40G QSFP+ Passive Copper Cable Assembly

CAD-Q10 / Q10-PxM

Features

- Compliant QSFP MSA specifications
- Fully compatible with IEEE802.3ba and Infiniband QDR specifications 40 Gb/s total bandwidth
- 4 independent duplex channels operating at 10Gbps, also support for 2.5Gbps, 5Gbps data rates
- 100ohm differential impedance system
- Low Near-End Crosstalk(NEXT)
- All-metal housing for superior EMI performance
- Precision process control for minimization of pair-to-pair skew
- AC coupling of PECL signals
- EEPROM for cable signature & system communications
- 30 AWG to 24 AWG cable sizes available
- RoHS compliant

Applications

- Data Servers、Routers、Switches
- Networked storage systems
- Data Center networking
- InfiniBand Trade Association (IBTA)
- IEEE-802.3ba
- 40Gigabit Ethernet (40GBASE–CR4)

Product Description

QSFP+ (Quad Small Form-factor Pluggable Plus) copper direct-attach cables are suitable for very short distances and offer a highly cost-effective way to establish a 40-Gigabit link

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between QSFP+ ports of QSFP+ switches within racks and across adjacent racks. These cables are used for 40GbE and Infniband standards, to maximize performance. QSFP+ are designed to meet emerging data center and high performance computing application needs for a high density cabling interconnect system capable of delivering an aggregate data bandwidth of 40Gb/s. This interconnect system is fully compliant with existing industry standard specifications such as the QSFP MSA and IBTA (InfiniBand Trade Association). The QSFP+ cables support the bandwidth transmission requirements as defined by IEEE 802.3ba (40 Gb/s) and Infiniband QDR (4x10 Gb/s per channel) specifications.

Recommended Operation Condition

Parameter	Symbol	Min	Max	Unit
Operating Case Temperature	Topc	-20	85	degC
Storage Temperature	Tst	-40	85	degC
Relative Humidity (non-condensation)	RS	30	60	%
Supply Voltage	VCC3	3.135	3.465	V
Voltage on LVTTL Input	Vi lvttl	-0.3	VCC3 +0.2	V
Power Supply Current	ICC3		10	mA
Total Power Consumption	Pd	-	30	mW

Notes:
Stress or conditions exceed the above range may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not applied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Time Domain

Item	Test Parameter	Specification (Proposal)
1	Intra-Skew* 1M 2M 3M 5M 7M	 20ps Max 25ps Max 30ps Max 40ps Max 50ps Max
2	Impedance Rise time: 39ps (20%~80%)	100 +/- 10 Ohm
3	Insertion Loss* (SDD21)for 1M	0.6GHz : -2.5 dB Max 1.25GHz : -3.15 dB Max

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		2.50GHz : -4.22 dB Max 3.25GHz : -4.95 dB Max 5.0GHz : -6.8 dB Max
	Insertion Loss* (SDD21) for 2M	0.6GHz : -3.1 dB Max 1.25GHz : -4.3 dB Max 2.50GHz : -6.14 dB Max 3.25GHz : -7.2 dB Max 5.0GHz : -10.1 dB Max
	Insertion Loss* (SDD21) for 3M	0.6GHz : -3.85 dB Max 1.25GHz : -5.36 dB Max 2.50GHz : -7.58 dB Max 3.25GHz : -8.99 dB Max 5.0GHz : -11.78 dB Max
	Insertion Loss* (SDD21) for 5M	0.6GHz : -4.45 dB Max 1.25GHz : -6.20 dB Max 2.50GHz : -8.98 dB Max 3.25GHz : -10.64 dB Max 5.0GHz : -14.03 dB Max
	Insertion Loss* (SDD21) for 7M	0.6GHz : -5.55 dB Max 1.25GHz : -7.93 dB Max 2.50GHz : -11.62 dB Max 3.25GHz : -13.80 dB Max 5.0GHz : -18.35 dB Max

*The item 1and 3, for different length requirements, different specification

Frequency Domain

Item	Test Parameter	Specification (Proposal)
1	Receive Return Loss (SDD22)	-12+2*SQRT(f) @ 0.01 to 4.1GHz < -6.3 + 13 * log10(f/5.5), with f in GHz ; @4.1 to 11.1GHz
2	Transmit Return Loss (SDD11)	-12+2*SQRT(f) @ 0.01 to 4.1GHz < -6.3 + 13 * log10(f/5.5), with f in GHz ; @4.1 to 11.1GHz
3	Common Mode Reflection (SCC22)	< -7 + 1.6 × f, with f in GHz； @ 0.01 to 2.5GHz -3dB @ 2.5 to 11.1GHz
4	Common Mode Conversion (SCD11)	-10dB @ 0.01 to 11.1GHz

