

E-AC-QQ-8D8xxxx00-CC

40-Gbps QSFP+ Active Optical Cable



Data Sheet



Description

The FOCI's E-AC-QQ-8D8xxxx00-CC Quad Small Form-Factor Pluggable Plus (QSFP+) active optical cables (AOC) are high-performance active optical cables with bi-directional signal transmission and aggregate 40-Gbps bandwidth for both InfiniBand QDR and Ethernet 40GBASE-SR applications.

Compared to conventional copper cables, longer and lighter optical cables enable the ease of complicated data-center cabling. The AOCs utilize multimode fiber with 850-nm VCSELs and PIN PDs. The certificated cables have superior signal integrity and bit-error-rate, which enables reliable operation performance.

Part number

40-Gbps QSFP+ Active Optical Cable

E-AC-QQ-8D8xxxx00-CC

Where xxxx=cable length in meters

Features

- 4-channel bi-directional AOC with aggregate bandwidth of 40-Gbps (Electrical Interface Only)
- Compliant to SFF-8436 QSFP+ Specification Revision 4.1
- Supports 40-Gbps aggregate data-rate links up to 100-m
- Low power consumption of max 1.5 W (Compliant to Power Level 1)
- Full Digital Diagnostics Monitor Interface
- Hot pluggable electrical interface
- 0 to 70°C case temperature operating range
- RoHS Compliance and Lead-Free

Applications

- 40GBASE-SR4 Ethernet links and InfiniBand QDR/DDR/SDR
- 4G/8G/10G Fiber Channel
- SATA/SAS Storage
- HPC Interconnects
- Datacom/Telecom switch and router connections
- Proprietary Interconnections

Absolute Maximum Rating

The parameters are not necessarily applied together. Exceeding these values may cause permanent damage. Functional operation under these conditions is not implied.

Parameter	Min	Max	Unit	Note
Storage Temperature	0	70	°C	1
3.3V Power Supply Voltage	-0.5	3.6	V	
Data Input Voltage- Single Ended	-0.5		V _{CC} +0.5	
Control Input Voltage	-0.5	3.6	V	
Relative Humidity	5	85	%	2

Notes:

1. Limited by the fiber cable jacket, not the active ends.
2. Non-condensing.

Recommended Operating Conditions

Parameter	Min	Typical	Max	Unit	Note
Case Operating Temperature	0	40	70	°C	
Power Supply Voltage	3.135	3.3	3.465	V	
Data Rate per Channel	2.5		10.3125	Gbps	1
Power Supply Noise Ripple Susceptibility (PSNR)			50	mV	2
Bit Error Ratio		10 ⁻¹²			3
Control Input Voltage High	2		V _{CC} +0.3	V	
Control Input Voltage Low	-0.3		0.8	V	
Two Wire Serial (TWS) Interface Clock Rate		100		kHz	
Differential Data Input / Output Load		100		Ohms	
Standard Cable Lengths	3		100	m	

Notes:

1. Lane speed up to 12.5-Gbps is available upon customer requests.
2. Power supply noise is defined as peak-to-peak noise amplitude over 1K to 15 MHz frequency range at host supply side by the recommended power supply filter for module. See Section 10 for the recommended power supply filter.
3. Bit-Error-Rate (BER) is tested with PRBS 2³¹-1 pattern.

Electrical Characteristics

Parameter	Min	Typical	Max	Unit	Note
Transceiver					
Transceiver Power Consumption			1.5	W	
Transceiver Power Supply Current			420	mA	
Transceiver Power-On Initialization Time			2000	ms	1
Transmitter					
Data Input Differential Peak-to-Peak Voltage Swing			1200	mVpp	
Differential Input Return Loss	Per IEEE 802.3ba, Section 86A.4.1.1			dB	2
Differential to Common Mode Input Return Loss	10			dB	2
J2 Jitter Tolerance	0.17			UI	
J9 Jitter Tolerance	0.29			UI	
Eye Mask Coordinates: X1, X2; Y1, Y2.	Specification Value 0.11,0.31; 95,350.			UI;mV	3
Receiver					
Data Output Differential Peak-to-Peak Voltage Swing	200		900	mVpp	4
Output Transition Time 20% to 80%	28			ps	
Differential Output Return Loss	Per IEEE 802.3ba, Section 86A.4.2.1			dB	2
Common Mode Output Return Loss	Per IEEE 802.3ba, Section 86A.4.2.2			dB	2
Output Total Jitter			62	ps	
J2 Jitter Output			0.42	UI	
J9 Jitter Output			0.65	UI	
Eye Mask Coordinates: X1, X2; Y1, Y2.	Specification Value 0.29, 0.5; 150, 425.			UI;mV	3

Notes:

1. "Initialization Time" is the time from when the supply voltages reach and remain above the minimum "Recommended Operating Conditions" to the time when the module enables TWS access. The module at that point is fully functional.
2. 10M to 11.1 GHz according to IEEE 802.3ba specification.
3. Hit ratio= 5×10^{-5} per sample.
4. AC-Coupled with 100Ω differential output impedance.

