QSFP28 To 4SFP28 Passive Copper Cable Assembly

CAB-ZQP/4ZSP-PXM

Features

- **100GbE to 4x25GbE data rate**
- **SFF-8402 SFP28 compliant**
- **SFF-8665 QSFP28 compliant**
- **Operating case temperature of 0-70 °C**
- **Single 3.3V supply voltage**
- **BER better than 10e-15**
- **Hot pluggable**
- **RoHS compliant**
- **SFF-8431/8432 compliant**
- **IEEE 802.3bj and P802.3by compliant**

Applications

- **Low EMI radiation Switches, servers and router**
- **Data Center networks**
- **Storage area networks**
- **High performance computing**
- **Telecommunication and wireless infrastructure**
- **Medical diagnostics and networking**
- **Test and measurement equipment**

Product Description

The 10Gtek® CAB-ZQP/4ZSP-PXM passive copper cable is a high speed, cost-effective 100GbE to 4x25GbE Ethernet connectivity solution, designed for the growing need for higher bandwidth in data centers. The CAB-ZQP/4ZSP-PXM cables are compliant with SFF-8402 SFP28 and SFF-8665 QSFP28 standard specifications and provide connectivity between system units with QSFP28 port on one side and up to four different SFP28 ports on the other. The cable connects data signals from each

of the 4 copper pairs on the QSFP28 end to the single pair of each of the SFP28 ends. Each (Q)SFP port comprises an EEPROM providing product information which can be read by the host system.

10Gtek's unique quality passive copper cable solutions provide power-efficient connectivity for short distance interconnects. It enables higher port bandwidth, density and configurability at a low cost and reduced power requirement in the data centers. Rigorous cable production testing ensures best out-of-the-box installation experience, performance and durability.

Recommended Operation Condition

Parameter	Symbol	Min	Max	Unit
Operating Case Temperature	Topc	0	70	degC
Storage Temperature	Tst	-40	125	degC
Relative Humidity (non-condensation)	RS	-	85	%
Supply Voltage	VCC3	3.135	3.465	V
Voltage on LVTTL Input	Vilvttl	-0.3	VCC3 +0.2	V
Power Supply Current	ICC3	0.001	-	mA
Total Power Consumption	Pd	-	0.003	W

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.

Frequency Domain

Item	Test Parameter	IEEE802.3bj Specification
1	Differential Insertion Loss (SDD21)	Maximum insertion loss at 12.8906Ghz -22.48dB Minimum insertion loss at 12.8906Ghz -8dB
2	Differential Insertion Loss (SDD21)	Maximum insertion loss at 12.8906Ghz -22.48dB Minimum insertion loss at 12.8906Ghz -8dB
3	Differential Return Loss (SDD22)	-16.5+2xSQRT(f) @ 0.01 to 4.1GHz -10.66+14xLog10(f/5.5) @4.1 to 19GHz
4	Differential Return Loss (SDD11)	-16.5+2xSQRT(f) @ 0.01 to 4.1GHz -10.66+14xLog10(f/5.5) @4.1 to 19GHz
5	Common Mode Reflection (SCC22)	-2dB @ 0.01 to 19GHz
6	Common Mode Reflection (SCC11)	-2dB @ 0.01 to 19GHz
7	Common Mode Conversion (SCD22)	-22+(20/25.78)*(f) @ 0.01 to 12.89GHz -15+(6/25.78)*(f) @ 12.9 to 19GHz
8	Common Mode Conversion (SCD11)	-22+(20/25.78)*(f) @ 0.01 to 12.89GHz -15+(6/25.78)*(f) @ 12.9 to 19GHz
9	Differential to Common Mode	-10dB @ 0.01 to 12.89GHz

	Conversion Loss (SCD12)	-27+(29/22)*(f) @ 12.9 to 15.7GHz -6.3dB @ 15.71 to 19GHz
10	Differential to Common Mode Conversion Loss (SCD21)	-10dB @ 0.01 to 12.89GHz -27+(29/22)*(f) @ 12.9 to 15.7GHz -6.3dB @ 15.71 to 19GHz

