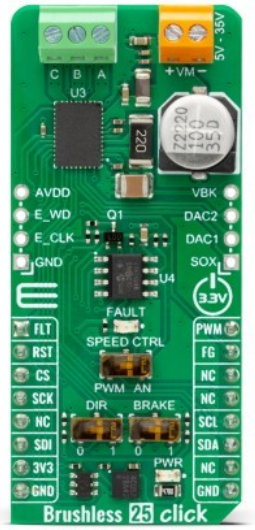
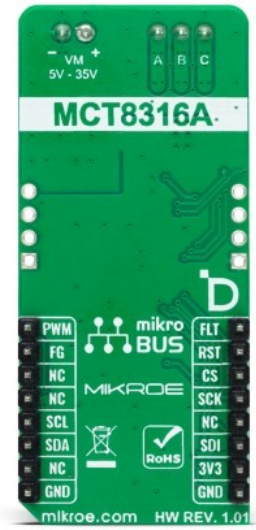
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Brushless 25 Click





PID: MIKROE-5644

Brushless 25 Click is a compact add-on board that controls brushless DC (three-phase BLDC) motors with any MCU. This board features the MCT8316A, a high-speed sensorless trapezoidal control integrated FET BLDC driver from Texas Instruments. It provides three individually controllable drivers intended to drive a three-phase BLDC motor, solenoids, or other loads. Each output driver channel consists of N-channel power MOSFETs (six of them in total) configured in a 1/2-H-bridge configuration. Besides, it has a wide operating voltage range from 4.5V to 35V, alongside several built-in protection circuits such as undervoltage, overvoltage, charge pump faults, overcurrent, and overtemperature. This Click board™ makes the perfect solution for driving three-phase brushless DC motors up to 8A peak output current rating.

Brushless 25 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?

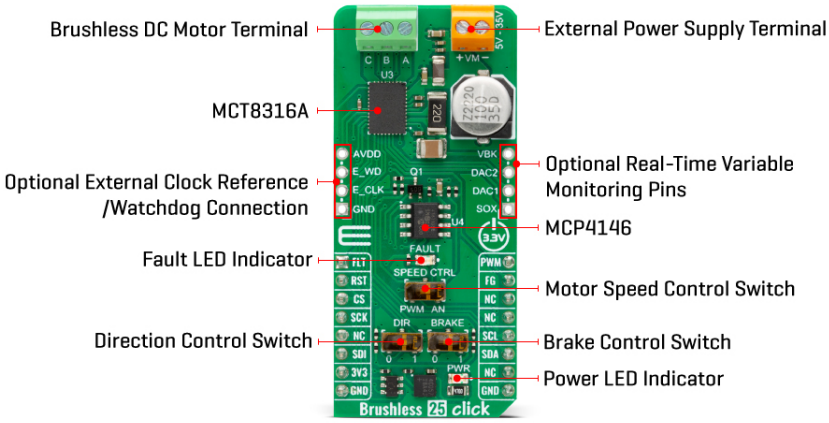
Brushless 25 Click is based on the MCT8316A, a high-speed sensorless trapezoidal control integrated FET BLDC driver from Texas Instruments. It is the ideal solution for applications requiring the high-speed operation of up to 3kHz of electrical speed, a very fast startup time of under 50ms for 12V to 24V BLDC motors, and fast deceleration of under 150ms. The driver's control is highly configurable through register settings stored in an onboard non-volatile EEPROM. This feature allows the device to operate as a stand-alone device once it has been configurated. In addition, the MCT8316A allows a high level of monitoring, where any variable in the algorithm can be observed as an analog output via two 12-bit DACs.

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Brushless 25 Click uses a standard I2C 2-Wire interface that allows the host MCU to configure EEPROM settings and read detailed fault and motor state information. If a fault condition occurs, the MCT8316A will pull the FLT pin to a low logic state, with a FAULT LED as a visual presentation. The FG pin is used as a motor speed indicator and provides pulses proportional to motor speed. For connecting the three-phase BLDC motor, this Click board™ features the half-bridge output CBA screw terminal and a VM terminal for an external motor power supply. The RST pin can set the motor driver to sleep mode by turning all MOSFETs OFF.

