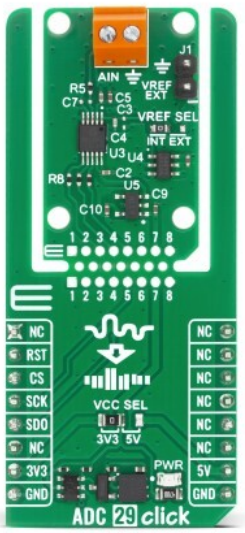
MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

ADC 29 Click



PID: MIKROE-7032

ADC 29 Click is a single-channel analog-to-digital conversion board for voltage measurement in embedded data acquisition systems. It features the MCP33141-025-E/MS SAR ADC from Microchip Technology, providing 12-bit resolution, sampling rates up to 250kSPS, no missing codes, and a single-ended 0V-to-VREF input range. A 3-wire SPI interface enables conversion control and data readout, while self-calibration and an integrated accumulator improve measurement accuracy and effective resolution. Onboard or external voltage-reference selection, 3.3V/5V logic compatibility, ClickID, Click Snap, and a screw terminal simplify integration. It is suitable for medical instruments, test equipment, battery management, motor control, power supplies, and battery-powered systems.

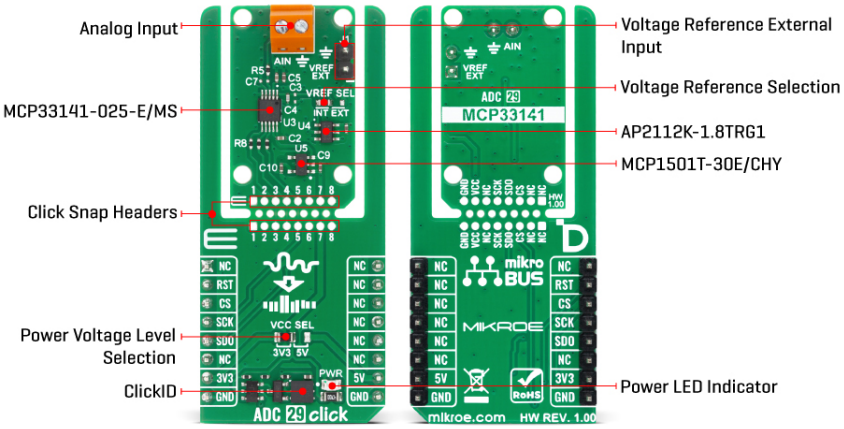
For more information about **ADC 29 Click** visit the official product page.

How does it work?

ADC 29 Click is a compact add-on board designed to provide analog-to-digital conversion for high-precision measurement systems. It is based on the MCP33141-025-E/MS, a low-power, single-channel successive approximation register (SAR) ADC from Microchip Technology. The MCP33141-025 provides 12-bit resolution with no missing codes, a sampling rate of up to 250kSPS, and no-latency output. Its single-ended input accepts signals from 0V to VREF and produces the corresponding unipolar straight-binary output code. With the onboard 3.0V reference selected by default, the available measurement range is from 0V to 3.0V. An external reference ranging from AVDD to 5.1V can also be used to adapt the full-scale input range to specific application requirements. The device is AEC-Q100 qualified and operates across an extended temperature range from -40°C to +125°C, making the board suitable for data acquisition, medical instruments, test equipment, electric vehicle battery management

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.
ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.
ISO 9001: 2015 certification of quality management system (QMS).

systems, motor control, switch-mode power supplies, and battery-powered equipment.



The MCP33141-025 uses an internal system clock to perform conversions independently of the serial interface clock. A conversion begins on the rising edge of the CNVST signal, after which the sampled input is processed and the result becomes available without pipeline latency. During the acquisition phase, the internal sampling capacitor is connected to the analog input while most of the analog circuitry is placed into a low-power state, reducing the typical analog supply current to approximately 1.5µA. Typical analog supply current during conversion is approximately 220µA. The device automatically performs self-calibration after power-up to minimize offset, gain, and dynamic linearity errors, while an additional recalibration can be initiated during normal operation when required by changes in temperature, reference voltage, or other operating conditions. An integrated data accumulator can combine up to 1024 consecutive conversion results directly inside the ADC, improving the effective resolution while reducing host MCU processing requirements and the amount of data transferred over the serial bus.

ADC 29 Click communicates with the host MCU through a 3-wire SPI-compatible serial interface operating in SPI Mode 0. The serial clock line is routed to the SCK pin of the mikroBUS™ socket, while the SDO output is routed to the MISO pin and transfers conversion data with the most significant bit first. The CNVST input is routed to the CS pin and performs two functions: its rising edge initiates a new conversion, while lowering it after conversion enables access to the output data. The SPI clock can operate at frequencies up to 100MHz, with a minimum clock frequency of 6MHz required for continuous data acquisition at the maximum 250kSPS sampling rate. The ADC's SDI input is permanently tied to the selected digital supply voltage, configuring the interface for operation without a BUSY output bit and eliminating the need for the MOSI line. The RST pin controls the onboard switching circuitry that connects the CS line either to the ADC or to the ClickID communication path, so it functions as an ID selection signal rather than as a reset input for the MCP33141-025. The integrated ClickID feature enables automatic identification of the board by a compatible host system.

