

Brushless 22 Click



PID: MIKROE-4995

Brushless 22 Click is a compact add-on board suitable for controlling brushless DC (BLDC) motors with any MCU. This board features the MTD6508, a 3-phase full-wave sensorless driver for BLDC motors from Microchip Technology. It features 180° sinusoidal drive, high torque output, and silent drive, rated for an operating voltage range including both mikroBUS™ power rails, and comes with speed control achieved through pulse-width modulation (PWM). Besides, it features several diagnostic circuits and drive-control functions such as motor lock protection, overcurrent limitation, and thermal shutdown protection. This Click board™ makes the perfect solution for home appliances and industrial equipment, such as cooling fans.

Brushless 22 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 22 Click as its foundation uses the MTD6508, a 3-phase full-wave sensorless driver for brushless DC motors from Microchip Technology. It features a 180° sinusoidal drive, high torque output, and silent drive. High efficiency and low power consumption are achieved due to CMOS transistors and a synchronous rectification drive type. With adaptive features and parameters, the MTD6508 is intended to cover a broad range of motor characteristics, making this Click board™ extremely cost-efficient in fan applications that require low acoustic noise, low mechanical vibration, and are highly efficient.

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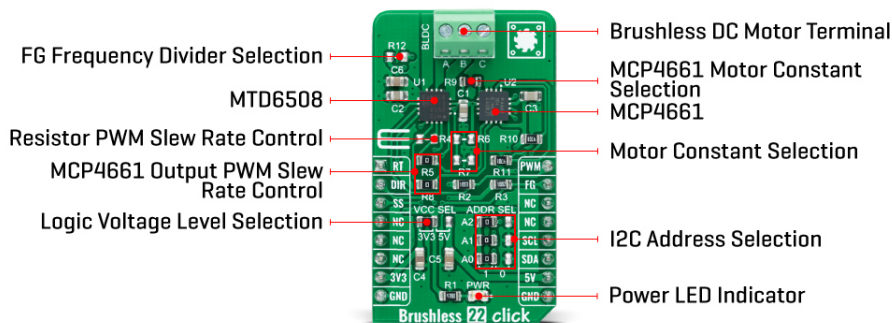
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This device provides start-up output slew rate and PWM duty cycle control that permit designers to balance acoustic performance and reliability. The rotational speed of the motor is controlled through the mikroBUS™ PWM signal. When the PWM signal is high, the motor rotates at full speed, and when the PWM signal is low, the MTD6508 outputs are set to a high impedance state, and the motor is stopped. The sinusoidal start-up open-loop phase current amplitude is controlled via SS pin, routed on the CS pin of the mikroBUS™ socket, which according to its logic state, chooses whether it is defined by the PWM input duty cycle or fixed at 100%. The output PWM slew rate can be adjusted with the R4 resistor during Start-Up, which is not populated in a default configuration to reduce motor vibration.

By default configuration, the output PWM slew rate can be set via the [MCP4661](#) digital potentiometer from Microchip Technology, which establishes communication with the MCU via I2C serial communication. The MCP4661 also allows the choice of the least significant bit (LSB) of its I2C slave address by positioning SMD jumpers labeled as ADDR SEL to an appropriate position marked as 0 and 1. Once the Start-Up open loop is finished, the MTD6508 will automatically switch to a fixed slew rate. Choosing MCP4661 and not R4 for setting output PWM slew rate, unpopulate R4 resistor, and leave populated R5 and R8.

In addition to the output PWM slew rate and its setting method, the user is also given the option of setting the electromechanical coupling coefficient of the motor (also referred to as “motor constant” or “BEMF constant”) via R9 resistor, which is populated in default configuration or by R6 and R7 voltage divider. The MTD6508 defines the BEMF coefficient as the peak value of the phase-to-phase BEMF voltage normalized to the electrical speed of the motor. Choosing MCP4661 and not voltage divider for setting BEMF constant, unpopulate R9 resistor and leave populated R6 and R7.

Alongside I2C communication, several GPIO pins connected to the mikroBUS™ socket pins are also used to forward the information to the MCU. The DIR pin, routed on the RST pin of the mikroBUS™ socket, is used to select the direction of motor rotation (clockwise/counterclockwise). The RT pin, routed on the AN pin of the mikroBUS™ socket, adjusts the phase regulation parameters to allow more stability in applications using 3-Phase BLDC motors attached to a light load, while the FG pin routed on the INT pin serves as a rotation speed indicator, gives information about the speed and phase of the motor. With R12 populated, the rotor speed rotation per minute (RPM) has to be multiplied by three because the FG signal frequency will be divided by three.

This Click board™ can operate with both 3.3V and 5V logic voltage levels selected via the VCC

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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	Brushless
Applications	Can be used for home appliances and industrial equipment, such as cooling fans
On-board modules	MTD6508 - 3-phase full-wave sensorless driver for brushless DC motors from Microchip Technology
Key Features	180° sinusoidal drive for high efficiency and low acoustic noise, position sensorless BLDC driver, motor constant setting, speed control, PWM slew rate control, protection features, and more
Interface	GPIO,I2C,PWM
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 Brushless 22 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
Phase Regulation	RT	1	AN	PWM	16	PWM	PWM Signal
Forward/Reverse Direction	DIR	2	RST	INT	15	FG	Rotation Speed Indicator
Start-Up Strength	SS	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

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			position 3V3, Right position 5V
JP2-JP4	ADDR SEL	Left	I2C Address Selection 1/0: Left position 1, Right position 0
R4	R4	Unpopulated	Output PWM Slew Rate Control via Resistor
R5/R8	R5/R8	Populated	Output PWM Slew Rate Control via MCP4661
R9	R9	Populated	Motor Constant Selection via MCP4661
R6/R7	R6/R7	Unpopulated	Motor Constant Selection via Resistors
R12	R12	Unpopulated	FG Frequency Divider Selection Jumper

Brushless 22 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Maximum Output Current	-	-	1	A
Operating Frequency	1	-	100	kHz
Operating Temperature Range	-40	+25	+120	°C

Software Support

We provide a library for the Brushless 22 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 Brushless 22 Click driver.

Key functions

- `brushless22_set_slew_rate_resistance` This function sets the slew rate resistance by configuring the onboard digital potentiometer.
- `brushless22_set_duty_cycle` This function sets the PWM duty cycle in percentages (Range[0..1]).
- `brushless22_switch_direction` This function switches the direction by toggling the DIR pin state.

Example Description

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This example demonstrates the use of the Brushless 22 Click board™ by driving the motor in both directions at different speeds.

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 github account](#).

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.Brushless22

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 MikroElektronika [compilers](#).

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

[Brushless 22 click example on Libstock](#)

[Brushless 22 click 2D and 3D files](#)

[MTD6508 datasheet](#)

[MCP4661 datasheet](#)

[Brushless 22 click schematic](#)

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