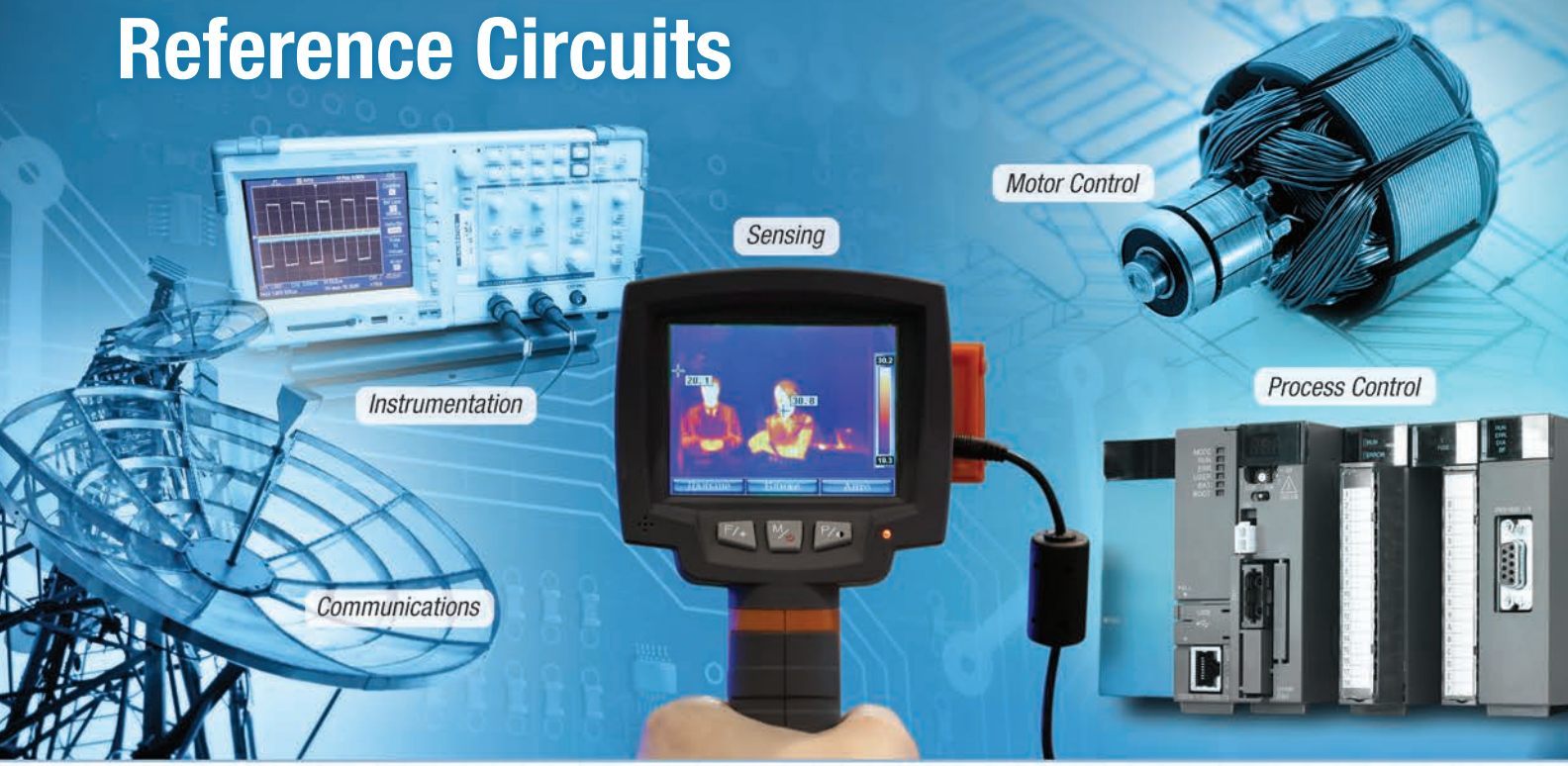
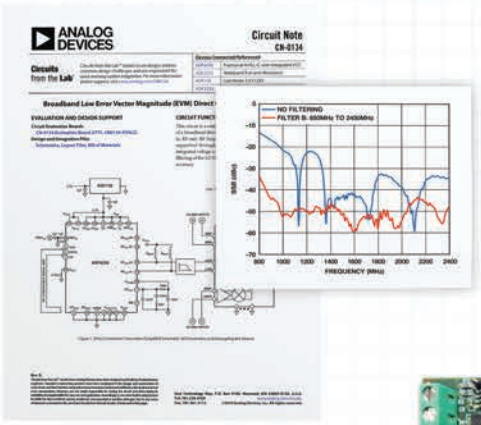
Reference Circuits

