

Preliminary Product Specification**200G QSFP56****Breakout Active Optical Cable****FCBR350QE2Cyy****FCBN350QE2Cyy****PRODUCT FEATURES**

- 200G QSFP56 breaking out to 2x 100G QSFP56 (half-populated)
- Four-channel parallel active optical cable
- Multirate capability: up to 53.125 Gb/s PAM4 or 26.5625 Gb/s NRZ per channel
- 4x50G PAM4 retimed 200GAUI-4 electrical interface (half populated on the 100G ends)
- Reliable VCSEL array technology using multimode fiber
- Low power dissipation: <4.5W per cable end
- Single 3.3V power supply
- Commercial operating case temperature range: 0°C to 70°C
- RoHS Compliant
- SFF-8636 compliant management interface

**APPLICATIONS**

- 200G Ethernet
- InfiniBand HDR

PRODUCT SELECTION (Standard Lengths*)**FCB_x350QE2Cyy**

x: N for OFNP cable; R for OFNR/LSZH cable

C: Commercial temperature range

yy: Cable length not longer than 30 meters (yy=01...03...05...10...15..20...25...30)

** Pls. Contact Coherent if any special requirements

I. Pin Descriptions

QSFP56 pin-out as being defined by QSFP MSA¹.

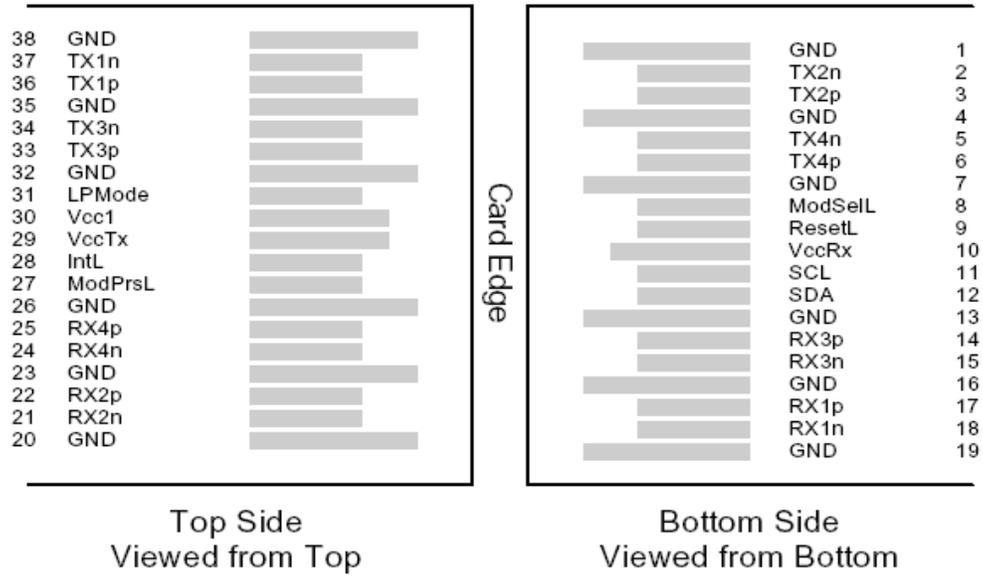


Figure 1 – QSFP-compliant 38-pin connector (per SFF-8679)

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	Interrupt	
29	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc1	+3.3 V Power Supply	
31	LPMODE	Low Power Mode	
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. Absolute Maximum Ratings

Module performance is not guaranteed beyond the operating range (see Section V). Exceeding the limits below may damage the transceiver module permanently.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		4.0	V	
Storage Temperature	T _S	-40		+85	°C	1
Case Operating Temperature	T _{OP}	0		+70	°C	
Relative Humidity	RH	15		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 on the rest of the cable.
2. Non-condensing.

III. Electrical Characteristics (EOL, T_{OP} = 0 to +70 °C, V_{CC} = 3.135 to 3.465 Volts)

NOTE: The Active Optical Cable requires an electrical connector compliant with the QSFP MSA be used on the host board to guarantee its electrical interface specification. Please check with your connector supplier.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.135	3.3	3.465	V	
Supply Current	Icc			1.59	A	
Module total power	P			4.5	W	1
Transmitter						
Signaling rate per lane		26.5625± 100 ppm.			Gbd	
AC common mode input voltage tolerance (RMS)				20	mV	
Differential input return loss		Per Eq.27			dB	2
Differential to common mode reflection		Per Eq.28			dB	2
Eye Height tolerance, with TX CDR enabled.				32	mV	3
Eye Width tolerance, with TX CDR enabled.				0.2	UI	3

