

400Gb/S QSFP-DD Active Optical Cable

P/N: AEA-PxxCA4



Product Features

- Compliant with QSFP-DD Rev 3.0
- Compliant with IEEE 802.3bm Physical Layer Specifications and Management Parameters
- SFF-8636 Management Interface
- SFF-8679 General Electrical
- Supports 425Gb/s aggregate bit rate
- 8x50G PAM4 VCSEL/PIN photo detector
- Low power consumption of max 7W
- Hot pluggable electrical interface
- 0 to 70°C case temperature operating range
- RoHS-6 Compliant

Application

- 400GBASE-SR8 Ethernet links

Absolute Maximum Rating

Parameter	Min	Max	Unit	Note
Storage Temperature	-40	85	°C	
Power Supply Voltage	-0.5	3.6	V	
Relative Humidity	0	85	%	

Recommended Operating Conditions

Parameter	Min	Typical	Max	Unit	Note
Case Operating Temperature	0		70	°C	
Center wavelength	840		860	nm	1
Power Supply Voltage	3.14		3.46	V	
Power Consumption		7		W	
Data Rate per Channel		26.5625		Gbps	
Bit Error Ratio			10^{-12}		2
Control Input Voltage High	2		V _{CC} +0.3	V	
Control Input Voltage Low	-0.3		0.8	V	
Number of Lanes		16			
Management Interface		Serial, I2C-based, maximum frequency 400 kHz			3

Note:

1. As defined by IEEE Std. 802.3bs TM/D3.5
2. PRBS13Q test pattern is used.
3. As defined by SFF-8636

Electrical Characteristics

Parameter	Min	Typical	Max	Unit	Note
Transceiver Electrical Characteristics					
Power Supply Current			2100	mA	
Power-on Initialization Time			2000	ms	
Transmitter at TP1a					
AC common-mode output voltage(RMS)			17.5	mV	
Differential peak-to-peak output voltage (Transmitter disabled)			35	mV	
Differential peak-to-peak output voltage (Transmitter enabled)			880	mV	
Eye symmetry mask width				UI	
Eye height, differential	32			mV	
Differential output return loss		See Eq.1			
Common to differential mode conversion return loss		See Eq.2			
Differential termination mismatch	10			%	
Transition time (20% to 80%)	10			ps	
Receiver at TP4					
Far-end Eye height, differential	30			mV	
Far-end pre-cursor ISI ratio	-4.5		2.5	%	
Differential output return loss		See Eq.1			
Common to differential mode conversion return loss		See Eq.2			
Differential termination mismatch	10			%	
Transition time (20% to 80%)	10			ps	
DC common mode voltage	-350		2850	mV	

$$1. \quad RLd(f) \geq \begin{cases} 9.5 - 0.37f & 0.01 \leq f < 8 \\ 4.75 - 7.4 \log_{10} \left(\frac{f}{14} \right) & 8 \leq f < 19 \end{cases} \quad (\text{dB}) \quad (\text{Eq.1})$$

where

f is the frequency in GHz, RLd is the CAUI-4 Chip-to-module input differential return loss

$$2. \quad RLdc(f) \geq \begin{cases} 22 - 20 \left(\frac{f}{25.78} \right) & 0.01 \leq f < 12.89 \\ 15 - 6 \left(\frac{f}{25.78} \right) & 12.89 \leq f < 19 \end{cases} \quad (\text{dB}) \quad (\text{Eq.2})$$

