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Hall Current 7 Click

PID: MIKROE-4420

Hall Current 7 Click is a compact add-on board that provides economical and precise solutions for AC or DC current sensing. This board features the ACS770, a thermally enhanced, fully integrated, Hall effect-based high precision linear current sensor with 100µΩ current conductor from Allegro MicroSystems. Applied current flows directly into the integrated conductor generating a magnetic field, and an integrated low-hysteresis core concentrates the magnetic field sensed by the Hall element with a typical accuracy of ±1% and 120 kHz bandwidth. This Click board™ is suitable for applications like motor control, load detection and management, DC-to-DC converter control, and similar applications that require accurate and reliable current sensing.

Hall Current 7 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.

.DO NOT TOUCH THE BOARD WHILE THE EXTERNAL POWER SUPPLY IS ON!

Note: This Click board™ needs to be used by trained personnel only while applying high voltages. Special care should be taken when working with hazardous voltage levels.

How does it work?

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.

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

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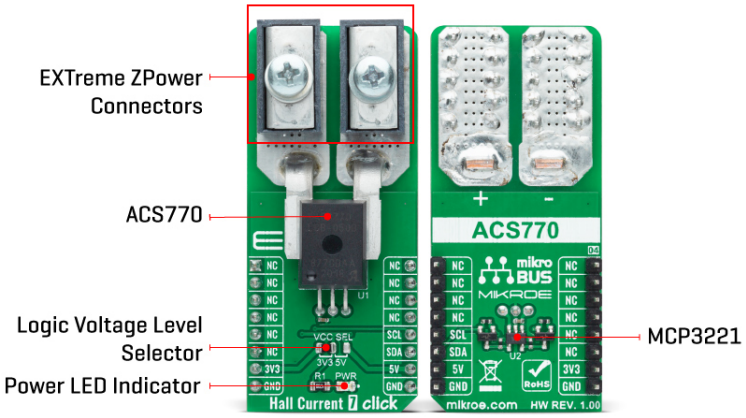
Hall Current 7 Click is based on the ACS770, a thermally enhanced, fully integrated, Hall effect-based high precision linear current sensor with 100µΩ current conductor from Allegro MicroSystems. This Hall-effect current sensor eliminates the need for a sense-resistor. The current flows directly into the integrated conductor, generating a magnetic field that will be measured. As current flows in its integrated conductor, an integrated low-hysteresis core concentrates the magnetic field that is then sensed by the Hall element with a typical accuracy of ±1% and 120 kHz bandwidth. This core also acts as a magnetic shield, rejecting external stray fields. The integrated conductor has 100µΩ resistance, providing ultralow-power loss.



The thickness of the copper conductor allows the survival of the device at high overcurrent conditions. The terminals of the conductive path are electrically isolated from the signal leads. This allows the ACS770 to be used in applications requiring electrical isolation without the use of optoisolators or other costly isolation techniques. The ACS770 outputs an analog signal that varies linearly with the bidirectional AC or DC primary sampled current. The analog signal is then brought to the analog to digital converter (ADC) that converts the output signal from the ACS770 into a digital value, which is available over the I2C interface.

Hall Current 7 Click communicates with MCU through the MCP3221, a successive approximation A/D converter with a 12-bit resolution from Microchip, using a 2-wire I2C compatible interface. This device provides one single-ended input with very low-power consumption, a low maximum conversion current, and a Standby current of 250 µA and 1 µA, respectively. Data can be transferred at rates of up to 100 kbit/s in the Standard and up to 400 kbit/s in the Fast Mode. Also, maximum sample rates of 22.3 kSPS with the MCP3221 are possible in a Continuous-Conversion Mode with a clock rate of 400 kHz.

This Click board™ is designed to operate with both 3.3V and 5V logic voltage levels selected via the VCC SEL jumper. It allows for both 3.3V and 5V capable MCUs to use the I2C communication lines properly. However, the Click board™ comes equipped with a library that contains easy to use functions and an example code which can be used, as a reference, for further development.

Specifications

Type	Current sensor,Measurements
Applications	Can be used for applications like motor control, load detection and management, DC-to-DC converter control, and similar

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	applications that require accurate and reliable current sensing.
On-board modules	Hall Current 7 Click is based on the ACS770, a thermally enhanced, fully integrated, Hall effect-based high precision linear current sensor with 100µΩ current conductor from Allegro MicroSystems.
Key Features	Ultralow-power loss, high precision, improved total output error, high reliability, high accuracy, extremely stable output offset voltage, and more.
Interface	I2C
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Hall Current 7 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	NC	
	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	**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	Power Supply Voltage Selection 3V3/5V: Left position 3V3, Right position 5V

Hall Current 7 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Working voltage for basic isolation	-	-	700	V(RMS)
Primary Sampled Current	-50	-	+50	A

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Sensitivity	-	40	-	mV/A

Software Support

We provide a library for the Hall Current 7 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 the necessary functions that enables the usage of the Hall Current 7 Click board™. It offers reading raw data from output register and calculations for raw output voltage, current and average current passing through the on board Hall Effect Sensor.

Key functions:

- uint16_t hallcurrent7_read_voltage (uint16_t v_ref); - Function is used to calculate raw output voltage.
- int16_t hallcurrent7_calc_current (uint16_t v_ref); - Function is used to calculate current.
- int16_t hallcurrent7_avg_current (uint16_t v_ref); - Function is used to calculate average current and correct for output error.

Examples description

The application is composed of three sections :

- System Initialization - Initializes I2C module and LOG structure.
- Application Initialization - Initalizes I2C driver and makes an initial log.
- Application Task - This example shows the capabilities of the Hall Current 7 Click board™ by measuring current passing through the on board Hall Effect Sensor and displaying data every two seconds. In order to get correct clculations user should change "v_ref" value to his own power supply voltage.

The full application code, and ready to use projects can be found on our LibStock 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

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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™

Downloads

Hall Current 7 click 2D and 3D files

ACS770 datasheet

Hall Current 7 click example on Libstock

Hall Current 7 click schematic

MCP3221 datasheet

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