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200G QSFP56 Active Optical Cable (AOC)
Hot Pluggable, 850nm VCSEL, MMF 1~100M, DDM

Part Number: FAOC-B0G-Q6Q6-xxx-xx

Overview

FAOC-B0G-Q6Q6-xxx-xx 200G QSFP+ Active Optical Cables (AOC) are direct-attach fiber assemblies with QSFP56 form factor. The AOC utilize multi-mode fiber with 850nm VCSEL and PIN PD. It could be used as an alternative solution to QSFP56 passive and active copper cables, while providing improved signal integrity, longer distances, superior electro-magnetic immunity & better bit error rate performance. They are suitable for 1~100 meters distances and offer a cost-effective way for very high port density connections.

Applications

- 200GBASE-SR4 Ethernet
- 200Gb/s InfiniBand HDR
- Data Center & Storage
- Datacom / Telecom Switch & Router

Features

- Compliant with IEEE 802.3cd 200GBASE-SR4
- Compliant with SFF-8665 for QSFP56 port
- Compliant with SFF-8679 4x hardware and electrical specification
- Compliant with IBTA InfiniBand HDR
- 4 independent full-duplex channels
- Aggregate data rate 212.5Gbps
- Hot Pluggable
- 4x50G PAM4 VCSEL / PIN array
- 38-pin electrical edge connector
- CMIS4.0 management interface
- 2-wire interface for management and diagnostic monitor compliant with SFF-8636
- Single 3.3V power supply
- Link distance 100m over OM4 fiber and 70m over MM OM3 fiber
- Low Power Consumption <4.5W
- RoHS Compliant

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Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Storage Temperature	T_{ST}	-5	+75	°C
Storage Relative Humidity	RH	5	85	%
Supply Voltage	V_{CC}	-0.5	+3.6	V

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	T_{OP}	0	-	+70	°C	
Supply Voltage	V_{CC}	+3.13	+3.3	+3.47	V	
Bit Rate, per Lane	BR		26.5625		GBd	
Data Rate Accuracy	ΔDR	-100		+100	ppm	
Bit Error Rate (Pre-FEC)	BER			$2.4x10^{-4}$		1
Power Consumption, per QSFP56	P			4.5	W	
Power-On Initialization Time				2000	ms	2
Control Input Voltage High	V_{IH}	2		Vcc+0.3	V	
Control Input Voltage Low	V_{IL}	-0.3		0.8	V	
Control Output Voltage High	V_{OH}	2		Vcc+0.3	V	
Control Output Voltage Low	V_{OL}	-0.3		0.8	V	
Minimum Cable Bending Radius		30			mm	

Note1: Measured with a PRBS 2^{31}-1 test pattern @26.5625Gbd PAM4.

Note2: Power-on Initialization Time is the time from when the power supply voltages reach and remain above the minimum recommended operating supply voltages to the time when the module is fully functional.

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Transmitter Electro-optical Characteristics

