QSFP28 100G to 2*QSFP28 50G High Speed Passive Direct Attached Copper Cable Product Specifications

Revision

Date	Revision	Revision Description	Author
2015-03-03	A	First released	Fude Wang

1 Product description

1.1 Meet SFF-8665 , IEEE802.3bj and P802.3by specifications.

1.2 System requirement (Connector & Cable System)

ITEM	REQUIREMENT	TEST CONDITON
Data Rate per Channel	25.78125Gbps	Mate connector to edge card contacts, include host board launched.
Cable Length	0.5m, 1m, 2m, 3m, 5m	/
Pin Assignment	SFF-8665/8636 pin function definition.	/

1.3 PCB Material is M6 or higher, overall thickness is 1.0mm over pads.

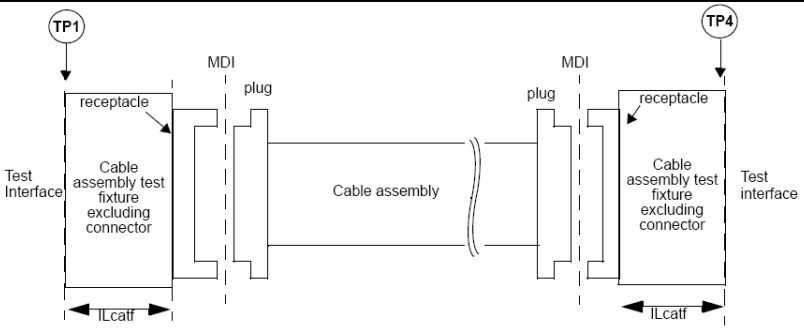
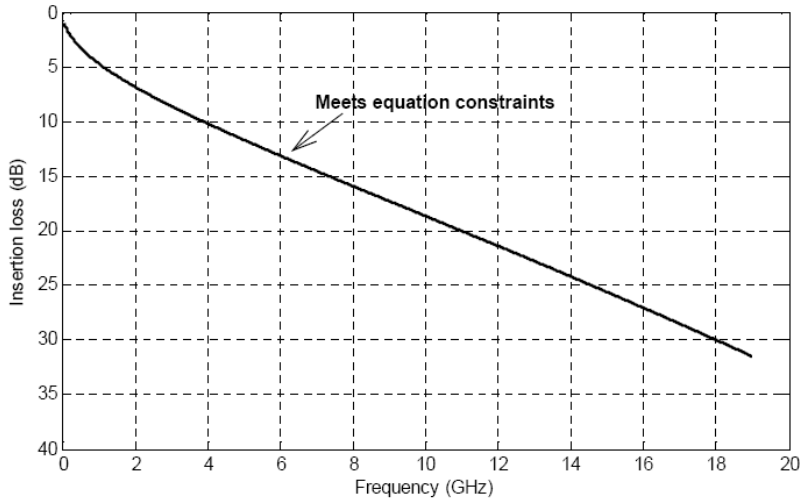
2 Cable Specification

ITEM	*REQUIREMENT*			
Jacket Color	*Black*			
Jacket Material	*PVC, FRNC, Meet RoHS and REACH requirement.*			
Flame Retardant Grade	*Meet UL CL2 and CSA(or cUL) FT4 upward flame retardant grade.*			
Core	*4 Pair*			
Gauge	*30AWG or 26AWG*			
Shielding	*Coverage ⩾85％.*			
Cable Diameter	*FRNC 26AWG*	*FRNC 30AWG*	*PVC 26AWG*	*PVC 30AWG*
	7.2 ±0.3mm	*5.9±0.2mm*	*6.7±0.3 mm*	*5.4±0.2mm*
Cable Assembly Length	*500±25mm*	*500±25mm*	*500±25mm*	*500±25mm*
	1000±30mm	*1000±30mm*	*1000±30mm*	*1000±30mm*
	1500±30mm	*1500±30mm*	*1500±30mm*	*1500±30mm*
	2000±30mm	*2000±30mm*	*2000±30mm*	*2000±30mm*
	2500±30mm	*2500±30mm*	*2500±30mm*	*2500±30mm*
	3000±30mm	*3000±30mm*	*3000±30mm*	*3000±30mm*
	5000±50mm		*5000±50mm*	

