TITLE	DOC No. DSPC-002215	
SFF-8644 MINI SAS HD AOC (Active Optical Cable)	REVISION：02	AUTHORIZED BY：Mike Sun
	DATE：2022.08.25	CLASSIFICATION：CONFIDENTIAL

1. Purpose

This document validates solely for the product of Jess Link, MINI SAS HD 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 Mini SAS HD active optical cables (AOC) are high- performance active optical cable with bi-directional signal transmission for both SAS 2.1(6G/s) and SAS 3.0(12G/s) 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 48-Gbps
- Compliant to SAS 2.1 and SAS 3.0 Specification.
- Supports 12-Gbps aggregate data-rate links up to 100 m
- Low power consumption of max 1.5 W (0.75w per end)
- Hot pluggable electrical interface
- 0 to 70°C case temperature operating range
- Flexible PCB connections
- 0^{o}C to 70^{o}C operation range
- RoHS Complianc

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4. Applications

- SAS 3.0 12G Application
- External Storage Connections

5. Revision History

Rev.	Comments	Date	Originator	Approval
01	Preliminary Draft	2019.10.1	Albert Lin	Mike Sun
02	Modify PN	2022.08.25	Albert Lin	Mike Sun

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	-10	70	℃
Power Supply Voltage	-0.5	3.6	V
Data Input Voltage- Single Ended	-0.5		Vcc+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	70	℃	
Power Supply Voltage	3.135	3.3	3.465	V	
Date Rate per Channel			12	Gbps	1
Power Supply Noise Ripple Susceptibility (PSNR)			50	mV	2
Bit Error Ratio		10^{-12}			3
Control Input Voltage High					
Control Input Voltage Low					
Two Wire Serial (TWS) Interface Clock Rate			400	kHz	
Differential Data Input / Output Load		100		Ohms	
Standard Cable Lengths	3		100	m	4

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 2^{31}-1 pattern.
   Longer cable length (up to 100-m) is available upon customer request

8. Electrical Characteristics

Parameter	Min	Typical	Max	Unit	Note
Transceiver					
Transceiver Power Consumption	-	-	0.75	W	
Transceiver Power Supply Current			227	mA	
Transmitter					
Data Input Differential Peak-to-Peak Voltage	200	-	1200	mV_{PP}	

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Swing					
Receiver					
Data Output Differential Peak-to-Peak Voltage Swing	200	-	900	mVpp	1
Output Transition Time 20% to 80%	28			ps	
Output Total Jitter			62	ps	
Eye Mask Coordinates: X1, X2; Y1, Y2.	Specification Value 0.29, 0.5; 150, 425.			UI; mV	2

Notes:

1. AC-Coupled with 100Ω differential output impedance.
2. Hit ratio= 5 × 10-5 per sample.

9. General Cable Characteristics

Parameter	Specification	Notes
Minimum Cable Bending Radius	45 mm	
Cable Cross-Section Dimension	Round Type Cable with OD 3.0mm	
Cable Cover Type	OFNR	1
Standard Cable Length	3, 6, 20, up to 100-m	2
Cable Length Tolerance	Depends on product's length	
Plug Insertion Force	70N Maximum	
Plug Extraction Force	40N Maximum	
Plug Retention Force	35N Maximum	
Minimum Cable Bending Radius	45 mm	

Notes:

1. Cable jacket type standard is OFNR. 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

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10. Module Pin Definitions:

