

40G QSFP+ TO 4X SFP+ Passive Copper Cable Assembly

CAB-Q10/4S-PxM

Features

- Fully compliant to the latest SFP+ & QSFP+ MSA
- Supports 40-Gigabit Ethernet standards
- Up to 10.3125 Gbps transfer rate per SFP+ channel
- 30 AWG to 26 AWG cable sizes available
- 100 ohm differential impedance system
- Single 3.3V power supply, low power consumption, <0.5W
- Operating case temperature: -20 to 85°C
- 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
- Low cross-talk
- RoHS compliant

Applications

- InfiniBand SDR, DDR,QDR
- 40G Ethernet transmission
- Fiber Channel
- Rack-to-Rack, Shelf-to-Shelf Interconnect
- Networking
- Hubs, switches, routers, servers
- Data center interconnect
- High Performance Computing application



Product Description

10Gtek's QSFP10 to 4x SFP+ Splitter Cable offers IT professionals a cost-effective interconnect solution for merging 40G QSFP and 10G SFP+ enabled host adapters, switches and servers. For typical applications, users can install this splitter cable between an available QSFP port on their 40-Gigabit/s rated switch and feed up to four upstream 10GbE-SFP+ enabled switches. Each QSFP-SFP+ splitter cable features a single QSFP connector (SFF-8436) rated for 40-Gb/s on one end and (4) SFP+ connectors (SFF-8431), each rated for 10-Gb/s, on the other. 10GSFP is the manufacturer of QSFP to 4 SFP+ Splitter Cables that designs and sources every subassembly in-house guaranteeing complete control over product performance, quality and consistency. Examples include our widely respected board-as-connector platform which is direct-welded to the wire and encased in a robust Zinc-Nickel back shell for superior crosstalk and EMI performance. Cable available in 0.5M (1.7ft), 1m (3.3ft), 2m (6.6ft), 3m (9.8ft) & 5m (16.4ft) lengths to accommodate your installation requirements.

Recommended Operation Condition

Parameter	Symbol	Min	Max	Unit
Operating Case Temperature	Topc	-40	85	degC
Relative Humidity (non-condensation)	RS	-	85	%
Supply Voltage	VCC3	3.135	3.465	V
Power Supply Current	ICC3		1	mA
Total Power Consumption	Pd	-	0.5	W

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	Tst	-40	125	degC	
Relative Humidity (non-condensation)	RS	-	85	%	
Operating Case Temperature	Topc	-20	85	degC	1
Supply Voltage	VCC3	-0.3	3.6	V	
Voltage on LVTTTL Input	Vilvttl	-0.3	VCC3 +0.2	V	

NOTE:

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.

Frequency Domain

Item	Test Parameter	Specification (Proposal)
1	Receive Return Loss (SDD22)	-12+2*SQRT(f) @ 0.01 to 4.1GHz < -6.3 + 13 * log ₁₀ (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 * log ₁₀ (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 (SCC11)	< -7 + 1.6 × f, with f in GHz; @ 0.01 to 2.5GHz -3dB @ 2.5 to 11.1GHz
5	Differential to Common-Mode Return Loss(SCD11)	> 10 dB @10Mhz to 11.1GHz

