Data Sheet

400-Gbps OSFP Active Optical Cable(400G OSFP AOC)
P/N: WS-OS4-AOCxCxxx

Features:

- Hot Pluggable OSFP cable end
- Supports 425Gb/s aggregate bit
- Power Dissipation, Typ. 10.0W
- Operating Case Temperature: 0℃~70℃
- 8x50G PAM4 VCSEL/PIN photo detector
- Compliant to OSFP MSA Rev 3.0
- CMIS4.0: Management Interface
- SFF-8679: General Electrical
- IEEE 802.3cd: Physical Layer Specifications and Management Parameters
- ROHS-6: Environment Safety
- TAA Compliance

Applications:

- Ethernet for 400GBASE-SR8
- HPC Interconnects
- Proprietary InterconnectionS

Absolute Maximum Ratings

Exceeding the limits below may damage the active optical cable permanently.

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note.
Maximum Supply Voltage	V_{cc}	-0.5		3.6	V	
Storage Temperature	T_{sto}	-40		85	℃	
Case Operating Temperature	T_{op}	0		70	℃	
Relative Humidity	RH	0		85	%	1

Notes:

1. No-condensing.

PARAMETERS

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
Supply Voltage	V_{cc}	3.14		3.46	V	
Power Consumption	P_{Con}		10	12	W	
Bit Rate	BR		26.5625		Gbd	1
Bit Error Ratio	BER	10^{-6}				2
Center wavelength	λ_c	840		860	nm	3
Number of Lanes		8				
Management Interface		Serial, I2C-based, maximum frequency 400 kHz				4
Logic Input Voltage High	V_{ih}	2		Vcc+0.3	V	
Logic Input Voltage Low	V_{il}	-0.3		0.8	V	

Notes:

1. Single lane
2. PRBS13Q test pattern is used.
3. As defined by IEEE Std. 802.3cd™ /D2.1
4. As defined by CMIS4.0

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
Transceiver Power Supply Current	I_{cc}		3000		mA	
Transceiver Power On Initialization Time	T_{init}			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	ESMW		0.22		UI	
Eye height, differential	EH	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%)	Tr, Tf	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%)	Tr, Tf	10			ps	
DC common mode voltage		-350		2850	mV	

