40G QSFP+ to QSFP+ Active Copper Cable (ACC)

Application

- InfiniBand QDR (4 x 10G), DDR (4 x 5G) and SDR (4 x 2.5G) interconnects
- 10G/40G Ethernet (10G/40GbE)
- 2G/4G/ 8G/ 10G Fibre Channel
- Networked storage systems
- External storage systems
- Data Center networking
- Hubs, Switches, Routers, Servers

Features

- 4-Channel Full-Duplex Active Copper Cable Transceiver
- Support for multi-gigabit data rates: 1Gb/s - 10.3Gb/s (per channel)
- Maximum aggregate data rate: 41.2Gb/s
- Wire AWG: AWG30
- AC coupling of PECL signals
- All-metal housing for superior EMI performance
- Available lengths (in meters): 1, 2, 3, 4, 5...
- Commercial temperatur range(COM): 0 to 70° C
- Single 3.3V power supply
- Low power consumption: less than 2W
- High-Density QSFP 38-PIN Connector
- Shielded copper twinaxial design for reduced skew rate and cross-talk
- Compliant QSFP MSA specifications
- Compliant with industry-standard QSFP+ form factor SFF-8436
- RoHS-6 Compliant

Description

FS.COM QSFP+ (Quad Small Form-factor Pluggable Plus) active cable assemblies are high performance, cost effective I/O solutions for 40G LAN, HPC and SAN applications. These QSFP+ copper direct-attach cables are suitable for very short distances and offer a highly cost-effective way to establish a 40-Gigabit link between QSFP+ ports of QSFP+ switches within racks and across adjacent racks.

FS.COM QSFP+ active copper cables are compliant with SFF-8436, QSFP+ MSA and IEEE 802.3ba 40GBASE-CR4. It is offer a low power consumption, short reach intercon-nect applications. The cable each lane is capable of transmitting data at rates up to 10Gb/s, providing an aggregated rate of 40Gb/s.

Products Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit
Operating Case Temperature	Tc	0		70	° C
Relative Humidity	RH	-		85	%
Supply Voltage	V_{CC3}	3.135	3.3	3.465	V
Total Power Consumption	PD			2.0	W
Data Rate Per Lane		1		10.3	Gb/s

Note:
1. Damage may occur if the transceiver is subjected to conditions beyond the limits.