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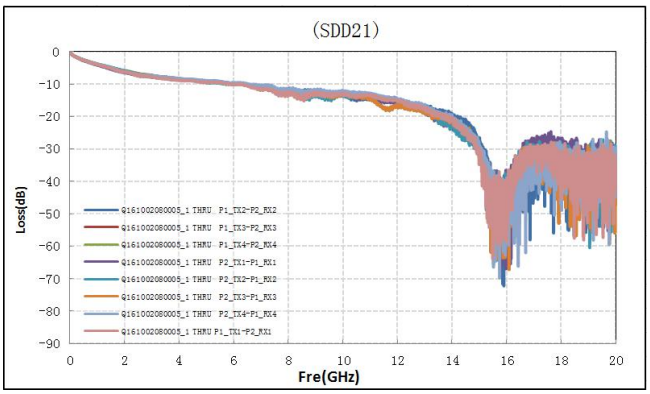
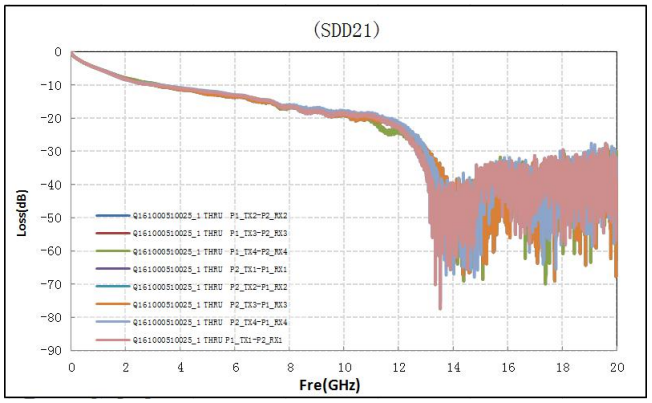
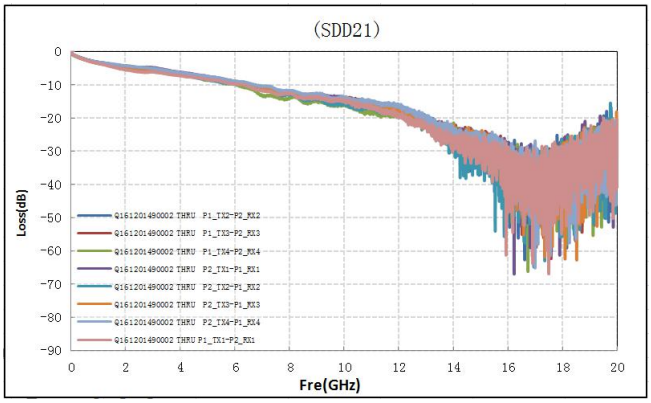
Typical Operation Characteristics