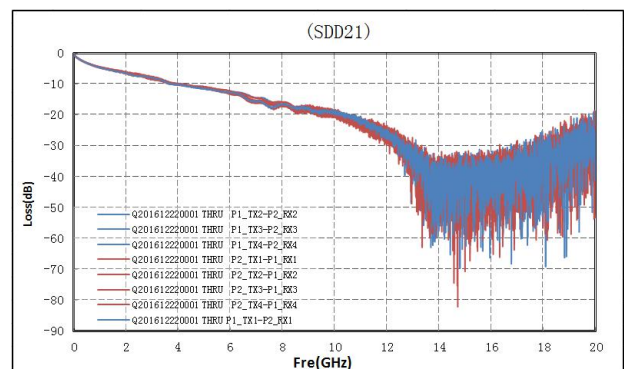
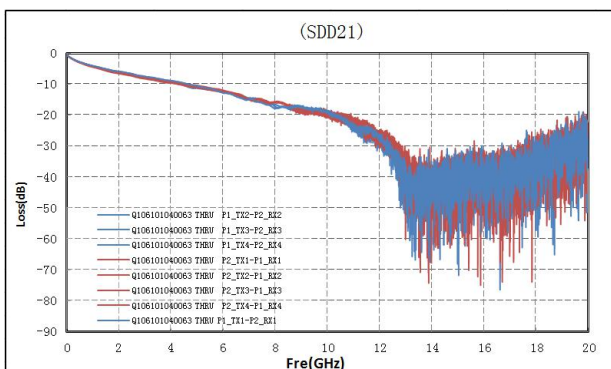
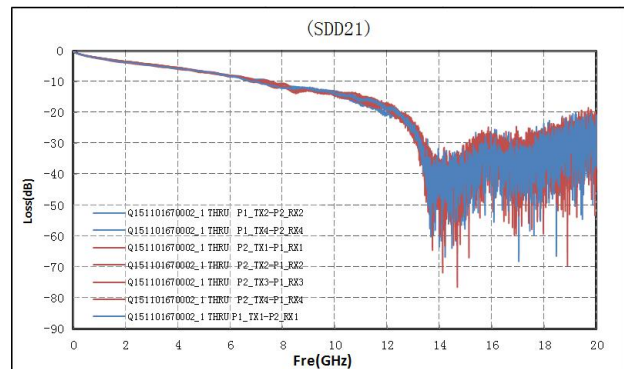
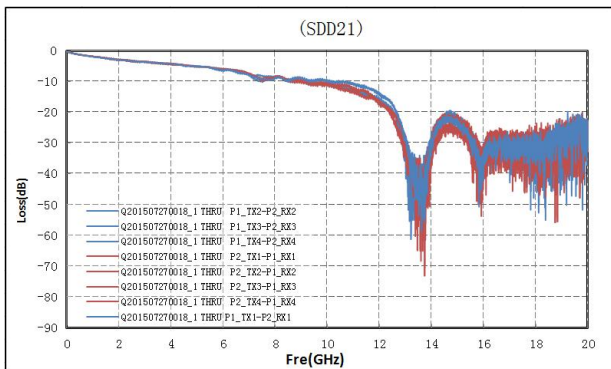
Time Domain

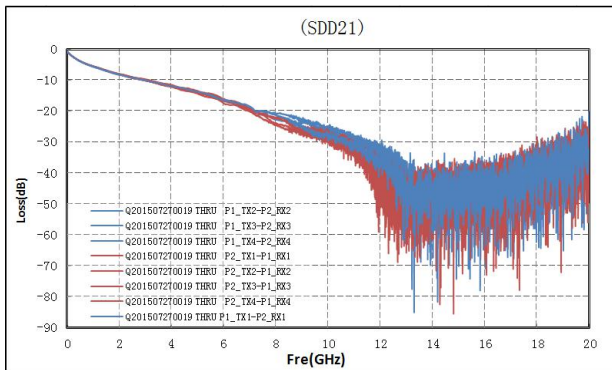
Item	Test Parameter	Specification (Proposal)
1	Intra-Skew* 1M 1.5M~2.5M 2.5M~3.5M 3.5M~5.5M 5.5M~7.5M	20ps Max
		25ps Max
		30ps Max
		40ps Max
		40ps Max
		50ps Max
2	Impedance Rise time: 50ps (20%~80%)	100 +/- 10 Ohm
3	Insertion Loss* (SDD21) for 1M	a. 0.6GHz : -2.05 dB Max
		b. 1.25GHz : -2.75 dB Max
		c. 2.50GHz : -4.11 dB Max
		d. 3.25GHz : -5.3 dB Max
		e. 5.0GHz : -6.6dB Max
	Insertion Loss* (SDD21) for 2M	a. 0.6GHz : -3.1 dB Max
		b. 1.25GHz : -4.0 dB Max
		c. 2.50GHz : -5.96 dB Max
		d. 3.25GHz : -7.2 dB Max
		e. 5.0GHz : -9.54 dB Max