where

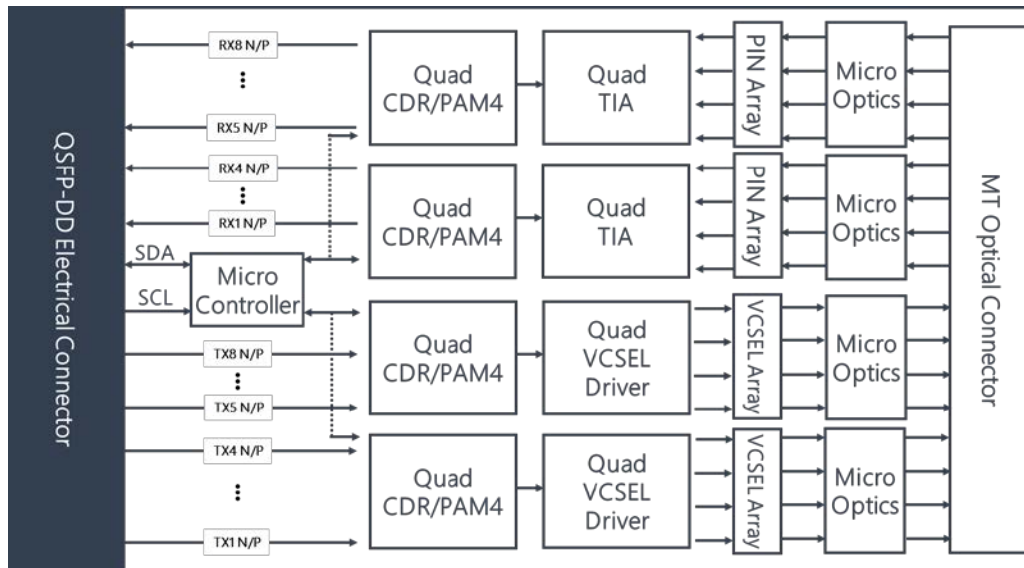
f is the frequency in GHz,

RLdc is the CAUI-4 Chip-to-module input differential to common mode input return loss

