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Brushless 16 Click





PID: MIKROE-4742

Brushless 16 Click is a compact add-on board suitable for controlling BLDC motors with any MCU. This board features the LB11685AV, a three-phase full-wave current-linear-drive motor driver from ON Semiconductor. It adopts a sensorless control system without the use of a Hall Effect device. The LB11685AV features a current soft switching circuit for quieter operation and is optimal for driving the cooling fan motors used in refrigerators. It also comes with several protection features such as motor lock, thermal shutdown, current limit, beat lock detection, and more. This Click board™ makes the perfect solution for use in home appliances such as air-conditioner and cooling fans, air purifiers, and industrial equipment.

Brushless 16 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?

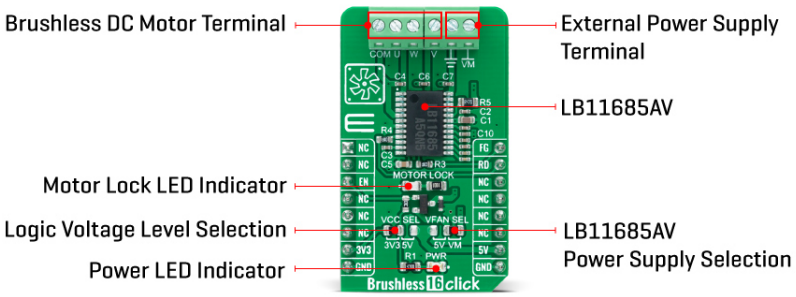
Brushless 16 Click as its foundation uses the LB11685AV, a three-phase full-wave current-linear-drive motor driver from ON Semiconductor. The LB11685AV adopts a sensorless control system without the use of a Hall-effect device. It features a current soft switching circuit for silent operation. Alongside, it is also characterized by easy control, current limit, and various protection features. This Click board™ makes the perfect solution for delivering quiet, cool operation to home appliances and office automation equipment.

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Start-Up Mode is set when the LB11685AV starts up its operation. After the "START" position, the LB11685AV outputs energization timing patterns for a Start-Up in each output (U/V/W) to determine the position of a motor. Based on the timing pattern, the motor starts rotation in which LB11685AV detects back-EMF, which defines a motor position. As a result, the LB11685AV outputs energization timing, which synchronizes with the motor position to the motor. That's how a motor starts rotation. When the LB11685AV switches from Start-Up Mode to Regular rotation Mode, the driving current is switched to full driving mode, which increases the rotation speed until it is stabilized.

Brushless 12 Click communicates with MCU using several GPIO pins. The device can be enabled or disabled through a dedicated Enable (EN) pin routed on the CS pin of the mikroBUS™ socket while the FG pin routed on the PWM pin serves as a rotation speed indicator and outputs a rectangular waveform in reverse to V motor signal made by back EMF. Besides, it is possible to detect motor lock events on the interrupt RD pin routed to the INT signal of the mikroBUS™ socket, where the indication of such a condition is performed using the red LED indicator labeled as MOTOR LOCK.

Brushless 16 Click supports an external power supply connected to the input terminal labeled as VM, next to the U, V, W, and COM terminals on which the BLDC motor needs to be connected. The absolute maximum rating of the power supply voltage is 19V which must not be exceeded, even for a moment. Do not exceed any of these ratings!

This Click board™ can operate with both 3.3V and 5V logic voltage levels selected via the VCC SEL jumper. It allows for both 3.3V and 5V capable MCUs to use the communication lines properly. Additionally, there is a possibility for LB11685AV power supply selection via jumper labeled as VFAN SEL to supply the LB11685AV from an external input terminal in the range from 4.5 to 19V or with a 5V from mikroBUS™ power rail.

Specifications

Type	Brushless
Applications	Can be used for use in home appliances such as air-conditioner and cooling fans, air purifiers, and industrial equipment.
On-board modules	LB11685AV - three-phase full-wave current-linear-drive motor driver from ON

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	Semiconductor
Key Features	Low power consumption, Hall-senor less, easy control, protection features (current limit, lock detection, thermal protection), stability at booting, and more
Interface	GPIO
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 16 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	**FG**	Rotation Speed Indication
	NC	2	RST	INT	15	**RD**	Motor Lock Detection
Enable	**EN**	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
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
LD2	MOTOR LOCK	-	Motor Lock LED Indicator
JP1	VCC SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	VFAN SEL	Right	LB11685AV Power Supply Selection 5V/VM: Left position 5V, Right position VM

Brushless 16 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage VCC	3.3	-	5	V
Supply Voltage VM	4.5	12	18	V
Maximum Output Current	-	-	1.2	A
Operating Temperature Range	-40	+25	+85	°C

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Software Support

We provide a library for the Brushless 16 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 16 Click driver.

Key functions:

- brushless16_cfg_setup - Config Object Initialization function.
- brushless16_init - Initialization function.

Examples description

This example showcases ability to enable and disable motor output, and check the status pins.

The application is composed of three sections :

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.Brushless16

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™

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mikroSDK

Click board™ Catalog

Click boards™

Downloads

Brushless 16 click 2D and 3D files

LB11685AV datasheet

Brushless 16 click schematic

Brushless 16 click example on Libstock

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