

TITLE QSFP28 100G(25Gx4) AOC (Active Optical cable)	DOC No.	DTRX-170013
	REVISION : 02	AUTHORIZED BY : Mike Sun
	DATE : 2020.08.05	CLASSIFICATION : CONFIDENTIAL

1. Purpose

This document validates solely for the product of Jess Link, QSFP28 100Gbps Active Optical Cable (AOC), with its basic information and electronic characteristics. With continuous performance improvement purpose, the document might subject to change without notice.

2. General Description

JPC's Quad Small Form-Factor Pluggable Plus (QSFP28) active optical cables (AOC) are high- performance active optical cable with bi-directional signal transmission and aggregate 100-Gbps bandwidth for both InfiniBand EDR and Ethernet 100GBASE-SR applications. Compared to conventional copper cables, longer and lighter optical cables enable the ease of complicated data-center cablings. The AOCs utilize Multimode fiber with 850nm VCSELs and PIN PDs. The certificated cables have superior signal integrity and bit-error-rate, which enables reliable operation performance.

3. Feature

- 4-channel bi-directional AOC with aggregate bandwidth of 100Gbps (25Gbps x 4ch)
- Compliant with SFF-8636 Rev 2.7
- Supports 100-Gbps aggregate data-rate links up to 100 m by using OM4 MMF.
- Low power consumption of max 2W
- Full Digital Diagnostics Monitor Interface
- Hot pluggable electrical interface
- 0 to 70°C case temperature operating range
- RoHS Compliance and Lead-Free

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4. Applications

- 100GBASE-SR4 Ethernet
- Datacom/Telecom switch & router connections
- Data Aggregation and Backplane Application
- Infiniband transmission at 4ch QDR,FDR and EDR

5. Modification History

Rev.	Comments	Date	Originator	Approval
01	Preliminary Draft	26/02/2018	Mike Sun	Ray Yang
02	Add Length 0.3m P/N	2020.08.05	Mike Sun	Ray Yang

6. Absolute Maximum Rating

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

Parameter	Min	Max	Unit
Storage Temperature	-40	85	°C
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	%

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7. Recommended Operating Conditions

Parameter	Min	Typical	Max	Unit	Note
Case Operating Temperature	0	40	85	°C	
Power Supply Voltage	3.135	3.3	3.465	V	
			600	mA	
Data Rate		103.125		Gbps	
Bit Error Ratio (BER)		10 ⁻¹²			
Standard Cable Lengths	1, 3, 5, 10, 20, 30, 50,60, 70,80,100			m	

8. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Transmitter electrical specifications (per Lane)					
Differential Data Input Voltage Peak to Peak Swing	V _{in,pp}			900	mV
Differential Input Impedance	Z _{ind}	90	100	110	ohm
Common Mode Noise RMS				17.5	mV
Differential input return loss	SDD22	Per OIF CEI-28G-VSR and CAUI-4 requirements			dB
Common Mode to Differential conversion and Differential to Common Mode Conversion	SDC22, SCD22				dB
Common Mode Return Loss	SCC22				dB
Transition Time, 20 to 80%	T _r , T _f	10			ps
Common Mode Voltage	V _{cm}	-0.3		2.8	V
Eye Width at 1E-15 probability	EW15	0.46			UI
Eye Height at 1E-15 probability	EH15	94			mv
Receiver electrical specifications (per Lane)					
Differential Data Output Voltage Peak to Peak Swing	V _{opp}	300		900	mV
Differential output Impedance	Z _{os}	90	100	110	Ohms

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Common Mode Voltage	Vcm	-0.35		2.85	V
Common Mode Noise RMS				17.5	mv
Differential output return loss	SDD22	Per OIF CEI-28G-VSR and CAUI-4 requirements			dB
Common Mode to Differential conversion and Differential to Common Mode Conversion	SDC22, SCD22				dB
Common Mode Return Loss	SCC22			-2	dB
Transition Time, 20 to 80%	Tr, Tf	10			ps
Vertical Eye Closure	VEC			5.5	dB
Eye Width at 1E-15 probability	EW15	0.57			UI