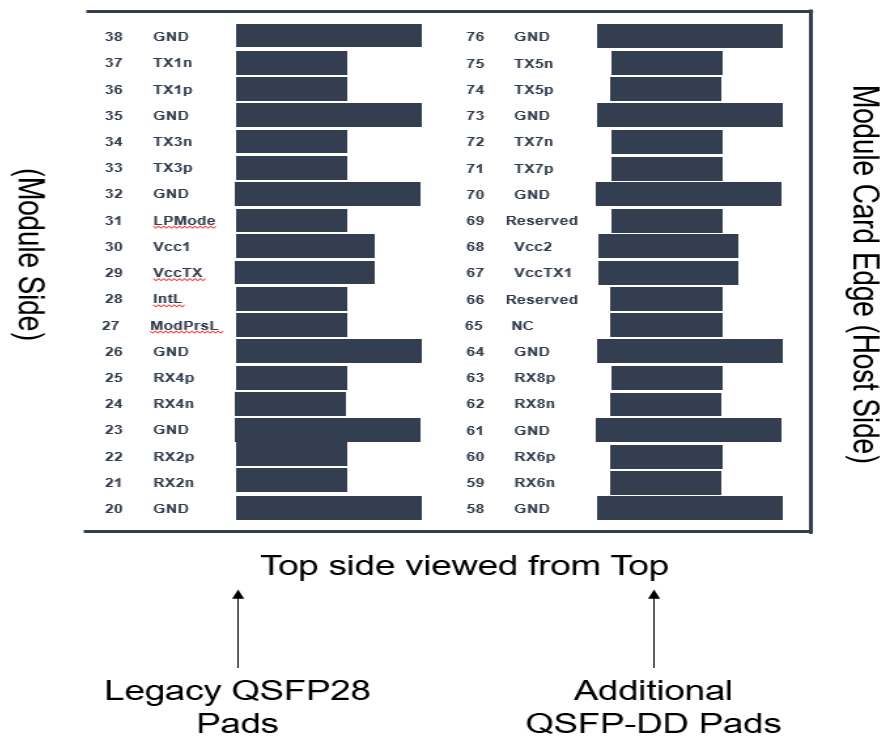
Optical Cable Secification

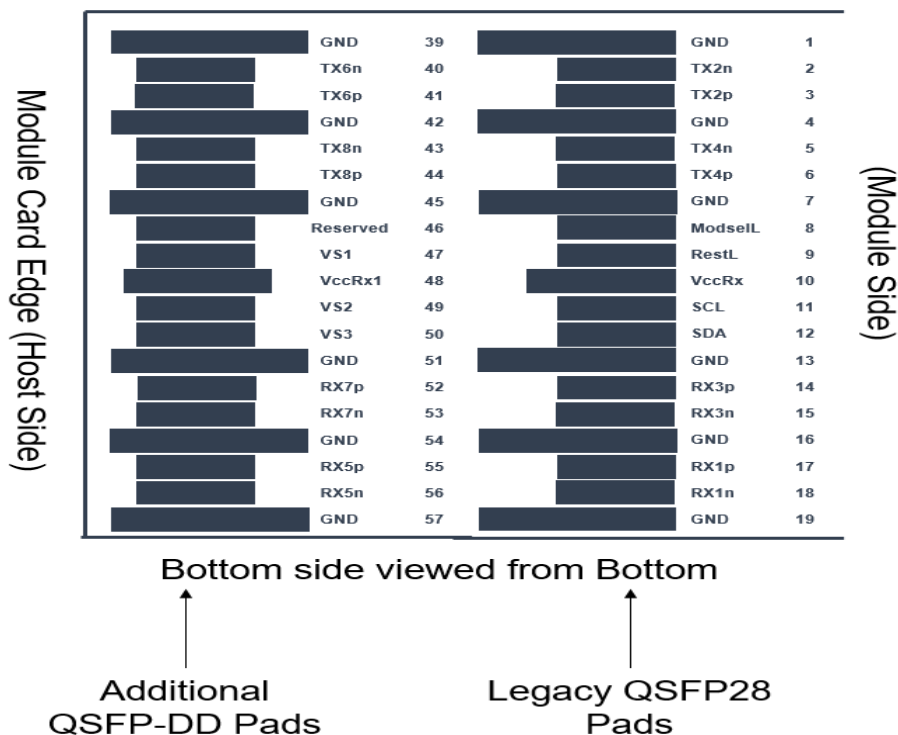
Parameter	Specification	Note
QSFP-DD Module Insertion	90 Nt	
QSFP-DD Module Extraction	50 Nt	
QSFP-DD Module Retention	90 Nt	
Insertion and removal cycles	50 Cycle	
Cable outer Diameter	3.0 mm	
Cable Jacket Material	LSZH	

Recommended Host Board SCHEMATIC



QSFP28 Module Pad Assignments and Descriptions





Pin	Symbol	Description	Notes
1	GND	Ground	1
2	TX2n	Transmitter Inverted Data Input	
3	TX2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	TX4n	Transmitter Inverted Data Input	
6	TX4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc RX	+3.3V Power Supply Receiver	2
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	RX3p	Receiver Non-Inverted Data Output	

15	RX3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	RX1p	Receiver Non-Inverted Data Output	
18	RX1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	RX2n	Receiver Inverted Data Output	
22	RX2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	RX4n	Receiver Inverted Data Output	
25	RX4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc TX	+3.3V Power supply transmitter	2
30	Vcc1	+3.3V Power supply	2
31	LPMODE	Initialization mode; In legacy QSFP applications, the InitMode pad is called LPMODE	
32	GND	Ground	1
33	TX3p	Transmitter Non-Inverted Data Input	
34	TX3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	TX1p	Transmitter Non-Inverted Data Input	
37	TX1n	Transmitter Inverted Data Input	
38	GND	Ground	1
39	GND	Ground	1
40	Tx6n	Transmitter Inverted Data Input	
41	Tx6p	Transmitter Non-Inverted Data Input	
42	GND	Ground	1

