

## 100G QSFP28/4SFP28 Direct Attach Cable



### General Description

QSFP28 passive copper cable assembly feature eight differential copper pairs, providing four data transmission channels at speeds up to 28Gbps per channel, and meets 100G Ethernet, 25G Ethernet and InfiniBand Enhanced Data Rate (EDR) requirements. Available in a broad range of wire gauges—from 26AWG through 30AWG—this 100G copper cable assembly features low insertion loss and low cross talk.

Designed for applications in the data center, networking and telecommunications markets that require a high speed, reliable cable assembly, this next generation product shares the same mating interface with QSFP+ form factor, making it backward compatible with existing QSFP ports. QSFP28 can be used with current 10G and 14G applications with substantial signal integrity margin.

## **Features and Benefits**

- Compatible with IEEE 802.3bj, IEEE 802.3by and InfiniBand EDR
- Supports aggregate data rates of 100Gbps
- Optimized construction to minimize insertion loss and cross talk
- Backward compatible with existing QSFP+ connectors and cages
- Pull-to-release slide latch design
- 26AWG through 30AWG cable
- Straight and break out assembly configurations available
- Customized cable braid termination limits EMI radiation
- Customizable EEPROM mapping for cable signature RoHS compliant

## **Product Applications**

- Switches, servers and routers
- Data Center networks
- Storage area networks
- High performance computing
- Telecommunication and wireless infrastructure
- Medical diagnostics and networking
- Test and measurement equipment

## **Industry Standards**

- 100G Ethernet(IEEE 802.3bj)
- 25G Ethernet(IEEE 802.3by)
- InfiniBand EDR
- SFF-8665 QSFP+ 28G 4X Pluggable Transceiver Solution(QSFP28)
- SFF-8402 SFP+ 1X 28Gb/s Pluggable Transceiver Solution(SFP28)

## Technical Documents

- 108-32081 QSFP28 Copper Module Direct Attach Cable Assembly
- 108-2364 Single Port and Ganged SFP+ Cages,Zsfp+ Single Port and Ganged Cages,and SFP+ Copper Direct Attach Cable Assemblies.

## High Speed Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Note
Differential Impedance	RIN,P-P	90	100	110	Ω	
Insertion loss	SDD21	8		22.48	dB	At 12.8906 GHz
	SDD11	12.45		See 1	dB	At 0.05 to 4.1 GHz
Differential Return Loss	SDD22	3.12		See 2	dB	At 4.1 to 19 GHz
	Common-mode to common-mode output return loss	SCC11	2		dB	At 0.2 to 19 GHz
Differential to common-mode return loss	SCD11	12		See 3	dB	At 0.01 to 12.89 GHz
	SCD22	10.58		See 4	dB	At 12.89 to 19 GHz
		10				At 0.01 to 12.89 GHz

Differential to common Mode			At 12.89 to 15.7
Conversion Loss	SCD21-IL	See 5	dB
		6.3	GHz
Channel Operating Margin			At 15.7 to 19 GHz
	COM	3	dB

**Notes:**

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

## Pin Descriptions

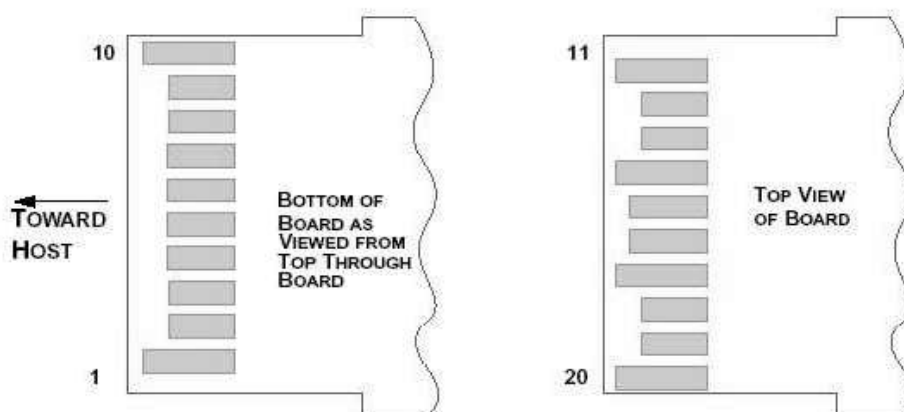
### SFP28 Pin Function Definition

Pin	Logic	Symbol	Name/Description	Notes
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 to VeeT	
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 Non-Inverted	
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 Non-Inverted	
19	CML_I	TD-	Transmitter Data Inverted	
20		VeeT	Transmitter Ground	