Control and Status I/O Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Initialization time	t_init			2000	ms
Reset Init Assert Time	t_reset_init			2	us
Serial Bus Hardware Ready Time	t_serial			2000	ms
Reset Assert Time	t_reset			2000	ms
LPMODE Assert Time	ton_LPMODE			100	us
LPMODE Deassert Time	Toff_LPMODE			300	ms
IntL Assert Time	ton_IntL			200	ms
IntL Deassert Time	toff_IntL			500	us
Rx LOS Assert Time	ton_los			100	ms
Tx Fault Assert Time	ton_Txfault			200	ms
Flag Assert Time	ton_flag			200	ms
Mask Assert Time	ton_mask			100	ms
Mask Deassert Time	toff_mask			100	ms
Power_override or Power_set Assert Time	ton_Pdown			100	ms
Power_override or Power_set Deassert Time	toff_Pdown			300	ms
Two wire Serial Interface Clock Rate			100	400	KHz
Power Supply Noise				50	mVpp

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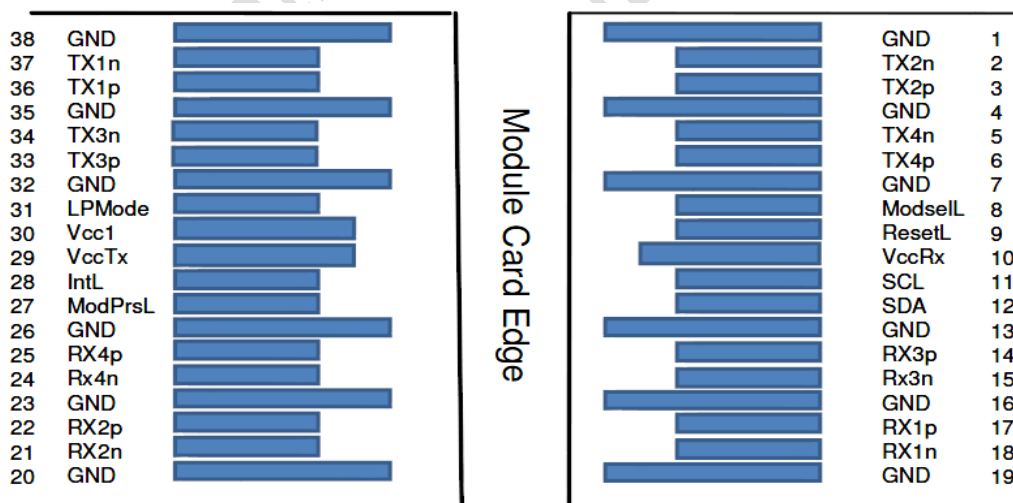
9. Optical Cable Specification

Parameter	Specification	Notes
Minimum Cable Bending Radius	30 mm	.
Cable Cross-Section Dimension	Round Cable with 3 mm in Diameter	
Cable Cover Type	LSZH or OFNR	1
Standard Cable Length	1, 3, 5, 10, 20, 30, 50,60, 70,80,100-m	2
Cable Length Tolerance	+100/-0 cm	

Notes:

1. Cable jacket type standard is LSZH. Other types can be available upon request.
2. Different cable length may be recommended to adopt different multi-mode fiber (MMF) grades of OM3, or OM4.

10. QSFP+ Module Pad Assignments and Descriptions



Top Side
Viewed From Top

Bottom Side
Viewed From Bottom

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QSFP28-compliant 38-pin connector (per SFF-8679)

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	LVTTTL-I	ModSelL	Module Select	3	
9	LVTTTL-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	LVTTTL-O	ModPrsL	Module Present	3	

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28	LVTTTL-O	IntL	Interrupt	3	
29		Vcc Tx	+3.3V Power supply transmitter	2	2
30		Vcc1	+3.3V Power supply	2	2
31	LVTTTL-I	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 QSFP28 module. All are common within the QSFP28 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. Requirements defined for the host side of the Host Edge Card Connector are listed in Table 6. Recommended host board power supply filtering is shown in the bottom Figure. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP28 module in any combination. The connector pins are each rated for a maximum current of 500 mA.

