

ACQ465ELF Product Specification



High Performance Simultaneous Data Acquisition

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Subject to change

Contents

- 1 Product Description 4**
 - 1.1 Product Variants 4
 - 1.2 Applications 4
 - 1.3 Carrier Compatibility 4

- 2 Physical 6**
 - 2.1 Board Outline 6
 - 2.2 Appearance 6
 - 2.3 Front Panel Connectors 7
 - 2.3.1 VHDCI 7
 - 2.3.2 Flexible Flat Cable - FFC 7

- 3 Digital Filters 8**

- 4 Electrical Specification 9**
 - 4.1 24-bit Mode 9
 - 4.2 16-bit Mode 9

- 5 Mechanical & Environmental Specification 10**

Revision History

Revision	Date	Author(s)	Description
1.0	21/04/2021	SR	Created
2.0	10/09/2023	SR	Formatting updates

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)
- Xilinx ZYNQ System on Chip (SoC)
- FPGA : Field Programmable Gate Array

1 Product Description

1. ACQ465ELF is a 32 channel, 24-bit simultaneous, analog input module, implemented with the AD4134 ADC with extremely good SNR
2. Standard configuration, 32 channels :
 - Sample rate up to 374 kSPS per channel, 24-bit
 - Sample rate up to 825 MSPS per channel, 16-bit
3. Device includes many features including programmable filters
4. Extended module with FMC connector and FMC front panel
5. 2-wire differential voltage inputs. High quality differential amplifier front end
6. 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
7. -HR version, best possible SNR from the AD4134 ADC
8. -HG version with high quality instrumentation amplifier front end, high CMRR and a choice of gains

1.1 Product Variants

- HR optimised for highest resolution
 - ACQ465ELF-32-HR-8V : 24-bit resolution, 32 channels, $\pm 8V$ inputs
 - ACQ465ELF-32-HR-4V : 24-bit resolution, 32 channels, $\pm 4V$ inputs
- HG High Gain
 - ACQ465ELF-32-HG004 : Gain=X4, $\pm 1V$ inputs
 - ACQ465ELF-32-HG040 : Gain=X40, $\pm 0.1V$ inputs
 - ACQ465ELF-32-HG400 : Gain=X400, $\pm 0.01V$ inputs

1.2 Applications

- Instrumentation applications, control and monitoring
- Acoustic and seismic applications
- LF Radar

1.3 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.

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 slot FMC carrier, Z7020
- D-TACQ ACQ1002 : D-TACQ dual slot FMC carrier, Z7020
- D-TACQ ACQ2106 : D-TACQ 6 slot FMC carrier, Z7030
- D-TACQ ACQ2206 : D-TACQ 6 slot FMC carrier, Z7030

- D-TACQ ACQ1102 : D-TACQ 2 slot FMC carrier, Z7030
- DAMC-FMC1Z7IO + D-TACQ ACQ400-MTCA-RTM-2

