

400G QSFP-DD to 4×100G QSFP56 Direct Attach Cable TSQDS-4PC1HG-xxM

General Description

QSFP-DD to 4xQSFP56 passive copper cable assembly feature eight differential copper pairs, providing four data transmission channels at speeds up to 56Gbps(PAM4) per channel, and meets 400G Ethernet and InfiniBand Enhanced Data Rate(EDR) requirements. Available in a broad range of wire gages from 28AWG through 30AWG-this 400G copper cable assembly features low insertion loss and low cross talk.

QSFP-DD to 4xQSFP56 uses PAM4 signals for transmission, which doubles the rate. However, there are more stringent requirements for cable insertion loss. For detailed requirements, please see High Speed Characteristics.

Features

- Compatible with IEEE 802.3bj and IEEE 802.3cd
- Compatible with QSFP-DD MSA and SFF-8665
- Supports aggregate data rates of 400Gbps(PAM4)
- Optimized construction to minimize insertion loss and cross talk
- Pull-to-release slide latch design
- 28AWG through 30AWG cable
- Straight and break out assembly configurations available
- Customized cable braid termination limits EMI radiation
- Customizable EEPROM mapping for cable signature
- RoHS Compatible

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

Recommended Operation Condition

Parameter	Symbol	Min	Max	Unit
Operating Case Temperature	Topc	0	70	degC
Storage Temperature	Tst	-40	85	degC
Relative Humidity (non-condensation)	RS	35	60	%
Supply Voltage	VCC3	3.135	3.465	V
Voltage on LVTTTL Input	Vilvttl	-0.3	VCC3 +0.2	V
Power Supply Current	ICC3		15	mA
Total Power Consumption	Pd	-	0.05	W

Notes:

Stress or conditions exceed the above range may cause permanent damage to the device.

This is a stress rating only and functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not applied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

High Speed Characteristics

Parameter	Symbol	Min	Typical	Max	Uni	Note
Differential Impedance	TDR	90	100	110	Ω	-
Insertion loss	SDD21	-16.06	-	-	dB	At 13.28 GHz
Differential Return Loss	SDD11	-12.45	-	See 1	dB	At 0.05 to 4.1 GHz
	SDD22	-3.12	-	See 2		At 4.1 to 19 GHz
Common-mode to common-	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		At 12.89 to 19 GHz
Differential to common Mode Conversion Loss	SCD21-IL	-	-	-10	dB	At 0.01 to 12.89 GHz
		-	-	See 5		At 12.89 to 15.7 GHz
		-	-	-6.3		At 15.7 to 19 GHz
Channel Operating Margin	COM	-	-	-3	dB	-

Notes:

Reflection Coefficient given by equation $SDD11(dB) < -16.5 + 2 \times \sqrt{f}$, with f in GHz

Reflection Coefficient given by equation $SDD11(dB) < -10.66 + 14 \times \log_{10}(f/5.5)$, with f in GHz

Reflection Coefficient given by equation $SCD11(dB) < -22 + (20/25.78) \times f$, with f in GHz

Reflection Coefficient given by equation $SCD11(dB) < -15 + (6/25.78) \times f$, with f in GHz

Reflection Coefficient given by equation $SCD21(dB) < -27 + (29/22) \times f$, with f in GHz

QSFP-DD Pin 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	LVC MOS- I/O	SCL	2-wire serial interface clock
12	LVC MOS- I/O	SDA	2-wire serial interface data
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	LVTTTL-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
39	-	GND	Ground
40	CML-I	Tx6n	Transmitter Inverted Data Input
41	CML-I	Tx6p	Transmitter Non-Inverted Data Input
42	-	GND	Ground
43	CML-I	Tx8n	Transmitter Inverted Data Input
44	CML-I	Tx8p	Transmitter Non-Inverted Data Input
45	-	GND	Ground
46	-	Reserved	-
47	-	VS1	-
48	-	VccRx1	+3.3V Power supply
49	-	VS2	-
50	-	VS3	-
51	-	GND	Ground
52	CML-O	Rx7p	Receiver Non-Inverted Data Output
53	CML-O	Rx7n	Receiver Inverted Data Output
54	-	GND	Ground
55	CML-O	Rx5p	Receiver Non-Inverted Data Output
56	CML-O	Rx5n	Receiver Inverted Data Output
57	-	GND	Ground
58	-	GND	Ground
59	CML-O	Rx6n	Receiver Inverted Data Output
60	CML-O	Rx6p	Receiver Non-Inverted Data Output
61	-	GND	Ground
62	CML-O	Rx8n	Receiver Inverted Data Output
63	CML-O	Rx8p	Receiver Non-Inverted Data Output

