

ADQ412 is a software-selectable two or four channel flexible member of the ADQ V6 Digitizer family. The ADQ412 has an outstanding combination of high bandwidth and dynamic range, which enables demanding measurements such as RF/IF sampling of very wide band signals.

Features

- Up to 4 analog channels
- Up to 3.6 GSPS sampling rate
- 12 bits resolution
- Up to 2 GHz analog bandwidth
- Internal and external clock reference
- Clock reference output
- External trigger input and output
- Multi record >1 MHz PRF
- Time stamp
- 700 Msamples data memory
- Data interface USB 2.0 / cPCIe / PXIe
- FPGA available for customized applications
- Support for C/C++ and MATLAB



Applications

- RADAR
- LIDAR
- Wireless communication
- Optical transmission
- High-speed data recording
- Test and measurement
- Ultrasonic ranging

Software support

- MATLAB
- C/C++

Ordering information

ORDERING INFORMATION	
ADQ412 USB	ADQ412
AVAILABLE OPTIONS	
See ADQ DSP datasheet	
High sampling rate	-3G
Extended analog bandwidth	-BW
RELATED PRODUCTS	
ADQ Development Kit	ADQ412 Dev Kit

Example: ADQ412-3G

Introduction

The ADQ412 is a flexible member in the ADQ V6 Digitizer family. It can be configured either as 2 analog channels at 2 GSPS (optional 3.6 GSPS) or as 4 channels at 1 GSPS (optional 1.8 GSPS) at the resolution of 12 bits. The analog input bandwidth is up to 2 GHz and there is in total 700 Msamples data memory. The ADQ412 is optimized for dynamic performance over a wide bandwidth, which makes it ideal for broadband applications such as IF/RF sampling and high-speed data recording. The ADQ412 offers an easy-to-use API that allows easy integration into any application. The digitizer connects to the host via a high-speed USB 2.0 cable or an eight-lane cPCIe / PXIe interface. The ADQ412 is equipped with an powerful Xilinx V6 LX240T FPGA which is partly available for customized real time applications.

ADQ Development Kit

SP Devices' ADQ Development Kit is an optional software tool that rapidly enhance the customization process of your next DSP application for the onboard FPGA. More details about this product can be found in the product brief for the ADQ Development Kit.

1 Technical data¹

KEY PARAMETERS	
Digitizer Resolution	12
Data memory	1 Gbytes
Trigger	Software / External / Level
Number of GPIOs	5
Front panel connectors	SMA/Micro-D Plug9w/MMCX
Clock source	Internal / External
Clock reference	Internal / External / PX1e

MODES OF OPERATION IN STANDARD CONFIG.	
QUAD CHANNEL MODE	
Number of channels	4
Sampling rate	1 GSPS
Analog bandwidth	2 GHz
DUAL CHANNEL MODE	
Number of channels	2
Sampling rate	2 GSPS
Analog bandwidth	1.3 GHz

ANALOG INPUT		
Impedance AC	50	Ω
Input voltage range	800	mV _{ppdiff}

EXTERNAL CLOCK REFERENCE		
Frequency typ	10	MHz
Signal level (min – max)	0.8 – 3.3	V _{PP}
Impedance AC	50	Ω

POWER SUPPLY		
Supply voltage	12	V
Power consumption	36	W

ENVIRONMENTAL / MECHANICAL		
Operating temperature	0 – 45	$^{\circ}\text{C}$
Storage temperature	-20 – 70	$^{\circ}\text{C}$
Relative humidity, non-condensing	5% – 95%	
Board size	100 x 163	mm ²
Case size	103 x 166 x 53	mm ³

OPERATING SYSTEM	
Windows XP	SP 2 and higher
Windows Vista	All versions

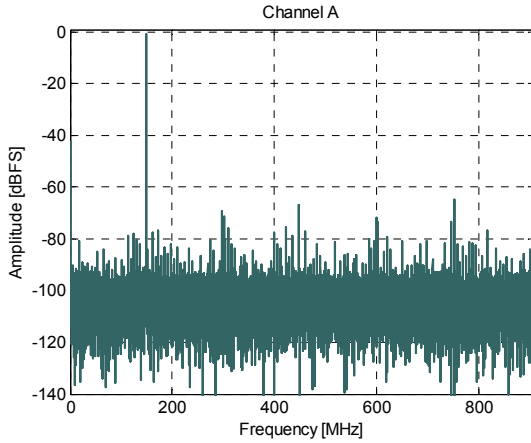
APPLICATION SOFTWARE	
ADCaptureLab	Data capture and analysis
MATLAB	Data capture interface
C/C++	Data capture interface

CERTIFICATION AND COMPLIANCE
CE

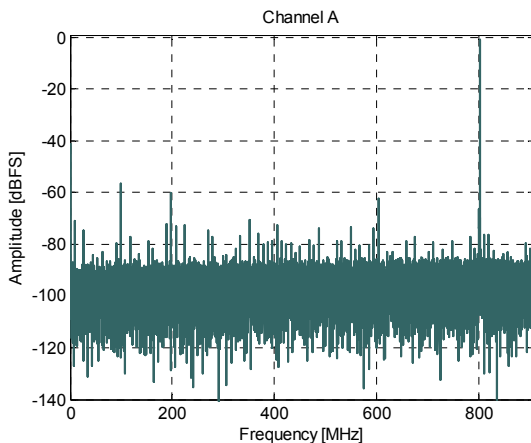
1. All values are typical unless otherwise noted.

