

100Gbps QSFP28 Passive High Speed Cable Specification

1 Description:

The 100G QSFP28 Direct Connect Cable (DAC) is a 4-channel parallel passive copper product for storage, data centers and high-performance computing connections. Each channel is capable of transmitting data at 25 Gbps, enabling a 100 Gbps total data rate of 5 meters.

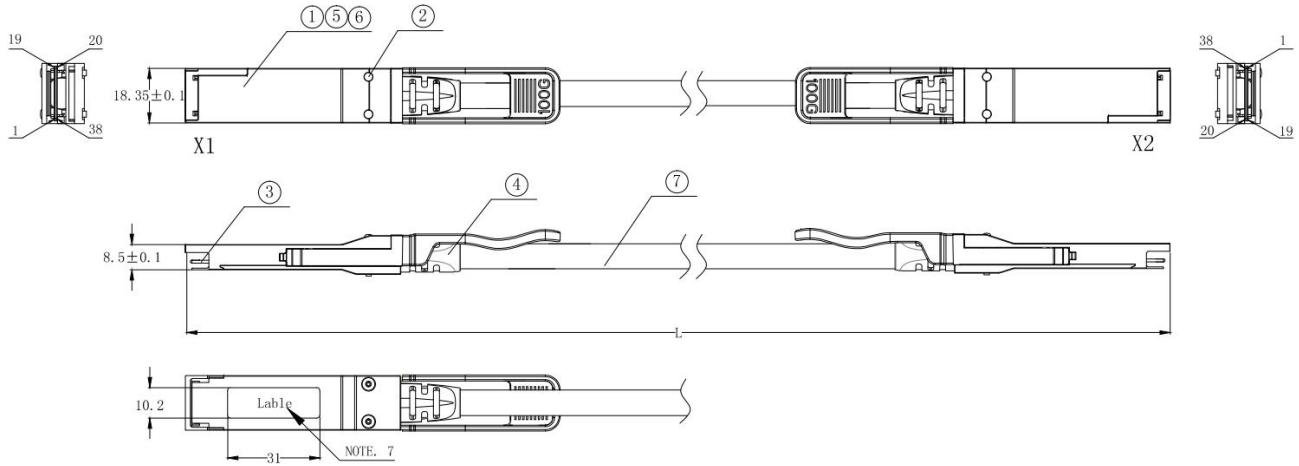
2 Features:

- Enhanced EMI / EMC performance
- 25Gbps data transfer rate per channel, up to 100Gbps
- Compliant with the IEEE 802.3bj standard and Infiniband EDR specifications
- Meets QSFP + MSA and SFF-8661 / SFF-8665 standards
- Support serial ID function through EEPROM
- 30AWG to 26AWG cable available
- RoHS and halogen-free options

3 Applications :

- Switch / router / HBA / SAN, NIC card
- 40G \ 100G Ethernet
- Storage, switch, data center, network center
- Infiniband, QDR / EDR

4 Outline drawing :



5 Wiring Diagram:

| X1 | X2 | REMARKS | X1 | X2 | REMARKS |
|--|--|---------|---|---|---------------------------------|
| 18(RX1-) | 37(TX1-) | pair | 37(TX1-) | 18(RX1-) | pair |
| 17(RX1+) | 36(TX1+) | | 36(TX1+) | 17(RX1+) | |
| 15(RX3-) | 34(TX3-) | pair | 34(TX3-) | 15(RX3-) | pair |
| 14(RX3+) | 33(TX3+) | | 33(TX3+) | 14(RX3+) | |
| 6 (TX4+) | 25(RX4+) | pair | 25(RX4+) | 6 (TX4+) | pair |
| 5 (TX4-) | 24(RX4-) | | 24(RX4-) | 5 (TX4-) | |
| 3 (TX2+) | 22(RX2+) | pair | 22(RX2+) | 3 (TX2+) | pair |
| 2 (TX2-) | 21(RX2-) | | 21(RX2-) | 2 (TX2-) | |
| 1, 4, 7, 13, 16, 19, 20, 23, 26, 32, 35, 38 | 1, 4, 7, 13, 16, 19, 20, 23, 26, 32, 35, 38 | GND | 8, 9, 10, 11, 12, 27, 28, 29, 30, 31 | 8, 9, 10, 11, 12, 27, 28, 29, 30, 31 | EEPROM point at both ends |

