40GBASE QSFP+ to 4 x SFP+ Active Optical Cable (AOC)

Application

- 40 Gigabit Ethernet
- Fibre channel applications
- High-performance computing clusters
- Servers, switches, storage and host card adapters
- Network Interference Cards (NICs)

Features

- Transmission data rate up to 10.3Gbit/s per channel
- Connector 1: QSFP+ (SFF-8436)
- Connector 2: 4 x SFP+ (SFF-8431)
- Cable Type: Active Optical Cable (AOC) Cable
- 850nm VCSEL transmitter, PIN photo-detector receiver, up to 300m on OM3 MMF
- Available lengths (in meters): 1, 2, 3, 4, 5....
- Hot pluggable
- Management interface and digital diagnostic monitoring(DDM) through I2C
- Support Rx output pre-emphasis
- Commercial temperature range (COM): 0~ 70 ° C
- Low power dissipation: less than 1.3W on QSFP+ end, less than 1W on SFP+ ends
- RoHS-6 compliant

Description

FS.COM 40GBASE QSFP+ to 4 x SFP+ Active Optical Cable is a 4 x 10 Gb/s parallel active optical cable for storage, data, and high-performance computing inter-connectivity. It transmits four separate streams of 10 Gb/s data over ribbon cables in a point-to-multipoint configuration. The cable contains a QSFP+ module on one end and four separate SFP+ modules at the other ends.

Based on FS.COM's proven VCSEL array technology and designed with MSA-compliant QSFP+ and SFP+ high-density connectors, these cables are compact, lightweight, and low power. With reaches up to 300 meters, the Fan-Out active optical cable is ideally suited for high-density 10G Ethernet, datacom and high-performance computing applications.

Products Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Maximum Supply Voltage	Vcc1, VccTx, VccRx	3.135	3.3	3.465	V	
Operating Case Temperature	Tc	0		70	° C	
Relative Humidity	RH	0		85	%	1

Note:

Non-condensing

II. QSFP+ Interface Specifications

Parameter	Description
Module Form Factor	QSFP+ (Supports SFF8436/SFF8472)
Channel Data Rate	Rate 40Gbps
BER	$<10^{-12}$
Operating Case Temperature	0 to + 70° C
Supply Voltage	3.3V
Supply Current	180mA per end typical
Management Interface Serial	I^2C (Supports SFF8472)

III. SFP+ Interface Specifications

Parameter	Description
Module Form Factor	SFP+ (Supports SFF8431/SFF8432/SFF8472)
Channel Data Rate	Rate 1 to 10.3125Gbps
BER	$<10^{-12}$
Operating Case Temperature	0 to + 70° C
Supply Voltage	3.3V
Supply current	455mA maximum
Management Interface Serial	I^2C (Supports SFF8472)

Notes:

1. Trade-offs are available between spectral width, center wavelength and minimum OMA, as shown in the table.
2. The optical power is launched into MMF.
3. Measured with a PRBS 2^{31}-1 test pattern @10.3125Gbps
4. Measured with a PRBS 2^{31}-1 test pattern @10.3125Gbps, BER≤10^{-12}.

IV. Optical Characteristics

The following optical characteristics are defined over the Recommended Operating Environment.