3 Electrical Performance

3.1 Signal integrity

<table>
<tr><th colspan="2">ITEM</th><th>REQUIREMENT</th><th>TEST CONDITION</th></tr>
<tr><td rowspan="3">Differential Impedance</td><td>Cable Impedance</td><td>100-5/+10Ω</td><td rowspan="3">Rise time of 25ps(at the SMA)
(20 % - 80 %).</td></tr>
<tr><td>Paddle Card Impedance</td><td>100±10Ω</td></tr>
<tr><td>Cable Termination Impedance</td><td>100±10Ω</td></tr>
<tr><td colspan="2">Differential(Input/Output)Return loss S_{DD11}/S_{DD22}</td><td>Return_loss(f) ⩾ { 16.5-2√f 0.05⩽f⩽4.1 ; 10.06-14log10(f/5.5) 4.1＜f＜10 }
Where
f is the frequency in GHz
Return_loss(f) is the return loss at frequency f</td><td>10MHz⩽f ⩽19GHz</td></tr>
<tr><td colspan="2">Differential to common-mode (Input/Output)Return loss S_{CD11}/S_{CD22}</td><td>Return_loss(f) ⩾ { 22-(20/25.78)f 0.01⩽f⩽12.89 ; 15-(6/25.78)f 12.89＜f＜19 }
Where
f is the frequency in GHz
Return_loss(f) is the Differential to common-mode return loss at frequency f</td><td>10MHz⩽f ⩽19GHz</td></tr>
<tr><td colspan="2">Common-mode to Common-mode (Input/Output)Return loss S_{CC11}/S_{CC22}</td><td>Return_loss(f)⩾2dB 0.2⩽f⩽19
Where
f is the frequency in GHz
Return_loss(f) is the common-mode to common-mode return loss at frequency f</td><td>10MHz⩽f ⩽19GHz</td></tr>
<tr><td colspan="2">Differential Insertion Loss(S_{DD21} Max.)</td><td>(Differential InsertionLoss Max.)
<table>
<tr><th>F / AWG</th><th>1.25GHz</th><th>2.5GHz</th><th>5.0GHz</th><th>7.0GHz</th><th>10Ghz</th><th>12.89Ghz</th></tr>
<tr><td>30(1m)Max.</td><td>5.7dB</td><td>6.6dB</td><td>7.7dB</td><td>8.9dB</td><td>9.6dB</td><td>10.7dB</td></tr>
<tr><td>30(1.5m)Max.</td><td>6.2dB</td><td>7.0dB</td><td>8.6dB</td><td>9.5dB</td><td>11.5dB</td><td>13.4dB</td></tr>
<tr><td>30(2m)Max.</td><td>6.6dB</td><td>7.9dB</td><td>9.3dB</td><td>11.0dB</td><td>13.5dB</td><td>16.1dB</td></tr>
</table></td><td>10MHz⩽f ⩽19GHz</td></tr>
</table>

	30(2.5m)Max. 7.3dB 8.9dB 10.7dB 12.8dB 15.6dB 18.8dB 30(3m)Max. 8.5dB 10.5dB 13.2dB 15.3dB 18.5dB 21.5dB 26(1m)Max. 5.5dB 6.2dB 7.0dB 7.8dB 8.7dB 9.5dB 26(1.5m)Max. 5.8dB 6.8dB 8.4dB 9.1dB 10.3dB 11.0dB 26(2m)Max. 6.1dB 7.3dB 9.2dB 10.0dB 11.1dB 12.5dB 26(2.5m)Max. 6.4dB 7.7dB 10.4dB 11.5 dB 13.2dB 15.0dB 26(3m)Max. 6.7dB 8.2dB 10.9dB 12.4dB 14.6dB 16.5dB  **Figure 92–17—Cable assembly test fixtures** *Note: Cable assembly measurements are to be made between TP1 and TP4 with cable assembly test fixtures as illustrated in Figure 92–17. Cable assembly IL max. as illustrated in Figure 92-11 and in Table4 excluding Test fixture Insertion loss.*  **Figure 92–11—Example maximum cable assembly insertion loss**	
Insertion Loss Deviation(ILD)	*-0.176*f - 0.7 ≤ ILD ≤ 0.176* f + 0.7*	50MHz≤f ≤19GHz
Insertion Loss Max. and Min.for Differential Pair	*(Insertion Loss Max.-Insertion Loss Min.)/ Insertion Loss Max. ≤10%*	10MHz≤f ≤19GHz

