

## DAC-QSFP28-2QSFP28-xM

### 100GBase QSFP28 to 2x 50GBase QSFP28 (Channel 1&2) Direct Attach Cable

Copper, Passive, 1m to 5m Lengths

#### FEATURES

- 25Gbps data transmission rate per channel, up to 100Gbps
- Complies with IEEE 802.3bj standard and InfiniBand EDR specification
- Complies with QSFP + MSA and SFF-8661/SFF-8665 standards
- Serial ID is supported through EEPROM
- Cables from 30AWG to 26AWG are optional
- RoHS compliant

#### APPLICATIONS

- Switch/router/HBA/SAN, NIC card
- 50G/100G Ethernet
- Storage, switches, data centres, network centres
- InfiniBand EDR

#### DESCRIPTION

100G QSFP28 Passive cable components, based on the 2x50G or 2x56G structure, meet the requirements of the next generation of 100G switches, servers, routers and other products. The QSFP28 cable assembly is designed to reduce cross talk and plug loss with excellent signal integrity, fully conforming to the next generation 100G Ethernet and InfiniBand EDR standards.

## WIRING DIAGRAM

wire	Starting signal	Starting	End	End signal
W1	RX1+	X1.17	X2.36	TX1+
	RX1-	X1.18	X2.37	TX1-
	GND	X1.19	X2.38	GND
	TX1+	X1.36	X2.17	RX1+
	TX1-	X1.37	X2.18	RX1-
	GND	X1.38	X2.19	GND
W2	GND	X1.20	X2.1	GND
	RX2-	X1.21	X2.2	TX2-
	RX2+	X1.22	X2.3	TX2+
	GND	X1.1	X2.20	GND
	TX2-	X1.2	X2.21	RX2-
	TX2+	X1.3	X2.22	RX2+
wire	Starting signal	Starting	End	End signal
W3	RX3+	X1.14	X3.36	TX1+
	RX3-	X1.15	X3.37	TX1-
	GND	X1.16	X3.38	GND
	TX3+	X1.33	X3.17	RX1+
	TX3-	X1.34	X3.18	RX1-
	GND	X1.35	X3.19	GND
W4	GND	X1.23	X3.1	GND
	RX4-	X1.24	X3.2	TX2-
	RX4+	X1.25	X3.3	TX2+
	GND	X1.4	X3.20	GND
	TX4-	X1.5	X3.21	RX2-
	TX4+	X1.6	X3.22	RX2+

## ELECTRICAL CHARACTERISTICS

ITEM		REQUIREMENT							TEST CONDITION
Differential Impedance	Cable Impedance	105+5/-10Ω							Rise time of 25ps (20% - 80%)
	Paddle Card Impedance	100±10Ω							
	Cable Termination Impedance	100±15Ω							
Differential (Input/Output) Return loss $S_{DD11}/S_{DD22}$		Return_loss(f)≥ <div><math>16.5-2\sqrt{f}</math><math>0.05\leq f &lt; 4.1</math></div> <div><math>10.66-14\log_{10}(f/5.5)</math><math>4.1\leq f\leq 19</math></div> Where f is the frequency in GHz Return loss (f) is the return loss at frequency f							10MHz≤f ≤19GHz
Differential to common-mode (Input/Output) Return loss $S_{CD11}/S_{CD22}$		Return_loss(f)≥ <div><math>22-(20/25.78)f</math><math>0.01\leq f &lt; 12.89</math></div> <div><math>15-(6/25.78)f</math><math>12.89\leq f\leq 19</math></div> Where f is the frequency in GHz Return_loss(f) is the Differential to common-mode return loss at frequency f							10MHz≤f ≤19GHz
Common-mode to Common-mode (Input/Output) Return loss $S_{CC11}/S_{CC22}$		$Return\_loss(f)\geq 2\text{dB}$ $0.2\leq f\leq 19$ Where f is the frequency in GHz Return_loss(f) is the common-mode to common-mode return loss at frequency f							10MHz≤f ≤19GHz
Differential Insertion Loss ( $S_{DD21}$ Max.)		(Differential InsertionLoss Max. For TPa to TPb Excluding Test fixture)							10MHz≤f ≤19GHz
		F AWG	1.25GHz	2.5GHz	5.0GHz	7.0GHz	10Ghz	12.89Ghz	
		30(1m) Max.	4.5dB	5.4dB	6.3dB	7.5dB	8.5dB	10.5dB	
		30/28(3m) Max.	7.5dB	9.5dB	12.2dB	14.8dB	18.0dB	21.5dB	
		26(3m) Max.	5.7dB	7.2dB	9.9dB	11.9dB	14.1dB	16.5dB	
		26/25(5m) Max.	7.8dB	10.0dB	13.5dB	16.0dB	19.0dB	22.0dB	

