# 100G QSFP28 to 4x25G SFP28 Passive Direct Attach Copper Breakout Cable



## Application

- 100/25 Gigabit Ethernet
- Switches, Routers, and HBAs
- Data Centers

## Features

- Supporting 100 Gbps to 4 x 25 Gbps
- Support data rates : 25.78Gb/s (per channel)
- IEEE 802.3bj 100GEBASE-CR4 and P802.3by compliant
- Compatible to SFP28 MSA and QSFP28 MSA
- Compatible to SFF-8402, SFF-8432 and SFF8665
- Maximum aggregate data rate: 100 Gb/s (4 x 25Gb/s)
- High-Density QSFP28 38-PIN and 4x SFP28 20-PIN Connector
- Copper link length up to 5m
- Power Supply : +3.3V
- Low crosstalk
- I2C based two-wire serial interface for EEPROM signature which can be customized
- Operating Temperature: 0~ 70 。C
- ROHS Compliant

## Description

FS.COM 100G QSFP28 to 4x25G SFP28 Passive Direct Attach Copper Breakout Cable assemblies are high performance, cost effective for SFP28 and QSFP28 equipment interconnects. The Hybrid cables are compliant with SFF-8402 and SFF-8665 specifications. It is offer a low power consumption, short reach inter connect applications.

The cable each lane is capable of transmitting data at rates up to 25Gb/s, providing an aggregated rate of 100Gb/s.

## Products Specifications



## I. Absolute Maximum Ratings

| Parameter | Min | Max | Unit |
|---|---|---|---|
| **Supply voltage** | -0.3 | 3.6 | V |
| **Data input voltage** | -0.3 | 3.6 | V |
| **Control input voltage** | -0.3 | 3.6 | V |

## II. Recommended Operating Environment

| Parameter | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Caseoperating Temperature | $T_C$ | 0 | | +70 | ° C |
| Supply Voltage | VCCT, R | +3.13 | 3.3 | +3.47 | V |
| Power Dissipation | PD | | | 0.1 | W |
| Operating relative humidity | | 5 | --- | 85 | % |

## III. Electrical Characteristics

| Parameter | Min | Typ. | Max | Unit |
|---|---|---|---|---|
| Characteristic impedance | 90 | 100 | 110 | Ω |
| Time delay | --- | --- | 4.5 | ns/m |
| Time delay skew (in the same pair) | --- | --- | 10 | ps |
| Time delay skew (pair to pair) | --- | --- | 50 | ps |

## IV. High Speed Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit | Note |
|---|---|---|---|---|---|---|
| **Differential Impedance** | RIN, P-P | 90 | 100 | 110 | Ω | |
| **Insertion loss** | SDD21 | 8 | | 22.48 | dB | At 12.8906 GHz |
| **Differential Return Loss** | SDD11 SDD22 | 12.45 | | See 1 | dB | At 0.05 to 4.1 GHz |
| | | 3.12 | | See 2 | dB | At 4.1 to 19 GHz |
| **Common-mode tocommon-mode output return loss** | SCC11 SCC22 | 2 | | | dB | At 0.2 to 19 GHz |
| **Differential to common-mode return loss** | SCD11 SCD22 | 12 | | See 3 | dB | At 0.01 to 12.89 |
| | | 10.58 | | See 4 | | At 12.89 to 19 GHz |
| **Differential to common Mode Conversion Loss** | SCD21-IL | 10 | | See 5 | dB | At 0.01 to 12.89 |
| | | | | | | At 12.89 to 15.7 |
| | | 6.3 | | | | At 15.7 to 19 GHz |
| **Channel Operating Margin** | COM | 3 | | | dB | |

**Notes:**

1. Reflection Coefficient given by equation SDD11(dB) < 16.5 - 2×SQRT(f ), with finGHz
2. Reflection Coefficient given by equation SDD11(dB) < 10.66 - 14×log10(f/5.5), with finGHz
3. Reflection Coefficient given by equation SCD11(dB) < 22 - (20/25.78)*f, with finGHz
4. Reflection Coefficient given by equation SCD11(dB) < 15 - (6/25.78)*f, with finGHz
5. Reflection Coefficient given by equation SCD21(dB) < 27 - (29/22)*f, with finGHz

