

## 200G QSFP56 Active Optical Cables P/N: WS-QS56-AOCxCxxx



### Features:

- Hot Pluggable QSFP Cable End
- Supports 212.5Gb/s aggregate bit rate
- Low Power Dissipation, Typ. 5.0W Each End
- 4x50G PAM4 VCSEL/PIN photo detector
- Operating Case Temperature: 0°C~70°C
- SFF-8636 Management Interface
- SFF-8679: General Electrical
- IEEE 802.3cd: Physical Layer Specifications and Management Parameters
- ROHS-6: Environment Safety

### Applications:

- Ethernet for 200GBASE-SR4

### General Product Characteristics

Parameter	Value	Unit	Comments
Module Form Factor	QSFP	As defined by SFF-8661	Module Form Factor
Number of Lanes	4 TX and 4 RX		
Maximum Aggregate Data Rate	212.5	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	38-pin edge connector		Pin-out as defined by SFF-8679
Typical Power Consumption per End	5	Watts	Varies with output voltage swing and pre-emphasis settings

Management Interface	Serial, I2C-based, 400 kHz maximum frequency		As defined by SFF-8636
----------------------	---	--	------------------------

### Absolute Maximum Ratings

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

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

Notes:

1. No-condensing.

### Parameters

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Ref.
Supply Voltage	$V_{cc}$	3.14		3.46	V	
Power Consumption	$P_{Con}$		5		W	
Bit Rate	BR		26.5625		GBd	1
Bit Error Ratio	BER	$10^{-6}$				2
Center wavelength	$\lambda_c$	840		860	nm	3
Number of Lanes		4				
Management Interface		Serial, I2C-based, maximum frequency 400 kHz				4
Logic Input Voltage High	$V_{ih}$	2		$V_{cc}+0.3$	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 <sup>TM</sup>/D2.1
4. As defined by SFF-8636

**Electrical Characteristics**

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Ref.
Transceiver Power Supply Current	$I_{cc}$		3100		mA	
Transceiver Power on Initialization Time	$T_{init}$			2000	ms	
<b>Transmitter at TP1a</b>						
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%)	$T_r, T_f$	10			ps	
<b>Receiver at TP4</b>						
AC common-mode output voltage (RMS)				17.5	mV	
Differential peak-to-peak output voltage				900	mV	
Near-end ESMW		0.265			UI	
Near-end Eye height, differential		70			mV	
Far-end ESMW		0.2			UI	
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%)	$T_r, T_f$	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

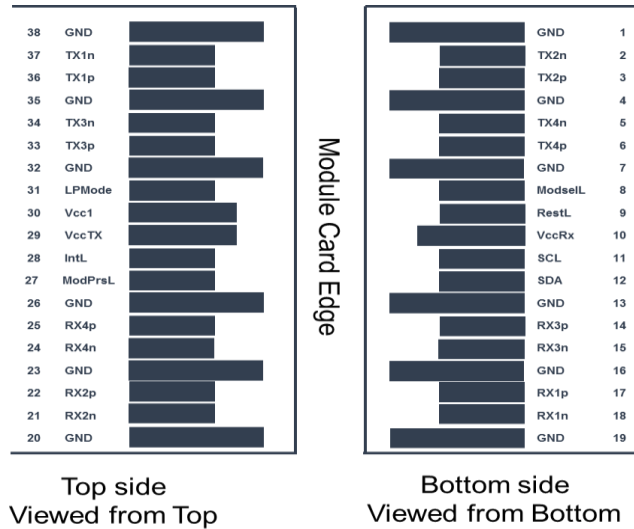
$$2. \quad RLdc(f) \geq \begin{cases} 22 - 20\left(\frac{f}{25.78}\right) & 0.01 \leq f < 12.89 \\ 15 - 6\left(\frac{f}{25.78}\right) & 12.89 \leq f < 19 \end{cases} \quad (\text{dB}) \quad (\text{Eq.2})$$

