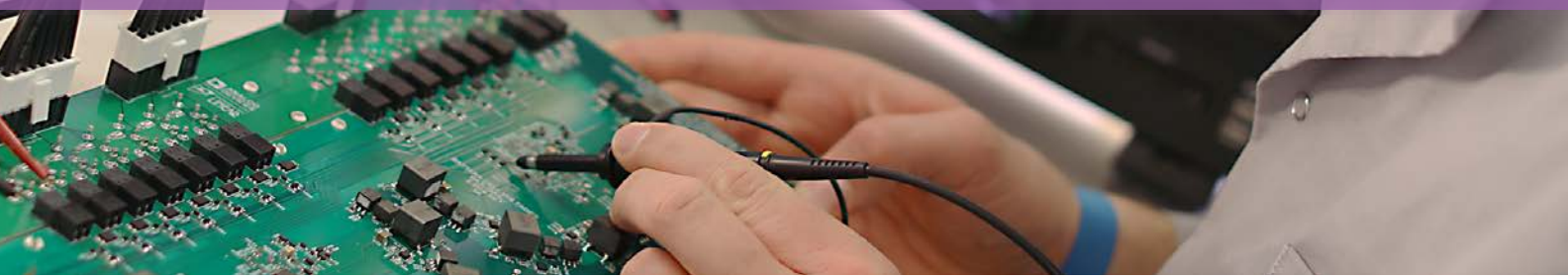
ANALOG DEVICES
AHEAD OF WHAT'S POSSIBLE™

# SOLUTIONS FOR RAPID PROTOTYPING

## *Answering the Needs of Practicing Engineers*

Analog Devices participates in many vibrant hardware and software ecosystems, from Arduino to Pmod. Rapidly make your prototype and test your concepts. ADI's reference designs support many different applications and technologies, and include everything from hardware to embedded firmware that makes it easier for engineers to get their product concepts up and running fast.



## Arduino Shields

Arduino shields are a popular hardware form factor that was first standardized by Arduino, and typically refer to being mechanically and electrically compatible with the Arduino Uno Rev 3 board. Many different FPGA, microprocessor, and DSP vendors provide plug and play connectivity into their development boards and environments using this form factor. Arduino shields provide analog and digital pins to configure devices and digitize signals coming from the real world. The digital communications protocols supported by Arduino shields are SPI, I²C, UART, PWM, and GPIO. All the below boards are compatible with either the EVAL-ADICUP360 or EVAL-ADICUP3029 and should work with any compatible Arduino form factor microcontroller platform. All software is open source and can be found on *github.com/analogdevicesinc/*.

### Water Quality Measurement System

- Measure from 1 to 4 sensor channels
- Selectable SPI, I²C, or UART communication
- 10-pin JTAG/SWD connector for easy programming
- Visit *analog.com/EVAL-CN0428-EBZ*

### Water Turbidity Measurement System

- 0 FTU to 1000 FTU measurement range
- ±0.5 FTU system accuracy (up to 1000 FTU)
- Integrated ambient light rejection
- Visit *analog.com/EVAL-CN0409-ARDZ*

### Total Dissolved Solids Measurement System

- Temperature compensation
- 1 µs to 1 s measurement range
- Standard BNC conductivity probe connector
- Visit *analog.com/EVAL-CN0411-ARDZ*

### Ultra Low Power Accelerometer with Display

- Ultra low power sleep and wake-up modes
- Programmable acceleration ranges
- Board mounted LCD display
- Visit *analog.com/EVAL-ADXL362-ARDZ*

### Micropower, 3-Axis, ±200 *g* Digital Output MEMS

- Ultra low power sleep and wake-up modes
- ±200 *g* measurement range
- Adjustable high-pass filter
- Visit *analog.com/EVAL-ADXL372-ARDZ*

### Dual Electrochemical Gas Detector

- Temperature compensation
- Work with industry-standard gas sensors
- Programmable for a variety of gases
- Visit *analog.com/EVAL-CN0396-ARDZ*

### NDIR Thermopile-Based Gas Sensing Design

- Optimized for $CO_2$ gas
- Single supply
- Visit *analog.com/EVAL-CN0338-ARDZ*

### Electrochemical Toxic Gas Detection

- Programmable for multiple other gases
- Resolution down to 1 ppm
- Low power, single-supply operation
- Visit *analog.com/EVAL-CN0357-ARDZ*