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

where

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

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

where

f is the frequency in GHz,

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

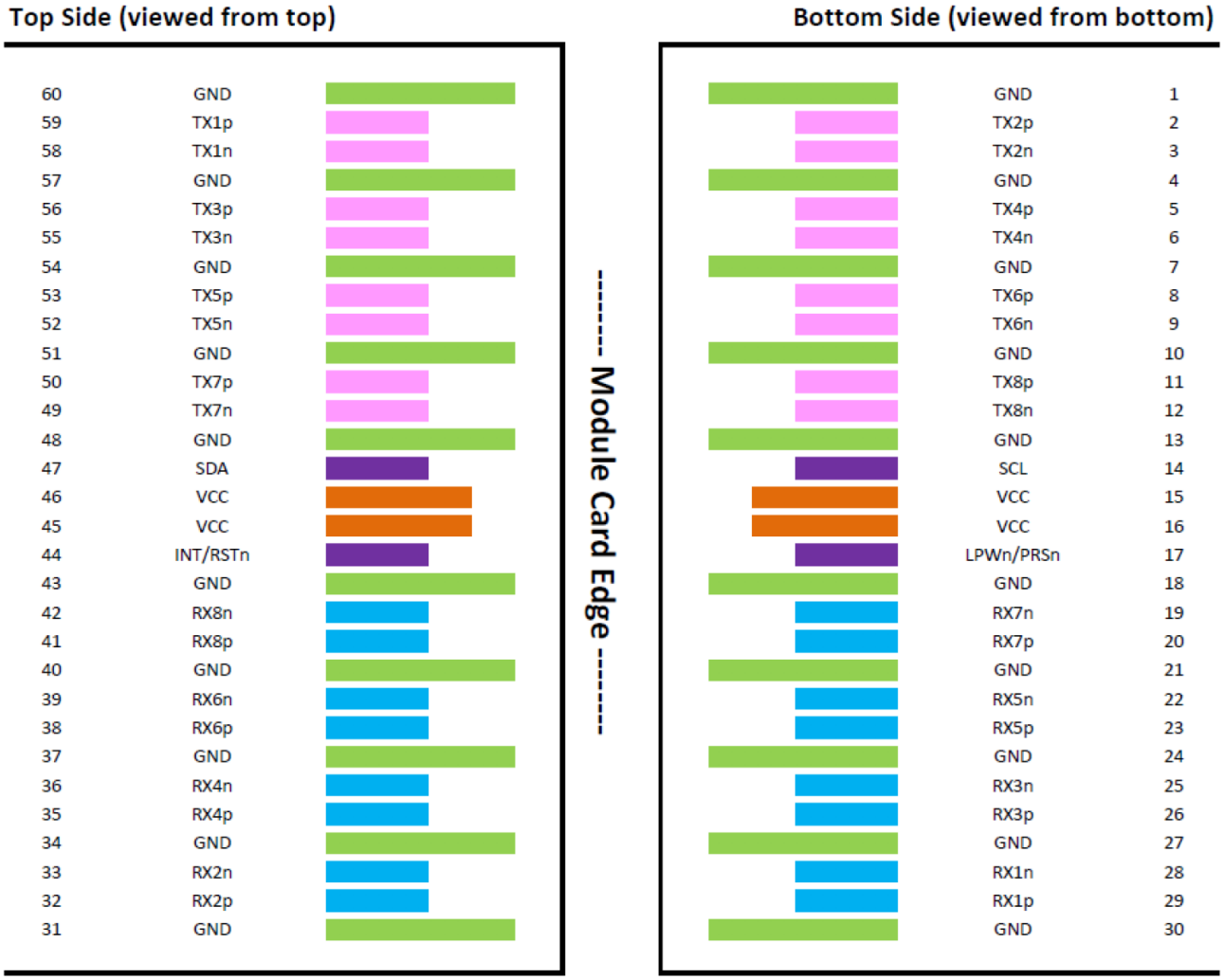
GENERAL PRODUCT CHARACTERISTICS

Parameter	Value	Unit	Comments
Module Form Factor	OSFP	As defined by OSFP Rev 3.0	Module Form Factor
Number of Lanes	8 TX and 8 RX		
Maximum Aggregate Data Rate	425	Gb/s	
Standard Cable Lengths	1, 2, 3, 5, 7, 10, 15, 20	meters	Other lengths may be available upon request
Protocols Supported	Ethernet		
Electrical Interface and Pin-out	60-pin edge connector		Pin-out as defined by OSFP Rev3.0
Management Interface	Serial, I2C-based, 400 kHz maximum frequency		As defined by CMIS4.0

The force specification for AOC is in the list below:

Parameter	Min.	Max.	Unit.	Comments.
OSFP Module Insertion		40	Newton	
OSFP Module Extraction		30	Newton	
OSFP Module Retention	125		Newton	
Insertion and removal cycles	50		Cycle	
Cable outer Diameter	2.9	3.0	mm	

Pin Assignment



PIN DESCRIPTIONS (compliant OSFP Rev. 2.0)

PIN	Symbol	Description	Plug Sequence
1	GND	Ground	1
2	TX2p	Transmitter Data Non-Inverted	3
3	TX2n	Transmitter Data Inverted	3
4	GND	Ground	1
5	TX4p	Transmitter Data Non-Inverted	3
6	TX4n	Transmitter Data Inverted	3

7	GND	Ground	1
8	TX6p	Transmitter Data Non-Inverted	3
9	TX6n	Transmitter Data Inverted	3
10	GND	Ground	1
11	TX8p	Transmitter Data Non-Inverted	3
12	TX8n	Transmitter Data Inverted	3
13	GND	Ground	1
14	SCL	2-wire Serial interface clock	3
15	VCC	+3.3V Power supply	2
16	VCC	+3.3V Power supply	2
17	LPWn/PRSn	Low-Power Mode / Module Present	3
18	GND	Ground	1
19	RX7n	Receiver Data Inverted	3
20	RX7p	Receiver Data Non-Inverted	3
21	GND	Ground	1
22	RX5n	Receiver Data Inverted	3
23	RX5p	Receiver Data Non-Inverted	3
24	GND	Ground	1
25	RX3n	Receiver Data Inverted	3
26	RX3p	Receiver Data Non-Inverted	3
27	GND	Ground	1
28	RX1n	Receiver Data Inverted	3
29	RX1p	Receiver Data Non-Inverted	3
30	GND	Ground	1
31	GND	Ground	1
32	RX2n	Receiver Data Inverted	3

