100G QSFP28 to 4x25G SFP28 Active Optical Cable

AOC-Q4/4S-xxx

Features

- Support 4x25GBASE-SR application
- Compliant to QSFP28 MSA SFF-8636
- and SFP28 MSA SFF-8431 and SF-8472
- Multi rate of up to 25.78125Gbps per lane
- +3.3V single power supply
- Low power consumption
- UL certification cables (optional)
- Operating case temp
- Commercial: 0℃ to +70℃
- RoHS 6/6 compliant

Applications

- 4x25Gbe-SR
- Other optical links

Absolute Maximum Ratings

Table1- Absolute Maximum Ratings

Form Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc3	-0.5		+3.6	V	
Storage Temperature	Ts	-10		+70	°C	
Operating Humidity	TOP	+5		+85	%	1

Note: 1 No condensation

Recommended Operating Conditions

Table 2- Recommended operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	Tc	0	-	+70	℃	
Power Supply Voltage	Vcc	3.14	3.3	3.47	V	
Power Dissipation	Pd	-	-	2.5	W	
Bit Rate	BR	10.3125	25.78125	-	Gbps	

Note: 1 Per terminal

Electrical Characteristics

Table 3- Electrical Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Units	Notes
ModSelL	Module Select	VOL	0	-	0.8	V	
	Module Unselect	VOH	2.5	-	Vcc	V	
Low Power	Mode LPMode	VIL	0	-	0.8	V	
	Normal Operation	VIH	2.5	-	Vcc+0.3	V	
ResetL	Reset	VIL	0	-	0.8	V	
	Normal Operation	VIH	2.5	-	Vcc+0.3	V	
ModPrsL	Normal Operation	VOL	0	-	0.4	V	
IntL	Interrupt	VOL	0	-	0.4	V	
	Normal Operation	VOH	2.4	-	Vcc	V	
Electrical transmitter Characteristics							
Differential Data Input Swing		Vout	200	-	1600	mV	
Input Differential Impedance		ZD	90	100	110	Ω	
Electrical Receiver Characteristics							
Differential Date Output Swing		Vin,p-p	200	-	800	mVpp	
Output Differential Impedance		BER			E-12		1
Input Differential Impedance		ZIN	90	100	110	Ω	

Note: 1 PRBS2^31-1@25.78125Gbps

Table 4- Electrical Characteristics for SFP28

Parameter	Symbol	Min	Typ	Max	Units	Notes
Electrical Transmitter Characteristics						
Differential Data Input Swing	Vin,p-p	200	-	1600	mVpp	
Input Differential Impedance	ZIN	90	100	110	Ω	

Tx_Fault	Normal Operation	VOL	0	-	0.8	V	
	Transmitter Fault	VOH	2.0	-	Vcc	V	
Tx_Disable	Normal Operation	VIL	0	-	0.8	V	
	Laser Disable	VIH	2.0	-	Vcc+0.3	V	
Electrical Receiver Characteristics							
Differential Date Output Swing		Vout	400	-	800	mV	
Bit Error Rate		BER	-	-	E-12	-	
Output Differential Impedance		ZD	90	100	110	Ω	
Rx_LOS	Normal Operation	VOL	0	-	0.8	V	
	Transmitter Fault	VOH	2.0	-	Vcc	V	

Pin arrangement

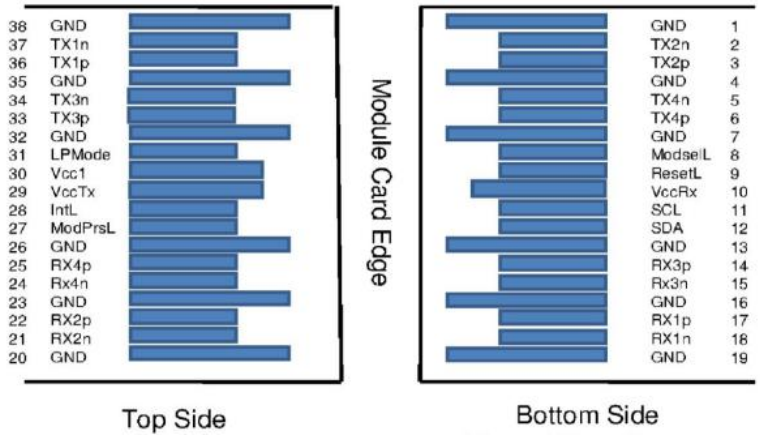


Figure 1, Pin View for QSFP28

Table 5- Pin Function Definitions for QSFP28

Pin	Symbol	Name/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	
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	
30	Vcc1	+3.3V Power supply	
31	LPMode	Low Power Mode	
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

Note: 1. Circuit ground is internally isolated from chassis ground.