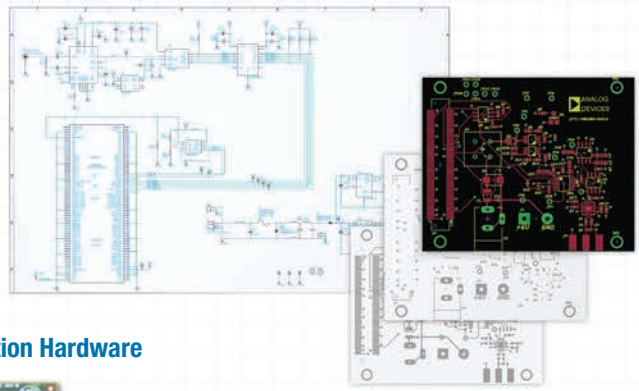


Analog Devices reference circuits are engineered and tested by our technology and applications experts.
For easy design integration, reference circuits include:

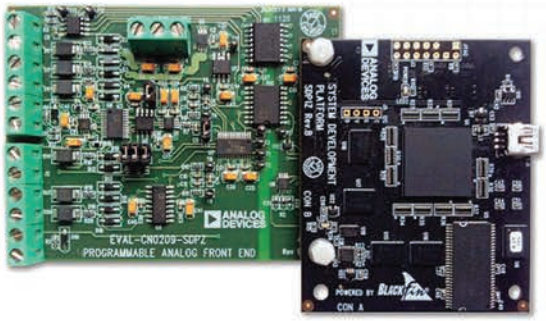
Documentation with Test Data



Design and Integration Files



Circuit Evaluation Hardware



Evaluate ADI Circuits

Evaluating reference circuits is made easy using the Analog Devices' low cost, versatile, and reusable System Demonstration Platform (SDP).

Prototype ADI Circuits

Easily connect to popular FPGA platforms and other embedded systems for quick prototyping of reference circuits.

Circuits from the Lab®
Reference Circuits

www.analog.com/circuits

ANALOG DEVICES

Sensor Applications

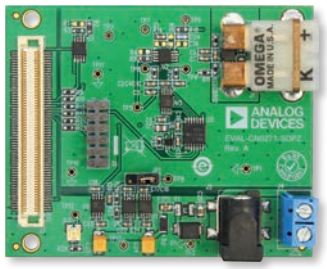
K-Type Thermocouple Measurement System with Integrated Cold Junction Compensation

Circuit Features

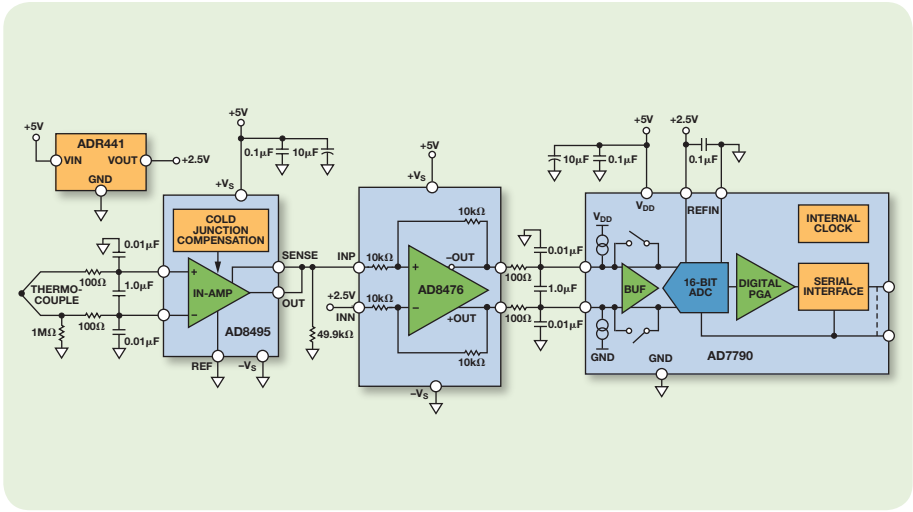
- K-type thermocouple system
- Cold junction compensation
- 16-bit ADC

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC



CN0271 circuit evaluation board.



CN0271 circuit diagram.

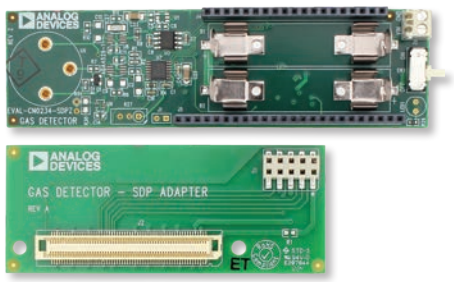
Single-Supply, Micropower Toxic Gas Detector Using an Electrochemical Sensor

