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APPROVED TECHNOLOGY

Technical Datasheet

QFX-QSFP-DAC-10MA-C

Juniper 40Gb/s QSFP+

Direct Attach Cable, Copper, Active, 10m

FEATURES

- Compliant with SFF-8436
- Fully compatible with IEEE802.3ba and Infiniband
- QDR specifications 40Gb/s total bandwidth
- 4 independent duplex channels operating at 10Gbps,
- also support for 2.5Gbps, 5Gbps data rates
- Low power <1.5W, low latency analogue circuitry
- Uses advanced analogue signal processing technology
- All-metal housing for superior EMI performance
- BER better than 10-15
- AC coupling of PECL signals
- Ultra-low crosstalk for improved performance
- EEPROM for cable signature & system communications
- 30 AWG to 26 AWG cable sizes available
- Tested in an end-to-end system
- RoHS compliant

APPLICATIONS

- Data
- Servers
- Networked storage systems
- Routers
- External storage systems
- Data Center networking
- Communications
- Switches
- Routers
- Industry Standards
- InfiniBand Trade Association (IBTA)
- EEE802.3ba
- 40Gigabit Ethernet (40G BASE – CR4)

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DESCRIPTION

ATGBICS Juniper QFX-QSFP-DAC-10MAAT active copper cables are 40Gb/s cable assembly. The cables are compliant with InfiniBand Architecture, SFF-8436 specifications and provide connectivity between devices using QSFP ports.

The QFX-QSFP-DAC-10MAAT is an assembly of 4 full-duplex lanes, where each lane is capable of transmitting data at rates up to 10Gb/s per direction, providing an aggregated rate of 40Gb/s. The cables use state of-the-art signal processing technology to fill the expanding need for cost effective data center interconnects that cannot be served with passive copper solutions. The unique low power cable solutions consume 50-75% less power than optical interconnects. Optimizing systems to operate with the active copper cables significantly reduce power consumption and EMI emission, eliminating the use of EDC hosts. Rigorous cable production testing ensures best out-of-the-box installation experience, performance and durability.

Recommended Operating Environment

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature **See Notes**	Topc	0	--	70	degC
Relative Humidity (non-condensation)	RS	-	-	85	%
Supply Voltage	VCC3	3.135	3.30	3.465	V
Power Supply Current	ICC3	-	70	80	mA
Total Power Consumption	Pd	-	-	0.5	W
Differential Input Voltage Swing	V DIFF	100		1800	mVp-p
Differential Output Voltage Swing	V DIFF			600	mVp-p
Total Power Consumption	Pd		1.5		W
Data Output Rise Time/Fall Time	Tr, Tf			120	ps
Bit Error Ratio	BER		<10-12		/

Notes:

1. Stress or conditions exceed the above range may cause permanent damage to the device.
2. 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.

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Performance Specifications – Electrical

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Reference Differential Input Impedance	Zd		100		Ω	
Termination Mismatch	ΔZ M			5	%	
Input AC Common Mode Voltage				25	mV (RMS)	
Differential Input S- parameter	SDD11	< -12 + 2 × SQRT(f), with finGHz.			dB	0.01-4.1GHz
		< -6.3 + 13 × log10(f/5.5), with fin GHz			dB	4.1-11.1GHz
Reflected Differential to Common Mode Conversion	SCD11			-10	dB	0.01-11.1GHz
Total Jitter				0.40	UI	
Deterministic Jitter				0.15	UI	
Receive						
Reference Differential Input Impedance	Zd		100		Ω	
Termination Mismatch	ΔZ M			5	%	
Output AC Common Mode Voltage				15	mV (RMS)	
Differential Output S- parameter	SDD22	< -12 + 2 × SQRT (f), with f in GHz			dB	0.01-4.1GHz
		< -6.3 + 13 × log10(f/5.5), with f in GHz			dB	4.1-11.1GHz
Common Mode Output Reflection Coefficient	SCC22	< -7 + 1.6 × f, with f in GHz.			dB	0.01-2.5GHz
				-3	dB	2.5-11.1GHz
Total Jitter				0.38	UI	