Insertion Loss* (SDD21) for 3M	a. 0.6GHz : -4.03 dB Max b. 1.25GHz : -5.42 dB Max c. 2.50GHz : -8.12 dB Max d. 3.25GHz : -9.78 dB Max e. 5.0GHz : -12.89 dB Max
Insertion Loss* (SDD21) for 5M	a. 0.6GHz : -4.45 dB Max b. 1.25GHz : -6.20 dB Max c. 2.50GHz : -8.98 dB Max d. 3.25GHz : -10.64 dB Max e. 5.0GHz : -14.03 dB Max
Insertion Loss* (SDD21) for 7M	a. 0.6GHz : -5.93 dB Max b. 1.25GHz : -8.34 dB Max c. 2.50GHz : -12.11 dB Max d. 3.25GHz : -14.28 dB Max e. 5.0GHz : -18.70 dB Max

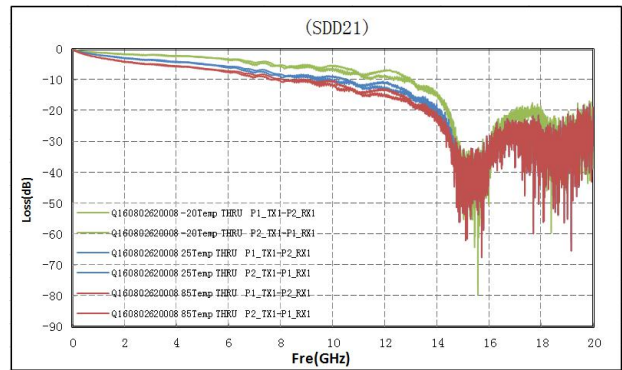
*For different length requirements, different specification

Typical Operation Characteristics





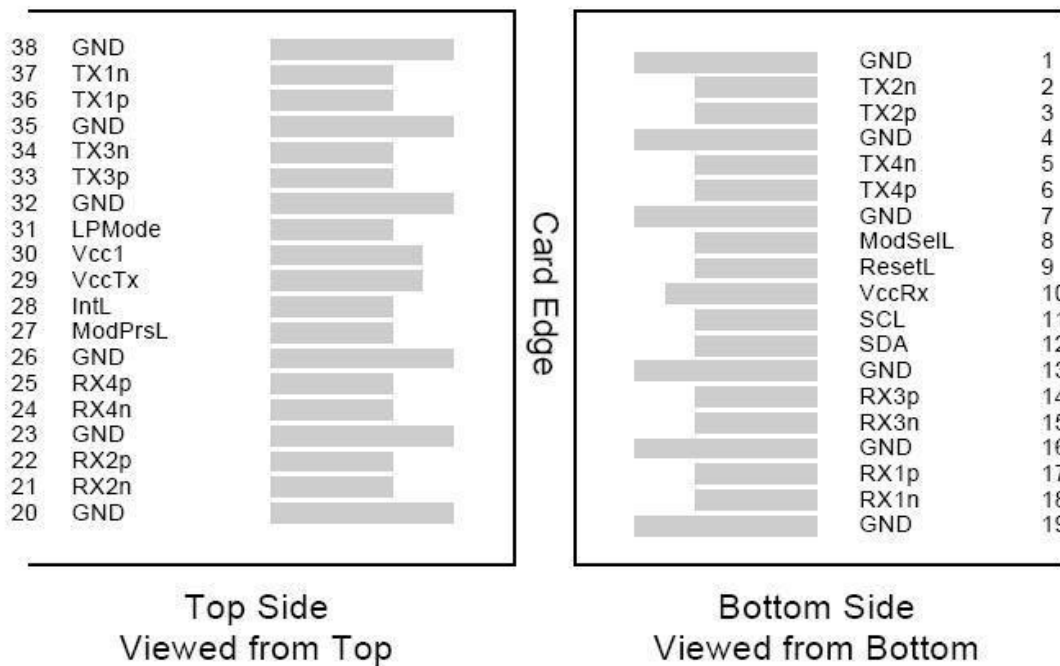
Q10-4SFP 26AWG 7M



Temperature test data (30AWG 1M)