Circuit Features

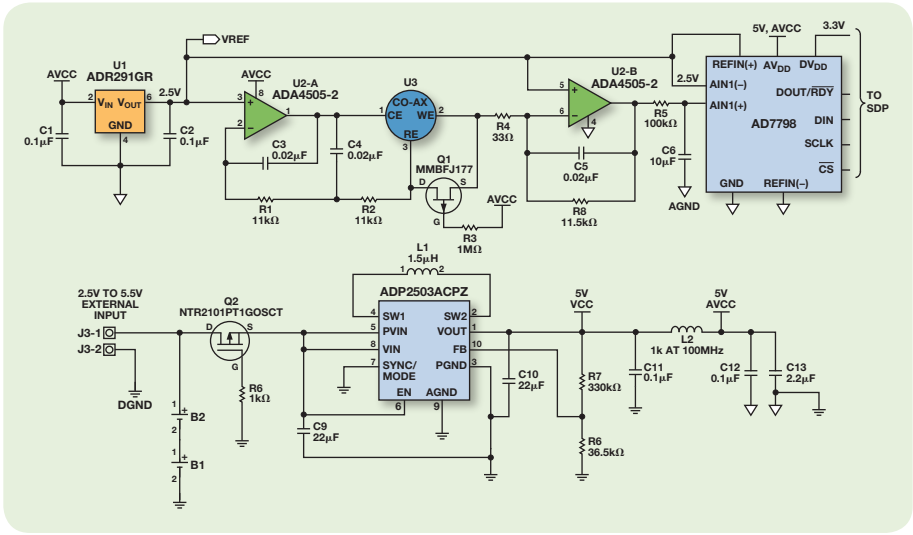
- Complete electrochemical sensor
- Low power
- Single supply

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC



CN0234 circuit evaluation board.



CN0234 circuit diagram.

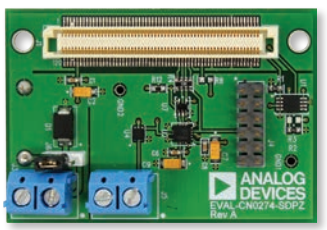
Ultralow Power Standalone Motion Switch

Circuit Features

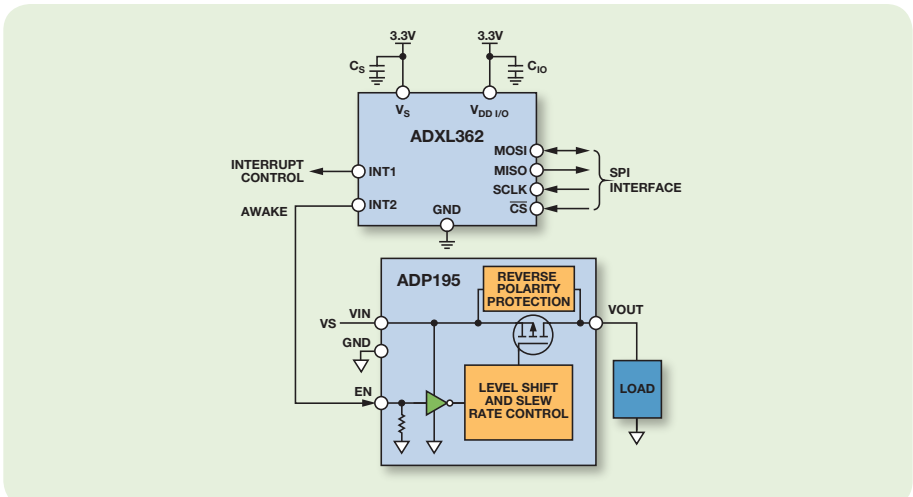
- Motion activated, high-side power switch
- Programmable operating range
- Ultralow power (300 nA when off)
- Designed to extend battery life

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC



CN0274 circuit evaluation board.



CN0274 circuit diagram.

Reference circuit design and integration files such as schematics, BOM, and PCB layout are available for all circuits. Device driver and hardware availability for each circuit are indicated in the table.

