

# 100G QSFP28 Passive Direct Attach Copper Twinax Cable



## Application

- 100 Gigabit Ethernet
- Fiber Channel over Ethernet
- InfiniBand EDR
- Data storage and communication industry Switch / router / HBA
- Enterprise network SAN
- Data Center Network

## Features

- QSFP28 conforms to the Small Form Factor SFF8665
- 4-Channel Full-Duplex Passive Copper Cable Transceiver
- Support data rates : 25.78Gb/s (per channel)
- Maximum aggregate data rate: 100Gb/s (4 x 25.78Gb/s)
- IEEE 802.3bj 100GEBASE-CR4
- Copper link x (x=1m, 2m, 3m, 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
- Compatible to QSFP28 MSA
- RoHS Compliant

## Description

FS.COM 100G QSFP28 to QSFP28 Passive Copper Cable assemblies are high performance, cost effective I/O solutions for LAN, HPC and SAN. The high speed cable assemblies meet and exceed 100 Gigabit Ethernet, InfiniBand EDR and temperature requirements for performance and reliability. The cables are compliant with SFF-8436 specifications and provide connectivity between devices using QSFP ports.

## Products Specifications



### I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit
<b>Operating Case Temperature</b>		-40		+85	°C
<b>Relative Humidity</b>	T <sub>c</sub>	0		+70	°C
<b>Supply Voltage</b>	V <sub>CC3</sub>	3.14	3.3	3.47	V
<b>Data Rate Per Lane</b>		1		25.78	Gb/s

#### Note:

Damage may occur if the transceiver is subjected to conditions beyond the limits.

## II. High Speed Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Note
<b>Differential Impedance</b>	RIN, P	9	100	110	Ω	
<b>Insertion loss</b>	SDD2	8		22.48	dB	At 12.8906
<b>Differential Return Loss</b>	SDD11 SDD22	12.45		See 1	dB	At 0.05 to
		3.12		See 2		At 4.1 to 19
<b>Common-mode to common-mode output return loss</b>	SCC11 SCC22	2			dB	At 0.2 to 19 GHz
<b>Differential to common-mode return loss</b>	SCD11 SCD22	12		See 3	dB	At 0.01 to
		10.58		See 4		At 12.89 to
<b>Differential to common Mode Conversion Loss</b>	SCD21-IL	10			dB	At 0.01 to
				See 5		At 12.89 to
		6.3				At 15.7 to
<b>Channel Operating Margin</b>	COM	3			dB	

### Notes:

1. Reflection Coefficient given by equation  $SDD11(dB) < 16.5 - 2 \times \sqrt{f}$ , with finGHz.
2. Reflection Coefficient given by equation  $SDD11(dB) < 10.66 - 14 \times \log_{10}(f/5.5)$ , with finGHz.
3. Reflection Coefficient given by equation  $SCD11(dB) < 22 - (20/25.78) \times f$ , with finGHz.
4. Reflection Coefficient given by equation  $SCD11(dB) < 15 - (6/25.78) \times f$ , with finGHz.
5. Reflection Coefficient given by equation  $SCD21(dB) < 27 - (29/22) \times f$ , with finGHz.