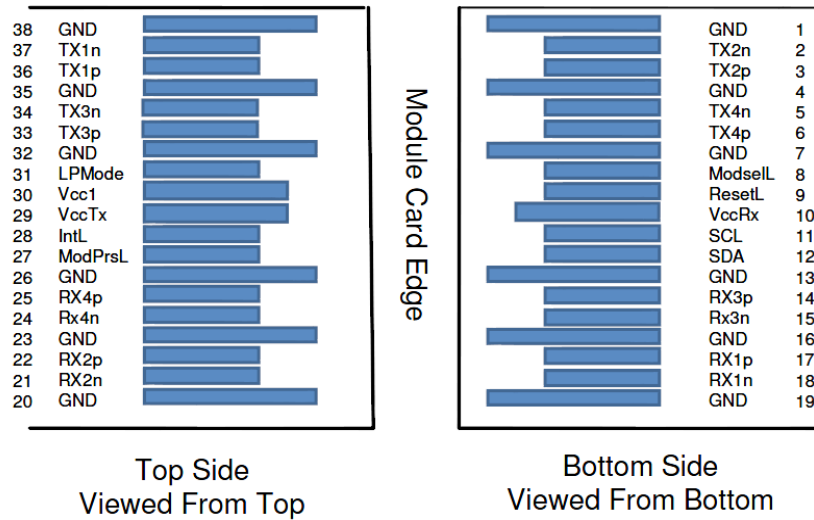
Optical Cable Specifications

Parameter	Specification	Notes
Minimum Cable Bending Radius	48 mm	IBTA Spec. is 100-mm.
Cable Cross-Section Dimension	Ribbon Type Cable with Size of $4.7 \times 2.5 \text{ mm}^2$	1
Cable Cover Type	LSZH	2
Standard Cable Length	10, 20, 30, 50, 100-m	
Cable Length Tolerance	+100/-0 cm	

Notes:

1. Round type cable is also available upon customer inquiry.
2. Cable cover type standard is LSZH. Other types can be available upon request.

QSFP+ Module Pad Assignments and Descriptions



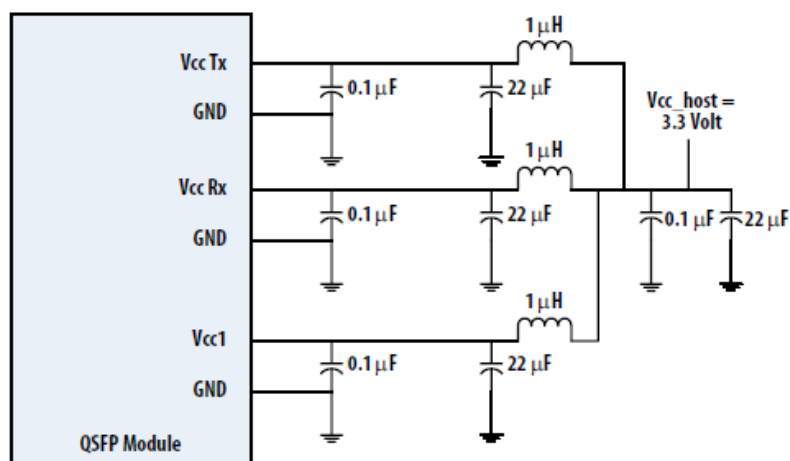
Pin	Logic	Symbol	Description	Plug Sequence	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	1
8	LVTTL-I	ModSelL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		Vcc Rx	+3.3V Power Supply Receiver	2	2
11	LVC MOS-I/O	SCL	2-wire serial interface clock	3	
12	LVC MOS-I/O	SDA	2-wire serial interface data	3	
13		GND	Ground	1	2
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL	Interrupt	3	
29		Vcc Tx	+3.3V Power supply transmitter	2	2

Pin	Logic	Symbol	Description	Plug Sequence	Notes
30	LVTTL - I	Vcc1	+3.3V Power supply	2	2
31		LPMode	Low Power Mode	3	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	1