Differential to common-mode Conversion Loss-Differential Insertion Loss(S_{CD21}-S_{DD21})	*Conversion_loss(f) – IL(f) ≥ { 10 (0.01≤f≤12.89); -27-(29/22)f (12.89≤f<15.7); 6.3 (15.7≤f≤19) }* *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*	10MHz≤f ≤19GHz
MDNEXT(multiple disturber near-end crosstalk)	≥26dB@12.89GHz	10MHz≤f ≤19GHz
Integrated Crosstalk Noise(ICN)	ICN≤8mV, 8≤ IL ≤ 10.43dB; ICN≤12.1-0.393*IL(mV), 10.43< IL ≤ 22.48dB	10MHz≤f ≤19GHz
AC Couple	100nF	Requirement of PRBS31 test.
Intra Skew	10ps/m	10MHz≤f ≤19GHz

3.2 Other Electrical Performance

ITEM	REQUIREMENT	TEST CONDITON
Low Level Contact Resistance	80milliohm Max. from initial.	EIA-364-23,apply a maximum voltage of 20mV and a current of 100mA.
Insulation Resistance	10Mohm Min.	EIA-364-21, AC 300V 1 minute.
Dielectric Withstanding Voltage	No disruptive discharge.	EIA-364-20,apply a voltage of 500VDC for 1 minute between adjacent terminals and between adjacent terminals and ground.

4 Cable Assembly Environmental Performance

ITEM	REQUIREMENT	TEST CONDITON
Operating Temp. Range	-20°C to +75°C	Cable operating tem. range.
Storage Temp. Range (in packed condition)	-40°C to +85°C	Cable storage temp. range in packed condition.
Thermal Cycling Non-Powered	Pass electrical tests per 3.1 after stressing.	EIA-364-32D, Method A, -25 to 90C, 100 cycles, 15 min. dwells
Salt Spraying	48 hours salt spraying after shell corrosive area less than 5%.	EIA-364-26

Mixed Flowing Gas	Pass electrical tests per 3.1 after stressing. (For connector only)	EIA-364-35 Class II,14 days.
Operating ambient RH - non condensing	5% to 85%	*Cable Operating ambient RH - non condensing. range.*

5 Mechanical Performance

ITEM	REQUIREMENT	TEST CONDITON
Vibration	No evidence of physical damage	Clamp & vibrate per EIA-364-28F,TC-VII, Test condition letter – D, 15 minutes in X, Y & Z axis.
Cable Flex	No evidence of physical damage	*Twist cable 180° (±90° from nominal position) for 100 cycles at 30 cycles per minute with a 0.5kg load applied to the cable jacket.* *Clamp position: 300mm.*
Cable Plug Retention in Cage	Pass electrical tests per 3.1 after stressing. 90N Min.	Cable plug is clamped with the cable hanging vertically. A 90N load is applied (gradually) to the cable jacket for a 1 minute duration. Force to be applied axially with no damage to cage. Per SFF 8661 Rev 2.1
Cable Retention in Plug	90N Min.	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
Mechanical Shock	No evidence of physical damage	Clamp and Shock per EIA-364-27C, TC-G,3 times in 6 directions, 100g, 6ms
Cable Plug Insertion	40N Max.	Per SFF8661 Rev 2.1
Cable Plug Extraction	30N Max.	Place axial load on de-latch to de-latch plug.Per SFF8661 Rev 2.1
Insertion/Removal tyCycles,Module/Cage	Proper function of latch / delatch after cycling	Insert and latch, then remove with delatch system. Per SFF8661 Rev 2.1 - 100 cycles
Latch Retention Force	90N Min. No evidence of physical damage	EIA-364-13
Durability	100 cycles,No evidence of physical damage	EIA-364-09, perform plug &unplug cycles:Plug and receptacle mate rate: 250times/hour. 100 times for QSFP28 module (CONNECTOR TO PCB)

End