

## DATA SHEET

### MODULETEK-AOC-QSFP28-QSFP28-OM3-aaa.aaM-C0C0C

100Gb/s QSFP28 Active Optical Cable Transceiver

#### AOC-QSFP28-QSFP28-OM3-aaa.aaM-C0C0C Overview

ModuleTek's AOC-QSFP28-QSFP28-OM3-aaa.aaM-C0C0C QSFP28 active optical cable transceivers are 4-channel active optical cable for QSFP28 application. This full-duplex optical assembly offers 4 independent transmit and receive channels, each capable of up to 25Gbps for an aggregate bandwidth of 100Gbps.

QSFP28 AOC can be used as a direct replacement for traditional copper cables with the added benefit of a lighter weight and smaller diameter solution for cable lengths from 1 to 70 meters.

#### Product Features

- Hot-pluggable QSFP28 form factor
- 4 high-speed full duplex channels
- Supports 103.1Gb/s aggregate bit rate
- 4x25Gbps 850nm VCSEL laser
- QSFP28 MSA compliant
- Low power dissipation: <3.5W per cable end (<2.5W with CDRs off)
- Cable lengths from 1 to 70 meters
- RoHS Compliant
- Operating temperature range: 0°C to 70°C

#### Applications

- 100G Ethernet
- Infiniband interconnects

## Ordering Information

Part Number	Description	Color on Clasp
AOC-QSFP28-QSFP28-OM3-aaa.aaM-C0C0C	100G QSFP28 Active Optical Cable (length from 1m to 70m)	Blue
<b>For More Information:</b> ModuleTek Limited Web: <a href="http://www.moduletek.com">www.moduletek.com</a> Email: <a href="mailto:sales@moduletek.com">sales@moduletek.com</a>		

## General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Bit Error Rate	BER			$10^{-12}$		
Operating Temperature	T <sub>OP</sub>	0		70	°C	1
Storage Temperature	T <sub>STO</sub>	-40		85	°C	2
Input Voltage	V <sub>CC</sub>	3.14	3.3	3.46	V	
Maximum Voltage	V <sub>MAX</sub>	-0.5		3.6	V	3

### Notes:

1. Case temperature
2. Ambient temperature
3. For electrical power interface

## AOC Electrical Input Requirements

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate Per Channel	DR		25.78125		Gb/s	
Differential Input Amplitude	$V_{IN\_PP}$			900	mV	
Input AC Common Mode Voltage	$V_{CM}$	-300		2800	mV	
Differential Termination Resistance Mismatch				10	%	
Differential Return Loss	SDD22				dB	1
Common Mode to Differential conversion and Differential to Common Mode conversion	SDC22, SCD22				dB	1
Transition Time(20%-80%)	$T_R/ T_F$	10			ps	

**Notes:**

1. Per OIF CEI-28G-VSR and CAUI-4 requirements

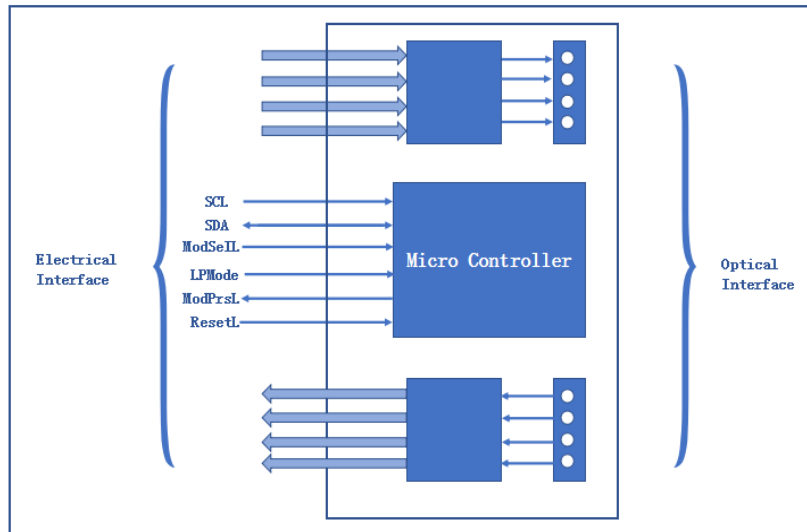
## AOC Electrical Output Requirements

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate Per Channel	DR		25.78125		Gb/s	
Differential Output Amplitude	$V_{OUT\_PP}$			900	mV	
Output AC Common Mode Voltage	$V_{CM}$	-350		2850	mV	
Differential Termination Resistance Mismatch				10	%	
Differential Return Loss	SDD22				dB	1
Common Mode to Differential conversion and Differential to Common Mode conversion	SDC22, SCD22				dB	1
Transition Time (20%-80%)	$T_R/ T_F$	9.5			ps	

