

400G OSFP to 2x200G QSFP56 AOC Breakout Cable

QSFP28 Series



- **400Gb/s to 2x200Gb/s data rate**
- **OSFP head end is CMIS 4.0 compliant**
- **4.5W Max power consumption for QSFP56 ends**
- **Single 3.3V power supply**
- **Hot pluggable**
- **SFF-8636 compliant I2C management interface**
- **RoHS Compliant Part**

Ascent's 400G OSFP product is an OSFP to 2x QSFP56, 400Gb/s to 2 x 200Gb/s Active Optical Breakout Cable (AOC) designed for connecting Mellanox NDR switch with OSFP cage to legacy 2 Mellanox HDR switch/HCA QSFP56 cages.

The cable is compliant with SFF-8665 for the QSFP56 pluggable solution. It provides connectivity between system units with a OSFP 400Gb/s connector on one side and two separate QSFP56 200Gb/s connectors on the other side, such as a switch and two servers.

The cable connects data signals from each of the 8 MMF (Multi Mode Fiber) pairs on the single OSFP end to the four pairs of each of the QSFP56 multiport ends. It supports 53.125Gb/s per channel.

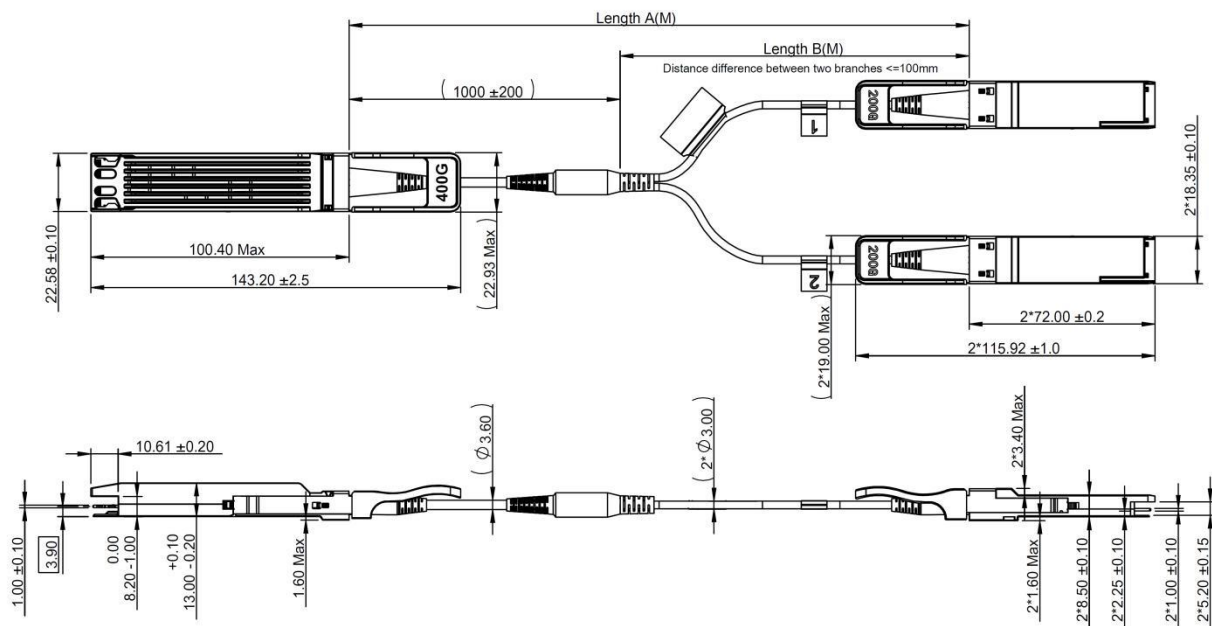
Ascent's active fiber cable solutions provide power-efficient connectivity for data center interconnects. It enables higher port bandwidth, density and configurability at a low cost, and reduced power requirement in the data centers. four-channel full-duplex active optical cable. The OSFP cable has low power dissipation and 8x50g PAM VCSEL/PIN photo detector. Its operating case temperature is 0°C~70°C.