where

$f$  is the frequency in GHz,

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

**Pin Assignment**



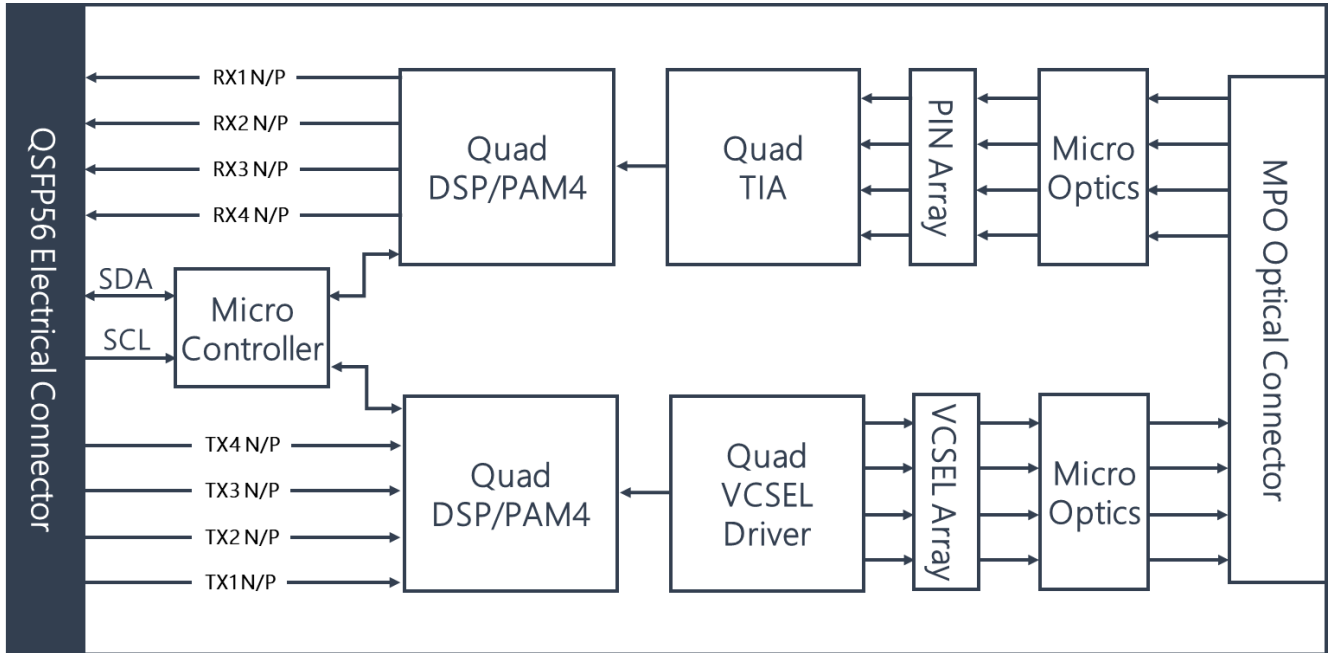
PIN	Symbol	Description	Ref.
1	GND	Ground	
2	TX2n	Transmitter Inverted Data Input	
3	TX2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	TX4n	Transmitter Inverted Data Input	
6	TX4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	2
9	ResetL	Module Reset	2
10	V <sub>cc</sub> RX	+3.3V Receiver Power Supply Receiver	
11	SCL	2-wire Serial Interface Clock	2
12	SDA	2-wire Serial Interface Data	2
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, internal pulled down to GND	
28	IntL	Interrupt output, should be pulled up on host board	
29	Vcc TX	+3.3V Transmitter Power Supply	
30	Vcc1	+3.3V Power Supply	
31	LPMode	Low Power Mode	2
32	GND	Ground	
33	TX3p	Transmitter Non-Inverted Data Input	
34	TX3n	Transmitter Inverted Data Input	
35	GND	Ground	
36	TX1p	Transmitter Non-Inverted Data Input	
37	TX1n	Transmitter Inverted Data Input	
38	GND	Ground	1

## Notes:

1. GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are reference to this potential unless otherwise noted. Module circuit ground is isolated from module chassis ground within the module.
2. Open collector, should be pulled up with 4.7~10K ohms on the host board to a voltage between 3.15V and 3.6V.

