

QSFP28 Passive Copper Cable Assembly

CAB-ZQP/ZQP-PXM

Features

- Compliant with SFF-8665
- Compliant with IEEE 802.3bj
- Up to 100Gb/s data rates
- Ultra low crosstalk for improved performance
- Low insertion loss
- BER better than 10⁻¹⁵
- Tested in an end-to-end system
- Compliant with RoHS



Applications

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

Product Description

10Gtek's CAB-ZQP/ZQP-PXM passive copper cables provide robust connections for leading edge 100Gb/s systems. Passive copper cables require no additional power to ensure quality connectivity. The 100Gb/s passive copper cables are fully compliant with SFF-8436 specification and provide connectivity between devices using QSFP28 ports. 10Gtek's CAB-ZQP/ZQP-PXM 100Gb/s passive copper cables fill the need for short, cost-effective connectivity in the data center.

10Gtek's high-quality solutions provide a power-efficient replacement for active power connectivity such as fiber optic cables for short distances. Optimizing systems to

operate with 10Gtek's CAB-ZQP/ZQP-PXM 100Gb/s passive copper cables significantly reduces power consumption and EMI emission.

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 LVTTTL Input	Vilvttl	-0.3	VCC3 +0.2	V
Power Supply Current	ICC3	0.001	-	mA
Total Power Consumption	Pd	-	0.03	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 Conversion Loss (SCD12)	-10dB @ 0.01 to 12.89GHz -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

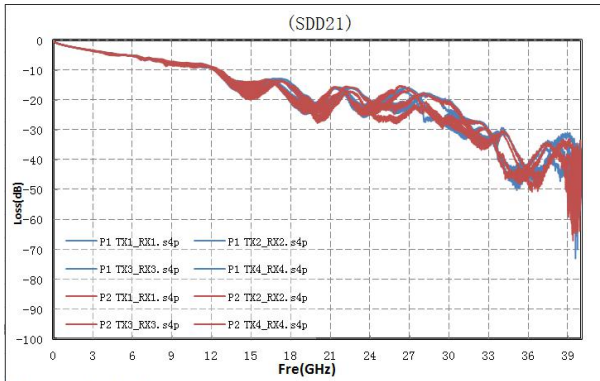
Time Domain

Item	Test Parameter	Specification (Proposal)
1	Intra-Skew* 1M 1.5M~2M 2.5M~3M	20ps Max 25ps Max 30ps Max
2	Impedance Rise time: 14ps (20%~80%)	100 +/- 10 Ohm
3	Insertion Loss* (SDD21)for 1M	a) 0.6GHz : -2.11 dB Max b) 1.25GHz : -2.88 dB Max c) 2.50GHz : -3.78 dB Max d) 3.25GHz : -4.95 dB Max e) 5.0GHz : -5.82 dB Max
	Insertion Loss* (SDD21) for 1.5M	a) 0.6GHz : -2.13 dB Max b) 1.25GHz : -3.24 dB Max c) 2.50GHz : -4.44 dB Max d) 3.25GHz : -5.99 dB Max e) 5.0GHz : -6.90 dB Max
	Insertion Loss* (SDD21) for 2M	a) 0.6GHz : -2.32 dB Max b) 1.25GHz : -3.76 dB Max c) 2.50GHz : -5.26 dB Max d) 3.25GHz : -7.20dB Max e) 5.0GHz : -8.14 dB Max
	Insertion Loss* (SDD21) for 2.5M	a) 0.6GHz : -2.58 dB Max b) 1.25GHz : -3.74 dB Max c) 2.50GHz : -5.27 dB Max d) 3.25GHz : -6.15dB Max e) 5.0GHz : -8.38 dB Max
	Insertion Loss* (SDD21) for 3M	a) 0.6GHz : -2.86 dB Max b) 1.25GHz : -4.24 dB Max c) 2.50GHz : -6.02 dB Max d) 3.25GHz : -6.99 dB Max e) 5.0GHz : -9.5 dB Max
	Insertion Loss* (SDD21) for 4M	a) 0.6GHz : -3.49 dB Max b) 1.25GHz : -5.29 dB Max c) 2.50GHz : -7.56 dB Max d) 3.25GHz : -8.87 dB Max e) 5.0GHz : -11.81 dB Max
	Insertion Loss* (SDD21) for 5M	a) 0.6GHz : -4.15 dB Max b) 1.25GHz : -6.37 dB Max c) 2.50GHz : -9.14 dB Max d) 3.25GHz : -10.5 dB Max e) 5.0GHz : -14.5 dB Max