This breakout cable is compliant with IEEE802.3cd , QSFP56 and OSFP end of the cable comprises an EEPROM providing product and status monitoring information, which can be read by the host system.

Key Features

- 400Gb/s to 2x200Gb/s data rate
- Programmable Rx output amplitude and pre-emphasis
- OSFP head end is CMIS 4.0 compliant
- QSFP56 ends are SFF-8665 compliant
- 4.5W Max power consumption for QSFP56 ends
- 14W Max power consumption for the OSFP head end
- Single 3.3V power supply
- Hot pluggable
- RoHS compliant
- SFF-8636 compliant I2C management interface

Outline Diagram



Cable Breakout point

Total Length(m)	Breakout*2*200G(m)
1	0.5
2	0.5
3	1
5	2
7	3
10	3
X (X>10)	3

Control Signals (OSFP)

This AOC has CMIS 4.0 (check for update, e.g. to CMIS 5) compliant management interface and OSFP 4.1 (check for update) compliant form factor and interfaces. This implies that the control signals shown in the pad layout are implemented with the following functions:

Name	Function	Description
LPWn/PRSn	Input/output	Multi-level signal for low power control from host to module and module presence indication from module to host. This signal requires the circuit as described in the OSFP Specification [].
INT/RSTn	Input,/output	Multi-level signal for interrupt request from module to host and reset control from host to module. This signal requires the circuit as described in the OSFP Specification [].
SCL	BiDir	2-wire serial clock signal. Requires pull-up resistor to 3.3V on host.
SDA	Bidir	2-wire serial data signal. Requires pull-up resistor to 3.3V on host.

Control Signals (QSFP)

This AOC is SFF-8636 compliant. This means that the control signals shown in the pad layout support the following :

Name	Function	Description
ModPrsL	Output	Module Present pin, grounded inside the module. Terminated with pull-up in the host system. Asserted low when the transceiver is inserted, whereby the host detects the presence of the transceiver.
ModSelL	Input	Module Select, terminated high in the module. Only when held low by the host, the module responds to 2-wire serial communication commands. The ModSelL enables multiple modules to share a single 2-wire interface bus.
ResetL	Input	Reset, pulled high in the module. A low level on the ResetL pin for longer than the minimum pulse length ($t_{\text{Reset_init}}$) initiates a complete module reset, returning all user module settings to their default state. During reset the host shall disregard all status bits until the module indicates completion of the reset interrupt by asserting IntL signal low with the Data_Not_Ready bit negated. Note that on power up (including hot insertion) the module completes the reset interrupt without requiring a reset.
LPMode	Input	Low Power Mode input, pulled up inside the module. The transceiver starts up in low power mode, i.e. <1.5 W with the two-wire interface active. The host system can read the power class declaration from the transceiver and determine if it has enough power to enable the high-speed operation/high power mode of the transceiver. This can be done by asserting LPMode low or by use of the Power_override and Power_set control bits (Address A0h, byte 93 bits 0,1).
IntL	OC output	Interrupt Low, terminated high in the host system. A "Low" indicates a possible module operational fault or a status critical to the host system, e.g. temperature alarm. The host identifies the source of the interrupt using the 2-wire serial interface. The INTL pin is de-asserted "High" after completion of reset, when byte 2 bit 0 (Data Not Ready) is read with a value of '0'.
SCL	BiDir	2-wire serial clock signal. Requires pull-up resistor to 3.3V on host.
SDA	Bidir	2-wire serial data signal. Requires pull-up resistor to 3.3V on host.
SDA	Bidir	2-wire serial data signal. Requires pull-up resistor to 3.3V on host.

Note: The low-speed signals are Low Voltage TTL (LVTTTL) compliant (except for SCL and SDA signals).