### III. Pin Description

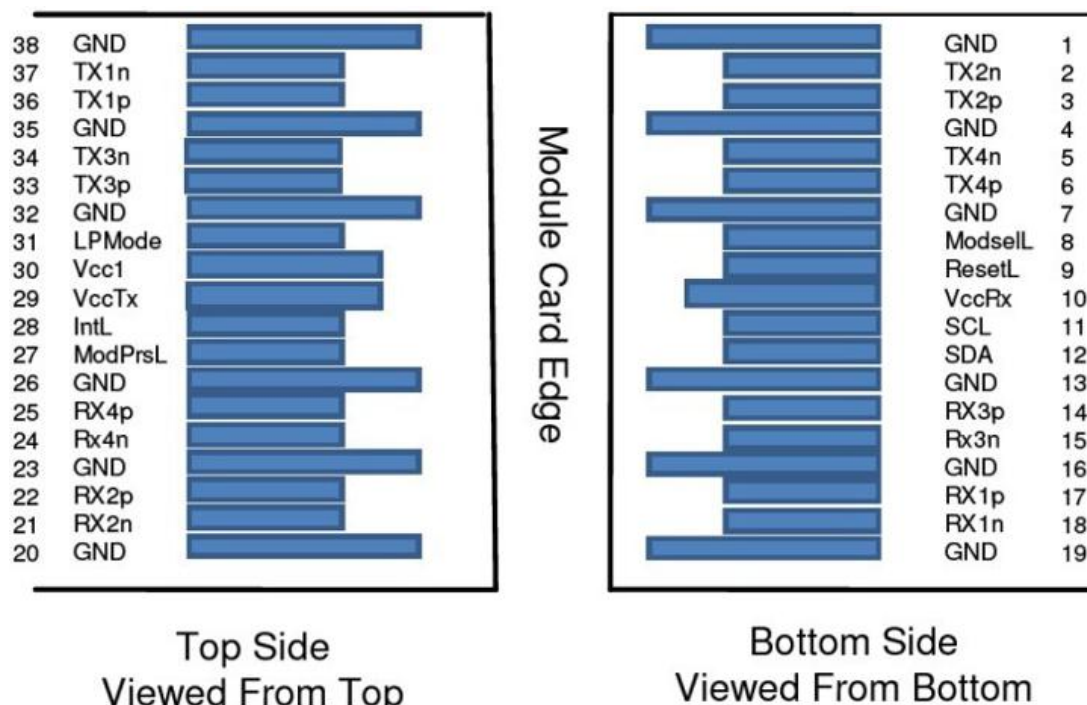


Figure 1.

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

	LVTTTL-I	ModSel	Module Select	
9	LVTTTL-I	ResetL	Module Reset	
10		Vcc Rx	+3.3V Power Supply	2
11	LVC MOS	SCL	2-wire serial interface	
12	LVC MOS	SDA	2-wire serial interface	
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	
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	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data	
25	CML-O	Rx4p	Receiver Non-Inverted	
26		GND	Ground	1
27	LVTTTL-O	ModPrs	Module Present	

28	LVTTTL-O	IntL	Interrupt	
29		Vcc Tx	+3.3V Power supply	2
30		Vcc1	+3.3V Power supply	2
31	LVTTTL-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 QSFP+ module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the hostboard signal-common ground plane.
- 2.Vcc Rx, Vcc1 and Vcc Tx 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 Figure 4. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP+ Module module in any combination. The connector pins are each rated for a maximum current of 500 mA.