Host board Connector Pinout for QSFP+

Figure 1 : MSA compliant Connector



Top Side Viewed from Top

Bottom Side Viewed from Bottom

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	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-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

Notes:

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. Vcc 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.

Electrical Control Line Description of QSFP+

ModSelL: The ModSelL is an input pin that the host holds “low” when it needs to communication with the module over the I2C interface. It is pulled “high” inside the QSFP+ module.

ResetL: The ResetL pin is normally pulled “high” in the module. The host pulls this “low” to initiate a module reset, returning all user modules settings to their default values.

LPMode: The QSFP+ module can have two power consumption modes: a low power mode and a high power mode.

ModPrsL: ModPrsL is used by the host to detect when a module is inserted into the appropriate port. This pin is grounded in the module and pulled “high” by the host.

IntL: This is an output pin and when asserted “low” it indicates a possible fault in the module which the host system is alerted to. The host system then can interrogate the module via the 2-wire interface to determine the cause of the fault.

Host board Connector Pinout for SFP+

Figure 1 : MSA compliant Connector

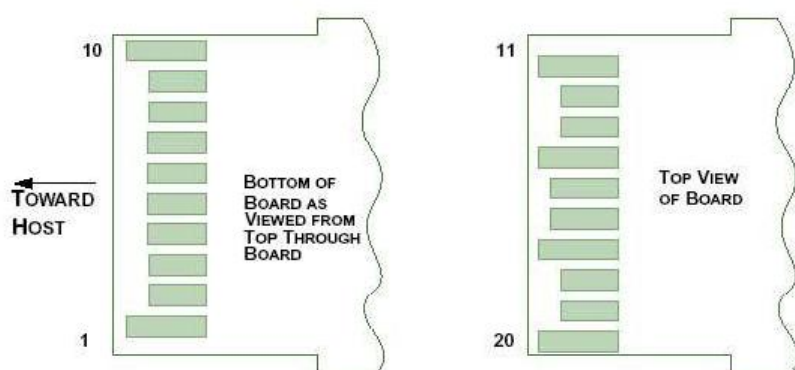


Figure 2: Pin Definitions.

Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	1
2	LVTTL-O	Tx_Fault	Transmitter Fault	2
3	LVTTL-I	Tx_Disable	Transmitter Disable	3
4	LVTTL-I/O	SDA	MOD-DEF2 2-wire serial interface data line	4
5	LVTTL-I/O	SCL	MOD-DEF1 2-wire serial interface clock line	4
6		Mod_Abs	Module Absent	5
7	LVTTL-I	RS0	Rate Select Zero	
8	LVTTL- O	Rx_LOS	Module Receiver Loss of Signal	2
9	LVTTL-I	RS1	Rate Select One	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3V Supply	
16		VccT	Module Transmitter 3.3V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

Notes:

1. The module signal grounds, VeeR and VeeT, shall be isolated from the module case.
2. This is an open collector/drain output and shall be pulled up with 4.7-10k to Vcc_Host on the host board. Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module has voltage exceeding module VccT/R + 0.5 V.
3. This is an open collector/drain input and shall be pulled up with 4.7-10k to VccT in the module.
4. See 2-wire electrical specifications .
5. This shall be pulled up with 4.7-10k to Vcc_Host on the host board.

Electrical Control Line Description of SFP+

Tx_Fault: Transmitter fault detection is not supported, the “TX-Fault” line is ground inside the module.

