

## LWO-AOC-QSFP28-xxM-HPE

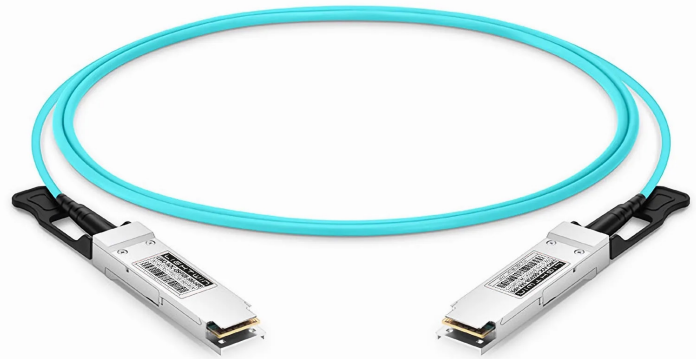
### 100Gbit QSFP28 AOC Active Optical Cable, HP Aruba

#### Features

- Compliant with QSFP28 SFF-8636
- HP Aruba Coding
- Built-in digital diagnostic functions
- VCSEL array transmitter and PIN array receiver
- Operating data rate: up to 25.78125G for each lane
- Maximum link length of 70m on OM3
- Single +3.3V power supply
- Maximum operation power: 2.5W
- Operation case temperature: 0 to 70°C
- RoHS compliant

#### Application

- 100GBASE-SR4 Ethernet
- Data Center, Enterprise and Telecom Networking



#### General Description

This product is a high data rate parallel active optical cable (AOC), to overcome the bandwidth limitation of traditional copper cable. 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 ultrafast computing data exchange.

The product is designed with form factor, optical/electrical connection according to HP Aruba requirements. It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

#### Functional Description

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.

A single +3.3V power supply is required to power up this product. Both power supply pins VccTx and VccRx are internally connected and should be applied concurrently. As per HP Aruba specifications the module offers 7 low speed hardware control pins (including the 2-wire serial interface): ModSelL, SCL, SDA, ResetL, LPMode, ModPrsL and IntL.

Module Select (ModSelL) is an input pin. When held low by the host, this product responds to 2-wire serial communication commands. The ModSelL allows the use of this product on a single 2-wire interface bus – individual ModSelL lines must be used. Serial Clock (SCL) and Serial Data (SDA) are required for the 2-wire serial bus communication interface and enable the host to access the QSFP memory map.

The ResetL pin enables a complete reset, returning the settings to their default state, when a low level on the ResetL pin is held for longer than the minimum pulse length. During the execution of a reset the host shall disregard all status bits until it indicates a completion of the reset interrupt. The product indicates this by posting an IntL (Interrupt) signal with the Data\_Not\_Ready bit negated in the memory map. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset.

Low Power Mode (LPMode) pin is used to set the maximum power consumption for the product in order to protect hosts that are not capable of cooling higher power modules, should such modules be accidentally inserted.

Module Present (ModPrsL) is a signal local to the host board which, in the absence of a product, is normally pulled up to the host Vcc. When the product is inserted into the connector, it completes the path to ground through a resistor on the host board and asserts the signal. ModPrsL then indicates it is present by setting ModPrsL to a "Low" state.

Interrupt (IntL) is an output pin. "Low" indicates a possible operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled to the Host Vcc voltage on the Host board.