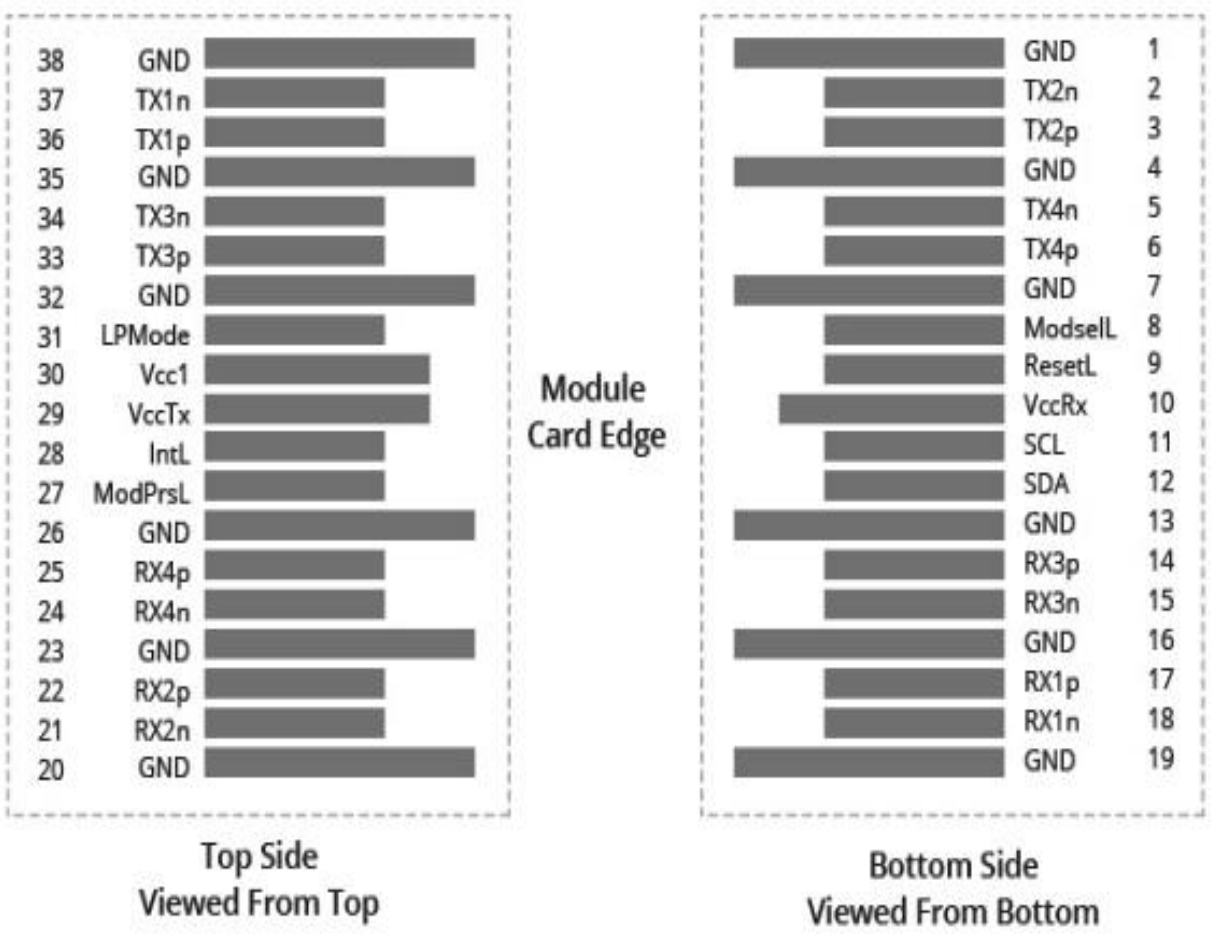
II. Performance Specification

Electrical	
Min. Dielectric Withstand Voltage	300 VDC
Insulation Resistance	1000 Mohms
Current Rating	0.5 Amp Min/Signal Contact
General	
Operating Temperature	0 to 70 ° C
Flammability Rating(Plastics)	UL 94
Green Features	RoHS, Lead-Free
Shield	Braid/Foil
Marking	Mfg Name, Part#, Date Code
Plug	
Backshell Material	Nickel-Plated Zinc Diecast
Contact Material	PCB with Gold-Plated Pads
Plastic Material	PA66
Latch	Positive Latching w/Pull Tab
Insertion Force	40N Max
Withdrawal Force	30N Max
Retention Force	90N Max
Durability	50 Cycles
Cable	
Conductor	Solid
Wire Gauge	AWG30, AWG28, AWG26, AWG24
Impedance	100 ± 5 ohms
Construction	Twinaxial
Cable OD	AWG 30 :4.2mm AWG 28 :4.7mm AWG 26:5.2mm AWG 24: 6.0mm
Jacket Type	PVC
Bend Radius	5X Cable OD -Single 10X Cable OD -Repeated