### Recommended Host Board Schematic



**Memory map**

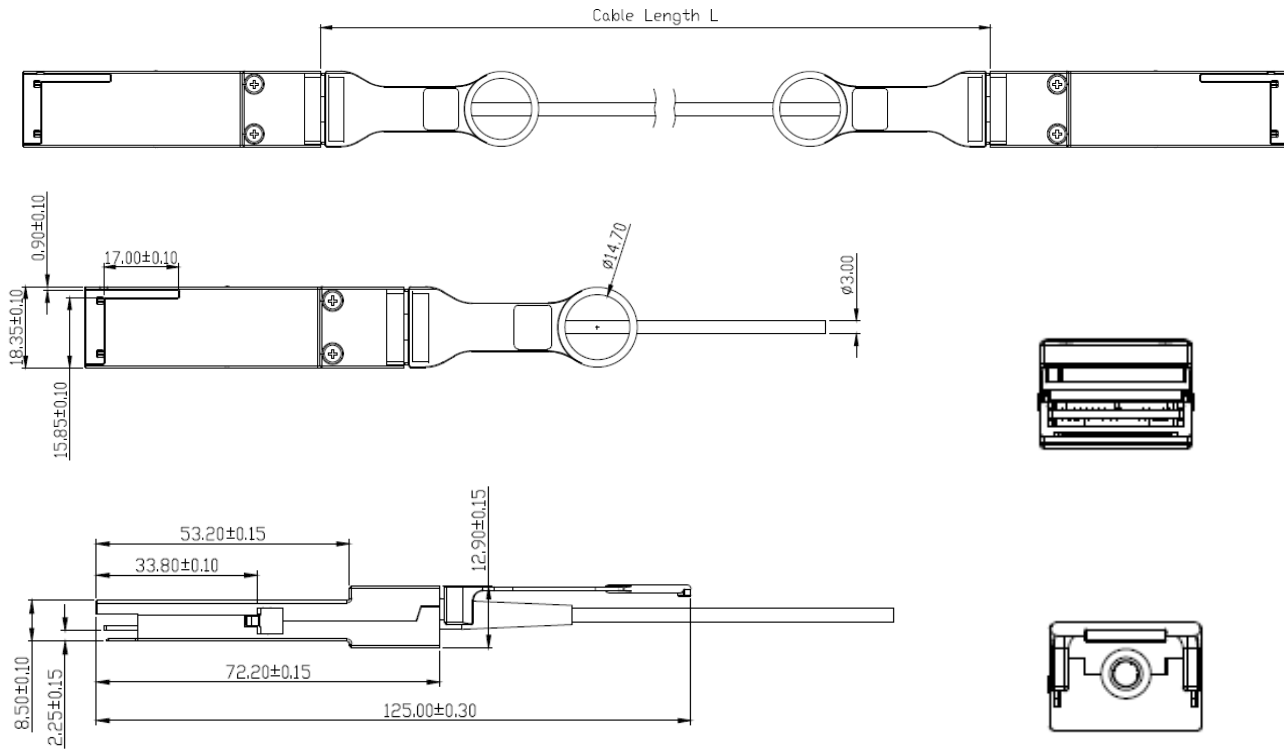
2-Wire Serial Address 1010000x	
Lower Page 00h	
0	Identifier
1 - 2	Status
3 - 2 1	Interrupt Flags
2 2 - 2 3	Free Side Device Monitors
3 4 - 8 1	Channel Monitors
8 2 - 8 5	Reserved
8 6 - 9 8	Control
99	Reserved
100-104	Hardware Interrupt Pin Masks
105-106	Vendor Specific
107	Reserved
108-110	Free Side Device Properties
111-112	Assigned for use by PCI Express
113	Free Side Device Properties
114-118	Reserved
119-122	Password Change Entry Area (Optional)
123-126	Password Entry Area (Optional)
127	Page Select Byte



