DataStorm DAQ Platform: Flexible Data Acquisition Solution for FPGA-Based Designs

Today's data acquisition systems are crucial elements for accurately capturing and processing real-world information. As system requirements for speed and accuracy increase, issues related to timing and data integrity become more challenging. To ease these design challenges, Arrow and Analog Devices provide validated reference platforms that connect Analog Devices' precision data converters, sensors, and other signal chain components to FPGAs and microprocessors. One such example is the DataStorm DAQ Platform.

The DataStorm DAQ is an Intel® Cyclone® V development kit designed for quick prototyping or proof of concept development. The on-board Cyclone® V FPGA has 85K LEs and includes a dual ARM® Cortex®-A9 MPCore™ to support a wide range of applications in instrumentation and measurement, medical, and communications. The board supports low pin count (LPC) FMC and PMOD connectors for easy extensibility. These connectors enable the FPGA to interface with analog signal chain components such as data converters, sensors, and other signal chain blocks. For example, for applications requiring accurate measurements, testing between the FPGA and precision data converters can be performed using mezzanine cards with LPC FMC connectors. Similarly, proof of concept evaluation can be performed using data converters, sensors, RF components, and more.

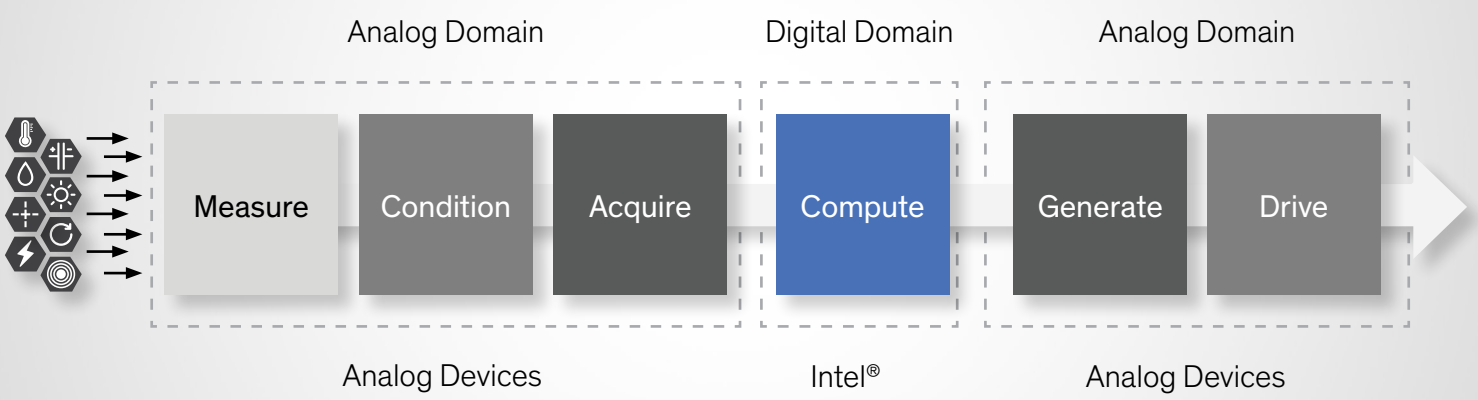
The DataStorm DAQ platform includes demo designs and tools, such as HDL code, device drivers, and reference project examples for rapid prototyping and reduced development time. Currently, the following mezzanine boards are supported with a full suite of tools and demonstrations:

- EVAL-AD4020FMCZ evaluation board with LPC FMC connector: 20-bit 1.8 MSPS, easy drive, differential SAR ADC
- EVAL-AD7768FMCZ evaluation board with LPC FMC connector: 8-channel, 24-bit, simultaneous sampling ADC, power scaling, 110.8 kHz BW
- Custom IIO Linux device drivers with LibIIO libraries
- IIO Oscilloscope, a Linux user space application

The DataStorm DAQ platform is ideal for precision applications in the following markets:

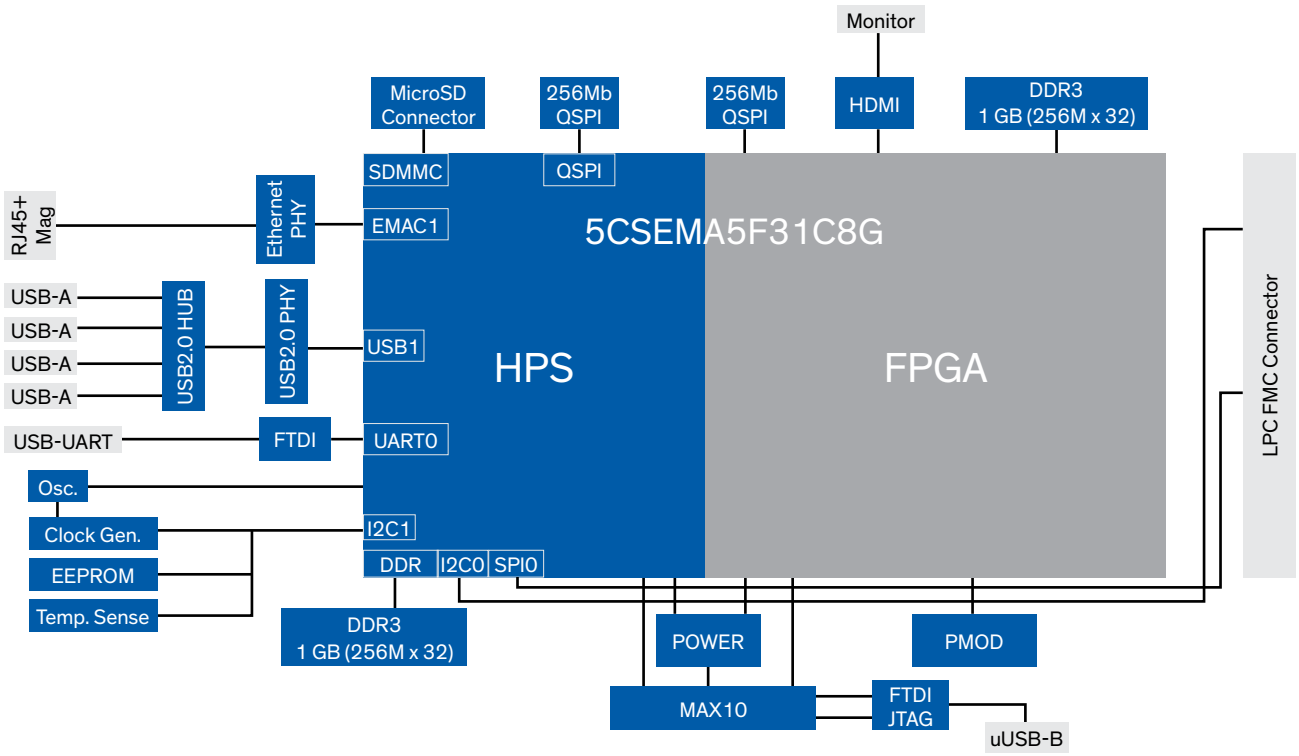
- Instrumentation
- Healthcare
- Energy and industrial
- Aerospace and defense
- Automotive
- Communications

Analog Devices and Intel® Collaboration



DataStorm DAQ Platform Overview

DataStorm DAQ is a standalone development platform with all the standard peripherals needed for native development. In additional Arrow provides reference designs and developer resources for rapid proofs of concept.



Features Include

SoC FPGA

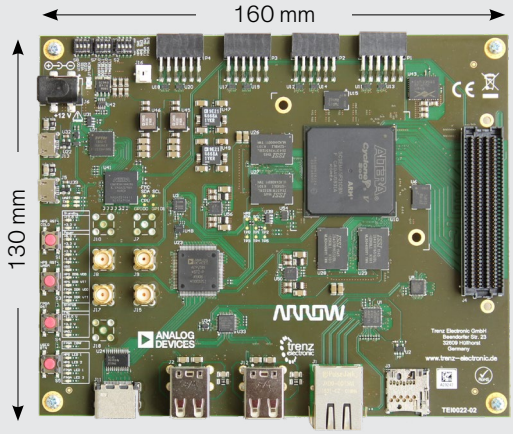
- Intel® Cyclone® V (5CSEMA5F31C8G)
- Package: FBGA 896 pins
- Speed grade: 8
- Temperature: Commercial (Tj = 0 °C to 85 °C)

Memory/Storage

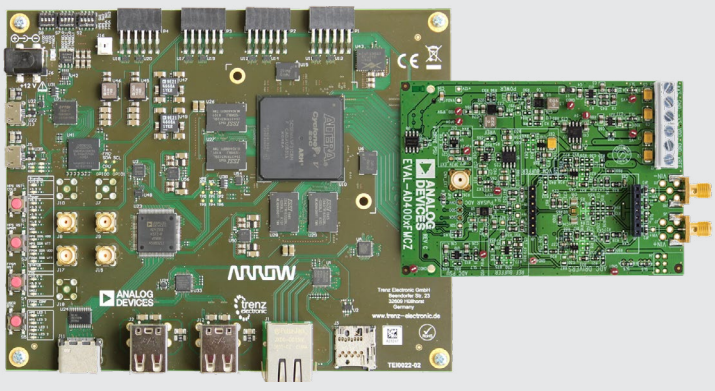
- 1 GB DDR3 SDRAM for HPS
- 1 GB DDR3 SDRAM for FPGA
- 32 MB SPI Flash for HPS
- 32 MB SPI Flash for FPGA