Application	Circuit Title	Hardware Available	Device Driver*	FPGA Application Project*	Circuit Number
Thermocouple	High Accuracy Multichannel Thermocouple Measurement Solution	•			CN0172
	Complete Type T Thermocouple Measurement System with Cold Junction Compensation	•	•		CN0206
	USB-Based Thermocouple Temperature Monitor with Cold Junction Compensation Using the ADuC7060/ADuC7061 Precision Analog Microcontroller	•			CN0214
	K-Type Thermocouple Measurement System with Integrated Cold Junction Compensation	•	•	•	CN0271
	USB-Based Temperature Monitor Using the ADuCM360 Precision Analog Microcontroller and an External Thermocoupler	•			CN0221
	Complete Closed-Loop Precision Analog Microcontroller Thermocouple Measurement System with 4 mA to 20 mA Output	•			CN0300
Load cell	Precision Weigh Scale Design Using the AD7791 24-Bit Sigma-Delta ADC with External ADA4528 Zero-Drift Amplifiers	•	•	•	CN0216
Weigh scale	Weigh Scale Design Using a 24-Bit Sigma-Delta ADC with Internal PGA	•	•		CN0107
	Weigh Scale Design Using the AD7781 20-Bit Sigma-Delta ADC with Internal PGA	•	•		CN0108
Tilt	Tilt Measurement Using a Dual-Axis Accelerometer	•	•	•	CN0189
Gas detector	Single-Supply, Micropower Toxic Gas Detector Using an Electrochemical Sensor	•	•		CN0234
Battery sensing	Fully Isolated Lithium Ion Battery Monitoring and Protection System	•	•	•	CN0235
	A Robust, Low Power, Battery Monitoring Circuit Front End	•			CN0253
Current sensing	High-Side Current Sensing with Input Overvoltage Protection	•	•	•	CN0241
	Bidirectional Isolated High-Side Current Sense with 270 V Common-Mode Rejection	•	•	•	CN0240
	500 V Common-Mode Voltage Current Monitor	•	•	•	CN0218
	Low Cost, Level Shifted Low-Side Current Monitor for Negative High Voltage Rails	•	•		CN0188
Capacitance sensing	Extending the Capacitive Input Range of the AD7745/AD7746 Capacitance-to-Digital Converter		•		CN0129
Motion sensing	Ultralow Power Standalone Motion Switch	•	•		CN0274
Light Sensing	2 MHz Bandwidth PIN Photodiode Preamp with Dark Current Compensation	•			CN0272
Microphone	Digital MEMS Microphone Simple Interface to a SigmaDSP® Audio Codec	•	•		CN0078
	High Performance Analog MEMS Microphone's Simple Interface to SigmaDSP Audio Codec	•	•		CN0207
	High Performance Digital MEMS Microphone's Simple Interface to SigmaDSP Audio Processor with I²S Output	•			CN0208
	Low Noise Analog MEMS Microphone and Preamp with Compression and Noise Gating	•			CN0262
	High Performance Digital MEMS Microphone Standard Digital Audio Interface to Blackfin® DSP	•			CN0266
Pressure sensors	Precision Weigh Scale Design Using the AD7190 24-Bit Sigma-Delta ADC with Internal PGA	•	•		CN0102
	Flexible, 4 mA-to-20 mA, Loop-Powered Pressure Sensor Transmitter with Voltage or Current Drive	•			CN0289
LVDT	LVDT Signal Conditioning Circuit	•	•		CN0288

*Availability based on date of publication. Content is regularly added; please check the website for latest information.

ADC Driver Applications

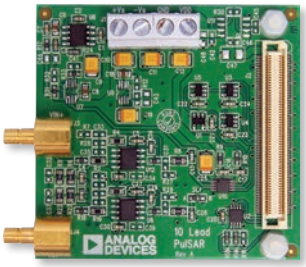
Optimizing AC Performance in an 18-Bit, 250 kSPS, PulSAR Measurement Circuit

Circuit Features

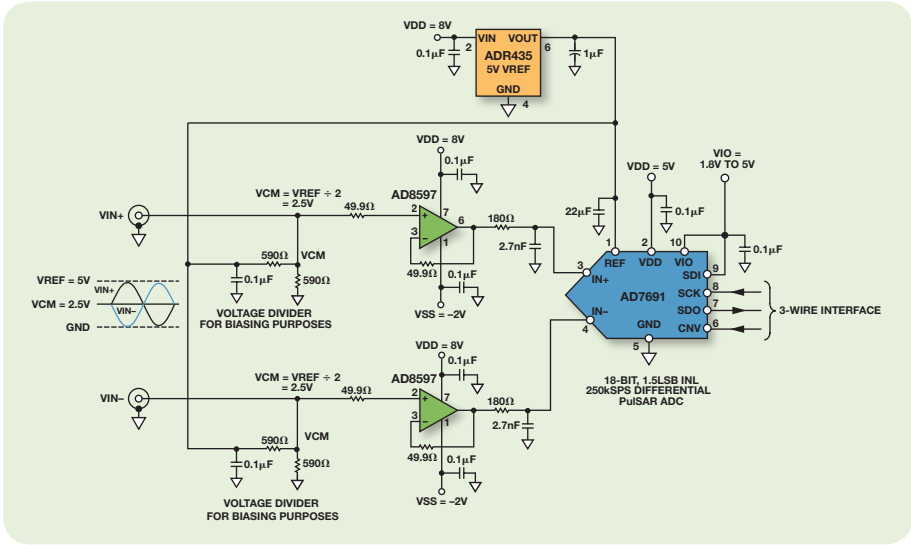
- 18-bit, 250 kSPS PulSAR® ADC
- Low noise driver
- Greater than 100 dB SNR at 1 kHz input
- Greater than 118 dB THD at 1 kHz input

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC



CN0261 circuit evaluation board.



CN0261 circuit diagram.