Time Domain

Item	Test Parameter	Specification (Proposal)
1	Intra-Skew* 1M 1.5M~2M	 20ps Max 25ps Max
2	Differential Impedance Rise time：14ps (20%~80%)	100 +/- 10 Ohm
3	Insertion Loss* (SDD21)for 1M	a) 0.6GHz : -2.09 dB Max b) 1.25GHz : -2.88 dB Max c) 2.50GHz : -3.69 dB Max d) 3.25GHz : -4.72 dB Max e) 5.0GHz : -5.82 dB Max
3	Insertion Loss* (SDD21) or 1.5M	a) 0.6GHz : -2.1 dB Max b) 1.25GHz : -3.23 dB Max c) 2.50GHz : -4.3 dB Max d) 3.25GHz : -5.65 dB Max e) 5.0GHz : -6.89 dB Max
3	Insertion Loss* (SDD21) or 2M	a) 0.6GHz : -2.28 dB Max b) 1.25GHz : -3.76 dB Max c) 2.50GHz : -5.08 dB Max d) 3.25GHz : -6.74dB Max e) 5.0GHz : -8.14 dB Max

* **Notes**:

The item 1and 3, Different diameter and length requirements, Different specification

Host board Connector Pinout

Figure 1 ： MSA compliant Connector

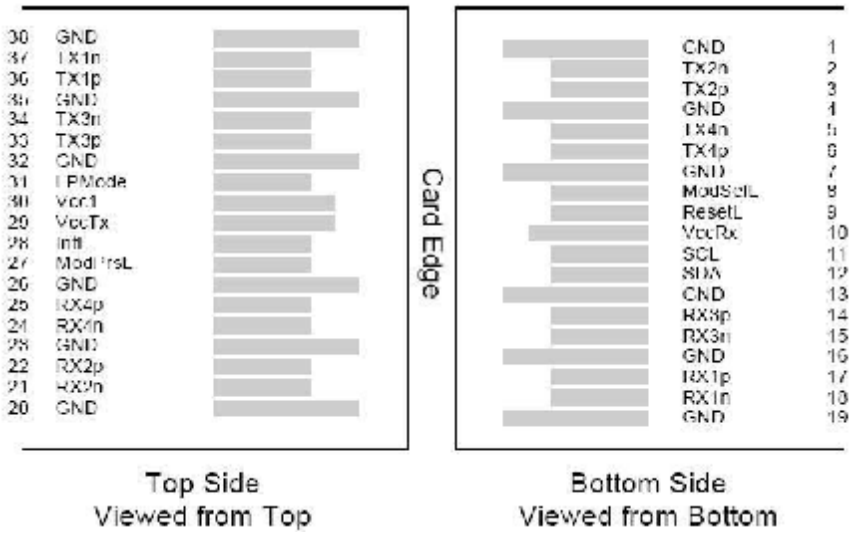


Figure 2： Pin Definitions.

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

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. The connector pins are each rated for a maximum current of 500mA.

Host board Connector Pinout for SFP28

Figure 1 ： MSA compliant Connector

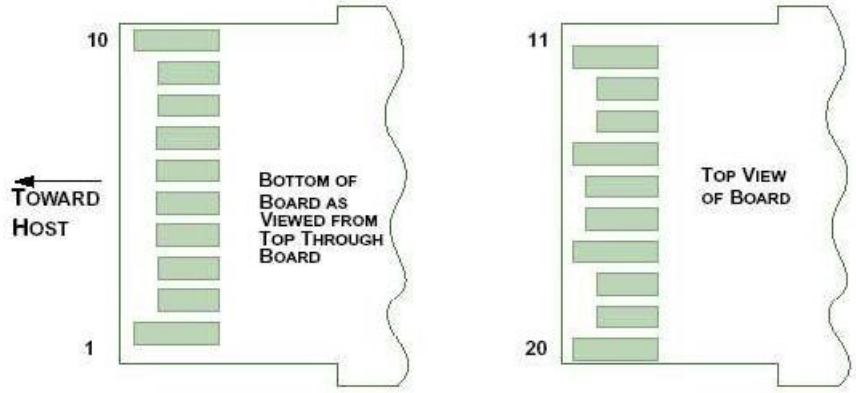


Figure 2： Pin Definitions.

