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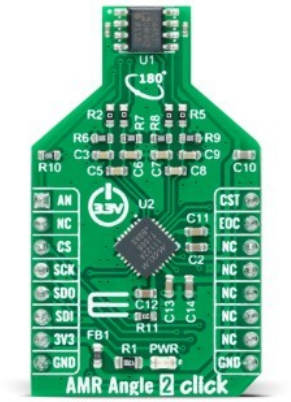
AMR Angle 2 Click



PID: MIKROE-4981

AMR Angle 2 Click is a compact add-on board containing an anisotropic magnetoresistive measurement solution ideal for either angle or linear position measurements. This board features the ADA4570, an integrated AMR angle sensor with an integrated signal conditioner and differential outputs from Analog Devices. The ADA4570 delivers amplified differential cosine and sine output signals, with respect to the angle measuring from 0° to 180° when the magnetic field is rotating in the x-axis and the y-axis (x-y) plane, processed later by MAX11122, SAR ADC, which forwards the digital angle information to MCU via SPI interface for further processing. This Click board™ is suitable for absolute position measurement (linear and angle), contactless angular measurement and detection, magnetic angular position sensing, actuator control and positioning, and more.

AMR Angle 2 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?

AMR Angle 2 Click as its foundation uses the ADA4570, an anisotropic magnetoresistive (AMR) sensor with integrated signal conditioning amplifiers and analog-to-digital converter (ADC) drivers from Analog Devices. It consists of two dies within one package, an AMR sensor, and a fixed gain instrumentation amplifier producing two differential analog outputs that indicate the angular position of the surrounding magnetic field. This amplified differential cosine and sine output signals are delivered with respect to the angle when the magnetic field is rotating in the x-axis and the y-axis (x-y) plane.

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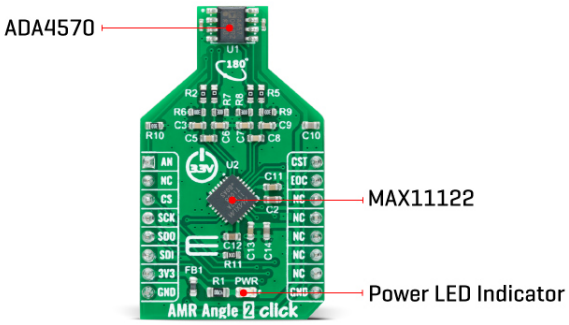

The ADA4570 contains two Wheatstone bridges at a relative angle of 45° to one another. A complete rotation of a dipole magnet produces two periods on the sinusoidal outputs, so the magnetic angle calculated from the sine and cosine differential outputs represents the physical orientation of the magnet with respect to the ADA4570 in the 0° to 180° measurement range. Within a homogeneous field in the x-y plane, the output signals of the ADA4570 are independent of the physical placement in the z-direction (air gap).

As mentioned before, alongside the AMR sensor, this Click board™ also contains one high-speed, low-power, serial output successive approximation register (SAR) analog-to-digital converter (ADC), the MAX11122 from Analog Devices. It processes sine and cosine outputs and then forwards them to the MCU via the SPI interface for further processing. Apart from the SPI communication lines, this Click board™ uses several more pins on the mikroBUS™ such as CST and EOC, routed to the PWM and INT pins of the mikroBUS™ socket, representing the signals with which the AD conversion starts and the signal indicating the completion of the conversion itself, respectively.

Also, the ADA4570 has an integrated temperature sensor that provides a voltage ratiometric to the ADA4570 supply voltage at the AN pin of the mikroBUS™ socket used to monitor the system's operating temperature and provide the reference for further calibration.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. However, the 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 absolute position measurement (linear and angle), contactless angular measurement and detection, magnetic angular position sensing, actuator control and positioning, and more
On-board modules	ADA4570 - anisotropic magnetoresistive (AMR) sensor from Analog Devices
Key Features	High precision 180° angle sensor, contactless

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	angular measurement, sine and cosine differential outputs, temperature compensated AMR bridge, industrial and automotive temperature range, and more
Interface	Analog,SPI
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on AMR Angle 2 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Temperature Monitoring	**AN**	1	AN	PWM	16	**CST**	ADC Conversion Start
	NC	2	RST	INT	15	**EOC**	ADC Conversion End Indicator
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	NC	
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator

AMR Angle 2 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Rotation Angle	0	-	180	deg
Angular Error	-	±0.1	-	deg
Resolution	12	-	-	bits
Operating Temperature Range	-40	+25	+150	°C

Software Support

We provide a library for the AMR Angle 2 Click as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika development boards.

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

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account.

Library Description

This library contains API for AMR Angle 2 Click driver.

Key functions

- amrangle2_read_angle This function reads a Vsin and Vcos voltages and converts them to angle in Degrees.
- amrangle2_read_temperature This function reads a temperature measurements in Celsius.
- amrangle2_read_vsin_vcos This function reads a voltage of sine and cosine differential signal outputs.

Example Description

This example demonstrates the use of AMR Angle 2 Click board™ by reading and displaying the magnet's angular position in Degrees and a system temperature in Celsius.

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

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.AMRAngle2

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 MikroElektronika compilers.

mikroSDK

This Click board™ is supported with mikroSDK - MikroElektronika 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.

Resources

mikroBUS™

mikroSDK

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