

Time-saving embedded tools

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Current 3 Click





PID: MIKROE-4203

Current 3 Click is a compact add-on board for applications like current sense and dual temperature monitor. This board features the EMC1702, a combination of the high-side current sensing device with a precision temperature measurement function from Microchip. The EMC1702 measures the voltage developed across a sense resistor to represent the high-side current of a battery or voltage regulator, and it contains additional bidirectional peak detection circuitry to flag instantaneous current spikes with programmable time duration and magnitude threshold. Also includes an external diode channel for temperature measurement as well as an internal diode for ambient temperature measurements. This Click board[™] is suitable for embedded, industrial, and power management systems applications.

Current 3 Click is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click boardTM comes as a fully tested product, ready to be used on a system equipped with the mikroBUSTM socket.

How does it work?

Current 3 Click is based on the EMC1702, a combination of the high-side current sensing device with a precision voltage and temperature measurement capabilities from Microchip. It measures the voltage developed across an external sense resistor to represent the high-side current of a battery or voltage regulator, and also measures the source voltage and uses these measured values to present a proportional power calculation. The EMC1702 contains additional bi-directional peak detection circuitry to flag instantaneous current spikes with programmable time duration and magnitude threshold. Also, it possesses an external diode channel for temperature measurement as well as an internal diode for ambient temperature measurements.

Mikroe produces entire development toolchains for all major microcontroller architectures. Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.



ISO 27001: 2013 certification of informational security management system. ISO 14001: 2015 certification of environmental management system. OHSAS 18001: 2008 certification of occupational health and safety management system.





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The EMC1702 current-sense measurement converts differential input voltage measured across an external sense resistor to a proportional output voltage. This voltage is digitized using a variable resolution (13-bit to 15-bit) Sigma-Delta ADC and I2C protocol. The current range allows for large variations in measured current with high accuracy and a low voltage drop across the resistor.

Current 3 Click communicates with MCU using the standard I2C 2-Wire interface with a maximum frequency of 400kHz. The EMC1702 slave address is determined by a resistor connected R6 (0 Ω) between the ground and the ADDR_SEL pin. Various values of this resistor also provide different slave addresses (0 Ω is equal to 1001_100(r/w)).

The EMC1702 has two levels of monitoring and contains user-programmable bipolar Full-Scale Sense Ranges (FSSR). Each VSENSE measurement is averaged over a user-programmable time. If VSENSE exceeds (or drops below) the respective limits, the ALERT pin, routed on the INT pin of the mikroBUS[™] socket labeled as ALT, may be asserted. It also contains user-programmable current peak detection circuitry on DUR_SEL and TH_SEL pins that will assert the THERM pin, routed on the RST pin of the mikroBUS[™] socket labeled as TRM, if a current spike is detected larger than the programmed threshold and of longer duration than the programmed time (threshold and duration selected by resistors R7 and R8).

This Click board[™] is designed to be operated with both 3.3V and 5V logic voltage levels that can be selected via VCC SEL jumper. This allows for both 3.3V and 5V capable MCUs to use the I2C communication lines properly.

Current sensor, Measurements Type Can be used for embedded, industrial, and Applications power management systems applications. Current 3 Click is based on the EMC1702, a On-board modules combination of the high-side current sensing device with a precision voltage and temperature measurement capabilities from Microchip. Key Features High-side current sensor, temperature monitoring, hardware set peak detector, Mikroe produces entire development toolchains for all major microcontroller architectures. Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

Specifications



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	accuracy, and more.		
Interface	12C		
Feature	No ClickID		
Compatibility	mikroBUS™		
Click board size	M (42.9 x 25.4 mm)		
Input Voltage	3.3V or 5V		

Pinout diagram

This table shows how the pinout on Current 3 Click corresponds to the pinout on the mikroBUS^m socket (the latter shown in the two middle columns).

Notes	Pin	● ● mikro* ● ● ● BUS			TV.	Pin	Notes
	NC	1	AN	PWM	16	NC	
Current Peak Duration Detection	TRM	2	RST	INT	15	ALR	Interrupt
	NC	3	CS	RX	14	NC	
	NC	4	SCK	ΤX	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	5V	Power Supply
Ground	GND	8	GND	GND	9	GND	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Logic Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V

Current 3 Click electrical specifications

Description	Min	Тур	Max	Unit
Supply Voltage	-0.3	-	26	V
Voltage on SENSE terminal	-0.3	-	26	V
Peak Detector Threshold Range	-	80	-	mV
Peak Detector Duration Range	-	3072	-	ms
Operating Temperature Range	-40	-	+85	°C

Software Support

We provide a library for the Current 3 Click on our <u>LibStock</u> page, as well as a demo application (example), developed using MikroElektronika <u>compilers</u>. The demo can run on all the main MikroElektronika <u>development boards</u>.

Library Description

Mikroe produces entire development toolchains for all major microcontroller architectures.

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The library covers all the necessary functions to control Current 3 Click board. A library performs the communication with the device via I2C interface.

Key functions:

- float current3 get temperature (uint8 t temp sel) Get temperature function.
- float current3 get source voltage (void) Get source voltage function.
- float current3 get current (void) Get current measurement function.

Examples description

The application is composed of three sections :

- System Initialization Initializes I2C and start to write log.
- Application Initialization Initialization driver enables I2C, check communication and set sense sampling configuration, also write log.
- Application Task (code snippet) This is an example which demonstrates the use of Current 3 Click board. Current 3 Click board can be used to measure current ranging up to 8000mA, and display temperature, voltage and current data. All data logs write on USB uart changes for every 2 sec.

The full application code, and ready to use projects can be found on our <u>LibStock</u> page.

Other mikroE Libraries used in the example:

- I2C
- UART
- Conversions

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. 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 <u>LibStock</u> 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

Current 3 click example on Libstock

Current 3 click 2D and 3D files

EMC1702 datasheet

Current 3 click schematic

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