Diagnostics and Other Features

The AOC complies with the SFF-8665 specification and has the following key features: Physical layer link optimization:

- Programmable Tx input equalization
- Programmable Rx output amplitude
- Programmable Rx output pre-emphasis
- Tx/Rx CDR control by default enabled for 100 GbE operation, disable it for 40G operation

Digital Diagnostic Monitoring (DDM):

- Rx receive optical power monitor for each lane
- Tx transmit optical power monitor for each lane
- Tx bias current monitor for each lane
- Supply voltage monitor
- Transceiver case temperature monitor
- Warning and Alarm thresholds for each DDM function (not user changeable)

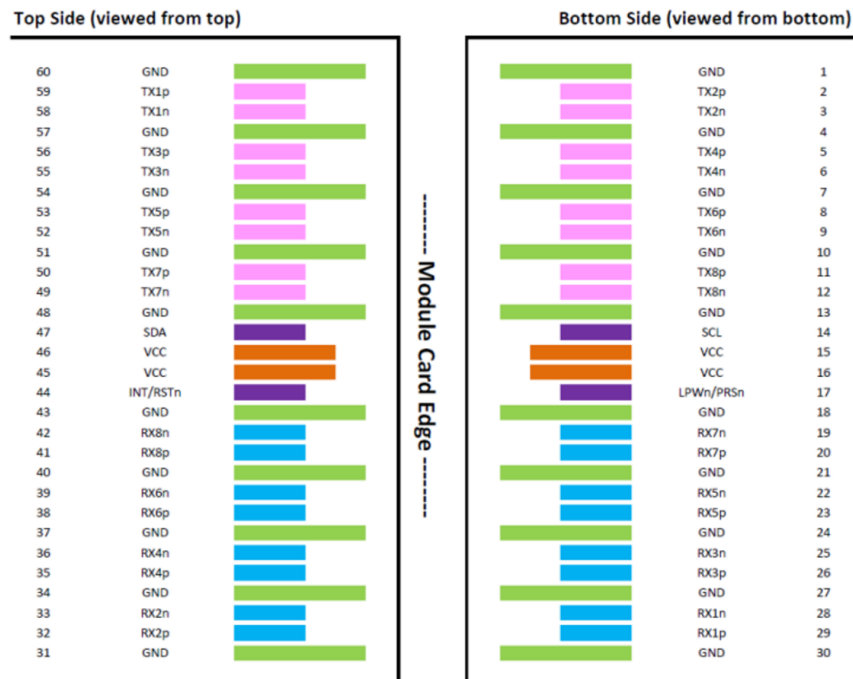
Other SFF-8636 functions and interrupt indications:

- Tx & Rx LOS indication
- Tx & Rx LOL indication
- Tx fault indication

LOS, LOL, and Tx Fault status flags can be read via the two-wire management interface and are jointly transmitted via the IntL output pin. Relevant advertisement, threshold, and readout registers are found in the SFF-8636 MSA.