There are three switches to control the connected motor manually. The speed can be controlled by a PWM or analog value, which can be selected via the SPEED CTRL switch. The PWM signal can be set over the corresponding pin of the mikroBUS™ socket, while the analog value can be set over the MCP4161, an 8-bit, single SPI digital potentiometer with non-volatile memory from Microchip. The motor driver expects up to 95KHz of PWM frequency or an analog voltage in 732µV resolution. In addition, this is also a way to wake up the motor driver from sleep mode.

The DIR switch changes the direction of the motor spinning with 0 and 1 positions. The low position (0) sets the phase driving sequence as ABC, while the high position (1) sets the ACB sequence. The I2C interface can overwrite this input. The Brake switch also has two states, with high entering the brake state. The MCT8316A will decrease the output speed to the threshold value and stay in the brake state as long as this switch is in a high position. This input also can be overwritten by the I2C interface.

In addition, the Brushless 25 Click comes with two headers above the mikroBUS™ socket for some optional feature addition. The VBK pin on the right-side unpopulated header is an output voltage pin from the internal buck regulator for some external loads. Other pins on this header are for monitoring algorithm variables and phase current feedback through DAC and SOX pins (the SOX pin can also be configured as one of the DAC pins). On the left side is an unpopulated header with E_WD and E_CLK signals acting as the external clock reference and watchdog input pins.

This Click board™ can only be operated with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. However, the Click board™ comes equipped with a library containing functions and an example code that can be used as a reference for further development.

Specifications

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Type	Brushless
Applications	Can be used for driving three-phase brushless DC motors, solenoids or other loads up to 8A output current rating
On-board modules	MCT8316A - high-speed sensorless trapezoidal control integrated FET BLDC driver from Texas Instruments
Key Features	Sensorless motor control algorithm, high output current, low power sleep mode, overcurrent detection and protection, fault diagnostic output, thermal warning and shutdown, PWM and analog motor control, brake function, direction spinning function, and more
Interface	I2C,SPI
ClickID	Yes
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V,External

Pinout diagram

This table shows how the pinout on Brushless 25 click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™				Pin	Notes
Fault Indicator	**FLT**	1	AN	PWM	16	**PWM**	PWM Signal
Reset	**RST**	2	RST	INT	15	**FG**	Motor Speed Indicator
SPI Chip Select	**CS**	3	CS	RX	14	NC	
SPI Clock	**SCK**	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	**SCL**	I2C Clock
SPI Data IN	**SDI**	6	MOSI	SDA	11	**SDA**	I2C Data
Power Supply	**3.3V**	7	3.3V	5V	10	NC	
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
LD2	Fault	-	Fault LED Indicator
SW1	SPEED CTRL	Right	Speed Control Selection PWM/AN: Left position PWM, Right position AN
SW2	BRAKE	Right	Brake Selection 0/1: Left position 0, Right

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			position 1
SW3	DIR	Right	Direction Spinning Selection 0/1: Left position 0, Right position 1

Brushless 25 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
External Supply Voltage Input	4.5	-	35	V
Maximum Output Current	-	-	8	A

Software Support

We provide a library for the Brushless 25 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 Brushless 25 Click driver.

Key functions

- brushless25_register_write Brushless 25 data writing function.
- brushless25_register_read Brushless 25 data reading function.
- brushless25_set_speed_value Brushless 25 set speed function.

Example Description

Application example shows the device's capability of controlling the brushless motor speed and state of the driver.

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.Brushless25

Additional notes and informations

Depending on the development board you are using, you may need USB UART click, USB UART

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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

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

Brushless 25 click example on Libstock

MCT8316A datasheet

MCP4146 datasheet

Brushless 25 click 2D and 3D files

Brushless 25 click schematic

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