III. Electrical Characteristics

Test Type	Test Item	24AWG	26AWG	28AWG	30AWG
Electrical Characteristics	Differential impedance	100±5Ω @ TDR	100±5Ω	100±5Ω	100±5Ω @ TDR
	Mutual capacitance	14pF/ft nominal	14pF/ft nominal	14pF/ft nominal	14pF/ft nominal
	Time delay	1.31ns/ft nominal, (4.3ns/m) nominal	1.35ns/ft nominal	1.35ns/ft nominal	1.35ns/ft nominal, (4.3ns/m) nominal
	Time delay skew (within pairs)	80ps/10m maximum	120ps/8.5m maximum	120ps/7m maximum	50ps/5.5m maximum
	Time delay skew (between pairs)	350ps/10m maximum	500ps/8.5m maximum	500ps/7m maximum	350ps/5.5m maximum
	Attenuation	10dB/10m maximum @ 1.25Ghz	10dB/8.5m maximum @ 1.25Ghz	10dB/7m maximum @ 1.25Ghz	8.4dB/5.5m maximum @ 1.25Ghz
	Conductor DC Resistance	0.026Ω /ft maximum @ 20° C	0.04Ω /ft maximum @ 20° C	0.06Ω /ft maximum @20° C	0.01Ω /ft maximum @20° C
Physical Characteristics	Conductors (two pair)	24AWG Solid, Silver plated copper	26AWG Solid, Silver plated copper	28AWG Solid, Silver plated copper	30AWG Solid, Silver plated copper
	Insulation	Foam polyolefin	Foam polyolefin	Foam polyolefin	Foam polyolefin
	Pair drain wire	26AWG Solid, Silver plated copper	28AWG Solid, Silver plated copper	30AWG Solid, Silver plated copper	30AWG Solid, Silver plated copper
	Overall cable shield	Aluminum/polyester tape, 125% coverage, Tin plated copper braid, 38AWG, 85% coverage	Aluminum/polyester tape, 125% coverage, Tin plated copper braid, 38AWG, 85% coverage	Aluminum/polyester tape, 125% coverage,Tin plated copper braid, 38AWG, 85% coverage	Aluminum/polyester tape, 125% coverage,Tin plated copper braid, 38AWG, 85% coverage
	Outer diameter	6.0mm	5.2mm	4.7mm	4.2mm

IV. Pin Designation



Pin	Logic	Symbol	Name/Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-inverted Data Input	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-inverted Data Input	
7		GND	Ground	1

8	LVTTL-I	ModSelL	Module Select	
9	LVTTL-I	ResetL	Module Reset	
10		Vcc Rx	+3.3V Power Supply Receiver	
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	2
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data	2
13		GND	Ground	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	2
28	LVTTL-O	IntL	Interrupt	2
29		Vcc Tx	+3.3V Power Supply Transmitter	
30		Vcc1	+3.3V Power Supply	
31	LVTTL-I	LPMode	Low Power Mode	

32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Input	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Input	
38		GND	Ground	1

Notes:

1.Module ground pins GND are isolated from the module case and chassis ground within the module.

2.Shall be pulled up with 4.7K-10Kohms to a voltage between 3.14V and 3.47V on the host board.

V. Low Speed Electrical Hardware Pins

In addition to 2-wire serial interface, 40G QSFP+ ACC module has the following low speed pins for control and status: ModPrsL ModPrsL is an output pin. When "low", indicates the module is present. The ModPrsL is asserted "Low" when inserted and deasserted "High" when the module is physically absent from the host connector.

(1) TX Fault

IntL is an output pin. When "Low", it. indicates a possible module operational fault or a status critical to the host system. The source of the interrupt could be identified by using the 2-wire serial interface

(2) LPMode

LPMode is a control pin. When "High", it could be used to set the module in low power mode (<2.0W). This pin, along with Power_overide bit and Power_set bit in management interface could be used to avoid system power crash. 40G QSFP+ active copper cable, however consumes less than 2.0W. Therefore this pin takes no effect.

(3) Modsell

ModSelL is an input signal. When held low by the host, the module responds to two-wire serial communication commands. The ModSelL signal allows multiple QSFP modules to be on a single two-wire interface bus. When the ModSelL signal is "High", the module will not respond to or acknowledge any two-wire interface communication from the host. The ModSelL signal input pin is biased to a "High" state in the module.

In order to avoid conflicts, the host system must not attempt two-wire interface communications within the ModSelL deassert time after any QSFP modules are de-selected. Similarly, the host must wait for the period of the ModSelL assert time before communicating with the newly selected module. The assert and deassert periods of different modules may overlap as long as the above timing requirements are met.