V_{CC}= 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C

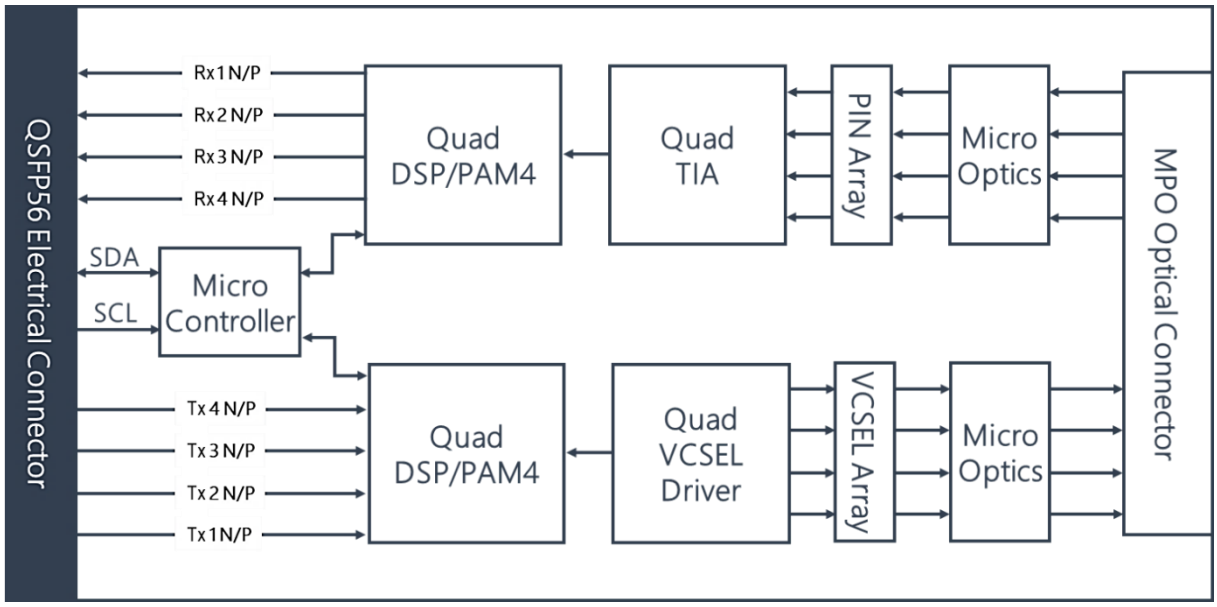
Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Average Launch Power, per Lane	P_{AVG}	-6.0		+4.0	dBm	
Optical Wavelength, each Lane	λc	840	850	860	nm	
Spectral Width (RMS)	Δλ			0.6	nm	
Optical Extinction Ratio	ER	3			dB	
Optical Return Loss Tolerance	ORLT			12	dB	
Differential Data Input Voltage	V_{IN-PP}	300		900	mVpp	
Common Mode Noise RMS				17.5	mV	
Common Mode Voltage		-0.4		3.3	V	
Differential termination mismatch				10	%	
DC common mode voltage		-350		2850	mV	

Receiver Electro-optical Characteristics

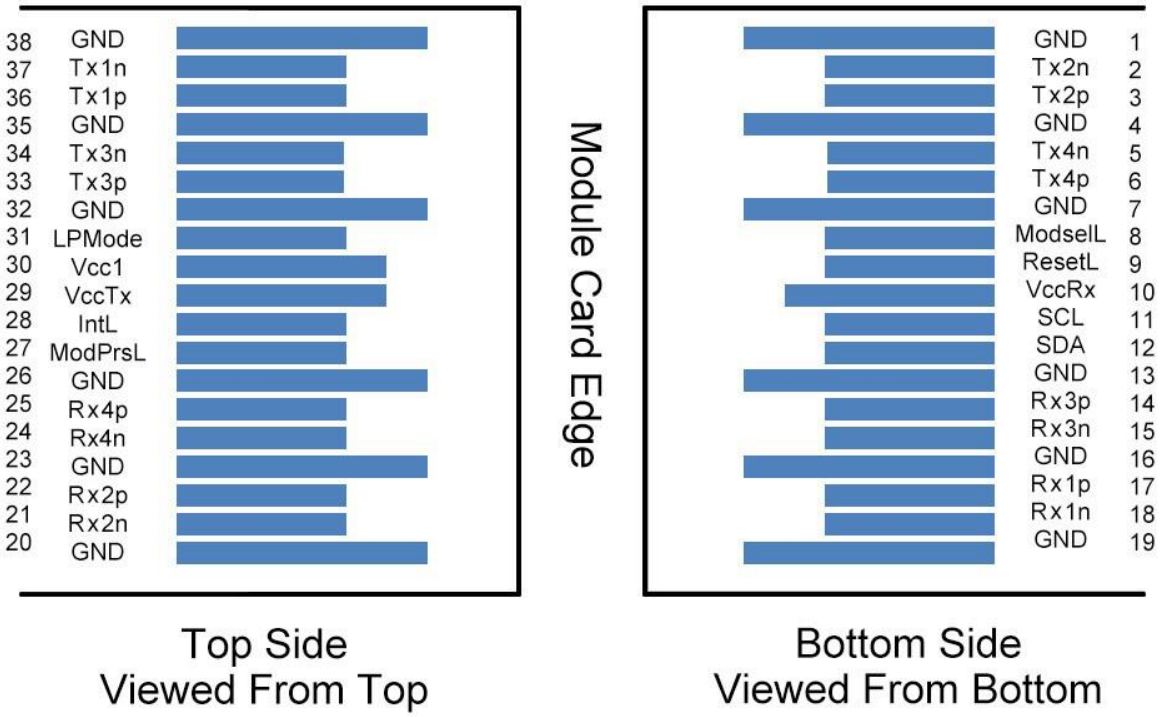
V_{CC} = 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Average Receive Power, per Lane	P_{Rx-AVG}	-7.9		+4.0	dBm	
Damage Threshold, per Lane	D_{TH}	+5.0			dBm	
Optical Wavelength, each Lane	λc	840	850	860	nm	
Receiver Reflectance	R_{Rx}			-12	dB	
Differential Data Output Voltage	V_{OUT-PP}	300		900	mVpp	
Differential termination mismatch				10	%	
Transition time (20% to 80%)	Tr, Tf	9.5			ps	
DC common mode voltage		-350		2850	mV	