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 specification.
5. This shall be pulled up with 4.7-10k to Vcc_Host on the host board 。

Memory Map

In addition to the electrical loopback function, this loopback module provides an MSA standard 2-wire serial communication interface to digital diagnostics and preloaded 256kB EEPROM memory maps; both standard and custom memory maps are available.

EEPROM Map for QSFP28

Device 0xA0			
Address (Dec)	**Value (Hex)**	**Name of Field (as per SFF-8636)**	**Description of data code**
0	0D	ID and status	
1-2	05 06	Status	
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	11	Identifier	11 = QSFP28
129	0	Ext. Identifier	00h = Power Class 1,No CLEI, No CDR
130	21	Connector	21h = Copper pigtail
131	0B	Transceiver Reserved	100GBASE-CR4
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	FF	Nominal bit rate (unit: 100M bps)	FF= 25.5G/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	1F	Extended Transceiver Codes	1Fh = Extended Module codes for InfiniBand
165	0	Vendor OUI[0]	10Gtek OUI Code
166	2	Vendor OUI[1]	
167	C9	Vendor OUI[2]	
168	51	QSFP28 to 4SFP28 Vendor Part Number (ASCII)	Fill in 10Gtek P/N “QSFP28-4SFP28-1M” Extra Bytes are filled with space (20h)
169	53		
170	46		
171	50		
172	32		
173	38		
174	2D		
175	34		
176	53		
177	46		
178	50		
179	32		
180	38		
181	2D		
182	31		
183	4D		
184-185	10Gtek ‘s Rev	QSFP28 to 4SFP28 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

EEPROM Map for SFP28

Device 0xA0			
Address (Dec)	**Value (Hex)**	**Name of Field (as per SFF-8431)**	**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	FF	Nominal bit rate (unit: 100M bps)	FF = 255*100Mb or 25Gb
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…	QSFP28 to 4SFP28 Vendor name	Fill in ”10Gtek” Extra Bytes are filled with space (20h)
36	0	Code for electronic or optical compatibility	00h = Reserved
37	0	QSFP28 to 4SFP28 Vendor IEEE company ID	10Gtek ‘s OUI
38	2		
39	C9		
40	53	Manufacture’s P/N	Fill in Part Number” QSFP28 -4SFP28-1M” Extra Bytes are filled with space (20h)
41	46		
42	50		
43	32		
44	38		
45	2D		

