QSFP28 to 4SFP28 Passive Copper Cable Assembly

ECX-QSFP28-4SFP-DAC-XX-XM

ENCONNEX

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The Enconnex® ECX-QSFP28-4SFP-DAC-XX-XM 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 ECX-QSFP28-4SFP-DAC-XX-XM 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.

Enconnex'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.

PRODUCT 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

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

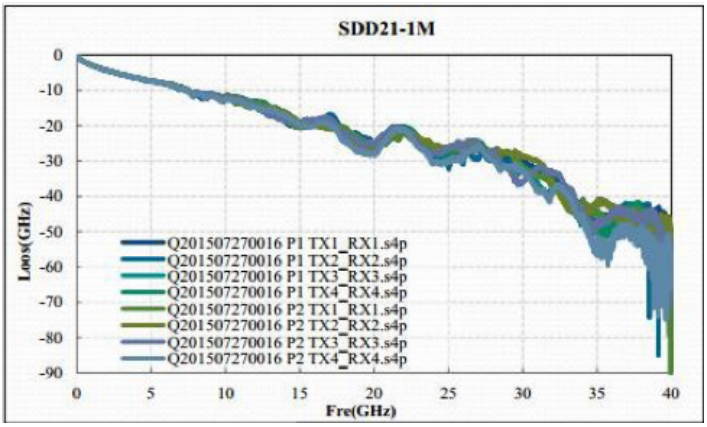
9	Differential to Common Mode Conversion Loss (SCD12)	-10dB @ 0.01 to 12.89GHz -27+(29/22)*(f) @ 12.9 to 15.7GHz -6.3dB @ 15.71 to 19GHz
10	Differential to Common Mode Conversion Loss (SCD21)	-10dB @ 0.01 to 12.89GHz -27+(29/22)*(f) @ 12.9 to 15.7GHz -6.3dB @ 15.71 to 19GHz

TIME DOMAIN

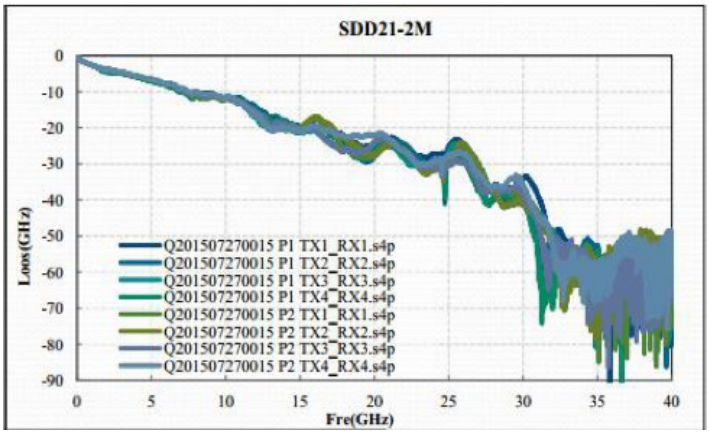
ITEM	TEST PARAMETER	IEEE802.3BJ SPECIFICATION
1	Intra-Skew* 1M 2M 3M 5M	20ps Max 25ps Max 30ps Max 40ps Max
2	Impedance Rise time: 14ps (20%~80%)	100 +/- 10 Ohm
3	Insertion Loss* (SDD21)for 1M	a) 0.6GHz : -2.09 dB Max b) 1.25GHz : -2.88 dB Max c) 2.50GHz : -3.69 dB Max d) 3.25GHz : -4.72 dB Max e) 5.0GHz : -5.82 dB Max
	Insertion Loss* (SDD21) for 2M	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
	Insertion Loss* (SDD21) for 3M	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
	Insertion Loss* (SDD21) for 5M	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

