Precision Microcontrollers Selection Guide

Precision Analog Microcontrollers—ARM Cortex-M3, ARM7, and 8051 Series

Analog Devices precision analog microcontrollers combine precision analog functions—such as high resolution ADCs and DACs, voltage reference, temperature sensor, and a host of other peripherals—with an industry-standard microcontroller and flash memory designed for industrial, instrumentation, medical, communications, and automotive applications.

The ADuCM36x family extends the precision data acquisition systems with the first fully integrated 24-bit data acquisition system incorporating dual high performance multichannel Σ-Δ analog-to-digital converters (ADCs), 32-bit ARM Cortex™-M3 MCU, and Flash/EE memory on a single chip designed for direct interfacing to external precision sensors in both wired and battery-powered applications.

The ADuCRF101 is a fully integrated data acquisition solution designed for low power wireless applications. It features a 14-bit ADC, 32-bit ARM Cortex-M3 MCU, 431 MHz to 464 MHz and 862 MHz to 928 MHz RF transceiver, and Flash/EE memory.

The ADuC7xxx ARM7TDMI® family integrates 12-, 16-, and 24-bit analog-to-digital converters, 12-bit DACs with flash, SRAM, and a host of digital peripherals.

The ADuC8xx series was the first to integrate true 12- to 24-bit analog precision, in-circuit reprogrammable Flash/EE memory, and an on-chip 8052 core.

Features

- Microcontrollers for industrial, instrumentation, medical, communications, and automotive applications
- Leading edge, mixed-signal integration with 12- to 24-bit ADCs, multiple 12- to 14-bit current and voltage DACs, reference, and current sources
- Wireless DAQ with Cortex-M3 and analog I/O
- ARM Cortex-M3, Flash/EE, and 16- to 24-bit analog I/O
- ARM7TDMI, Flash/EE, and 12- to 24-bit analog I/O
- 8052 series with Flash/EE and 12- to 24-bit analog I/O
- Complete suite of development tools