## V. QSFP28 Module Pad Layout

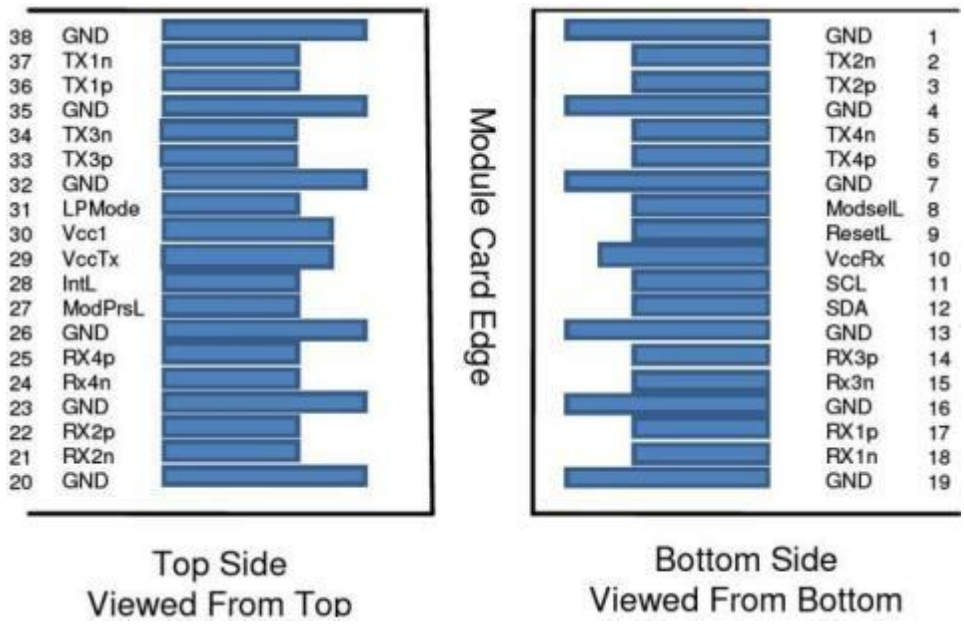



**Figure 1.**

| Pin | Logic | Symbol | Name/Description | Note |
|---|---|---|---|---|
| 1 | | GND | Ground | 1 |
| 2 | CML-I | Tx2n | Transmitter Inverted Data | |
| 3 | CML-I | Tx2p | Transmitter Non-Inverted | |
| 4 | | GND | Ground | 1 |
| 5 | CML-I | Tx4n | Transmitter Inverted Data | |
| 6 | CML-I | Tx4p | Transmitter Non-Inverted | |
| 7 | | GND | Ground | 1 |
| 8 | LVTTL-I | ModSelL | Module Select | |

| | | | | |
|---|---|---|---|---|
| 9 | LVTTL-I | ResetL | Module Reset | |
| 10 | | Vcc Rx | +3.3V Power Supply | 2 |
| 11 | LVCMOSI/O | SCL | 2-wire serial interface | |
| 12 | LVCMOSI/O | SDA | 2-wire serial interface data | |
| 13 | | GND | Ground | 1 |
| 14 | CML-O | Rx3p | Receiver Non-Inverted | |
| 15 | CML-O | Rx3n | Receiver Inverted Data | |
| 16 | | GND | Ground | 1 |
| 17 | CML-O | Rx1p | Receiver Non-Inverted Data | |
| 18 | CML-O | Rx1n | Receiver Inverted Data | |
| 19 | | GND | Ground | 1 |
| 20 | | GND | Ground | 1 |
| 21 | CML-O | Rx2n | Receiver Inverted Data | |
| 22 | CML-O | Rx2p | Receiver Non-Inverted Data | |
| 23 | | GND | Ground | 1 |
| 24 | CML-O | Rx4n | Receiver Inverted Data | |
| 25 | CML-O | Rx4p | Receiver Non-Inverted Data | |
| 26 | | GND | Ground | 1 |
| 27 | LVTTL-O | ModPrsL | Module Present | |
| 28 | LVTTL-O | IntL | Interrupt | |
| 29 | | Vcc Tx | +3.3V Power supply | 2 |

| | | | | |
|---|---|---|---|---|
| 30 | | Vcc1 | +3.3V Power supply | 2 |
| 31 | LVTTL-I | LPMode | Low Power Mode | |
| 32 | | GND | Ground | 1 |
| 33 | CML-I | Tx3p | Transmitter Non-Inverted | |
| 34 | CML-I | Tx3n | Transmitter Inverted Data | |
| 35 | | GND | Ground | 1 |
| 36 | CML-I | Tx1p | Transmitter Non-Inverted | |
| 37 | CML-I | Tx1n | Transmitter Inverted Data | |
| 38 | | GND | Ground | 1 |

**Notes:**

1.GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 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 receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in Table 6. Recommended host board power supply filtering is shown in Figure4. VccRx, Vcc1 and VccTx may be internally connected within the QSFP28 Module module in any combination. The connector pins are each rated for a maximum current of 500mA.

