ACQ423ELF

32 Channel Simultaneous Analog Input Module

Product Description

- 32 channel simultaneous inputs
- 16 bit resolution
- Programmable Input Voltage Range
- High SNR typical 90dB
- Software channel masking for higher sample rate, options:
  - 32 Channels Enabled, Fs = 200ksps
  - 16 Channels Enabled, Fs = 350ksps

Digitiser Key Features

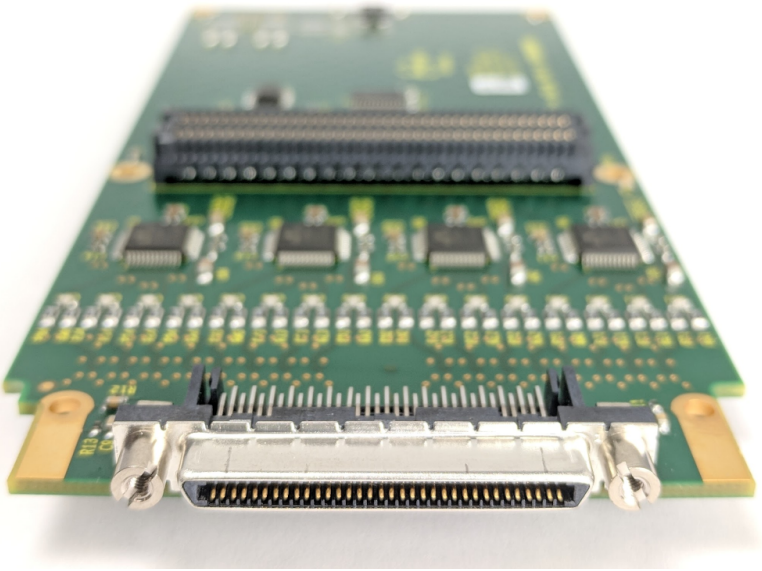
- Ideal for Instrumentation applications, control and monitoring
- Compatible with all D-TACQ Carriers offering up to 192 channels in a 1U 19” system
- Wide range of triggering and capture modes
- Compatible with a range of D-TACQ Breakout Panels and Termination Modules
- Internal FFC connectors for possible OEM Termination or Signal Conditioning

Platform Key Features

D-TACQ supplies a complete working Intelligent Digitizer Appliance providing:

- FPGA based system with a range of flexible and customisable features
- Microprocessor system running open source Linux
- Comprehensive API provided in Python
- Onboard EPICS IOC for rapid integration

Please contact info@d-tacq.com for details on the above system integration options.



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Glossary

- FMC : VITA57.1 FPGA Mezzanine Card
- ELF : Electrically Extended FMC, implies ULPC or DULPC (only compatible with D-TACQ carriers)
- LPC : FMC Low Pin Count standard as per VITA57.1
- ULPC : Subset by D-TACQ, Ultra Low Pin Count
- DULPC : Subset by D-TACQ, Differential Ultra Low Pin Count (ULPC with extra differential signalling)
- ZYNQ: Xilinx System on Chip (SoC) + FPGA logic
- FPGA : Field Programmable Gate Array

1 Product Description

1. ACQ423ELF is a minimum cost 32 channel simultaneous analog input module, intended to replace obsolete high channel count digitizers operating in the range 10..200kHz
2. Standard configuration : 32 channels, 200kSPS/channel, 16 bit, differential, fixed bandwidth 130kHz
3. Software channel masking for higher sample rate, options:
   - 32 Channels Enabled, Fs = 200ksps
   - 16 Channels Enabled, Fs = 350ksps
4. Front end tolerates significant continuous overvoltage. Transient suppression is provided for VHDCI via transition panel eg BNC PANEL, see Termination Panels.
5. Front panel connector: VHDCI or FFC (for local interconnect)
   - VHDCI compatible with D-TACQ range of termination panels
   - FFC compatible with 2xD37 front panel and facilitates custom transitions. Please contact info@d-tacq.com for details

1.1 Product Variants

- ACQ423ELF-32-200-16 32 channels, 200kSPS/ch 16 bit resolution with VHDCI Front Panel Connector
- ACQ423ELF-32-200-16-FFC 32 channels, 200kSPS/ch 16 bit resolution with FFC Connector. This is ordered in conjunction with custom front panel i.e D37

1.2 Carrier Compatibility

The FMC module standard adds user IO to carrier modules fitted with FPGA resource. D-TACQ recommends modules based on the Xilinx ZYNQ system on chip, combining FPGA resource with ARM CPU and Gigabit Ethernet see Module Carriers.

The ELF module standard is a D-TACQ standard and is compatible with only D-TACQ Carriers.

