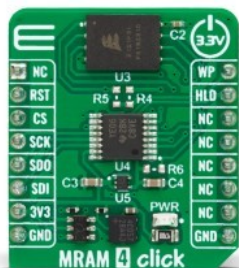


MRAM 4 Click



PID: MIKROE-5838

MRAM 4 Click is a compact add-on board representing a magneto-resistive random-access memory solution. This board features the [EM064LXQADG13IS1R](#), an industrial STT-MRAM persistent memory from [Everspin Technologies](#). It is a 64Mb MRAM IC RAM and can achieve up to 200MHz as a single and double data rate (STR/DTR). The MRAM technology is analog to Flash technology with SRAM-compatible read/write timings (Persistent SRAM, P-SRAM), where data is always non-volatile. It also has a hardware write-protection feature and performs read and write operations with data retention for ten years and unlimited read, write, and erase operations for the supported life of the chip. This Click board™ makes the perfect solution for the development of applications that need data storage and retrieval without incurring significant latency penalties.

How does it work?

MRAM 4 Click is based on the EM064LXQADG13IS1R, an industrial STT-MRAM persistent memory from Everspin Technologies. It can deliver up to 400Mbps reads and writes via eight I/O signals with a clock frequency 200MHz. As this is a persistent memory, byte-level writes and reads do not require erasing. Nonvolatile settings are not reflow protected, which you have to keep in mind. A dedicated 256-byte OTP area outside the main memory is readable and user-lockable, with a permanent lock WRITE OTP command. The EM064LX is capable of chip/bulk and sector erase. Subsector erase is possible in 4KB, 32KB granularity. In addition, the MRAM memory features 16 configurable hardware write-protected regions plus top/bottom select, program/erase protection during power-up, and CRC command to detect accidental changes to user data.

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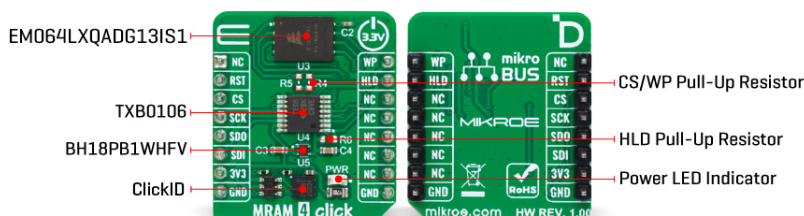
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ISO 9001: 2015 certification of quality management system (QMS).



As the EM064LXQADG13IS1R works at the recommended 1.8V voltage, the MRAM 4 Click is equipped with a BH18PB1WHFV, a CMOS LDO regulator from Rohm Semiconductor. To work with different logic level voltage, this Click board™ comes with a TXB0106, a 6-bit bidirectional level-shifting and voltage translator from Texas Instruments. On board, there are two unpopulated jumpers labeled R5 and R6. The chip select and write protection can be pulled up for further hardware development.

MRAM 4 Click uses a standard 4-Wire SPI serial interface to communicate with the host MCU. You can use write protection functionality over the WP pin. The hardware reset is available over the HLD pin, whereas in the low logic state, the memory will self-initialize and return the device to the ready state. There is an unpopulated R6 resistor for an external pull-up, as this pin shouldn't be allowed to float.

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. Also, it comes equipped with a library containing functions and an example code that can be used as a reference for further development.

Specifications

Type	MRAM
Applications	Can be used for the development of applications that need data storage and retrieval without incurring significant latency penalties
On-board modules	EM064LXQADG13IS1R - industrial STT-MRAM persistent memory from Everspin Technologies
Key Features	Security and write protections, erase capability as bulk and subsector, dedicated OTP area outside main memory, wide range SPI compatibility, low power modes, data integrity, 10 years of data retention, data endurance with unlimited read, write, and erase operations, and more
Interface	SPI

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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 MRAM 4 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	WP	Write Protect
ID SEL	RST	2	RST	INT	15	HLD	Data Transfer Pause
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
R4	-	Unpopulated	Write Protection Signal Pull-Up Resistor
R5	-	Unpopulated	Chip Select Signal Pull-Up Resistor
R6	-	Unpopulated	Hold Signal Pull-Up Resistor

MRAM 4 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Memory Size	-	-	64	Mb
Memory Organization	8M x 8			

Software Support

We provide a library for the MRAM 4 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 MRAM 4 Click driver.

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Key functions

- mram4_memory_write MRAM 4 memory write function.
- mram4_memory_read MRAM 4 memory read function.
- mram4_block_erase MRAM 4 block erase function.

Example Description

This example demonstrates the use of MRAM 4 Click board™. The demo app writes specified data to the memory and reads it back.

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.MRAM4

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™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

[ClickID](#)

Downloads

[MRAM 4 click example on Libstock](#)

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[MRAM 4 click 2D and 3D files](#)

[TXB0106 datasheet](#)

[MRAM 4 click schematic](#)

[EM064LXQADG13IS1R datasheet](#)

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