

## 40G QSFP+ Active Optical Cable ( OPQCTx-AOC)



- ✧ Reliable VCSEL array technology using multimode fiber
- ✧ Available in standard lengths of 1,3, 5, 10, 15, 20, 30, 50,100m
- ✧ Low power consumption <1.5W
- ✧ Operating case temperature 0°C to +70°C
- ✧ 3.3V power supply voltage
- ✧ RoHS compliant
- ✧ Hot Pluggable QSFP form factor

### Features:

- ✧ Four-channel full-duplex active optical cable
- ✧ Transmission data rate up to 11.3Gbit/s per channel

### Applications:

- ✧ Infiniband QDR/DDR/SDR
- ✧ Datacenter
- ✧ 40G Ethernet
- ✧ 4G/8G/10G Fibre Channel

### Description:

The OPWAY QSFP+ active optic cables are a high performance, low power consumption, long reach interconnect solution supporting Infini Band QDR/DDR/SDR,12.5G/10G/8G/4G/2G fiber channel, PCIe and SAS. It is compliant with the QSFP MSA and IEEE P802.3ba.OPWAY QSFP AOC is an assembly of 4 full-duplex lanes, where each lane is capable of transmitting data at rates up to 11.3Gb/s, providing an aggregated rate of 45.2Gb/s.OPWAY QSFP+AOC is one kind of parallel transceiver which provides increased port density and total system cost savings.

### ● Absolute Maximum Ratings

The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

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

### ● Recommended Operating Conditions and Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T <sub>OPC</sub>	0		70	°C
Power Supply Voltage	V <sub>CC</sub>	3.13	3.3	3.47	V
Power Consumption		-		1.5	W
Data Rate	DR	1	10.3	11.3	Gbps

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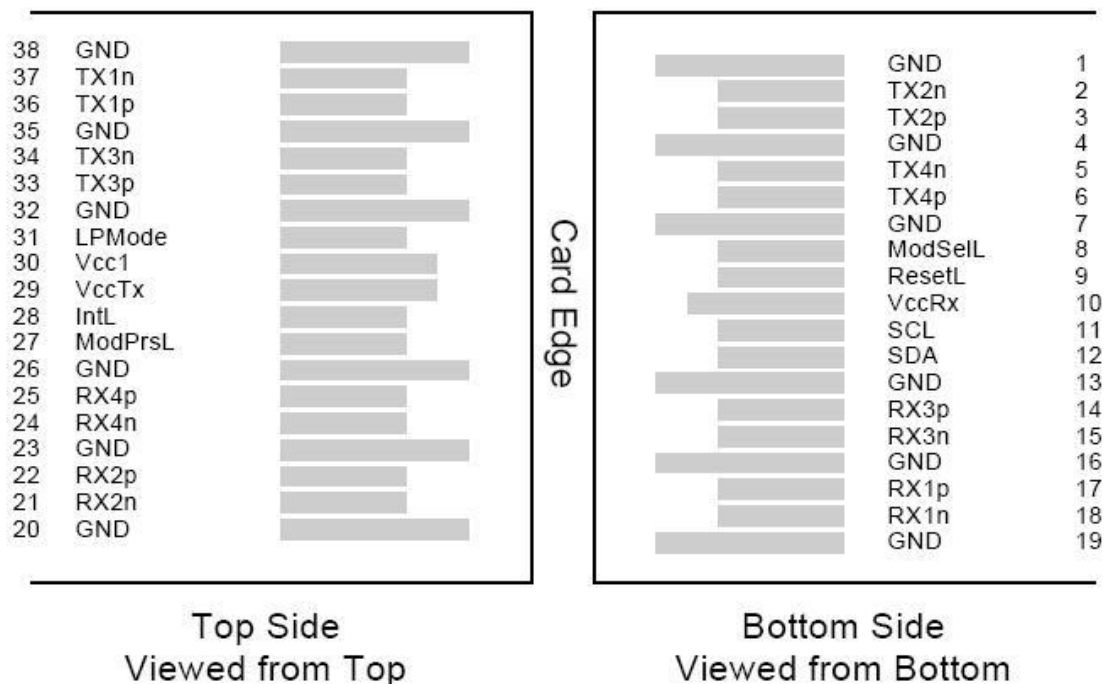
Data Speed Tolerance	$\Delta$ DR	-100		+100	ppm
Link Distance with OM3 fiber	D	0		100	m

