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# FRAM 5 Click







PID: MIKROE-5119

**FRAM 5 Click** is a compact add-on board representing a highly reliable ferroelectric random access memory solution. This board features the FM24V10, a 1Mbit nonvolatile memory employing an advanced ferroelectric process organized as 128K words of 8 bits each from Infineon. This I2C configurable FRAM performs read and write operations similar to a RAM providing reliable data retention for 151 years while eliminating the complexities, overhead, and system-level reliability problems caused by EEPROM and other nonvolatile memories. This Click board™ is ideal for nonvolatile memory applications requiring frequent or rapid writes and unlimited endurance.

FRAM 5 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?

FRAM 5 Click as its foundation uses the FM24V10, a 1Mbit ferroelectric random access memory (FRAM) logically organized as 131,072×8 bits and accessed using an industry-standard I2C interface from Infineon. The functional operation of the FRAM is similar to serial I2C EEPROM, where the significant difference between the FM24V10 and EEPROM represents the F-RAM's superior write performance, high endurance, and low power consumption. This Click board™ is ideal for nonvolatile memory applications requiring frequent or rapid writes, where example ranges from data collection to demanding industrial controls where the long write time of serial EEPROM can cause data loss.

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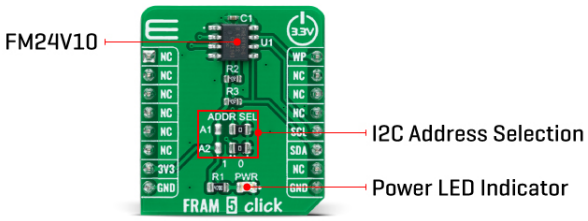


This Click board™ communicates with MCU using the standard I2C 2-Wire interface, supporting operation with a clock frequency up to 3.4MHz. Unlike serial EEPROM, the FM24V10 performs write operations at bus speed, where no write delays are incurred. It provides reliable data retention for 151 years while eliminating the complexities, overhead, and system-level reliability problems caused by EEPROM and other nonvolatile memories and supports 10 trillion (1014) read/write cycles or 100 million times more write cycles than EEPROM. Besides, the FM24V10 allows choosing its I2C slave address using the SMD jumpers labeled ADDR SEL. The selection can be made by positioning the SMD jumpers to an appropriate position marked as 1 or 0.

An additional feature of this FRAM represents the configurable Write Protection function labeled as WP routed on the PWM pin of the mikroBUS™ socket. The WP pin protects the entire memory and all registers from write operations and must be set to a high logic state to inhibit all the write operations. All memory and register writes are prohibited when this pin is high, and the address counter is not incremented.

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 | FRAM |
|---|---|
| Applications | Can be used for nonvolatile memory applications requiring frequent or rapid writes and unlimited endurance |
| On-board modules | FM24V10 - 1Mbit nonvolatile memory employing an advanced ferroelectric process organized as 128K words of 8 bits each from Infineon |
| Key Features | Low power consumption, high endurance, 151 years data retention, advanced high-reliability ferroelectric process, fast serial interface, sophisticated write protection scheme, and more |

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| | |
|---|---|
| Interface | I2C |
| ClickID | No |
| 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 FRAM 5 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

| Notes | Pin | mikroBUS | | | | Pin | Notes |
|---|---|---|---|---|---|---|---|
| | NC | 1 | AN | PWM | 16 | **WP** | Write Protect |
| | NC | 2 | RST | INT | 15 | NC | |
| | NC | 3 | CS | RX | 14 | NC | |
| | NC | 4 | SCK | TX | 13 | NC | |
| | NC | 5 | MISO | SCL | 12 | **SCL** | I2C Clock |
| | NC | 6 | MOSI | SDA | 11 | **SDA** | I2C Data |
| 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 |
| JP1-JP2 | ADDR SEL | Right | I2C Address Selection 1/0: Left position 1, Right position 0 |

## FRAM 5 Click electrical specifications

| Description | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | - | 3.3 | - | V |
| Memory Size | - | - | 1 | Mbit |
| Write Endurance | $10^{14}$ | - | - | Write Cycles |
| Data Retention | 151 | - | - | Years |
| Operating Temperature Range | -40 | +25 | +85 | °C |

## Software Support

We provide a library for the FRAM 5 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 account.

### Library Description

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This library contains API for FRAM 5 Click driver.

Key functions

- fram5_check_communication This function checks the communication by reading and verifying the device ID.
- fram5_memory_write This function writes a desired number of data bytes starting from the selected memory address.
- fram5_memory_read This function reads a desired number of data bytes starting from the selected memory address.

**Example Description**

This example demonstrates the use of FRAM 5 Click board™ by writing specified data to the memory and reading it back.

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.FRAM5

**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

Click board™ Catalog

Click boards™

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## Downloads

FRAM 5 click example on Libstock

FM24V10 datasheet

FRAM 5 click 2D and 3D files

FRAM 5 click schematic

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