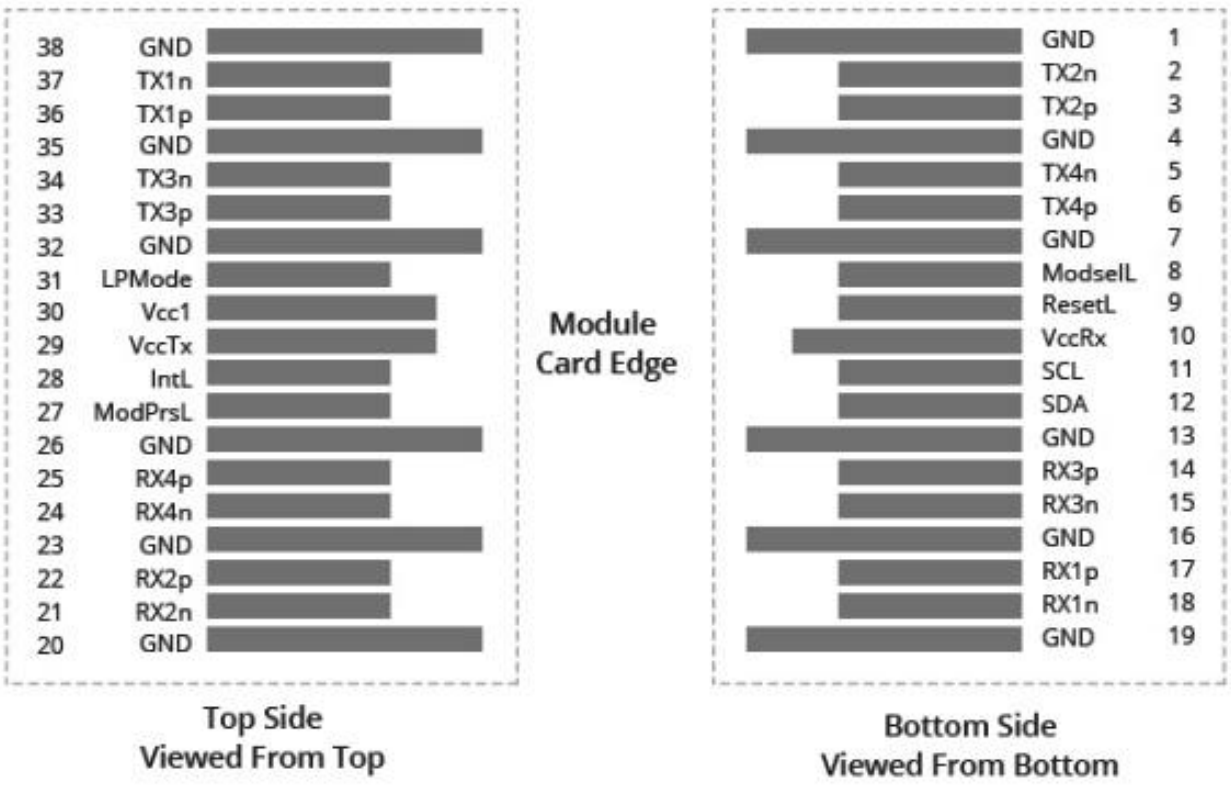
Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Transmitter						
Center Wavelength	C	840	850	860	nm	
RMS spettral width	ΔI	-7.5		0.65	nm	
Average launch power, each lane	Pout			2.5	dBm	
Difference in launch power between any two lanes (OMA)				4	dB	
Extinction Ratio	ER	3			dB	
Peak power, each lane				4	dBm	
Transmitter and dispersion penalty (TDP), each lane	TDP			3.5	dB	
Average launch power of OFF transmitter, each lane				-30	dB	
Receiver						
Stressed receiver sensitivity in OMA, each lane	C	840	850	860	nm	
Maximum Average power at receiver input, each lane				-5.4	dBm	1
Receiver Reflectance				2.4	dBm	
Peak power, each lane				-12	dB	
LOS Assert					dBm	
LOS De-Assert – OMA				-7.5	dBm	
LOS Hysteresis					dB	

Notes:

Measured with conformance test signal at TP3 for BER = $10e^{-12}$.