Tx_Disable: This is an input line to the module allowing the host to disable the VCSEL driver, switching off the transmitter. The line is pulled high with a pull-up resistor inside the module. When this pin is asserted low or grounded the VCSEL driver operates normally

RS0/RS1: These are optional input lines to the module to allow the host to select the rate of the module.

MOD_DEFO: This line is used to detect the absence or presence of the module by the host. This line is connected to a ground inside the module. The host may pull this line up to Vcc with a resistor and asserted high to detect the absence of the module.

SCL/SDA: A complete memory map is support via the I2C interface.

Rx_LOS: This line represents the receiver signal strength detection signal and is an output line. When the optical signal strength falls below a certain threshold, the module asserts this line high.

Memory Map

The QSFP+ and SFP+ connector provides an MSA standard 2-wire serial communication interface to 256kB EEPROM memory maps; both standard and custom memory maps are available.

EEPROM Map			
Device 0xA0			
Address (Dec)	Value (Hex)	Name of Field (as per SFF-8636)	Description of data code
0	0D	ID and status	0Dh = QSFP+
1-2	01 02	Status	Compliance SFF-8636 Flat EEPROM, No IntL, Ready
3-21	0	Interrupt Flags	00h
22-33	0	Module Monitors	00h

34-81	0	Channel Monitors	00h
82-85	0	Reserved	00h
86-97	0	Control	00h
98-99	0	Reserved	00h
100-106	0	Module and Channel Mask	00h
107-118	0	Reserved	00h
119-122	0	Password Change Entry Area (Optional)	00h
123-126	0	Password Entry Area (Optional)	00h
127	0	Page Select Byte	00h
128	0D	Identifier	0Dh = QSFP+
129	0	Ext. Identifier	00h = Power Class 1, No CLEI, No CDR
130	21	Connector	21h = Copper pigtail
131	0	Transceiver Reserved	00h = not specified
132	0		00h = not specified
133	0		00h = not specified
134	0		00h = not specified
135	41		00h = not specified
136	80		00h = not specified
137	80		00h = not specified
138	0		00h = not specified
139	0	Encoding	00h = not specified
140	67	Nominal bit rate (unit: 100M bps)	67h= 10.3125G/bps
141	0	Reserved	00h = not specified
142	0	Length(SMF)	00h = not specified
143	0	Length (E-50µm)	00h = not specified
144	0	Length (50 µm)	00h = not specified
145	0	Length (62.5 µm)	00h = not specified
146	Length in meters	Cable Length(Copper)	Fill in length in units of 1 meter
147	A0	Device Tech	A0h = Copper Cable Un equalizer
148-163	31 30 47 74 65 6B 20 20 20 ...	Vendor name	Fill in "10Gtek" Extra Bytes are filled with space (20h)
164	03	Extended Transceiver Codes	03h =IB 4X Copper Passive
165	0	Vendor OUI[0]	10Gtek OUI Code
166	0	Vendor OUI[1]	
167	0	Vendor OUI[2]	

168	43	QSFP Vendor Part Number (ASCII)	Fill in 10Gtek P/N "CAB-Q10/4S-P1M"Extra Bytes are filled with space (20h)
169	41		
170	42		
171	2D		
172	51		
173	31		
174	30		
175	2F		
176	34		
177	53		
178	2D		
179	50		
180	31		
181	4D		
182	20		
183	20		
184-185	10Gtek 's Rev	QSFP Vendor Revision Number (ASCII)	Fill in 10Gtek Rev. Extra Bytes are filled with space (20h)
186	Attenuation 2.5GHz	Copper Cable Attenuation	Fill in attenuation @ 2.5GHz in dB
187	Attenuation 5.0GHz		Fill in attenuation @ 5.0GHz in dB
188-189	0	Wavelength Tolerance	00h
190	46	Max Case Temperature	46 = 70C
191	Check Sum	Check Code for Base ID Fields	Fill in Check Sum
192	0	Options	00h = not specified
196-211	Manufacturer's S/N	Serial Number provided by Vendor (ASCII)	Fill in manufacturer's S/N Extra Bytes are filled with space (20h)
212-213	Year	Vendor's manufacturing data code	ASCII code, Two low order digits of year.(00 = 2000)
214-215	Month		ASCII code, digits of month.(01= Jan through 12 = Dec)
216-217	Day		ASCII code, day of month.(01~31)
218-219	Lot Number	Date Code[L]	ASCII code, Vendor Specific lot code
220	0	Diagnostic Monitoring Type	00h = not specified
221	0	Enhanced Options	00h = not specified
222	0	Reserved	Reserved
223	Check Sum	Check code for Extended ID fields	Fill in Check Sum