On-Board

- Flexible clocking architecture
- Temperature sensor
- Intel® MAX®10 for board management



DataStorm DAQ Platform



ADI Mezzanine Card Attached to the DataStorm DAQ via LPC FMC Connector

EVAL-AD4020FMCZ Evaluation Board with LPC FMC Connector

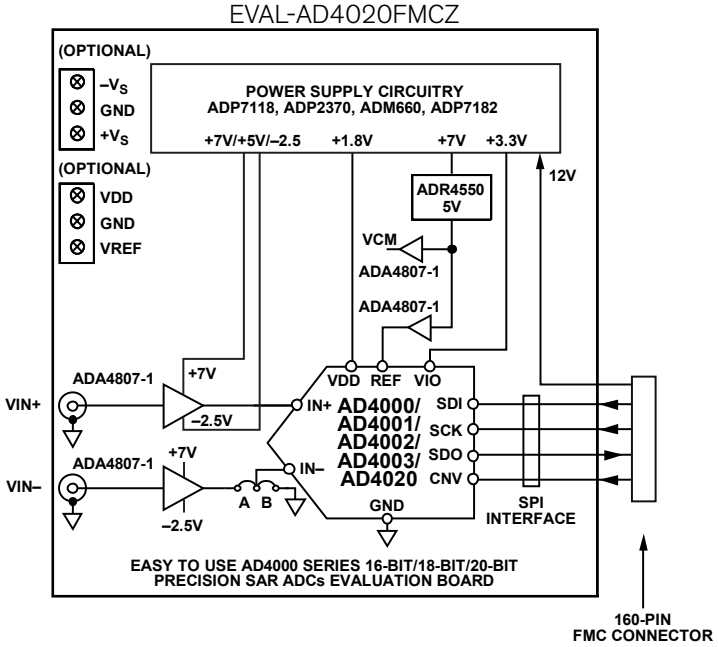
20-bit, 1.8 MSPS, Easy Drive, Differential SAR ADC

Fully featured evaluation board for 10-lead AD4020 analog signal conditioning circuitry. On-board reference, reference buffers, and ADC drivers, and PC software for control and data analysis of time and frequency domain.

Features of the AD4020 ADC

- Easy Drive: Greatly reduced input kickback, input current reduced to 0.5 µA/MSPS, enhanced acquisition phase, ≥77% of cycle time at 1 MSPS
- High-performance throughput: 1.8 MSPS and INL: ±3.1 ppm maximum
- Differential analog input range: ±VREF, VREF from 2.4 V to 5.1 V
- Oversampled dynamic range: 104 dB for OSR = 2, 131 dB for OSR = 1024
- 10-lead packages: 3 mm × 3 mm LFCSP, 3 mm × 4.90 mm MSOP
- Guaranteed operation: -40°C to +125°C
- Low power consumption

EVAL-AD4020FMCZ



EVAL-AD7768FMCZ Evaluation Board with LPC FMC Connector

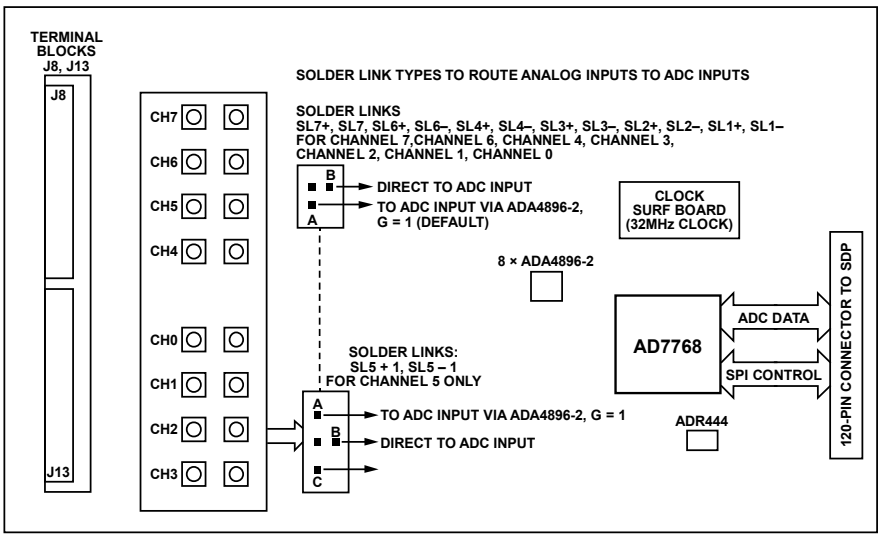
8-Channel, 24-Bit, Simultaneous Sampling ADC, Power Scaling, 110.8 kHz BW

Evaluation board for the AD7768 24-bit, 8-channel, simultaneous sampling, 256 kSPS, sigma-delta ADC with power scaling. User PC software executable controls the AD7768 over a USB cable through the FPGA board. The evaluation board features a low pin count (LPC) FMC connector.