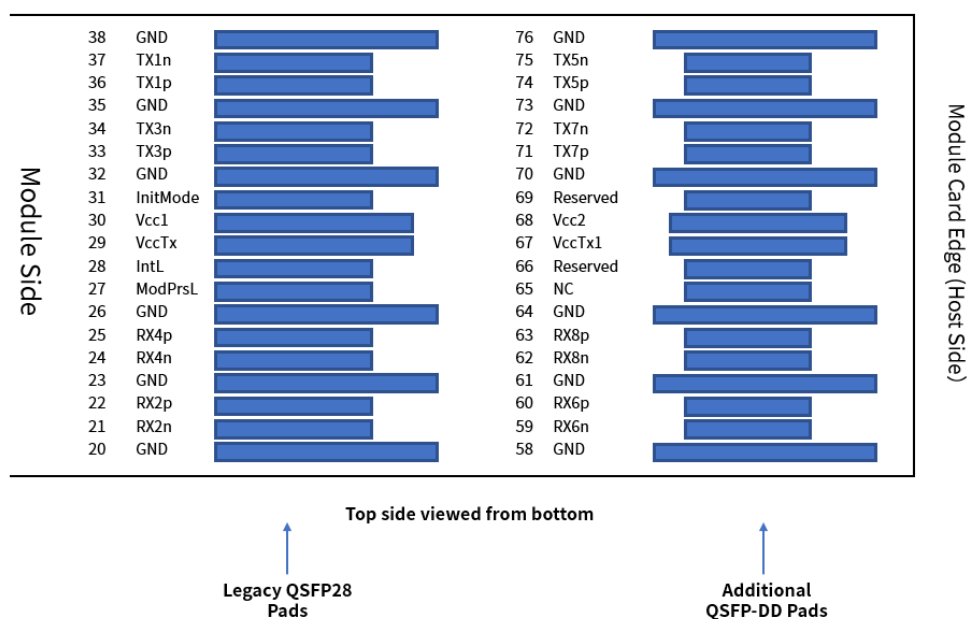
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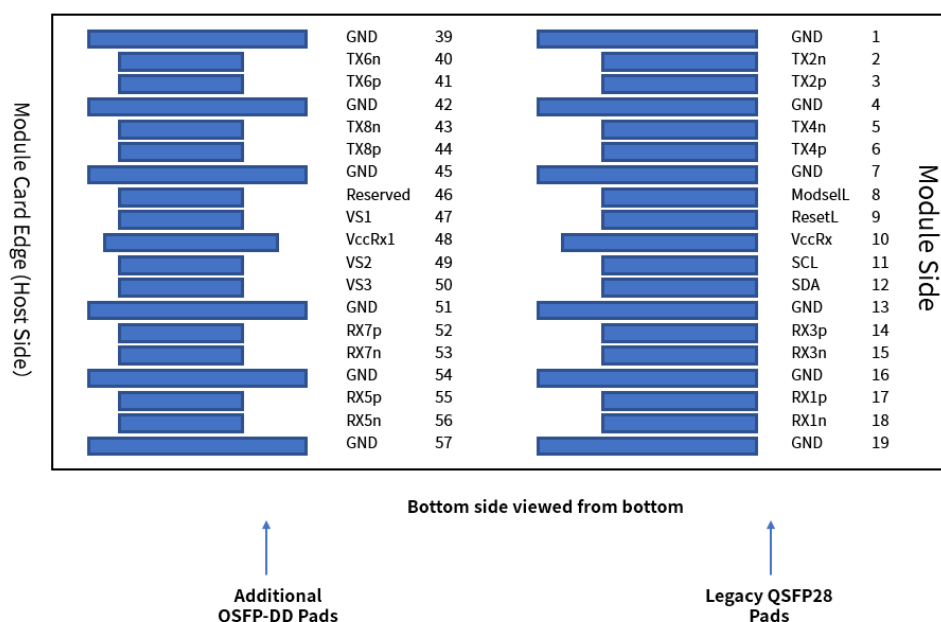
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64	-	GND	Ground
65	-	NC	-
66	-	Reserved	-
67	-	VccTx1	+3.3V Power supply
68	-	VCC2	+3.3V Power supply
69	-	Reserved	-
70	-	GND	Ground
71	CML-I	Tx7p	Transmitter Non-Inverted Data Input
72	CML-I	Tx7n	Transmitter Inverted Data Input
73	-	GND	Ground
74	CML-I	Tx5p	Transmitter Non-Inverted Data Input
75	CML-I	Tx5n	Transmitter Inverted Data Input
76	-	GND	Ground