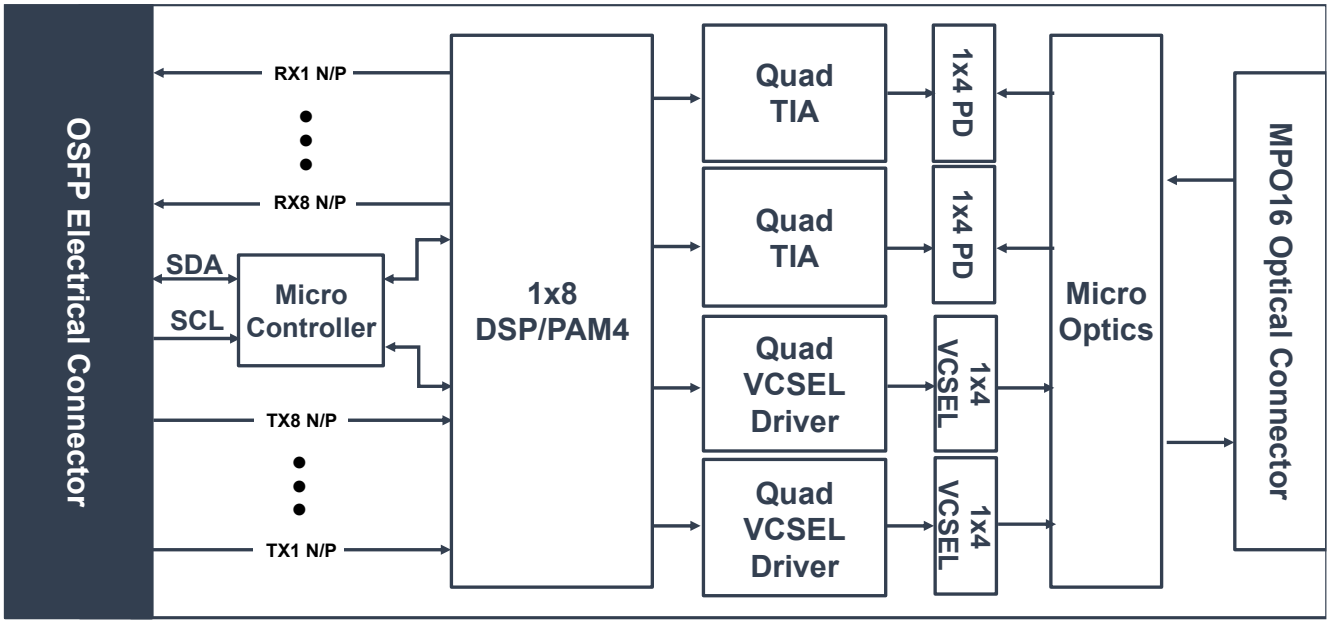
33	RX2p	Receiver Data Non-Inverted	3
34	GND	Ground	1
35	RX4n	Receiver Data Inverted	3
36	RX4p	Receiver Data Non-Inverted	3
37	GND	Ground	1
38	RX6n	Receiver Data Inverted	3

PIN	Symbol	Description	Plug Sequence
39	RX6p	Receiver Data Non-Inverted	3
40	GND	Ground	1
41	RX8n	Receiver Data Inverted	3
42	RX8p	Receiver Data Non-Inverted	3
43	GND	Ground	1
44	INT/RSTn	Module Interrupt / Module Reset	3
45	VCC	+3.3V Power supply	2
46	VCC	+3.3V Power supply	2
47	SDA	2-wire Serial interface data	3
48	GND	Ground	1
49	TX7p	Transmitter Data Non-Inverted	3
50	TX7n	Transmitter Data Inverted	3
51	GND	Ground	1
52	TX5p	Transmitter Data Non-Inverted	3
53	TX5n	Transmitter Data Inverted	3
54	GND	Ground	1
55	TX3p	Transmitter Data Non-Inverted	3
56	TX3n	Transmitter Data Inverted	3
57	GND	Ground	1
58	TX1p	Transmitter Data Non-Inverted	3
59	TX1n	Transmitter Data Inverted	3