## LWO-AOC-QSFP28-xxM-HPE

### 100Gbit QSFP28 AOC Active Optical Cable, HP Aruba

#### Pin Assignment and Description

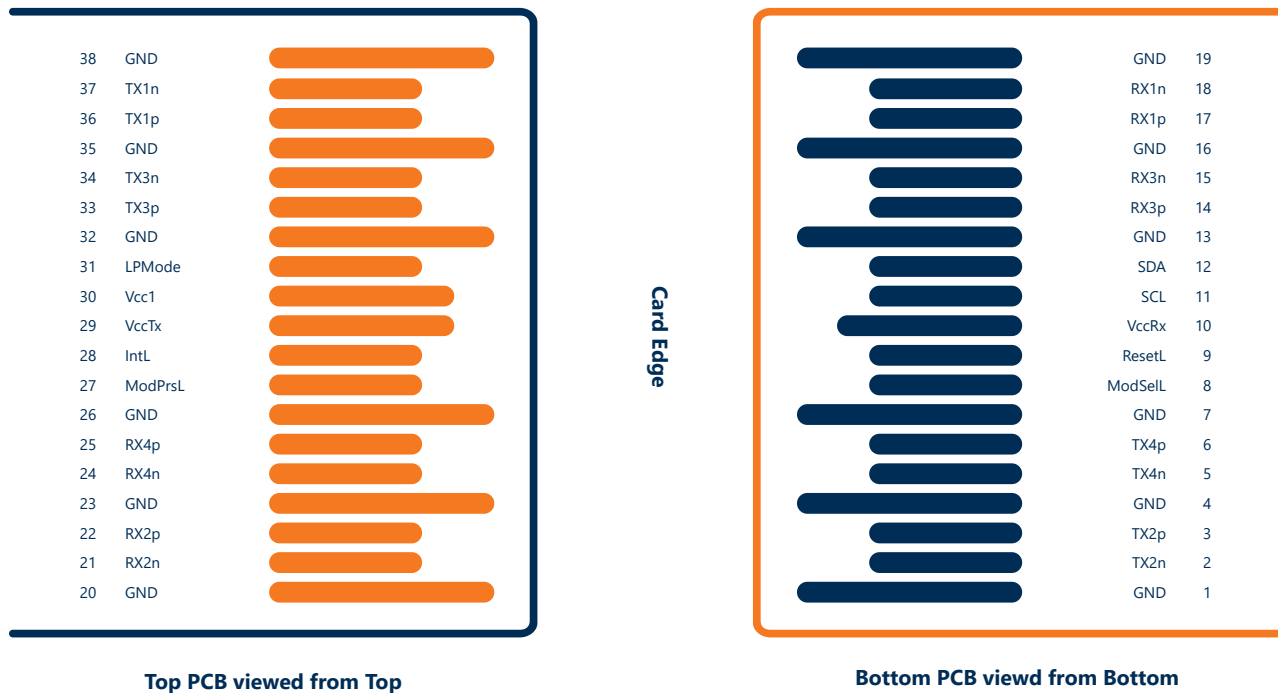


Figure 1: QSFP28 module pad assignment and layout

#### PIN Definition 1/2

PIN	Logic	Symbol	Name/Description	Plug Sequence <sup>3</sup>	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Output	3	
7		GND	Ground	1	1
8	LVTTL-I	ModSelL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		VccRx	+3.3V Power Supply Receiver	2	2
11	LVC MOS-I/O	SCL	TWI serial interface clock	3	
12	LVC MOS-I/O	SDA	TWI serial interface clock	3	
13		GND	Ground	1	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	

## LWO-AOC-QSFP28-xxM-HPE

### 100Gbit QSFP28 AOC Active Optical Cable, HP Aruba

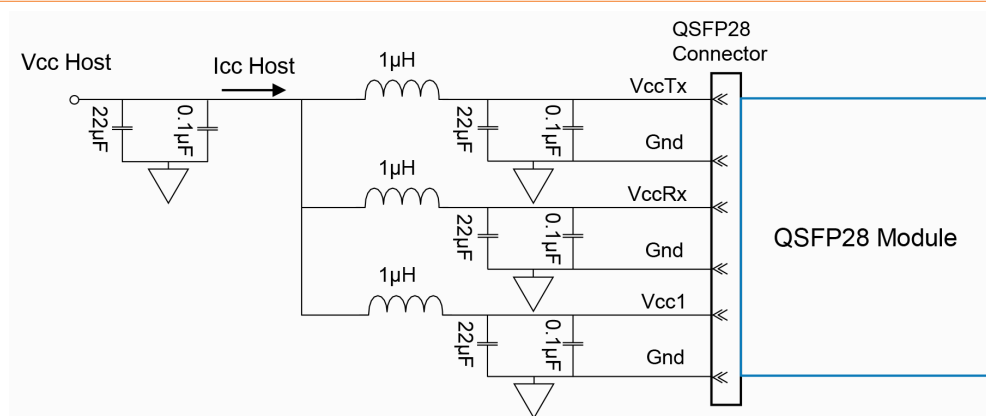
#### PIN Definition 1/2

19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTTL-O	ModPrsL	Module Present	3	
28	LVTTTL-O	IntL/ RxLOS	Interrupt/optional RxLOS	3	
29		VccTx	+3.3 V Power Supply transmitter	2	2
30		Vcc1	+3.3 V Power Supply	2	2
31	LVTTTL-I	LPMoDe/TxDis	Low Power mode/optional TX Disable	3	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Output	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Output	3	
38		GND	Ground	1	1

#### Notes

1. QSFP28 uses common ground (GND) for all signals and supply (power). 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. Each connector Gnd contact is rated for a maximum current of 500 mA.
2. VccRx, Vcc1, and VccTx shall be applied concurrently. For power classes 4 and above the module differential loading of input voltage pads must not result in exceeding contact current limits. Each connector Vcc contact is rated for a maximum current of 1500 mA.
3. Plug Sequence specifies the mating sequence of the host connector and module. The sequence is 1, 2, and 3 see Figure 1 for pad locations.