### Mulitchannel Electrochemical Gas Detector

- 3- or 4-wire electrochemical gas sensors
- Gas sensor diagnostics and life expectancy
- Temperature and humidity compensation
- Visit *analog.com/EVAL-CN0429-EBZ*

### Volatile Organic Compound Gas Detection

- Temperature and humidity compensation
- Can be used with multiple sensor types
- Low power
- Visit *analog.com/EVAL-CN0395-ARDZ*

Visit *analog.com*

## Arduino Shields (Continued)

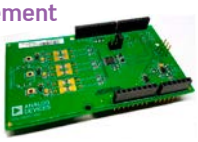
### Universal 4-Channel Thermocouple Measurement System (Digital)

- Flexible 4-channel thermocouple system
- Cold junction compensation
- 24-bit digitization
- Visit *analog.com/EVAL-CN0391-ARDZ*

### Universal 4-Channel Thermocouple Measurement System (Analog)

- Flexible 4-channel thermocouple system
- Cold junction compensation
- Visit *analog.com/EVAL-CN0394-ARDZ*

### Ultra Low Power Light Recognition Measurement



- Recognizes red, green, blue light sources
- Sensors are integrated on board
- Ultra low power
- Visit *analog.com/EVAL-CN0397-ARDZ*

### Robust Closed-Loop Solenoid Control Design

- Overvoltage and undervoltage sensor control
- Useful for on/off and proportional solenoids
- Closed-loop driver circuit for more precise control
- Visit *analog.com/EVAL-CN0415-ARDZ*

### Soil Moisture and pH Measurement System

- Temperature compensation
- Uses BNC standard pH probe connector
- Uses voltage output moisture probes
- Visit *analog.com/EVAL-CN0398-ARDZ*

### Precision Weigh Scale/Load Cell Design

- High gain, low noise
- 4- or 6-wire load cell compatible
- Full-scale sensor output up to 10 mV
- Visit *analog.com/EVAL-CN0216-ARDZ*

### Programmable, 3-Channel LED Current Source

- 1 A max current load per channel
- Design to drive red, green, blue LEDs
- Isolated repeater for multiple LED banks
- Visit *analog.com/EVAL-CN0410-ARDZ*

### Dual RF RMS Power Detector

- Measure forward and reverse rms power
- Good up to 7 GHz
- SMA input connector
- Visit *analog.com/DC2847A-KIT*

### RF/Microwave RMS Power Detector

- 100 MHz to 40 GHz
- SMA input connector
- Visit *analog.com/DC2870A-KIT*

### RF Gain and Phase Detector

- Low frequency to 2.7 GHz
- SMA input connector
- Visit *analog.com/EVAL-AD8302-ARDZ*

### TruPWR™ RMS Detector

- 50 MHz to 9 GHz
- SMA input connector
- Visit *analog.com/EVAL-ADL5902-ARDZ*

### RS-485 Communications Shield

- Isolated and nonisolated bus path
- Selectable as a master or a slave node
- Connect up to 32 boards together for network validation
- Visit *analog.com/EVAL-CN0416-ARDZ*

### 4-Channel Analog Input PLC Module with HART

- ±10 V, 4 mA to 20 mA input
- Hardware open wire detection
- HART compliant
- Visit *analog.com/EVAL-CN0414-ARDZ*

### 4-Channel Analog Output PLC Module with HART

- ±10 V, 4 mA to 20 mA output
- Programmable output values
- HART compliant
- Visit *analog.com/EVAL-CN0418-ARDZ*

## Pmod

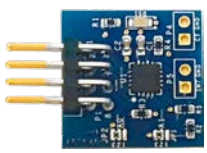
The Pmod™ (peripheral module)-compatible interface is an open standard by Digilent (a National Instruments Company) for peripherals used with FPGAs or microcontroller development boards.

The modules are available from simple push buttons to more complex modules with analog-to-digital converters (ADCs), digital-to-analog converters (DACs), or LCD displays. These modules can be used with a variety of FPGA or microcontroller development boards from different vendors and support major digital communication protocols such as SPI, I²C, and UART. Pmod-compatible interfaces normally have additional software drivers and configuration is required. All software is open source and can be found on *github.com/analogdevicesinc/*.

