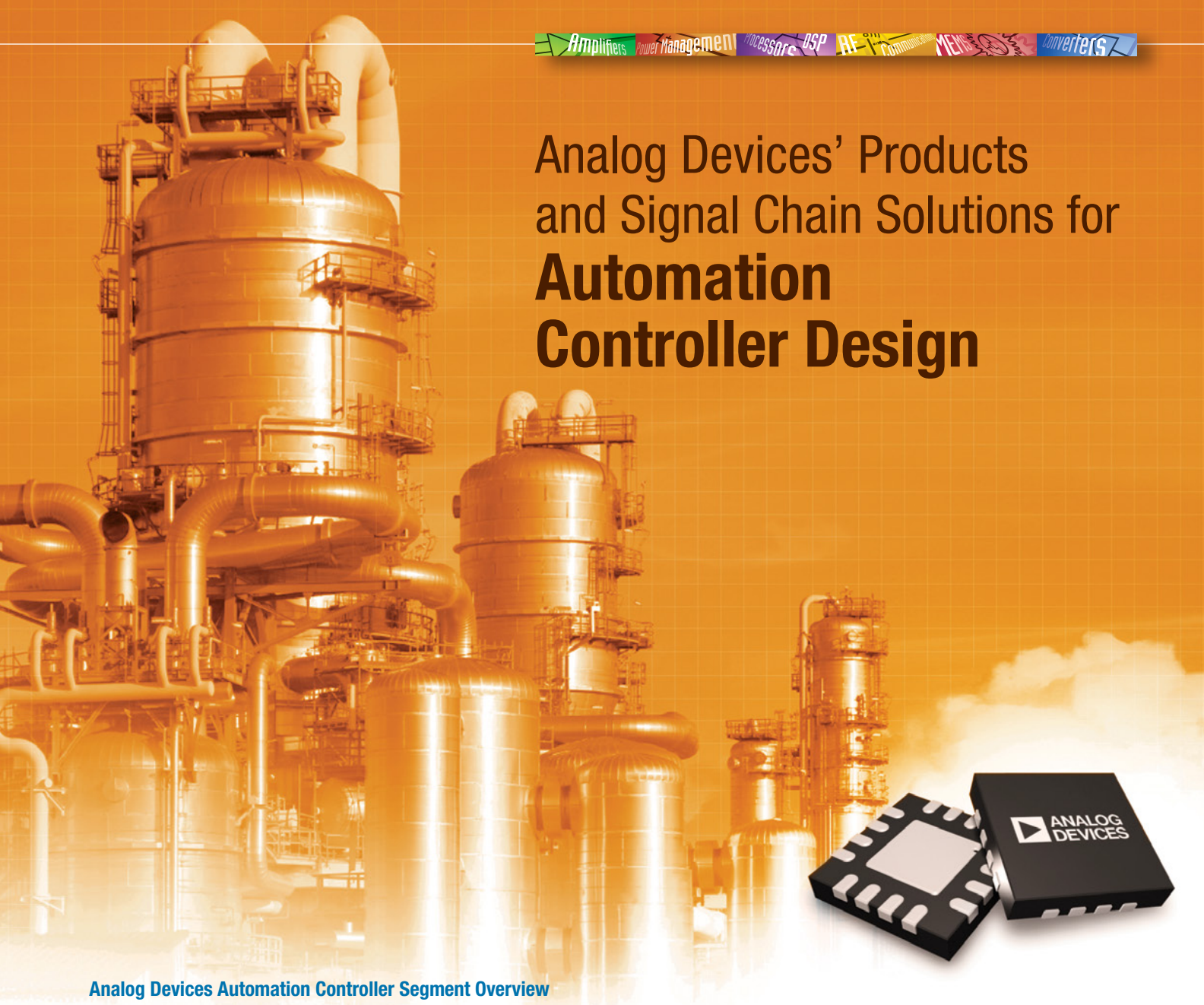
Analog Devices' Products and Signal Chain Solutions for **Automation Controller Design**



Analog Devices Automation Controller Segment Overview

Analog Devices is a leading supplier of industrial precision signal measurement solutions. These solutions are designed into automation controller modules for PLC and DCS systems in process and manufacturing plants and machinery across a wide range of industries including chemical and pharmaceutical, hydrocarbon (oil and gas), environmental (waste water and treatment), and automotive. The combination of ADI's proven system expertise in industrial applications and a comprehensive portfolio of products with leading performance vs. power and integration makes ADI an essential partner for engineers designing automation controllers.

Main Challenges and System Considerations

- High availability systems
- High reliability, longevity of supply, and lower assembly and manufacturing costs
- Increasing I/O channel density and smaller module housing is driving the need for smaller, more integrated solutions, with lower power and enhanced thermal and power efficiency
- Increasing end market need for higher levels of functional safety

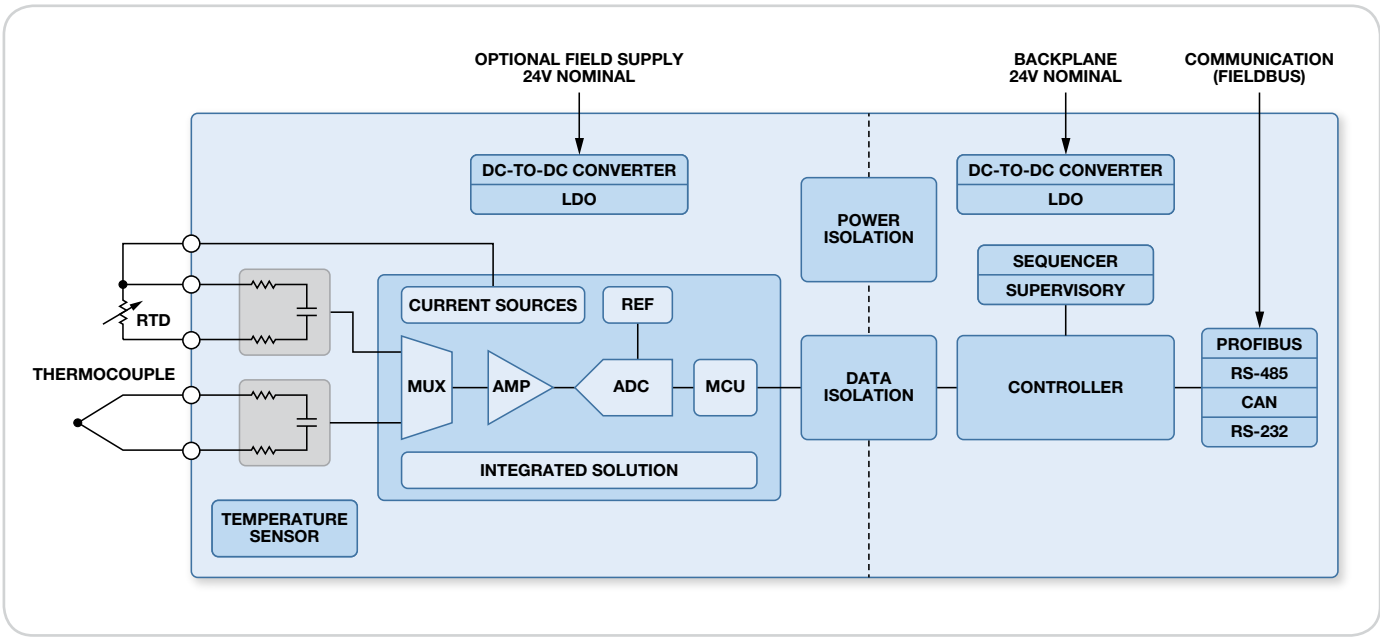
Why Choose ADI?