V. Pin Designation

A. QSFP+ end



QSFP+ MSA-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

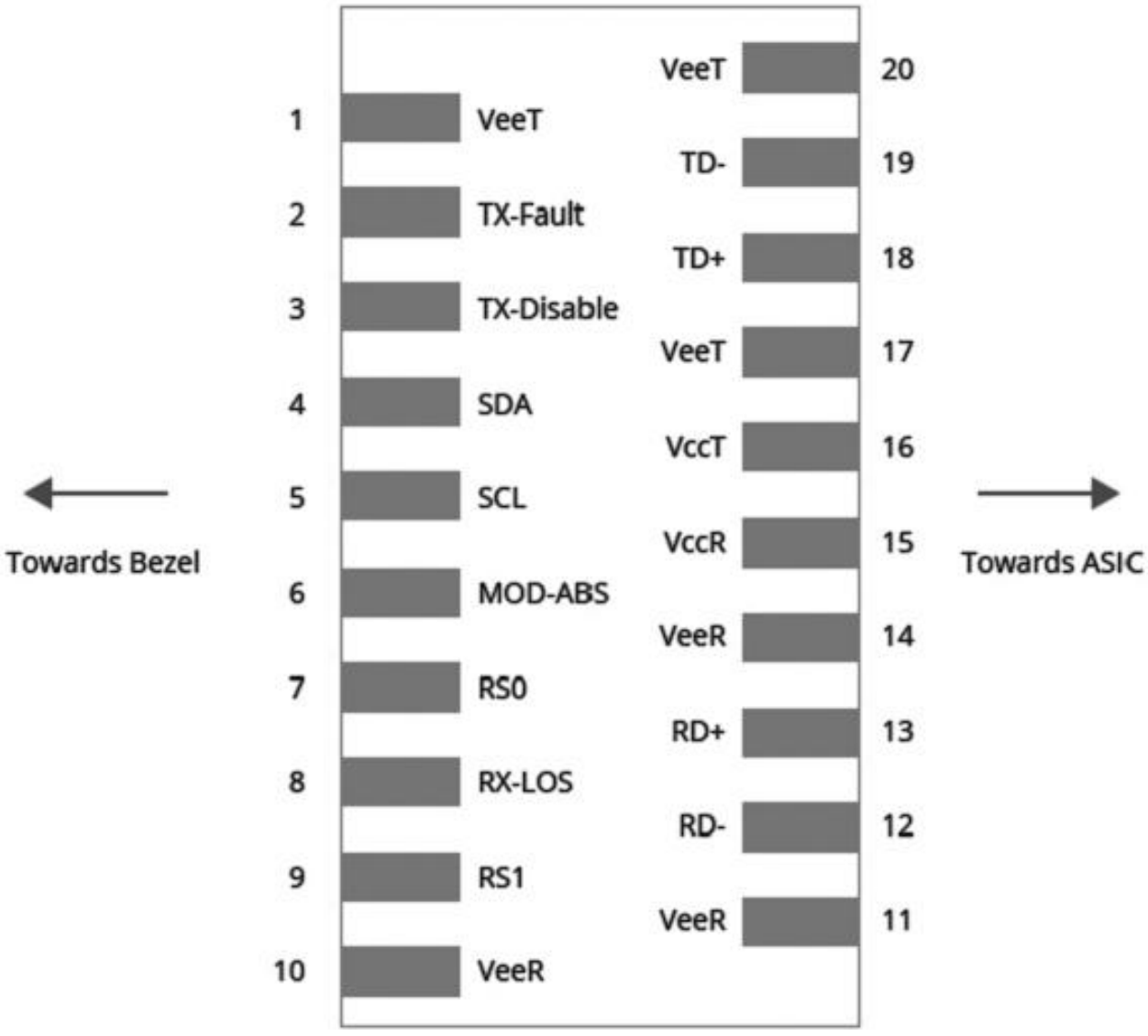
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc I	+3.3 V Power Supply	
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Notes:

Circuit ground is internally isolated from chassis ground.

B. SFP+ end

Diagram of Host Board Connector Block Pin Numbers and Names on the SFP+ ends.