### Low Power, Low Noise 3-Axis Digital Output Accelerometer

- 20-bit ADC resolution
- Programmable high- and low-pass digital filters
- Low power (200 µA in measurement mode and 21 µA in standby mode)
- Visit *analog.com/EVAL-ADXL355-PMDZ*

### ±0.25°C Accurate Digital Temperature Sensor



- 16-bit digital temperature resolution
- I²C Interface for up to 4 nodes on a single bus
- Low power (700 µW at 3.3 V normal mode, 7 µW at 3.3 V in shutdown mode)
- Visit *analog.com/EVAL-ADT7420-PMDZ*

## PMOD (Continued)

### Programmable 4 mA to 20 mA Current Loop Transmitter

- Low power
- 12-, 14-, 16-bit resolution control
- Visit *analog.com/EVAL-CN0179-PMDZ*

### Fully Isolated, 4 mA to 20 mA Data Acquisition System

- Galvanically isolated from processor
- Standard 4 mA to 20 mA industrial input
- Works from single 3.3 V supply
- Visit *analog.com/EVAL-CN0336-PMDZ*

### Precision Weigh Scale/Load Cell Design

- High gain, low noise
- 4- or 6-wire load cell compatible
- Full scale sensor output up to 10 mV
- Visit *analog.com/EVAL-CN0216-PMDZ*

### Isolated pH Monitor Temperature Compensation

- ±0.5% accurate with temperature compensation
- Works with pH sensors 1 M to 1G Ω output impedance
- Uses standard connectors (BNC for pH and RCA for temperature)
- Visit *analog.com/EVAL-CN0326-PMDZ*

### Accurate Relative Humidity Measurement System

- Contactless humidity measurement
- Highly accurate
- Visit *analog.com/EVAL-CN0346-PMDZ*

### Piezoelectric Vibration Measurement System

- Vibration measurements up to 500 kHz
- Use wide variety of charge crystal sensors
- Low power
- Visit *analog.com/EVAL-CN0350-PMDZ*

### Dual-Channel Colorimeter

- Red, green, blue LED absorption
- Vial holder and diffusor glass included
- Digital synchronization between channels
- Visit *analog.com/EVAL-CN0363-PMDZ*

### High Temperature 16-Bit Data Acquisition System

- Entire board can work up to 175°C
- Low power for battery applications
- 16-bit, 600 kSPS DAQ
- Visit *analog.com/EVAL-CN0365-PMDZ*

### Low Power 2.4 GHz ISM Band Radio

- Global ISM band
- High sensitivity
- Programmable output power
- Visit *analog.com/EVAL-ADF7242-PMDZ*

### Fully Isolated, ±10 V Data Acquisition System

- Galvanically isolated from processor
- Standard ±10 V industrial input
- Works from single 3.3 V supply
- Visit *analog.com/EVAL-CN0335-PMDZ*

### Fully Isolated, 3-Wire RTD Temperature Measurement System

- Galvanically isolated from processor
- Uses standard 3-wire RTD sensors
- Includes lead wire temperature compensation
- Visit *analog.com/EVAL-CN0337-PMDZ*

### Temperature Compensated Bridge Signal Conditioner and Driver Design

- Connect pressure sensor or load cells
- Drive voltage range or 5 V to 15 V
- Full scale sensor output from 10 mV to 1 V
- Visit *analog.com/EVAL-CN0355-PMDZ*

### Electrochemical Toxic Gas Measurement System

- Measures a wide variety of gases
- Sensor sensitivity can be programmed
- Can use three or four electrode sensors
- Visit *analog.com/EVAL-CN0357-PMDZ*

### Fully Isolated Conductivity Measurement System

- Galvanically isolated from processor
- 1% accurate conductivity measurements after calibration
- Visit *analog.com/EVAL-CN0349-PMDZ*

### Multichannel Thermocouple Measurement System with Cold Junction Compensation

- Measure up to 4 channels
- Overall power consumption of <8 mW
- <2°C error from −25°C to +400°C
- Visit *analog.com/EVAL-CN0354-PMDZ*

### Single Supply LED Current Driver

- Programmable output current
- Range from 0 mA to 20 mA
- Low power
- Visit *analog.com/EVAL-CN0370-PMDZ*