- ADI is a technology leader in precision converters and signal processing with a long history of serving the needs of industrial customers
- ADI is continually investing in core technology and application specific products to meet current and future industrial needs
- Best-in-class signal chain solutions with the most efficient precision measurement over a wide range of module inputs and outputs
- ADI has deep system expertise and many years' experience supporting automation controller design cycles
- Long product life cycles, superior reliability, and on time delivery

Automation Controller Applications

- Analog input temperature module
- Analog input group isolated module
- Analog input channel-to-channel isolated module
- Analog output group isolated module
- Analog output channel-to-channel isolated module

Analog Input: Temperature Module



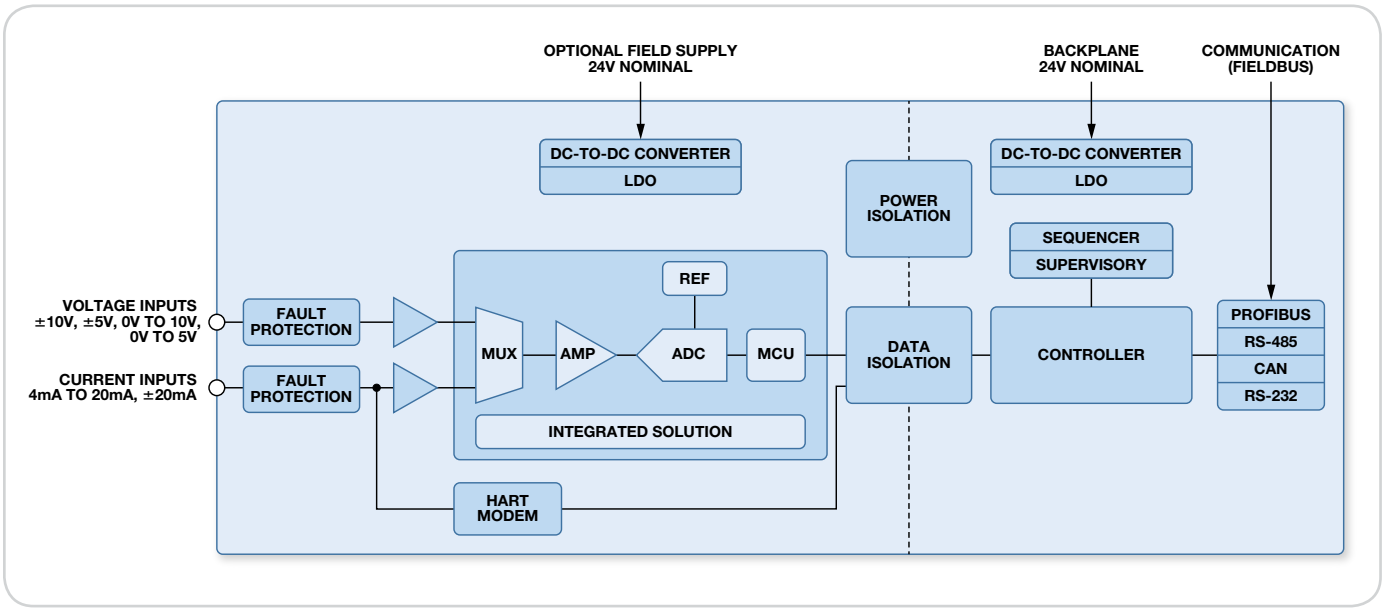
Analog Input

Part Number	Description	Key Features and Benefits	
Integrated Solution—Microcontroller			

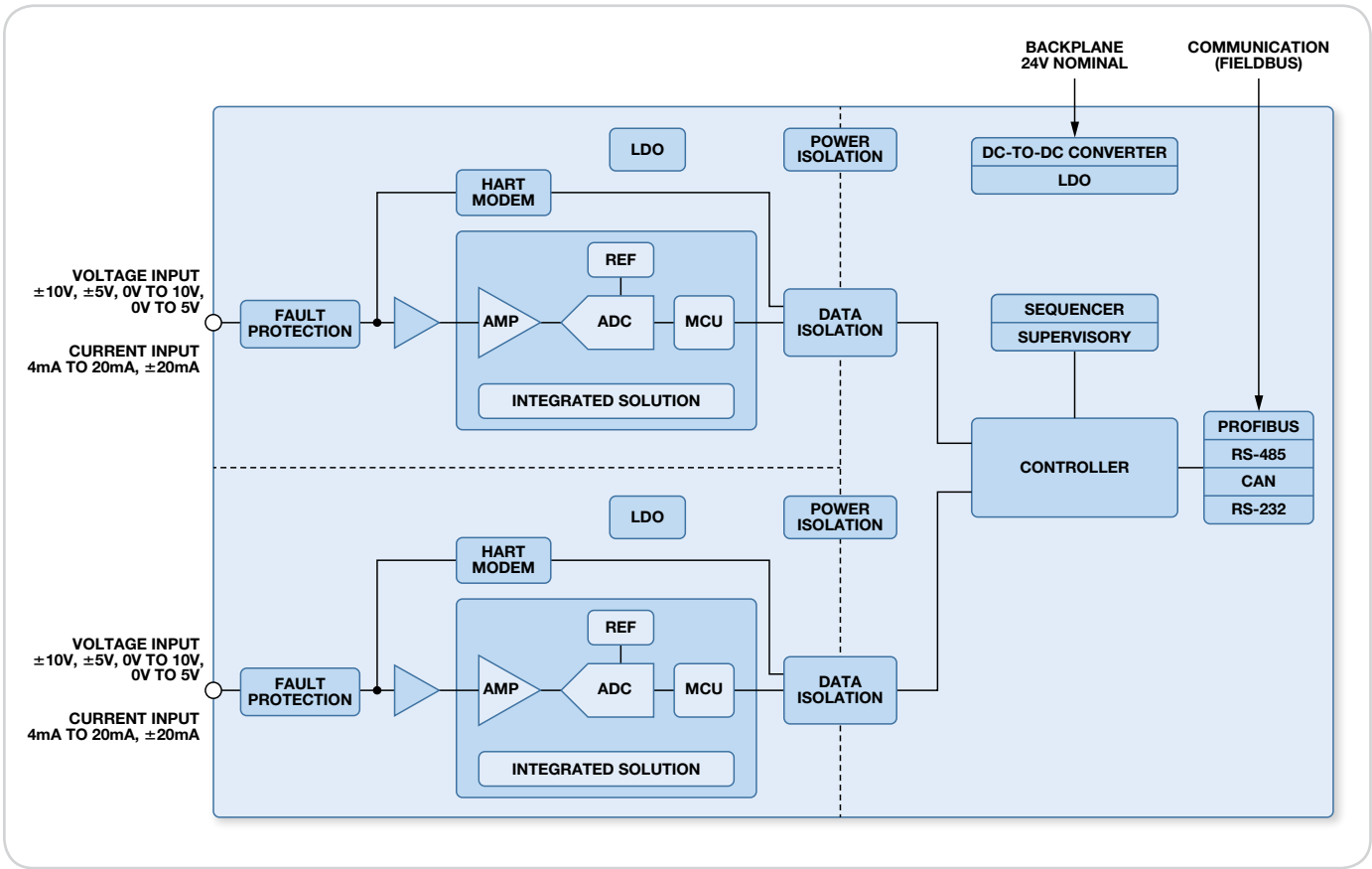
ADuCM360/ ADuCM361	Low power precision analog microcontroller, ARM Cortex™-M3 with dual/single Σ-Δ ADCs	• Analog performance
		  • Dual PGA and 24-bit, 4 kSPS ADCs
		  • 12 multiplexed analog inputs
		  • 12-bit DAC
		• Digital performance
		  • 32-bit ARM Cortex-M3 processor
		  • 128 kB flash, 8 kB SRAM
			• Power consumption only 1 mA with core operating at 500 kHz (both ADCs on, input buffers off, PGA gain of 4, one SPI port on, and all timers on)
			• Package and temperature
			  • 48-lead LFCSP (7 mm × 7 mm)
			  • –40°C to +125°C