Transceiver Block Diagram



Pin Assignment



Top Side
Viewed From Top

Bottom Side
Viewed From Bottom

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Pin Description

Pin	Logic	Name	Function / Description
1		GND	Module Ground
2	CML-I	Tx2n	Transmitter Inverted Data Input
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input
4		GND	Module Ground
5	CML-I	Tx4n	Transmitter Inverted Data Input
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input
7		GND	Module Ground
8	LVTLL-I	ModSelL	Module Select
9	LVTLL-I	ResetL	Module Reset
10		VccRx	+3.3V Power Supply Receiver
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data
13		GND	Module Ground
14	CML-O	Rx3p	Receiver Non-Inverted Data Output
15	CML-O	Rx3n	Receiver Inverted Data Output
16		GND	Module Ground
17	CML-O	Rx1p	Receiver Non-Inverted Data Output
18	CML-O	Rx1n	Receiver Inverted Data Output
19		GND	Module Ground
20		GND	Module Ground
21	CML-O	Rx2n	Receiver Inverted Data Output
22	CML-O	Rx2p	Receiver Non-Inverted Data Output
23		GND	Module Ground
24	CML-O	Rx4n	Receiver Inverted Data Output
25	CML-O	Rx4p	Receiver Non-Inverted Data Output
26		GND	Module Ground
27	LVTLL-O	ModPrsL	Module Present
28	LVTLL-O	IntL	Interrupt
29		VccTx	+3.3V Power Supply Transmitter
30		Vcc1	+3.3V Power Supply
31	LVTLL-I	LPMode	Low Power Mode
32		GND	Module Ground

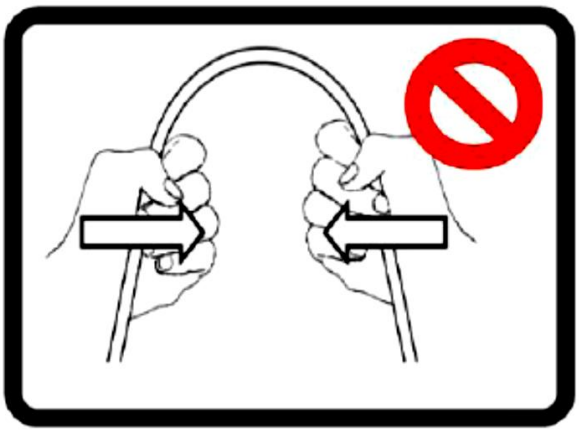
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input
34	CML-I	Tx3n	Transmitter Inverted Data Input
35		GND	Module Ground
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input
37	CML-I	Tx1n	Transmitter Inverted Data Input
38		GND	Module Ground