### IV. Channel Insertion Loss Budget

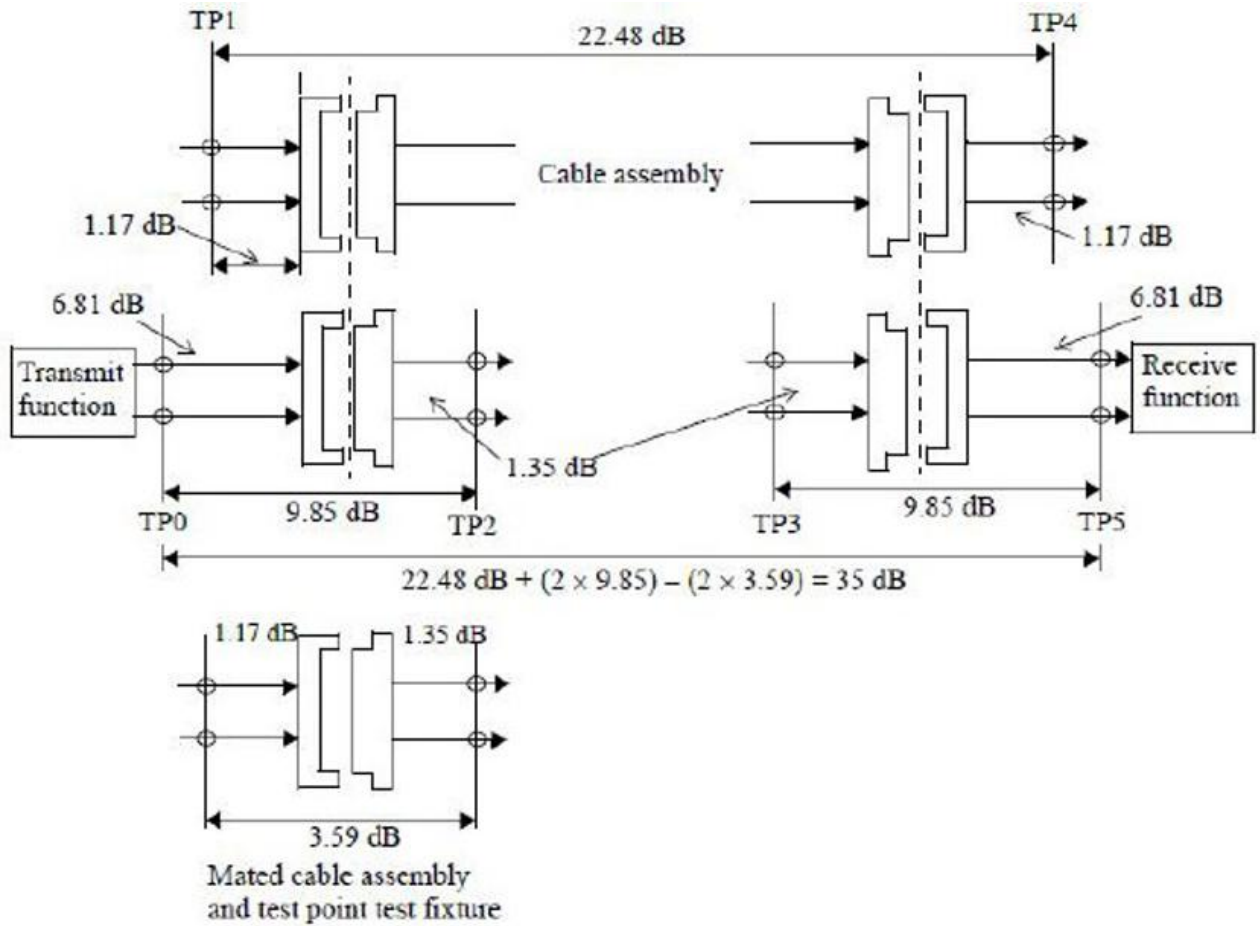
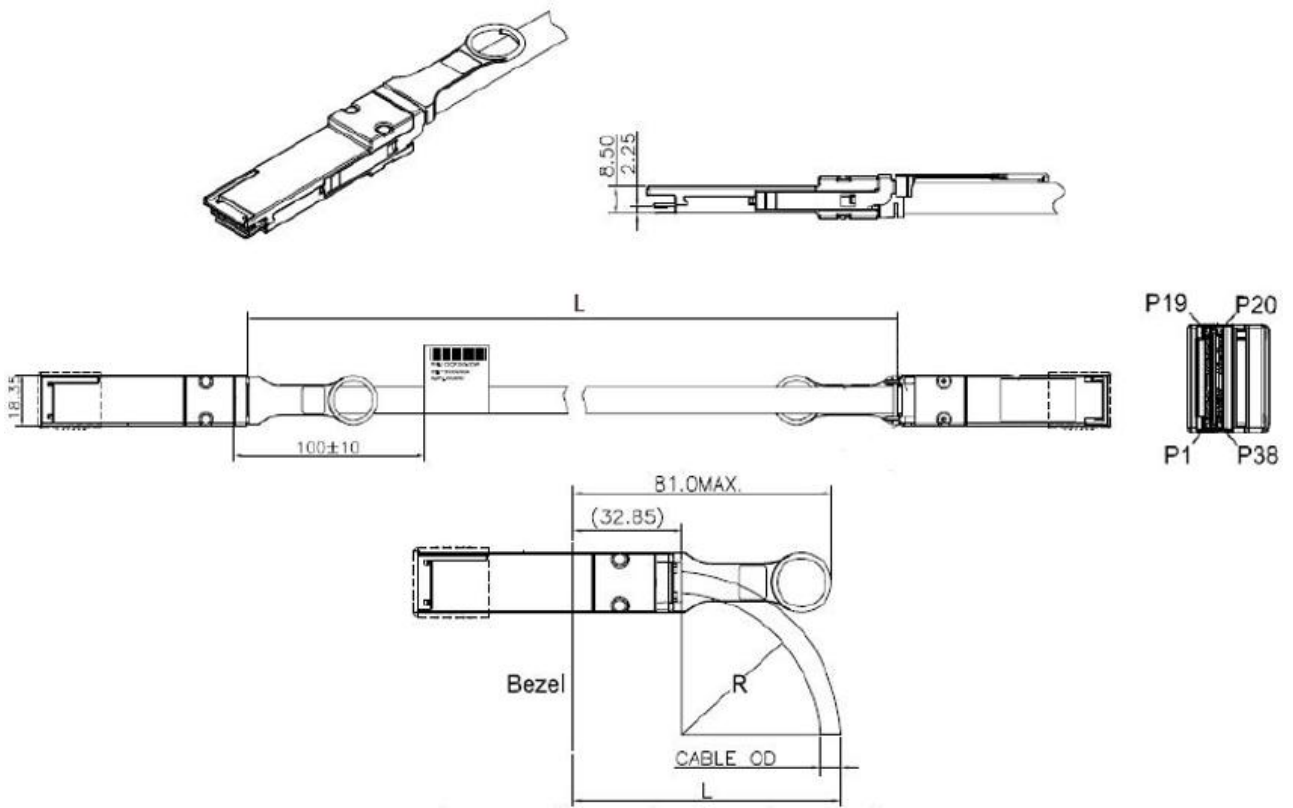


