

Brushless 21 Click



PID: MIKROE-5055

Brushless 21 Click is a compact add-on board suitable for controlling brushless DC (BLDC) motors with any MCU. This board features the [AMT49400](#), an advanced 3-phase, sensorless BLDC motor driver with integrated power MOSFETs from [Allegro Microsystems](#). The AMT49400 is rated for an operating voltage range from 4V to 16V. Motor rotation speed is controlled by applying a duty cycle command to the PWM input, while a simple I2C interface is provided for setting motor-rated voltage, rated current, rated speed, resistance, and startup profiles. Besides, it features additional diagnostic circuits and drive-control functions such as motor lock detection and over-current (short) protection. This Click board™ makes the perfect solution for home appliances such as pumps and cooling fans, industrial equipment, and more.

Brushless 21 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 21 Click as its foundation uses the AMT49400, a three-phase BLDC controller with integrated MOSFETs from Allegro Microsystems. The integrated field-oriented control (FOC) algorithm achieves the best efficiency and dynamic response and minimizes acoustic noise. Also, Allegro's proprietary non-reverse startup algorithm improves startup performance. The BLDC motor, connected to the terminals labeled as U, V, and W, will start towards the target direction after power-up without reverse shaking or vibration. The Soft-On Soft-Off (SOSO) feature gradually increases the current to the motor at ON command (windmill condition). It gradually reduces the current from the motor at the OFF command, further reducing the acoustic noise and operating the motor smoothly.

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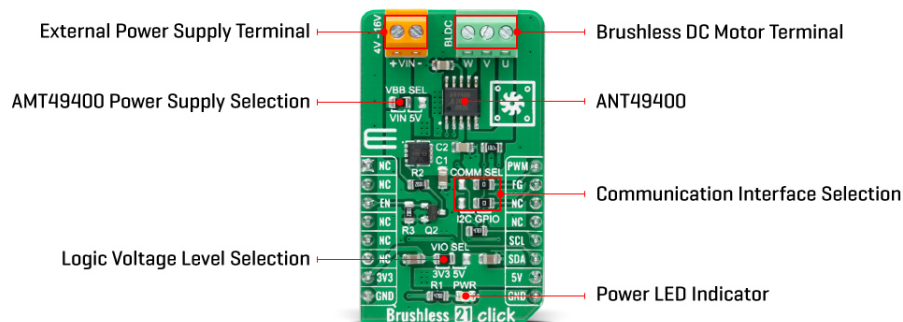
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This Click board™ allows interface selection to communicate with MCU. The selection between PWM and I2C interface can be made by positioning SMD jumpers labeled as COMM SEL to an appropriate position. Note that all the jumpers' positions must be on the same side, or the Click board™ may become unresponsive. While the I2C interface is selected, setting motor-rated voltage, rated current, rated speed, resistance, and startup profiles are allowed via the EEPROM programmability. On the other side, the motor speed is controlled by applying a duty cycle command to the PWM input pin of the AMT49400.

Alongside the PWM pin from the mikroBUS™ socket, this Click board™ also has the Enable pin labeled as EN and routed to the CS pin of the mikroBUS™ socket to optimize power consumption used for power ON/OFF purposes. The FG pin, routed on the INT pin of the mikroBUS™ socket, provides motor speed information to the system, such as motor lock detection. This feature monitors the motor position to determine if the motor is running as expected. If a lock condition is detected, the motor drive will be disabled for 5 seconds before an attempted auto-restart.

This Click board™ can operate with both 3.3V and 5V logic voltage levels selected via the VIO SEL jumper. It allows for both 3.3V and 5V capable MCUs to use the communication lines properly. Additionally, there is a possibility for the AMT49400 power supply selection via jumper labeled as VBB SEL to supply the AMT49400 from an external power supply terminal in the range from 4V to 16V or with 5V from mikroBUS™ power rail. 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 such as pumps and cooling fans, industrial equipment, and more
On-board modules	AMT49400 - three-phase BLDC controller with integrated MOSFETs from Allegro Microsystems
Key Features	Coding-free sensorless field-oriented control, quiet and quick startup, PWM/I2C interface, lock detection, optional closed-loop speed

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	control, protection features, and more
Interface	I2C,PWM
ClickID	No
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V or 5V,External

Pinout diagram

This table shows how the pinout on Brushless 21 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	PWM	PWM Signal
Enable	EN	2	RST	INT	15	FG	Motor Speed Detection
	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	VIO SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	VBB SEL	Left	AMT49400 Power Supply Selection VIN/5V: Left position VIN, Right position 5V
JP3-JP4	COMM SEL	Right	Communication Interface Selection I2C/GPIO: Left position I2C, Right position GPIO

Brushless 21 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage VIO	3.3	-	5	V
External Supply Voltage VIN	4	-	16	V
Operating Temperature Range	-40	+25	+105	°C
Maximum Output Current	-	-	2	A

Software Support

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We provide a library for the Brushless 21 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 21 Click driver.

Key functions

- brushless21_set_duty_cycle This function sets the duty cycle in percentages (Range[0..1]).
- brushless21_get_motor_speed This function reads the motor speed in Hz.
- brushless21_switch_direction This function switches the motor direction by toggling the DIR bit.

Example Description

This example demonstrates the use of the Brushless 21 Click board™ by driving the motor 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.Brushless21

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

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[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

Downloads

[Brushless 21 click 2D and 3D files](#)

[AMT49400 datasheet](#)

[Brushless 21 click schematic](#)

[Brushless 21 click example on Libstock](#)

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