**Notes:**

1. Per OIF CEI-28G-VSR and CAUI-4 requirements

## Block-Diagram-of-Transceiver



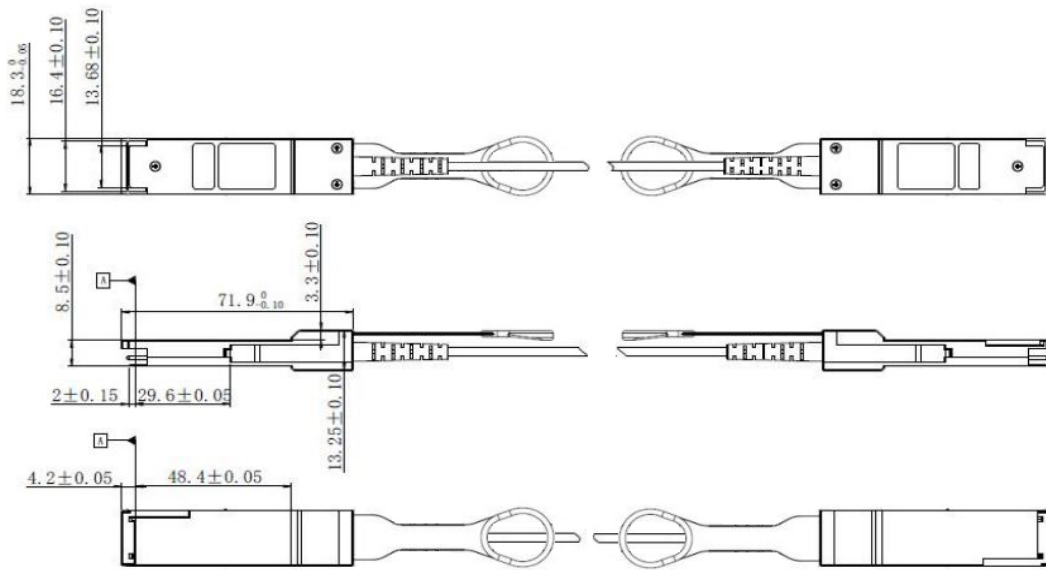
The QSFP28 AOC has miniature optical engine embedded into each end of the cable assembly. The engines interconnect 4 independent transmit/receive lanes.

A functional block diagram of the engine is shown in the above Figure. The transmitter sections consist of a 4-channel VCSEL array, a 4-channel input buffer and laser driver.

An on board micro-controller provides control, diagnostic and monitoring for the cable functions, as well as the external I2C serial communication interface.

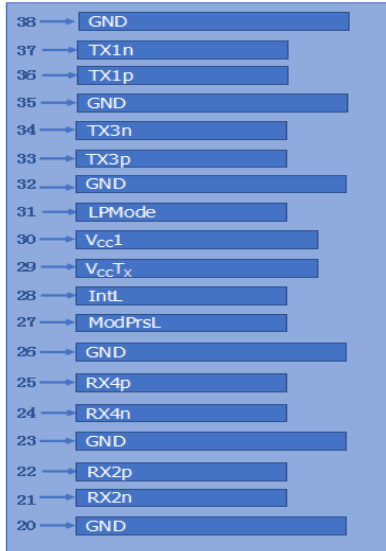
The Receiver section consists of a 4-channel PIN photodiode array, a 4-channel TIA array, and a 4-channel output buffer.

## Dimensions

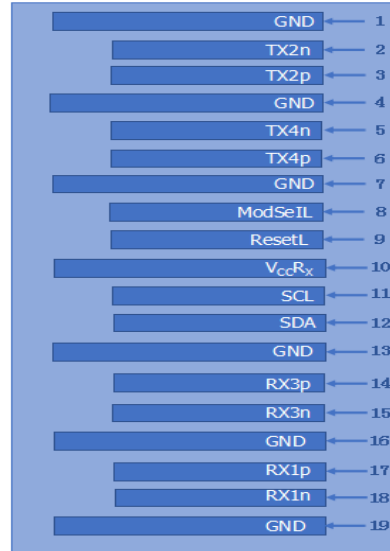


ALL DIMENSIONS ARE  $\pm 0.2\text{mm}$  UNLESS OTHERWISE SPECIFIED  
UNIT: mm

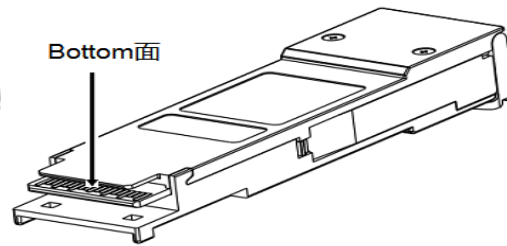
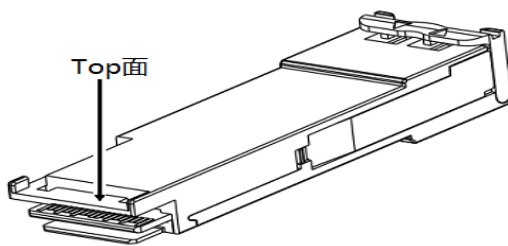
## Electrical Pad Layout



Top of Board



Bottom of Board



## Pin Assignment

PIN #	Symbol	Description	Remarks
1	GND	Ground	
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	V <sub>cc</sub> R <sub>X</sub>	+3.3V Power Supply Receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	
20	GND	Ground	
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	V <sub>cc</sub> T <sub>X</sub>	+3.3V Power Supply transmitter	
30	V <sub>cc</sub> 1	+3.3V Power Supply	
31	LPMODE	Low Power Mode	
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	

## References

1. IEEE standard 802.3bm. IEEE Standard Department.
2. QSFP28 4X PLUGGABLE TRANSCEIVER –SFF-8665