EINK CLICK - WITHOUT DISPLAY

PID: MIKROE-3683
Weight: 17 g

eINK Click is an adapter Click board™, used to interface a compatible eINK display with the host MCU. The most distinctive feature of the eINK displays is their very low power consumption and the ability to retain the information, even after disconnecting from the power source. The power is consumed only when the display content is changing. The Click board™ comes shipped with the 172x72 eINK display, driven by the integrated SSD1606 controller and it can display 4 shades: black, dark gray, light gray and white. The same type of display is used on the popular Kindle E-readers.

eINK 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.

The eINK is a reasonably new technology with a promising future. The displayed content does not degrade when exposed to direct sunlight, the display actually behaves like a real paper; it is more readable when there is more light hitting its surface. There is a wide range of applications, where eINK can be implemented: it can be used for very low power consumption applications that require display output, such as mobile phones and wearables, industrial and packaging applications, electronic reading and writing, electronic shelf labels and similar applications that can utilize this type of display.

HOW DOES IT WORK?

The eINK displays are using the SPI communication protocol for the communication with the host MCU. These displays features inherently wide viewing angle and high contrast, as well as good readability in daylight conditions. The click board™ itself carries the supporting electronics, used to provide all the necessary voltages for the proper operation of the eINK display. The display driver pins are routed through the flat cable of the display and connected via the 24pin, 0.5mm ZIF connector on the click board. For example, SSD1606 - 4GS Active Matrix EPD, 128 x 180 Display Driver with Controller is widely used, and pretty common choise when it comes to eINK displays. From there, the command and data lines are routed to the appropriate pins on the mikroBUS™ of the eINK click.

The eINK click also contains the LM75 thermal sensor, which uses I2C protocol to communicate with the display driver IC. This is required for thermal compensation of the display, so it can be operated in a wide temperature range, from 0°C to +50°C. The total power consumption of this device is very low. The power is only required when rearranging of the microcell pigments is required, while no power is required to sustain the content of the display. The display retains the content, even when the power is disconnected.

This Click Board™ uses both I2C and SPI communication interfaces. It is designed to be operated only with up to 3.3V logic levels. Proper conversion of logic voltage levels should be applied, before the Click board™ is used with MCUs operated at 5V.

The supplied click library contains easy to use functions, that simplify the workflow with the eINK click. Their usage is demonstrated in the provided example application, which can be used as a reference for the custom design.

EINK DISPLAYS

The eINK click - without display can be used as adapter for connecting any e-paper display from our offer:

- E-Paper display 1,54" 200x200 dots
- E-Paper display 2,9" 296x128 dots
- E-Paper display 2,13" 122x250 dots

Note: this click is coming without display in its package.

SPECIFICATIONS

Type	Adapter
Applications	eINK click can be used for applications that require a low power consumption display, which is readable during daylight
On-board modules	EA-EPA20-A, a 2 inch,172x72 pixels ePAPER display with the integrated SSD1606 driver/controller, from Electronic Assembly., LMA75 temperature sensor, onboard.
Key Features	The eINK display retains the display content, even when the power is off, very low power consumption, clearly visible during the daylight
Interface	SPI
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 eINK click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro BUS		Pin	Notes
	NC	1	AN	PWM	16	D/C	Data/Config
Reset	RST	2	RST	INT	15	BSY	Busy indicator
SPI Chip select	SDN	3	CS	RX	14	NC	
SPI Clock	SCK	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
SPI data input	SDI	6	MOSI	SDA	11	NC	
Power Supply	3.3V	7	3.3V	5V	10	NC	
Ground	GND	8	GND	GND	9	GND	Ground

SOFTWARE SUPPORT

We provide a library for the eINK click on our Libstock page, as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika development boards.

Library Description
The library covers all functionalities of EPA20-A eINK display.

Key functions:
- `eink_fill_screen( uint8_t color )` - Fills the screen with provided color.
- `eink_text( uint8_t *text, uint8_t x, uint8_t y )` - Writes text on the screen.
- `eink_image_bmp( const uint8_t* img )` - Displays image on the screen.

Examples Description

The application is composed of three sections:
- System Initialization - Initializes SPI module and CS pin, RST pin, PWM pin as output and INT pin as an input.

- Application Initialization - Initializes driver and configures the display
- Application Task - (code snippet) - Repeats operations with a pause of 3 seconds between them.
- Display black letters on a white background
- Display white letters on a black background
- Display external image

```
void applicationTask()
{
  eink_fill_screen( _EINK_COLOR_WHITE );
  eink_set_font( &guiFont_Exo_2_Condensed21x32_Regular[0], _EINK_COLOR_BLACK, _FO_HORIZONTAL );
  eink_text( &_eINK_Text[0], 14, 50 );
  delay_ms( 3000 );

  eink_fill_screen( _EINK_COLOR_BLACK );
  eink_set_font( &guiFont_Exo_2_Condensed21x32_Regular[0], _EINK_COLOR_WHITE, _FO_HORIZONTAL );
  eink_text( &_eINK_Text[0], 14, 50 );
  Delay_ms( 3000 );

  eink_image_bmp( &_mikroe_bmp[0] );
  Delay_ms( 3000 );
}
```

The example carries bmp image converted to an array using Visual TFT.
The full application code, and ready to use projects can be found on our Libstock page.
Other mikroE Libraries used in the example:

- SPI

Additional notes and information

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. The terminal available in all MikroElektronika compilers, or any other terminal application of your choice, can be used to read the message.

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.