60	GND	Ground	1

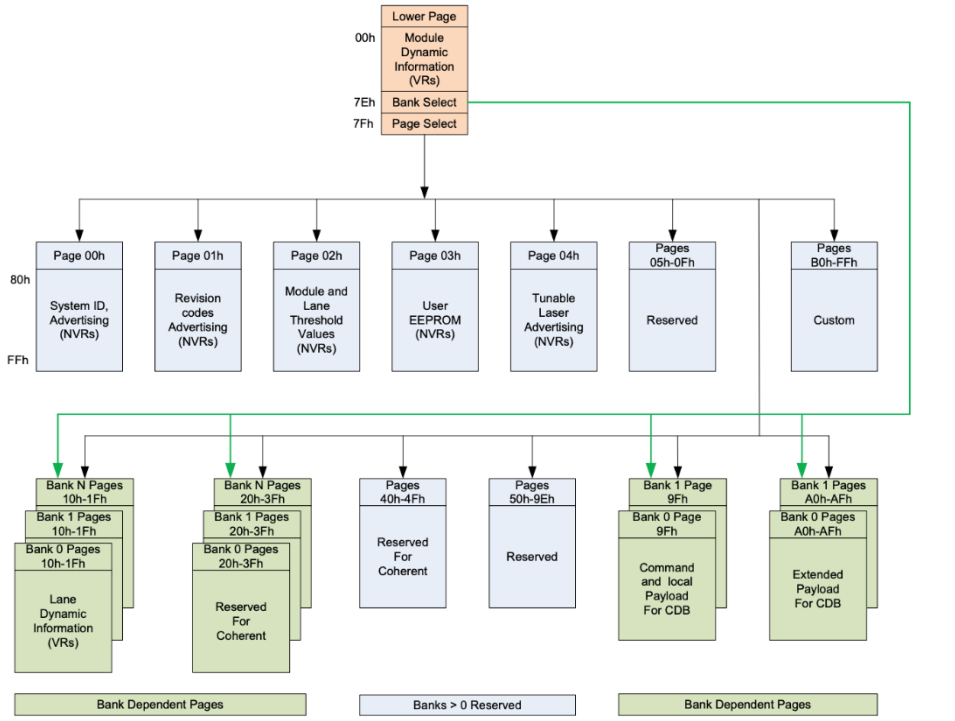
Name	Direction	Description
TX[8:1]p	input	Transmit differential pairs from host to module.
TX[8:1]n	input	
RX[8:1]p	output	Receiver differential pairs from module to host.
RX[8:1]n	output	
SCL	bidir	2-wire serial clock signal. Requires pull-up resistor to 3.3V on host.
SDA	bidir	2-wire serial data signal. Requires pull-up resistor to 3.3V on host.
LPWn/PRSn	bidir	Multi-level signal for low power control from host to module and module presence indication from module to host. This signal requires the circuit as described in Section 10.5.3
INT/RSTn	bidir	Multi-level signal for interrupt request from module to host and reset control from host to module. This signal requires the circuit as described in Section 10.5.2
VCC	power	3.3V power for module.
GND	ground	Module Ground. Logic and power return path.

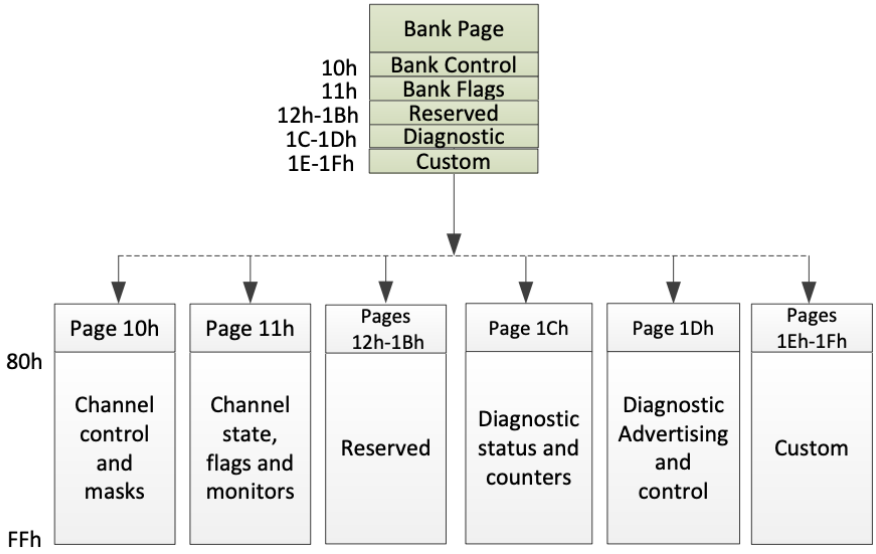
Recommended Host - Transceiver Interface Block Diagram