DC common mode input voltage Tolerance		-350		2850	mV	4
Receiver						
Signaling rate per lane		26.5625± 100 ppm.			Gbd	
Bit error rate				9E-6		
AC common-mode output voltage (RMS)				20	mV	
Differential unsigned output voltage		450			mV	5
Near-end ESMW (Eye symmetry mask width)		0.265			UI	6
Near-end Eye height, differential		70			mV	
Far-end ESMW (Eye symmetry mask width)		0.2			UI	
Far-end Eye height, differential		30			mV	
Far-end pre-cursor ISI ratio		-7		4	%	
Common mode output return loss		-2			dB	
Differential output return loss		Per Eq.27			dB	2
Common mode to differential reflection		Per Eq.28			dB	2
Differential termination mismatch				10	%	
Transition time (20% to 80%)		9.5			ps	7
DC common mode voltage (min)		-350		2850	mV	4

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. Ref: InfiniBand™ Architecture Specification Volume 2 Release 1.4.
3. Ref: CEI-04 16.3.10.3.1.2
4. Referred to Signal Ground.
5. Hit Ratio=5E-5 with 100Ohm load.
6. Ref: 802.3 120E.4.2
7. PRBS13Q, see 120E.3.1.5 for positions in the pattern

$$S_{DDxx}(f) \leq \left(-11, 0.05 \leq f < 26.5625/7.5 \right) \left(-6.0 + 9.2 \cdot \log_{10} \left(\frac{15 \cdot f}{7 \cdot 26.5625} \right), 26.5625/7.5 \leq f \leq 26.5 \right) \quad \text{Eq. 27}$$

$$S_{CD11}, S_{DC22}(f) \leq \left(-25 + 20 \left(\frac{f}{26.5625} \right), 0.05 \leq f < 26.5625/2 \right) \left(-18 + 6 \left(\frac{f}{26.5625} \right), 26.5625/2 \leq f < 26.5 \right) \quad \text{Eq. 28}$$

IV. General Specifications

Parameter	Value	Unit	Notes
Module Form Factor	QSFP		As defined by QSFP MSA
Number of Lanes	4 Tx and 4 Rx		
Maximum Aggregate Data Rate	212.5	Gb/s	
Maximum Data Rate per Lane	26.5625 ± 100 ppm	GBd	
Standard Cable Lengths	3, 5, 10, 15, 20, 30	meters	Other lengths may be available upon request
Protocols supported	Ethernet/HDR Infiniband		
Electrical Interface and Pin-out	200GAUI-4		Pin-out as defined by QSFP MSA

Standard Optical Cable Type	Multimode round fiber cable		Two options available: OFNR and Low Smoke Zero Halogen (LSZH), or OFNP
Maximum Power Consumption per End	5 (retimed Tx)	Watts	Maximum total power value is specified across the full temperature and voltage range
Management Interface	SFF-8636		Serial, I2C-based, 1 MHz maximum frequency

Data Rate Specifications	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate per Lane	BR	26.5625 ± 100 ppm			GBd	1
Pre-FEC Bit Error Ratio	BER			10 ⁻⁶		2

Notes:

1. Supports Infiniband HDR
2. Tested with a PRBS 2³¹-1 test pattern.

V. Environmental Specifications

Coherent FCBx350QE2Cyy QSFP56 Breakout Active Optical Cables have an operating case temperature range of 0°C to +70°C.

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T _{op}	0		+70	°C	
Storage Temperature	T _{sto}	-40		+85	°C	1

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

VI. Regulatory Compliance

Coherent FCBx350QE2Cyy QSFP56 Active Optical Cables are RoHS compliant. Copies of certificates are available from Coherent upon request.

Coherent FCBx350QE2Cyy QSFP56 Active Optical Cables are Class 1 Laser Products. They are certified per the following standards:

Feature	Agency	Standard
Laser Eye Safety	FDA/CDRH	CDRH 21 CFR 1040 and Laser Notice 50
Laser Eye Safety	TÜV	EN 60825-1: 2007 IEC 60825-2: 2004+A1+A2
Electrical Safety	TÜV	EN 60950
Electrical Safety	UL/CSA	CLASS 3862.07 CLASS 3862.87

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

Either round-section construction LSZH, riser-rated or round-section construction, plenum-rated cable is alternative for Coherent FCBx350QE2Cyy QSFP56 Active Optical Cables.

VII. Memory Map

Compatible with SFF-8636.

VIII. Mechanical Specifications

Coherent FCBx350QE2Cyy QSFP56 Active Optical Cables are compatible with the QSFP MSA for pluggable form factor modules.