The analog signal is connected through the two-position TB1 screw terminal, which provides dedicated AIN and ground connections. The input path includes a 22Ω series resistor and an unpopulated capacitor footprint that can be used for additional input filtering when required. The VREF SEL jumper selects between the onboard reference voltage and an externally supplied reference, with the internal reference selected by default. The onboard MCP1501T-30E/CHY precision voltage reference generates a stable 3.0V reference, while the two-pin J1 header provides VREF EXT and ground connections for an external reference source.

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

A green PWR LED indicates that the board is powered. ADC 29 Click also supports the Click Snap feature, allowing the ADC section to be detached by breaking the PCB along the predefined lines. Once detached, the Snap section can operate independently through the signal pads marked 1 through 8 and can be secured in the required location using its fixed-position mounting holes.

ADC 29 Click can operate from either the 3.3V or 5V mikroBUS™ power rail, selected through the VCC SEL jumper, which is set to 3.3V by default. The selected VCC voltage supplies the MCP33141-025 digital interface and determines the logic levels of the SPI signals, allowing direct use with both 3.3V and 5V host MCUs. An onboard AP2112K-1.8 low-dropout regulator generates the fixed 1.8V analog supply required by the ADC, while the reference circuitry is powered from the selected VCC rail. This Click board™ comes equipped with a software library containing easy-to-use functions and a ready-to-use example code, both available for download and use as a reference for further application development.

Click Snap

Click Snap is an innovative feature of our standardized Click add-on boards, designed to bring greater flexibility and optimize your prototypes. By simply snapping the PCB along predefined lines, you can easily detach the main sensor/IC/module area, reducing the overall size, weight, and power consumption - ideal for the final phase of prototyping. For more details about Click Snap, visit the official page dedicated to this feature.

Specifications

Type	ADC
Applications	Ideal for applications such as data acquisition, medical instruments, test equipment, electric vehicle battery management systems, motor control, switch-mode power supplies, and battery-powered equipment
On-board modules	MCP33141-025-E/MS - low-power 12-bit, 250kSPS single-channel SAR ADC from Microchip Technology
Key Features	12-bit single-channel SAR conversion, sampling rates up to 250kSPS, no missing codes and no-latency output, 0V-to-VREF single-ended input range, self-calibration, integrated accumulator for up to 1024 conversions, selectable onboard or external voltage reference, 3-wire SPI interface, 3.3V/5V logic compatibility, ClickID, Click Snap, and more
Interface	SPI
Feature	Click Snap,ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V or 5V

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.

ISO 9001: 2015 certification of quality management system (QMS).

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

Pinout diagram

This table shows how the pinout on ADC 29 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
	NC	1	AN	PWM	16	NC	
Reset	**RST**	2	RST	INT	15	NC	
Device Enable / ID COMM	**CS**	3	CS	RX	14	NC	
Serial Data Clock	**SCK**	4	SCK	TX	13	NC	
Serial Data Output	**SDO**	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	**3.3V**	7	3.3V	5V	10	**5V**	Power Supply
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Voltage Selection
J1	J1	-	External Voltage Reference Input
J1	VREF SEL	Left	Internal or External Voltage Reference Selection
TB1	TB1	-	Terminal for AIN

ADC 29 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Sample Rate	-	250	-	kSPS
ADC Resolution	-	12	-	bit

Software Support

ADC 29 Click demo application is developed using the NECTO Studio, ensuring compatibility with mikroSDK's open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a mikroBUS™ socket.

Example Description

This example demonstrates the use of the ADC 29 Click board by reading the voltage levels from the single-ended analog input and displaying the results via UART.

Key Functions

- adc29_cfg_setup This function initializes Click configuration structure to initial values.
- adc29_init This function initializes all necessary pins and peripherals used for this Click board.

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.

ISO 9001: 2015 certification of quality management system (QMS).

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

- adc29_read_raw_adc This function triggers a single conversion and reads the raw 12-bit ADC result by using SPI serial interface.
- adc29_read_voltage This function triggers a single conversion and reads the ADC result, then converts it to a voltage in volts.
- adc29_recalibrate This function initiates a manual self-calibration of the ADC by transmitting 1024 SCLK pulses.

Application Init

Initializes the driver and waits for the device power-on auto-calibration to complete.

Application Task

Reads the voltage from the analog input and displays the result on the USB UART once per second.

Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following this tutorial.
- UART Terminal - Monitor data via the UART Terminal using a USB to UART converter. For detailed instructions, check out this tutorial.

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the NECTO Studio. The application code can also be found on the MIKROE GitHub account.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

ClickID

Downloads

ADC 29 Click example package

ADC 29 Click 2D and 3D files v100

ADC 29 Click schematic v100

MCP33141-025-E/MS datasheet

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.

ISO 9001: 2015 certification of quality management system (QMS).