### Ultra Low Power, Multichannel Data Acquisition with Energy Harvesting

- Low power (100 µW at 22 kSPS)
- Photovoltaic or thermoelectric energy
- 4-channel 16-bit DAQ
- Visit *analog.com/EVAL-CN0372-PMDZ*

## Precision Data Acquisition Pmod-Compatible Boards

- 0 V to 5 V inputs
- SMB input connectors
- Requires external supply
- Visit *analog.com/pulsarpmods*

| Resolution | ADC Throughput (kSPS) | Analog Input Stage | Part Number | Resolution | ADC Throughput (kSPS) | Analog Input Stage | Part Number |
|---|---|---|---|---|---|---|---|
| 14-bit | 250 | Single-ended | EVAL-AD7942-PMDZ | 16-bit | 500 | Differential | EVAL-AD7693-PMDZ |
| 14-bit | 500 | Single-ended | EVAL-AD7946-PMDZ | 16-bit | 500 | Single-ended | EVAL-AD7988-5-PMDZ |
| 16-bit | 100 | Differential | EVAL-AD7988-1-PMDZ | 16-bit | 1000 | Single-ended | EVAL-AD7980-PMDZ |
| 16-bit | 250 | Single-ended | EVAL-AD7685-PMDZ | 16-bit | 1333 | Single-ended | EVAL-AD7983-PMDZ |
| 16-bit | 250 | Differential | EVAL-AD7687-PMDZ | 18-bit | 400 | Differential | EVAL-AD7690-PMDZ |
| 16-bit | 250 | Differential | EVAL-AD7691-PMDZ | 18-bit | 1000 | Differential | EVAL-AD7982-PMDZ |
| 16-bit | 500 | Single-ended | EVAL-AD7686-PMDZ | 18-bit | 1333 | Differential | EVAL-AD7984-PMDZ |
| 16-bit | 500 | Differential | EVAL-AD7688-PMDZ | | | | |

## Arduino Form Factor Microcontroller Board

Arduino has changed expectations for the industry and end users. It's now more important than ever to be able to interface with popular standards and pinouts so that users can easily and quickly prototype and evaluate different solution combinations. Using some of ADI's popular ARM® Cortex®-M3 microcontrollers with intriguing analog and digital functionality, we've created development platforms based on these features to enable customer designs. Using open-source ecosystems and tools, these development platforms offer customers a low cost solution that enables maximum reuse from industry standards, as well as open-source licensing for all the software, allowing customers to get to market faster with their solutions. All software is open source and can be found on *github.com/analogdevicesinc/*.

### EVAL-ADICUP360

- Compatible with Ar duino Uno, Arduino Due, and Pmod form factors
- Low power ARM Cortex-M3
- Open-source IDE tools
- No external debugger/emulator tools needed
- Integrated dual 24-bit Σ-Δ converters on chip
- Visit *analog.com/eval-adicup360*

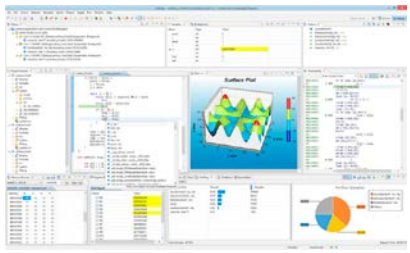
### EVAL-ADICUP3029

- Compatible with Arduino Uno, Pmod, and Grove form factors
- Ultra low power ARM Cortex-M3
- Open-source IDE tools
- No external debugger/emulator tools needed
- On-board Bluetooth® and Wi-Fi
- Visit *analog.com/eval-adicup3029*

## CrossCore Embedded Studio

CrossCore® Embedded Studio™ is a world-class integrated development environment (IDE) for the Analog Devices ARM processor families found on the EVAL-ADICUP360 and EVAL-ADICUP3029. CMSIS-DAP, OpenOCD, and other open-source tools are an easy and cost-effective means for embedded firmware development using the on-board USB-based debugger found on the EVAL-ADICUP360 or the EVAL-ADICUP3029.

- Eclipse-based IDE
- Outstanding code generation tools, including compilers, assemblers, linkers, and loaders based on the GNU toolchain for ARM Cortex-M family
- Available for Windows and Linux



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## Circuits from the Lab Reference Designs

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