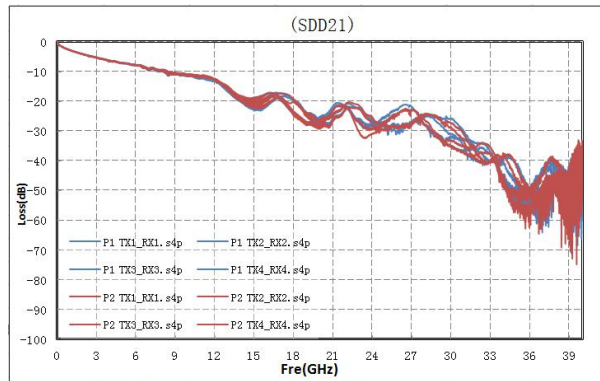
* Notes:

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

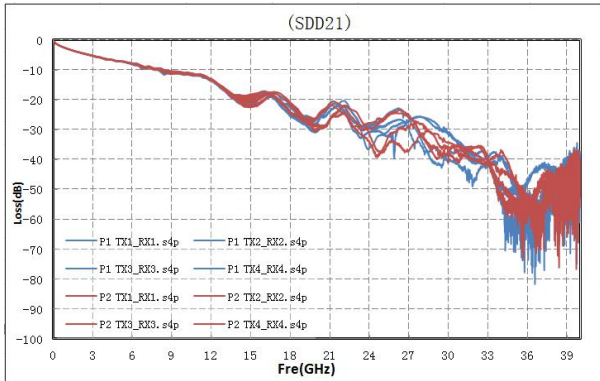
Typical Operation Characteristics



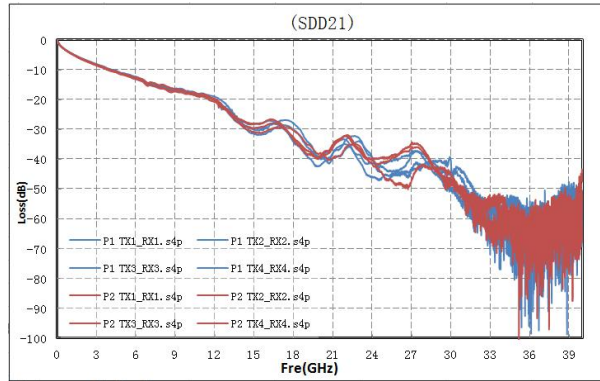
QSFP28 30AWG 1M



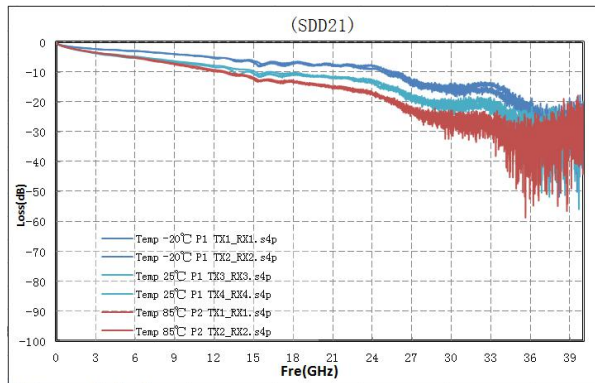
QSFP28 30AWG 2M



QSFP28 26AWG 1M



QSFP28 26AWG 5M



Temperature test data (26AWG 3M)