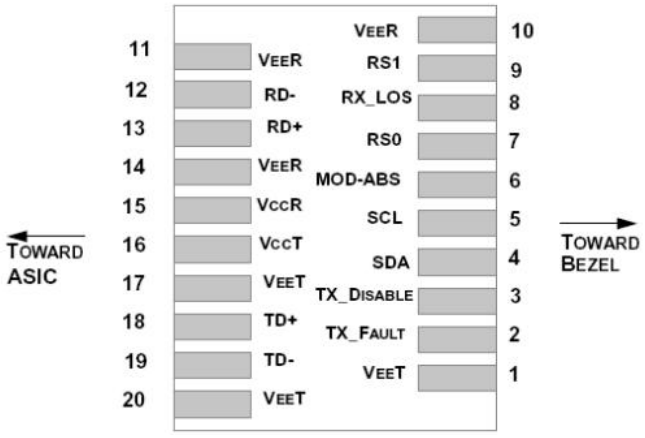


Figure 2, Pin View for SFP28

Table 6-Pin Function Definitions

PIN	Name	Function	Notes
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2 wire serial interface data input/output (SDA)	
5	SCL	2 wire serial interface clock input (SCL)	
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	2
7	RS0	Rate Select 0, optionally controls SFP+ module receiver	4
8	LOS	Receiver Loss of Signal Indication (In FC designated as Rx_LOS and in Ethernet designated as NOT Signal Detect)	2
9	RS1	Rate Select 1, optionally controls SFP+ module transmitter	4
10	VeeR	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data out put	
13	RD+	Receiver non-inverted data out put	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data out put	
19	TD-	Transmitter non-inverted data out put	
20	VeeT	Module transmitter ground	1

Note:

1. The module ground pins are isolated from the module case.
2. The pins shall be pulled up with 4.7K-10Kohms to a voltage between 3.14V and 3.46V on host board.
3. The pin is pulled up to VCCT with a 4.7K-10KΩ resistor in the module.
4. See SFF-8472 Rev12.2 Table 10-2.