Compatible carriers include:

- D-TACQ ACQ1001 : D-TACQ single site FMC/ELF carrier, Z7020
- D-TACQ ACQ1002 : D-TACQ dual site FMC/ELF carrier, Z7020
- D-TACQ ACQ2106 : D-TACQ 6 site ELF carrier, Z7030
- D-TACQ ACQ2206 : D-TACQ 6 site ELF carrier, Z7030
- D-TACQ ACQ1102 : D-TACQ 2 site FMC/ELF carrier, Z7030
- DAMC-FMC1Z7IO + D-TACQ ACQ400-MTCA-RTM-2 : 2 site ELF + 1 site FMC carrier, Z7030/7035
- Quantum Detectors PandABox, ZYNQ 7030 with single ELF site. Please contact info@d-tacq.com for details

D-TACQ supplies a complete working Intelligent Digitizer appliance including programmable logic and microprocessor system running Linux.

2 Physical

2.1 Board Outline

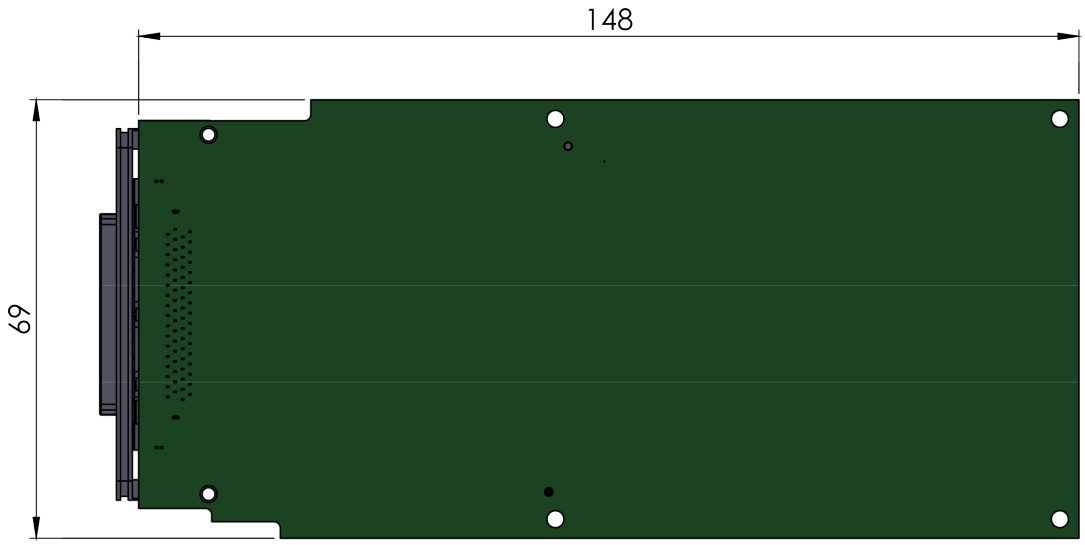

Figure 1: Board Outline D-TACQ ELF

2.2 Appearance with VHDCI Connector

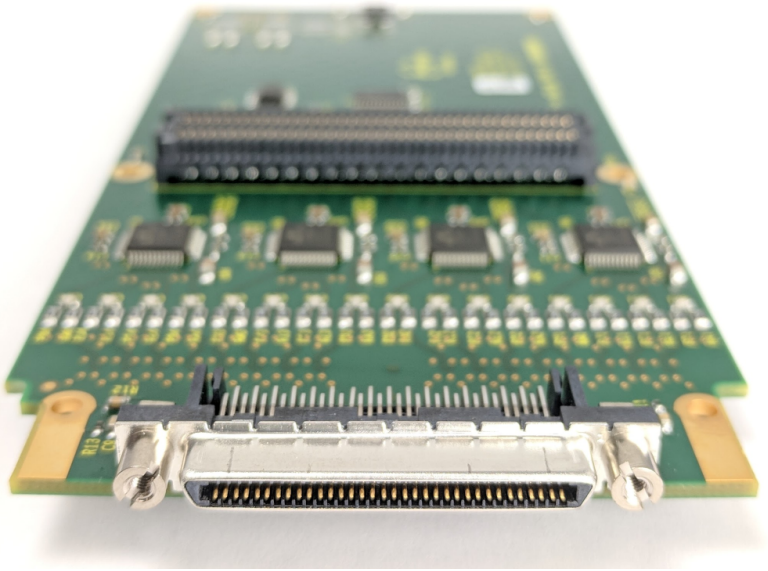

Figure 2: Board Photo

2.3 Front Panel Connectors

2.3.1 VHDCI

- 68 Pin VHDCI. Pinout compatible with D-TACQ BNCPANEL, SMAPANEL, LEMOPANEL, PTBPANEL
- For direct external cable to front panel

