

Product Specification

400G Quadwire® QSFP-DD Direct Attach Cable FDBC850QE1Cxx

PRODUCT FEATURES

- Supports aggregate data rates of 400Gb/s (PAM4)
- Up to 3-meter transmission
- 28AWG to 30AWG cable
- Compatible with IEEE 802.3bj and IEEE 802.3cd
- Compatible to QSFP-DD
- Temperature Range: 0°C-70°C
- RoHS compliant



APPLICATIONS

- 400G Ethernet
- Storage area networks
- High performance computing

400G Quadwire® FDBC850QE1Cxx are QSFP-DD direct-attach cables designed for 400G Ethernet links. Each passive copper cable assembles 16 differential copper pairs to provide 8 data transmission channels at speeds up to 56Gb/s (PAM4) per channel. This 400G copper cable assembly features low insertion loss and low cross talk. It uses PAM4 signals for transmission. Various wire gauges are available from 30 to 26 AWG with various choices of cable length (up to 3m).

PRODUCT SELECTION

Coherent P/N	If xx=	Cable length (unit: meter)	If xx=	Cable length (unit: meter)
FDBC850QE1Cxx	01	1.0	Z5	0.5
	02	2.0	A5	1.5
	03	3.0	B5	2.5

Please contact Coherent for other custom options.

I. QSFP-DD 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	LVC MOS-	SCL	2-wire serial interface clock
	I/O		
12	LVC MOS-	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
39		GND	Ground

Pin	Logic	Symbol	Description
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
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

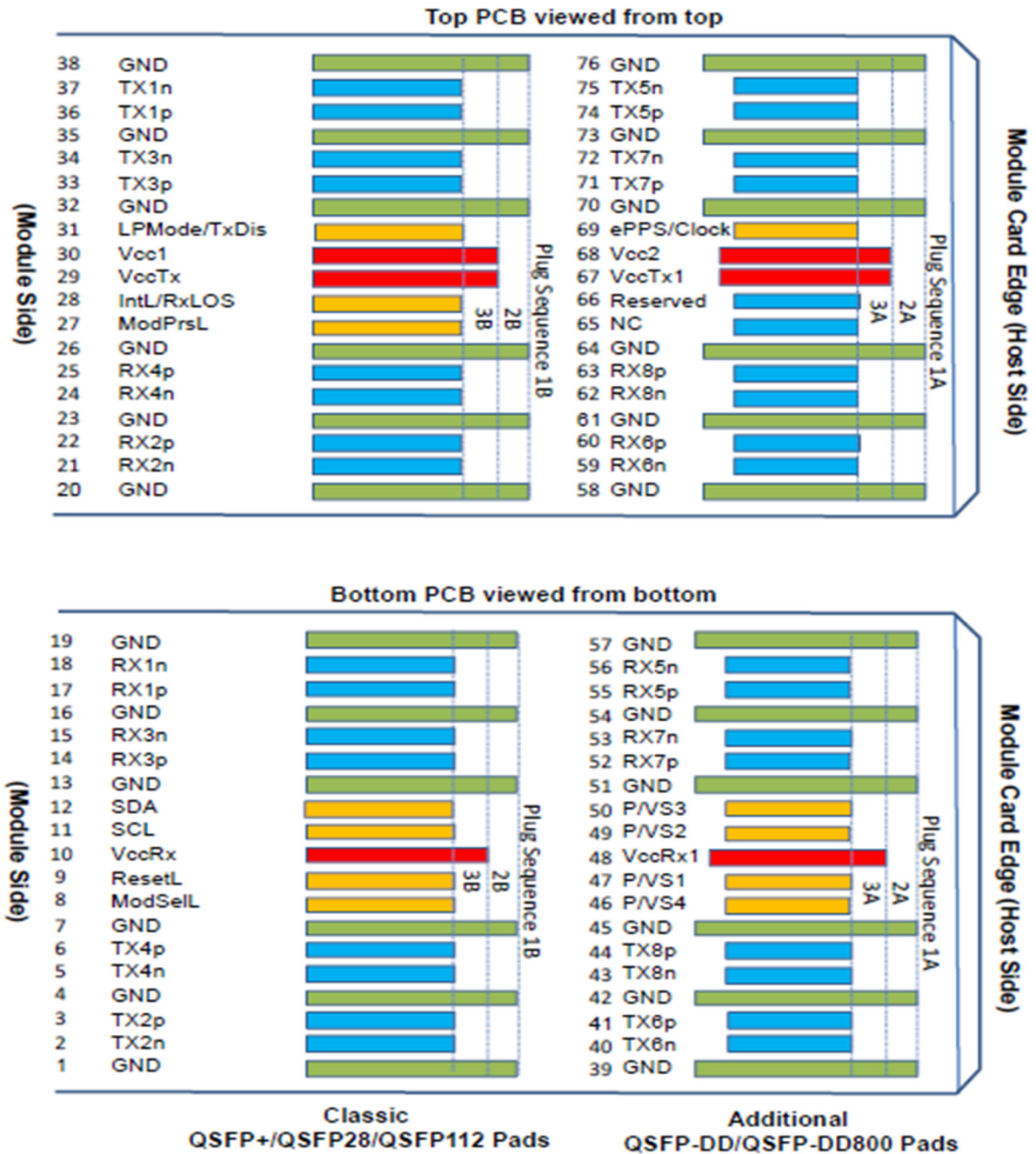


Figure 1. Diagram of Host Board Connector Block Pin Numbers and Names

II. General Product Characteristics

QSFP-DD DAC Specifications	
Channel Data Rate	56 Gbps (PAM4)
Operating Temperature	0 to + 70°C
Storage Temperature	-40 to + 85°C
Supply Voltage	3.3 V
Management Interface	I ² C