Pin	Symbol	Name/Description	Notes
1	V	Transmitter Ground (Common with Receiver Ground)	1
2	T	Transmitter Fault.	2
3	T	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	4

5	SLC	2-wire Serial Interface Clock Line	4
6	MOD_ABS	Module Absent. Grounded within the module	4
7	RS0	No connection required	
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	RSI	No connection required	
10	V	Receiver Ground (Common with Transmitter Ground)	1
11	V	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	V	Receiver Ground (Common with Transmitter Ground)	1
15	V	Receiver Power Supply	
16	V	Transmitter Power Supply	
17	V	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. TFAULT is an open collector/drain output, which is pulled up with a 4.7k – 10k Ohms resistor on the host board, but is grounded inside the SFP+ cable plug.
3. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
4. Should be pulled up with 4.7k – 10k on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. LOS is open collector output. Should be pulled up with 4.7k – 10k on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

VI. Installation

Caution:

Follow accepted ESD practices when handling SFP+ connectors to prevent damage to the internal components within the connector. ESD (electrostatic discharge) is the sudden flow of electricity between two objects at different voltage potentials caused by contact. The basis of any ESD protection strategy is to ground or bring all elements in the ESD protected area to the same potential. An ESD wrist strap should be used for everything in the ESD protected area including personnel, tools, cabinets and components.

A. Installing SFP+ Modules

Follow these steps to install a FS.COM SFP+ cable assembly:

Step 1. Remove the protective ESD cap from the connector.

Step 2. Slide the SFP+ cable end into the slot until it locks into position (see figure 1).

There is an audible click when the connector is properly seated.

Figure 1. Installing an SFP+ Module

Figure 2. Disconnecting Latch Mechanism

Figure 3. Removing Modules

Caution :

The latching mechanism locks the SFP+ connector into place when cables are connected. Do not pull on the cable in an attempt to remove the SFP+ connector.

B. Removing SFP+ Modules

Follow these steps to remove a FS.COM SFP+ cable assembly:

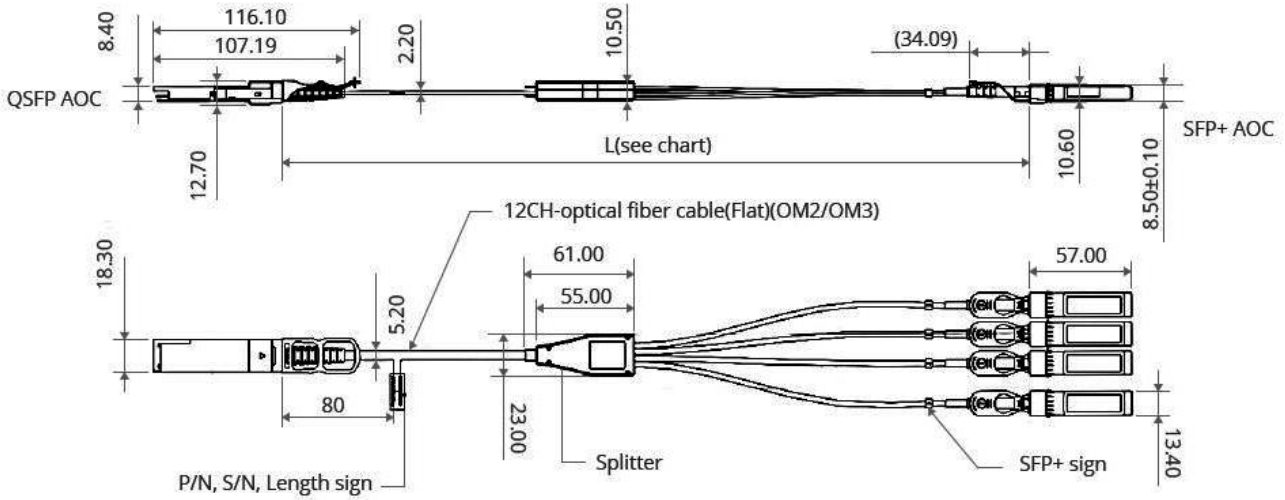
Step 1. Pull on the SFP+ latch pull lanyard. See figure 2.