2 Dynamic performance AC

2.1 Noise and distortion



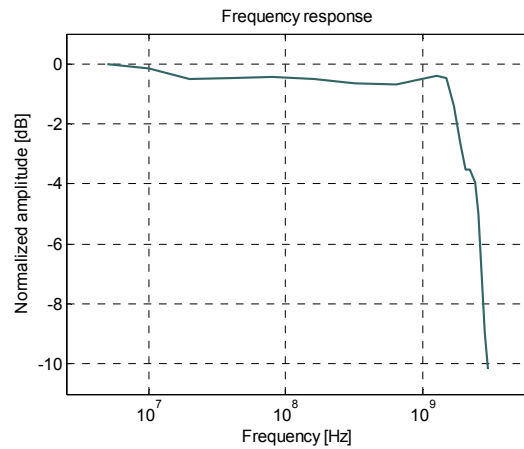
SFDR	63	dB
SNR	57	dB
ENOB	8.7	bits



SFDR	55	dB
SNR	51	dB
ENOB	7.8	bits

Figure 1: FFT of 149 MHz and 999 MHz input signal at 1800MSps.

2.2 Frequency response



Bandwidth (-3 dB)	2 GHz
1 dB flatness	1.6 GHz

Figure 2: Frequency response.

3 Block Diagram

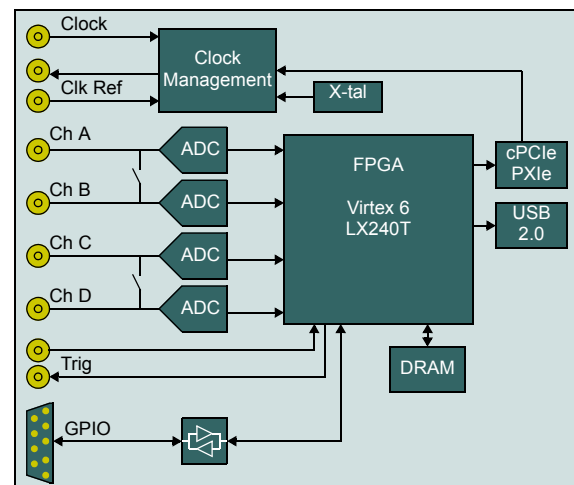


Figure 3: Block diagram

The ADQ412 can operate in a 4 channel mode where the four ADCs operate on one channel each.

In the 2 channel mode, two ADCs operate on the same analog input in an interleaved mode. This doubles the sampling rate.

Since the load on the input is lower for the 4 channels mode, the input bandwidth is higher. This

mode is suitable for RF/IF sampling in the second Nyquist band.

The 2 channel mode offers the largest digital bandwidth, which is suitable for sampling of widely modulated signals at a low IF, for example pulses.

4 Digital signal processing

The high data rate in 2 channel mode is enabled by SP Devices' technology for interleaving ADCs: ADX.

The ADQ412 is a member of the ADQ V6 Digitizer family, which means that it is built on the ADQ DSP board. See ADQ DSP datasheet for more information.

5 Host interface

The standard version of ADQ412 operates as a stand alone measurement instrument connected to a host PC through a Hi-Speed USB link. This enables flexible operation together with a stationary computer or a laptop.



(a) Front panel



(b) Rear panel

Figure 4: ADQ412 stand alone box

The ADQ412 may also operate as a plug in card in a chassis for integrated measurement systems. PCIe version for integration into a PC is also available. See the **Options** for more details on the variations.

6 Options

6.1 cPCIe / PXIe interface

The ADQ412 is available with cPCIe / PXIe interface. See ADQ DSP datasheet.

cPCIe / PXIe INTERFACE		
Bus width	8	lanes
Bus peak capacity	16	Gbit/s
Sustained data rate, 4 lanes	400	MByte/s
PXIe card size	1 slot 3U 4TE	



Figure 5: cPCIe / PXIe interface

Order code: **-PXIE**

6.2 PCIe / PXIe interface

The ADQ412 is available with PCIe interface. See ADQ DSP datasheet.

cPCIe / PXIe INTERFACE		
Bus width	8	lanes
Bus peak capacity	16	Gbit/s
Sustained data rate, 8 lanes	TBD	MByte/s

Order code: **-PCIE**

PCIE option is available Q4 2010.

6.3 High sampling rate

The ADQ412 is available at a up to 3.6 GSPS.

MODES OF OPERATION FOR OPTION -3G	
QUAD CHANNEL MODE	
Number of channels	4
Sampling rate	1.8 GSPS
Analog bandwidth	2 GHz
DUAL CHANNEL MODE	
Number of channels	2
Sampling rate	3.6 GSPS
Analog bandwidth	1.3 GHz

Order code: **-3G**

6.4 Extended analog bandwidth

The ADQ412 is available with extended analog bandwidth at 3.6 GSPS. This options is optimized for analog bandwidth and is only available in a 2 channel version.

MODE OF OPERATION FOR OPTION -BW	
DUAL CHANNEL MODE	
Number of channels	2
Sampling rate	3.6 GSPS
Analog bandwidth	2 GHz

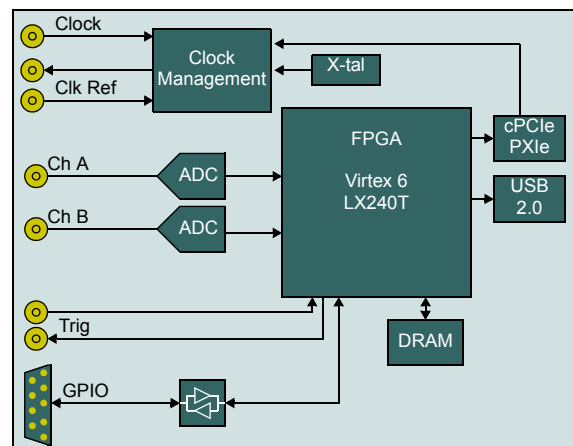


Figure 6: Block diagram

Order code: **-BW**

6.5 Other options

See ADQ DSP datasheet.