QSFP-DD Pin Definition





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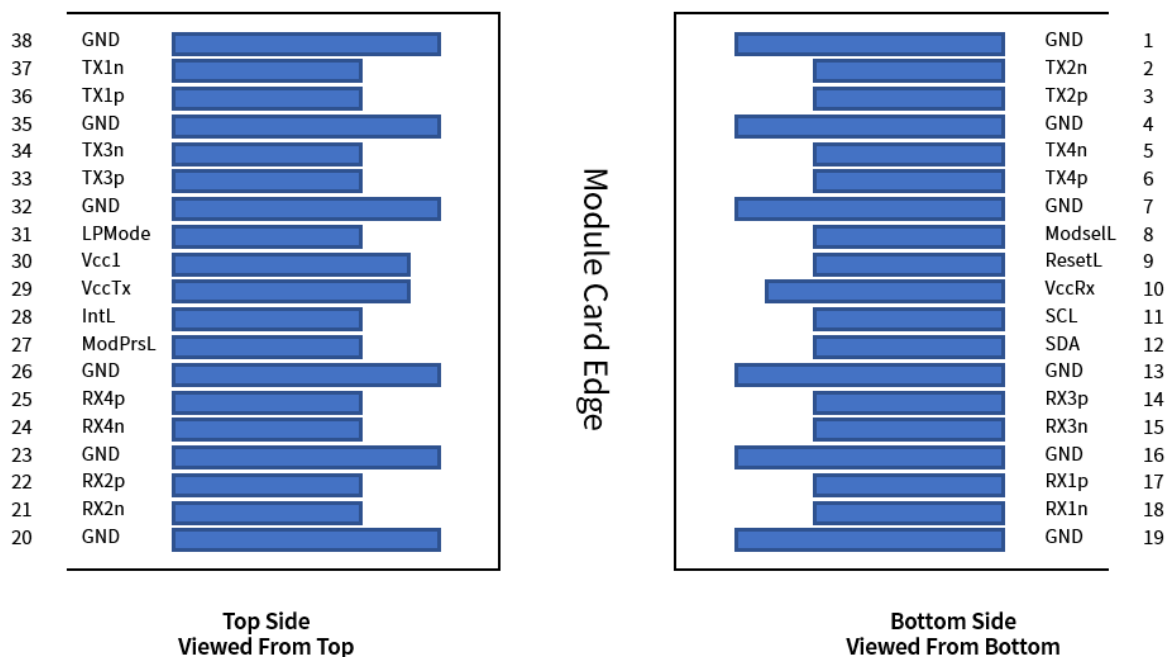
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17	CML-O	Rx1p	Receiver Non-Inverted Data Output
18	CML-O	Rx1n	Receiver Inverted Data Output
19	-	GND	Ground
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21	CML-O	Rx2n	Receiver Inverted Data Output
22	CML-O	Rx2p	Receiver Non-Inverted Data Output
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38	-	GND	Ground

Qsfp56 Pin Descriptions



Ordering Information

400G QSFP-DD 4x100G QSFP56 Copper Breakout Cable Assemblies, Passive.

P/N	Length	Data Rate	AWG	Length Tolerance
TSQDQ-4PC1HG-01M	1M	400G	30	+3.5/-3.5cm
TSQDQ-4PC1HG-02M	2M	400G	28	+3.5/-3.5cm
TSQDQ-4PC1HG-03M	3M	400G	28	+4/-4cm