www.analog.com/microcontroller

ANALOG DEVICES

Precision Analog Microcontroller (MicroConverter®) Products

Part Number	MCU, MIPS	Flash Code (Bytes)	Flash Data (Bytes)	RAM (Bytes)	External Memory Interface	Power Supply (V)	GPIOs[1]	Download/Debug	ADCs	DACs	Temp Sensor Accuracy (°C)[2]
Precision Analog Microcontroller with Cortex-M3 Core											
ADuCM360 ***New***	Cortex-M3, 20D	128k		8k	None	1.8 to 3.6	19	UART and SWD	Dual, 24-bit, 11-channel, up to 3.906 kSPS	1 × 12-bit with op amp mode for driving 4 mA to 20 mA loop	±6.0
ADuCM361 ***New***	Cortex-M3, 20D	128k		8k	None	1.8 to 3.6	19	UART and SWD	Single 24-bit, 11-channel, up to 3.906 kSPS	1 × 12-bit with op amp mode for driving 4 mA to 20 mA loop	±6.0
Precision Analog Microcontroller with ARM7 Core											
ADuC7019	ARM7, 40	62k		8k	None	2.7 to 3.6	14	JTAG + UART/I²C	12-bit, 5-channel (2 differential), 1 MSPS	12-bit, triple	±3.0
ADuC7020	ARM7, 40	62k		8k	None	2.7 to 3.6	14	JTAG + UART/I²C	12-bit, 5-channel (2 differential), 1 MSPS	12-bit, quad	±3.0
ADuC7021	ARM7, 40	62k, 32k		8k	None	2.7 to 3.6	13	JTAG + UART	12-bit, 8-channel (4 differential), 1 MSPS	12-bit, dual	±3.0
ADuC7022	ARM7, 40	62k, 32k		8k	None	2.7 to 3.6	13	JTAG + UART	12-bit, 10-channel (5 differential), 1 MSPS	None	±3.0
ADuC7023	ARM7, 40	62k		8k	None	2.7 to 3.6	20	JTAG + I²C	12-bit, 12-channel, 1 MSPS	12-bit quad	±3.0
ADuC7024	ARM7, 40	62k		8k	None	2.7 to 3.6	30	JTAG + UART/I²C	12-bit, 10-channel (5 differential), 1 MSPS	12-bit, dual	±3.0
ADuC7025	ARM7, 40	62k, 32k		8k	None	2.7 to 3.6	30	JTAG + UART	12-bit, 12-channel (5 differential), 1 MSPS	None	±3.0
ADuC7026	ARM7, 40	62k		8k	Code and data	2.7 to 3.6	40	JTAG + UART/I²C	12-bit, 12-channel (6 differential), 1 MSPS	12-bit, quad	±3.0
ADuC7027	ARM7, 40	62k		8k	Code and data	2.7 to 3.6	40	JTAG + UART	12-bit, 16-channel (8 differential), 1 MSPS	None	±3.0
ADuC7028	ARM7, 40	62k		8k	None	2.7 to 3.6	30	JTAG + UART/I²C	12-bit, 8-channel (4 differential), 1 MSPS	12-bit, quad	±3.0
ADuC7029	ARM7, 40	62k		8k	None	2.7 to 3.6	22	JTAG + I²C	12-bit, 7-channel, 1 MSPS	12-bit quad	±3.0
ADuC7121	ARM7, 40	126k		8k	None	3 to 3.6	32	JTAG + I²C	12-bit, 9-channel, 1 MSPS	12-bit quad and 5 × 11-bit IDAC	±3.0
ADuC7122	ARM7, 40	126k		8k	None	3 to 3.6	32	JTAG + I²C	12-bit, 13-channel, 1 MSPS	12 × 12-bit	±3.0
ADuC7124	ARM7, 40	126k		32k	None	2.7 to 3.6	30	JTAG + UART	12-bit, 12-channel, 1 MSPS	12-bit dual	±3.0
ADuC7126	ARM7, 40	126k		32k	Code and data	2.7 to 3.6	40	JTAG + UART/I²C	12-bit, 16-channel, 1 MSPS	12-bit quad	±3.0
ADuC7128	ARM7, 40	126k		8k	None	3.0 to 3.6	28	JTAG + UART	12-bit, 10-channel (5 differential), 1 MSPS	10-bit DAC, PWM	±3.0
ADuC7129	ARM7, 40	126k		8k	Code and data	3.0 to 3.6	38	JTAG + UART	12-bit, 10-channel (5 differential), 1 MSPS	10-bit DAC, PWM	±3.0
ADuC7060	ARM7, 10.24	32k		4k	No	2.5	16	JTAG + UART	Dual, 24-bit, 5-channel/ 8-channel, 8 kSPS	Single, 14-bit	±3.0
ADuC7061	ARM7, 10.24	32k		4k	No	2.5	8	JTAG + UART	Dual, 24-bit, 5-channel/ 8-channel, 8 kSPS	Single, 14-bit	±3.0
Precision Analog Microcontrollers with ARM7 Core for Automotive Battery Monitoring											
ADuC7032-8L	ARM7, 20	96k		6k	None	3 to 18	9	JTAG + LIN	3 × 16-bit Σ-Δ ADC	—	±2.0
ADuC7036	ARM7, 20	96k		6k	None	3.5 to 18	9	JTAG + LIN	2 × 16-bit Σ-Δ ADC	—	±3.0
ADuC7039	ARM7, 20	64k		4k	None	3.5 to 18	5	JTAG + LIN	2 × 16-bit Σ-Δ ADC	—	±3.0
Precision Analog Microcontrollers with 8052 Core											
ADuC845	8052, 12	62k, 32k, 8k	4k	2k + 256	Data only	2.7 to 3.6, 4.75 to 5.25	32	Single pin or UART	24-bit, dual, 1.3 kSPS	12-bit, single	±1.5
ADuC847	8052, 12	62k, 32k, 8k	4k	2k + 256	Data only	2.7 to 3.6, 4.75 to 5.25	32	Single pin or UART	24-bit, 1.3 kSPS	12-bit, single	None
ADuC848	8052, 12	62k, 32k, 8k	4k	2k + 256	Data only	2.7 to 3.6, 4.75 to 5.25	32	Single pin or UART	16-bit, 1.3 kSPS	12-bit, single	None
ADuC841	8052, 20	62k, 8k	4k	2k + 256	Data only	2.7 to 3.6, 4.75 to 5.25	32	Single pin or UART	12-bit, 8-channel, 400 kSPS	12-bit, dual	±1.5
ADuC842	8052, 16	62k, 32k, 8k	4k	2k + 256	Data only	2.7 to 3.6, 4.75 to 5.25	32	Single pin or UART	12-bit, 8-channel, 400 kSPS	12-bit, dual	±1.5
ADuC843	8052, 16	62k, 32k, 8k	4k	2k + 256	Data only	2.7 to 3.6, 4.75 to 5.25	32	Single pin or UART	12-bit, 8-channel, 400 kSPS	None	±1.5

[1]Pins that are also analog inputs are limited to digital input only; that is, GPI, not GPIO. In the case of the ARM7 parts, all pins are full GPIO.