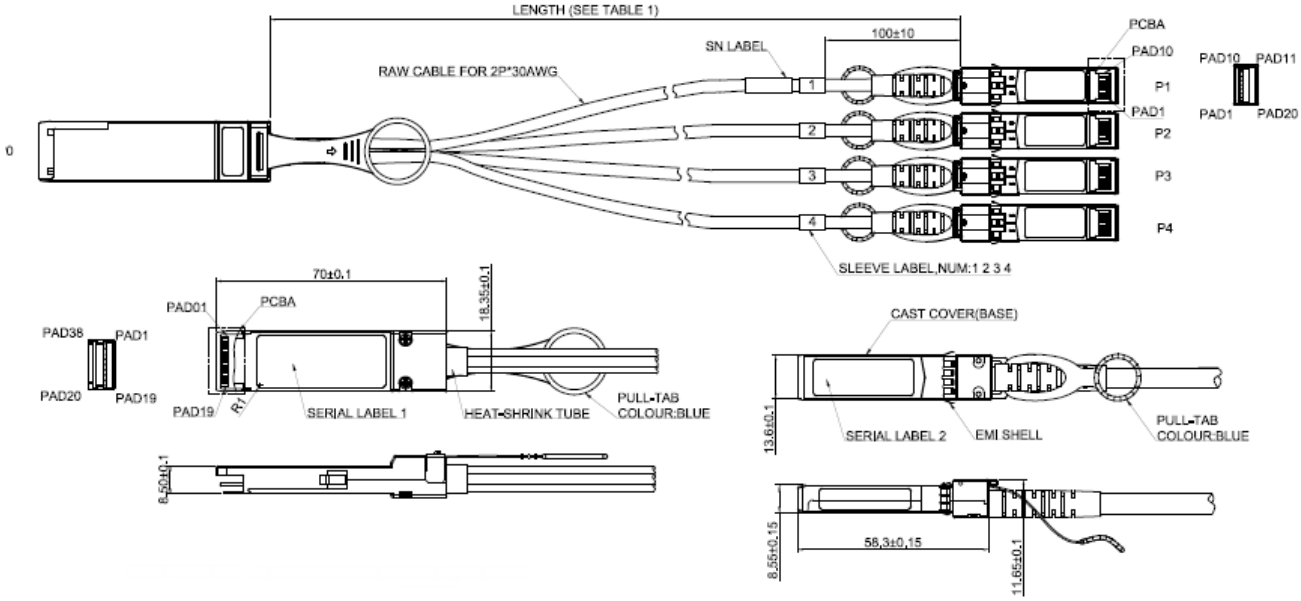
46	32		
47	35		
48	47		
49	2D		
50	31		
51	4D		
52	20		
53	20		
54	20		
55	20		
56	30	Revision lever for part number provided by Vendor (ASCII)	1
57	31		
58	20		
59	20		
60	1	Laser Wavelength (Passive /Active Cable Specification compliance)	01h = Passive Cable
61	0		00h = Not specified
62	0	Reserved	
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	41	Serial number Provided by Vendor (ASCII)	Fill in Manufacture's serial number "A1234560001" Extra Bytes are filled with space (20h)
69	31		
70	32		
71	33		
72	34		
73	35		
74	36		
75	30		
76	30		
77	30		
78	31		
79	20		
80	20		
81	20		
82	20		
83	20		
84	31	Vendor's manufacturing data code	ASCII code, Two low order digits of year.(00 = 2000) ASCII code, digits of month.(01= Jan through 12 = Dec) ASCII code, day of month.(01~31)
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

Mechanical				
Parameter	**Minimum**	**Typical**	**Maximum**	**Unit**
Cable Diameter (28 AWG)		0.185		Inches
Bend Radius (28 AWG)	0.925			Inches
Cable Diameter (30 AWG)		0.181		Inches
Bend Radius (30 AWG)	0.905			Inches
Within Pair Skew			60	ps/5m
Cable Insertion Loss		24.06		dB/5m
Bulk Cable Time Delay			5.2	ns/m
Bulk Cable Impedance	95	100	105	Ohms
Insertion Force	/		QSFP28: 40 SFP28: 18	N
Withdrawal Force	/		QSFP28: 30 SFP28: 12.5	N
Retention Force	90		/	N
Durability	QSFP28: 250 Cycles SFP28: 250 Cycles		/	/

Mechanical Dimensions



Ordering Information

100G QSFP28 to 4SFP28 Copper Cable Assemblies, Passive

Length	Data Rate	P/N	AWG	Length Tolerance
1m	100G	CAB-ZQP/4ZSP-P1M	/ 28 30	+0.1/-0.0m
1.5M	100G	CAB-ZQP/4ZSP-P1.5M	/ 28 30	+0.1/-0.0m
2M	100G	CAB-ZQP/4ZSP-P2M	/ 28 30	+0.1/-0.0m
2.5M	100G	CAB-ZQP/4ZSP-P2.5M	/ 28 /	+0.1/-0.0m
3M	100G	CAB-ZQP/4ZSP-P3M	/ 28 /	+0.3/-0.3m

Revision History

Revision	Initiated	Review	Approved	Revision History	Release Date
V1.1	Vinson	Steven	Nicky	Released.	Apr,18, 2016

Further Information

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