Step 2. Grasp the SFP+ connector on both sides and remove it from the system. See figure 3.

Step 3. If possible, replace the ESD protective cap or put the SFP+ into an ESD protected bag.

VII. Mechanical Specifications

The mechanical specifications are based on QSFP+ and SFP+ transceiver module specifications, substituting the optical connectors with a cable connecting both ends.



Test Center

FS.COM transceivers are tested to ensure connectivity and compatibility in our test center before shipped out. FS.COM test center is supported by a variety of mainstream original brand switches and groups of professional staff, helping our customers make the most efficient use of our products in their systems, network designs and deployments.

The original switches could be found nowhere but at FS.COM test center, eg: Juniper MX960 & EX 4300 series, Cisco Nexus 9396PX & Cisco ASR 9000 Series, HP 5900 Series & HP 5406R ZL2 V3(J9996A), Arista 7050S-64, Brocade ICX7750-26Q & ICX6610-48, Avaya VSP 7000 MDA 2, etc.

Cisco ASR 9000 Series(A9K-MPA-1X40GE)

ARISTA 7050S-64(DCS-7050S-64)

Juniper MX960

Brocade ICX 7750-26Q

Extreme Networks X670V VIM-40G4X

Mellanox M3601Q

Dell N4032F

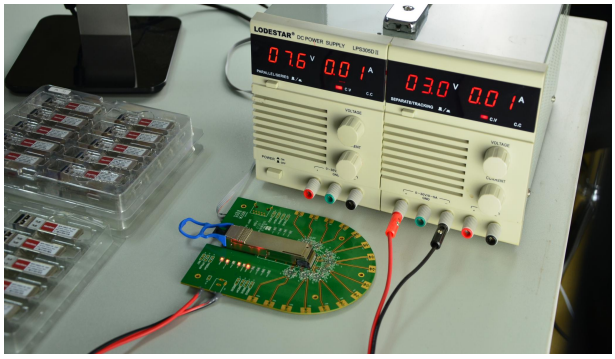
HP 5406R ZL2 V3(J9996A)

AVAYA 7024XLS(7002QQ-MDA)

Test Assured Program

FS.COM truly understands the value of compatibility and interoperability to each optics. Every module FS.COM provides must run through programming and an extensive series of platform diagnostic tests to prove its performance and compatibility. In our test center, we care of every detail from staff to facilities—professionally trained staff, advanced test facilities and comprehensive original-brand switches, to ensure our customers to receive the optics with superior quality.

Our smart data system allows effective product management and quality control according to the unique serial number, properly tracking the order, shipment and every part.



Our in-house coding facility programs all of our parts to standard OEM specs for compatibility on all major vendors and systems such as Cisco, Juniper, Brocade, HP, Dell, Arista and so on.

With a comprehensive line of original-brand switches, we can recreate an environment and test each optics in practical application to ensure quality and distance.