224-255	0	Vendor Specific ID Fields	0
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EEPROM Map for SFP+			
Device 0xA0			
Address (Dec)	Value (Hex)	Name of Field (as per INF-8074)	Description of data code
0	3	Identifier	03h = SFP/SFP+/SFP28
1	4	Extended identifier	04h = Serial ID defined
2	21	Code for Connector type	21h = Copper pigtail
3	0	Transceiver application supported	00h = Not specified
4	0	Escon compliance code	00h = Not specified
5	0	Sonnet compliance code	00h = Not specified
6	0	Ethernet compliance code	00h = Not specified
7	0	Fiber channel link length	00h = Not specified
8	4	Fiber channel Technology	04h = SFP+ Passive copper cable
9	0	Fiber channel Transmission media	00h = Not specified
10	0	Fiber channel speed	00h = Not specified
11	0	Code for high speed serial Encoding	00h = Not specified
12	67	Nominal bit rate (unit: 100M bps)	FF = 103*100Mb or 10.3Gb
13	0	Reserved	00h = Not specified
14-17	0	Link length supported for Various type of fiber	00h = Not specified
18	1	Link length supported for copper or direct attach cable units of m	Note 1: use 01h for length < 1m Note 2: Fractional length are rounded up to the nearest integer
19	0	Link length supported for 50um OM3 fiber units of 10m	00h = Not specified
20-35	31 30 47 74 65 6B 20 20 20 20 ...	SFP Vendor name	Fill in "10Gtek" Extra Bytes are filled with space (20h)
36	0	Code for electronic or optical compatibility	00h = Reserved
37	0	SFP Vendor IEEE company ID	10Gtek 's OUI
38	0		
39	0		
40	43	Manufacture's P/N	Fill in Part Number" CAB-Q10/4S-P1M"