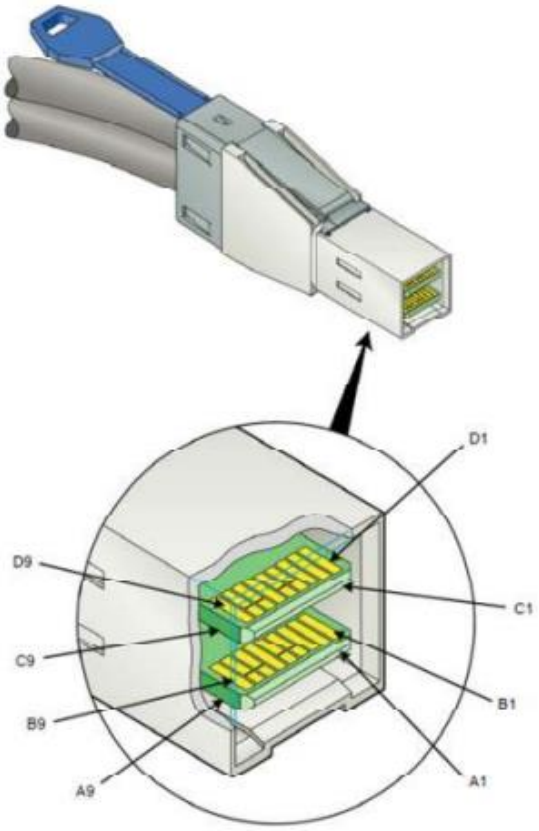

Table 1: Pin Function Definition for upper PCB

Pin	Logic	Symbol	Mating level	Description
D1		Vact	Second	+3.3V Power Supply (Transmitter)
D2		Vman	Second	Power Supply Management Interface
D3		GND	First	Ground
D4	CML-I	TX0+	Third	Transmitter Non-Inverted Data Input, AC coupled
D5	CML-I	TX0-	Third	Transmitter Inverted Data Input, AC coupled
D6		GND	First	Ground
D7	CML-I	TX2+	Third	Transmitter Non-Inverted Data Input, AC

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				coupled
D8	CML-I	TX2-	Third	Transmitter Inverted Data Input, AC coupled
D9		GND	First	Ground
C1	I/O"	SCL	Second	2-wire serial interface clock, place 4.7kΩ -10kΩ Pull up Resistor to Vman on Host board
C2	I/O"	SDA	Second	2-wire serial interface data, place 4.7kΩ -10kΩ Pull up Resistor to Vman on Host board
C3		GND	First	Ground
C4	CML-I	TX1+	Third	Transmitter Non-Inverted Data Input, AC coupled
C5	CML-I	TX1-	Third	Transmitter Inverted Data Input, AC coupled
C6		GND	First	Ground
C7	CML-I	TX3+	Third	Transmitter Non-Inverted Data Input, AC coupled
C8	CML-I	TX3-	Third	Transmitter Inverted Data Input, AC coupled
C9		GND	First	Ground

Pin	Logic	Symbol	Mating level	Description
B1		Vact	Second	+3.3V Power Supply (Receiver)
B2	LVTTL-O	ModPrsL	Second	Module Present, place 4.7kΩ - 10kΩ Pull up Resistor to Vman on Host board
B3		GND	First	Ground
B4	CML-0	RX0+	Third	Receiver Non-Inverted Data Output, AC coupled
B5	CML-0	RX0-	Third	Receiver Inverted Data Output, AC coupled
B6		GND	First	Ground
B7	CML-0	RX2+	Third	Receiver Non-Inverted Data Output, AC coupled
B8	CML-0	RX2-	Third	Receiver Inverted Data Output, AC coupled
B9		GND	First	Ground
A1		Reserved	Second	not connected

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A2	LVTTL-O	IntL	Second	Management interface interrupt signal, place 4.7kΩ - 10kΩ Pull up Resistor to Vman on Host board
A3		GND	First	Ground
A4	CML-0	RX1+	Third	Receiver Non-Inverted Data Output, AC coupled
A5	CML-0	RX1-	Third	Receiver Inverted Data Output, AC coupled
A6		GND	First	Ground
A7	CML-0	RX3+	Third	Receiver Non-Inverted Data Output, AC coupled
A8	CML-0	RX3-	Third	Receiver Inverted Data Output, AC coupled
A9		GND	First	Ground

11. Product description &P/N List

Part Number	Description
P5388FC3002M-1	Mini SAS HD 4X AOC 2m OM3
P5388FC3003M-1	Mini SAS HD 4X AOC 3m OM3
P5388FC3004M-1	Mini SAS HD 4X AOC 4m OM3
P5388FC3006M-1	Mini SAS HD 4X AOC 6m OM3
P5388FC3020M-1	Mini SAS HD 4X AOC 20m OM3