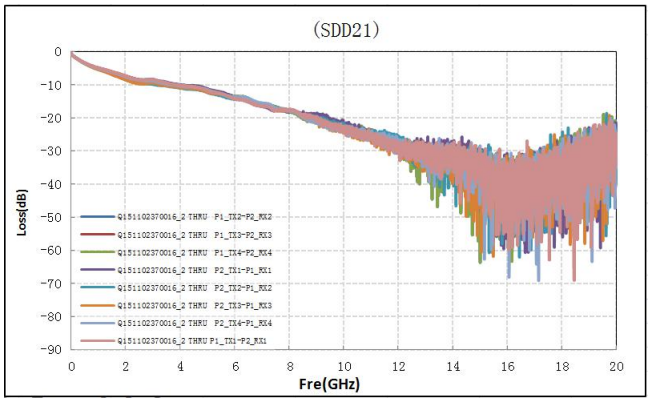
QSFP 30AWG 1M



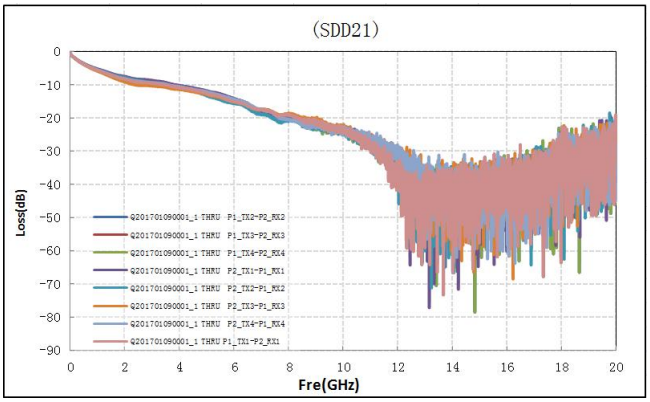
QSFP 30AWG 2M



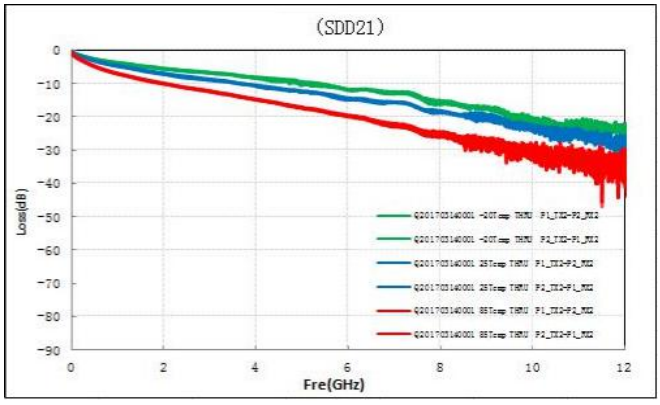
QSFP 28AWG 3M



QSFP 26AWG 5M



QSFP 24AWG 7M



Temperature test data (26AWG 5M)

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Host board Connector Pinout

Figure 1: MSA compliant Connector

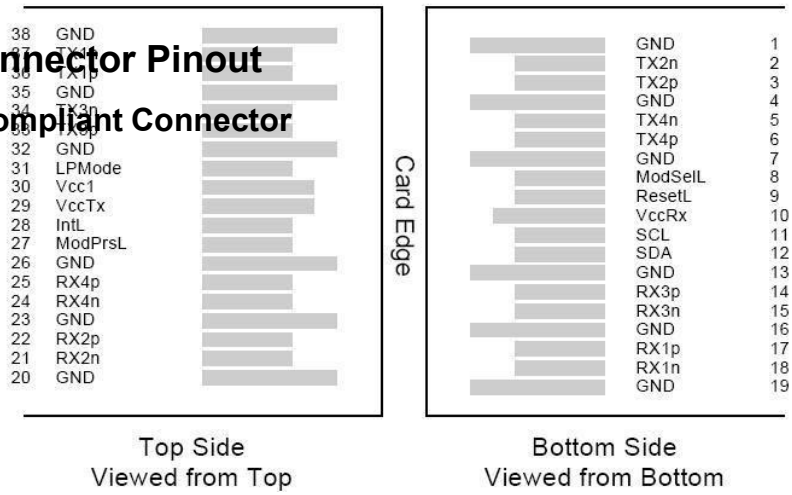


Figure 2： Pin Definitions

Pin	Logic	Symbol	Name/Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+ 3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
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	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
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 Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

Note:

1. 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 otherwise noted. Connect these directly to the host board signal common ground plane
2. cc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. 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.

2‐wire Management Interface

The transceivers provide management two‐wire interface and the management memory map is specified by SFF‐8436