### ● Electrical Characteristics

The following characteristics are defined over the Recommended Operating Conditions unless otherwise noted. Typical values are for  $T_c = 40\text{ }^\circ\text{C}$ ,  $V_{cc} = 3.3\text{ V}$

Parameter	Symbol	Min	Typical	Max	Unit
Differential input impedance	$Z_{in}$	90	100	110	ohm
Differential Output impedance	$Z_{out}$	90	100	110	ohm
Differential input voltage amplitude	$\Delta V_{in}$	300		1100	mVp-p
Differential output voltage amplitude	$\Delta V_{out}$	400		800	mVp-p
Bit Error Rate	BR				E-12
Input Logic Level High	$V_{IH}$	2.0		VCC	V
Input Logic Level Low	$V_{IL}$	0		0.8	V
Output Logic Level High	$V_{OH}$	VCC-0.5		VCC	V
Output Logic Level Low	$V_{OL}$	0		0.4	V

### ● Pin Assignment



### ● Pin Descriptions

PIN	Logic	Symbol	Name/Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	

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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) Module circuit ground is isolated from module chassis ground within the module. GND is the symbol for signal and supply (power) common for QSFP modules.
- 2) The connector pins are each rated for a maximum current of 500mA.

### ModSelL Pin

The ModSelL is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP modules on a single 2-wire interface bus. When the ModSelL is “High”, the module will not respond to any 2-wire interface communication from the host. ModSelL

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has an internal pull-up in the module.

### ResetL Pin

Reset. LPMoDe\_Reset has an internal pull-up in the module. A low level on the ResetL pin for longer than the minimum pulse length ( $t_{Reset\_init}$ ) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time ( $t_{init}$ ) starts on the rising edge after the low level on the ResetL pin is released. During the execution of a reset ( $t_{init}$ ) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL signal with the Data\_Not\_Ready bit negated. Note that on power up (including hot insertion) the module will post this completion of reset interrupt without requiring a reset.

### LPMoDe Pin

OPWAY QSFP+ SR4 operate in the low power mode (less than 1.5 W power consumption) This pin active high will decrease power consumption to less than 1W.

### ModPrsL Pin

ModPrsL is pulled up to Vcc on the host board and grounded in the module. The ModPrsL is asserted “Low” when the module is inserted and de-asserted “High” when the module is physically absent from the host connector.

### IntL Pin

IntL is an output pin. When “Low”, it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt by using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled up to Vcc on the host board.

### Power Supply Filtering

The host board should use the power supply filtering shown in Figure1.

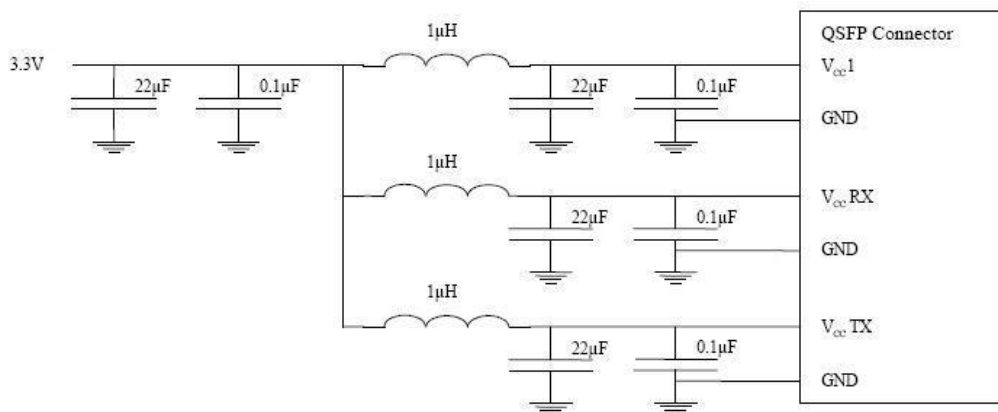


Figure1. Host Board Power Supply Filtering

## ● EEPROM Serial ID Memory Contents

### Serial ID: Data Fields (Page 00)

Address	Size (Bytes)	Name	Description of Base ID Field
Base ID fields			
128	1	Identifier	Identifier Type of serial Module
129	1	Ext. Identifier	Extended Identifier of Serial Module
130	1	Connector	Code for connector type
131-138	8	Specification compliance	Code for electronic compatibility or optical compatibility