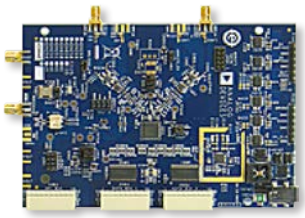
High Performance, 16-Bit, 250 MSPS Wideband Receiver with Antialiasing Filter

Circuit Features

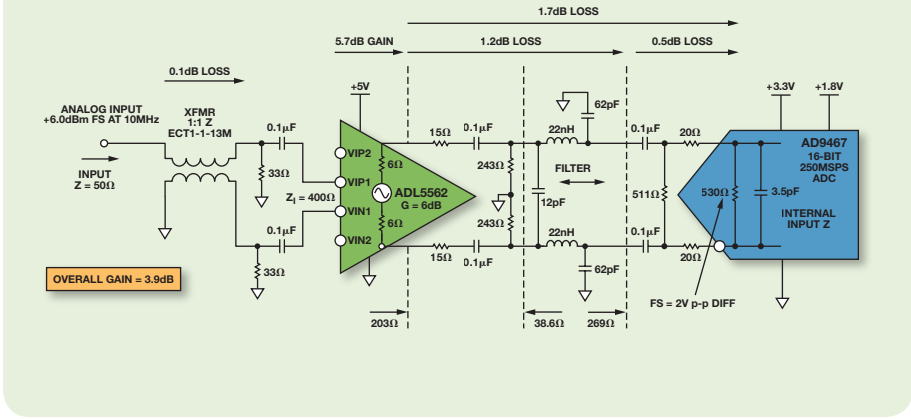
- 16-bit, 250 MSPS wideband receiver
- Antialiasing filter
- 72 dB SNR at 120 MHz input
- 82 dB SFDR at 120 MHz input

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC



CN0227 circuit evaluation board.



CN0227 circuit diagram.

Low Power Successive Approximation ADC System with Optimum Low Power Drive Amplifier for Sub-Nyquist Input Signals Up to 1 kHz

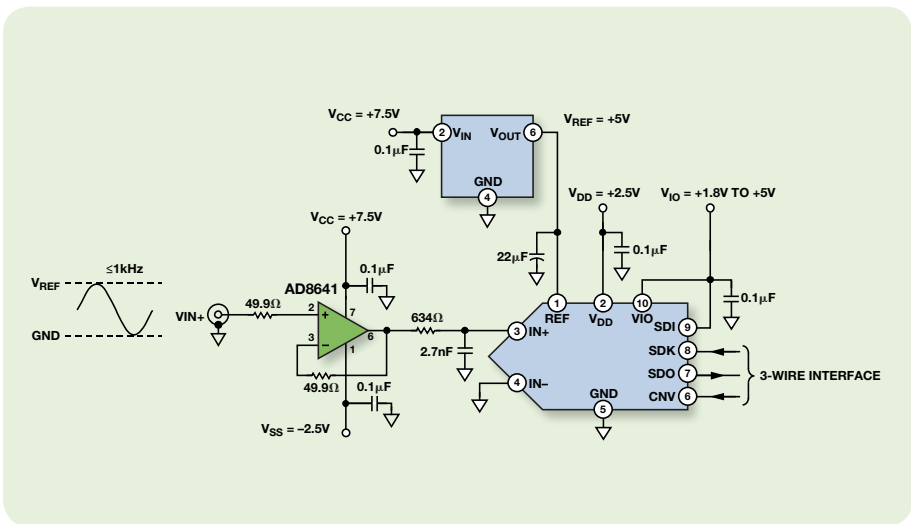
Circuit Features

- 16-bit, 100 kSPS SAR ADC system
- Optimum low power drive amplifier
- Input signals up to 1 kHz

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC

CN0306 circuit evaluation board.



CN0306 circuit diagram.

Reference circuit design and integration files such as schematics, BOM, and PCB layout are available for all circuits. Device driver and hardware availability for each circuit are indicated in the table.