Pin	Function	Pin	Function
1	0V	35	0V
2	0V	36	0V
3	AI01+	37	AI01-
4	AI02+	38	AI02-
5	AI03+	39	AI03-
6	AI04+	40	AI04-
7	AI05+	41	AI05-
8	AI06+	42	AI06-
9	AI07+	43	AI07-
10	AI08+	44	AI08-
11	AI09+	45	AI09-
12	AI10+	46	AI10-
13	AI11+	47	AI11-
14	AI12+	48	AI12-
15	AI13+	49	AI13-
16	AI14+	50	AI14-
17	AI15+	51	AI15-
18	AI16+	52	AI16-
19	AI17+	53	AI17-
20	AI18+	54	AI18-
21	AI19+	55	AI19-
22	AI20+	56	AI20-
23	AI21+	57	AI21-
24	AI22+	58	AI22-
25	AI23+	59	AI23-
26	AI24+	60	AI24-
27	AI25+	61	AI25-
28	AI26+	62	AI26-
29	AI27+	63	AI27-
30	AI28+	64	AI28-
31	AI29+	65	AI29-
32	AI30+	66	AI30-
33	AI31+	67	AI31-
34	AI32+	68	AI32-

Table 1: Front Panel VHDCI Connector Pinout

2.3.2 Flexible Flat Cable - FFC

- For custom front panel, see below for an example. Please contact info@d-tacq.com for details

2.3.3 FFC to D37 Front Panel

The example below shows the FFC version fitted with a custom D37 Front panel. Note; there are two D37 connectors per mezzanine site.

Figure 3: Example Fitted to ACQ2106 Carrier, 96 channels in 1U

Figure 4: Front View of ACQ2106 Carrier, 96 channels in 1U

The pinout of the connectors on the D37 panel is given in the tables below@

Pin	Function	Pin	Function
1	AI01+	20	AI01-
2	AI02+	21	AI02-
3	AI03+	22	AI03-
4	AI04+	23	AI04-
5	AI05+	24	AI05-
6	AI06+	25	AI06-
7	AI07+	26	AI07-
8	AI08+	27	AI08-
9	AI09+	28	AI09-
10	AI10+	29	AI10-
11	AI11+	30	AI11-
12	AI12+	31	AI12-
13	AI13+	32	AI13-
14	AI14+	33	AI14-
15	AI15+	34	AI15-
16	AI16+	35	AI16-
17	0V		

Table 2: D37 Front Panel 1-16 Connector Pinout

Pin	Function	Pin	Function
1	AI17+	20	AI17-
2	AI18+	21	AI18-
3	AI19+	22	AI19-
4	AI20+	23	AI20-
5	AI21+	24	AI21-
6	AI22+	25	AI22-
7	AI23+	26	AI23-
8	AI24+	27	AI24-
9	AI25+	28	AI25-
10	AI26+	29	AI26-
11	AI27+	30	AI27-
12	AI28+	31	AI28-
13	AI29+	32	AI29-
14	AI30+	33	AI30-
15	AI31+	34	AI31-
16	AI32+	35	AI32-
17	0V		

Table 3: D37 Front Panel 17-32 Connector Pinout

3 Electrical Specification

#	Parameter	Value
1	Number of Channels	32
2	Sample Rate (Max)	200 kHz / 32 channels, 350 kHz / 16 channels, per channel simultaneous
3	Resolution	16-bit
4	Coupling	DC, Differential Input
5	Input Impedance	> 1 MΩ
6	Input Voltage Range	±10V, ±5V, 0-10V, 0-5.12V [1]
7	Input Voltage Withstand	±40V [2]
8	Offset Error	0.01% FS with numerical calibration
9	Gain Error	0.01% FS with numerical calibration
10	INL	±1 LSB
10	DNL	±1 LSB
11	Bandwidth(-3dB)	130kHz
12	CMRR	> 60 dB FS @ 1 kHz
13	Crosstalk	< 95 dB @ 1 kHz FS Input
14	THD	-90 dB [3]
15	SINAD	-84 dB [3]
16	SFDR	100 dBc [3]
17	SNR [4]	90 dB [3]
18	Temperature Stability	<25ppm/°C

[1] Input Full Scale may saturate below the Input Voltage Range span by up to 0.1%
[2] Maximum Continuous, up to ±100V transient
[3] Typical values measured at full scale with an 8.9 kHz input
[4] ±10V Input Range

Table 4: ACQ423ELF Electrical Performance

4 Mechanical & Environmental Specification

#	Parameter	Value
1	Form Factor	Long ELF
2	Power Consumption	Typical 2.5W, Max 3.5W
3	Environmental	0 °C - 50 °C Operational −10 °C - 85 °C Non-Operational
4	Mezzanine Socket	D-TACQ ELF Ultra Low Pin Count ULPC

Table 5: Mechanical & Environmental Specification

Revision History

Revision	Date	Author(s)	Description
1	17/08/2018	JMcL	Initial Version
2	03/10/2019	JMcL	minor updates
3	07/10/2020	JMcL	Update to Single Ended Input Range
4	26/10/2023	JMcL	Updated carrier support
5	5/2/2024	SR	Addition of D37 pinout