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Deterministic Jitter				0.64	UI	

Host board Connector Pinout

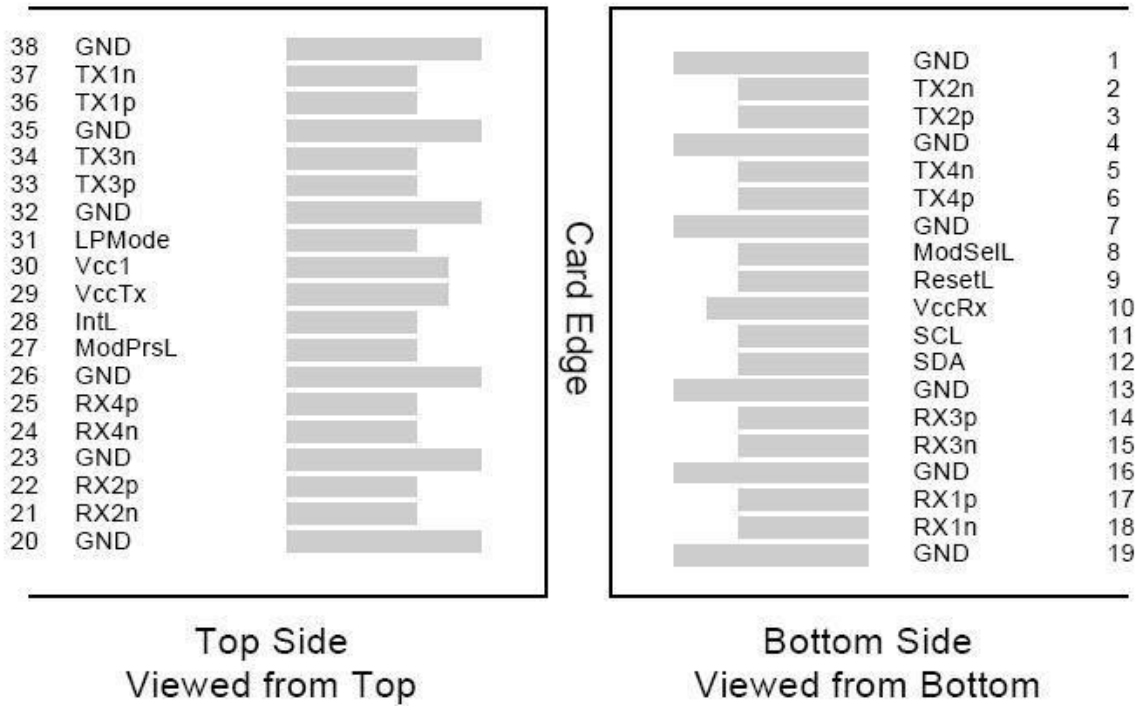


Figure 1: MSA compliant Connector

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Figure 2: Pin Definitions

Pin	Logic	Symbol	Name/Description	Notes
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	

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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

EEPROM Map

Device 0xA0			
Address (Dec)	**Value (Hex)**	**Name of Field (As per SFF-8436)**	**Description of data code**
0	0D	ID and status	
1-2	03 04	Status	
3-21	0	Interrupt Flags	00h
22-33	01 81	Module Monitors	00h
34-81	0	Channel Monitors	00h
82-85	0	Reserved	00h
86-97	0	Control	00h

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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	0C	Identifier	0C = QSFP
129	0	Ext. Identifier	00h = Power Class 1, No CLEI, No CDR
130	21	Connector	21h = No Separable connector
131	08	Transceiver Reserved	40GBASE-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	67	Nominal bit rate (unit: 100M bps)	67= 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	F0	Device Tech	F0h = Copper Cable With Equalizers