Recommended Typical Application Circuit

Memory map

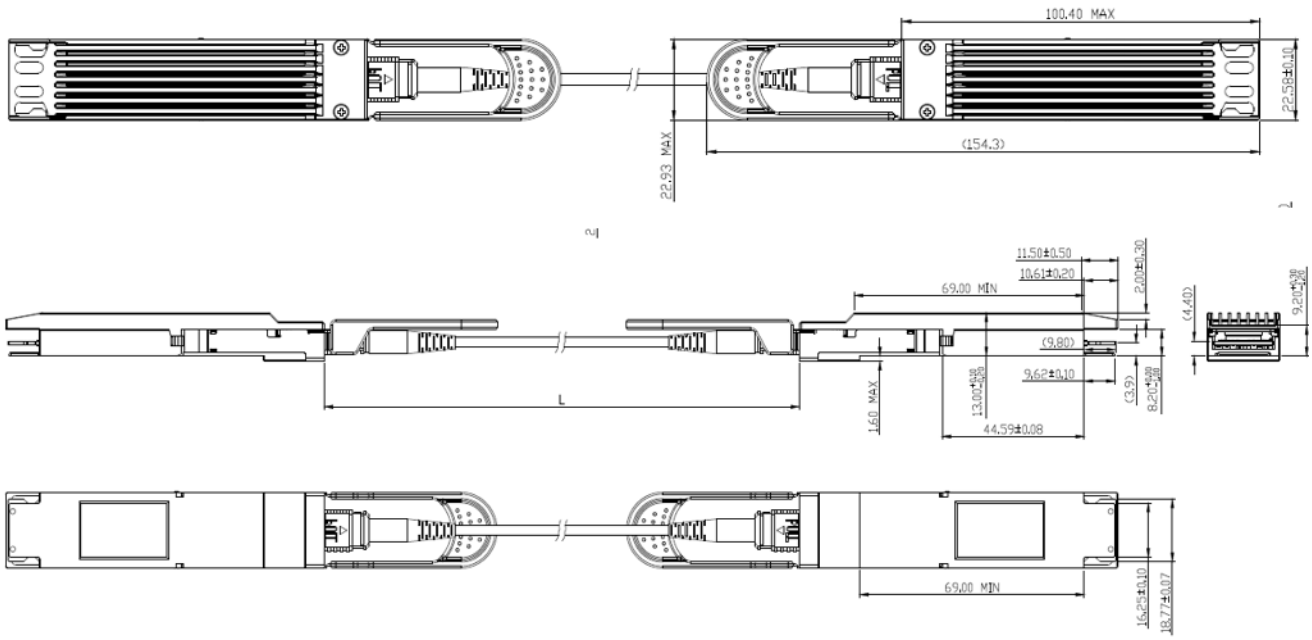




Mechanical Drawing

Product shall be of design, construction and physical dimensions specified on applicable

product drawing.



Unit: mm

Ordering Information

Part No	Specification							
	Package	Data rate	Laser	Fiber	Cable Type	Cable Length	Temp.	Application
WS-OS4-AOCxCx13	OSFP	26.5625 GBd	850nm	OM3	Ribbon OFNP OFNR,and LSZH	1m	0~70°C	400G Ethernet
WS-OS4-AOCxCx23	OSFP	26.5625 GBd	850nm	OM3	Ribbon OFNP OFNR,and LSZH	2m	0~70°C	400G Ethernet
WS-OS4-AOCxCx33	OSFP	26.5625 GBd	850nm	OM3	Ribbon OFNP OFNR,and LSZH	3m	0~70°C	400G Ethernet
WS-OS4-AOCxCx53	OSFP	26.5625 GBd	850nm	OM3	Ribbon OFNP OFNR,and LSZH	5m	0~70°C	400G Ethernet
WS-OS4-AOCxCx73	OSFP	26.5625 GBd	850nm	OM3	Ribbon OFNP OFNR,and LSZH	7m	0~70°C	400G Ethernet
WS-OS4-AOCxC103	OSFP	26.5625 GBd	850nm	OM3	Ribbon OFNP OFNR,and LSZH	10m	0~70°C	400G Ethernet
WS-OS4-AOCxC153	OSFP	26.5625 GBd	850nm	OM3	Ribbon OFNP OFNR,and LSZH	15m	0~70°C	400G Ethernet
WS-OS4-AOCxC203	OSFP	26.5625 GBd	850nm	OM3	Ribbon OFNP OFNR,and LSZH	20m	0~70°C	400G Ethernet
WS-OS4-AOCxCH04	OSFP	26.5625 GBd	850nm	OM4	Ribbon OFNP OFNR,and LSZH	100m	0~70°C	400G Ethernet

Note:

Cable type: x= P for OFNP, R for OFNR, and L for LSZH

Fiber: OM3 (up to 70m) and OM4 (100m)

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	15-Oct-2020	New Issue	Elma Yueh	Wayne Liao	Wayne Liao

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