

## Product Specification

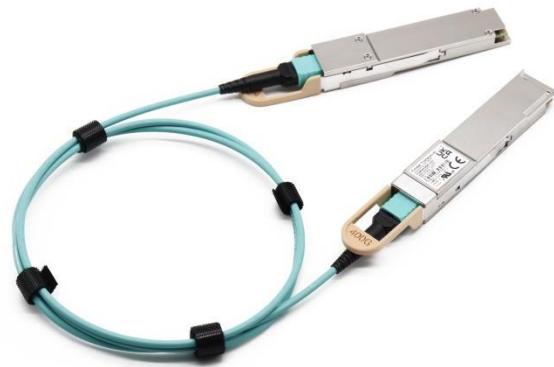
### 400G QSFP112 Active Optical Cable

**FCBN4X0QE1Czz**

**FCBR4X0QE1Czz**

#### PRODUCT FEATURES

- Four-channel full-duplex active optical cable
- Signal rate: 106.25 Gb/s per channel
- QSFP112 high-density form factor
- Reliable VCSEL array technology using multimode fiber
- OFNP or LSZH cable options
- Hot Pluggable
- Low power dissipation: <8W per end
- Commercial operating case temperature range: 0°C to 70°C
- RoHS-6 Compliant. Compliant to RoHS Directive 2011/65/EU



#### APPLICATIONS

- 400G Ethernet

#### PRODUCT SELECTION (Standard Lengths\*)

**FCBy4X0QE1Czz**

Y=cable type: R or N (R=OFNR/LSZH, N=OFNP)

zz	Length (meter)	zz	Length (meter)	zz	Length (meter)	zz	Length (meter)	zz	Length (meter)	zz	Length (meter)	zz	Length (meter)
01	1	08	8	15	15	22	22	29	29	34	34	48	48
02	2	09	9	16	16	23	23	30	30	36	36	50	50
03	3	10	10	17	17	24	24	P5	0.5	38	38	60	60
04	4	11	11	18	18	25	25	A5	1.5	40	40	70	70
05	5	12	12	19	19	26	26	B5	2.5	42	42	80	80
06	6	13	13	20	20	27	27	C5	3.5	44	44	90	90
07	7	14	14	21	21	28	28	32	32	46	46	X0	100

\*For availability of additional cable lengths or cable types, please contact Coherent.

I. Pin Descriptions

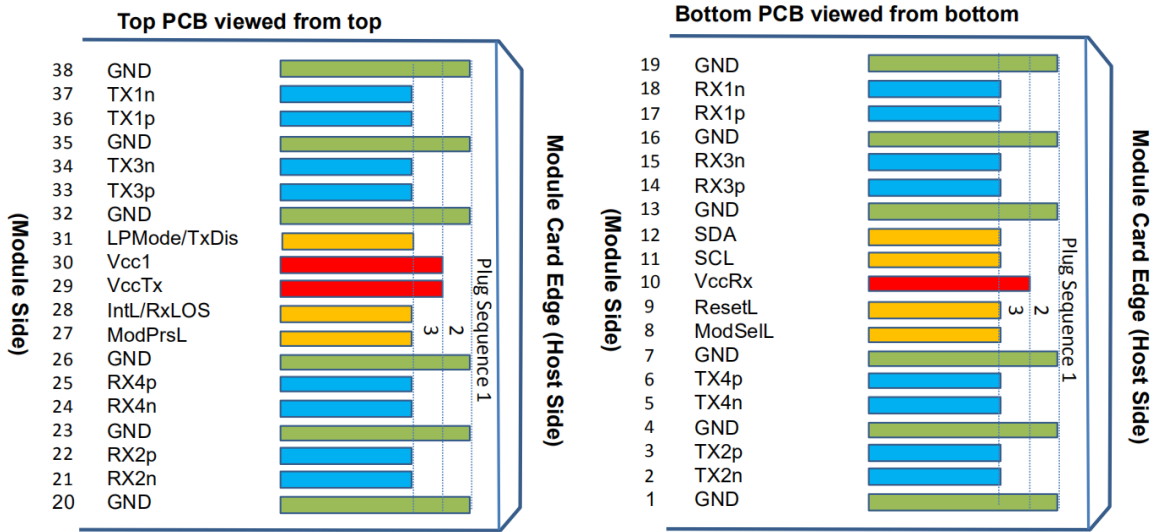


Figure 1 – QSFP112-compliant 38-pin connector

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	+3.3 V 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/RxLOSL	Interrupt/optional RxLOS	
29	Vcc Tx	+3.3 V Power Supply Transmitter	
30	Vcc1	+3.3 V Power Supply	
31	LPMoDe/TxDis	Low Power mode/optional TX Disable	
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

