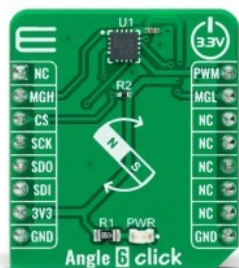


Angle 6 Click



PID: MIKROE-5282

Angle 6 Click is a compact add-on board that detects the absolute angular position of a permanent magnet, typically a diametrically magnetized cylinder on a rotating shaft. This board features the [MAQ470GQE](#), a 12-bit contactless angle sensor with PWM output from [Monolithic Power Systems](#). It supports a wide range of magnetic field strengths and spatial configurations, with both end-of-shaft and off-axis (side-shaft mounting), supported configurations. Fast data acquisition and processing provides accurate angle measurement at speeds from 0 to 60,000 rpm, alongside magnetic field strength detection with programmable thresholds. This Click board™ offers a highly reliable and contactless method to measure various applications' angles, position, and speed.

Angle 6 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?

Angle 6 Click as its foundation uses the MAQ470GQE, 12-bit PWM output angle sensor that detects the absolute angular position of a permanent magnet, typically a diametrically magnetized cylinder on a rotating shaft from Monolithic Power Systems. It allows users to read angle position information and detect the speed or direction of magnet rotation. Fast data acquisition and processing provide accurate angle measurement at speeds from 0 to 60,000rpm. It supports a wide range of magnetic field strengths and spatial configurations, with both end-of-shaft and off-axis (side-shaft mounting), supported configurations.

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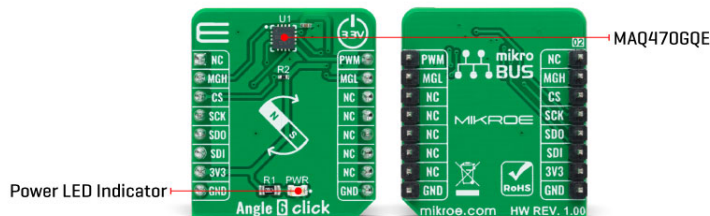
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The MAQ470GQE features magnetic field strength detection with programmable thresholds to allow sensing of the magnet position relative to the sensor to create functions such as the sensing of axial movements or diagnostics. It can operate over a wide magnetic field range from 30mT to 150mT (60mT typical) with 5mT accuracy. Eight magnetic field thresholds are programmable in approximate 15mT steps allowing detection of changes in the distance between the magnet and the sensor. On-chip non-volatile memory provides storage for configuration parameters, including the reference zero angle position and magnetic field detection thresholds.

The magnetic field is detected with integrated Hall devices located in the sensors' center. The angle is measured using the Spinaxis™ method, based on phase detection generating a sinusoidal signal with a phase representing the angle of the magnetic field. The angle is then obtained by a time-to-digital converter, representing output from the front-end to the digital conditioning block, which measures the time between the zero-crossing of the sinusoidal signal and the edge of a constant waveform. This output delivers a digital number proportional to the angle of the magnetic field at the rate of 1MHz in a straightforward and open-loop manner.

The Angle 6 Click communicates with MCU using the standard SPI serial interface for angle reading and register programming, which supports SPI Mode 0 and 3 and operates at clock rates up to 25 MHz. It also has the magnetic flags used to indicate when the sensor position's magnetic field is out of range, defined by the lower and upper magnetic field thresholds, routed on the RST and INT pins of the mikroBUS™ socket labeled as MGH and MGL.

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 as a highly reliable and contactless method to measure various applications' angles, position, and speed
On-board modules	MAQ470GQE - 12-bit contactless angle sensor with PWM output from Monolithic Power

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	Systems
Key Features	Fast data acquisition, SPI serial interface, magnetic field strength detection, contactless sensing for long life, supported both end-of-shaft and off-axis, and many more
Interface	PWM, SPI
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Supply Voltage	3.3V

Pinout diagram

This table shows how the pinout on Angle 6 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
	NC	1	AN	PWM	16	PWM	PWM Signal
Magnetic Field Strength Detection (HIGH)	MGH	2	RST	INT	15	MGL	Magnetic Field Strength Detection (LOW)
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

Designator	Name	Default	Description: describe the user + list all options with respective descriptions
LD1	PWR	-	Power LED Indicator

Angle 6 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Magnetic Field Detection Range	30	60	150	mT
Magnetic Field Detection Accuracy	-	5	-	mT
Resolution	-	12	-	bit
Operation Temperature Range	-40	-	+125	bit °C

Software Support

We provide a library for the Angle 6 Click as well as a demo application (example), developed using MikroElektronika [compilers](#). The demo can run on all the main MikroElektronika [development boards](#).

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

Library Description

This library contains API for Angle 6 Click driver.

Standard key functions:

- angle6_cfg_setup Config Object Initialization function.
- angle6_init Initialization function.
- angle6_default_cfg Click Default Configuration function.

Example key functions:

- angle6_write_register This function writes a data byte to the selected register by using SPI serial interface.
- angle6_read_register This function reads a data byte from the selected register by using SPI serial interface.
- angle6_read_angle This function reads raw angle data and converts it to degrees.

Example Description

This example demonstrates the use of Angle 6 click board by reading and displaying the magnet's angular position in degrees.

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.Angle6

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

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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](#)

[Click boards™](#)

Downloads

[Angle 6 click 2D and 3D files](#)

[Angle 6 click schematic](#)

[MAQ470GQE datasheet](#)

[Angle 6 click example on Libstock](#)

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