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Magneto 13 Click

PID: MIKROE-5643

Magneto 13 Click is a compact add-on board with an accurate and reliable magnetic device. This board features the MA736, a contactless digital angle sensor from Monolithic Power Systems. It is a MagAlpha sensor that detects the absolute angular position of a permanent magnet, typically a diametrically magnetized cylinder or a rotating shaft. The MA736 sensor supports a wide range of magnetic field strengths, end-of-shaft, and side-shaft (off-axis mounting) spatial configurations. This Click board™ makes the perfect solution for general-purpose angle measurement, high-resolution angle encoders, automotive positioning sensing, robotics, and more.

How does it work?

Magneto 13 Click is based on the MA736, a contactless digital angle sensor from Monolithic Power Systems. Its angle encoder has a configurable 8-bit to 12.5-bit absolute resolution and low latency at a constant rotation speed, allowing rotation measurements from 0 to 60.000 RPM. If used in servo motor applications, it is worth knowing that digital filtering is adjustable to optimize the control loop performance. For the best performance, the best mounting method would be to place the sensor on the rotation axis of a permanent magnet, such as a diametrically magnetized cylinder.

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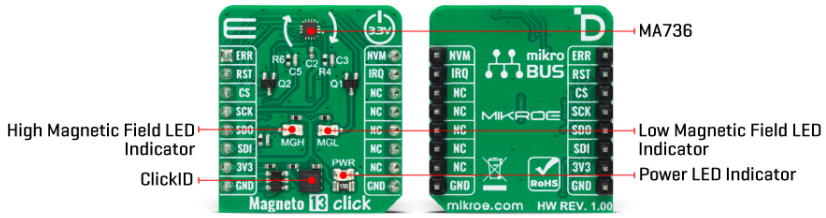

The Magneto 13 Click detects the strength of the magnetic field, and for diagnostic purposes, it uses configurable thresholds. The configuration parameters, such as the reference zero-angle and magnetic field detection threshold, are stored in on-chip non-volatile memory (NVM). The values from the NVM are loaded automatically during the Start-up condition and can be restored through the SPI interface. The sensor detects the magnetic field with the integrated Hall devices, with the angle measured with the SpinAxis method, which digitizes the direction of the field. Doing so, it does not need feedback loop-based circuits or complex arctangent computations. This method generates a sinusoidal signal with a phase representing the magnetic field's angle. The angle is obtained by a time-to-digital converter that measures the time between the zero crossing of the sinusoidal signal and the edge of a constant waveform.

To communicate with the host MCU, this Click board™ uses the standard 4-Wire SPI serial interface, supporting SPI mode 0 and mode 3. Modes are detected automatically by the sensor. In addition, error flags with active HIGH are available on ERR pin. The angle changes exceeding the defined threshold are indicated as output interruptions over the IRQ pin. The NVM pin is the output that MA736 uses to indicate whether it is busy accessing the non-volatile memory. Also, two LEDs, MGH and MGL, make a visual presentation if the field strength is above or below the selected threshold.

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. 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 general-purpose angle measurement, high-resolution angle encoders, automotive positioning sensing, robotics, and more.
On-board modules	MA736 - contactless digital angle sensor from Monolithic Power Systems
Key Features	Low power consumption, highest reliability and durability, high-resolution output, operates with wide magnetic range,

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	programmable threshold, non-volatile memory, and more
Interface	SPI
Feature	ClickID
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on Magneto 13 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™				Pin	Notes
Error Flag	**ERR**	1	AN	PWM	16	**NVM**	Non-Volatile Memory Indicator
ID SEL	**RST**	2	RST	INT	15	**IRQ**	Angle Interrupt
SPI Select / ID COMM	**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
LD2	MGL	-	Low Magnetic Field LED Indicator
LD3	MGH	-	High Magnetic Field LED Indicator

Magneto 13 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Rotation Speed Measurement	0	-	60.000	RPM
Magnetic Field Accuracy	-	5	-	mT
Resolution	8	-	12.5	bit

Software Support

We provide a library for the Magneto 13 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

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(recommended), downloaded from our LibStock™ or found on Mikroe github account.

Library Description

This library contains API for Magneto 13 Click driver.

Key functions

- magneto13_get_angle Magneto 13 gets the angular position function.
- magneto13_get_field_strength Magneto 13 gets the magnetic field strength function.
- magneto13_set_mag_field_thd Magneto 13 sets the magnetic field threshold function.

Example Description

This library contains API for the Magneto 13 Click driver. The demo application reads and displays 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), downloaded from our LibStock™ or found on Mikroe github account.

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.Magneto13

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, that needs to be downloaded from the LibStock and installed for the compiler you are using to ensure proper operation of mikroSDK compliant Click board™ demo applications.

For more information about mikroSDK, visit the official page.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

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ClickID

Downloads

Magneto 13 click example on Libstock

MA736GGU datasheet

Magneto 13 click 2D and 3D files v100

Magneto 13 click schematic v100

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