[2]Temperature sensor is calibrated on all Σ-Δ parts, while it is not calibrated on the successive approximation parts.

[3]External reference option available.

PWMs	Internal Reference[3]	Serial Ports	Clocking	Timers[4]	Other Peripherals[5]	Temperature Range[6] (°C)	Package
6-channel, 16-bit	1.2 V, ±5 ppm typ	UART, 2 × SPI, I^2C	16 MHz internal oscillator, 32 kHz oscillator, external 32 kHz watch crystal	2 general-purpose 16-bit timers, 32-bit wake-up timer, 16-bit watchdog timer	Programmable PGA, programmable sensor excitation $I_{SOURCES}$	–40 to +125	7 mm × 7 mm, 48-lead LFCSP
6-channel, 16-bit	1.2 V, ±5 ppm typ	UART, 2 × SPI, I^2C	16 MHz internal oscillator, 32 kHz oscillator, external 32 kHz watch crystal	2 general-purpose 16-bit timers, 32-bit wake-up timer, 16-bit watchdog timer	Programmable PGA, programmable sensor excitation $I_{SOURCES}$	–40 to +125	7 mm × 7 mm, 48-lead LFCSP
See Note 7	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	6 mm × 6 mm, 40-lead LFCSP
See Note 7	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	6 mm × 6 mm, 40-lead LFCSP
See Note 7	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	6 mm × 6 mm, 40-lead LFCSP
See Note 7	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	6 mm × 6 mm, 40-lead LFCSP
5-channel 16-bit	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	Trimmed on-chip oscillator (±3%), external watch crystal, 41.78 MHz PLL	3 general-purpose 32-bit timers, 32-bit wake-up timer, 16-bit watchdog timer	PLA, comparator, PSM, POR	–40 to +125	5 mm × 5 mm, 32-lead LFCSP; 6 mm × 6 mm, 40-lead LFCSP; 36-ball WLCSP
3-phase, 16-bit	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	9 mm × 9 mm, 64-lead LFCSP; 64-lead LQFP
3-phase, 16-bit	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	9 mm × 9 mm, 64-lead LFCSP; 64-lead LQFP
3-phase, 16-bit	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	14 mm × 14 mm, 80-lead LQFP
3-phase, 16-bit	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	14 mm × 14 mm, 80-lead LQFP
3-phase, 16-bit	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	External, internal (3%), PLL (prog)	2 × 32-bit, 2 × 16-bit	PLA, comparator, PSM, POR	–40 to +125	6 mm × 6 mm, 64-ball BGA
3-phase, 16-bit	2.5 V, ±40 ppm typ	UART, SPI, 2 I^2C ports	Trimmed on-chip oscillator (±3%), external watch crystal, 41.78 MHz PLL	4 general-purpose 32-bit timers, 32-bit wake-up timer, 16-bit watchdog timer	PLA, comparator, PSM, POR	–40 to +125	5 mm × 5 mm, 49-ball CSP_BGA
6-channel, 16-bit	2.5 V, ±10 ppm typ, ±30 ppm max	UART, SPI, 2 I^2C ports	Trimmed on-chip oscillator (±3%), external watch crystal, 41.78 MHz PLL	1 general-purpose 48-bit timer, 2 general-purpose 32-bit timers, 32-bit wake-up timer, 16-bit watchdog timer	PLA, PSM, POR	–10 to +95	7 mm × 7 mm, 108-ball CSP_BGA
6-channel, 16-bit	2.5 V, ±10 ppm typ, ±30 ppm max	UART, SPI, 2 I^2C ports	Trimmed on-chip oscillator (±3%), external watch crystal, 41.78 MHz PLL	1 general-purpose 48-bit timer, 2 general-purpose 32-bit timers, 32-bit wake-up timer, 16-bit watchdog timer	PLA, PSM, POR	–10 to +95	7 mm × 7 mm, 108-ball CSP_BGA