(4) ResetL

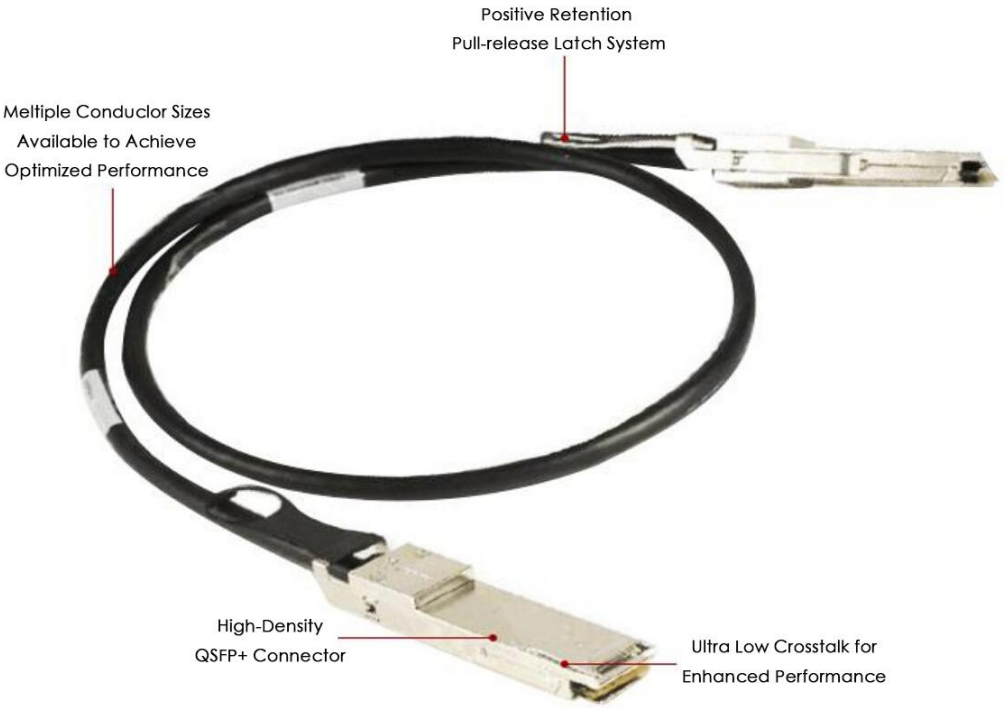
The ResetL signal is pulled to Vcc in the QSFP+ module. A logic low level on the ResetL signal for longer than the minimum pulse length (t_Reset_init) initiates a complete module reset, returning all user module settings to their default state.

(5) ResetL

The ResetL signal is pulled to Vcc in the QSFP+ module. A logic low level on the ResetL signal for longer than the minimum pulse length (t_Reset_init) initiates a complete module reset, returning all user module settings to their default state.

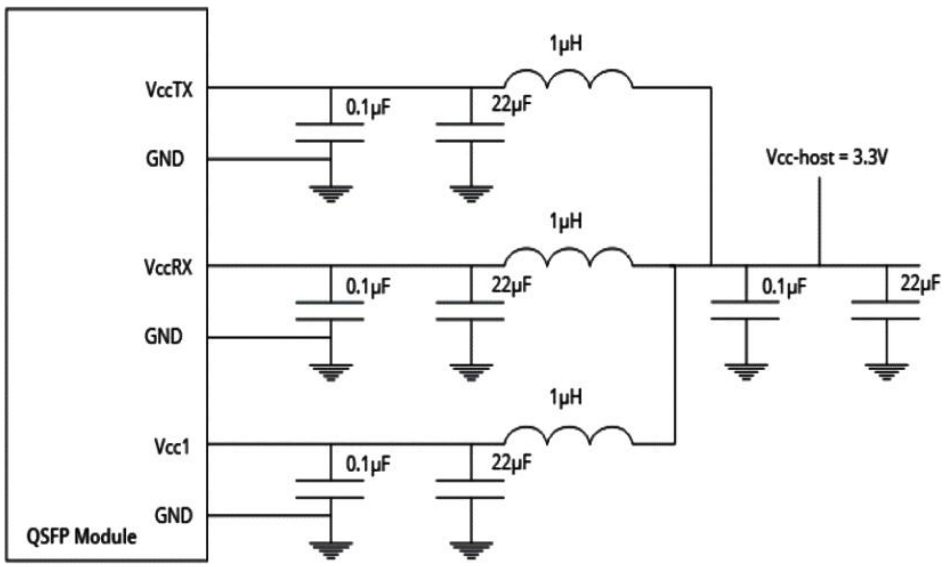
Module Reset Assert Time (t_init) starts on the rising edge after the low level on the ResetL pin is released. During the execution of a reset (t_init) the host will disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL signal with the Data_Not_Ready bit negated. Note that on power-up (including hot insertion) the module will post this completion of reset interrupt without requiring a reset.