ADuC7060/ ADuC7061	Low power, precision analog microcontroller, ARM7TDMI® with dual Σ-Δ ADCs	• Dual 24-bit 8 kSPS Σ-Δ ADCs • 8 multiplexed analog inputs • Single 14-bit DAC • ARM7TDMI 16-/32-bit RISC controller	• 32 kB flash and 4 kB SRAM • UART, SPI, GPIO, PWM • Nominal supply 2.5 V • Temperature range: –40°C to +125°C
Integrated Solution—ADC			
AD7792/AD7793/ AD7794/AD7795	3-channel/6-channel, low noise, low power, Σ-Δ ADC with on-chip in-amp	• 24-bit (AD7793, AD7794)/ 16-bit (AD7792, AD7795) • Low power: 400 μA • PGA: gain from 1 to 128 • 4 ppm/°C on-chip reference	• Programmable current sources • Burnout currents • Simultaneous 50 Hz and 60 Hz rejection • 4.17 SPS to 400 SPS output data rate • Temperature: –40°C to +105°C
ADC			
AD7685/AD7942	16-/14-bit, 250 kSPS PulSAR® ADC	• Throughput: 250 kSPS • Pseudo differential analog input range: 0 V to V_{REF} with V_{REF} up to V_{DD}	• INL: ±2 LSB max • SINAD: 93.5 dB @ 20 kHz • Supply range: 2.3 V to 5.5 V
Reference			
ADR4520/ADR4525/ ADR4530/ADR4533/ ADR4540/ADR4550	Ultralow noise, 2 ppm/°C, high accuracy voltage reference (2.048 V/2.50 V/3.00 V/ 3.30 V/4.096 V/5.00 V)	• Initial accuracy: 0.02% max • Temperature coefficient: 2 ppm/°C max • Output noise (0.1 Hz to 10 Hz): 1.25 μV p-p @ V_{OUT} of 2.5 V	• Supply range: 3 V to 15 V • Temperature range: –40°C to +125°C • 8-lead SOIC package
ADR3412/ADR3420, ADR3425/ADR3430, ADR3433/ADR3440, ADR3450	Low power, 10 ppm/°C CMOS voltage reference (1.20 V/2.048 V/2.50 V/3.00 V/3.30 V/ 4.096 V/5.00 V)	• Initial accuracy: 0.1% max • Temperature coefficient: 8 ppm/°C max • Output noise (0.1 Hz to 10 Hz): 18 μV p-p @ V_{OUT} of 2.5 V	• Supply range: 2.7 V to 5.5 V • Temperature range: –40°C to +125°C • 6-lead SOT-23 package

Analog Input: Group Isolated Module



Analog Input: Channel-to-Channel Isolated Module



Analog Input

Part Number	Description	Key Features and Benefits	
Fault Protector			
ADG465/ADG468	Single-/octal-channel protector	• Fault protection up to ±40 V • Low power dissipation	• Latchup proof construction

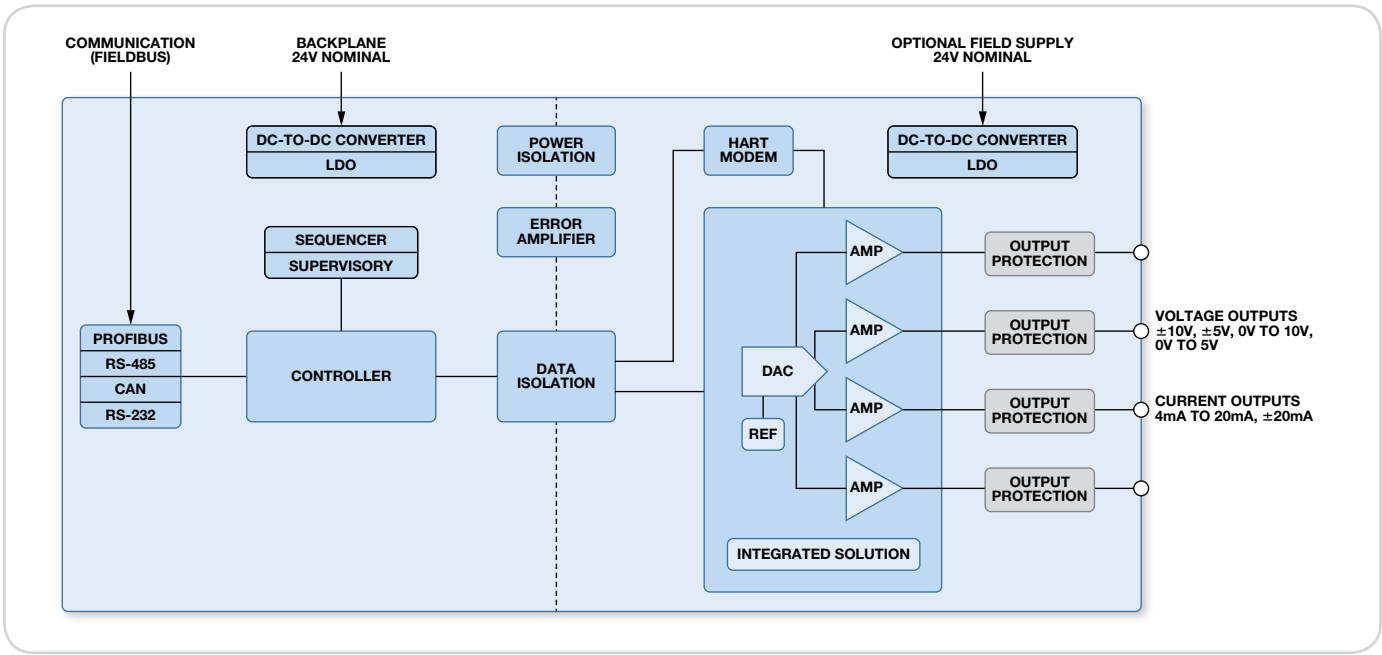
Analog Input (continued)

Part Number	Description	Key Features and Benefits	
HART Modem			
AD5700/AD5700-1	Low power HART® modem	• HART compliant fully integrated FSK modem • On-chip oscillator (AD5700-1) • 4 mm × 4 mm, 24-lead LFCSP	• 1.71 V to 5.5 V power supply • Buffered HART output • Temperature range: –40°C to +125°C
Amplifiers			
ADA4096-2/ ADA4096-4	30 V, micropower, overvoltage protection, RRIO dual/quad op amps	• Input overvoltage protection, 32 V above and below the supply rails • No phase reversal for input voltage up to ±32 V beyond the power supply	• Single-supply operation: 3 V to 30 V • Rail-to-rail input and output swing • Unity gain bandwidth: 800 kHz typ @ V_{SY} = ±15 V
AD8275	G = 0.2, level translation, 16-bit ADC driver	• Translates ±10 V to +4 V • Drives 16-bit SAR ADCs • High CMRR: 96 dB • Low gain drift: 1 ppm/°C	• Low offset drift: 2.5 µV/°C • Rail-to-rail output • 8-lead MSOP package
AD8475	Precision, selectable gain, full differential funnel amp	• Attenuate and level shift: G = 0.4×, 0.8× • Fully differential or single-ended input/output • Rail-to-rail output	• Suited for driving 18-bit converter up to 4 MSPS • 10 nV/√Hz output noise • 3 ppm/°C gain drift
ADC			
AD7192/AD7193/ AD7194	2-channel/4-channel/8-channel, 4.8 kHz, ultralow noise, 24-bit Σ-Δ ADC with PGA	• 4.7 Hz to 4.8 kHz output data rate • PGA: gain from 1 to 128 • Up to 22 noise free bits (gain = 1)	• Offset drift: 5 nV/°C • Gain drift: 1 ppm/°C
AD7173-8	Low power, 8-channel/16-channel, 31.25 kSPS, 24-bit, Σ-Δ ADC	• Fast and flexible output rate: 1.25 SPS to 31.25 kSPS • 17.5 noise free bits at 31.25 kSPS • 24 noise free bits at 1.25 SPS • INL: ±3 ppm/FSR	• Crosspoint multiplexer (enable system diagnostic) • Internal clock and internal 2.5 V, 3.5 ppm/°C reference • 6 mm × 6 mm, 40-lead LFCSP • Temperature range: –40°C to +105°C
AD7176-2	24-bit, 250 kSPS Σ-Δ ADC with 20 µs settling	• Fast and flexible output rate—5 SPS to 250 kSPS • Fast settling time—20 µs • 17 noise free bits at 250 kSPS • 22 noise free bits at 5 SPS	• INL: ±2.5 ppm of FSR • Crosspoint multiplexer (enable system diagnostic) • Internal clock and internal 2.5 V, 2 ppm/°C reference • Temperature range: –40°C to +105°C
AD7685/AD7942	16-/14-bit, 250 kSPS PulSAR® ADC	• Throughput: 250 kSPS • Pseudo differential analog input range: 0 V to V_{REF} with V_{REF} up to V_{DD}	• INL: ±2 LSB max • SINAD: 93.5 dB @ 20 kHz • Supply range: 2.3 V to 5.5 V
Reference			
ADR4520/ADR4525/ ADR4530/ADR4533/ ADR4540/ADR4550	Ultralow noise, 2 ppm/°C, high accuracy voltage reference (2.048 V/ 2.50 V/3.00 V/3.30 V/4.096 V/5.00 V)	• Initial accuracy: 0.02% max • Temperature coefficient: 2 ppm/°C max • Output noise (0.1 Hz to 10 Hz): 1.25 µV p-p @ V_{OUT} of 2.5 V	• Supply range: 3 V to 15 V • Temperature range: –40°C to +125°C • 8-lead SOIC package
ADR3412/ADR3420, ADR3425/ADR3430, ADR3433/ADR3440, ADR3450	Low power, 10 ppm/°C CMOS voltage reference (1.20 V/2.048 V/2.50 V/3.00 V/ 3.30 V/4.096 V/5.00 V)	• Initial accuracy: 0.1% max • Temperature coefficient: 8 ppm/°C max • Output noise (0.1 Hz to 10 Hz): 18 µV p-p @ V_{OUT} of 2.5 V	• Supply range: 2.7 V to 5.5 V • Temperature range: –40°C to +125°C • 6-lead SOT-23 package
Microcontroller			