	Optional Page 01h	Optional Page 02h	Optional Page 03h
Upper Page 00h	128 CC_APPS	128-255 User EEPROM data	128-175 Free Side Device Thresholds
128 Identifier	129 AST Table Length (TL)		
129-191 Base ID Fields	130-131 Application Code Entry 0		
	132-133 Application Code Entry 1		
	134-253 other entries		176-223 Channel Thresholds
	254-255 Application Code Entry TL		224 TX EQ & RX Emphasis Magnitude ID
192-223 Extended ID			225 RX output amplitude indicators
224-255 Vendor Specific ID			226-241 Channel Monitor Masks
			252-255 Reserved



**Mechanical Drawing**



Unit: mm

The force specification for AOC is in the list below:

Parameter	Min.	Max.	Unit.	Comments.
QSFP Module Insertion		40	Newton	
QSFP Module Extraction		30	Newton	
QSFP Module Retention	90		Newton	
Insertion and removal cycles	50		Cycle	
Cable outer Diameter	2.9	3.0	mm	

**Ordering Information**

Part No	Specification							
	Package	Data rate	Laser	Fiber	Cable Type	Cable Length	Temp.	Application
WS-QS56-AOCLC014	QSFP56	50 GB/s per channel	25 GBd VCSEL	OM4	Ribbon LSZH	1m	0~70°C	200GBASE-SR4
WS-QS56-AOCLC034	QSFP56	50 GB/s per channel	25 GBd VCSEL	OM4	Ribbon LSZH	3m	0~70°C	200GBASE-SR4
WS-QS56-AOCLC054	QSFP56	50 GB/s per channel	25 GBd VCSEL	OM4	Ribbon LSZH	5m	0~70°C	200GBASE-SR4
WS-QS56-AOCLC104	QSFP56	50 GB/s per channel	25 GBd VCSEL	OM4	Ribbon LSZH	10m	0~70°C	200GBASE-SR4
WS-QS56-AOCLC154	QSFP56	50 GB/s per channel	25 GBd VCSEL	OM4	Ribbon LSZH	15m	0~70°C	200GBASE-SR4
WS-QS56-AOCLC204	QSFP56	50 GB/s per channel	25 GBd VCSEL	OM4	Ribbon LSZH	20m	0~70°C	200GBASE-SR4
WS-QS56-AOCLCxyy	QSFP56	50 GB/s per channel	25 GBd VCSEL	OMy	Ribbon LSZH	xxm	0~70°C	200GBASE-SR4

- xx = cable length
- y= 4 (OM4) or other fiber type
- Please contact our sales for more information

**Modification History**

Revision	Date	Description	Originator	Review	Approved
V1.0	15-Jun-2020	New Issue	Ivy Chen	Wayne Liao	Wayne Liao



**Taipei Headquarters**  
 16F-5, No. 75, Sec. 1,  
 Xintai 5th Rd., Xizhi  
 Dist., New Taipei City  
 22101, Taiwan  
 Tel: +886-2-2698-7208  
 Fax: +886-2-2698-7210

**U.S. Branch**  
 2080 Rancho Higuera Ct.  
 Fremont, CA 94539,  
 USA  
 Tel: 510-651-7800  
 Fax: 510-651-7822

**ShenZhen Branch**  
 610#, 6F, No.204  
 Building, 2nd Industrial  
 zone Nanyou, Nanshan  
 district, Shenzhen,  
 Guangdong China  
 518054  
 Tel: +86-755-86265980