6-channel, 16-bit	2.5 V, ±15 ppm typ	2 UARTs SPI, 2 I^2C ports	Trimmed on-chip oscillator (±3%), external watch crystal, 41.78 MHz PLL	1 general-purpose 48-bit timer, 2 general-purpose 32-bit timers, 32-bit wake-up timer, 16-bit watchdog timer	Programmable logic array, analog comparator	–40 to +125	9 mm × 9 mm, 64-lead LFCSP; 14 mm × 14 mm, 80-lead LQFP
6-channel, 16-bit	2.5 V, ±15 ppm typ	2 UARTs, SPI, 2 I^2C ports	Trimmed on-chip oscillator (±3%), external watch crystal, 41.78 MHz PLL	1 general-purpose 48-bit timer, 2 general-purpose 32-bit timers, 32-bit wake-up timer, 16-bit watchdog timer	Programmable logic array, analog comparator	–40 to +125	9 mm × 9 mm, 64-lead LFCSP; 14 mm × 14 mm, 80-lead LQFP
6-channel, 16-bit	2.5 V, ±40 ppm typ	2 UARTs, SPI, 2 I^2C ports	External, internal (2%), PLL (prog)	1 × 16-bit, 3 × 32-bit, 1 × 48-bit	PLA, comparator, PSM, POR	–40 to +125	9 mm × 9 mm, 64-lead LFCSP
6-channel, 16-bit	2.5 V, ±40 ppm typ	2 UARTs, SPI, 2 I^2C ports	External, internal (2%), PLL (prog)	1 × 16-bit, 3 × 32-bit, 1 × 48-bit	PLA, comparator, PSM, POR	–40 to +125	9 mm × 9 mm, 64-lead LFCSP
6-channel	1.2 V, ±10 ppm typ	UART, SPI, I^2C	External, internal (3%), PLL (prog)	4 × timers	SPI/I^2C/vectored interrupt controller	–40 to +125	9 mm × 9 mm, 48-lead LQFP; 7 mm × 7 mm, 48-lead LFCSP
2-channel	1.2 V, ±10 ppm typ	UART, SPI, I^2C	External, internal (3%), PLL (prog)	4 × timers	SPI/I^2C/vectored interrupt controller	–40 to +125	5 mm × 5 mm, 32-lead LFCSP
—	1.2 V, ±5 ppm typ	LIN transceiver, SPI	Internal (1%), PLL (prog)	1 × 16-bit, 3 × 32-bit, 1 × 48-bit	Comparator, wake-up, WDT	–40 to +125	9 mm × 9 mm, 48-lead LQFP
—	1.2 V, ±5 ppm typ	SPI, BSD, STI, LIN bus	Precision oscillator, low power oscillator, 20.48 MHz PLL, external watch crystal	1 general-purpose 48-bit timer, 1 general-purpose 32-bit timer, 32-bit wake-up timer, 16-bit watchdog timer, 16-bit STI timer or general-purpose timer	High voltage wake-up pin	–40 to +115	7 mm × 7 mm, 48-lead LFCSP
—	1.2 V, ±5 ppm typ	SPI, LIN bus	Precision oscillator, low power oscillator, 20.48 MHz PLL, external watch crystal	1 general-purpose 16-bit timer, 32-bit wake-up timer, and 16-bit watchdog timer		–40 to +115	6 mm × 6 mm, 32-lead LFCSP
Dual, 16-bit	1.25 V, ±100 ppm typ	UART, SPI, I^2C	Internal, PLL	3 × 16-bit, 1 × baud rate, 1 × TIC	POR, PSM, WDT, $I_{SOURCES}$, burnout	–40 to +125[6]	8 mm × 8 mm, 56-lead LFCSP; 14 mm × 14 mm, 52-lead MQFP
Dual, 16-bit	1.25 V, ±100 ppm typ	UART, SPI, I^2C	Internal, PLL	3 × 16-bit, 1 × baud rate, 1 × TIC	POR, PSM, WDT, $I_{SOURCES}$, burnout	–40 to +125[6]	8 mm × 8 mm, 56-lead LFCSP; 14 mm × 14 mm, 52-lead MQFP
Dual, 16-bit	1.25 V, ±100 ppm typ	UART, SPI, I^2C	Internal, PLL	3 × 16-bit, 1 × baud rate, 1 × TIC	POR, PSM, WDT, $I_{SOURCES}$, burnout	–40 to +125[6]	8 mm × 8 mm, 56-lead LFCSP; 14 mm × 14 mm, 52-lead MQFP
Dual, 16-bit	2.5 V, ±15 ppm typ	UART, SPI, I^2C	External	3 × 16-bit, 1 × baud rate, 1 × TIC	POR, PSM, WDT	–40 to +85	8 mm × 8 mm, 56-lead LFCSP; 14 mm × 14 mm, 52-lead MQFP
Dual, 16-bit	2.5 V, ±15 ppm typ	UART, SPI, I^2C	Internal, PLL	3 × 16-bit, 1 × baud rate, 1 × TIC	POR, PSM, WDT	–40 to +85	8 mm × 8 mm, 56-lead LFCSP; 14 mm × 14 mm, 52-lead MQFP
Dual, 16-bit	2.5 V, ±15 ppm typ	UART, SPI, I^2C	Internal, PLL	3 × 16-bit, 1 × baud rate, 1 × TIC	POR, PSM, WDT	–40 to +85	8 mm × 8 mm, 56-lead LFCSP; 14 mm × 14 mm, 52-lead MQFP