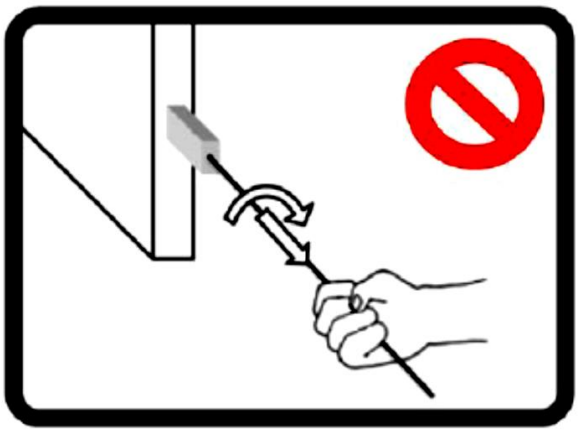
Note1: GND is the symbol for signal and supply (power) common for QSFP modules. All are common within the QSFP module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground lane.

Note2: VccRx, Vcc1 and VccTx are the receiver and transmitter power suppliers and shall be applied concurrently. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

Handling

Care should be taken to restrict exposure to the conditions defined in the Absolute Maximum Ratings and Recommended Operating Conditions. Put the product in an even and stable location. If the product falls down or drops, it may cause an injury or malfunction. The cable must not be subject to extreme bends during installation or while in operation. If you bend the cable at a radius less than the cable minimum bend radius, then the cable may get damaged. Don’t twist or pull by force ends of the cable, which might cause malfunction. In addition, the bending direction should be perpendicular to the flat surface of the ribbon cable. Please do not bend or kink the cable in lateral directions of flat surface of the ribbon.





Digital Diagnostic Functions

As defined by the QSFP MSA (SFF-8636), Ficer's QSFP56 transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current (4-Channel)
- Transmitted optical power (4-Channel)
- Received optical power (4-Channel)
- Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Controller (DDC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the QSFP56 transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the QSFP56 transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory.

For more detailed information including memory map definitions, please see the QSFP MSA Specification.

Digital Diagnostic Memory Map (compliant QSFP-DD Rev4.0 CMIS)