#### Notes

1. Circuit ground is internally isolated from chassis ground.

## II. General Product Characteristics

Parameter	Value	Unit	Notes
Module Form Factor	QSFP112		
Number of Lanes	4 Tx and 4 Rx		
Maximum Aggregate Data Rate	425	Gb/s	
Maximum Data Rate per Lane	106.25	Gb/s	
Standard Cable Lengths	1, 3, 5, 10, 15, 20, 30	meters	Other lengths may be available upon request
Protocols Supported	Typical applications include 400G Ethernet		
Electrical Interface and Pin-out	38-pin edge connector		Pin-out as defined by QSFP112 Hardware Specification
Standard Optical Cable Type	Multimode fiber cable		OFNP or OFNR/LSZH
Maximum Power Consumption per End	8	Watts	Varies with output voltage swing and pre-emphasis settings
Management Interface	CMIS-Rev5		Serial, I2C-based, 400 kHz maximum frequency

Data Rate Specifications	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate per Lane	BR			106.25	Gb/sec	1
Pre-FEC Bit Error Ratio	BER			$2.4 \times 10^{-4}$		2
Post-FEC Bit Error Ratio	BER			$10^{-12}$		2, 3

### Notes:

1. Supports 400 Gigabit Ethernet applications.
2. Tested with a PRBSQ  $2^{31}-1$  test pattern.
3. Assumes FEC provided by host system.

### III. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc1, VccTx, VccRx	-0.5		3.6	V	
Storage Temperature	T <sub>S</sub>	-40		85	°C	1
Case Operating Temperature	T <sub>OP</sub>	0		70	°C	
Relative Humidity	RH	5		85	%	2

#### Notes:

1. Assumes no mechanical load force on the unit. Ensuring no mechanical load force requires a cable bend radius of >70 mm.
2. Non-condensing.

### IV. Electrical Characteristics (T<sub>OP</sub> = 0 to 70°C, V<sub>CC</sub> = 3.3 ± 5% Volts)

The 400G QSFP112 Active Optical Cables requires an electrical connector compliant with QSFP112 Hardware Specification be used on the host board to guarantee its electrical interface specification.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc1, VccTx, VccRx	3.135		3.465	V	
Supply Current per 400G end	I <sub>cc</sub>			2.55	A	
Power Dissipation per 400G end	P			8	W	1, 2
<b>Input electrical specifications (per Lane)</b>						
Signaling rate per lane		53.125 ± 100ppm			Gbd	
Differential pk-pk voltage tolerance		750			mV	
Differential termination mismatch				10	%	
Single-ended voltage tolerance range		-0.4		3.3	V	
DC common-mode voltage tolerance		-0.35		2.85	V	

Output electrical specifications (per Lane)						
Signaling rate per lane		53.125 ± 100ppm			Gbd	
Differential peak-to-peak output voltage (Short mode)				600	mV	
Differential peak-to-peak output voltage (Long mode)				845	mV	
Transition time (20% to 80%)	$t_r, t_f$	8.5			ps	
Eye height	EH			15	mV	
Vertical eye closure,	VEC			12	dB	
Differential termination mismatch				10	%	
DC common-mode voltage tolerance		-0.35		2.85	V	

**Notes:**

1. Maximum total power value is specified across the full operational temperature and voltage range when CDRs are locked or a lack of input signal results in squelch being activated.
2. Settable in various discrete steps via the I2C interface.

**V. Memory Map and Control Registers**

Compatible with CMIS-rev5.2 .

Digital diagnostic specification table

Parameter	Symbol	Min	Max	Units	Notes
Temperature monitor	DMI_Temp	-3	3	°C	Over operating temp
TX power monitor	DMI_TX	-3	3	dB	
RX power monitor	DMI_RX	-3	3	dB	
Supply voltage monitor	DMI_VCC	-0.1	0.1	V	Full operating range

**VI. Environmental Specifications**

Coherent 400G QSFP112 Active Optical Cables have an operating temperature range from 0°C to +70°C case temperature.

Environmental Specifications	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T <sub>op</sub>	0		70	°C	
Storage Temperature	T <sub>sto</sub>	-40		85	°C	1

Notes:

1. Assumes no mechanical load force on the unit. Ensuring no mechanical load force requires a cable bend radius of >70 mm.

## VII. Regulatory Compliance

Coherent QSFP112 Active Optical Cables are RoHS-6 Compliant. Copies of certificates to be available at Coherent upon request.

Coherent QSFP112 Active Optical Cables are Class 1 laser eye safety compliant per IEC 60825-1.

Standard fiber cable type is OFNP cable . Other cable types can be supported upon request such as OFNR/LSZH.

