



- ✧ Up to 28Gb/s data rate per channel
- ✧ QSFP MSA compliant
- ✧ Up to 100m OM4 MMF transmission
- ✧ Operating case temperature: 0 to 70oC
- ✧ Single 3.3V power supply
- ✧ Maximum power consumption 3.5W each terminal
- ✧ RoHS compliant

## Features:

- ✧ 4 independent full-duplex channels

## Applications:

- ✧ 100G Ethernet
- ✧ Infiniband EDR

## Description:

This product is a high data rate parallel active optical cable (AOC), to overcome the bandwidth limitation of traditional copper cable. This product converts the parallel electrical input signals into parallel optical signals (light), by a driven Vertical Cavity Surface Emitting Laser (VCSEL) array. The light propagates through the ribbon fiber individually, and be captured by the photo diode array. The optical signals are converted into parallel electrical signals and outputted. Consequently, each terminal of the cable has 8 ports, 4 for data transmission and 4 for data receiving, to provide totally 100Gb/s data exchange.

The AOC offers 4 independent data transmission channels and 4 data receiving channels via the multimode ribbon fibers, each capable of 25Gb/s operation. Consequently, an aggregate data rate of 100Gb/s over 100 meters transmission can be achieved by this product, to support the ultra-fast computing data exchange.

The product is designed with form factor, optical/electrical connection according to the QSFP Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

## ● Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	TS	-40	85	°C	
Relative Humidity(non-condensing)	RH	0	85	%	
Operating Case Temperature	TOP	0	70	°C	
Supply Voltage	VCC	-0.3	3.6	V	
Input Voltage	Vin	-0.3	Vcc+0.3	V	

## ● Recommended Operating Conditions and Supply Requirements

Parameter	Symbol	Min	Typical	Max	Units
Operating Case Temperature	TOP	0		70	°C
Power Supply Voltage	VCC	3.135	3.3	3.465	V
Data Rate, each Lane			25.78125	28.05	Gb/s
Control Input Voltage High		2		Vcc	V
Control Input Voltage Low		0		0.8	V

## ● Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating temperature and supply voltage unless otherwise specified.

Parameter	Symbol	Min	Typical	Max	Units	Notes
PowerConsumption, each Terminal				3.5	W	
Supply Current, each Terminal	Icc			1060	mA	
Transceiver Power-on Initialization Time				2000	ms	1
<b>Transmitter (each Lane)</b>						
Single Ended Input Voltage Tolerance (Note 2)		-0.3		3.6	V	
AC Common Mode Input Voltage Tolerance		15			mV	RMS
Differential Input Voltage Swing Threshold		50			mVpp	LOSA Threshold
Differential Input Voltage Swing	Vin,pp	180		1000	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	
Total Jitter				0.40	UI	
Deterministic Jitter				0.15	UI	
<b>Receiver (each Lane)</b>						
Single Ended Output Voltage		-0.3		4	V	
AC Common Mode Output Voltage				7.5	mV	RMS
Differential Output Voltage Swing	Vout,pp	300		1000	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	
Total Jitter				0.3	UI	
Deterministic Jitter				0.15	UI	

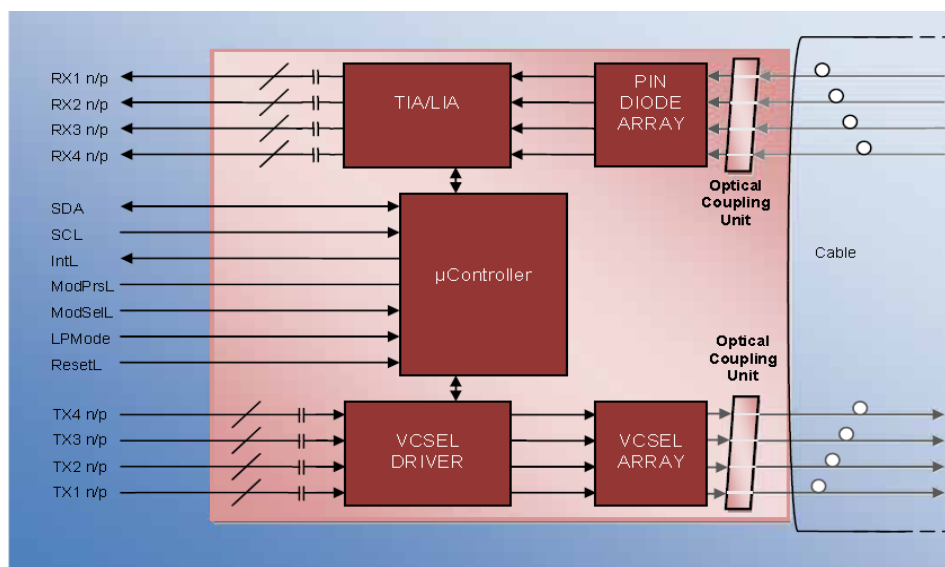
Notes:

1.Power-on Initialization Time is the time from when the power supply voltages reach and remain above the minimum recommended operating supply voltages to the time when the module is

fullfunctional.