## CONTINUED

<b>Differential to common-mode Conversion Loss-Differential Insertion Loss (<math>S_{CD21}-S_{DD21}</math>)</b>	$\text{Conversion\_loss}(f) - IL(f) \geq$ $\left\{ \begin{array}{ll} 10 & 0.01 \leq f < 12.89 \\ 27-(29/22)f & 12.89 \leq f < 15.7 \\ 6.3 & 15.7 \leq f \leq 19 \end{array} \right\}$ <p>Where f is the frequency in GHz  Conversion_loss(f) is the cable assembly differential to common-mode conversion loss  IL(f) is the cable assembly insertion loss</p>	$10\text{MHz} \leq f \leq 19\text{GHz}$
<b>MDNEXT (multiple disturber near-end crosstalk)</b>	$\geq 26\text{dB @ } 12.89\text{GHz}$	$10\text{MHz} \leq f \leq 19\text{GHz}$
<b>Low Level Contact Resistance</b>	70milliohms Max. From initial.	EIA-364-23: Apply a maximum voltage of 20mV and a current of 100 mA.
<b>Insulation Resistance</b>	10Mohm (Min.)	EIA364-21: AC 300V 1 minute
<b>Dielectric Withstanding Voltage</b>	NO disruptive discharge.	EIA-364-20: Apply a voltage of 300 VDC for 1 minute between adjacent terminals and between adjacent terminals and ground.

## ENVIRONMENTAL CHARACTERISTICS

ITEM	REQUIREMENT	TEST CONDITON
<b>Operating Temperature Range</b>	-20°C to +75°C	Cable operating temperature range.
<b>Storage Temperature Range (in packed condition)</b>	-40°C to +80°C	Cable storage temperature range in packed condition.
<b>Thermal Cycling Non-Powered</b>	No evidence of physical damage	EIA-364-32D, Method A, -25 to 90C, 100 cycles, 15 min. dwells
<b>Salt Spraying</b>	48 hours salt spraying after shell corrosive area less than 5%.	EIA-364-26
<b>Mixed Flowing Gas</b>	Pass electrical tests per 3.1 after stressing. (For connector only)	EIA-364-35 Class II, 14 days.
<b>Temperature Life</b>	No evidence of physical damage	EIA-364-17C w/ RH, Damp heat 90°C at 85% RH for 500 hours then return to ambient
<b>Cable Cold Bend</b>	4H, No evidence of physical damage	Condition: -20°C±2°C, mandrel diameter is 6 times the cable diameter.

## MECHANICAL & PHYSICAL CHARACTERISTICS

ITEM	REQUIREMENT	TEST CONDITON
<b>Vibration</b>	Pass electrical tests per 3.1 after stressing.	Clamp & vibrate per EIA-364-28E, TC-VII, test condition letter – D, 15 minutes in X, Y & Z axis.
<b>Twist</b>	No evidence of physical damage	Twist cable 180° ( $\pm 90^\circ$ from nominal position) for 100 cycles at 30 cycles per minute with a 0.5kg load applied to the cable jacket. Clamp position: 300mm
<b>Cable Flex</b>	No evidence of physical damage	Flex cable 180° for 20 cycles ( $\pm 90^\circ$ from nominal position) at 12 cycles per minute with a 1.0kg load applied to the cable jacket. Flex in the boot area 90° in each direction from vertical. Per EIA-364-41C
<b>Cable Plug Retention in Cage</b>	90N Min. No evidence of physical damage	Force to be applied axially with no damage to cage. Per SFF 8661 Rev 2.1 Pull on cable jacket approximately 1 ft behind cable plug. No functional damage to cable plug below 90N. Per SFF-8432 Rev 5.0
<b>Cable Retention in Plug</b>	90N Min. No evidence of physical damage	Cable plug is fixtured with the bulk cable hanging vertically. A 90N axial load is applied (gradually) to the cable jacket and held for 1 minute. Per EIA-364-38B
<b>Mechanical Shock</b>	Pass electrical tests Per 3.1 after stressing.	Clamp and shock per EIA-364-27B, TC-G, 3 times in 6 directions, 100g, 6ms.
<b>Cable Plug Insertion</b>	40N Max. (QSFP28)	Per SFF8661 Rev 2.1
<b>Cable plug Extraction</b>	30N Max. (QSFP28)	Place axial load on de-latch to de-latch plug. Per SFF8661 Rev 2.1
<b>Durability</b>	50 cycles, No evidence of physical damage	EIA-364-09, perform plug & unplug cycles: Plug and receptacle mate rate: 250 times/hour. 50 times for QSFP28/SFP28 module (CONNECTOR TO PCB)

## MECHANICAL DIMENSIONS (UNITS: mm)

