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H-Bridge 13 Click

PID: MIKROE-5795

H-Bridge 13 Click is a compact add-on board with an H-bridge gate driver, also known as a full-bridge pre-driver. This board features the DRV8411A, a dual H-bridge motor driver with current regulations from Texas Instruments. It can drive one bipolar stepper motor, one or two brushed DC motors, solenoids, and other inductive loads. This gate driver has a high output current capability of 4A at its peak, and the Tripler charge pump allows the device to operate at a wide power supply voltage range of 1.65 up to 11V. This Click board™ makes the perfect solution for the development of battery-powered toys, POS printers, video security cameras, office automation machines, robotics, electronic smart locks, and more.

H-Bridge 13 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?

H-Bridge 13 Click is based on the DRV8411A, a dual H-Bridge motor driver with current regulations from Texas Instruments. The Tripler charge pump integrates all capacitors and allows for 100% duty cycle operation. The inputs and outputs can be paralleled to drive high-current brush DC motors. It also implements current sensing and regulation parts. Internal current mirrors output the current sense information on the IPROPI pins, eliminating the need for large power shunt resistors, thereby saving board area and reducing system cost, and allowing the host MCU to detect motor stalls or changes in load conditions. There are four screw terminals to connect the motors and one VM external power supply input to power the motors.

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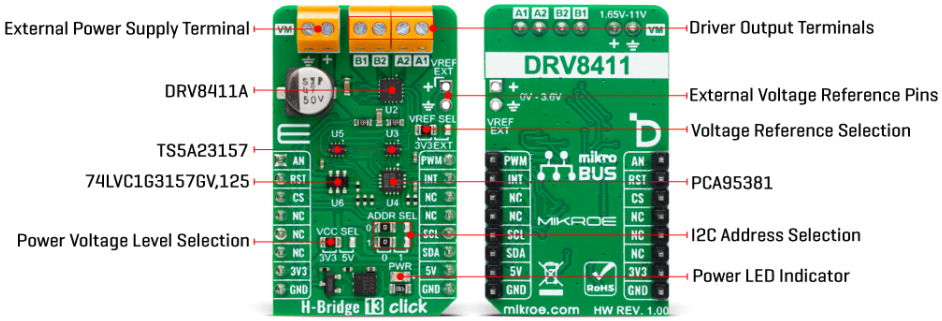

The motor driver comes with several protection features, such as a VM undervoltage lockout (UVLO), auto-recovery overcurrent protection (OCP), thermal shutdown (TSD), and fault indication. The integrated current regulation feature limits motor current to a predefined maximum based on the VREF and xIPROPI settings. The xIPROPI signal can provide current feedback to a microcontroller during the H-bridges drive and brake/slow-decay states. The reference voltage can be selected over the onboard 3.3V rail or an external one over the VREF SEL jumper, where the 3.3V is selected by default. The external reference voltage can be connected over the VREF EXT header.

The H-Bridge control inputs for the motor driver's full bridges A and B are fed by two TS5A23157s, dual 10Ω SPDT analog switches from Texas Instruments. These single-pole double-throw switches are designed to handle both digital and analog signals. They feature a low-charge injection, excellent ON-resistance matching, and low total harmonic distortion. Normally closed IO ports of this switch are controlled over the PCA9538A, a low-voltage 8-bit IO port with interrupt and reset from NXP Semiconductors. The analog current output that is proportional to the load current for full bridges A and B can be monitored by selecting one of the channels at a time over the 74LVC1G3157GV,125, a 10Ω single-pole double-throw analog switch from Nexperia.

H-Bridge 13 Clisk uses a standard 2-Wire I2C interface of the PCA9538A to communicate with the host MCU supporting fast mode up to 400KHz. The I2C address can be selected over the ADDR SEL jumper, where 0 is selected by default. By controlling the PCA9538A, you can control the switches, the PWM signal, full bridge inputs, and the motor driver itself. You can also read the DRV8411A's fault indicator over the I2C interface and the interrupt INT pin. The speed of the motors can be controlled over the PWM pin and the TS5A23157s switches. The analog current outputs can be read over the AN pin by selecting one of the bridges over the PCA9538A and I2C interface. The PCA9538A can be reset over the RST pin.

This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the PWR SEL jumper. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. Also, this 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	Brushed
Applications	Can be used for the development of battery-

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	powered toys, POS printers, video security cameras, office automation machines, robotics, electronic smart locks, and more
On-board modules	DRV8411A - dual H-Bridge motor driver with current regulations from Texas Instruments
Key Features	Two half bridges up to 11V, high output current up to 4A peak, high performance, switches for protection of the host MCU, PWM control interface, low-power sleep mode, VM undervoltage lockout, auto-recovery overcurrent protection, thermal shutdown, fault indication, and more
Interface	I2C,PWM
ClickID	Yes
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 H-Bridge 13 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Analog Output	**AN**	1	AN	PWM	16	**PWM**	PWM Control
Reset	**RST**	2	RST	INT	15	**INT**	Interrupt
	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	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	VREF SEL	Left	Voltage Reference Selection 3V3/EXT: Left position 3V3, Right position EXT
JP3-JP4	ADDR SEL	Left	I2C Address Selection 0/1: Left position 0, Right position 1

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H-Bridge 13 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
External Power Supply Range	1.65	-	11	V
Output Current	-	-	4	A

Software Support

We provide a library for the H-Bridge 13 Click as well as a demo application (example), developed using MIKROE compilers. The demo can run on all the main MIKROE development boards.

Package can be downloaded/installed directly from NECTO Studio Package Manager(recommended), downloaded from our LibStock™ or found on Mikroe github account.

Library Description

This library contains API for H-Bridge 13 Click driver.

Key functions

- hbridge13_write_reg H-Bridge 13 write register function.
- hbridge13_set_direction H-Bridge 13 set direction function.
- hbridge13_get_an_voltage H-Bridge 13 get xIPROPI voltage function.

Example Description

This example demonstrates the use of the H-Bridge 13 Click board™ by driving the motor connected to OUT A and OUT B, in both directions with braking and freewheeling.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager(recommended), downloaded from our LibStock™ or found on Mikroe github account.

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.HBridge13

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 MIKROE compilers.

mikroSDK

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This Click board™ is supported with mikroSDK - MIKROE 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™

ClickID

Downloads

H-Bridge 13 click example on Libstock

TS5A23157 datasheet

PCA9538A datasheet

74LVC1G3157 datasheet

DRV8411A datasheet

H-Bridge 13 click 2D and 3D files

H-Bridge 13 click schematic

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