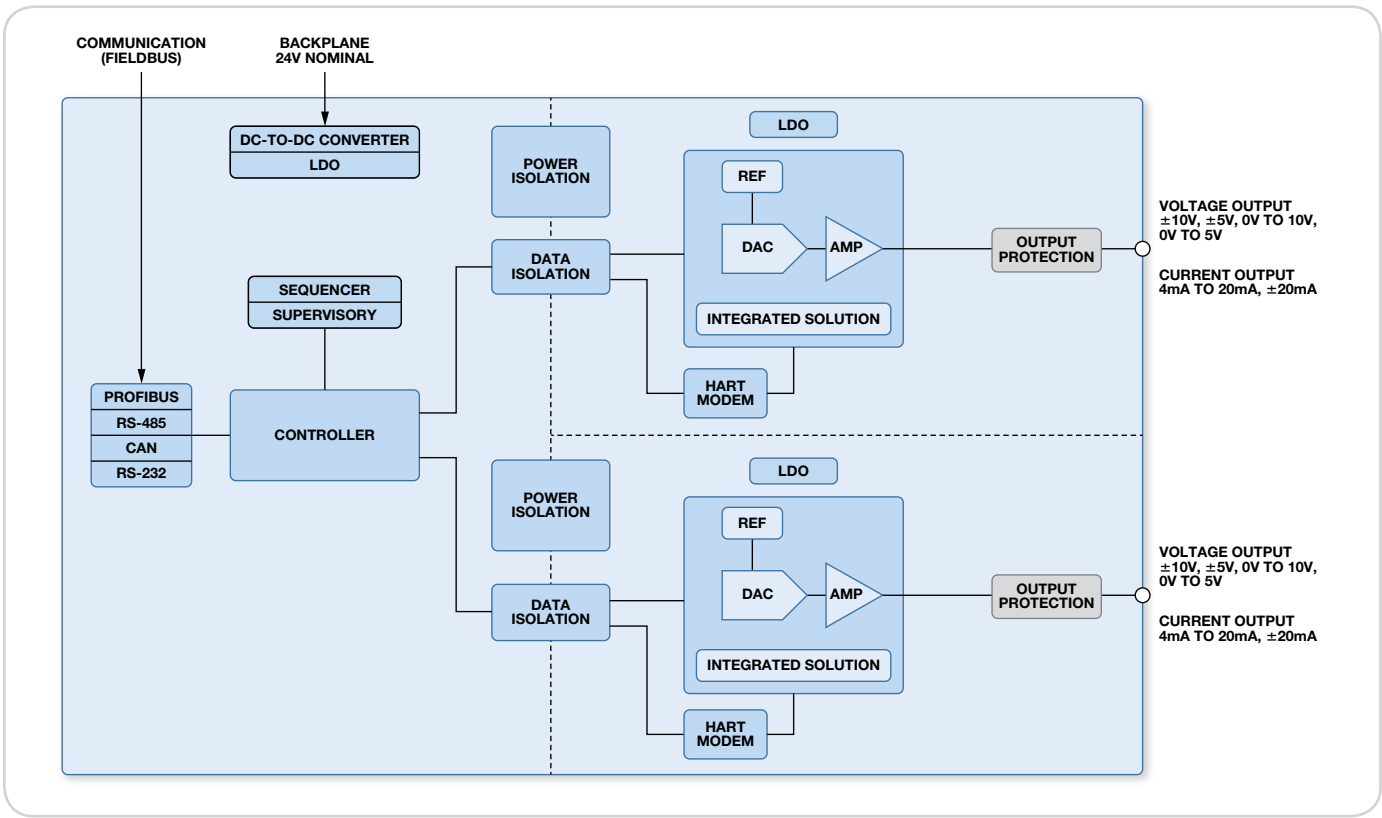
ADuCM360/ ADuCM361	Low power precision analog microcontroller, ARM Cortex-M3 with dual/single Σ-Δ ADCs	• Analog performance
		  • Dual PGA and 24-bit, 4 kSPS ADCs
		  • 12 multiplexed analog inputs
		  • 12-bit DAC
		• Digital performance
		  • 32-bit ARM Cortex-M3 processor
		  • 128 kB flash, 8 kB SRAM
			• Power consumption only 1 mA with core operating at 500 kHz (both ADCs on, input buffers off, PGA gain of 4, one SPI port on, and all timers on)
			• Package and temperature
			  • 48-lead LFCSP (7 mm × 7 mm)
			  • –40°C to +125°C

Power Management			
ADP2441	36 V, 1 A, synchronous step-down dc-to-dc regulator	• Wide input voltage range: 4.5 V to 36 V • Adjustable output down to 0.6 V • High efficiency up to 94% • ±1% output voltage accuracy	• Adjustable frequency 300 kHz to 1 MHz • Soft start with tracking, power-good pin, and overcurrent limit protection
ADP1720	50 mA, high voltage, micropower linear regulator	• Wide input voltage range: 4 V to 28 V • I_Q = 74 µA @ 1 mA load	• Max output current: 50 mA • Low dropout voltage: 275 mV @ 50 mA load

Analog Output: Group Isolated Module



Analog Output: Channel-to-Channel Isolated Module



Analog Output

Part Number	Description	Key Features and Benefits	
HART Modem			
AD5700/AD5700-1	Low power HART modem	• HART compliant fully integrated FSK modem • On-chip oscillator (AD5700-1) • 4 mm × 4 mm, 24-lead LFCSP	• 1.71 V to 5.5 V power supply • Buffered HART output • Temperature range: –40°C to +125°C

Analog Output (continued)

