



# AnalogMAX-DAQ 1: A High-Accuracy Programmable Data Acquisition Platform with the Intel® MAX® 10 FPGA

Based on Analog Devices' AD4000 Series 16-/18-/20-Bit Easy Drive, Differential SAR ADCs

AnalogMAX-DAQ1 is a high-performance, high-accuracy data acquisition platform that meets power, footprint, and reliability requirements of measurement instruments in industrial, medical, and scientific applications. This platform is an ideal tool to develop products that enhance the efficiency of field testing and require accurate and reliable operation over long periods of time. The non-volatile low-cost Intel® MAX® 10 FPGA offers 8K Logic Elements (LEs) and a flexible environment to customize designs for a variety of use cases.

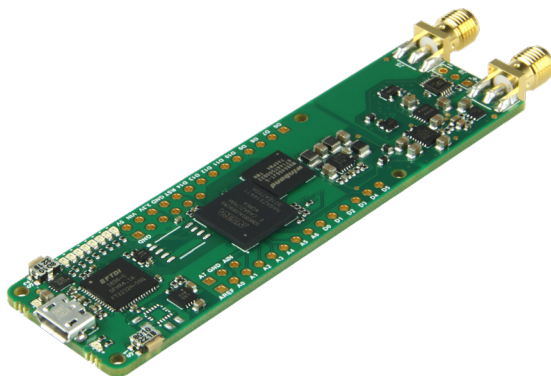
The data acquisition platform is based on the high-impedance, programmable ADC driver stage using AD8251 along with AD8475 driving the Analog Devices' AD4003 Easy Drive, Differential SAR ADC. The high throughput allows accurate capture of both high frequency signals and decimation to achieve higher SNR (Signal-to-Noise-Ratio), while also reducing antialiasing filter challenges. The reduced non-linear input current in high input-impedance mode coupled with a long signal acquisition phase broadens the range of low power precision amplifiers that can drive the AD4003 directly, reducing the signal-chain power demands.

The internal overvoltage protection protects the ADC inputs against overvoltages, minimizes disturbance on the reference pin, and removes the need for external protection devices. The span compression enables the ADC driver stage to operate from the same supply rail as the ADC without the need for a negative supply while preserving the full ADC code range, thus simplifying power management. This combination supports increased channel density while reducing the system-level complexity and power requirements, without compromising performance.

## Benefits of the AnalogMAX-DAQ1 Platform

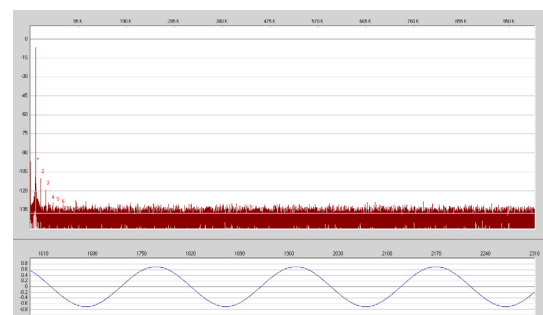
- > **High-accuracy analog front-end**  
– Ideal for applications requiring accurate data capture at high throughputs
- > **Flexible platform** – Based on the programmable Intel® MAX® 10 FPGA, easily adjusts to a wide range of use cases and production needs
- > **Rapid prototyping and product development** – Rapid development and testing with an out-of-the-box experience that includes a Jupyter notebook demo with Python code
- > **Quick customization services**  
– Add new functionality, lower BOM cost, or have the complete product designed