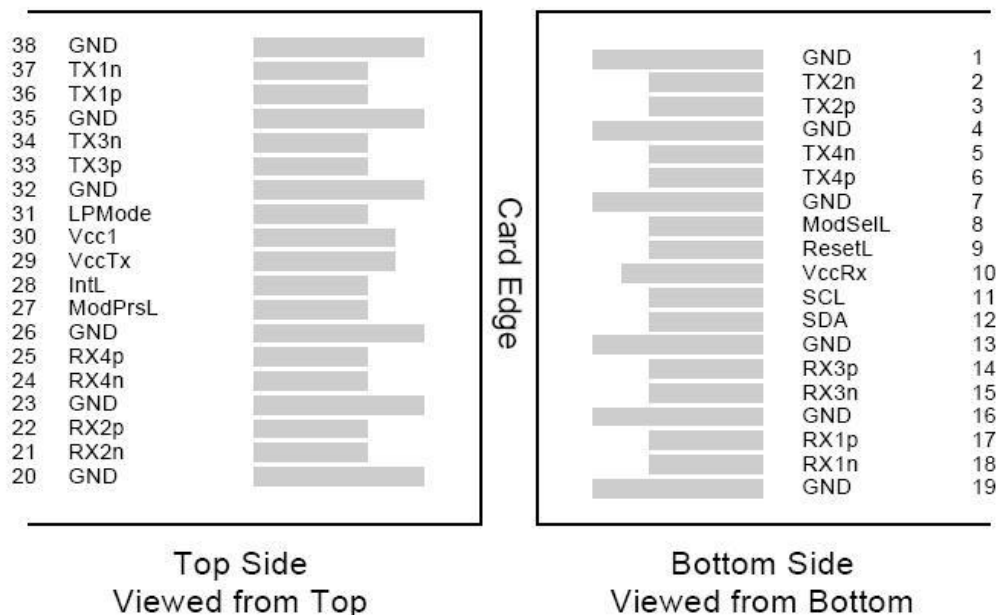
2.The single ended input voltage tolerance is the allowable range of the instantaneous input signals.

## ● AOC Block Diagram



Block Diagram of One of the QSFP28 End Modules

## ● Pin Assignment:



MSA compliant Connector

## ● Pin Definitions

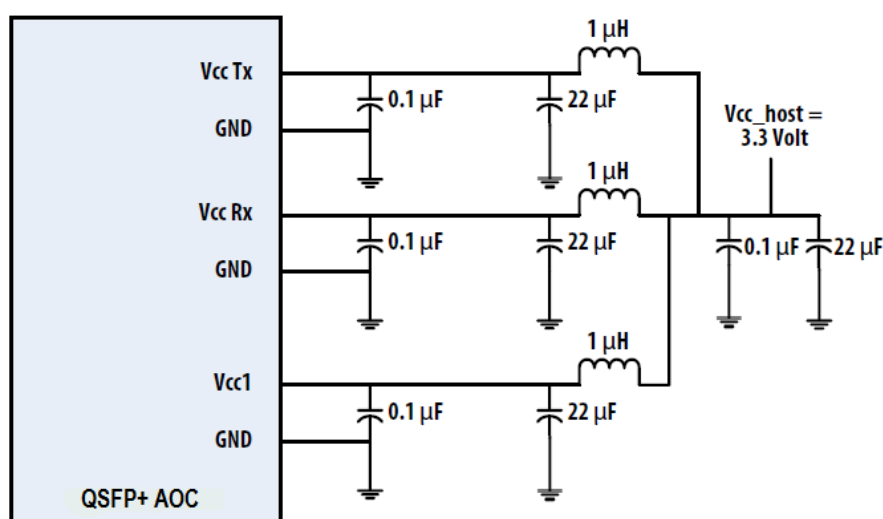
PIN	Logic	Symbol	Name/Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2