Part Number	Description	Key Features and Benefits	
Integrated Output Solution			
AD5755-1/AD5755/ AD5735/AD5757/ AD5737	Quad-channel,16-bit, 4 mA to 20 mA and voltage output DAC, dynamic power control, HART connectivity	• Dynamic power control for thermal management • 16-bit (AD5755-1, AD5755) and 12-bit (AD5735) options • Quad channel • Standard industrial voltage and current output ranges • ±0.04% FSR max total unadjusted error (TUE) on voltage outputs	• ±0.05% FSR max total unadjusted error (TUE) on current outputs • Current output only versions available (AD5757/AD5737) • User programmable offset and gain • On-chip diagnostics • On-chip reference (±10 ppm/°C maximum) • –40°C to +105°C temperature range • 64-lead LFCSP package (9 mm × 9 mm)
AD5422/AD5412	Single-channel, 12-/16-bit, current source and voltage output DAC, HART connectivity	• 16-bit (AD5422) and 12-bit (AD5412) options • Standard industrial voltage and current output ranges • ±0.1% FSR max total unadjusted error (TUE) on voltage outputs • ±0.15% FSR max total unadjusted error (TUE) on current outputs	• Current output only versions available (AD5420/AD5410) • On-chip reference (±10 ppm/°C maximum) • Optional regulated DV_{CC} output • 40-lead LFCSP package (6 mm × 6 mm)
DAC			
AD5683R/AD5681R/ AD5689R/AD5687R/ AD5686R/AD5684R	Single/dual/quad, 16-/12-bit *nano*DAC+™ with 2 ppm/°C on-chip reference	• Single (AD5683R/AD5681R), dual (AD5689R/ AD5687R), or quad (AD5686R/AD5684R) DAC • 16-/12-bit resolution • INL: ±2 LSB maximum @ 16 bits • On-chip 2.5 V, 5 ppm/°C max reference • Total unadjusted error (TUE): ±0.1% of FSR max (±0.06% FSR for single)	• Offset error: ±1.5 mV max • 1.8 V logic compatibility • 8-lead LFCSP (2 mm × 2 mm) or MSOP (single) • 16-lead LFCSP (3 mm × 3 mm) or TSSOP (dual/quad)
AD5668/AD5648/ AD5628	Octal, 16-/14-/12-bit *dense*DAC® with on-chip reference	• Octal DAC: 16-/14-/12-bit resolution • On-chip 1.25 V/2.5 V, 10 ppm/°C max reference	• 16-lead TSSOP/WLCSP/LFCSP (4 mm × 4 mm)
Reference			
ADR4520/ADR4525/ ADR4530/ADR4533/ ADR4540/ADR4550	Ultralow noise, 2 ppm/°C, high accuracy voltage reference (2.048 V/2.50 V/3.00 V/ 3.30 V/4.096 V/5.00 V)	• Initial accuracy: 0.02% max • Temperature coefficient: 2 ppm/°C max • Output noise (0.1 Hz to 10 Hz): 1.25 µV p-p @ V_{OUT} of 2.5 V	• Supply range: 3 V to 15 V • Temperature range: –40°C to +125°C • 8-lead SOIC package
ADR3412/ADR3420, ADR3425/ADR3430, ADR3433/ADR3440, ADR3450	Low power, 10 ppm/°C CMOS voltage reference (1.20 V/2.048 V/2.50 V/3.00 V/3.30 V/ 4.096 V/5.00 V)	• Initial accuracy: 0.1% max • Temperature coefficient: 8 ppm/°C max • Output noise (0.1 Hz to 10 Hz): 18 µV p-p @ V_{OUT} of 2.5 V	• Supply range: 2.7 V to 5.5 V • Temperature range: –40°C to +125°C • 6-lead SOT-23 package
Amplifier/Driver			
AD5750/AD5751/ AD5748/AD5749	Industrial current/voltage output driver with programmable ranges	• Standard industrial voltage and current output ranges (including ±20 mA) • Current output only version available (AD5749) • ±0.1% FSR max total unadjusted error (TUE) on voltage outputs • ±0.1% FSR max total unadjusted error (TUE) on current outputs	• 60 V/55 V loop compliance (AD5751, AD5749) • On-chip diagnostics • Temperature range: –40°C to +105°C • 32-lead LFCSP package (5 mm × 5 mm)
ADA4096-2/ ADA4096-4	30 V, micropower, overvoltage protection, RRIO dual/quad op amps	• Input overvoltage protection, 32 V above and below the supply rails • No phase reversal for input voltage up to ±32 V beyond the power supply	• Single-supply operation: 3 V to 30 V • Rail-to-rail input and output swing • Unity gain bandwidth: 800 kHz typ @ V_{SY} = ±15 V
Power Management			
ADP2441	36 V, 1 A, synchronous step-down dc-to-dc regulator	• Wide input voltage range: 4.5 V to 36 V • Adjustable output down to 0.6 V • High efficiency up to 94% • ±1% output voltage accuracy	• Adjustable frequency 300 kHz to 1 MHz • Soft start with tracking, power-good pin, and overcurrent limit protection
ADP1720	50 mA, high voltage, micropower linear regulator	• Wide input voltage range: 4 V to 28 V • I_Q = 74 µA @ 1 mA load	• Max output current: 50 mA • Low dropout voltage: 275 mV @ 50 mA load

Isolation, Power, and Communication

Analog Devices offers a wide range of supporting products to meet the various isolation, power, and communications requirements for automation controller design.

Part Number	Description	Key Features and Benefits	
Controller			
ADSP-BF504/ ADSP-BF504F/ ADSP-BF506F	ADSP-BF50x fixed point DSP	• 400 MHz (800 MMACS) Blackfin® core • 2 UART, 2 SPI, 2 SPORT, and CAN interfaces for communications	• 32 MB executable flash (ADSP-BF504F/ADSP-BF506F) • True 12-bit, dual SAR ADC (ADSP-BF506F)
Supervisory (www.analog.com/supervisory)			
ADM8323	Supervisory circuit	• Windowed watchdog • Manual reset input	• 5-lead SOT-23 package
ADM6305	Supervisory circuit	• Pretrimmed V_{CC} threshold options • Manual reset input	• 5-lead SOT-23 package
Data Isolation			
ADuM3481	3.75 kV rms quad-channel digital isolator	• Small package: 20-lead SSOP • Low dynamic power consumption	• Low voltage I/O: 1.8 V to 5.5 V • 50 year minimum lifetime at 565 V p-p
ADuM1441	Micropower 2.5 kV rms quad-channel isolator	• 0.3 µA per channel quiescent current • 148 µA/Mbps per channel typical dynamic current	• Small package: 16-lead QSOP • 50 year minimum lifetime at 565 V p-p
ADuM1401	2.5 kV rms quad-channel isolator	• 16-lead SOIC wide package	• 50 year minimum lifetime at 565 V p-p
ADuM4401	5 kV rms quad-channel digital isolator	• 16-lead SOIC wide package • Reinforced isolation rating	• 50 year minimum lifetime at 565 V p-p
Power Isolation			
ADuM5401	Quad-channel data isolator with integrated dc-to-dc converter	• *iso*Power® integrated, isolated dc-to-dc converter • Quad dc-to-25 Mbps (NRZ) signal isolation channels	• 16-lead SOIC package with 7.6 mm creepage • Temperature range: –40°C to +105°C
ADuM3471	Quad-channel data with isolated switching regulators	• Integrated transformer driver • Regulated adjustable output: 3.3 V to 24 V • 2 W output power	• Quad dc-to-25 Mbps (NRZ) signal isolation channels • 20-lead SSOP package • Temperature range: –40°C to +105°C
ADP1621	Constant frequency, current mode step-up dc-to-dc controller	• 92% efficiency (no sense resistor required) • ±1.0% initial accuracy • Capable of high supply input voltage (> 5.5 V) with an external NPN or a resistor	• Programmable operating frequency (100 kHz to 1.5 MHz) with one resistor • Synchronizable to external clock
Isolated Error Amplifier			
ADuM3190	2.5 kV rms isolated error amplifier	• Stable over time and temperature • 0.5% initial accuracy • 1% accuracy over the full temperature range • Bandwidth: 400 kHz	• Low power operation: < 7 mA total • Wide supply voltage range: 3 V to 20 V • Temperature range: –40°C to +125°C • 16-lead QSOP package
Power Management			
ADP2441	36 V, 1 A, synchronous step-down dc-to-dc regulator	• Wide input voltage range: 4.5 V to 36 V • Adjustable output down to 0.6 V • High efficiency up to 94% • ±1% output voltage accuracy	• Adjustable frequency 300 kHz to 1 MHz • Soft start with tracking, power-good pin, and overcurrent limit protection
ADP5050/ADP5051/ ADP5052/ADP5053	Integrated power solution with quad buck regulators	• Wide input voltage range: 4.5 V to 15 V • I²C Interface (ADP5050, ADP5051) • 200 mA LDO regulator (ADP5050, ADP5052) • Watchdog timer and reset (ADP5051, ADP5053)	• 250 kHz to 1.4 MHz adjustable switching frequency • Two programmable 1.2 A/2.5 A/4 A sync buck regulators with low-side FET driver • Two 1.2 A sync buck regulators
ADP1720	50 mA, high voltage, micropower linear regulator	• Wide input voltage range: 4 V to 28 V • I_Q = 74 µA at 1 mA load	• Max output current: 50 mA • Low dropout voltage: 275 mV @ 50 mA load