#### Recommended Power Supply Filter



FFigure 2: Reference Power Supply Filter for Module Testingsr

## LWO-AOC-QSFP28-xxM-HPE

### 100Gbit QSFP28 AOC Active Optical Cable, HP Aruba

#### Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min.	Max.	Units	Notes
Storage Temperature	TS	-40.0	85	degC	
Power Supply Voltage	V <sub>CC</sub>	-0.5	3.6	V	
Relative Humidity (non- condensation)	RH	5	85	%	

#### Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
Operating Case Temperature	T <sub>OP</sub>	0		70	degC	
Power Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V	
Data Rate, each Lane			25.781125		Gbps	
Power Consumption per termina		-		2.5	W	
Bit Error Ratio				1x10 <sup>-12</sup>		1

#### Notes

1. PRBS2^31-1@25.78125Gbps

#### Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter		Unit	Min.	Typical	Max.	Notes
<b>Transceiver</b>						
Data Input Swing Differential		mV	200	-	1000	
Date Differential Impedance		Ω	90	100	110	
ModSelL	Module Select	V	V <sub>EE</sub> -0.3	-	0.4	
	Module Unselect	V	2	-	VCC+0.3	
LPMode	Low Power Mode	V	V <sub>EE</sub> -0.3	-	0.8	
	Normal Operation	V	2	-	VCC+0.3	
ResetL	Reset	V	V <sub>EE</sub> -0.3	-	0.8	
	Normal Operation	V	2	-	VCC+0.3	
<b>Receiver</b>						
Data Output Swing Differential		mV	200	-	1000	
Date Differential Impedance		Ω	90	100	110	
ModPrsL	Normal Operation	V	V <sub>EE</sub> -0.3	-	0.4	
IntL	Interrupt	V	V <sub>EE</sub> -0.3	-	0.4	
	Normal Operation	V	2	-	VCC+0.3	

## LWO-AOC-QSFP28-xxM-HPE

### 100Gbit QSFP28 AOC Active Optical Cable, HP Aruba

#### Mechanical Dimensions

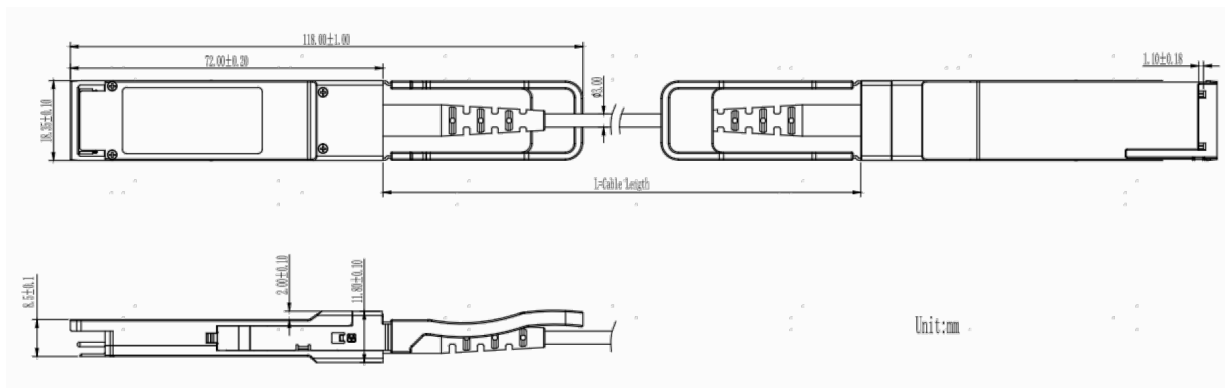


Figure 3. Mechanical Outline

#### ESD

This transceiver is specified as ESD threshold 1kV for high speed data pins 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.

#### Laser Safety

This is a Class 1M Laser Product according to EN 60825-1:2014. This product complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

#### Ordering Information

Part Number	Cable length
LWO-AOC-QSFP28-5M-HPE	5 Meter
LWO-AOC-QSFP28-10M-HPE	10 Meter
LWO-AOC-QSFP28-20M-HPE	20 Meter