## VI. SFP28 Pin Descriptions

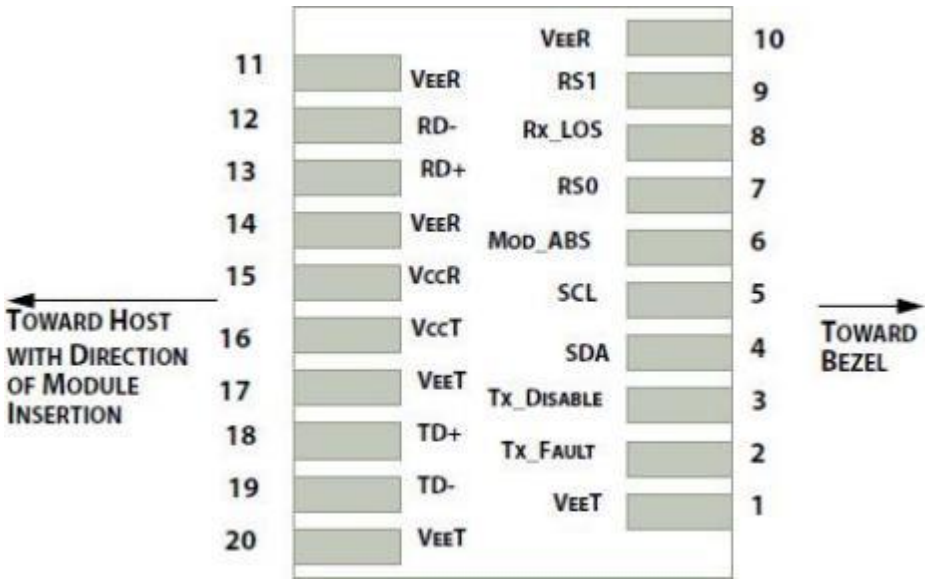


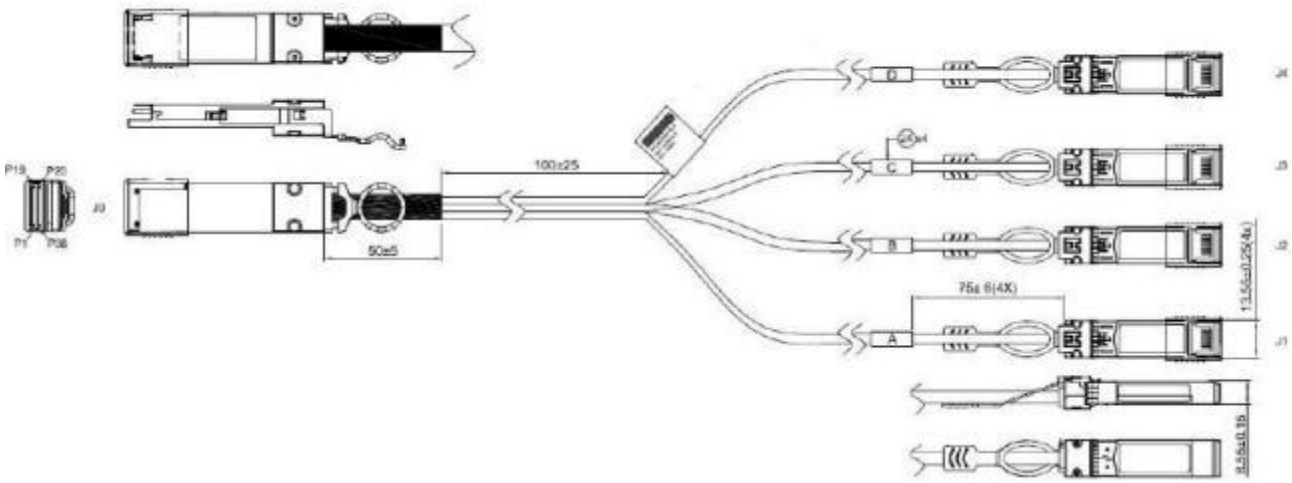

**Figure 2. Host PCB SFP28 pad contact assignment**

| Pin | Logic | Symbol | Name/Description | Note |
|---|---|---|---|---|
| 1 | | VeeT | Transmitter Ground | |
| 2 | LV-TTL-O | TX_Fault | N/A | 1 |
| 3 | LV-TTL-I | TX_DIS | Transmitter Disable | 2 |
| 4 | LV-TTL-I/O | SDA | Tow Wire Serial Data | |
| 5 | LV-TTL-I | SCL | Tow Wire Serial Clock | |
| 6 | | MOD_DEF0 | Module present, connect | |
| 7 | LV-TTL-I | RS0 | N/A | 1 |
| 8 | LV-TTL-O | LOS | LOS of Signal | 2 |
| 9 | LV-TTL-I | RS1 | N/A | 1 |
| 10 | | VeeR | Reciever Ground | |
| 11 | | VeeR | Reciever Ground | |
| 12 | CML-O | RD- | Reciever Data Inverted | |
| 13 | CML-O | RD+ | Reciever Data | |
| 14 | | VeeR | Reciever Ground | |
| 15 | | VccR | Reciever Supply 3.3V | |
| 16 | | VccT | Transmitter Supply 3.3V | |
| 17 | | VeeT | Transmitter Ground | |
| 18 | CML-I | TD+ | Transmitter Data | |

**Notes:**

1. Signals not supported in SFP28 Copper pulled-downto VeeT with 30K ohms resistor
2. Passive cable assemblies do not support LOS and TX_DIS

## Ⅶ. Mechanical Specifications



## Test Center

FS.COM transceivers are tested to ensure connectivity and compatibility in our test center before shipped out. FS.COM test center is supported by a variety of mainstream original brand switches and groups of professional staff, helping our customers make the most efficient use of our products in their systems, network designs and deployments.

The original switches could be found nowhere but at FS.COM test center, eg: Juniper MX960 & EX 4300 series, Cisco Nexus 9396PX & Cisco ASR 9000 Series, HP 5900 Series & HP 5406RZL2 V3(J9996A), Arista 7050S-64, Brocade ICX7750-26Q & ICX6610-48, Avaya VSP 7000 MDA 2, etc.



Cisco ASR 9000 Series(A9K-MPA-1X40GE)


ARISTA 7050S-64(DCS-7050S-64)



Juniper MX960


Brocade ICX 7750-26Q



Extreme Networks X670VVIM-40G4X