Recommended Circuit

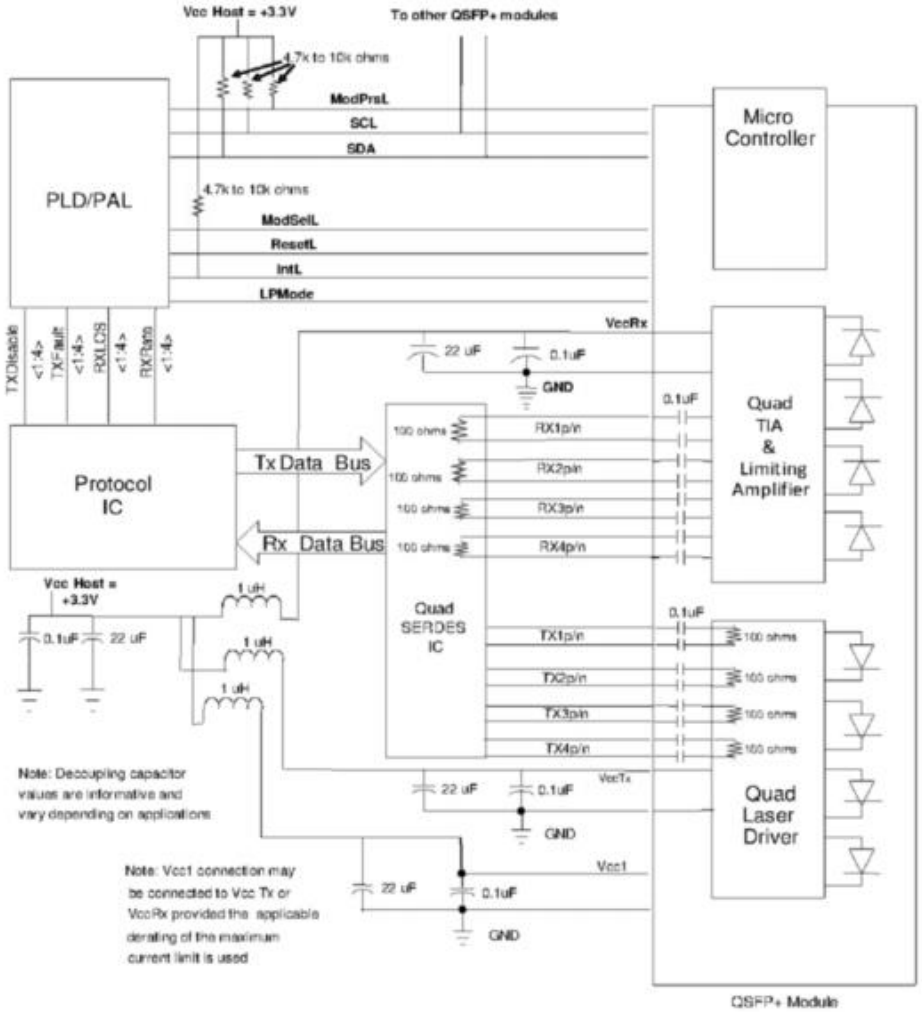


Figure 3, Recommended Interface Circuit for QSFP28

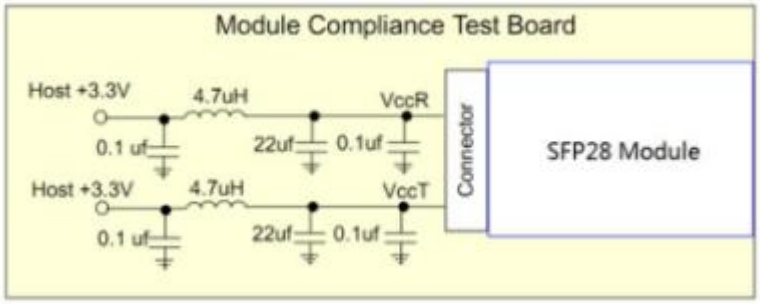