## High-Accuracy Data Acquisition Platform Based on Intel® MAX® 10 FPGA



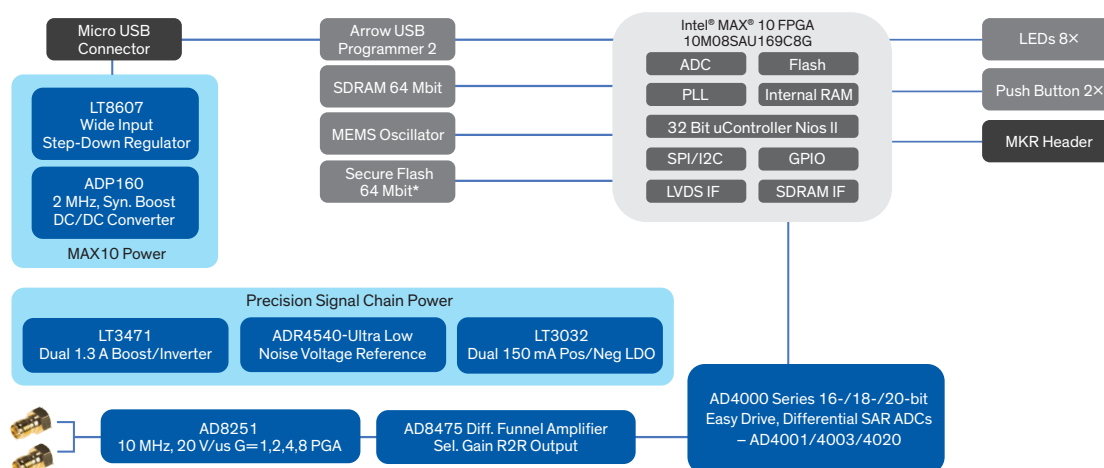
Part #: AnalogMAX-DAQ1

## Signal Spectrum



Input signal is a 1 kHz sine wave

## AnalogMAX-DAQ1 Block Diagram



\*: Optional, not mounted on the PCB

## Hardware Features

- > Intel® MAX® 10 FPGA with 8K LEs, in the UBG-169 package
- > High-accuracy, 18-bit 2 MSPS ADC (Analog Devices AD4003. Also pin-compatible with AD4000/AD4001/AD4020 ADCs)
- > Power: Small foot-print, low-noise power design
- > Memory: SDRAM Memory up to 64 Mb, 166 MHz, 64 Mb Quad SPI Flash and 4Kb EEPROM Memory
- > Dual high-speed USB to multipurpose UART/FIFO IC
- > Micro USB2 Receptacle 90
- > 2x SMA female connectors
- > I/O interface: 23 x GPIO
- > Dimension: 86.5 mm x 25 mm

## Key Components

### Processor

- > Intel® MAX® 10 FPGA: Non-volatile low-cost FPGAs (part #: 10M08SAU169C8G)

### Analog Signal Chain

- > AD4000/AD4001/AD4003/AD4020: 16-/18-/20-Bit Easy Drive, Differential SAR ADCs
- > AD8251: 10 MHz,  $G = 1, 2, 4, 8$  iCMOS® Programmable Gain Instrumentation Amplifier
- > AD8475: Precision, Selectable Gain, Fully Differential Funnel Amplifier

## Software and Demo Features

- > ADC performance evaluation demo – Utilizes the VisualAnalog™ software package and works out-of-the-box
- > Signal processing and data visualization demo – a Jupyter notebook demo with Python code available to change gain and capture corresponding data. Time-domain and FFT plots available

## Features of the AD4000 Series 16-/18-/20-Bit Easy Drive, Differential SAR ADCs

- > Low-power solution with guaranteed 18-bit no missing codes
- > Throughput: 2 MSPS / 1 MSPS / 500 kSPS options
- > INL:  $\pm 1.0$  LSB ( $\pm 3.8$  ppm)
- > SNR: 100.5 dB at  $f_{IN} = 11$  kHz, 99 dB at  $f_{IN} = 100$  kHz
- > THD: -123 dB at  $f_{IN} = 1$  kHz

## Ordering Information



Part #:  
AnalogMAX-DAQ1

Chat live and in real-time on [arrow.com](https://arrow.com) or connect with a Customer Support team:

### Online

[www.arrow.com/analogMAX](https://www.arrow.com/analogMAX)

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