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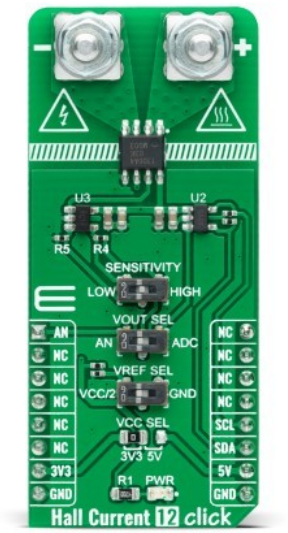
Hall Current 12 Click



PID: MIKROE-4798

Hall Current 12 Click is a compact add-on board that provides economical and precise AC or DC current sensing solutions. This board features the TMCS1100, a galvanically isolated Hall-effect current sensor capable of DC or AC current measurement with high accuracy, excellent linearity, and temperature stability from Texas Instruments. It enables the lowest drift, <1% full-scale error, and highest accuracy over time and temperature. It also provides a reliable 600V lifetime working voltage and 3kVRMS isolation between the current path and circuitry with uni/bidirectional current sensing. Besides, the user is allowed to process the output signal in analog or digital form. This Click board™ is suitable for AC or DC current-sensing in industrial and commercial systems, motor and load control, power factor correction, overcurrent protection, and many more.

Hall Current 12 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 LOAD IS CONNECTED!

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?

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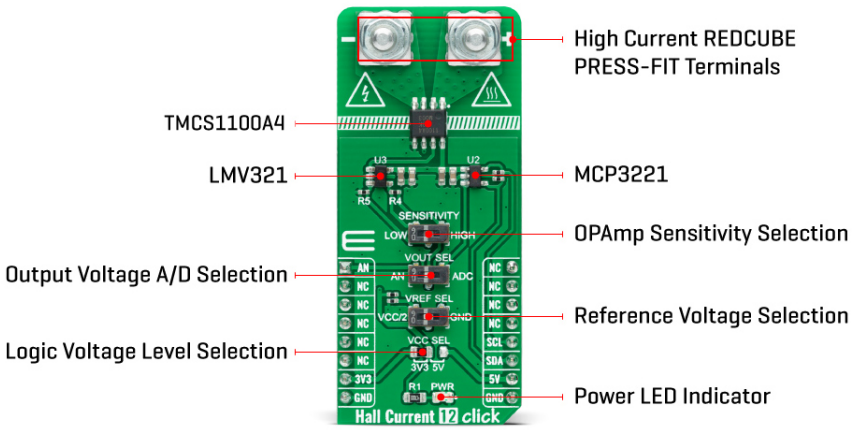
Hall Current 12 Click as its foundation uses the TMCS1100A4, a precision Hall-effect current sensor, featuring a 600V isolation working voltage, <1% full-scale error across temperature, and a reference voltage enabling unidirectional or bidirectional current sensing from Texas Instruments. The input current flows through an internal 1.8mΩ conductor that generates a magnetic field measured by an integrated Hall-effect sensor and amplified by a precision signal chain. The device has a bandwidth of 80kHz and can be used for both AC and DC current measurements. It is optimized for high accuracy and temperature stability, with offset and sensitivity compensated across the operating temperature range.



The reference voltage provided to the TMCS1100A4 on the VREF pin determines the zero current output voltage. This zero-current output level, along with sensitivity, determines the measurable input current range allowing for unidirectional or bidirectional sensing. An onboard SMD switch labeled as VREF SEL, placed to an appropriate position marked as VCC/2 and GND, can select reference voltage. With VCC/2, the TMCS1100A4 measures input current up to ±5.75A, while with the GND position from 0.125A up to 12A.

Hall Current 12 Click has two ways to communicate with the MCU. The output analog signal from TMCS1100A4 is forwarded to the input of the operational amplifier, the LMV321 low-voltage rail-to-rail OpAmp from Texas Instruments, which represents the most cost-effective solution for applications where low voltage operation is needed. The output of the LMV321 OPAmp has a stable unity-gain, acting as a buffer so that the host MCU can sample the output voltage of the TMCS1100A4 via the AN pin of the mikroBUS™ socket. Also, with this method, it is possible to increase the sensitivity of its output signal by placing the switch labeled as SENSITIVITY to the appropriate position marked as LOW or HIGH, giving the user the option to select reduced or increased sensitivity.

Another way of signal processing is for the TMCS1100A4 analog output signal to be converted to a digital value using MCP3221, a successive approximation A/D converter with a 12-bit resolution from Microchip using a 2-wire I2C compatible interface. Selection can be performed by onboard SMD switch labeled as VOUT SEL, placing it to an appropriate position marked as AN and ADC. With the MCP3221, data transfers at rates of up to 100kbit/s in the Standard and up to 400kbit/s in the Fast Mode.

Also, this Click board™ should be connected in series with the load. The current is measured by two onboard terminal connectors, one terminal block for the positive and the other for the negative current input.

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

Specifications

Type	Current sensor,Measurements
Applications	Can be used for AC or DC current-sensing in industrial and commercial systems, motor and load control, power factor correction, overcurrent protection, and many more
On-board modules	TMCS1100A4 - galvanically isolated Hall-effect current sensor capable of DC or AC current measurement from Texas Instruments
Key Features	High accuracy and precision, excellent linearity, and temperature stability, 3kVRMS isolation rating, robust 600V lifetime working voltage, bidirectional and unidirectional current sensing, and more
Interface	Analog,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 12 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™				Pin	Notes
Analog Signal	**AN**	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

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JP1	VCC SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
SW1	SENSITIVITY	Left	OPAmp Sensitivity Selection LOW/HIGH: Left position LOW, Right position HIGH
SW2	VOUT SEL	Left	Output Voltage A/D Selection AN/ADC: Left position AN, Right position ADC
SW3	VREF SEL	Left	Reference Voltage Selection VCC/2/GND: Left position VCC/2, Right position GND

Hall Current 12 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage VCC	3.3	-	5	V
Maximum Measurement Range @ VREF = VCC/2	-	-	±5.75	A
Maximum Measurement Range @ VREF = GND	0.125	-	12	A
Sensitivity	-	400	-	mV/A
Operating Temperature Range	-40	+25	+125	°C

Software Support

We provide a library for the Hall Current 12 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

This library contains API for Hall Current 12 Click driver.

Key functions:

- hallcurrent12_get_adc - Hall Current 12 get ADC function.
- hallcurrent12_get_adc_voltage - Hall Current 12 get ADC voltage function.
- hallcurrent12_get_current - Hall Current 12 get current function.

Examples description

This library contains API for Hall Current 12 Click driver. The demo application reads ADC value and current (A).

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

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github account.

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.HallCurrent12

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 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 12 click example on Libstock

TMCS1100A4 datasheet

LMV321 datasheet

Hall Current 12 click 2D and 3D files

Hall Current 12 click schematic