VI. High Speed Interconnect

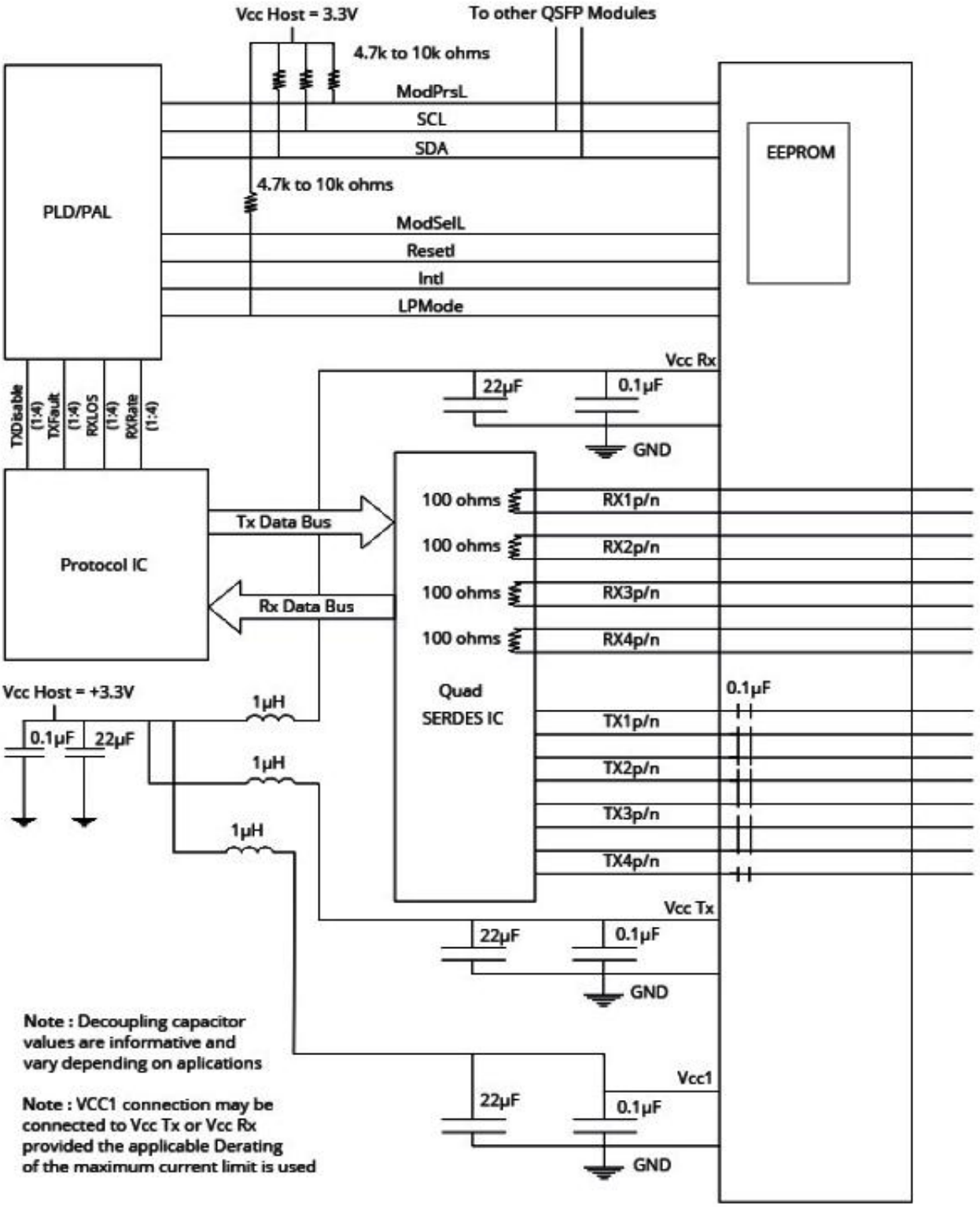


VII. Recommended Power Supply Filtering Example

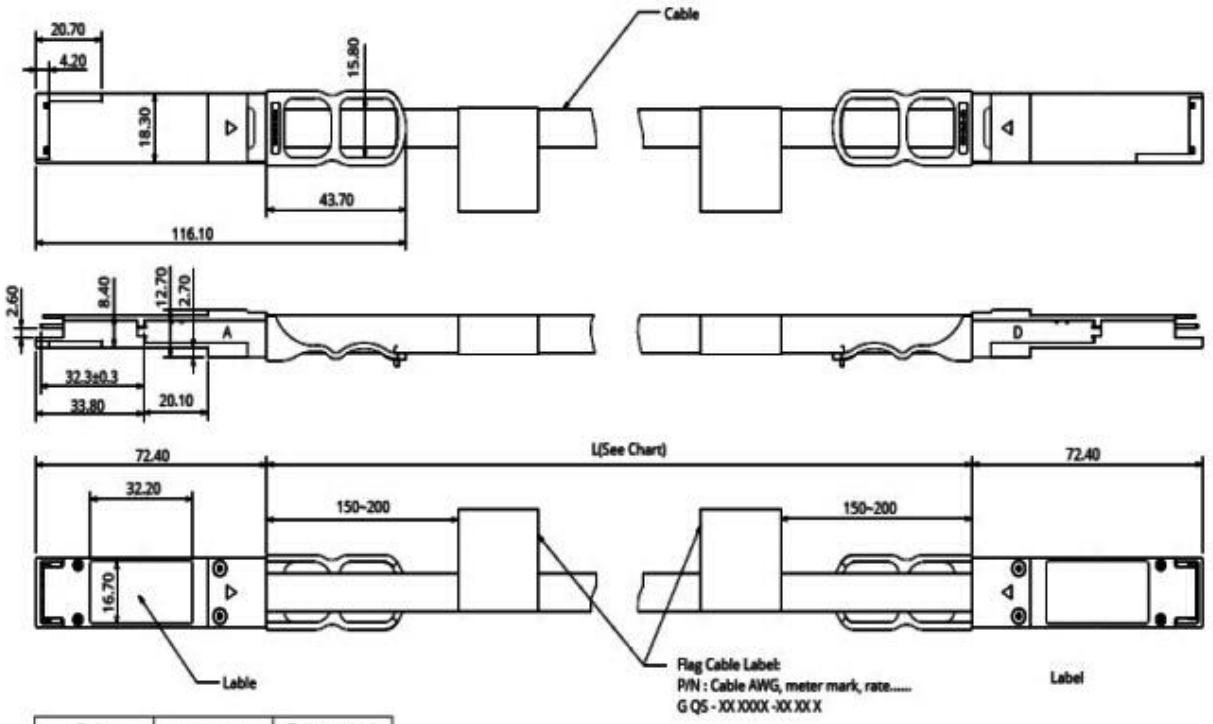
A typical host board mechanical layout for attaching the QSFP+ transceiver is presented