Features of the AD7768 ADC

- 108 dB dynamic range
- 10.8 kHz maximum input bandwidth (-3 dB bandwidth)
- -120 dB total harmonic distortion (THD) typical
- ±2 ppm of full-scale range (FSR) integral nonlinearity (INL), ±50 µV offset error, ±30 ppm gain error
- Optimized power dissipation vs. noise vs. input bandwidth
- Selectable power, speed, and input bandwidth (BW) modes
- Input BW range: dc to 110.8 kHz
- Programmable input bandwidth/ sampling rates

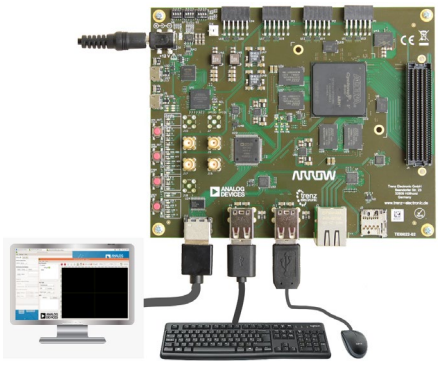
EVAL-AD7768FMCZ



Golden System Reference Design

The GSRD (Golden System Reference Design) provides a set of essential hardware and software system components that can be used as a known-good starting point for various custom user designs. The GSRD for the DataStorm DAQ board consists of the following:

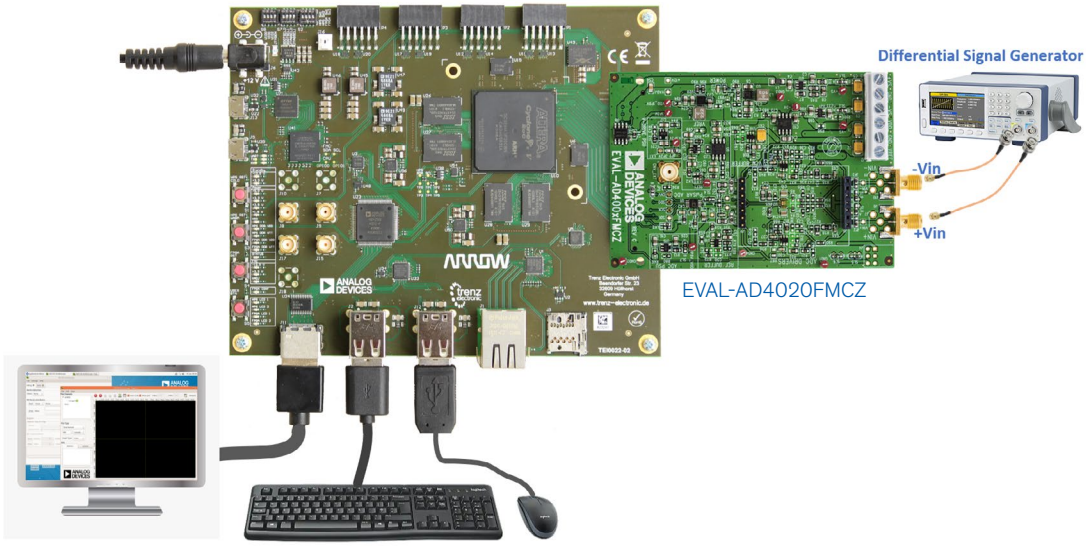
> Golden Hardware Reference Design
> Bootloader
> Linux Kernel
> Linux Device tree
> Root File System
> Downloadable, bootable SD card image



Learn More

Reference Designs

Specific reference designs for ADI attached technologies are available with a roadmap of more to come. Currently reference designs for the EVAL-AD4020FMCZ and EVAL-AD7768FMCZ are available on the DataStorm DAQ github page.



Developer Resources

For additional flexibility, Arrow provides the complete documentation to customize software for a specific application. Developer resources include the following:

1. Golden System Reference Design (GSRD)
2. FMC Card Reference Design
3. Board Block Diagrams
4. Board Schematics
5. Connector Pinout

Documentation and Instructions

github.com/ArrowElectronics/data-storm-daq/wiki

Online

www.arrow.com/datastormdaq

Ordering Information

> DATASTORMDAQ: DataStorm DAQ is an Intel® Cyclone® V development kit
> EVAL-AD4020FMCZ: 20-Bit, 1.8 MSPS, precision SAR, differential ADC evaluation board with the FMC connector
> EVAL-AD7768FMCZ: 8-Channel, 24-Bit, 256 kSPS simultaneous sampling ADC evaluation board with the FMC connector

Five Years Out

19_10/2020