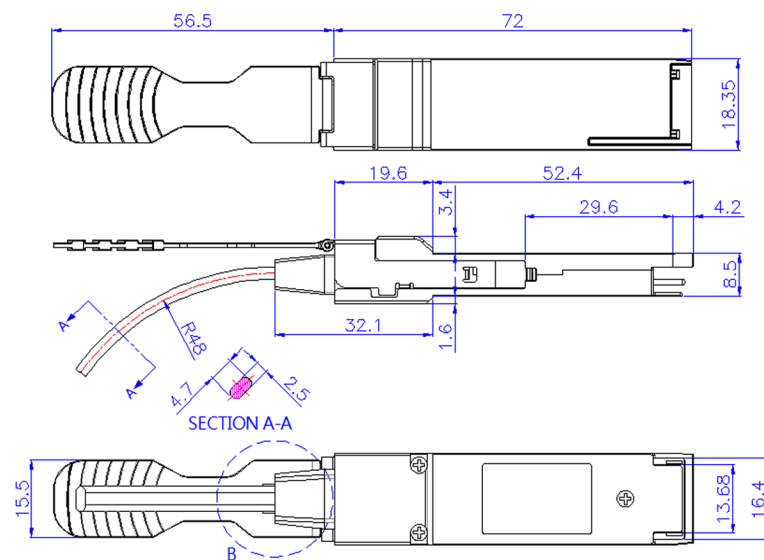
Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP+ module in any combination. The connector pins are each rated for a maximum current of 500 mA.

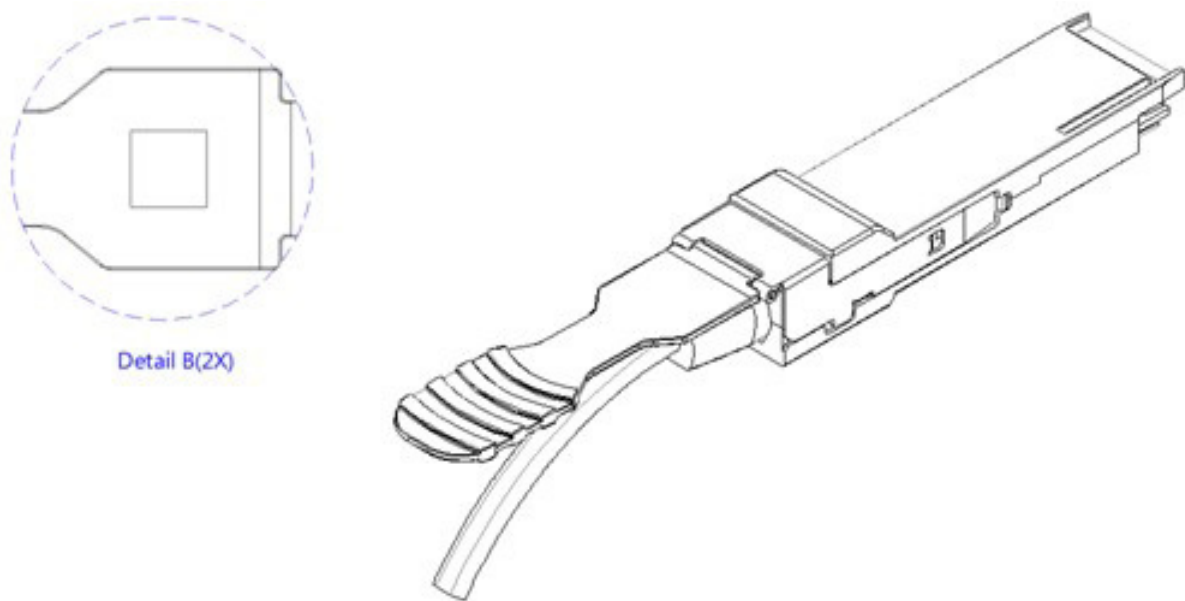
Recommended Host Board Power Supply Circuit



Package Outline

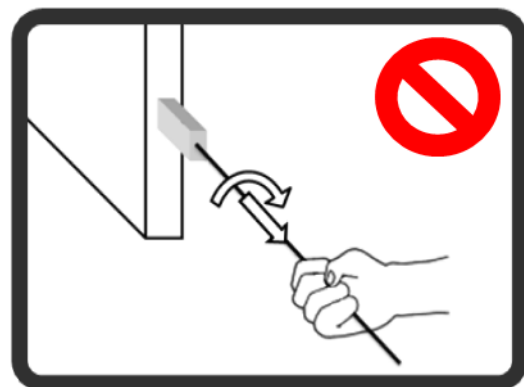
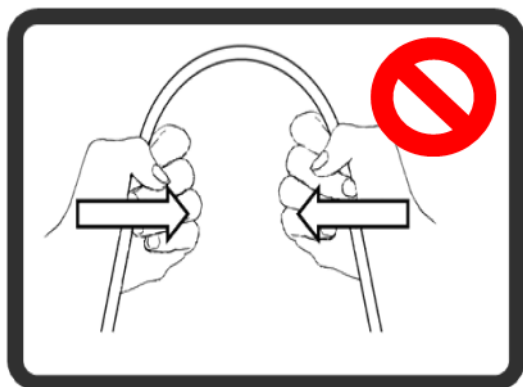