Mellanox M3601Q


Dell N4032F



HP 5406RZL2 V3(J9996A)



AVAYA 7024XLS(7002QQ-MDA)

## Test Assured Program

FS.COM truly understands the value of compatibility and interoperability to each optics. Every module FS.COM provides must run through programming and an extensive series of platform diagnostic tests to prove its performance and compatibility. In our test center, we care of every detail from staff to facilities—professionally trained staff, advanced test facilities and comprehensive original-brand switches, to ensure our customers to receive the optics with superior quality.



Our smart data system allows effective product management and quality control according to the unique serial number, properly tracking the order, shipment and every part.



Our in-house coding facility programs all of our parts to standard OEM specs for compatibility on all major vendors and systems such as Cisco, Juniper, Brocade, HP, Dell, Arista and so on.



With a comprehensive line of original-brand switches, we can recreate an environment and test each optics in practical application to ensure quality and distance.



The last test assured step to ensure our products to be shipped with perfect package.

## Order Information

| Part Number | Data Rate | Length | Wire Gauge | Connector Type | Temp. Range | Cable Jacket |
|---|---|---|---|---|---|---|
| QSFP-100G-4SPC01 | Up to 100G | 1m | AWG30 | Passive Copper | 0-70℃ | PVC |
| QSFP-100G-4SPC02 | Up to 100G | 2m | AWG30 | Passive Copper | 0-70℃ | PVC |
| QSFP-100G-4SPC03 | Up to 100G | 3m | AWG30 | Passive Copper | 0-70℃ | PVC |
| QSFP-100G-4SPC05 | Up to 100G | 5m | AWG26 | Passive Copper | 0-70℃ | PVC |

**Notes:**

100G QSFP28 to 4x25G SFP28 Passive Direct Attach Copper Breakout Cable is individually tested on corresponding equipment such as Cisco, Arista, Juniper, Dell, Brocade and other brands, and passes the monitoring of FS.COM intelligent quality control system.