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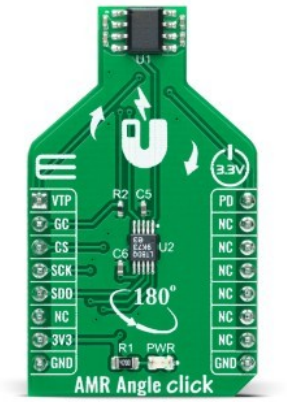
AMR Angle Click



PID: MIKROE-4561

AMR Angle 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 ADA4571, an AMR sensor with clean and amplified cosine and sine output signals related to a rotating magnetic field angle from Analog Devices. It can provide better than 0.2° angular accuracy over 180°, and linear accuracy of 2mil (0.002 inches) over a 0.5-inch range, depending on the size of the used magnet. 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 Click supports the mikroSDK compliant library, which includes functions that simplify software development. This Click board™ comes as a thoroughly tested product, ready to be used on a system equipped with the mikroBUS™ socket.

How does it work?

AMR Angle Click, as its foundation, uses the ADA4571, an anisotropic magnetoresistive (AMR) sensor with integrated signal conditioning amplifiers and ADC drivers, as well as a temperature sensor for temperature compensation from Analog Devices. It produces two analog outputs that indicate the surrounding magnetic field's angular position and consists of two die within one package, an AMR sensor, and a fixed gain instrumentation amplifier, with G=40 nominally. It provides better than 0.2° angular accuracy over 180°, and linear accuracy of 2mil (0.002 inches) over a 0.5-inch range, depending on the used magnet's size.

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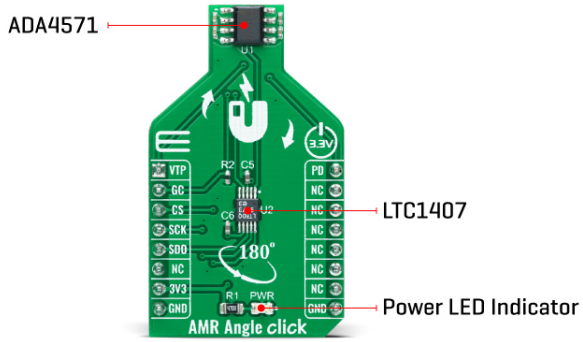

The ADA4571 contains two Wheatstone bridges, at a relative angle of 45° to one another. A rotating magnetic field in the x-y sensor plane delivers two sinusoidal output signals with the double frequency of the angle between sensor and magnetic field direction. Within a homogeneous field in the x-y plane, the output signals are independent of the physical placement in the z-direction (air gap).

The AMR Angle Click communicates with MCU through the 3-Wire SPI serial interface using the LTC1407, 12-bit 3MSPS ADC with two 1.5MSPS simultaneously sampled differential inputs from Analog Devices. The LTC1407 samples both channels of the sensor simultaneously using an SPI interface, allowing access to both channels on one data line. Besides, it possesses additional functionality routed on some GPIO pins such as Power-Down mode, Gain control, and temperature monitoring.

The power-down feature labeled as PD and routed on the PWM pin of the mikroBUS™ socket shuts down the device. It sets its outputs to a high impedance to avoid current consumption, while the VTEMP routed on the AN pin can be used for temperature monitoring or calibration purposes. Gain control, labeled as GC and routed on the RST pin of the mikroBUS™ socket, activates by switching this pin to a high level. In this mode, the AMR sensor amplitude outputs are compensated to reduce temperature variation, which results in higher and controlled output voltage levels. It can also be used as a sensor self-diagnostic feature by comparing the sine and cosine amplitude outputs when enabled and disabled, such as radius check.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before use with 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	ADA4571 - AMR sensor with clean and

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	amplified cosine and sine output signals related to a rotating magnetic field angle from Analog Devices LTC1407 - 12-bit 3MSPS ADC with two 1.5MSPS simultaneously sampled differential inputs from Analog Devices
Key Features	High precision 180° angle sensor, maximum angular error of 0.5°, magnetoresistive (MR) bridge temperature compensation mode, fault diagnostic, and more.
Interface	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 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™				Pin	Notes
Temperature Monitoring	**VTP**	1	AN	PWM	16	**PD**	Power-Down Mode
Gain Control	**GC**	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	
	NC	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 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Rotation Angle	0	-	180	degrees
Angular Error	-	-	0.5	degrees
Resolution	12	-	-	bits
Operating Temperature Range	0	+25	+70	°C

Software Support

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

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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 AMR Angle Click driver.

Key functions

- amrangle_angle_read This function reads an angle in degrees.
- amrangle_read_vtp_temp This function returns calculated temperature using vtp pin voltage.
- amrangle_gain_control_mode This function sets the gain control mode pin which is used to compensate the sensor amplitude output for reduction of temperature variation.

Example Description

This demo application shows the performance of AMR Angle Click by reading and presenting the temperature and angle results on the UART log.

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.AMRAngle

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.

Resources

mikroBUS™

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mikroSDK

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Click Boards™

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AMR Angle click 2D and 3D files

AMR Angle click schematic

ADA4571 datasheet

LTC1407 datasheet

AMR Angle click example on Libstock

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