1. Signals not supported in SFP+ Copper pulled-down to VeeT with 30K ohms resistor

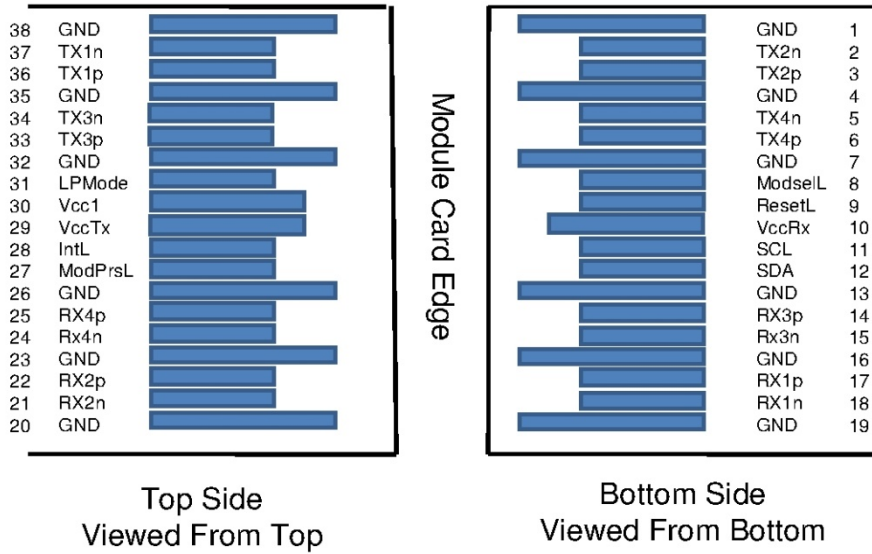
2. Passive cable assemblies do not support LOS and TX\_DIS



**QSFP28 Pin Function Definition**

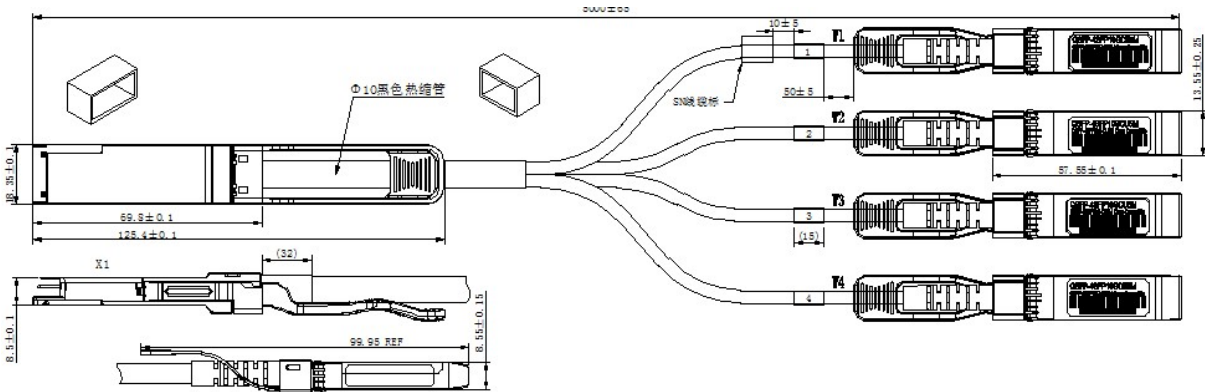
Pin	Logic	Symbol	Description
1		GND	Ground
2	CML-I	Tx2n	Transmitter Inverted Data Input
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input
4		GND	Ground
5	CML-I	Tx4n	Transmitter Inverted Data Input
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input
7		GND	Ground
8	LVTTL-I	ModSelL	Module Select
9	LVTTL-I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



### Mechanical Specifications

The connector is compatible with the SFF-8432 and SFF-8665 specification.



Length (m)	Cable AWG
1	30
2	30
3	26
4	26
5	26



## Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical	MIL-STD-883C Method 3015.7	Class 1(>2000 Volts)
Electromagnetic Interference(EMI)	FCC Class B	Compliant with Standards
	CENELEC EN55022 Class B	
	CISPR22 ITE Class B	
RF Immunity(RFI)	IEC61000-4-3	Typically Show no Measurable Effect from a 10V/m Field Swept from
RoHS Compliance	RoHS Directive 2011/6/5/EU and it's Amendment Directives 6/6	RoHS 6/6 compliant