Pin Assignment

OSFP END

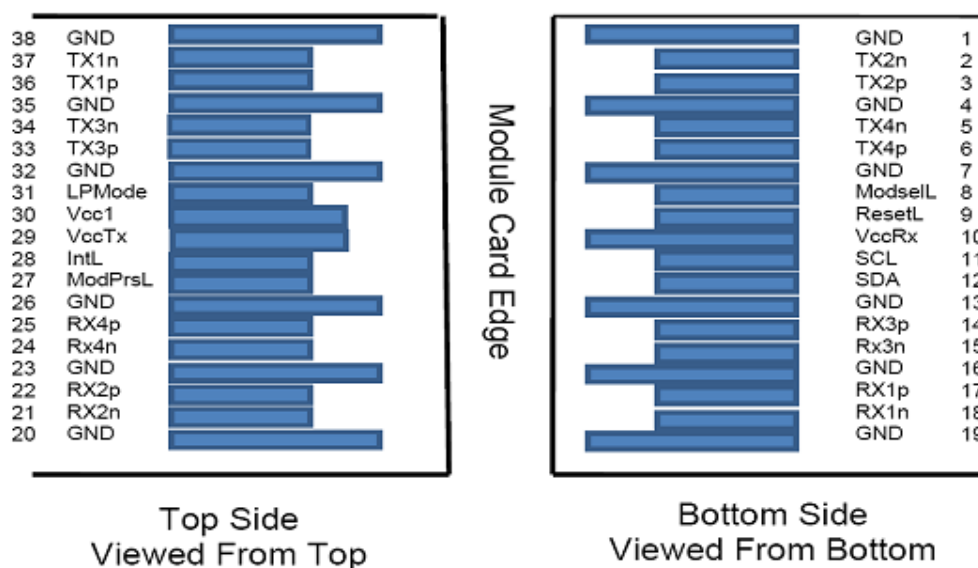


The AOC is OSFP MSA Specification for OSFP Octal Small Form Factor Pluggable Module Rev. 1.12 compliant, see www.osfpmsa.org.

Pin	Symbol	Description
1	GND	Ground
2	Tx2p	Transmitter Non-Inverted Data Input
3	Tx2n	Transmitter Inverted Data Input
4	GND	Ground
5	Tx4p	Transmitter Non-Inverted Data Input
6	Tx4n	Transmitter Inverted Data Input
7	GND	Ground
8	Tx6p	Transmitter Non-Inverted Data Input
9	Tx6n	Transmitter Inverted Data Input
10	GND	Ground
11	Tx8p	Transmitter Non-Inverted Data input
12	Tx8n	Transmitter Inverted Data Input
13	GND	Ground
14	SCL	2-wire serial interface clock
15	Vcc	+3.3V Power
16	Vcc	+3.3V Power

Pin	Symbol	Description
17	LPWn / PRSn	Low-Power Mode / Module Present
18	GND	Ground
19	Rx7n	Receiver Inverted Data Output
20	Rx7p	Receiver Non-Inverted Data Output
21	GND	Ground
22	Rx5n	Receiver Inverted Data Output
23	Rx5p	Receiver Non-Inverted Data Output
24	GND	Ground
25	Rx3n	Receiver Inverted Data Output
26	Rx3p	Receiver Non-Inverted Data Output
27	GND	Ground
28	Rx1n	Receiver Inverted Data Output
29	Rx1p	Receiver Non-Inverted Data Output
30	GND	Ground
31	GND	Ground
32	Rx2p	Receiver Non-Inverted Data Output
33	Rx2n	Receiver Inverted Data Output
34	GND	Grounds
35	Rx4p	Receiver Non-Inverted Data Output
36	Rx4n	Receiver Inverted Data Output
37	GND	Ground
38	Rx6p	Receiver Non-Inverted Data Output
39	Rx6n	Receiver Inverted Data Output
40	GND	Ground
41	Rx8p	Receiver Non-Inverted Data Output
42	Rx8n	Receiver Inverted Data Output
43	GND	Ground
44	INT / RSTn	Module Interrupt / Module Reset
45	VCC	+3.3V Power
46	VCC	+3.3V Power
47	SDA	2-wire Serial interface data
48	GND	Ground
49	Tx7n	Transmitter Inverted Data Input

Pin	Symbol	Description
50	Tx7p	Transmitter Non-Inverted Data Input
51	GND	Ground
52	Tx5n	Transmitter Inverted Data Input
53	Tx5p	Transmitter Non-Inverted Data Input
54	GND	Ground
55	Tx3n	Transmitter Inverted Data Input
56	Tx3p	Transmitter Non-Inverted Data Input
57	GND	Ground
58	Tx1n	Transmitter Inverted Data Input
59	Tx1p	Transmitter Non-Inverted Data Input
60	GND	Ground

QSFP56 END

Pin	Symbol	Description
1	Ground	Ground
2	Tx2n	Connected to Port 1 lane Rx2 Inverted Data
3	Tx2p	Connected to Port 1 lane Rx2 Non-Inverted Data
4	Ground	Ground
5	Tx4n	Connected to Port 2 lane Rx2 Non-Inverted Data
6	Tx4p	Connected to Port 2 lane Rx2 Inverted Data
7	Ground	Ground
8	Mod-Sell	Cable Select
9	ResetL	Cable Reset