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

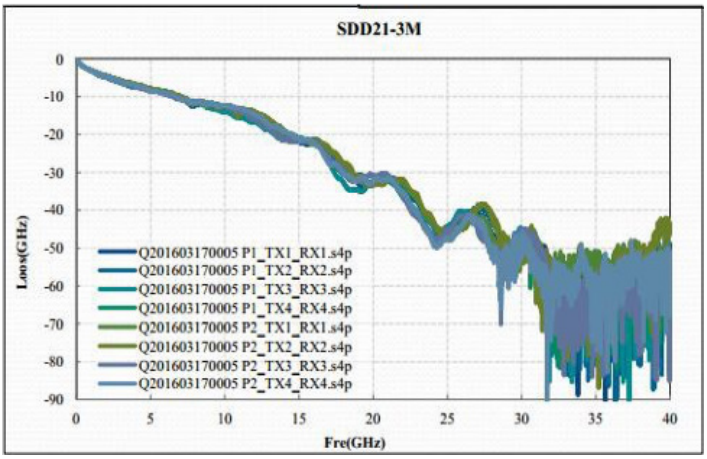
TYPICAL OPERATION CHARACTERISTICS



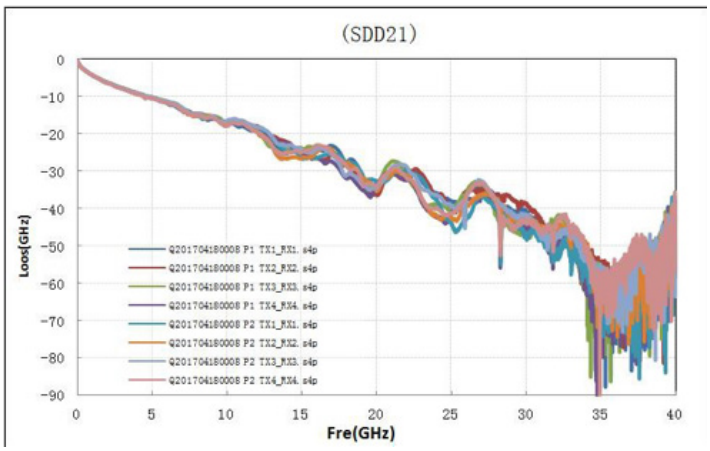
QSFP28_4SFP28 30AWG 1M



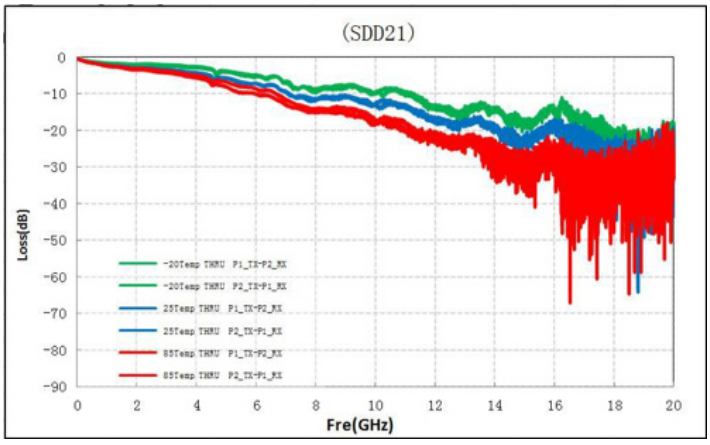
QSFP28_4SFP28 30AWG 2M



QSFP28_4SFP28 30AWG 3M



QSFP28_4SFP28 26AWG 5M



Temperature test data (26AWG 3M)