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

2 Physical

2.1 Board Outline

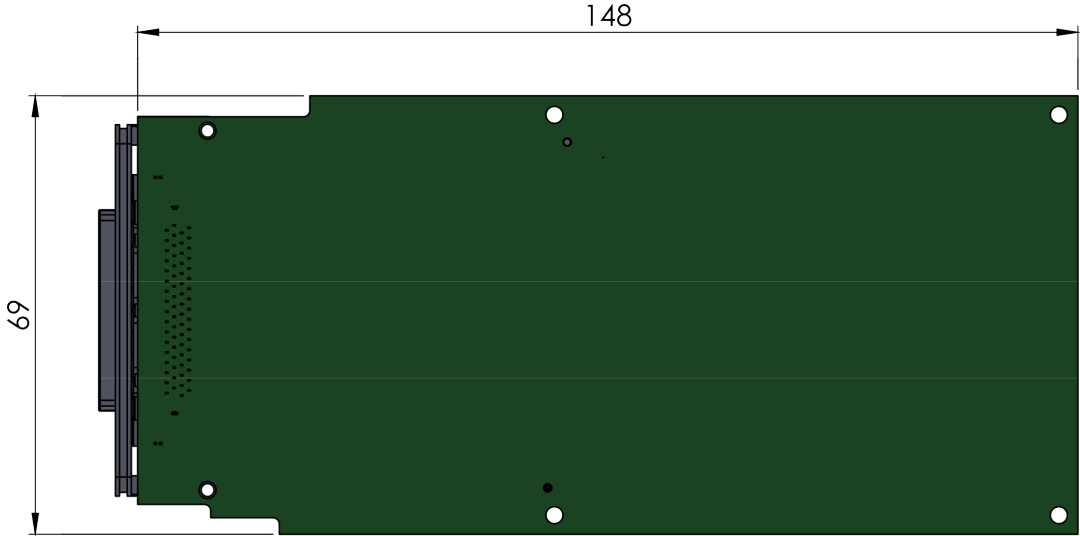


Figure 1: Board Outline

2.2 Appearance

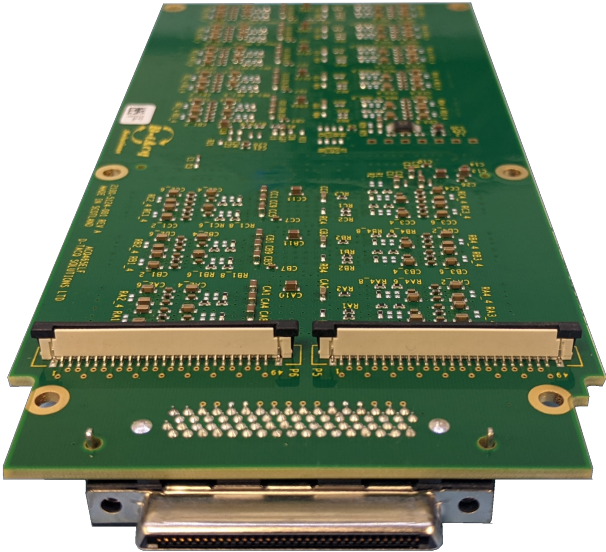


Figure 2: Board Photo

2.3 Front Panel Connectors

Figure 2 shows the duplicate front panel connector options

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. Please contact info@d-tacq.com for details

3 Digital Filters

Filter Name	-3 dB BW (Hz)	Sample Rate Range	Description
Sinc3	$0.2617 \times F_{\text{sample}}$	0.01 to 1200 kSPS	Fast settling
Sinc6	$0.1861 \times F_{\text{sample}}$	0.01 to 1200 kSPS	Balancing settling with rejection
Wideband 0.433	$0.433 \times F_{\text{sample}}$	2.5 to 374 kSPS	Wideband low ripple filter
Wideband 0.108	$0.433 \times F_{\text{sample}}$	2.5 to 374 kSPS	Wideband low ripple filter with lower bandwidth

Table 2: Digital Filters

Full filter definitions can be found in the ADC datasheet for the [AD4134](#).

4 Electrical Specification

4.1 24-bit Mode

#	Parameter	Value
1	Number of Channels	32
2	Sample Rate (Max)	374 kHz, per channel simultaneous
3	Resolution	24-bit
4	Coupling	DC, Differential Input
5	Input Impedance	1 M Ω
6	Input Voltage Range	See Section 1.1
7	Input Voltage Withstand	\pm 30 V
8	Offset Error	0.01% FS with numerical calibration
9	Gain Error	0.01% FS with numerical calibration
10	INL	\pm 2 ppm of FS
11	Analog Input BW	See Digital Filters
12	CMRR ¹	> 60 dB FS @ 1 kHz
13	Crosstalk	< 90 dB @ 1 kHz FS Input
14	THD	-110 dB
15	SFDR	120 dBc
16	SNR ² ACQ465ELF-32-HR Filter: Wideband 250 kHz Sample Rate	97 dB

¹ Much higher (\gg 60 dB) CMRR with HG Product Variant

² With a full-scale 8 kHz signal

Table 3: ACQ465ELF 24-bit Electrical Performance

4.2 16-bit Mode

#	Parameter	Value
1	Number of Channels	32
2	Sample Rate (Max)	825 kHz, per channel simultaneous
3	Resolution	16-bit
4	Coupling	DC, Differential Input
5	Input Impedance	1 M Ω
6	Input Voltage Range	See Section 1.1
7	Input Voltage Withstand	\pm 30 V
8	Offset Error	0.01% FS with numerical calibration
9	Gain Error	0.01% FS with numerical calibration
10	INL	\pm 2 ppm of FS
11	Analog Input BW	400 kHz front-end, constrained by Digital Filters
12	CMRR ¹	> 60 dB FS @ 1 kHz
13	Crosstalk	< 90 dB @ 1 kHz FS Input
14	THD	-110 dB
15	SFDR	115 dBc
16	SNR ² ACQ465ELF-32-HR Filter: Sinc3 (0.2617) 825 kHz Sample Rate	91 dB

¹ Much higher (\gg 60 dB) CMRR with HG Product Variant

² With a full-scale 8 kHz signal

Table 4: ACQ465ELF 16-bit Electrical Performance

5 Mechanical & Environmental Specification

#	Parameter	Value
1	Form Factor	Long ELF
2	Power Consumption	Typical 9.5 W
3	Environmental	0 °C - 50 °C Operational -10 °C - 85 °C Non-Operational
4	Mezzanine Socket	ELF (ULPC)

Table 5: Mechanical & Environmental Specification