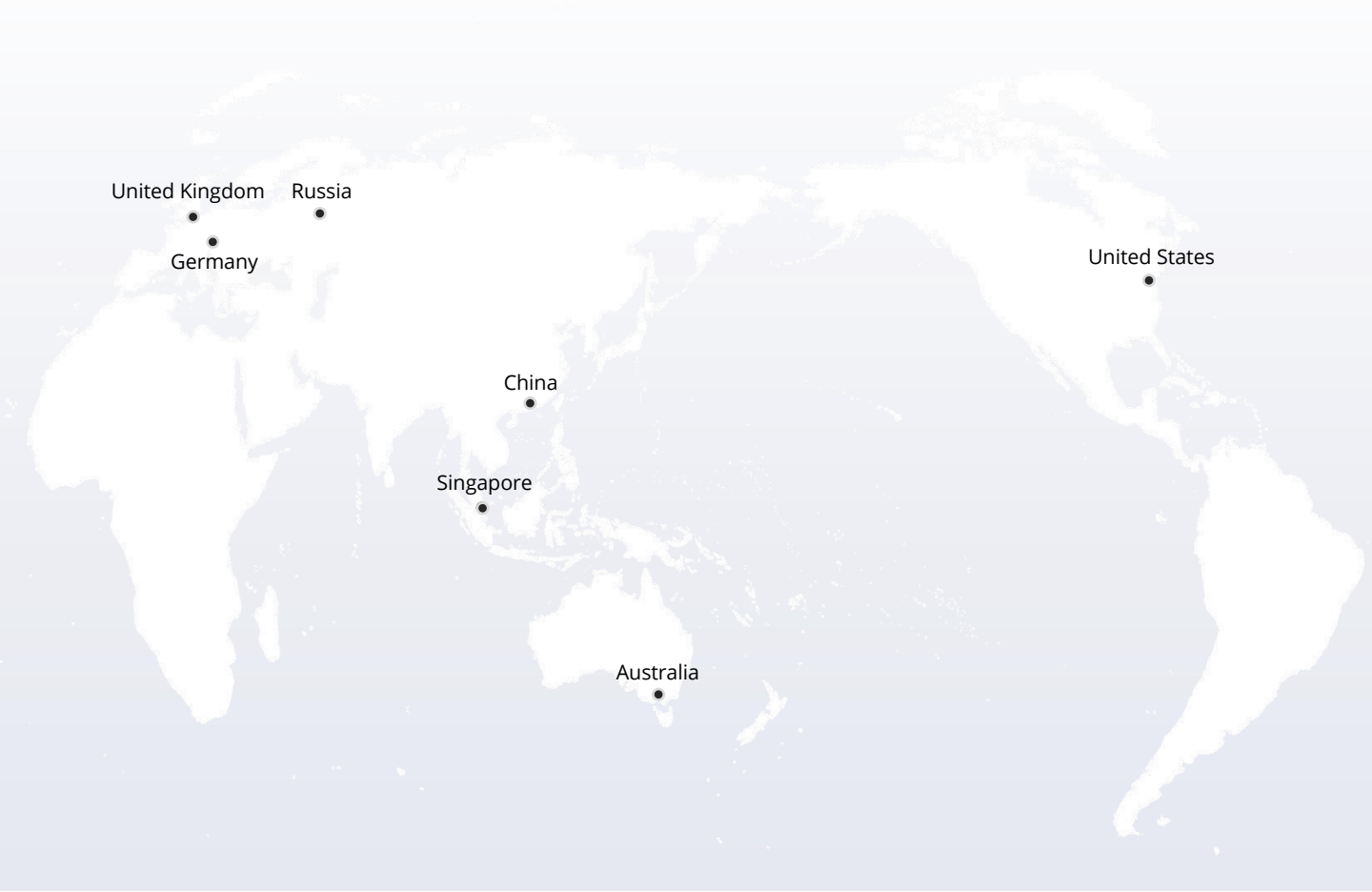
The last test assured step to ensure our products to be shipped with perfect package.

Order Information

Part Number	Data Rate	Length	Wire Gauge	Connector Type	Temp. Range	Cable Jacket
QSFP-4SFP10G-AOC-1	Up to 40G	1m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-2	Up to 40G	2m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-3	Up to 40G	3m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-5	Up to 40G	5m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-7	Up to 40G	7m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-10	Up to 40G	10m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-15	Up to 40G	15m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-20	Up to 40G	20m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-25	Up to 40G	25m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP
QSFP-4SFP10G-AOC-30	Up to 40G	30m	AOC Cable	QSFP+ to 4SFP+	0-70 ° C	OFNP

Notes:

1. 40GBASE QSFP+ to 4 x SFP+ AOC is individually tested on corresponding equipment such as Cisco, Arista, Juniper, Dell, Brocade and other brands, and passes the monitoring of FS.COM intelligent quality control system.
2. Customized 40GBASE QSFP+ to 4 x SFP+ AOCs are available in various lengths.



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