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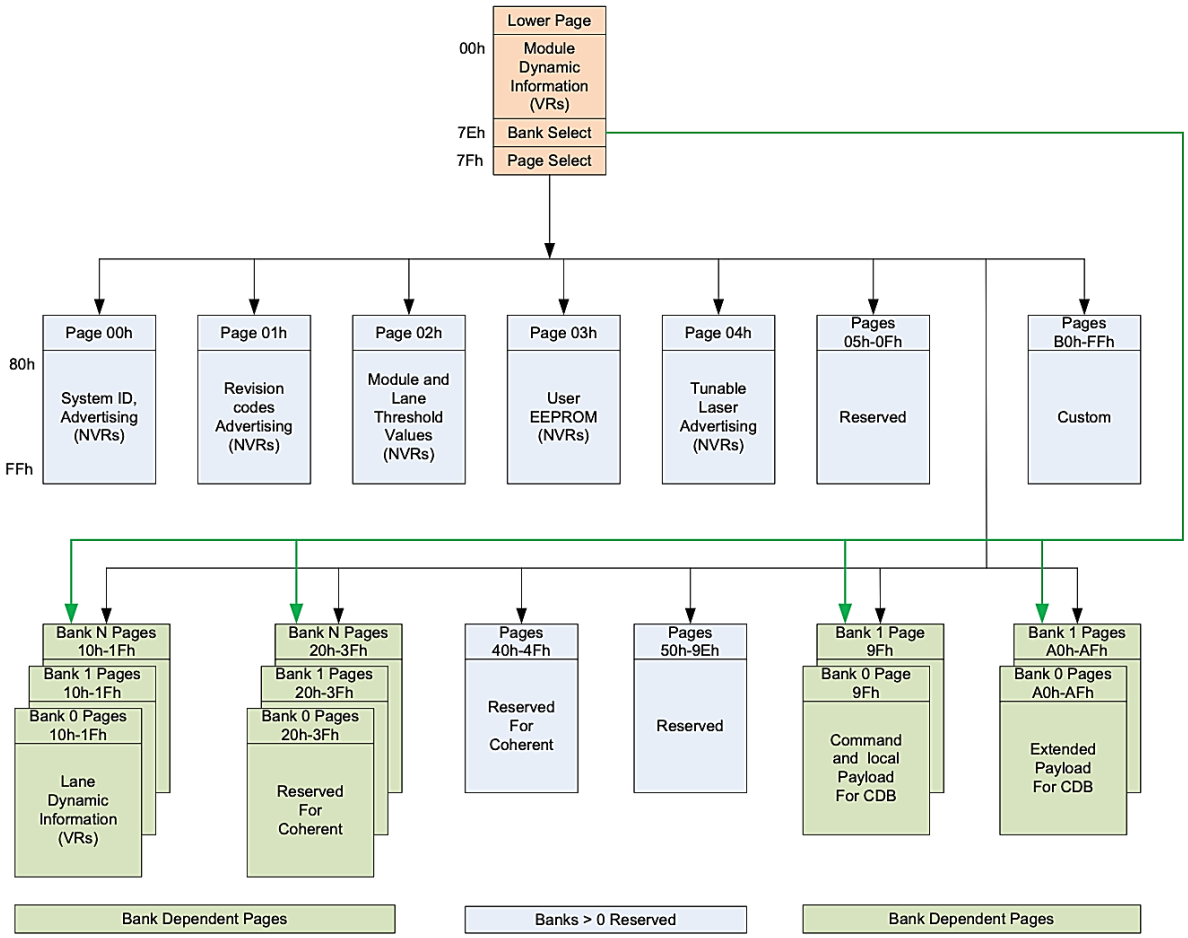
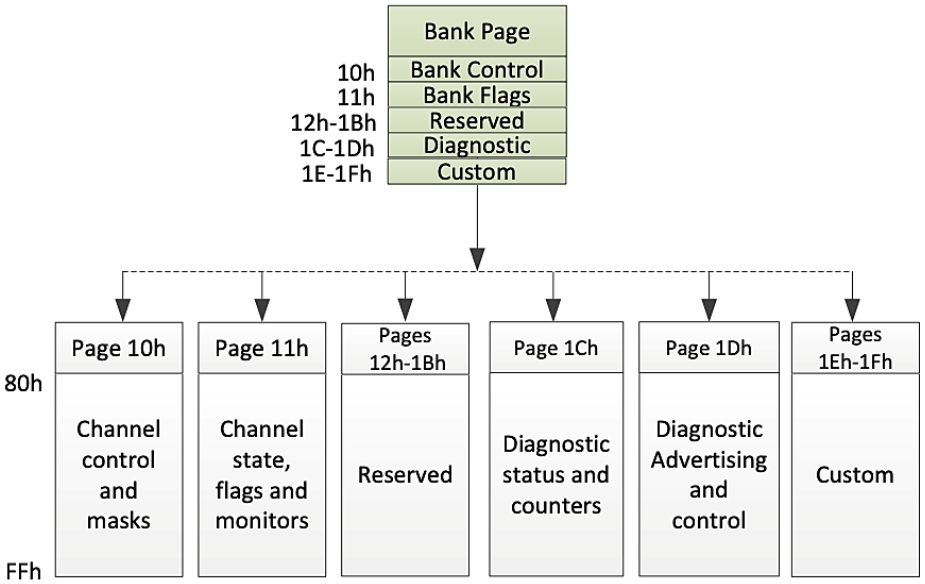
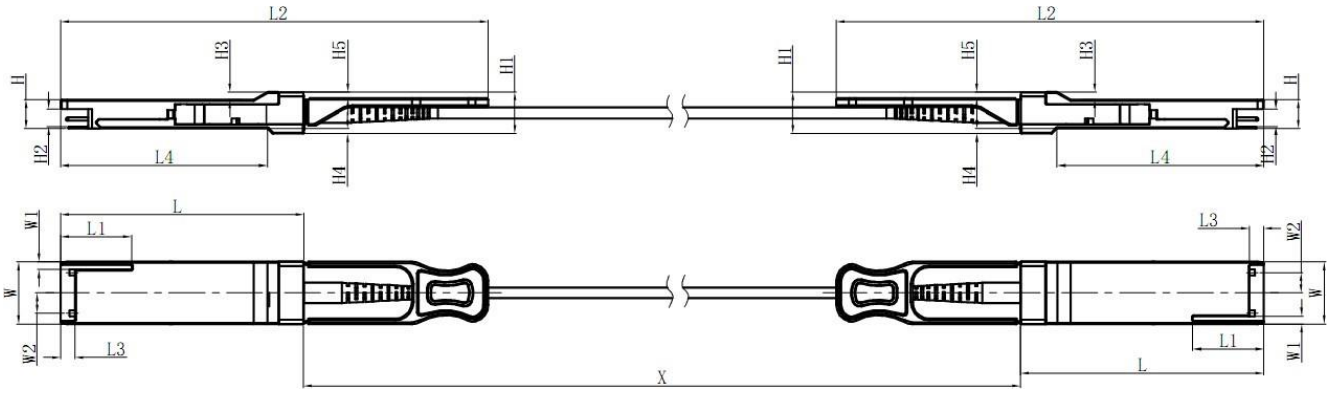

