

# ACQ435ELF Advance Product Specification



*High Performance Simultaneous Data Acquisition*

*Preliminary Product Information*

*Subject to Change*

**CONFIDENTIAL**

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# 1 Product Description

1. **ACQ435ELF** is a 32 channel, 24 bit simultaneous analog input module.
2. Standard configuration : 32 channels, 128kSPS/channel.
3. Extended module with *ELF* connector and *ELF* front panel.
4. 2-wire Differential inputs, high quality instrument amplifier front end with switched input voltage ranges.
5. Factory set input function: Follower (voltage input) or Transimpedance (current input). Since the input is differential, there are 4 possible configurations, however only two are used:
  - FF : Both buffers in Follower configuration.
  - TF : Positive side buffer in Transimpedance configuration.
  - FF is the default and is implied.

## 1.1 Product Variants

- **ACQ435ELF-32FF** : 24 bit resolution, 128kSPS/channel, 32 channels + follower, - follower inputs.
- **ACQ435ELF-24TF-8FF** : 24 bit resolution, 128kSPS/channel, 24 channels + transimpedance, - follower inputs; 8 channels + follower, - follower inputs.
- **ACQ435ELF-24** : 24 channels, 24 bit resolution, 128kSPS/channel.
- **ACQ435ELF-16** : 16 channels, 24 bit resolution, 128kSPS/channel.

For 8 channel applications, consider **ACQ430FMC**.

## 1.2 Applications

- Instrumentation applications, control and monitoring.
- Acoustic and seismic applications.

## 1.3 Overview

The *ELF* module standard, based on the same front panel and connector footprint at *FMC*, 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 a dual-core ARM Cortex A9 and gigabit Ethernet. Compatible modules include

- D-TACQ **ACQ1001** : D-TACQ single slot *ELF* carrier, Z7010
- D-TACQ **ACQ2006** : D-TACQ 6 slot *ELF* carrier, Z7020

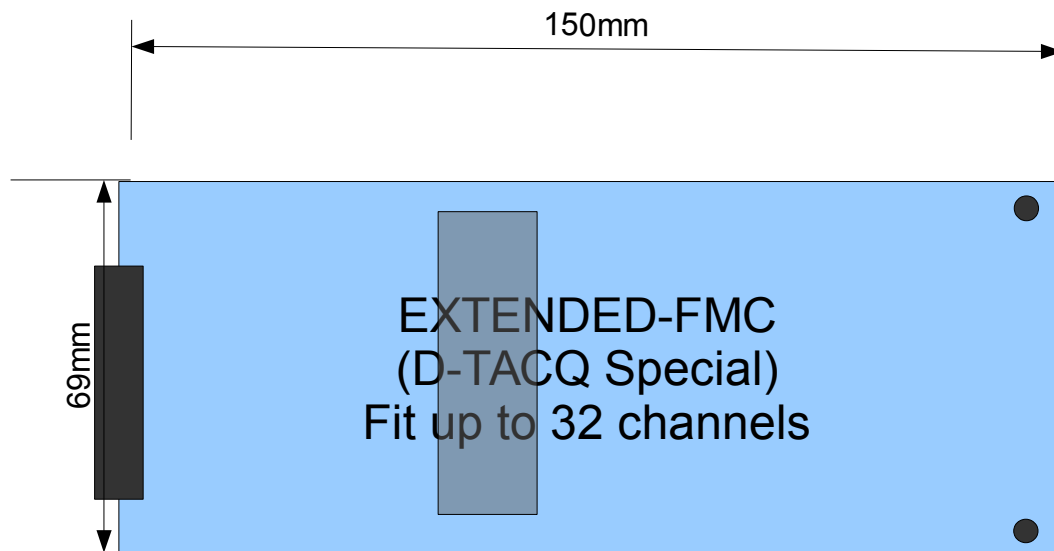
D-TACQ supplies a complete working Intelligent Digitizer appliance including programmable logic and microprocessor system running Linux.