Converter Type	Circuit Title	Analog-to-Digital Converter	Amplifier	Hardware Available	Device Driver*	FPGA Application Project*	Circuit Number
SAR	12-Bit, 1 MSPS SAR ADC and Driver with Total Power Dissipation Less Than 5 mW	AD7091R	AD8031	•	•		CN0247
	High Impedance, High CMR, ±10 V Analog Front End Signal Conditioner for Industrial Process Control and Automation	AD7687	AD8295/ AD8275	•	•		CN0225
	Optimizing AC Performance in an 18-Bit, 250 kSPS, PulSAR Measurement Circuit	AD7691	AD8597	•	•		CN0261
	Ultralow Power, 18-Bit, Differential PulSAR ADC Driver	AD7982	ADA4940		•		CN0237
	Precision, Low Power, Single-Supply, Fully Integrated Differential ADC Driver for Industrial-Level Signals	AD7982	AD8475		•		CN0180
	Oversampled SAR ADC with PGA Achieving Greater Than 125 dB Dynamic Range	AD7985	AD8253				CN0260
	Low Power Successive Approximation ADC System with Optimum Low Power Drive Amplifier for Sub-Nyquist Input Signals Up to 4 kHz	AD7988-5	OP1177	•	•	•	CN0305
	Low Power Successive Approximation ADC System with Optimum Low Power Drive Amplifier for Sub-Nyquist Input Signals Up to 1 kHz	AD7988-1	AD7988-1	•	•	•	CN0306
	16-Bit, 6 MSPS SAR ADC System with Low Power Input Drivers and Reference Optimized for Multiplexed Applications	ADA4897-1	ADA4897-1				CN0307
Sigma-delta	Precision Weigh Scale Design Using a 24-Bit Sigma-Delta ADC with External ADA4528 Zero-Drift Amplifiers	AD7791	ADA4528	•	•	•	CN0216
	Precision 24-Bit, 250 kSPS Single-Supply Sigma-Delta ADC System for Industrial Signal Levels	AD7176-2	AD8475	•	•	•	CN0310
High speed	Single-Supply DC-Coupled 16-Bit, 125 MSPS Analog Front End for Bipolar Input	AD9265	ADA4930-1			•	CN0252
	High Performance, 65 MHz Bandwidth Quad IF Receiver with Antialiasing Filter and 184.32 MSPS Sampling Rate	AD6657A	ADL5565	•			CN0259
	High Performance, 12-Bit, 500 MSPS Wideband Receiver with Antialiasing Filter	AD9434	ADA4960-1				CN0238
	High Performance, 16-Bit, 250 MSPS Wideband Receiver with Antialiasing Filter	AD9467	ADL5562	•	•		CN0227
	Resonant Approach to Designing a Band-Pass Filter for Narrow-Band, High IF, 16-Bit, 250 MSPS Receiver Front End	AD9467	ADL5565		•		CN0268
	High Performance, High IF, 75 MHz Bandwidth, 14-Bit, 250 MSPS Receiver Front End with Band-Pass Antialiasing Filter	AD9643	ADL5202		•		CN0242
	High Sampling Receiver Front End with Band-Pass Filter	AD9642	ADL5565				CN0279

*Availability based on date of publication. Content is regularly added; please check the website for latest information.

Isolation Applications

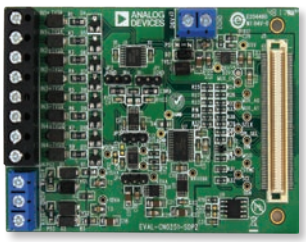
A Flexible 4-Channel Analog Front End for Wide Dynamic Range Signal Conditioning

Circuit Features

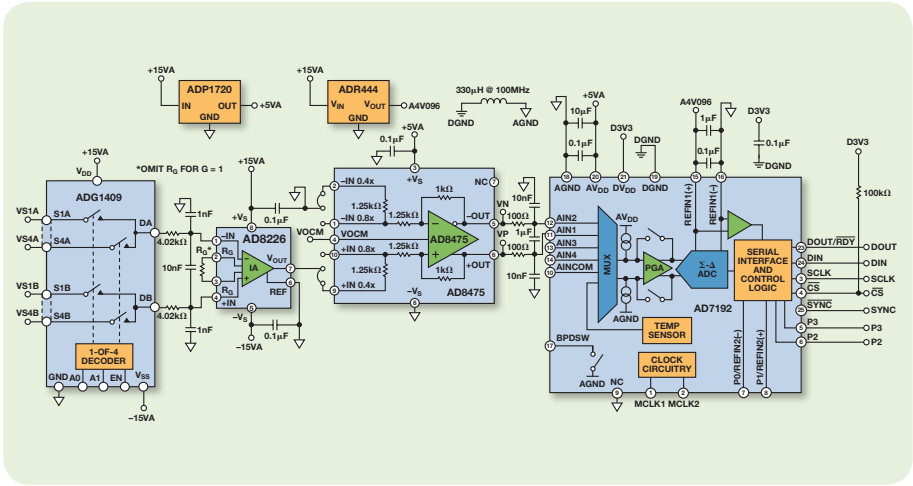
- 4-channel wide dynamic range
- Industrial signal input levels (±10 V)
- Circuit provides high common-mode rejection

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC



CN0251 circuit evaluation board.



CN0251 circuit diagram.