HOST BOARD CONNECTOR PINOUT

FIGURE 1: MSA COMPLIANT CONNECTOR

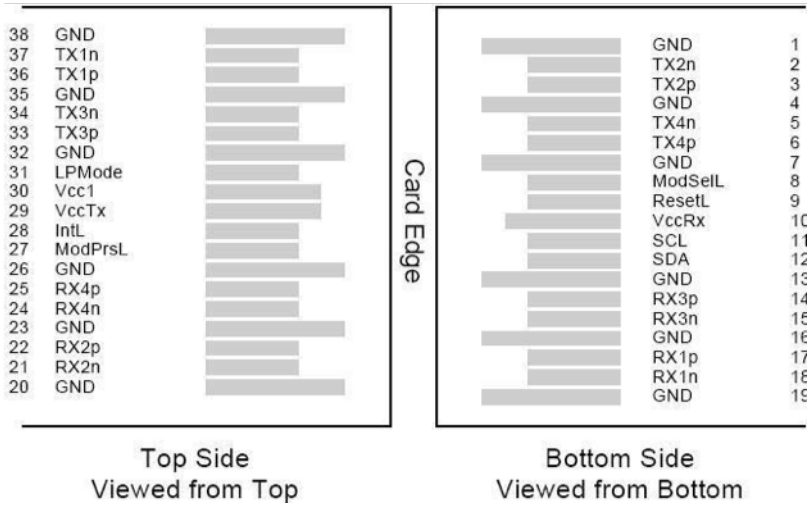


FIGURE 1: MSA COMPLIANT CONNECTOR

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

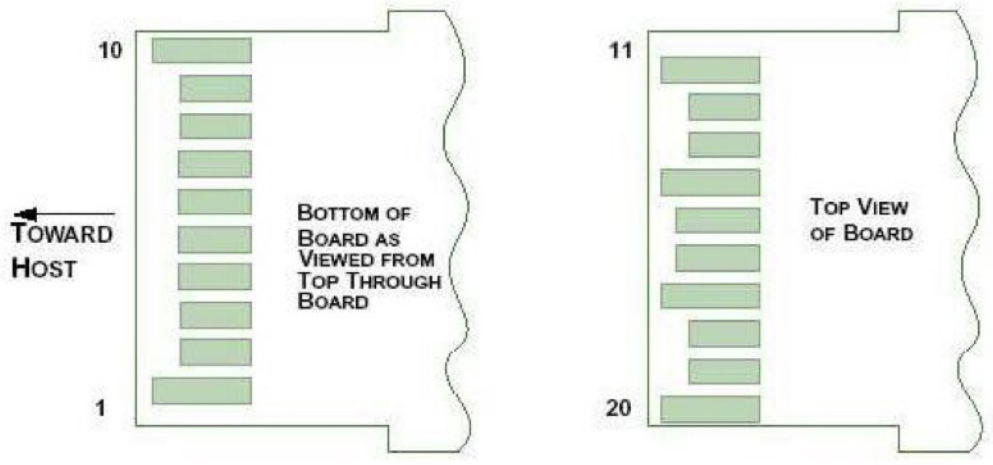


FIGURE 2: PIN DEFINITIONS

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.

HOST BOARD CONNECTOR PINOUT

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

HOST BOAR

DEVICE 0XA0			
Address (Dec)	VALUE (HEX)	NAME OF FIELD (AS PER SFF-8436)	DESCRIPTION OF DATA CODE
0	03	Identifier	03h=SFP/SFP+/SFP28
1	04	Ext. Identifier	04h=GBIC/SFP function is defined by two-wire interface ID only
2	21	Connector	21h = Copper pigtail
3	01	Transceiver Reserved	01h=1X Copper Passive
4	0		00h = not specified
5	0		00h = not specified
6	04		04h=1000BASE-CX
7	41		41h = Short Distance, Electrical inter-enclosure (EL)
8	84		84h = Electrical intra-enclosure (EL)\Passive Cable
9	80		80h = 80h=Twin Axial Pair (TW)
10	F5		F5h =1600,1200, 800, 400, 200, 100 MByte/sec
11	00	Encoding	00h = not specified
12	FF	Nominal bit rate (unit: 100M bps)	FF= 25500MBs
13	0	Reserved	00h = not specified
14	0	Length(SMF)	00h = not specified
15	0	Length (E-50μm)	00h = not specified
16	0	Length (50 μm)	00h = not specified
17	0	Length (62.5 μm)	00h = not specified
18	01	Cable Length(Copper)	Copper Length 1M
19	00	Length (OM3)	00h = not specified
20-35	31 30 47 74 65 6B 20...	Vendor name	Enconnex
36	0C	Extended Transceiver Codes	0C=25GBASE-CR CA-S
37	0	Vendor OUI[0]	Enconnex OUI Code
38	0	Vendor OUI[1]	
39	0	Vendor OUI[2]	

40	43	Vendor PN	ECX-QSFP28-4SFP-DAC-XX-XM
41	41		
42	42		
43	2D		
44	5A		
45	51		
46	50		
47	2D		
48	34		
49	5A		
50	53		
51	50		
52	2D		
53	50		
54	31		
55	4D		
56-59	56 30 31	Vendor Rev	V01
60-61	0	Wavelength or Copper cable Attenuation	00h = not specified
62	0	Unallocated	00h = not specified
63	0	CC_EXT	
64-65	68 00	Options	00h = not specified
66-67	51 31 37 30 31 30 30 30 31 30 30 31	BR, max/BR, min	68h=25G
68-83	31 37 30 31 30 31	Vendor SN	Q17010001001
84-91	0	Date Code	170101
92	0	Diagnostic Monitoring Type	00h = not specified
93	30 31	Enhanced Options	00h = not specified
94	08	SFF-8472 Compliance	08=SFF-8472 Compliance
95	0	CC_EXT	
96-127	0	Vendor Specific	00h = not specified