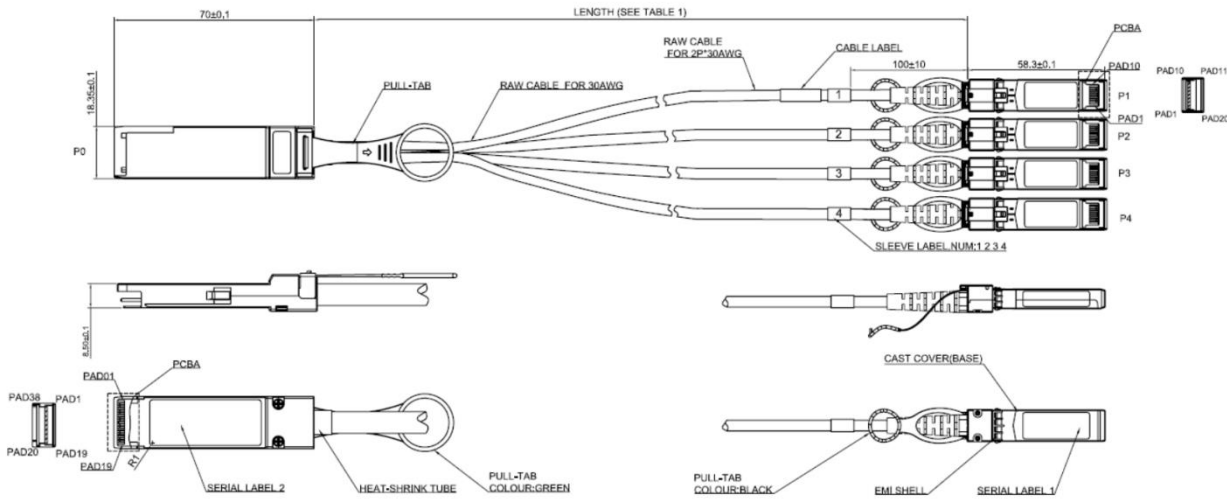
41	41		Extra Bytes are filled with space (20h)
42	42		
43	2D		
44	51		
45	31		
46	30		
47	2F		
48	34		
49	53		
50	2D		
51	50		
52	31		
53	4D		
54	20		
55	20		
56	30	Revision lever for part number provided by Vendor (ASCII)	1
57	31		
58	20		
59	20		
60	1	Laser Wavelength (Passive /Active Cable Specification compliance)	01h = Passive Cable
61	0		00h = Not specified
62	0	Reserved	
63	1E	Checksum	addresses 0 to 62
64	0	Indicates which options Transceiver signals are Implemented	00h = Copper passive (not used)
65	0		00h = Copper passive (not used)
66	0	Maximum bit rate margin	00h = Not specified
67	0	Minimum bit rate margin	00h = Not specified
68-83	Manufacture r's S/N	Serial number Provided by Vendor (ASCII)	Fill in Manufacture's serial number "Q170000000001" Extra Bytes are filled with space (20h)
84		31	Vendor's manufacturing data code
85	35		
86	31		
87	31		
88	32		
89	32		
90	20	Lot number	ASCII code, vendor specific lot code
91	20		

92	0	DD monitoring type	00h = Not specified
93	0	Enhanced software options	00h = Not specified
94	0	SFF-8472 compliance	00h = Digital diagnostic functionality not included or undefined
95	43	Check sum	addresses 64 to94
96-127	0	Vendor Specific ID Fields	0
128-255	FF	Reserved for SFF-8079 (address 128 to 255	Not used

Mechanical Specifications

Parameter	Minimum	Typical	Maximum	Unit
Cable Diameter (26AWG)		QSFP+: 0.413 SFP+: 0.197		Inches
Bend Radius (26AWG)	QSFP+ : 2.065 SFP+ :0.984			Inches
Cable Diameter (30 AWG)		QSFP+: 0.323 SFP+ : 0.165		Inches
Bend Radius (30 AWG)	QSFP+ : 1.615 SFP+ :0.825			Inches
Within Pair Skew			100	ps/10m
Bulk Cable Time Delay			5.2	ns/m
Bulk Cable Impedance	95	100	105	Ohms
Insertion Force	/		QSFP+: 40 SFP+: 30	N
Withdrawal Force	/		QSFP+: 30 SFP+: 11	N
Retention Force	90		/	N
Durability	QSFP+: 250 SFP+ 50		/	Cycles

Mechanical Dimensions



40G QSFP+ to 4x SFP+ Copper Cable Assemblies, Passive

Length	Data Rate	P/N	AWG	Length Tolerance
1m	40G	CAB-Q10/4S-P1M	26 / 28 /30	+0.1/-0.0m
2M	40G	CAB-Q10/4S-P2M	26 / 28 /30	+0.3/-0.3m
3M	40G	CAB-Q10/4S-P3M	26 / 28 /30	+0.3/-0.3m
5M	40G	CAB-Q10/4S-P5M	26	+0.6/-0.6m
7M	40G	CAB-Q10/4S-P7M	26	+0.9/-0.9m

Revision History

Revision	Initiated	Review	Approved	Revision History	Release Date
V1.1	Vinson	Steven	Nicky	Released.	Apr,26, 2017

Further Information

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