Figure 4, Recommended Host Board Power Supply Circuit for SFP28

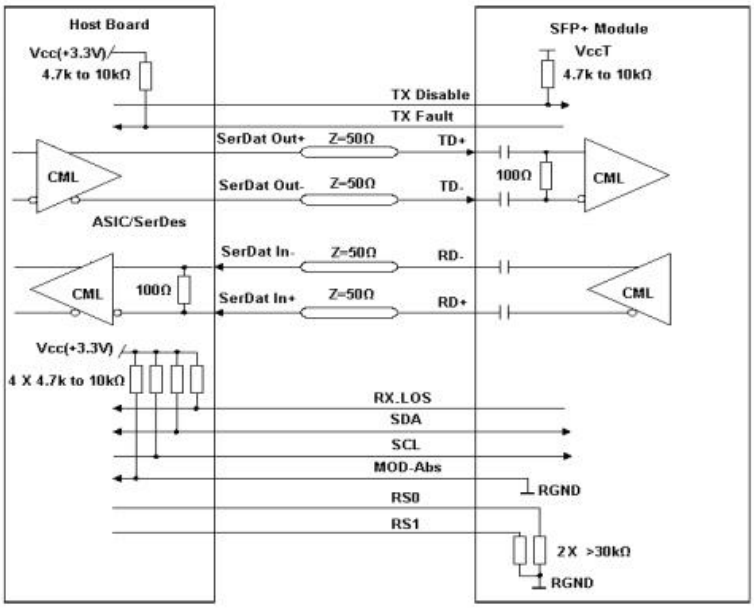
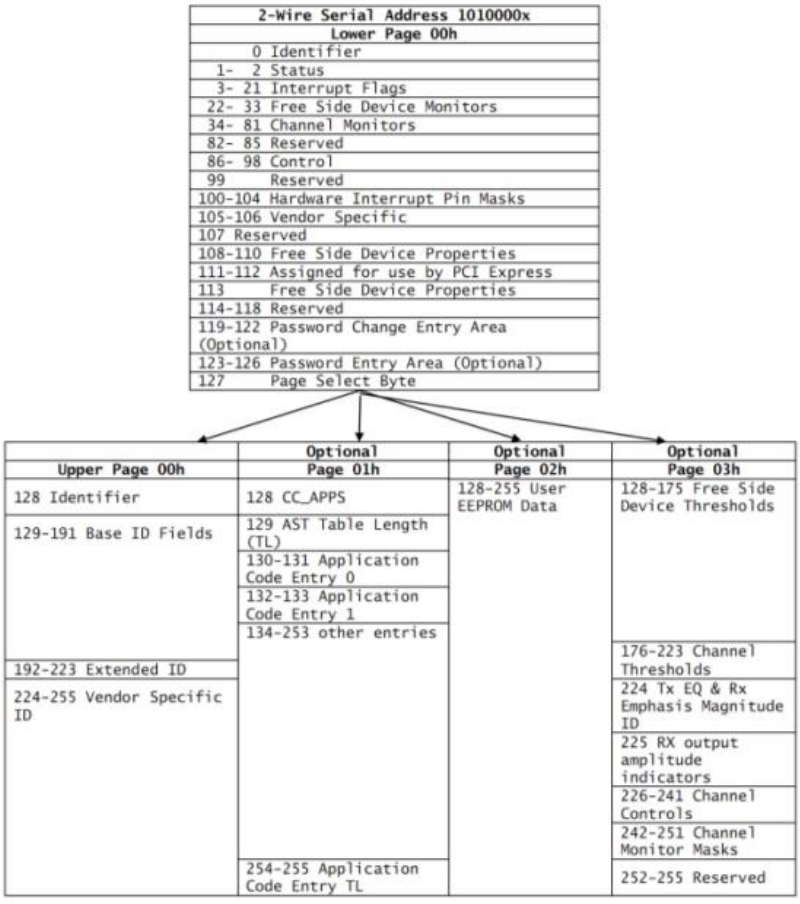