## VIII. Mechanical Specifications

Coherent 400G QSFP112 Active Optical Cables mechanical specifications are compliant with the QSFP112 Hardware Specification.

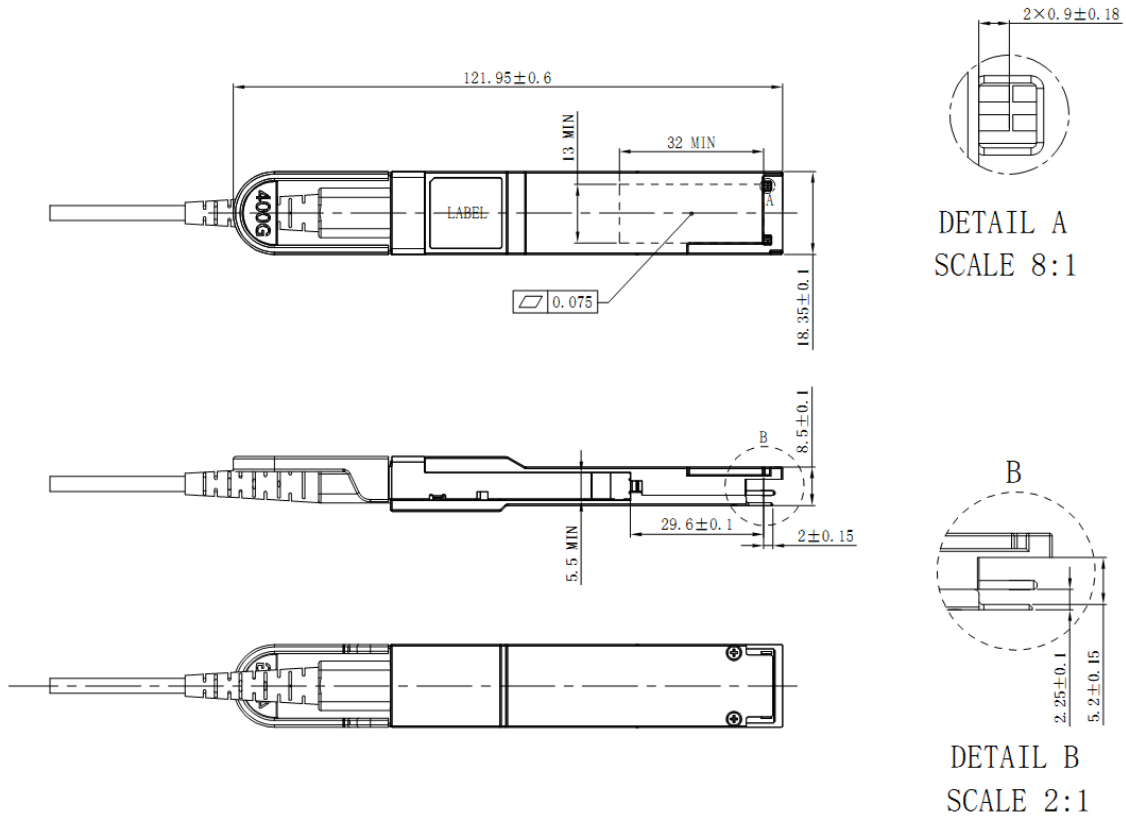


Figure 3 – 400G QSFP112 AOC mechanical drawing

Standard Product Insertion, Extraction and Retention Forces	Min	Max	Units	Notes
Cable Proof (Tensile) Test (0°)		44.0	Newtons	
Cable Proof (Tensile) Test (90°)		33.0	Newtons	
Impact		8	Cycles	1.5m drop
Flex		8.9	Newtons	
Twist		13.0	Newtons	
Module retention	90	N/A	Newtons	No damage below 90N
Host Connector Retention	180	N/A	Newtons	No damage below 180N



## Connectivity Schematic Table

A End	B End
TX1	RX1
RX1	TX1
TX2	RX2
RX2	TX2
TX3	RX3
RX3	TX3
TX4	RX4
RX4	TX4

**IX. References**

1. QSFP-DD/QSFP-DD800/QSFP112 Hardware Specification for QSFP DOUBLE DENSITY 8X AND QSFP 4X PLUGGABLE TRANSCEIVERS, Rev 6.3, July 26, 2022.
2. Common Management Interface Specification (CMIS) , Rev 5.2, April 27, 2022.
3. “400GCAUI-4” Retimed 4x100G electrical interface, to be defined by IEEE 802.3ck
4. Directive 2011/65/EU of the European Council Parliament and of the Council, “on the restriction of the use of certain hazardous substances in electrical and electronic equipment.” Certain products may use one or more exemptions as allowed by the Directive.
5. Application Note AN-2038: “Coherent Implementation of RoHS Compliant Transceivers”.

**X. For More Information**

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