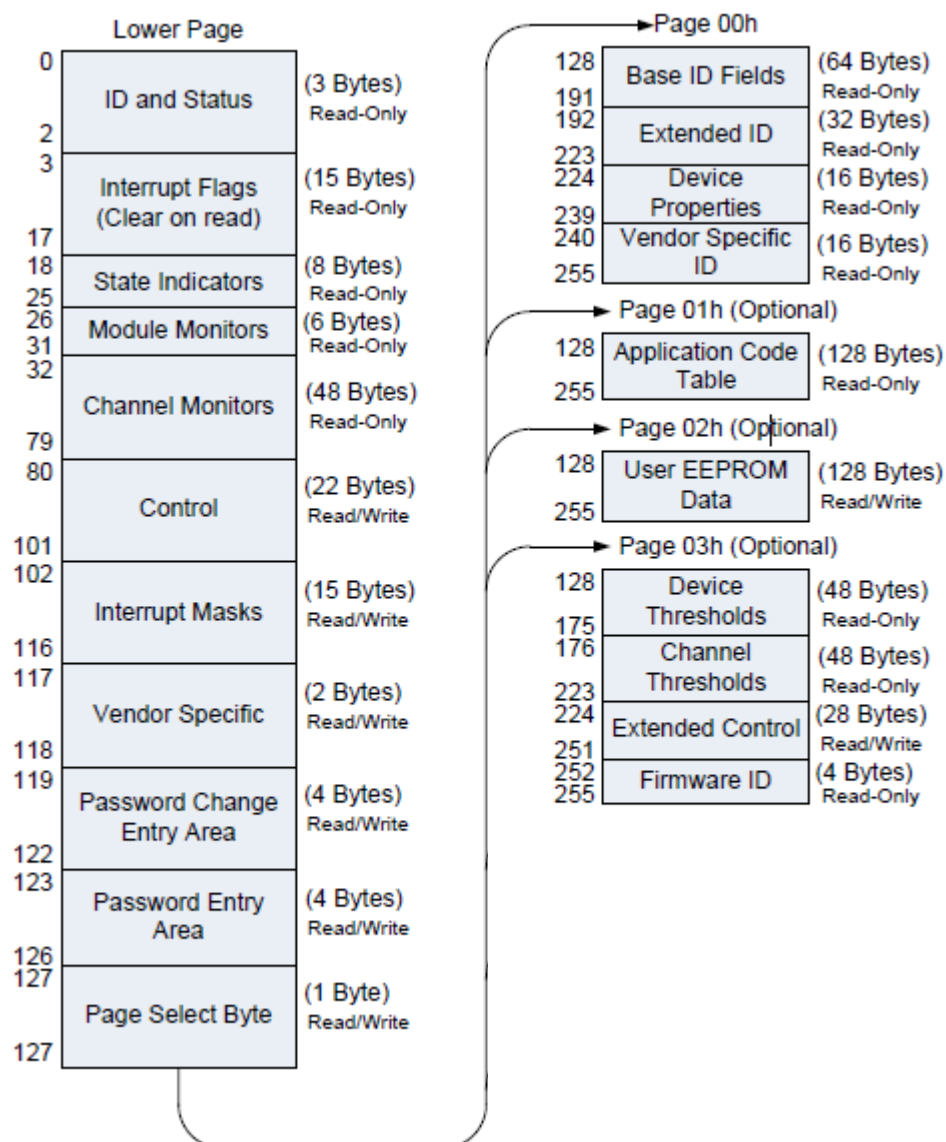
43	Tx8n	Transmitter Inverted Data Input	
44	Tx8p	Transmitter Non-Inverted Data Input	
45	GND	Ground	1
46	Reserved	For future use	3
47	VS1	Module Vendor Specific 1	3
48	3.3V Power Supply	2A	2
49	VS2	Module Vendor Specific 2	3
50	VS3	Module Vendor Specific 3	3
51	GND	Ground	1
52	Rx7p	Receiver Non-Inverted Data Output	
53	Rx7n	Receiver Inverted Data Output	
54	GND	Ground	1
55	Rx5p	Receiver Non-Inverted Data Output	
56	Rx5n	Receiver Inverted Data Output	
57	GND	Ground	1
58	GND	Ground	1
59	Rx6n	Receiver Inverted Data Output	
60	Rx6p	Receiver Non-Inverted Data Output	
61	GND	Ground	1
62	Rx8n	Receiver Inverted Data Output	
63	Rx8p	Receiver Non-Inverted Data Output	
64	GND	Ground	1
65	NC	No Connect	3
66	Reserved	For future use	3
67	VccTx1	3.3V Power Supply	2
68	Vcc2	3.3V Power Supply	2
69	Reserved	For Future Use	3
70	GND	Ground	1
71	Tx7p	Transmitter Non-Inverted Data Input	

72	Tx7n	Transmitter Inverted Data Input	
73	GND	Ground	1
74	Tx5p	Transmitter Non-Inverted Data Input	
75	Tx5n	Transmitter Inverted Data Input	
76	GND	Ground	1

