0M | ±50 | 30 |
| Q56-200G-4*S56 100G ACC-3035 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 30AWG-3.0M | ±60 | 30 |
| Q56-200G-4*S56 100G ACC-2830 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 28AWG-3.5M | ±50 | 28 |
| Q56-200G-4*S56 100G ACC-2835 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 28AWG-3.5M | ±60 | 28 |
| Q56-200G-4*S56 100G ACC-2840 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 28AWG-4.0M | ±60 | 28 |
| Q56-200G-4*S56 100G ACC-2845 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 28AWG-4.5M | ±70 | 28 |
| Q56-200G-4*S56 100G ACC-2635 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 26AWG-3.5M | ±60 | 26 |
| Q56-200G-4*S56 100G ACC-2640 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 26AWG-4.0M | ±60 | 26 |
| Q56-200G-4*S56 100G ACC-2645 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 26AWG-4.5M | ±70 | 26 |
| Q56-200G-4*S56 100G ACC-2650 | QSFP56 200G to 4*SFP56(50G) Active Redriver Copper Cable, 26AWG-5.0M | ±70 | 26 |

**Important Notice**

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## 4.0 Revision Record

| Rev. | Comments | Author | Date |
|------|----------|--------|------|
| A01 | Initial Release | James Chen | 10/01/2023 |
| | | | |
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