below. The recommended host electrical connector should be a 38-pin IPASS right angle connector assembly and the cage assembly should be QSFP+ single cage.



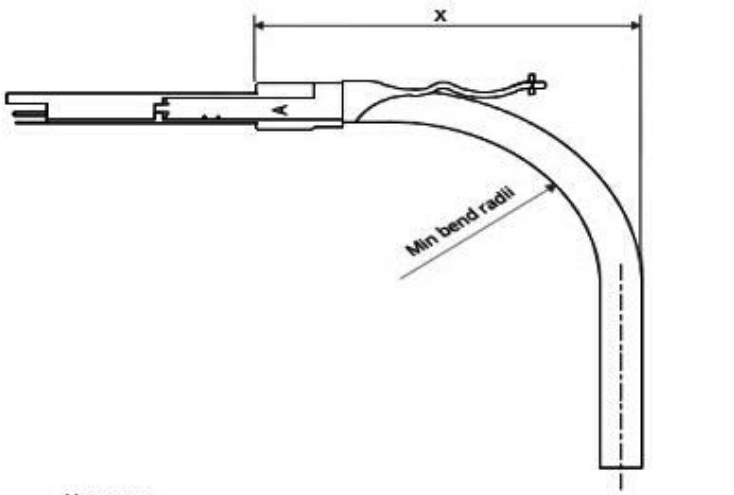
VIII. QSFP+ Host Board Schematic for Active Copper Cables