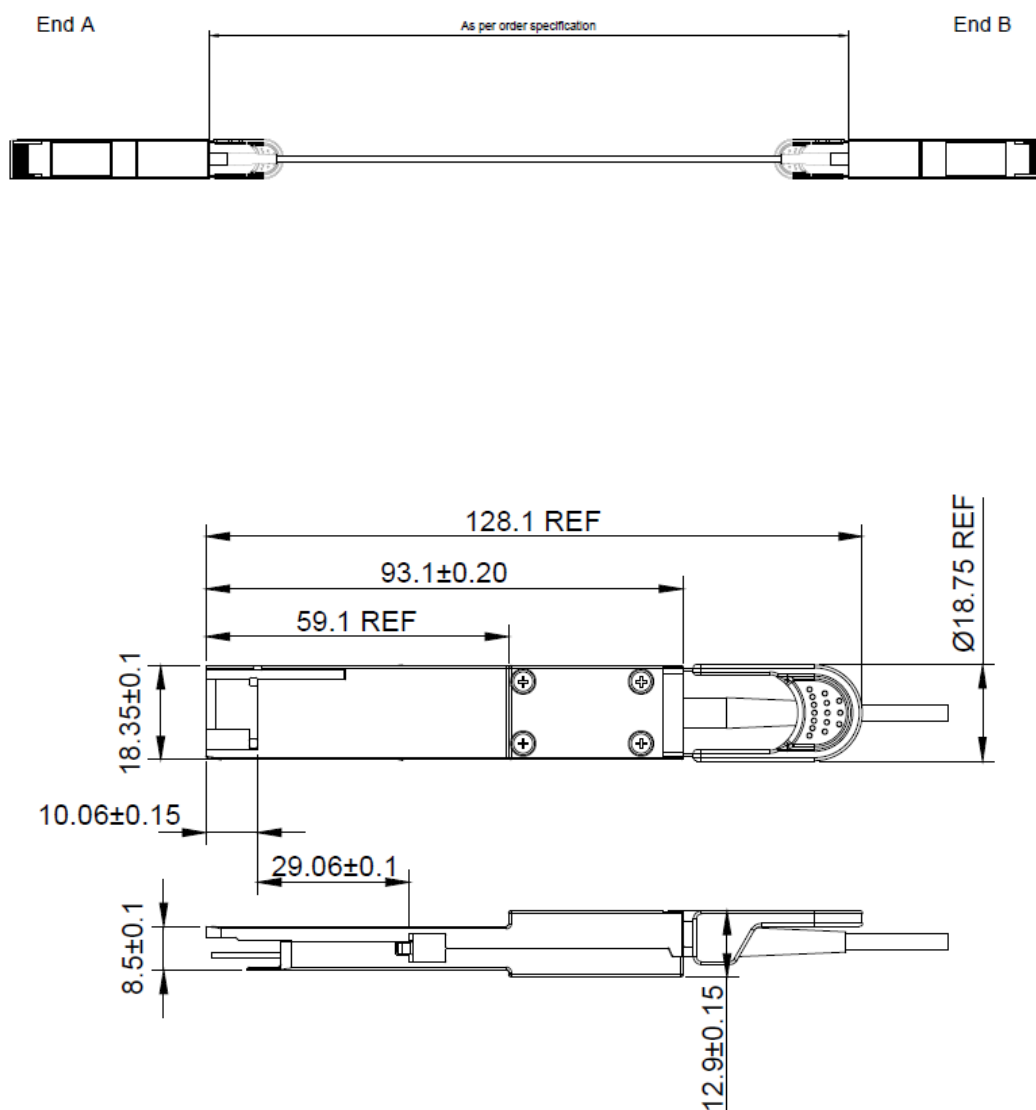
Note:

1. QSFP-DD uses common ground (GND) for all signals and supply (power). All are common within the QSFP-DD 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. VccRx, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 shall be applied concurrently. Requirements defined for the host side of the Host Card Edge Connector are listed in Table 4. VccRx, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 may be internally connected within the module in any combination. The connector Vcc pins are each rated for a maximum current of 1000 mA.
3. All Vendor Specific, Reserved and No Connect pins may be terminated with 50ohms to grounds on the host. Pad 65 (No connect) shall be left unconnected within the module. Vendor specific and Reserved pads shall have an impedance to GND that is greater than 10k ohms and less than 100 pF.

Memory Map



Mechanical Design Diagram



Unit: mm

Order Information

Model Name	Module Type	Length
AEA-PB1CA4	200G QSFP-DD Active Optical Cable (OM3)	1m
AEA-PB3CA4	200G QSFP-DD Active Optical Cable (OM3)	3m
AEA-PB5CA4	200G QSFP-DD Active Optical Cable (OM3)	5m
AEA-PB7CA4	200G QSFP-DD Active Optical Cable (OM3)	7m
AEA-PBACA4	200G QSFP-DD Active Optical Cable (OM3)	10m
AEA-PBCCA4	200G QSFP-DD Active Optical Cable (OM3)	20m

Note:

Cable length can be customized upon customer's request.