EEPROM Map

Device 0xA0

Address (Dec)	Value (Hex)	Name of Field (as per SFF-8436)	Description of data code
0	0D	ID and status	0Dh= QSFP+
1-2	01 02	Status	01h 02h=Digital state of the IntL Interrupt output pin
3-21	00	Interrupt Flags	00h = not specified
22-33	00	Module Monitors	00h = not specified
34-81	00	Channel Monitors	00h = not specified
82-85	00	Reserved	00h = not specified
86-97	00	Control	00h = not specified
98-99	00	Reserved	00h = not specified
100-106	00	Module and Channel Mask	00h = not specified
107-118	00	Reserved	00h = not specified
119-122	00	Password Change Entry Area (Optional)	00h = not specified
123-126	00	Password Entry Area (Optional)	00h = not specified
127	00	Page Select Byte	00h = not specified
128	0D	Identifier	0Dh= QSFP+
129	00	Ext. Identifier	00h = Power Class 1,No CLEI, No CDR
130	21	Connector	21h = Copper pigtail
131	08	Transceiver Reserved	08h=40GBASE-CR4
132	00		00h = not specified
133	00		00h = not specified
134	00		00h = not specified
135	00		00h = not specified
136	00		00h = not specified
137	00		00h = not specified
138	00		00h = not specified
139	05	Encoding	05h = 64B/66B
140	67	Nominal bit rate (unit: 100M bps)	67h= 1030MBs
141	00	Reserved	00h = not specified
142	00	Length(SMF)	00h = not specified
143	00	Length (E-50μm)	00h = not specified
144	00	Length (50 μm)	00h = not specified
145	00	Length (62.5 μm)	00h = not specified
146	01	Cable Length(Copper)	01h=Copper Length 1M
147	A0	Device Tech	A0h = Copper Unequalized
148-163	31 30 47 74 65 6B 20...	Vendor name	10Gtek
164	07	Extended Transceiver Codes	07h=QDR/DDR/SDR Support
165	00	Vendor OUI[0]	10Gtek OUI Code
166	00	Vendor OUI[1]	
167	00	Vendor OUI[2]	

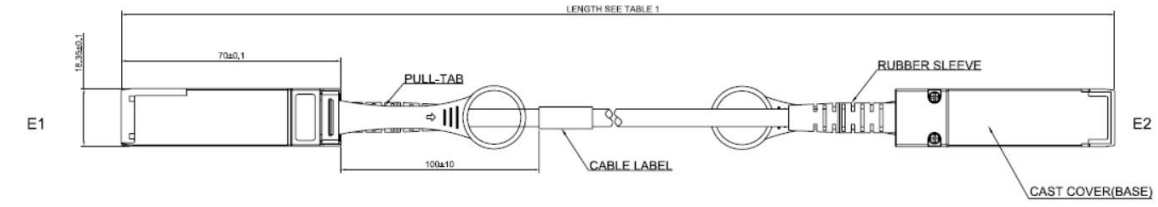
168	43	Vendor PN	CAB-Q10/Q10-P1M
169	41		
170	42		
171	2D		
172	51		
173	31		
174	30		
175	2F		
176	51		
177	31		
178	30		
179	2D		
180	50		
181	31		
182	4D		
183	20		
184-185	30 31	Vendor Rev	30h 31h=01
186-187	00	Wavelength or Copper cable Attenuation	00h = not specified
188-189	00		00h = not specified
190	46	Max Case Temperature	46h= 70℃
191	Check Sum	Check Code for Base ID Fields	Fill in Check Sum
192	00	Link Codes	00h = not specified
193 -195	00	Options	00h = not specified
196-211	51 31 37 30 31 30 30 30 31 30 30 31	Vendor SN	Q17010001001
212-219	31 37 30 31 30 31	Date Code	170101
220	00	Diagnostic Monitoring Type	00h = not specified
221	00	Enhanced Options	00h = not specified
222	00	BR, Nominal	00h = not specified
223	Check Sum	Check code for Extended ID fields	Fill in Check Sum
224-255	00	Vendor Specific ID Fields	00h = not specified

Mechanical Specifications

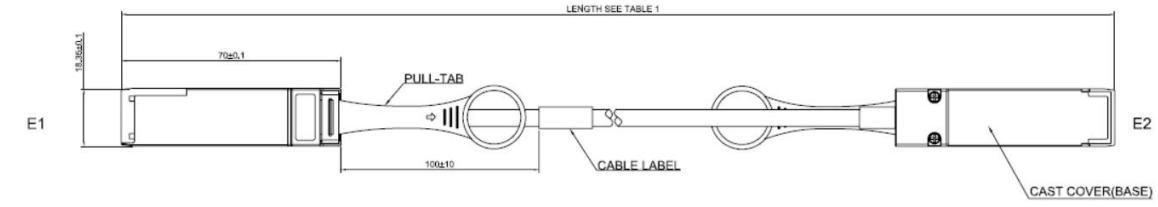
Mechanical				
Parameter	**Minimum**	**Typical**	**Maximum**	**Unit**
Cable Diameter (24 AWG)		0.385		Inches
Bend Radius (24 AWG)	1.929			Inches
Cable Diameter (26 AWG)		0.346		Inches