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139	1	Encoding	Code for serial encoding algorithm
140	1	BR, nominal	Nominal bit rate, units of 100 Mbits/s
141	1	Extended Rate select Compliance	Tags for extended rate select compliance
142	1	Length(SMF)	Link length supported for SMF fiber in km (note 1)
143	1	Length(OM3 50um)	Link length supported for EBW 50/125um fiber (OM3), units of 2m (note 1)
144	1	Length(OM2 50um)	Link length supported for 50/125um fiber (OM2), units of 1m (note 1)
145	1	Length(OM1 62.5 um)	Link length supported for 62.5/125um fiber (OM1), units of 1m (note 1)
146	1	Length (Copper)	Link length of copper or active cable, units of 1m (note 1) Link length supported for 50/125 um fiber (OM4), units of 2 m) when Byte 147 declares 850nm VCSEL as defined in Table 37
147	1	Device tech	Device technology
148-163	16	Vendor name	QSFP+ vendor name(ASCII)
164	1	Extended Module	Extended Module codes for InfiniBand
165-167	3	Vendor OUI	QSFP+ vendor IEEE company ID
168-183	16	Vendor PN	Part number provided by QSFP+ vendor(ASCII)
184-185	2	Vendor rev	Revision level for part number provided by vendor (ASCII)
186-187	2	Wave length or Copper Cable Attenuation	Nominal laser wavelength (wavelength=value/20 in nm) or copper cable attenuation in dB at 2.5GHz (Adrs 186) and 5.0GHz (Adrs 187)
188-189	2	Wavelength tolerance	Guaranteed range of laser wavelength(+/- value) from nominal wavelength. (wavelength Tol.=value/200 in nm)
190	1	Max case temp.	Maximum case temperature in degrees C
191	1	CC_BASE	Check code for base ID fields (addresses 128-190)
<b>Extended ID fields</b>			
192-195	4	Options	Rate Select, TX Disable, TX Fault, LOS, Warning indicators for: Temperature, VCC, RX power, TX Bias
196-211	16	Vendor SN	Serial number provided by vendor (ASCII)
212-219	8	Date Code	Vendor's manufacturing date code
220	1	Diagnostic Monitoring Type	Indicates which types of diagnostic monitoring are implemented (if any) in the Module. Bit 1,0 Reserved
221	1	Enhanced Options	Indicates which optional enhanced features are implemented in the Module.
222	1		Reserved
223	1	CC_EXT	Check code for the Extended ID Fields (addresses 192-222)
<b>Vendor Specific ID Fields</b>			
224-255	32		Vendor Specific EEPROM