## **1.4 Glossary**

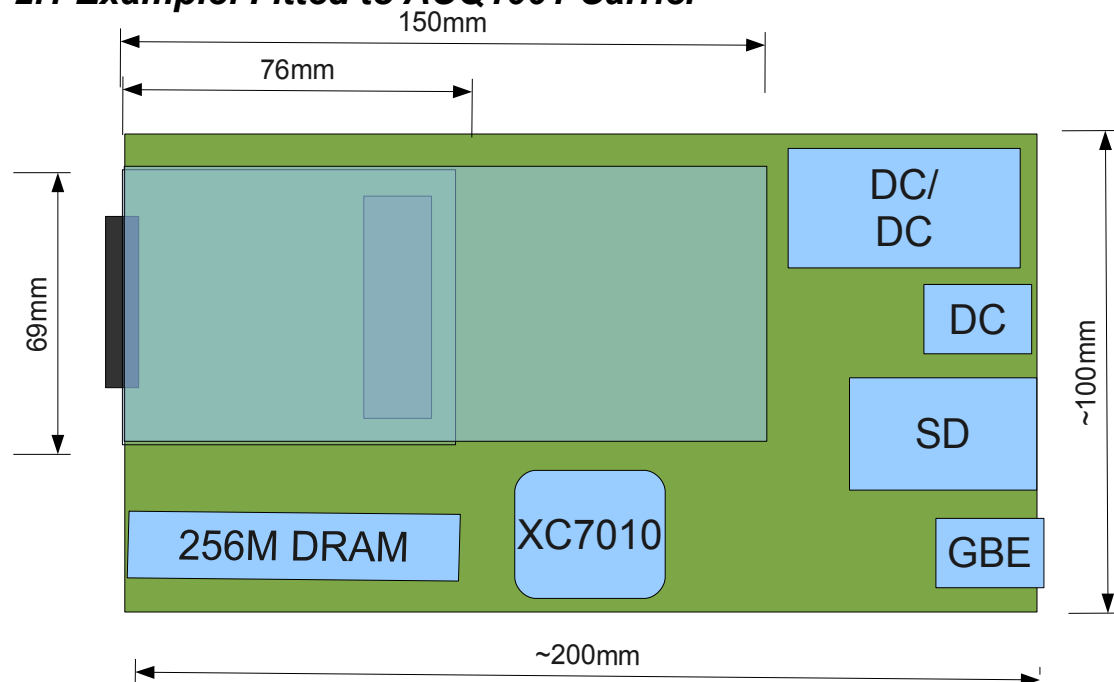
- FMC: [VITA57 FPGA Mezzanine Card](#).
- ELF: D-TACQ extension to FMC, elongated card with provision for dedicated analog power supply rails.
- [Xilinx ZYNQ Soc](#)
- LPC : FMC Low pin count wiring standard.
- ULPC: FMC/ELF Ultra low pin count (D-TACQ).

## 2 Physical

### **Extended ELF Module**



#### **2.1 Example: Fitted to ACQ1001 Carrier**



## 3 Interface Specification.

### **3.1 Front Panel Connector**

- 68 Pin VHDCI
- Pinout compatible with D-TACQ BNCPANEL, SMAPANEL, LEMOPANEL, PTBPANEL.

NB:

-32 variant uses entire BNCPANEL as expected.

-24 variant uses BNCPANEL CH01..CH12, CH21..CH22

-16 variant uses BNCPANEL CH01..CH08, CH25..CH32

### 3.2 32 Channel Pinout

*after software mapping for faceplate order*

|                         |          |                |
|-------------------------|----------|----------------|
| Input Configuration Key | Follower | Transimpedance |
|-------------------------|----------|----------------|

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

### 3.3 24 Channel Pinout

*after software mapping for faceplate order*

|                         |          |                |
|-------------------------|----------|----------------|
| Input Configuration Key | Follower | Transimpedance |
|-------------------------|----------|----------------|

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



### 3.4 16 Channel Pinout

*after software mapping for faceplate order*

|                         |          |                |
|-------------------------|----------|----------------|
| Input Configuration Key | Follower | Transimpedance |
|-------------------------|----------|----------------|

| Pin | Variant     |  | Pin | Variant     |  |
|-----|-------------|--|-----|-------------|--|
|     | <b>16FF</b> |  |     | <b>16FF</b> |  |
| 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  |             |  | 45  |             |  |
| 12  |             |  | 46  |             |  |
| 13  |             |  | 47  |             |  |
| 14  |             |  | 48  |             |  |
| 15  |             |  | 49  |             |  |
| 16  |             |  | 50  |             |  |
| 17  |             |  | 51  |             |  |
| 18  |             |  | 52  |             |  |
| 19  |             |  | 53  |             |  |
| 20  |             |  | 54  |             |  |
| 21  |             |  | 55  |             |  |
| 22  |             |  | 56  |             |  |
| 23  |             |  | 57  |             |  |
| 24  |             |  | 58  |             |  |
| 25  |             |  | 59  |             |  |
| 26  |             |  | 60  |             |  |
| 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-       |  |

**3.5 32 Channel Raw Memory Order**

| <i>Memory Offset</i> | <i>Faceplate Channel</i> |
|----------------------|--------------------------|
| 00                   | 03                       |
| 01                   | 07                       |
| 02                   | 11                       |
| 03                   | 15                       |
| 04                   | 04                       |
| 05                   | 08                       |
| 06                   | 12                       |
| 07                   | 16                       |
| 08                   | 01                       |
| 09                   | 05                       |
| 10                   | 09                       |
| 11                   | 13                       |
| 12                   | 02                       |
| 13                   | 06                       |
| 14                   | 10                       |
| 15                   | 14                       |
| 16                   | 31                       |
| 17                   | 27                       |
| 18                   | 23                       |
| 19                   | 19                       |
| 20                   | 32                       |
| 21                   | 28                       |
| 22                   | 24                       |
| 23                   | 20                       |
| 24                   | 29                       |
| 25                   | 25                       |
| 26                   | 21                       |
| 27                   | 17                       |
| 28                   | 30                       |
| 29                   | 26                       |
| 30                   | 22                       |
| 31                   | 18                       |