Bend Radius (26 AWG)	1.732			Inches
Cable Diameter (28 AWG)		0.295		Inches
Bend Radius (28 AWG)	1.476			Inches
Cable Diameter (30 AWG)		0.259		Inches
Bend Radius (30 AWG)	1.299			Inches
Within Pair Skew			120	ps/10m
Cable Insertion Loss		10		dB/10m
Bulk Cable Crosstalk			1	%
Bulk Cable Time Delay			4.3	ns/m
Cable Capacitance (intra-pair)			43	pF/m
Bulk Cable Impedance	95	100	105	Ohms

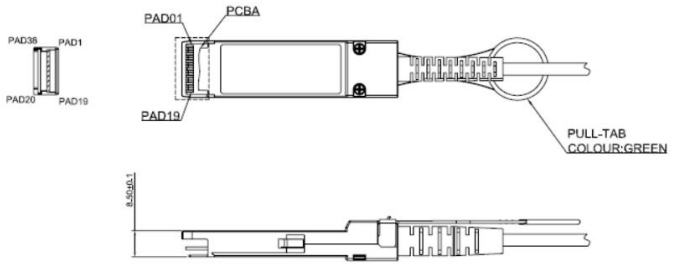
Mechanical Dimensions (30\28AWG for Type A, 26\24AWG for Type B)



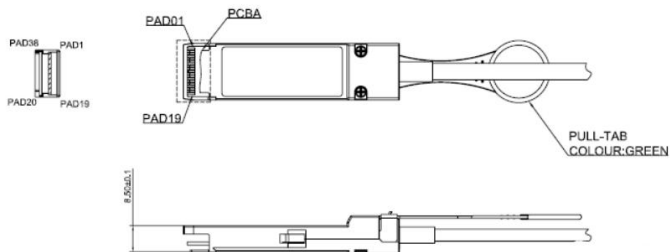
TYPE A



TYPE B



TYPE A



NOTES:

1. CABLE DISTANCE DEPENDENCE ON WIRE GAUGE DATA RATE,AND HOST BOARD DRIVER CAPABILITIES
2. MATERIALS;
   - BACKSHELLS: ZINC DIE CAST WITH BRIGHT NICKEL PLATING
   - DE-LATCH: STAINLESS STEEL WITH OVER MOLDED NYLON
   - SCREW: STAINLESS STEEL
   - CABLE: SOLID SILVER PLATED COPPER. 2 INDIVIDUAL SHIELDED PAIRS WITH 8 SHIELDED OVERALL (JACKET COLOR: BLACK)
   - PCB: FR4,4 LAYERS,(AC COUPLING)
3. IMPEDANCE-100 OHMS DIFFERENTIAL
4. TWO-WIRE SERIAL MEMORY: EEPROM(256BYTES),DIGITAL MONITORING & CONTROL FUNCTION AND MEMORY PAGE NOT SUPPORTED.
5. THIS PRODUCT MEETS THE RESTICTION OF HAZARDOUS SUBSTANCES IN ELECTRICIAL AND ELECTRONIC REQUIREMENTS (ROHS)
6. COMPLIANT TO INDUSTRY STANDARDS:QSFP+MSA SFF-8436

Ordering Information

40G QSFP+ Passive Copper Cable Assembly, Passive

Length	Data Rate	P/N	AWG	Length Tolerance
0.5M	40G	CAB-Q10/Q10-P50CM	24 / 26 / 28 / 30	+1/-0cm
1M	40G	CAB-Q10/Q10-P1M	24 / 26 / 28 / 30	+1/-3cm
1.5M	40G	CAB-Q10/Q10-P1.5M	24 / 26 / 28 / 30	+3/-3cm
2M	40G	CAB-Q10/Q10-P2M	24 / 26 / 28 / 30	+3/-3cm
2.5M	40G	CAB-Q10/Q10-P2.5M	24 / 26 / 28 / 30	+3/-3cm
3M	40G	CAB-Q10/Q10-P3M	24 / 26 / 28	+3/-3cm
5M	40G	CAB-Q10/Q10-P5M	24 / 26	+6/-6cm
7M	40G	CAB-Q10/Q10-P7M	24 / 26	+9/-9cm

Revision History

Revision	Initiated	Review	Approved	Revision History	Release Date
V1.3	Vinson	Steven	Nicky	Released.	Jan/ 2016
V1.4	Vinson	Steven	Nicky	Released.	Apr/2017
V1.5	Vinson	Steven	Nicky	Released.	Sep/2017
V1.6	Vinson	Steven	Nicky	Update the Relative Humidity	Aug/2019

Further Information

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