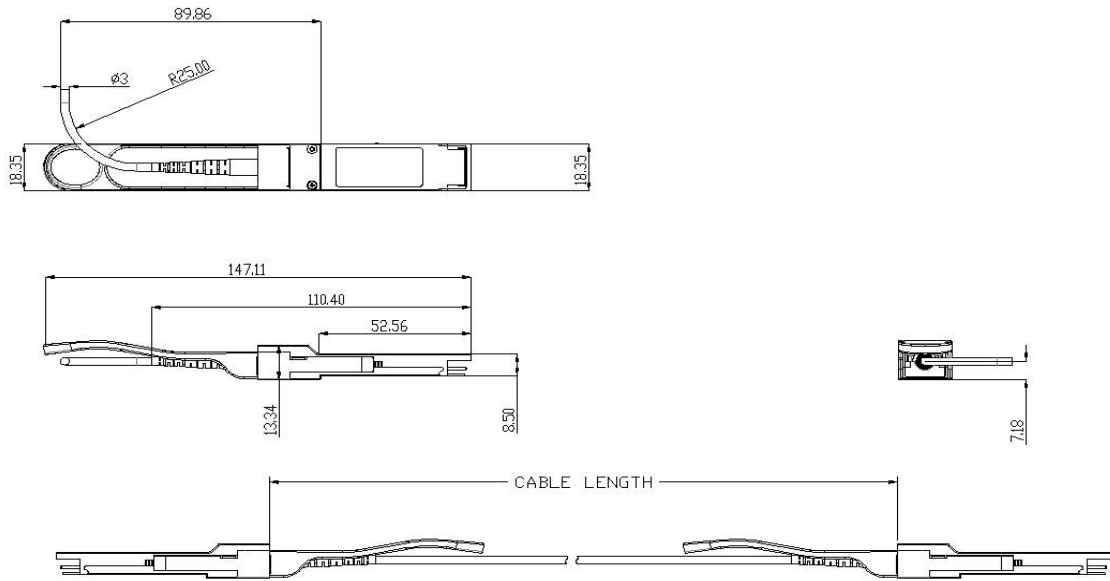
**Note 1:** A value of zero means that the Module does not support the specified technology or that the length information must be determined from the Module technology.

### Shenzhen Opway Communication Co., Ltd.

3F, Building 5, Section 2, Baiwangxin High-tech Industrial Park, 1002 Songbai Rd.,  
Nanshan, Shenzhen, Guangdong, China 518000  
Tel: +86-755-86000306 Fax: +86-755-86000825  
E-mail: info@opwaytech.com http://www.opwaytech.com

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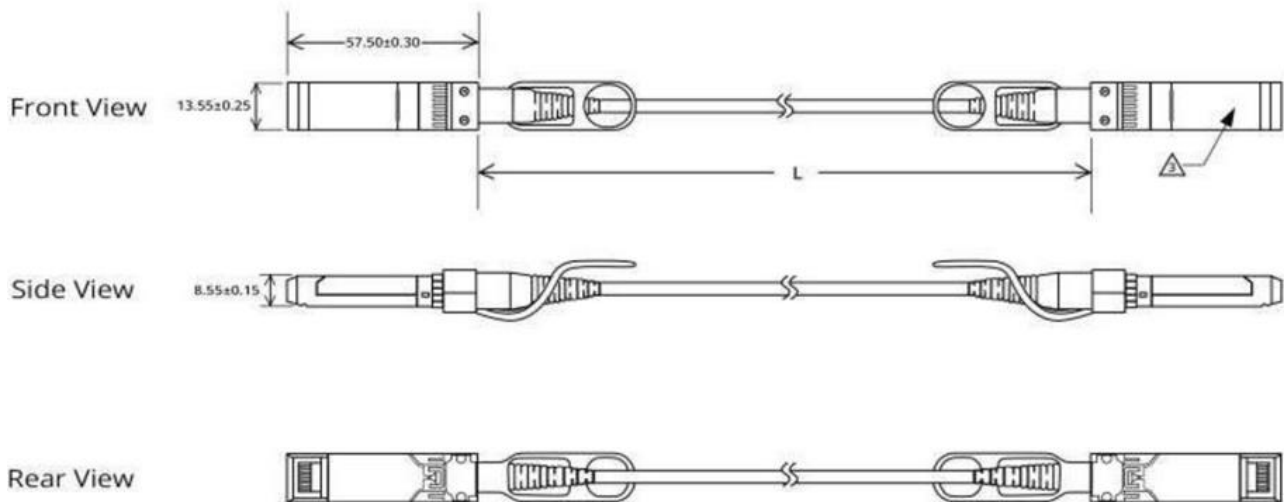
● **Mechanical Dimensions:**



Dimensions in Millimeters

**The length**

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



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### 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	31mm*10mm	$\pm 0.5$ mm

### 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.

### ● Order Information

Part Number	Product Description
OPQCTx-AOC	40Gb/s QSFP+ Active Optical Cable

#### Notes:

where "x" denotes cable length in meters. Examples are as follows:

$x = 3$  for 3m,  $x = 10$  for 10m,  $x = 50$  for 50m,  $x = A0$  for 100m

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