### 3.6 24 Channel Raw Memory Order

| <i>Memory Offset</i> | <i>Faceplate Channel</i> |
|----------------------|--------------------------|
| 00                   | 03                       |
| 01                   | 07                       |
| 02                   | 11                       |
| 03                   | 04                       |
| 04                   | 08                       |
| 05                   | 12                       |
| 06                   | 01                       |
| 07                   | 05                       |
| 08                   | 09                       |
| 09                   | 02                       |
| 10                   | 06                       |
| 11                   | 10                       |
| 12                   | 31                       |
| 13                   | 27                       |
| 14                   | 23                       |
| 15                   | 32                       |
| 16                   | 28                       |
| 17                   | 24                       |
| 18                   | 29                       |
| 19                   | 25                       |
| 20                   | 21                       |
| 21                   | 30                       |
| 22                   | 26                       |
| 23                   | 22                       |

### **3.7 16 Channel Raw Memory Order**

| <i><b>Memory Offset</b></i> | <i><b>Faceplate Channel</b></i> |
|-----------------------------|---------------------------------|
| 00                          | 03                              |
| 01                          | 07                              |
| 02                          | 04                              |
| 03                          | 08                              |
| 04                          | 01                              |
| 05                          | 05                              |
| 06                          | 02                              |
| 07                          | 06                              |
| 08                          | 31                              |
| 09                          | 27                              |
| 10                          | 32                              |
| 11                          | 28                              |
| 12                          | 29                              |
| 13                          | 25                              |
| 14                          | 30                              |
| 15                          | 26                              |

## 4 ACQ435ELF Electrical Specification.

| #  | Parameter                | Value                                                                   |
|----|--------------------------|-------------------------------------------------------------------------|
| 1  | Number of Channels       | 32                                                                      |
| 2  | Sample Rate              | 128 kHz,<br>per channel simultaneous                                    |
| 3  | Resolution               | 24 bits                                                                 |
| 4  | Coupling                 | DC, Differential Input                                                  |
| 5  | Input Impedance          | 100K                                                                    |
| 6  | Input Voltage Range      | ±6 V                                                                    |
| 7  | Input Voltage Withstand  | ±30V                                                                    |
| 8  | Offset Error             | 0.01 %FS                                                                |
| 9  | Gain Error               | 0.01 %FS                                                                |
| 10 | INL                      | ±0.002% FS                                                              |
| 11 | CMRR                     | >60dB FS @ 1 kHz                                                        |
| 12 | THD                      | -106 dB                                                                 |
| 13 | SINAD                    | 102 dB                                                                  |
| 14 | SFDR                     | 107 dBc*                                                                |
| 15 | SNR                      | 104 dB*<br>* Typical values measured at full scale with a 9.76kHz input |
| 16 | Analog Input BW          | 80kHz                                                                   |
| 17 | Crosstalk                | <90dB @ 1kHz FS Input                                                   |
| 18 | Digital Filter:Pass Band | 0.453 Fsample                                                           |
|    | Digital Filter:3dB       | 0.490 Fsample                                                           |
|    | Digital Filter:Stop Band | 0.547 Fsample                                                           |
|    | Digital Filter:Attenuate | 95 dB                                                                   |
|    |                          |                                                                         |

## 5 ACQ1001 ELF Carrier Specification.

| #  | Parameter         | Value                                                           |
|----|-------------------|-----------------------------------------------------------------|
| 1  | Formfactor        | approx 200mm x 100mm                                            |
| 2  | Power source      | External DC 12V, 1A                                             |
| 3  | Power Consumption | 12W Max                                                         |
| 4  | SOC Type          | Z7010, dual-core ARM A9,<br>Gigabit Ethernet                    |
| 5  | FPGA Resource     | 80 DSP Slices, 100 GMAC/s                                       |
| 6  | ELF Socket        | Standard ELF, Low Pin Count LPC<br>Fits D-TACQ Extended modules |
| 7  | DRAM              | 256MB, soldered                                                 |
| 8  | Data IO           | RS232, SD Card, USB OTG                                         |
| 9  | Signal IO         | CLK, TRG inputs, two digital outputs<br>SMA or LEMO             |
| 10 | Digital Expansion | PIM Socket                                                      |
| 11 | Digital IOS       | 10 on 10 way ribbon header.                                     |