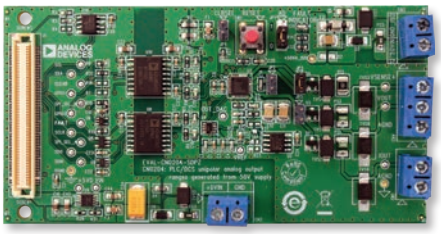
Flexible, High Voltage, High Accuracy, Low Drift PLC/DCS Analog Output Module

Circuit Features

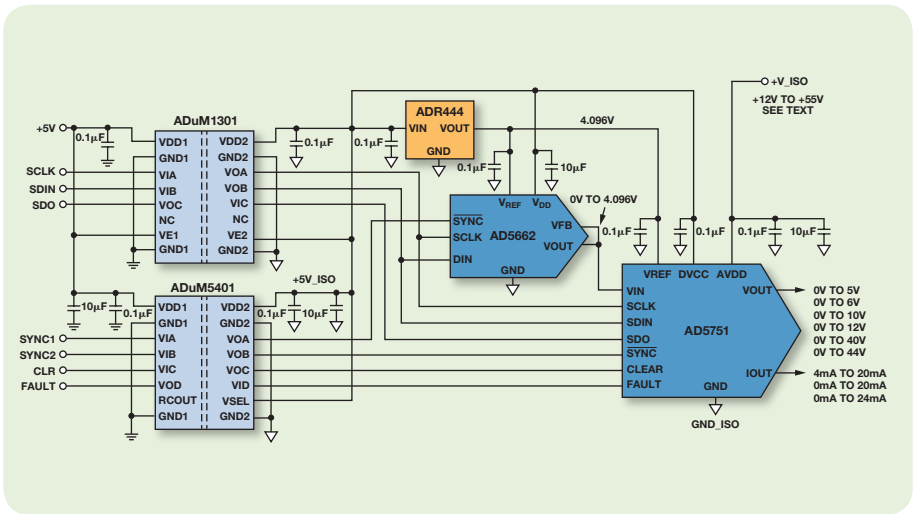
- High voltage, up to 44 V
- Programmable analog output
- Galvanic isolation from rest of system
- Ideal for PLC and DCS modules

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC



CN0204 circuit evaluation board.



CN0204 circuit diagram.

Fully Isolated Lithium Ion Battery Monitoring and Protection System

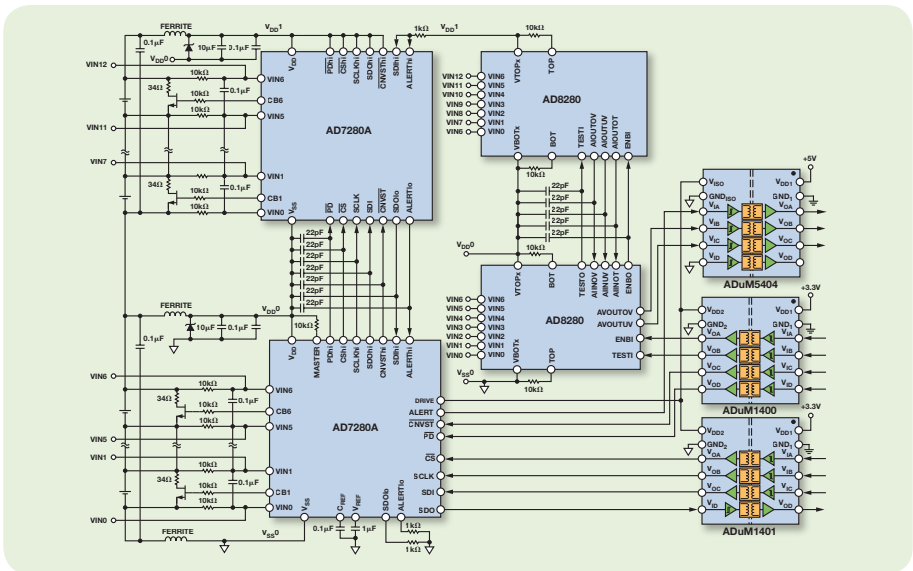
Circuit Features

- Measures and monitors 12 battery channels (scalable to 48)
- Alarm interrupts for different voltage conditions
- Battery cell balancing and load sharing
- Full galvanic isolation protects system

Connectivity Options

- Evaluation: SDP
- Prototype: BeMicro, FMC

CN0235 circuit evaluation board.



CN0235 circuit diagram.

Reference circuit design and integration files such as schematics, BOM, and PCB layout are available for all circuits. Device driver and hardware availability for each circuit are indicated in the table.