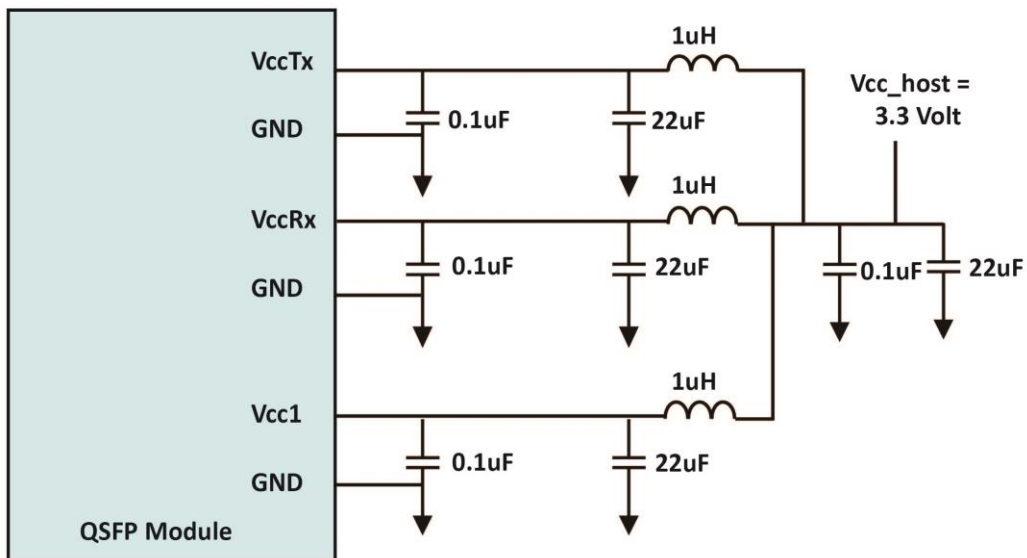
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11. EEPROM Information

Addr	Field Size	Name of Field	Hex	Description
	(Bytes)			
128	1	Identifier	11	
129	1	Ext. Identifier	8C	
130	1	Connector	0C	
131-138	8	Specification compliance	01,00,00,00,00,00,02,02	
139	1	Encoding	07	
140	1	BR, nominal	FF	100Gb/s
141	1	Rate Identifier	00	
142	1	Length(SMF)	00	
143	1	Length(OM3 50 um)	23	
144	1	Length(OM2 50 um)	00	
145	1	Length(OM1 62.5 um)	00	
146	1	Length (Copper)	01	
147	1	Device tech	00	
148-163	16	Vendor name	4A,45,53,53,2D,4C,49,4E 4B,20,20,20,20,20,20,20	"JESS-LINK" Vendor Name(ASCII)
164	1	Reserved	00	
165-167	3	Vendor OUI	00,18,97	OUI
168-183	16	Vendor PN	50,34,35,30,30,46,43,30 30,30,31,4D,2D,31,20,20	Part No.(ASCII)
184-185	2	Vendor rev	Variable	