Figure 2 . 35dB Channel insertion loss budget at 12.8906 GHz

**Note:**

The connector insertion loss is 1.07dB for the mated test fixture. The host connector is allocated 0.62dB of additional margin.

## V. Mechanical Specifications



Cable Gauge	Cable "OD"	Minimum Bend Radius "R"	Minimum Bend Space "L"
30 AWG	6.6mm	33mm	72.45mm
26 AWG	8.4mm	42mm	83.25mm



## 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 5406R ZL2 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 X670V VIM-40G4X



Mellanox M3601Q



Dell N4032F



HP 5406R ZL2 V3(J9996A)



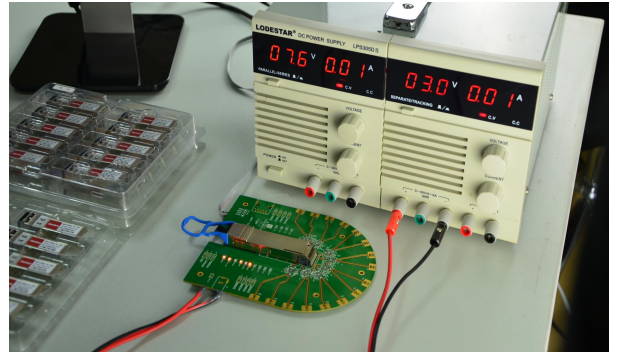
AVAYA 7024XLS(7002QQ-MDA)

## 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 tracing 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
Q28-PC01	Up to 100G	1m	AWG30	Passive Copper	0-70°C	PVC
Q28-PC02	Up to 100G	2m	AWG30	Passive Copper	0-70°C	PVC
Q28-PC03	Up to 100G	3m	AWG30	Passive Copper	0-70°C	PVC
Q28-PC05	Up to 100G	5m	AWG26	Passive Copper	0-70°C	PVC

**Note:**

100G QSFP28 to QSFP28 Passive Copper 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.



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