Figure 5, Recommended Interface Circuit for SFP28

Monitoring Specification



2-Wire Serial Address 1010000x
Lower Page 00h
0 Identifier
1- 2 Status
3- 21 Interrupt Flags
22- 33 Free Side Device Monitors
34- 81 Channel Monitors
82- 85 Reserved
86- 98 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

Upper Page 00h	Optional Page 01h	Optional Page 02h	Optional Page 03h
128 Identifier	128 CC_APPS	128-255 User EEPROM Data	128-175 Free Side Device Thresholds
129-191 Base ID Fields	129 AST Table Length (TL)		
	130-131 Application Code Entry 0		
	132-133 Application Code Entry 1		
	134-253 other entries		
192-223 Extended ID			176-223 Channel Thresholds
224-255 Vendor Specific ID			224 Tx EQ & Rx Emphasis Magnitude ID
			225 RX output amplitude indicators
			226-241 Channel Controls
			242-251 Channel Monitor Masks
	254-255 Application Code Entry TL		252-255 Reserved

Figure 6, Memory Map for QSFP28

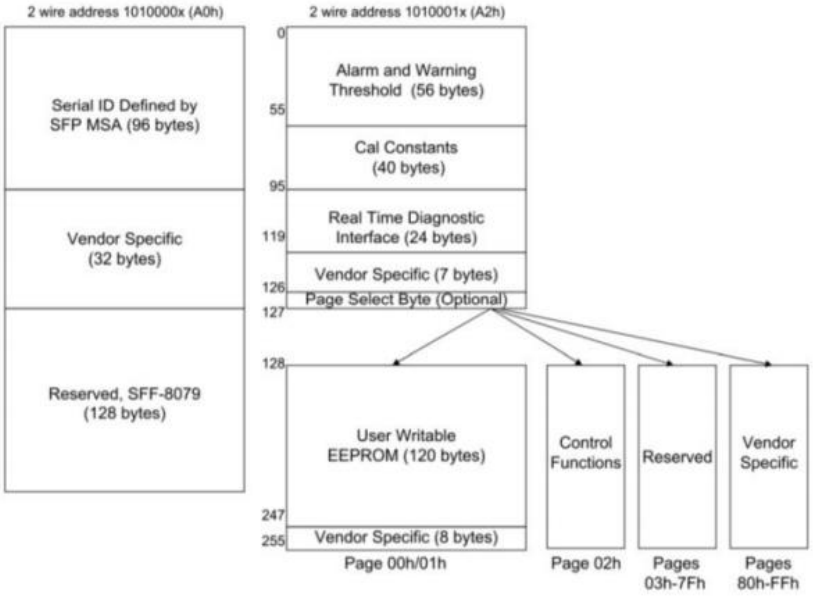
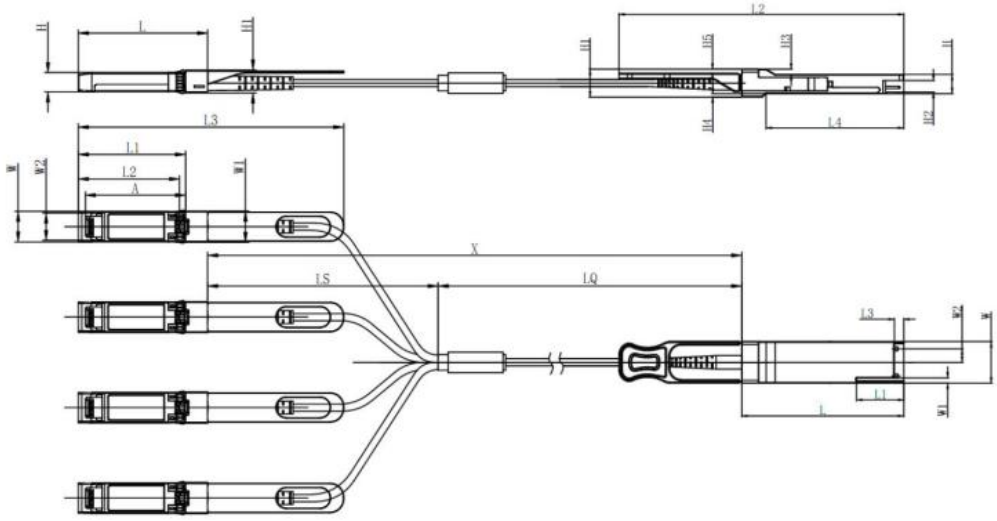


Figure 7, Memory Map for SFP28

Mechanical



Unit mm

QSFP28	L	L1	L2	L3	L4	W	W1	W2	H	H1	H2	H3	H4	H5	H6
Max	72.2	-	128	4.35	61.4	18.45	-	6.2	8.6	12.4	5.35	2.5	1.6	2.0	-
Type	72.0	-	-	4.20	61.2	18.35	-	-	8.5	12.2	5.2	2.3	1.5	1.8	6.55
Min	68.8	16.5	124	4.05	61.0	18.25	2.2	5.8	8.4	12.0	5.05	2.1	1.3	1.6	-

SFP28	L	L1	L2	L3	W	W1	W2	H	H1	A
Max	57.6	47.7	44.55	119.9	13.8	14.0	12.3	8.7	10.3	45.25
Type	57.4	47.5	44.35	117.9	13.55	13.8	12.1	8.5	10.1	45
Min	57.2	47.3	44.15	115.9	13.3	13.6	11.9	8.4	9.9	44.65

Figure 8, Mechanical Diagram

Table 7- Cable Length

Cable Length（Unit: m）	Tolerant（Unit: cm）
＜1.0	+5/-0
1.0~4.5	+15/-0
5.0~14.5	+30/-0
⩾15.0	+2%/-0

Table 8- Breakout Cable Nominal Length

Total LengthX (Unit: m)	Breakout Point Measured from QSFP LQ (Unit: m)	Breakout Point Measured from SFP LS(Unit: m)
1	0.3	0.7
2	0.6	1.4
3	1	2
5	2	3
7	4	3
10	7	3
15	12	3
20	17	3
25	22	3
30	27	3
40	37	3
50	47	3

Warnings

Handling Precautions : This device is susceptible to damage as a result of electrostatic discharge (ESD).

A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

Ordering Information

Part No.	Bit Rate (Gbps)	Laser (nm)	Distance	Fiber Type	Connector	Temp
AOC-Q4Q4-xxx	103.125	850	1~50m	MMF	N/A	0℃~+70℃

Note: 1 Case Temperature

Revision History

Revision	Initiated	Approved	content	Revision History	Release Date
V1.0	QR.huang	Nicky.Wen	Released	The latest version	Jun/2017
V1.1	HT.huang	Nicky.Wen	Released	Update format	Oct/2017
V1.2	HT.Huang	Nicky.Wen	Released	Version update encryption	Jan/2019

Further Information