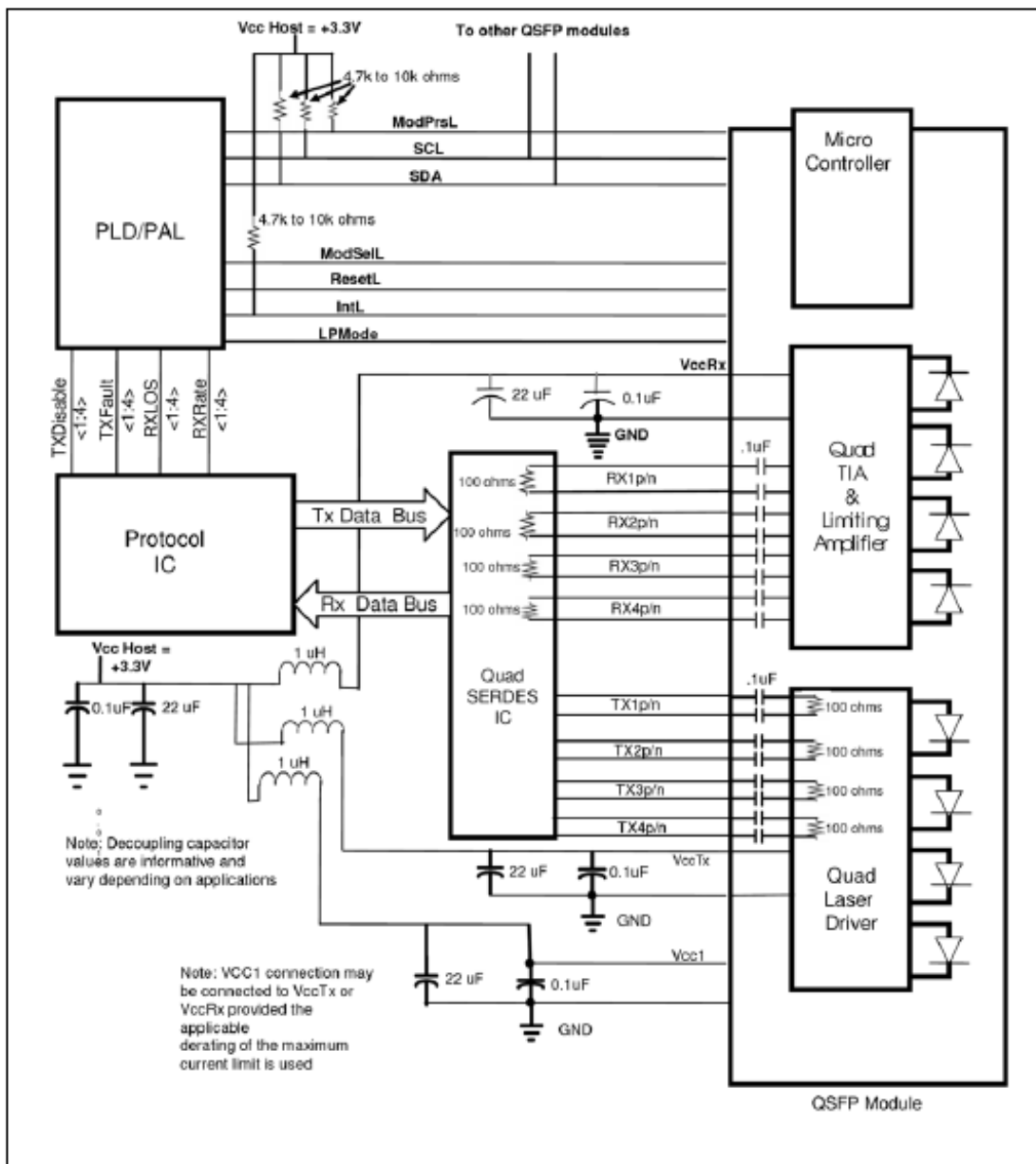
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12. Recommended Host Board Power Supply Circuit



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13. Recommended Interface Circuit



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14. Memory Map

The memory map is structured as a single address and multiple page approaches, according to the QSFP28 SFF-8636 MSA specification as shown in the below. For more detailed description of this memory map or lower pages, please see our Memory Map document with flexible customization settings. 2-Wire Serial Address: 1010000x (A0H)

