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Angle 9 Click

PID: MIKROE-5576

Angle 9 Click is a compact add-on board that detects the absolute position of a permanent magnet. This board features the AAS33001, a precision angle sensor with incremental and motor commutation outputs and on-chip linearization from Allegro Microsystems. It is a contactless angle sensor for 0° to 360° angular position, rotation speed, and directional measurement. Support for incremental output interface (ABI) and motor commutation (UVW) is also available. The same goes for the on-chip EEPROM for storing factory and customer calibration parameters. This Click board™ makes the perfect solution for the development of contactless potentiometers, contactless knobs, RC servos, and other angular position measurement solutions.

Angle 9 Click is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click board™ comes as a fully tested product, ready to be used on a system equipped with the mikroBUS™ socket.

How does it work?

Angle 9 Click is based on the AAS33001, a precision angle sensor with incremental and motor commutation outputs and on-chip linearization from Allegro Microsystems. It is a rotary position circular vertical Hall-sensor-based device (CVH), incorporating one electrically independent Hall sensor die, thus providing solid-state consistency and reliability. The Hall sensor measures the magnetic field vector through a 360° in the x-y plane parallel to the face of the angle sensor. The Hall sensor also computes an angle measurement based on the actual physical reading and internal parameters that the user has set.

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MIKROE
Time-saving embedded tools

- ABI/UVW Interface Pins
- Rotating Magnetic Holder Mounting Surface
- AAS33001 Power Supply Selection
- External Power Supply Header
- AAS33001
- Power LED Indicator

The Angle 9 Click can monitor the angular position of a rotating magnet at speeds ranging from 0 up to 15,000 RPM with a refresh rate of 1μs. For testing purposes, this Click board™ can be used with a rotary magnetic holder, which is sold separately. It is a unique addition that can be used alongside a precision angle sensor allowing fast prototyping and quick measurement during development. This magnetic holder is an adjustable shaft with a 6mm diameter magnet that can be positioned right above the angle sensor.

The Ange 9 Click also has a header that allows you to use it with additional devices over the ABI and UVW interfaces. Both interfaces use all three pins (A/U, B/V, I/W), so you can't use both at the same time. The Incremental Output Interface (ABI) is available in the form of quadrature A/B and Index outputs to emulate an optical or mechanical encoder. The brushless DC motor output is available over the U, V, and W signals for stator commutation of brushless DC (BLDC). The device is mode-selectable for 1 to 16 pole pairs. PWM output is always resolved to a 12-bit angle resolution. The external power supply can be selected over the VCC SEL jumper with 5V from the mikroBUS™ socket chosen by default. The external power supply can range from 3.7 to 18V and be connected over the header terminal.

Angle 9 Click uses a full-duplex standard 4-Wire SPI serial interface to communicate with the host MCU, using SPI mode 3 and supporting frequencies up to 10MHz. The readout is possible with a 12-bit resolution with error flags or a 15-bit resolution without error flags. The angle sensor can be reset over the RST pin. The PWM interface over the PWM pin provides the initial position for ABI/UVW interfaces.

This Click board™ can only be operated with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. This Click board™ comes equipped with a library containing functions and an example code that can be used as a reference for further development.

Specifications

Type	Magnetic
Applications	Can be used for the development of contactless potentiometers, contactless knobs, RC servos, and other angular position measurement solutions
On-board modules	AAS33001 - a precision angle sensor with

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	incremental and motor commutation outputs and on-chip linearization from Allegro Microsystems
Key Features	Contactless angle measurement, highest reliability, and durability, high-resolution output signal, allows adding rotary magnetic holder for fast prototyping, and fast measurement during the development process, incremental output interface, motor commutation interface, external power supply, and more
Interface	SPI
ClickID	Yes
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V,5V,External

Pinout diagram

This table shows how the pinout on Angle 9 click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro BUS			Pin	Notes
	NC	1	AN	PWM	16	**PWM**	PWM Angle Output
	NC	2	RST	INT	15	NC	
SPI Chip Select	**CS**	3	CS	RX	14	NC	
SPI Clock	**SCK**	4	SCK	TX	13	NC	
SPI Data OUT	**SDO**	5	MISO	SCL	12	NC	
SPI Data IN	**SDI**	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	AAS33001 Power Supply Selection 5V/VEXT: Left position 5V, Right position VEXT

Angle 9 click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
External Power Supply Voltage	3.7	-	18	V
Magnetic Input Field Range	-	-	1200	G
Angle Output	-	12/15	-	bit

Angular Position Range	0	-	360	°

Software Support

We provide a library for the Angle 9 Click as well as a demo application (example), developed using MIKROE compilers. The demo can run on all the main MIKROE development boards.

Package can be downloaded/installed directly from NECTO Studio Package Manager (recommended), downloaded from our LibStock™ or found on Mikroe github account.

Library Description

This library contains API for Angle 9 Click driver.

Key functions

- angle9_read_angle This function reads the magnetic angular position in degrees.

- angle9_read_field_strength This function reads the magnetic field strength in gauss.

- angle9_read_temperature This function reads the sensor internal temperature in degrees celsius.

Example Description

This example demonstrates the use of Angle 9 Click board™ by reading and displaying the magnet's angular position in degrees, field strength in gauss, and the internal sensor temperature in degrees celsius.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager (recommended), downloaded from our LibStock™ or found on Mikroe github account.

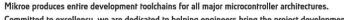Other Mikroe Libraries used in the example:
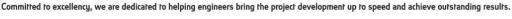
- MikroSDK.Board
- MikroSDK.Log
- Click.Angle9

Additional notes and informations

Depending on the development board you are using, you may need USB UART click, USB UART 2 Click or RS232 Click to connect to your PC, for development systems with no UART to USB interface available on the board. UART terminal is available in all MIKROE compilers.

mikroSDK

This Click board™ is supported with mikroSDK - MIKROE Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the LibStock and installed for the compiler you are using.

For more information about mikroSDK, visit the [official page](#).

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).

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click Boards™

ClickID

Downloads

Angle 9 click example on Libstock

AAS33001 datasheet

Angle 9 click 2D and 3D files

Angle 9 click schematic