III. High Speed Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Note		
Differential Impedance	TDR	85	100	110	Ω			
Insertion loss	SDD21	-17.16			dB	At 13.28 GHz		
Differential Return Loss	SDD11 SDD22			See 1	dB	At 0.05 to 4.1 GHz		
				See 2	dB	At 4.1 to 19 GHz		
Common mode to common mode output return loss	SCC11 SCC22			-2	dB	At 0.2 to 19 GHz		
				Differential to common mode return loss	SCD11 SCD22	See 3	dB	At 0.01 to 12.89 GHz
See 4	dB					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	dB	At 12.89 to 15.7 GHz		
				-6.3	dB	At 15.7 to 19 GHz		
Notes:								
1. Reflection Coefficient given by equation $SDD11(dB) < -16.5 + 2 \times \text{SQRT}(f)$, with f in GHz								
2. Reflection Coefficient given by equation $SDD11(dB) < -10.66 + 14 \times \log_{10}(f/5.5)$, with f in GHz								
3. Reflection Coefficient given by equation $SCD11(dB) < -22 + (20/25.78)*f$, with f in GHz								
4. Reflection Coefficient given by equation $SCD11(dB) < -15 + (6/25.78)*f$, with f in GHz								
5. Reflection Coefficient given by equation $SCD21(dB) < -27 + (29/22)*f$, with f in GHz								

IV. Mechanical Specifications

The connector is compatible with the QSFP-DD specification.

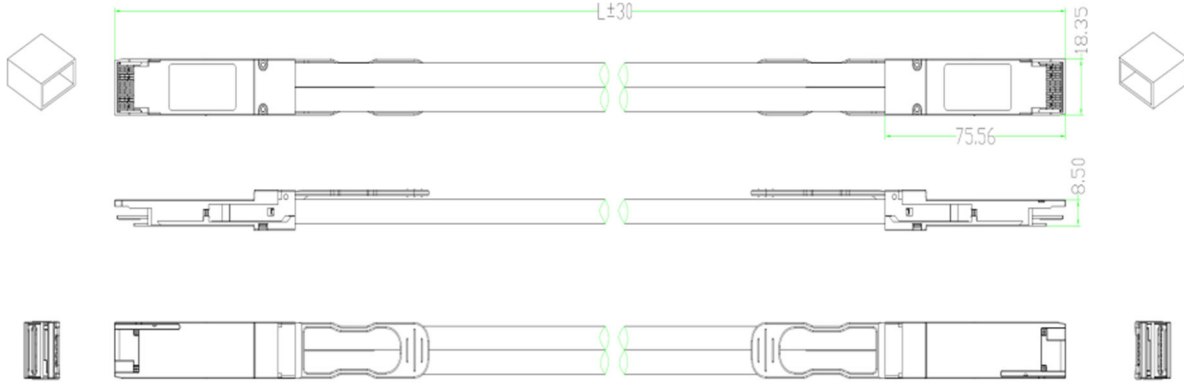


Figure 2. FDBC850QE1Cxx Mechanical drawing

Length (m)	Cable AWG
1	30
1.5	30
2	28
2.5	28
3	28

V. Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	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 80 to 1000MHz
RoHS Compliance	RoHS Directive 2011/65/EU and it's Amendment Directives (EU)	RoHS (EU) 2015/863 compliant
REACH Compliance	REACH Regulation (EC) No 1907/2006	REACH (EC) No1907/2006 compliant

VI. References

1. QSFP-DD Hardware Specification for QSFP DOUBLE DENSITY 8X PLUGGABLE TRANSCEIVER Rev 5.0
2. SFF-8665: “QSFP+ 28Gb/s 4X Pluggable Transceiver Solution (QSFP28)”, Rev 1.9, June 29, 2015 and associated SFF documents referenced therein:
 - i. SFF-8661
 - ii. SFF-8679
 - iii. SFF-8662
 - iv. SFF-8663
 - v. SFF-8672
3. Directive 2011/65/EU of the European Council Parliament and of the Council, “on the restriction of the use of certain hazardous substances in electrical and electronic equipment” as well as Commission Delegated Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU. Certain products may use one or more exemptions as allowed by the Directive.
4. Application Note AN-2038: “II-VI Implementation of RoHS Compliant Transceivers”.
5. Common Management Interface Specification (CMIS) Rev 4.0.
6. IEEE P802.3bs, 400GAUI-8 Interface.

VII. For More Information

Coherent Corp.
375 Saxonburg Boulevard
Saxonburg, PA 16056
sales@coherent.com
www.coherent.com