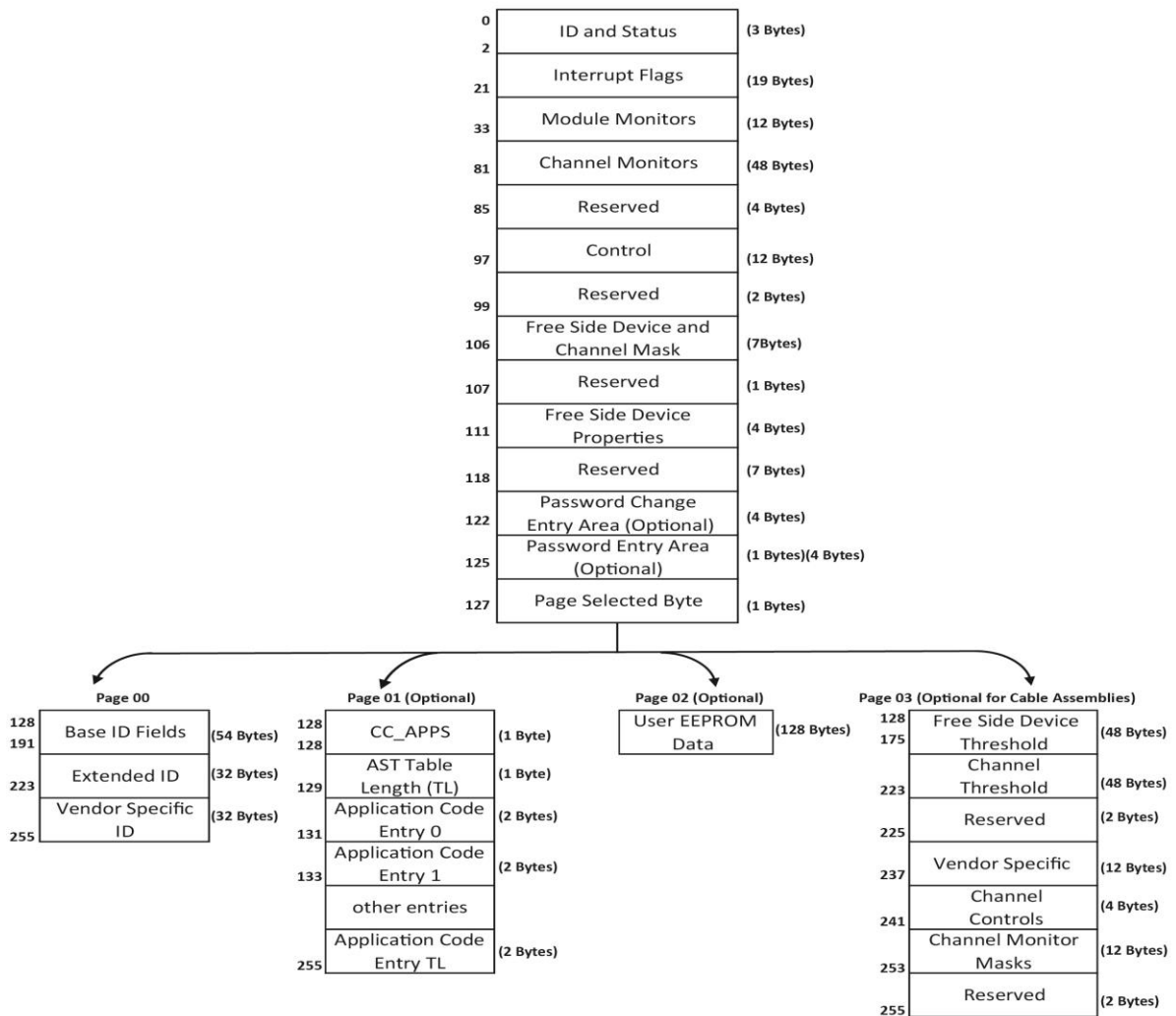


Figure 30 - QSFP+ Memory Map

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15. Part Number and Description

Part Number	Description
P4500FC0S020-1	JPC 100G active fiber cable, QSFP28, OM3, 0.2m
P4500FC0001M-1	JPC 100G active fiber cable, QSFP28, OM3, 1m
P4500FC0003M-1	JPC 100G active fiber cable, QSFP28, OM3, 3m
P4500FC0005M-1	JPC 100G active fiber cable, QSFP28, OM3, 5m
P4500FC0007M-1	JPC 100G active fiber cable, QSFP28, OM3, 7m
P4500FC0010M-1	JPC 100G active fiber cable, QSFP28, OM3, 10m
P4500FC0015M-1	JPC 100G active fiber cable, QSFP28, OM3, 15m
P4500FC0020M-1	JPC 100G active fiber cable, QSFP28, OM3, 20m
P4500FC0025M-1	JPC 100G active fiber cable, QSFP28, OM3, 25m
P4500FC0030M-1	JPC 100G active fiber cable, QSFP28, OM3, 30m
P4500FC0050M-1	JPC 100G active fiber cable, QSFP28, OM3, 50m
P4500FH0075M-1	JPC 100G active fiber cable, QSFP28, OM4, 75m
P4500FH0100M-1	JPC 100G active fiber cable, QSFP28, OM4, 100m