Lower Page
00h
Module Dynamic Information (VRs)
7Eh
Bank Select
7Fh
Page Select
80h
FFh
Page 00h
System ID, Advertising (NVRs)
Page 01h
Revision codes Advertising (NVRs)
Page 02h
Module and Lane Threshold Values (NVRs)
Page 03h
User EEPROM (NVRs)
Page 04h
Tunable Laser Advertising (NVRs)
Pages 05h-0Fh
Reserved
Pages B0h-FFh
Custom
Bank N Pages 10h-1Fh
Bank 1 Pages 10h-1Fh
Bank 0 Pages 10h-1Fh
Lane Dynamic Information (VRs)
Bank N Pages 20h-3Fh
Bank 1 Pages 20h-3Fh
Bank 0 Pages 20h-3Fh
Reserved For Coherent
Pages 40h-4Fh
Reserved For Coherent
Pages 50h-9Eh
Reserved
Bank 1 Page 9Fh
Bank 0 Page 9Fh
Command and local Payload For CDB
Bank 1 Pages A0h-AFh
Bank 0 Pages A0h-AFh
Extended Payload For CDB
Bank Dependent Pages
Banks > 0 Reserved
Bank Dependent Pages


Bank Page
10h
Bank Control
11h
Bank Flags
12h-1Bh
Reserved
1C-1Dh
Diagnostic
1E-1Fh
Custom
80h
FFh
Page 10h
Channel control and masks
Page 11h
Channel state, flags and monitors
Pages 12h-1Bh
Reserved
Page 1Ch
Diagnostic status and counters
Page 1Dh
Diagnostic Advertising and control
Pages 1Eh-1Fh
Custom

Mechanical Dimensions



	L	L1	L2	L3	L4	W	W1	W2	H	H1	H2	H3	H4	H5
Max	72.2	-	128	4.35	61.4	18.45	-	6.2	8.6	12.4	5.35	2.5	1.6	2.0
Typical	72.0	-	-	4.20	61.2	18.35	-	-	8.5	12.2	5.2	2.3	1.5	1.8
Min	68.8	16.5	124	4.05	61.0	18.25	2.2	5.8	8.4	12.0	5.05	2.1	1.3	1.6

(All Dimensions are ±0.20mm Unless Otherwise Specified, Unit: mm)

Cable Length (CL)	Tolerance
< 1m	+10 / -0cm
1 ~ 4.5m	+15 / -0cm
4.6m ~ 14.5m	+30 / -0cm
14.6m ~ 100m	+2% / -0cm

Ordering Information

FAOC-B0G-Q6Q6-□□□-L3

Cable Length

□□□meters (including QSFP56)

Example: 003=3m, 015=15m, 100=100m, 0X5=0.5m, 3X5=3.5m

Cable Jacket

P: PVC Q: OFNP
L: LSZH* (default)

Fiber Type

2: MM 50/125 OM2
3: MM 50/125 OM3* (default)
4: MM 50/125 OM4

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