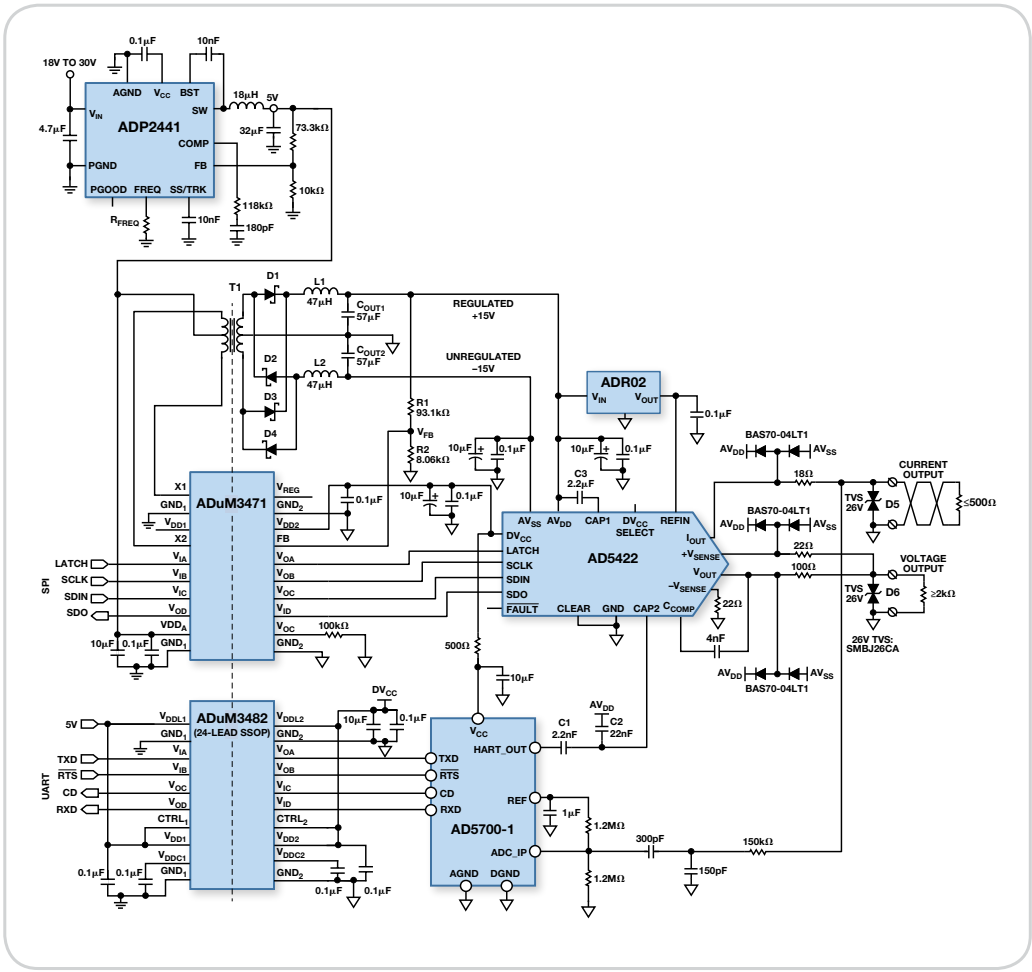
Isolation, Power, and Communication (continued)

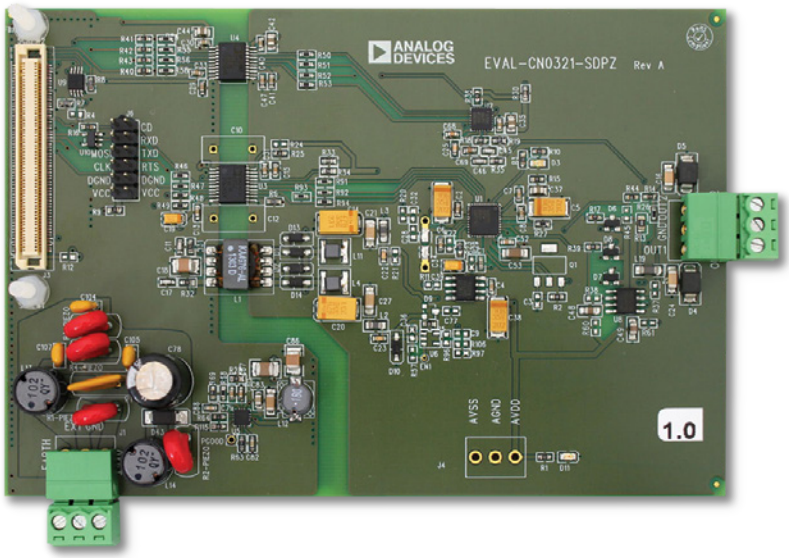
Part Number	Description	Key Features and Benefits	
PROFIBUS			
ADM1486	5 V, high speed, low power, half-duplex RS-485 PROFIBUS® transceiver	• 30 Mbps data rate • 2.1 V min differential output with 54 Ω termination	• Low power 0.8 mA I_{CC}
ADM2485/ ADM2486	2.5 kV single isolated, high speed, half-duplex RS-485 transceiver	• Fully isolated digital interface • Integrated oscillator driver for external isolation transformer (ADM2485)	• Half-duplex RS-485 transceiver • 5 V or 3.3 V operation • 16 Mbps/20 Mbps data rate (ADM2485/ADM2486)
RS-485			
ADM2587E	2.5 kV signal and power isolated, ±15 kV ESD protected, full-/half-duplex RS-485 transceiver 500 kbps	• 500 kbps data rate • Fully Isolated power and data • ±15 kV ESD protection on RS-485 I/O pins	• 5 V or 3.3 V operation • Open and Short-circuit, fail-safe receiver inputs
ADM2482E	2.5 kV signal isolated, ESD protected, full-/half-duplex RS-485 transceiver with transformer driver 16 Mbps	• 16 Mbps data rate • Fully isolated digital interface • Integrated oscillator driver for external transformer	• ±15 kV ESD protection on RS-485 I/O pins • 5 V or 3.3 V operation • Open and Short-circuit, fail-safe receiver inputs
ADM2490E	5 kV signal isolated, high speed (16 Mbps), ESD protected, full-duplex RS-485	• 16 Mbps data rate • Fully isolated digital interface • ±8 kV ESD protection on RS-485 I/O pins	• 5 V or 3.3 V operation • Receiver open circuit, fail-safe design
CAN			
ADM3051	High speed industrial CAN transceiver with bus protection for 24 V systems	• High speed data rates up to 1 Mbps • Short-circuit protection on bus pins • Slope control for reduced EMI	• Unpowered nodes do not disturb the bus • Temperature range: –40°C to +125°C
ADM3052	5 kV rms isolated CAN transceiver with integrated high voltage, bus side, linear regulator	• High speed data rates up to 1 Mbps • Fully isolated digital interface • Integrated V+ linear regulator • Bus side powered by V+ and V–	• Short-circuit protection on bus pins • Integrated bus miswire protection • Unpowered nodes do not disturb the bus
ADM3053	2.5 kV rms signal and power isolated CAN transceiver with integrated isolated dc-to-dc converter	• High speed data rates up to 1 Mbps • Fully isolated power and data • Short-circuit protection on bus pins	• Slope control for reduced EMI • Unpowered nodes do not disturb the bus
ADM3054	5 kV rms signal isolated high speed CAN transceiver with bus protection	• High speed data rates up to 1 Mbps • Fully isolated digital interface • Short-circuit protection on bus pins	• Unpowered nodes do not disturb the bus • Able to detect loss of power on bus side • Temperature range: –40°C to +125°C
RS-232			
ADM3251E/ ADM3252E	Isolated single-/dual-channel RS-232 line driver/receiver	• 460 kbps data rate • Fully isolated power and data	• 15 kV ESD protection on R_{IN} and T_{OUT} pins
ADM3101E	±15 kV ESD protected, 3.3 V single-channel RS-232 line driver/receiver	• 460 kbps data rate • Single-channel RS-232 line driver/receiver	• 0.1 µF charge pump capacitors
Wireless Communication			
ADF7023	High performance, low power, ISM band FSK/GFSK/OOK/MSK/GMSK transceiver IC	• Ultralow power • Frequency bands: 862 MHz to 928 MHz and 431 MHz to 464 MHz • Data rate supported: 1 kbps to 300 kbps	• Flexible firmware programmable system controller and packet processor
ADF7242	Low power IEEE 802.15.4/proprietary GFSK/FSK zero-IF 2.4 GHz transceiver IC	• Frequency range (global ISM band) 2400 MHz to 2483.5 MHz • Programmable data rates and modulation	• Low power consumption • High sensitivity

Circuits from the Lab Reference Designs

Analog Devices Circuits from the Lab® Reference Designs are engineered and tested by our technology and applications experts to ensure both performance and function. Low cost hardware is available to allow for evaluation and rapid prototyping with several development platforms. Thorough documentation and design files are provided to ease application understanding and minimize system integration issues.