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148-163	31 30 47 74 65 6B 20 20 20 …	Vendor name	Extra Bytes are filled with space (20h)
164	03	Extended Transceiver Codes	07 =QDR/DDR/SDR Support
165	0	Vendor OUI[0]	OUI Code
166	2	Vendor OUI[1]	
167	C9	Vendor OUI[2]	
168	43	QSFP Vendor Part Number (ASCII)	Fill in “QSFP-H40G-ACU1M” Extra Bytes are filled with space (20h)
169	41		
170	42		
171	2D		
172	51		
173	31		
174	30		
175	2F		
176	31		
177	30		
178	2D		
179	41		
180	31		
181	4D		
182	20		
183	20		
184-185	Rev	QSFP Vendor Revision Number (ASCII)	Fill in 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

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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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Mechanical Specifications

Mechanical				
Parameter	**Minimum**	**Typical**	**Maximum**	**Unit**
Cable Diameter (26 AWG)		0.341		Inches
Bend Radius (26 AWG)	1.732			Inches
Cable Diameter (28 AWG)		0.307		Inches
Bend Radius (28 AWG)	1.535			Inches
Cable Diameter (30 AWG)		0.244		Inches
Bend Radius (30 AWG)	1.22			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

AWG Information

Length	Data Rate	AWG	Length Tolerance
1m	40G	30	+0.1/-0.0m
2M	40G	30	+0.3/-0.3m
3M	40G	30	+0.3/-0.3m
5M	40G	30	+0.5/-0.5m
7M	40G	30	+0.9/-0.9m
10M	40G	28	+0.9/-0.9m
15M	40G	26	+0.9/-0.9m

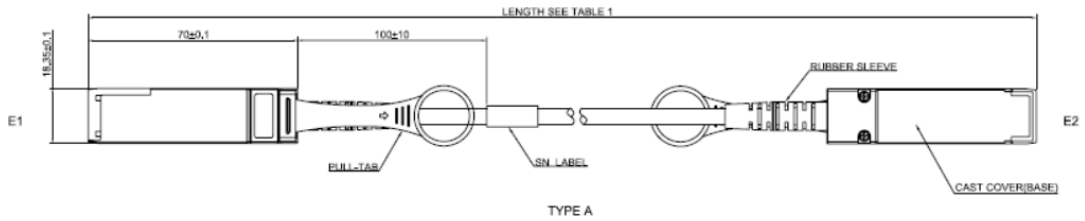
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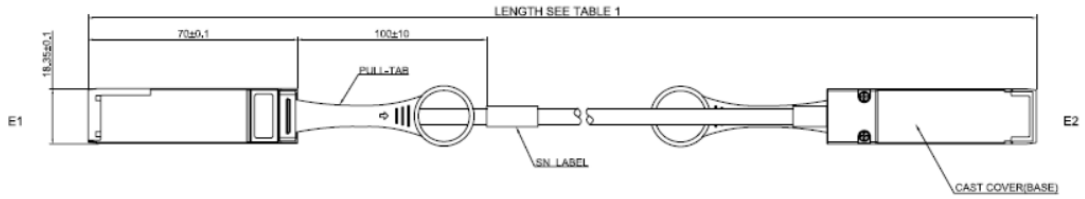
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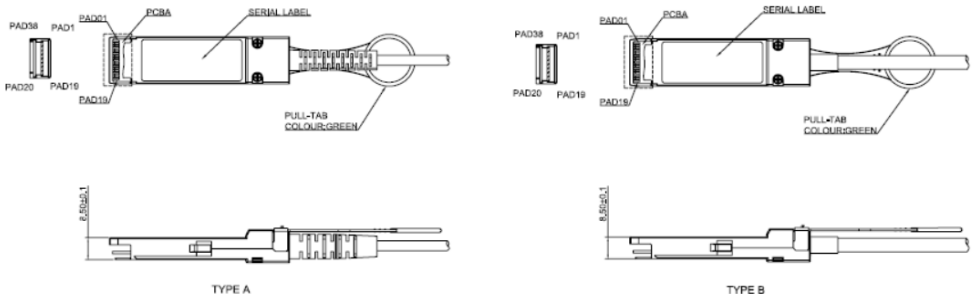
Mechanical Dimensions



TYPE A



TYPE B



TYPE A

TYPE B

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