Unit: mm



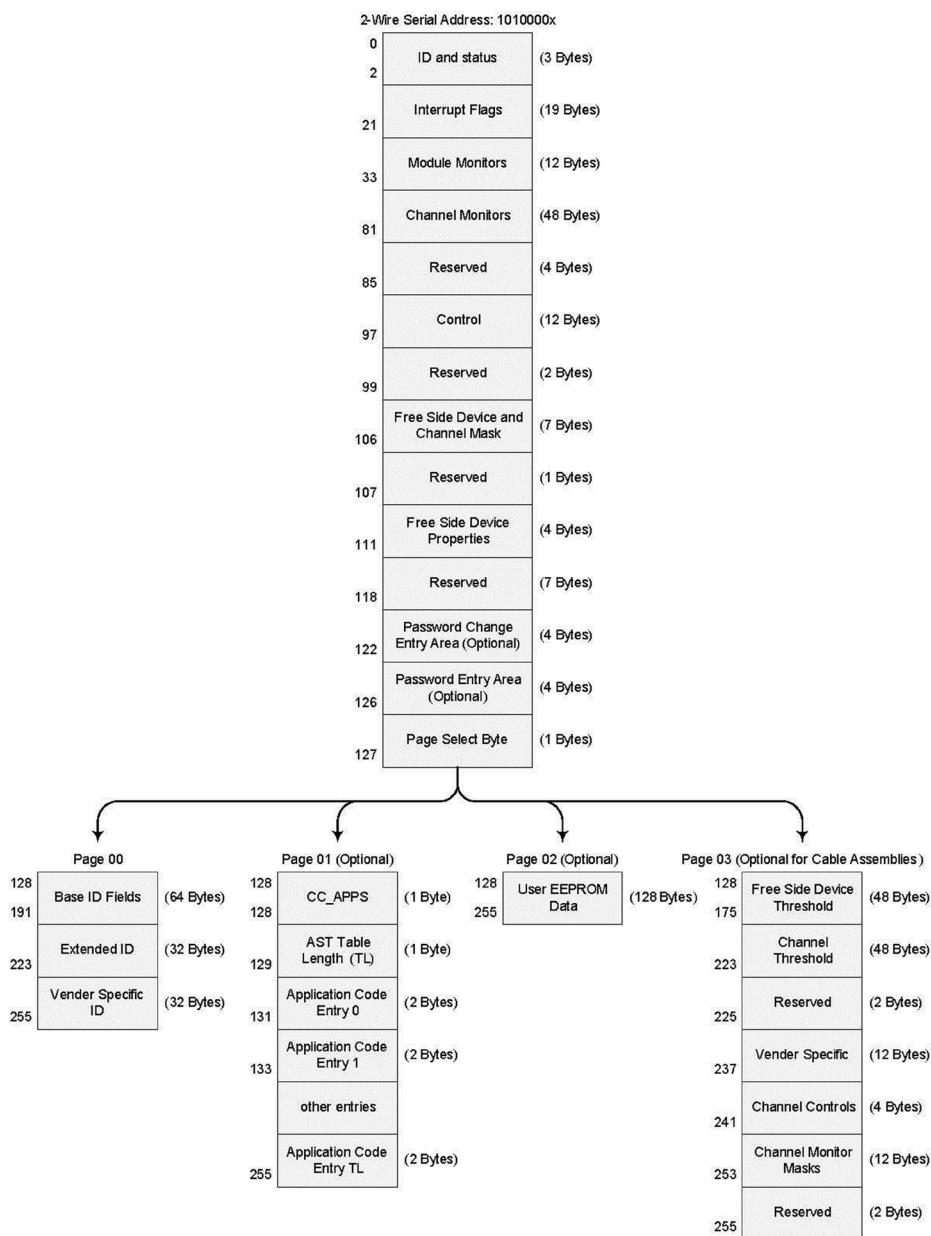
Handling

Care should be taken to restrict exposure to the conditions defined in the Absolute Maximum Ratings. Place the product in an even and stable location. If the product falls down or drops, it may cause an injury or malfunction. The cable must not be subjected to extreme bends during installation or while in operation. If you bend the cable at a radius less than the cable minimum bend radius, then the cable may get damaged. Don't twist or pull by force ends of the cable, which might cause malfunction. In addition, the bending direction should be perpendicular to the flat surface of the ribbon cable. Please do not bend or kink the cable in lateral directions of flat surface of the ribbon.



Memory Map

The memory map is structured as a single address and multiple page approaches, according to the QSFP+ SFF-8436 MSA specification as shown below. For more detailed description of this memory map or lower pages, please see our Memory Map document with flexible customization settings.



For product information and a complete list of cloud computing and data center related products, please go to our website: www.foci.com.tw
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