30		Vcc1	+3.3 V Power Supply	2
31	LVTTL-I	LPMode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

**Notes:**

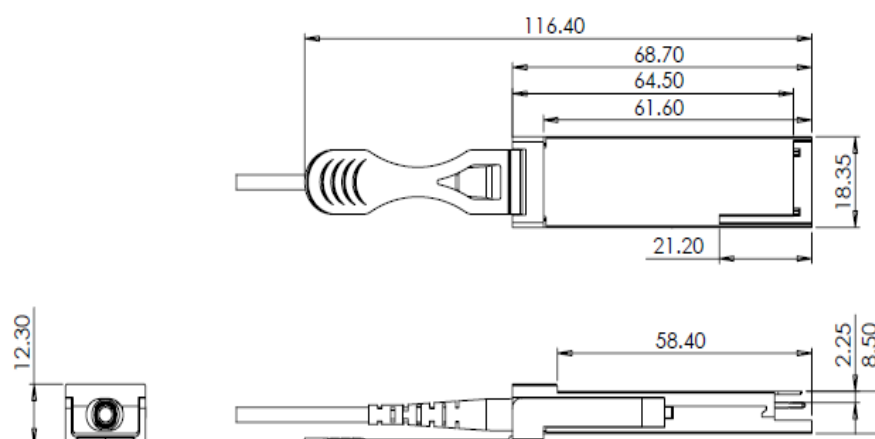
1. GND is the symbol for signal and supply (power) common for QSFP28 modules. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

### ● Recommended Power Supply Filter



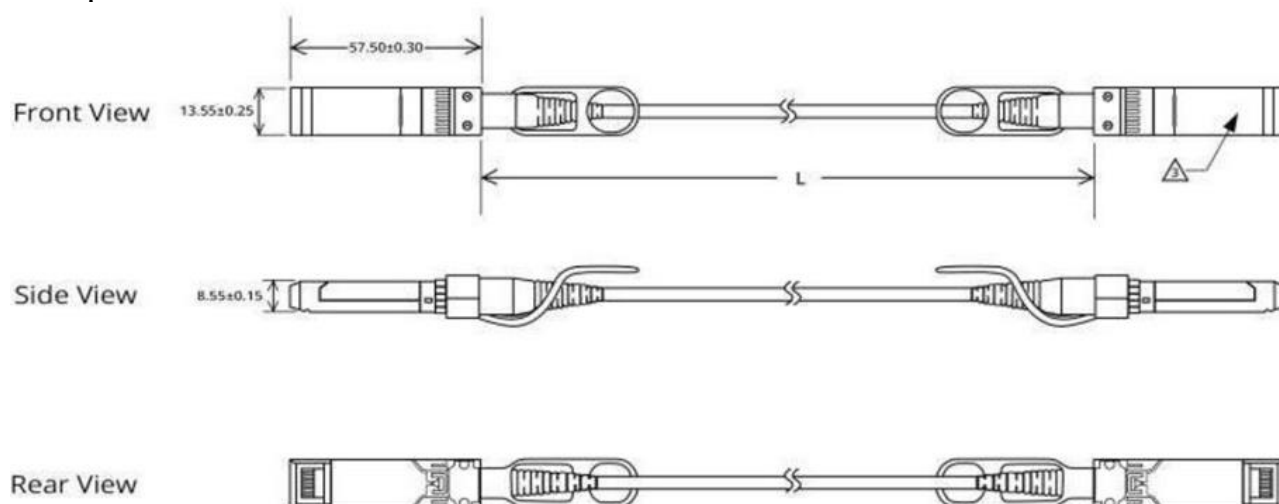
**Figure 3. Recommended Power Supply Filter**

### ● Mechanical Dimensions:



### The length

The length starts at the module connection and the module connection (as shown below). Acceptable Standards are shown below



### Acceptable standard

Type	Length (m)	tolerance (cm)
AOC	$L \leq 1$	$+7 \sim -0$
	$1 < L < 7$	$+10 \sim -0$
	$L \geq 7$	$+2\% \sim -0$

### Label size

type	Size (mm)	tolerance (mm)
label	28mm*15mm	$\pm 0.5\text{mm}$

### ● ESD

This transceiver is specified as ESD threshold 1kV for SFI pin and 2kV for all others electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

● **Order Information:**

OPQET3-AOC	QSFP28 active optical cable with full real-time digital diagnostic monitoring
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where "x" denotes cable length in meters. Examples of cable length offered are as follows:

x = 1 for 1m      x = 50 for 50m  
x = 5 for 5m      x = 75 for 75m  
x = 10 for 10m    x = 100 for 100m

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