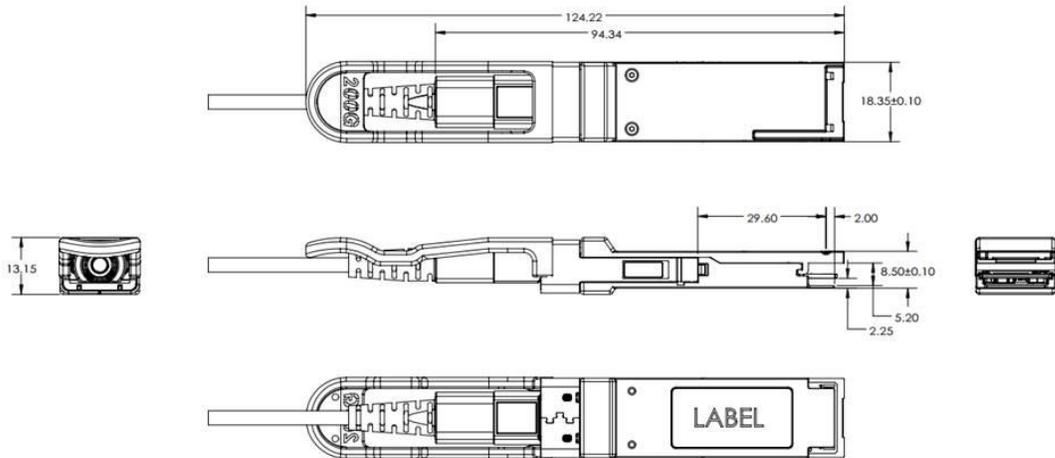
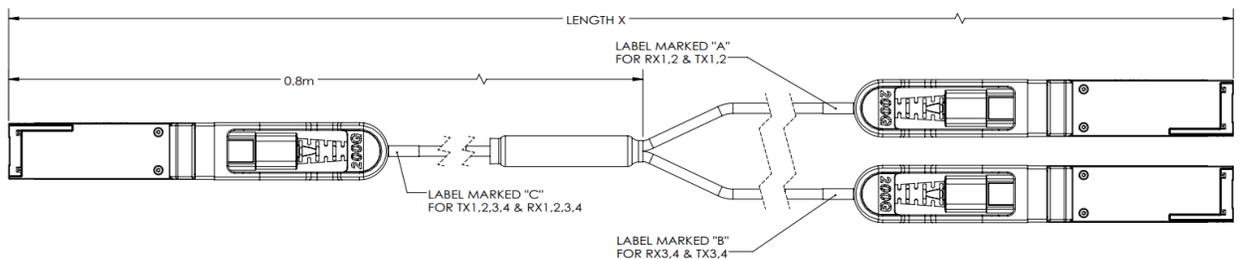


Figure 2. Module Mechanical Dimensions



Mark "C"	Fiber	Mark "A"	Mark "B"
RX1	8	TX4	TX3
RX2	7	TX2	TX4
RX3	6	-	-
RX4	5	-	-
-	Fake Fiber	-	-
-	Fake Fiber	-	-
-	Fake Fiber	-	-
-	Fake Fiber	-	-
TX4	4	-	-
TX3	3	-	-
TX2	2	RX2	RX4
TX1	1	RX1	RX3

Figure 3. Active Optical Cable Dimensions

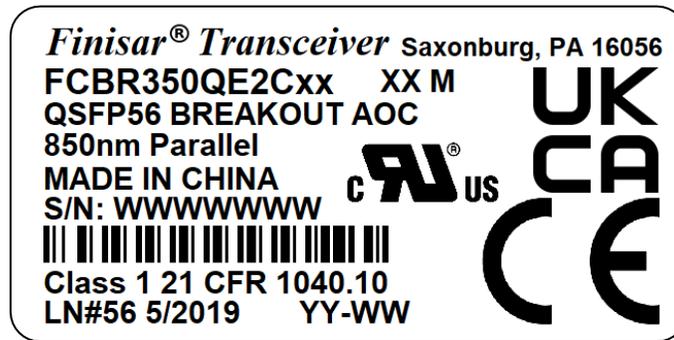


Figure 4. Product Label

IX. References

1. SFF-8665: “QSFP+ 28Gb/s 4X Pluggable Transceiver Solution (QSFP28)”, Rev 1.9, June 29, 2015 and associated SFF documents referenced therein:
 - i. SFF-8636
 - ii. SFF-8661
 - iii. SFF-8662
 - iv. SFF-8663
 - v. SFF-8672
 - vi. SFF-8679
2. 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” as well as Commission Delegated Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU. Certain products may use one or more exemptions as allowed by the Directive.
3. Application Note AN-2038: “Coherent Implementation of RoHS Compliant Transceivers”.
4. InfiniBand[™] Architecture Specification Volume 2 Release 1.4.

X. For More Information

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