Host board Connector Pinout

Figure 1 : MSA compliant Connector

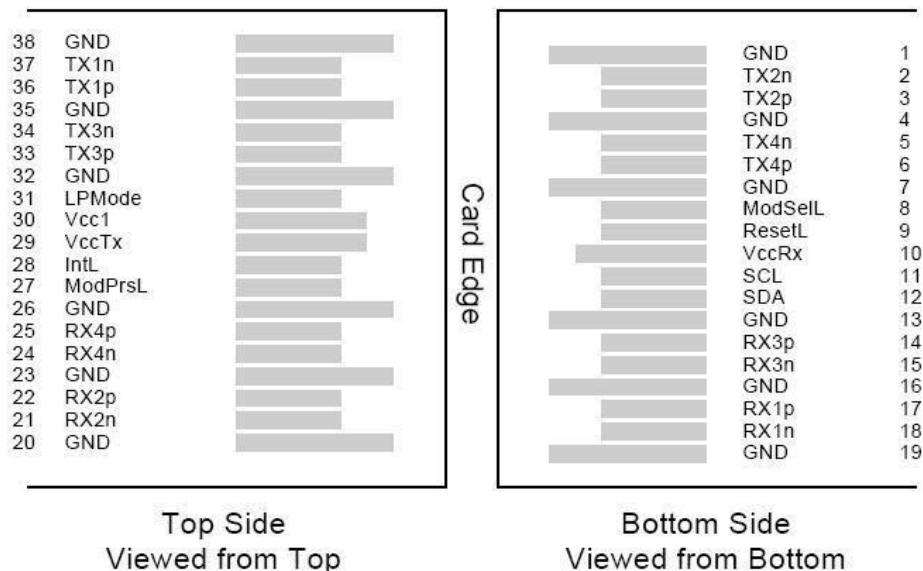


Figure 2: Pin Definitions.

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

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			
Device 0xA0			
Address (Dec)	Value (Hex)	Name of Field (as per SFF-8636)	Description of data code
0	11	ID and status	11h = QSFP28
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

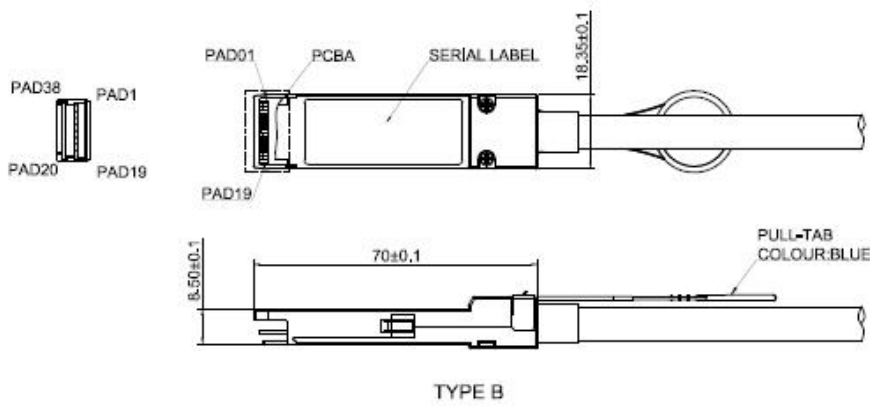
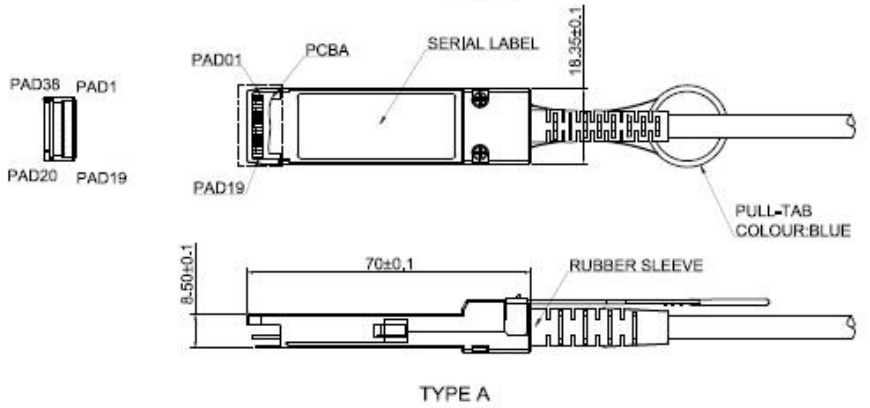
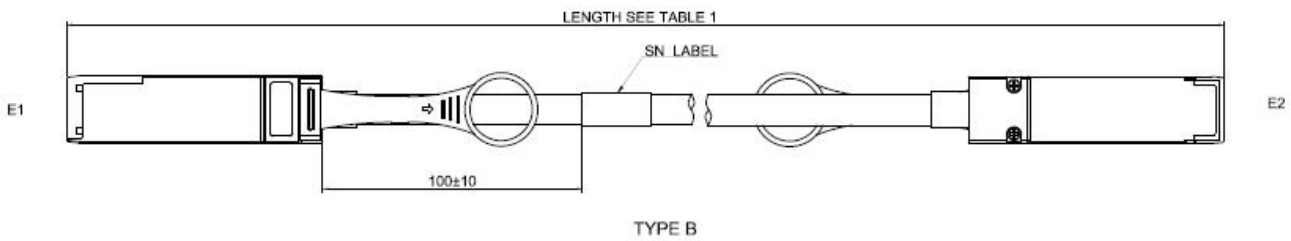
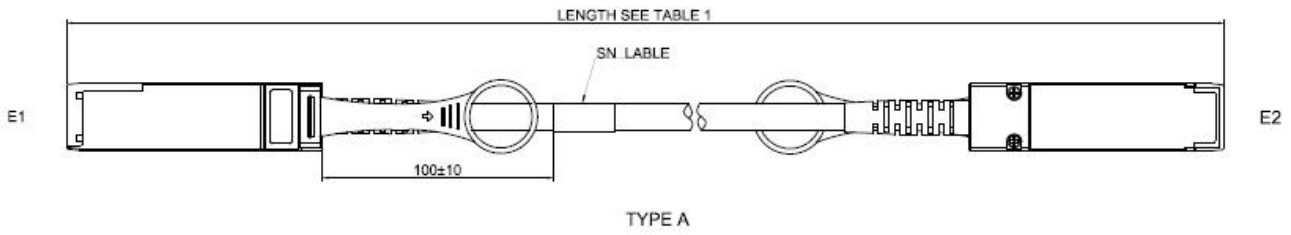
128	11	Identifier	11h = QSFP28
129	0	Ext. Identifier	00h = Power Class 1, No CLEI, No CDR
130	21	Connector	21h = Copper pigtail
131	0B	Transceiver Reserved	100GBASE-CR4
132	0		00h = not specified
133	0		00h = not specified
134	0		00h = not specified
135	41		00h = not specified
136	80		00h = not specified
137	80		00h = not specified
138	0		00h = not specified
139	0		Encoding
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	0	Vendor OUI[1]	
167	0	Vendor OUI[2]	
168	0x43	QSFP28 Vendor Part Number (ASCII)	Fill in 10Gtek P/N "CAB-ZQP/ZQP-P1M" Extra Bytes are filled with space (20h)
169	0x41		
170	0x42		
171	0x2D		
172	0x5A		
173	0x51		
174	0x50		
175	0x2F		
176	0x5A		
177	0x51		
178	0x50		
179	0x2D		
180	0x50		
181	0x31		
182	0x4D		
183	0x20		
184-185	10Gtek 's Rev	QSFP28 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		Fill in attenuation @ 5.0GHz in dB