CN0321: Fully Isolated, Single-Channel Voltage and 4 mA to 20 mA Output with HART





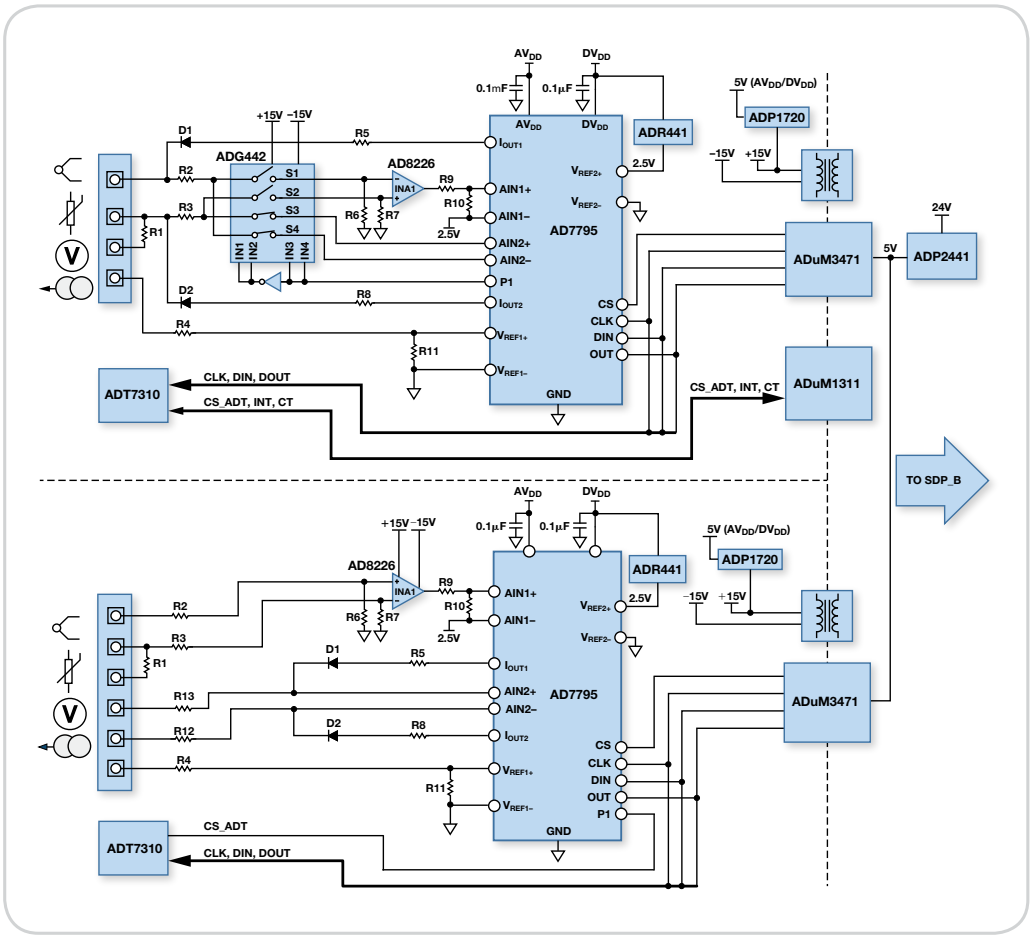
CN0325 circuit diagram.

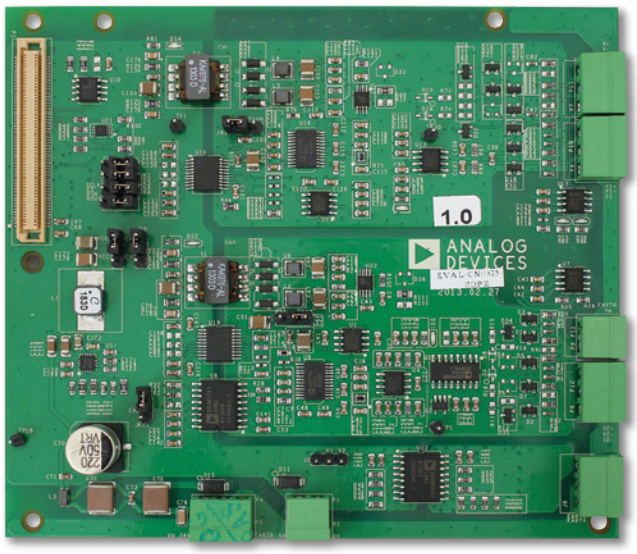
Features and Benefits

- Voltage and 4 mA to 20 mA output
- Fully isolated
- HART connectivity

For more information on this reference circuit and details on how to order, visit *www.analog.com/cn0321*.

CN0325: PLC/DCS Universal Analog Input Using Either 4-Pin or 6-Pin Terminal Block





CN0321 circuit diagram.

For more information on this reference circuit and details on how to order, visit *www.analog.com/cn0325*.

Features and Benefits

- PLC/DCS universal input module
- 4-pin or 6-pin terminal block
- Fully isolated
- 16-bit Σ-Δ ADC

Circuits from the Lab Reference Designs for Automation Controllers

Temperature

Reference Circuit No.	Circuit Description	Functions	Features and Benefits
CN0287	Fully Isolated 4-Channel, Temperature Measurement Circuit Optimized for Performance, Robustness, and Low Cost	Temperature measurement	• 4-channel thermocouple/RTD measurements • Fully isolated • Input protection
CN0172	High Accuracy Multichannel Thermocouple Measurement Solution	Temperature measurement	• 3-channel K-type thermocouple measurement system • Typical temperature range of –200°C to +1200°C • Highly accurate temperature measurement to 0.25°C • 16-bit digital temperature sensor used for cold junction compensation
CN0066	Fully Isolated Input Module Based on the AD7793 24-Bit Σ-Δ ADC and the ADuM5401 Digital Isolator	Temperature measurement	• Fully isolated input module • 24-bit Σ-Δ ADC • Single-supply input circuit • Programmable gain allows detection of small signals
CN0206	Thermocouple Temperature Measurement System with Less Than 500 μA Current Draw	Temperature measurement	• Typical temperature range of –200°C to +400°C • T-type thermocouple measurement system • Low power 500 μA max, and low system noise of 0.2 degrees • Single-chip solution with programmable gain and cold junction compensation • High performance and accuracy

Input

Reference Circuit No.	Circuit Description	Functions	Features and Benefits
CN0325	PLC/DCS Universal Analog Input Using Either 4-Pin or 6-Pin Terminal Block	Low speed input (< 5 kHz)	• PLC/DCS universal input module • 4-pin or 6-pin terminal block • Fully isolated • 16-bit Σ-Δ ADC
CN0209	Software Configurable, Universal Analog Front End for Industrial and Sensor Data Acquisition	Low speed input (< 5 kHz)	• Complete analog front end for process control • Inputs include RTD, thermocouple, 4 mA to 20 mA, ±10 V • Easily switch between the various input types
CN0067	Fully Isolated Input Module Based on the AD7793 24-Bit Σ-Δ ADC, the ADuM5401 Digital Isolator, and a High Performance In-Amp	Low speed input (< 5 kHz)	• Industrial control input module • 4 mA to 20 mA current inputs and unipolar input voltage • 24-bit of digitally isolated resolution
CN0201	Complete 5 V, Single-Supply, 8-Channel Multiplexed Data Acquisition System with PGIA for Industrial Signal Levels	High speed input (> 5 kHz)	• Complete 8-channel 16-bit DAS on a single chip • Industrial signal levels up to ±10 V • Single supply
CN0310	Precision 24-Bit, 250 kSPS Single-Supply Σ-Δ ADC System for Industrial Signal Levels	High speed input (> 5 kHz)	• 24-bit, 250 kSPS ADC system • Industrial signal levels • Single supply
CN0213	A Complete High Performance, High Speed Analog Front-End Process Control	High speed input (> 5 kHz)	• Optimized for high precision and high common-mode rejection ratio (CMRR) • Industrial signal levels
CN0225	High Impedance, High CMR, ±10 V Analog Front-End Signal Conditioner for Industrial Process Control and Automation	High speed input (> 5 kHz)	• Analog front end for ±10 V inputs • High common-mode rejection • 16-bit resolution • Board space reduction