Pin	Symbol	Description
10	Vcc Rx	+3.3 V Power supply receiver
11	SCL	2-wire serial interface clock
12	SDA	2-wire serial interface data
13	Ground	Ground
14	Rx3p	Receiver Non-Inverted Data Output
15	Rx3n	Receiver Inverted Data Output
16	Ground	Ground
17	Rx1p	Receiver Non-Inverted Data Output
18	Rx1n	Receiver Inverted Data Output
19	Ground	Ground
20	Ground	Ground
21	Rx2n	Connected to Port 1 lane Tx2 Inverted Data
22	Rx2p	Connected to Port 1 lane Tx2 Non-Inverted Data
23	Ground	Grounds
24	Rx4n	Connected to Port 2 lane Tx2 Inverted Data
25	Rx4p	Connected to Port 2 lane Tx2 Non-Inverted Data
26	Ground	Ground
27	ModPrsL	Cable 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
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

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Operating Case Temperature	Top	0	+70	°C
Storage Temperature Range	Ts	-40	+85	°C
Relative Humidity	RH	0	85	%
Power Supply Voltage	Vcc	-0.5	+3.6	V

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Case Temperature Range	Tca	0	/	70	°C
Power Supply Voltage	Vcc	3.135	3.3	3.465	V

Optical Characteristics

This section shows the range of values for normal operation. The host board power supply filtering should be designed as recommended in the SFF Committee Spec.

Parameter	Min.	Typ.	Max.	Unit
Supply Voltage (Vcc)	3.135	3.3	3.465	V
Power Consumption 400Gb/s End	-	4.35	4.5	W
Power Consumption 400Gb/s End	-	13	14	W
Supply Noise Tolerance(10Hz to 10MHz)	66	-	-	mVpp
Operating Case Temperature	0	-	70	°C
Operating Relative Humidity	5	-	85	%

Electrical Characteristics

Parameter (per lane)	Min.	Typ.	Max.	Unit
Signaling Rate	-100 ppm	53.125	+100	Gbps
Differential Data Input Swing at TP1a	TBD		900	mVpp
Differential Data Output Swing at TP4	-	-	900	mVpp
Near-End ESMW	0.265	-	-	UI
Near-End Output Eye Height	70	-	-	mVpp
Output Transition Time, 20% to 80%	9.5	-	-	ps

Note:

1. Multiple clock domains are supported only on line-side Rx. Host side Rx supports a single clock domain only.
2. QSFP Tx CDR lock can only occur if Tx lane 4 is transmitting data.

Mechanical Characteristics

Parameter (per lane)	Min.		Unit
Diameter	3 +/-0.2		mm
Differential Data Input Swing at TP1a	TBD		mVpp
Length Tolerance	length < 5 m	+300 / -0	mm
Near-End ESMW	5 m ≤ length < 50	+500 / -0	mm
Near-End Output Eye Height	50 m ≤ length	+1000 / -0	mm
Cable Color	Aqua		-

Ordering Information

Product Name	Product Description
OSFP-2Q56-AOC-003	400G OSFP to 2x200G QSFP56 Active Optical Breakout Cable, IB twin port HDR, 3m (10ft)
OSFP-2Q56-AOC-005	400G OSFP to 2x200G QSFP56 Active Optical Breakout Cable, IB twin port HDR, 5m (16ft)
OSFP-2Q56-AOC-010	400G OSFP to 2x200G QSFP56 Active Optical Breakout Cable, IB twin port HDR, 10m (33ft)
OSFP-2Q56-AOC-015	400G OSFP to 2x200G QSFP56 Active Optical Breakout Cable, IB twin port HDR, 15m (49ft)
OSFP-2Q56-AOC-020	400G OSFP to 2x200G QSFP56 Active Optical Breakout Cable, IB twin port HDR, 20m (66ft)
OSFP-2Q56-AOC-030	400G OSFP to 2x200G QSFP56 Active Optical Breakout Cable, IB twin port HDR, 30m (98ft)

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