Application	Circuit Title	Digital Isolator	Hardware Available	Device Driver*	FPGA Application Project*	Circuit Number
USB	Universal Serial Bus (USB) Hub Isolator Circuit	ADuM4160	•			CN0158
	Universal Serial Bus (USB) Cable Isolator Circuit	ADuM4160	•			CN0159
	Universal Serial Bus (USB) Peripheral Isolator Circuit	ADuM4160	•			CN0160
Analog-to-analog	A Novel Analog-to-Analog Isolator Using an Isolated Sigma-Delta Modulator, Isolated DC-to-DC Converter, and Active Filter	ADuM5000	•			CN0185
Current sense	Low Cost, Level Shifted Low-Side Current Monitor for Negative High Voltage Rails	ADuM5402	•	•	•	CN0188
	500 V Common-Mode Voltage Current Monitor	ADuM5402	•	•	•	CN0218
	Bidirectional Isolated High-Side Current Sense with 270 V Common-Mode Rejection	ADuM5402	•	•	•	CN0240
PLC	Galvanically Isolated, 2-Channel, 16-Bit, Simultaneous Sampling, Daisy-Chained Data Acquisition System	ADuM1402	•	•	•	CN0194
	Flexible, High Voltage, High Accuracy, Low Drift PLC/DCS Analog Output Module	ADuM5401	•	•	•	CN0204
	2 MHz Bandwidth PIN Photodiode Preamp with Dark Current Compensation	ADuM5400	•	•	•	CN0229
	Low Cost, 16-Bit, 250 kSPS, 8-Channel, Isolated Data Acquisition System	ADuM3471	•			CN0254
H-bridge	H-Bridge Driver Circuit Using Isolated Half-Bridge Drivers	ADuM7234	•			CN0196
Battery monitoring	Lithium Ion Battery Stack Monitor with Both Signal and Power Isolation	ADuM5401	•	•		CN0197
	Fully Isolated Lithium Ion Battery Monitoring and Protection System	ADuM5404	•	•	•	CN0235
Industrial	16-Bit Isolated Industrial Voltage and Current Output DAC with Isolated DC-to-DC Supplies	ADuM3471				CN0233
Data acquisition	A Flexible 4-Channel Analog Front End for Wide Dynamic Range Signal Conditioning	ADuM5401	•	•		CN0251
	Galvanically Isolated, 2-Channel, 16-Bit, Simultaneous Sampling, Daisy-Chained Data Acquisition System	ADuM1402	•	•	•	CN0194
LVDS	Isolated LVDS Interface Circuit	ADuM3442	•			CN0256

*Availability based on date of publication. Content is regularly added; please check the website for latest information.

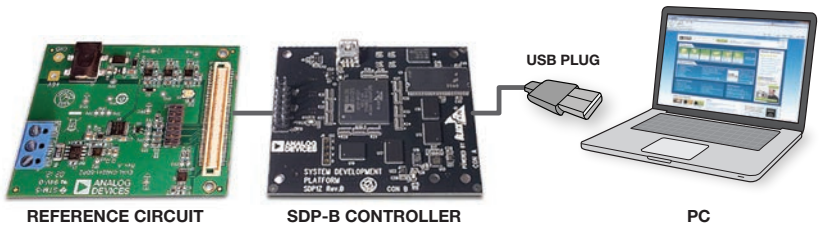
Evaluating and Prototyping Reference Circuits

Evaluation Using the System Demonstration Platform (SDP)

Analog Devices' new System Demonstration Platform comprises a series of controller boards, interposer boards, and daughter boards that enable easy, low cost evaluation of ADI components and reference circuits using a versatile and reusable platform.

www.analog.com/sdp

- Common platform for easy evaluation
- Application software available for demo
- Low cost, with boards starting at $50
- Expandable platform
- Designed for reuse, only need to purchase once

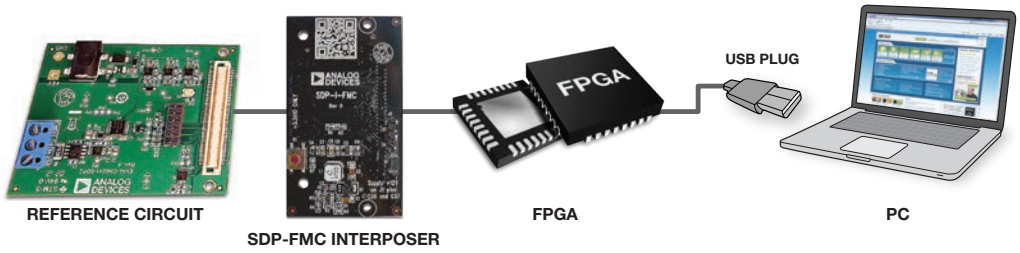


Prototyping with Third-Party Partners

ADI reference circuits enable quick and easy connectivity to several embedded processors and interactive development environments. Reusable interposer boards currently include connections to Xilinx® FPGAs and Arrow® BeMicro SDK.

www.analog.com/alliances

- Common connector across many circuits
- Interposer boards connect with popular FPGAs
- Low cost, with boards starting at $50
- Facilitates rapid prototyping
- Customer familiar software environment



The SDP-to-FMC interposer allows users to connect ADI reference circuits to FPGA platforms for quick and easy prototyping.

Design Resources

Get HDL interface code, Linux device drivers, and reference design examples from the Analog Devices wiki site:

wiki.analog.com

Bring your questions to our experts in the Circuits from the Lab online community:

ez.analog.com

engineerzone™
SUPPORT COMMUNITY

Scan the code to access our circuits video library, or go here:

www.analog.com/circuit-videos

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