(continued next page)

Circuits from the Lab Reference Designs for Automation Controllers (continued)

Output

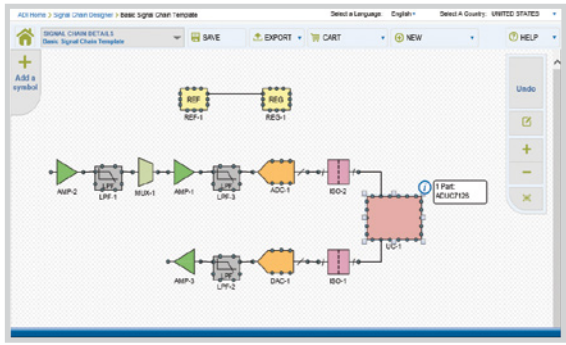
Reference Circuit No.	Circuit Description	Functions	Features and Benefits
CN0321	Fully Isolated, Single-Channel Voltage and 4 mA to 20 mA Output with HART	Fully integrated DAC plus drivers solutions	• Voltage and 4 mA to 20 mA output • Fully isolated • HART connectivity
CN0198	5 V Regulator Supplies High Transient Current for Dynamic Power Controlled DAC	Fully integrated DAC plus drivers solutions	• Quad 16-bit 4 mA to 20 mA and voltage output DAC • Dynamic power control • External 5 V regulator
CN0065	16-Bit Fully Isolated Output Module Using the AD5422 Single Chip Voltage and Current Output DAC and the ADuM1401 Digital Isolator	Fully integrated DAC plus drivers solutions	• Voltage and current output • 16-bit digitally isolated industrial control output module
CN0278	Complete 4 mA to 20 mA HART Solution with Additional Voltage Output Capability	Fully integrated DAC plus drivers solutions	• Complete HART compliant solution • 4 mA to 20 mA • Lowest power in industry
CN0203	Flexible PLC and DCS Analog Output Module Only Using Two Analog Components	Low voltage DAC with output driver	• Programmable analog output • 16-bit resolution • 0.1% error with no missing codes • Ideal for PLC output modules
CN0204	Flexible, High Voltage, High Accuracy, Low Drift PLC/DCS Analog Output Module	Low voltage DAC with output driver	• High voltage, up to 44 V output • Programmable analog output • Galvanic isolation from rest of system • Ideal for PLC and DCS modules
CN0229	4-Channel, Flexible, Configurable, Voltage and Current Output Circuit for I/O Card and PLC Applications	Low voltage DAC with output driver	• Quad-channel current and voltage outputs • 16-bit resolution for PLC systems • Digitally isolated from application
CN0063	16-Bit Fully Isolated Voltage Output Module Using the AD5662 DAC, ADuM1401 Digital Isolator, and External Amplifiers	Low voltage DAC with discreet output solution	• Digitally isolated 16-bit industrial control output module • Bipolar output voltage
CN0064	16-Bit Fully Isolated 4 mA to 20 mA Output Module Using the AD5662 DAC, ADuM1401 Digital Isolator, and External Amplifiers	Low voltage DAC with discreet output solution	• 4 mA to 20 mA output module • Digitally isolated 16-bit industrial control output module
CN0179	Less Than 200 mA, Low Power, 4 mA to 20 mA, Process Control Current Loop	Low voltage DAC with discreet output solution	• Low power 4 mA to 20 mA current loop • 12-, 14-, or 16-bit digital control • Use in programmable logic controllers

Online Tools And Resources

To learn more about products, signal chain solutions, and technical expertise offered by Analog Devices to help engineers meet today's automation controller challenges, visit *www.analog.com/plc_dcs*.

Signal Chain Designer—*www.analog.com/signalchaindesigner*

Signal Chain Designer™ is an advanced product selection and recommendation toolset, bringing together a powerful search engine, verified product recommendations, tested application circuits, and integrated Analog Filter Wizard™ and Photodiode Wizard,™ and connects to other Analog Devices engineering tools to provide an easy to use, one stop circuit builder for design engineers.



ADIsimPower—*www.analog.com/adisimpower*

ADIsimPower™ is a collection of downloadable Excel spreadsheets that produce complete power designs optimized to your design goals. Get a schematic, bill of materials, and performance data customized to your specific needs in minutes.

ADIsimDAC—*www.analog.com/adisimdac*

The purpose of the ADIsimDAC™ tool is to assist the user with finding Analog Devices DACs and DAC application circuits. It takes user inputs along with typical parametric data to sort, select, and suggest applicable DACs, system components, and circuits solutions.

Analog Filter Wizard—*www.analog.com/filterwizard*

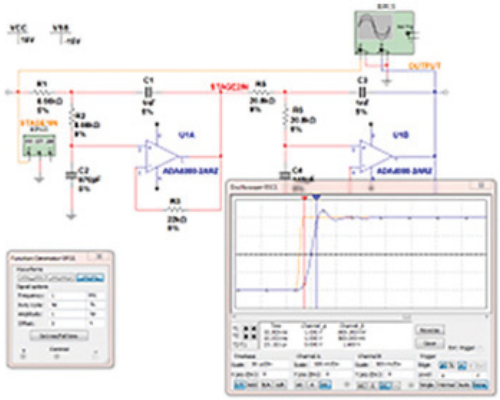
This online tool simplifies the filter design process with an intuitive user interface and easily accessible tutorials and help.

Online Tools And Resources (continued)

To learn more about products, signal chain solutions, and technical expertise offered by Analog Devices to help engineers meet today's automation controller challenges, visit *www.analog.com/plc_dcs*.

Multisim ADC Component Evaluator, ADI Edition—*www.analog.com/multisim*

The free downloadable version of NI Multisim™ 12.0 is tailored for circuit design with ADI components in a SPICE simulation environment.



Circuits from the Lab Reference Designs

For a complete list of Analog Devices Circuits from the Lab Reference Designs for field instrument designs, visit *www.analog.com/circuits*.

Circuits from the Lab® Reference Designs

EngineerZone® Online Support Community

Find answers to your design questions. Join our engineer community at *ez.analog.com*.

engineerzone™ SUPPORT COMMUNITY

Quality, Reliability, and Product Life Cycle

ADI is committed to the establishment and continuous improvement of world class systems and processes aimed at satisfying our customers' evolving needs.

For information about our quality and reliability program, visit *www.analog.com/quality*.
For information about product life cycle, visit *www.analog.com/product_status_info*.

Analog Devices, Inc.
Worldwide Headquarters
Analog Devices, Inc.
One Technology Way
P.O. Box 9106
Norwood, MA 02062-9106
U.S.A.
Tel: 781.329.4700
(800.262.5643,
U.S.A. only)
Fax: 781.461.3113

Analog Devices, Inc.
Europe Headquarters
Analog Devices, Inc.
Wilhelm-Wagenfeld-Str. 6
80807 Munich
Germany
Tel: 49.89.76903.0
Fax: 49.89.76903.157

Analog Devices, Inc.
Japan Headquarters
Analog Devices, KK
New Pier Takeshiba
South Tower Building
1-16-1 Kaigan, Minato-ku,
Tokyo, 105-6891
Japan
Tel: 813.5402.8200
Fax: 813.5402.1064

Analog Devices, Inc.
Asia Pacific Headquarters
Analog Devices
5F, Sandhill Plaza
2290 Zuchongzhi Road
Zhangjiang Hi-Tech Park
Pudong New District
Shanghai, China 201203
Tel: 86.21.2320.8000
Fax: 86.21.2320.8222

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

Printed in the U.S.A. BR12083-2-2/14

www.analog.com

ANALOG DEVICES