6 Electrical Performance:

6.1 Signal Integrity

| (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}] | $\text{Return_loss}(f) \geq \left\{ \begin{array}{ll} 16.5-2\sqrt{f} & 0.05 \leq f < 4.1 \\ 10.66-14\log_{10}(f/5.5) & 4.1 \leq f \leq 19 \end{array} \right\}$ <p>Where f is the frequency in GHz Return loss(f) is the return loss at frequency f</p> | 10MHz≤f≤19GHz | | | | | |
| [Differential to common-mode (Input/Output)Return loss S_{CD11}/S_{CD22}] | $\text{Return_loss}(f) \geq \left\{ \begin{array}{ll} 22-(20/25.78)f & 0.01 \leq f < 12.89 \\ 15-(6/25.78)f & 12.89 \leq f \leq 19 \end{array} \right\}$ <p>Where f is the frequency in GHz Return_loss(f) is the Differential to common-mode return loss at frequency f</p> | 10MHz≤f≤19GHz | | | | | |
| [Common-mode to Common-mode (Input/Output)Return loss S_{CC11}/S_{CC22}] | $\text{Return_loss}(f) \geq 2\text{dB} \quad 0.2 \leq f \leq 19$ <p>Where f is the frequency in GHz Return_loss(f) is the common-mode to common-mode return loss at frequency f</p> | 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 | 9.9 dB | 11.9dB | 14.1dB | 16.5dB | |

| | | | | | | | | |
|--|--|-------|--------|--------|--------|--------|--------|-------------------|
| | 26/25(5m)Max. | 7.8dB | 10.0dB | 13.5dB | 16.0dB | 19.0dB | 22.0dB | |
| [Insertion Loss Deviation] | $-0.176*f - 0.7 \leq \text{ILD} \leq 0.176* f + 0.7$ | | | | | | | 50MHz ≤ f ≤ 19GHz |
| Differential to common-mode Conversion Loss-Differential Insertion Loss(S _{CD21} -S _{DD21}) | $\text{Conversion_loss}(f) - \text{IL}(f) \geq \begin{cases} 10 & 0.01 \leq f < 12.89 \\ 27-(29/22)f & 12.89 \leq f < 15.7 \end{cases}$ <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> | | | | | | | 10MHz ≤ f ≤ 19GHz |
| [MDNEXT(multiple disturber near-end crosstalk)] | ≥35dB @12.89GHz | | | | | | | 10MHz ≤ f ≤ 19GHz |
| [Intra Skew] | 15ps/m, | | | | | | | 10MHz ≤ f ≤ 19GHz |

6.2 Other Electrical Performance

| (ITEM) | (REQUIREMENT) | (TEST CONDITON) |
|-----------------------------------|--------------------------------|--|
| [Low Level Contact Resistance] | 70milliohms Max. From initial. | EIA-364-23:Apply a maximum voltage of 20mV And a current of 100 mA. |
| Insulation Resistance | 10Mohm(Min.) | EIA364-21:AC 300V 1minute |
| [Dielectric Withstanding Voltage] | NO disruptive discharge. | EIA-364-20:Apply a voltage of 300 VDC for 1minute between adjacent terminals And between adjacent terminals and ground. |

7 Environment Performance

| (ITEM) | (REQUIREMENT) | (TEST CONDITON) |
|---|---|--|
| [Operating Temp. Range] | -20°C to +75°C | Cable operating temperature range. |
| [Storage Temp. Range (in packed condition)] | -40°C to +80°C | Cable storage temperature range in packed condition. |
| [Thermal Cycling Non-Powered] | No evidence of physical damage | 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. |
| Temp. Life | No evidence of physical damage | EIA-364-17C w/ RH, Damp heat 90°C at 85% RH for 500 hours then return to ambient |
| Cable Cold Bend | 4H, No evidence of physical damage | Condition: -20°C±2°C, mandrel diameter is 6 times the cable diameter. |

8 Mechanical and Physical Characteristics

| (ITEM) | (REQUIREMENT) | (TEST CONDITON) |
|------------------------------|--|--|
| Vibration | 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. |
| Twist | 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 Flex | No evidence of physical damage | Flex cable 180° for 20 cycles (±90° 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 |
| Cable Plug Retention in Cage | 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 |
| Cable Retention in Plug | 90N Min. | Cable plug is fixtured with the bulk cable |

| | | |
|-----------------------|---|--|
| | No evidence of physical damage | hanging vertically. A 90N axial load is applied (gradually) to the cable jacket and held for 1 minute. Per EIA-364-38B |
| Mechanical Shock | Pass electrical tests Per 3.1 after stressing. | Clamp and shock per EIA-364-27B, TC-G, 3 times in 6 directions, 100g, 6ms. |
| Cable Plug Insertion | 40N Max.(QSFP28) | Per SFF8661 Rev 2.1 |
| Cable plug Extraction | 30N Max. (QSFP28) | Place axial load on de-latch to de-latch plug.Per SFF8661 Rev 2.1 |
| Durability | 50 cycles, No evidence of physical damage | EIA-364-09, perform plug & unplug cycles: Plug and receptacle mate rate: 250times/hour. 50times for QSFP28/SFP28 module (CONNECTOR TO PCB) |