	5.0GHz		
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

Mechanical Specifications

Mechanical				
Parameter	Minimum	Typical	Maximum	Unit
Cable Diameter (26AWG)		0.385		Inches
Bend Radius (26AWG)	1.925			Inches
Cable Diameter (30 AWG)		0.271		Inches
Bend Radius (30 AWG)	1.355			Inches
Within Pair Skew			100	ps/10m
Cable Insertion Loss		29.77		dB/5m
Bulk Cable Time Delay			5.2	ns/m
Bulk Cable Impedance	95	100	105	Ohms
Insertion Force	/		40	N
Withdrawal Force	/		30	N
Retention Force	90		/	N
Durability	50 Cycles		/	/

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



Ordering Information

100G QSFP28 Copper Cable Assemblies, Passive

Length	Data Rate	P/N	AWG	Length Tolerance
1m	100G	CAB-ZQP/ZQP-P1M	/ 26 30	+0.1/-0.0m
1.5M	100G	CAB-ZQP/ZQP-P1.5M	/ 26 30	+0.3/-0.3m
2M	100G	CAB-ZQP/ZQP-P2M	/ 26 30	+0.3/-0.3m
2.5M	100G	CAB-ZQP/ZQP-P2.5M	/ 26 30	+0.3/-0.3m
3M	100G	CAB-ZQP/ZQP-P3M	/ 26 /	+0.3/-0.3m
4M	100G	CAB-ZQP/ZQP-P4M	/ 26 /	+0.6/-0.6m
5M	100G	CAB-ZQP/ZQP-P5M	/ 26 /	+0.6/-0.6m

Revision History

Revision	Initiated	Review	Approved	Revision History	Release Date
V1.2	Vinson	Steven	Nicky	Released.	Apr,12, 2017

Further Information

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