[4] **TIC:** time interval counter.

[5] **PSM:** power supply monitor; **WDT:** watchdog timer; **POR:** power-on reset; **$I_{SOURCES}$:** current sources; **burnout:** sensor burnout capability; **PLA:** programmable logic array.

[6] 125°C applies to the MQFP package only.

[7] Can be used through PLA.

Simplifying Designs for Your Competitive Edge

Development Systems

Each series of precision analog microcontrollers is supported by a complete range of low cost mini kits right up to full featured evaluation systems including nonintrusive emulator, evaluation board, and power supplies.

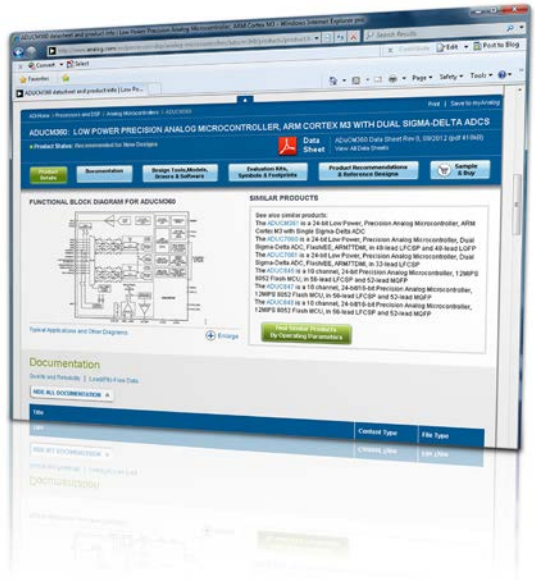
Circuits from the Lab Reference Designs

Circuits from the Lab Reference Designs have been built and tested to ensure function and performance.

www.analog.com/circuits

Circuits from the Lab® Reference Designs

Flexible evaluation and debug hardware for Cortex-M3 series.



Software Development Tools

8052-based products, ARM7-based products, and Cortex-M3-based products are all supported by industry-standard tool suites.

Integrated Development Environments

- Complete development suite, compilers, debuggers, IDEs, etc.
- Third party developers offer integrated development environments (IDEs).

Examples, Software, and Libraries

- Library of software drivers and extensive support for all major tool providers offers a fast route to best fit and an optimized development process.

ADI Software Tools

- The Elves tool helps generate C code using predefined parameters and low level functions, which are provided. These functions allow configuration of each of the device peripherals, clocks, and power-down modes.

  Tools like Elves help with code efficiency, execution speed, and ease of programming development.

engineerzone™ SUPPORT COMMUNITY

Technical Support

- Worldwide FAE network to provide local support
- Application support for faster time to market
- Analog Microcontrollers Support Community

  ez.analog.com/community/analog-microcontrollers

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).

G11145-0-10/13(A)

www.analog.com/microcontroller

ANALOG DEVICES