HOST BOAR

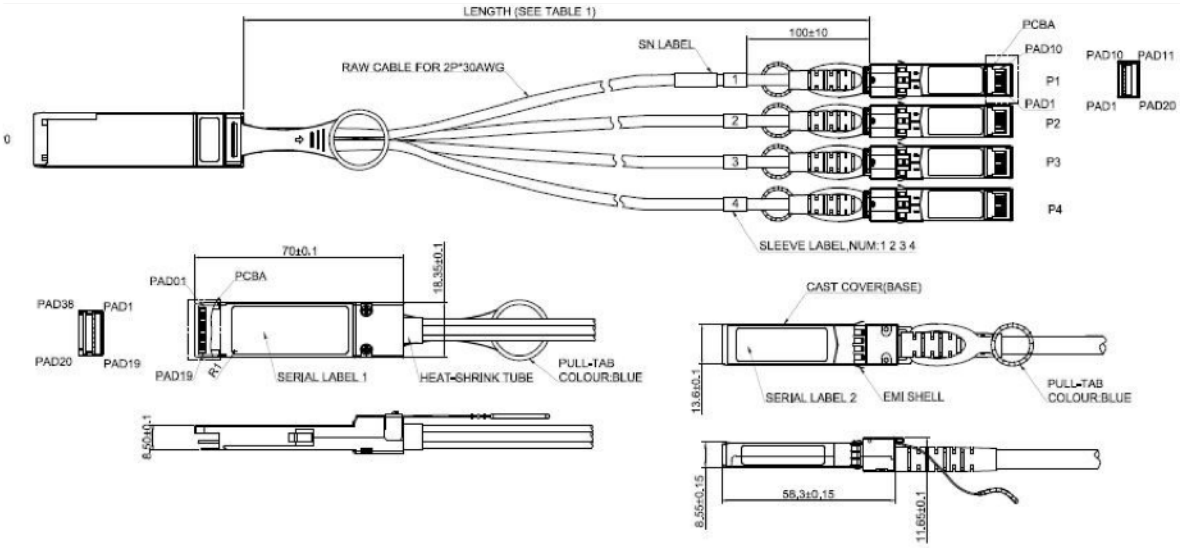
DEVICE 0XA0			
Address (Dec)	VALUE (HEX)	NAME OF FIELD (AS PER SFF-8436)	DESCRIPTION OF DATA CODE
0	11	ID and status	
1-2	01 02	Status	
3-21	0	Interrupt Flags	00h
22-33	0	Module Monitors	00h
34-81	0	Channel Monitors	00h
82-85	0	Reserved	00h
86-97	0	Control	00h
98-99	0	Reserved	00h
100-106	0	Module and 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	80	Transceiver Reserved	80h=Reserved
Transceiver Reserved	80h=Reserved		00h = not specified
132	0		00h = not specified
133	0		00h = not specified
134	0		00h = not specified
135	00		00h = not specified
136	00		00h = not specified
137	00		00h = not specified
138	00		00h = not specified
139	00	Encoding	00h = not specified
140	FF	Nominal bit rate (unit: 100M bps)	FF= 25500MBs
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	01	Cable Length(Copper)	Copper Length 1M
147	A0	Device Tech	A0h = Copper Unequalized
148-163	31 30 47 74 65 6B 20...	Vendor name	Enconnex
164	1F	Extended Transceiver Codes	1F =EDR/QDR/DDR/SDR Support

165	0	Vendor OUI[0]	Enconnex OUI Code
166	0	Vendor OUI[1]	
167	0	Vendor OUI[2]	
168	43	Vendor PN	ECX-QSFP28-4SFP-DAC-XX-XM
169	41		
170	42		
171	2D		
172	5A		
173	51		
174	50		
175	2D		
176	34		
177	5A		
178	53		
179	50		
180	2D		
181	50		
182	31		
183	4D		
184-185	30 31	Vendor Rev	01
186-187	Attenuation 2.5/5GHz	Wavelength or Copper cable Attenuation	Fill in attenuation @ 2.5/5GHz in dB
188-189	Attenuation 7/12GHz	Max Case Temperature	Fill in attenuation @ 7/12GHz in dB
190	46	Check Code for Base ID Fields	46 = 70C
191	Check Sum	Link Codes	Fill in Check Sum
192	0B	Options	0Bh = 100GBASE-CR4
193 -195	0		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	0	Diagnostic Monitoring Type	00h = not specified
221	0	Enhanced Options	00h = not specified
222	0	BR, Nominal	00h = not specified
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 (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
0.5M	100G	ECX-QSFP28-4SFP-DAC-XX-0.5M	/ 28 30	+0.01/-0.01m
1M	100G	ECX-QSFP28-4SFP-DAC-XX-1M	/ 28 30	+0.03/-0.03m
1.5M	100G	ECX-QSFP28-4SFP-DAC-XX-1.5M	/ 28 30	+0.03/-0.03m
2M	100G	ECX-QSFP28-4SFP-DAC-XX-2M	/ 28 30	+0.03/-0.03m
2.5M	100G	ECX-QSFP28-4SFP-DAC-XX-2.5M	/ 28 30	+0.03/-0.03m
3M	100G	ECX-QSFP28-4SFP-DAC-XX-3M	/ 28 30	+0.03/-0.03m
4M	100G	ECX-QSFP28-4SFP-DAC-XX-4M	26 / /	+0.06/-0.06m
5M	100G	ECX-QSFP28-4SFP-DAC-XX-5M	26 / /	+0.06/-0.06m

REVISION HISTORY

REVISION	INITIATED	REVIEW	APPROVED	REVISION HISTORY	RELEASE DATE
V1.2	Vinson	Steven	Nicky	Released.	Mar/2017
V1.3	Vinson	Steven	Nicky	Released.	Sep/2017

FURTHER INFORMATION

For further information Enconnex Sales

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