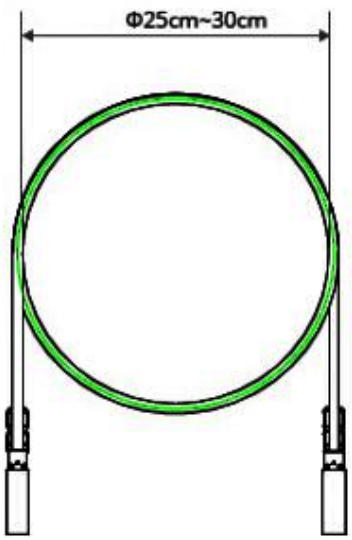


IX. Mechanical Dimensions



Code	Length range(m)	Tolerance(cm)
L	L ≤ 0.5	±3
	0.5<L≤5	±5
	5<L≤20	±8
	20<L	±10





Unit : mm

CABLE AWG	OD	min bend radii	"X"min. Distance 1X bend
30	4.2	21	59

VIII. Installation

Caution:

Follow accepted ESD practices when handling QSFP+ 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 QSFP+ Modules

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

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

Step 2. Slide the QSFP+ 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 QSFP+ Module

Figure 2. Disconnecting Latch Mechanism

Figure 3. Removing Modules

Caution :

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

B. Removing QSFP+ Modules

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

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

Step 2. Grasp the QSFP+ 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 QSFP+ into an ESD protected bag.

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

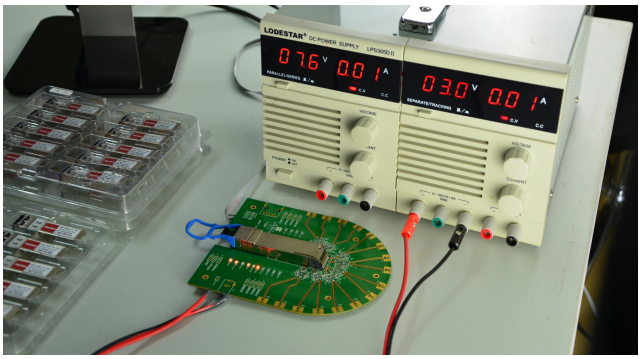
Dell N4032F

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 tracing 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 JackePart Numt
QSFP-40G-DAC-1	Up to 40G	1m	AWG30	Active Copper	0-70℃	PVC
QSFP-40G-DAC-2	Up to 40G	2m	AWG30	Active Copper	0-70℃	PVC
QSFP-40G-DAC-3	Up to 40G	3m	AWG30	Active Copper	0-70℃	PVC
QSFP-40G-DAC-4	Up to 40G	4m	AWG30	Active Copper	0-70℃	PVC
QSFP-40G-DAC-5	Up to 40G	5m	AWG30	Active Copper	0-70℃	PVC
QSFP-40G-DAC-6	Up to 40G	6m	AWG28	Active Copper	0-70℃	PVC
QSFP-40G-DAC-7	Up to 40G	7m	AWG28	Active Copper	0-70℃	PVC
QSFP-40G-DAC-8	Up to 40G	8m	AWG26	Active Copper	0-70℃	PVC
QSFP-40G-DAC-9	Up to 40G	9m	AWG26	Active Copper	0-70℃	PVC
QSFP-40G-DAC-10	Up to 40G	10m	AWG26	Active Copper	0-70℃	PVC

Notes:

1. 40G QSFP+ Active Copper Twinax Cable 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+ ACCs are available in various lengths.
3. The Wire Gauge can be customized if it is required, like AWG24, AWG26, AWG28 and AWG30.