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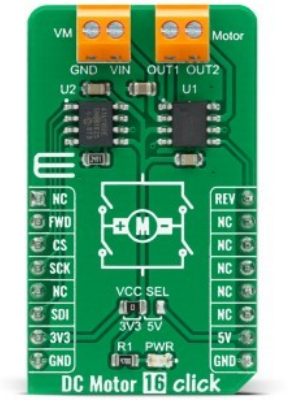
DC Motor 16 Click



PID: MIKROE-4333

DC Motor 16 Click is a compact add-on board that contains a high-performance single phase reversible DC motor drive with speed control. This board features the ZXBM5210, a fully-featured DC motor drive solution with an average current capability of up to 700mA from Diodes Incorporated. The ZXBM5210 has several modes of operations selected by two GPIO pins, has a wide supply voltage range from 3V to 18V, and low power consumption. It possesses three speed control modes, and provides under/over voltage protection, over current limit, and thermal shutdown capability. This Click board™ is suitable for a reversible DC motor and actuator drive, remote control motorized toy applications, home appliances, handheld power tools, and many more.

DC Motor 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?

DC Motor 16 Click is based on the ZXBM5210, a single chip solution for driving a single-coil reversible direct current (DC) fans and motors from Diodes Incorporated. The driver output stage is designed to minimize audible switching noise and electromagnetic interference (EMI) ensuring a low noise solution. The device has four motor operation modes: Standby, Forward, Reverse, and Brake Mode. These four modes are controlled by the FWD and REV pins routed to the RST and PWM pins of the mikroBUS™ used for controlling the motor rotation directions. In the Standby mode, all the internal circuits are turned off to minimize power consumption, while the Brake mode allows the motor to stop quickly. The power consumption in the Standby mode is less than in the Brake mode. To prevent the ZXBM5210 from entering the Standby mode

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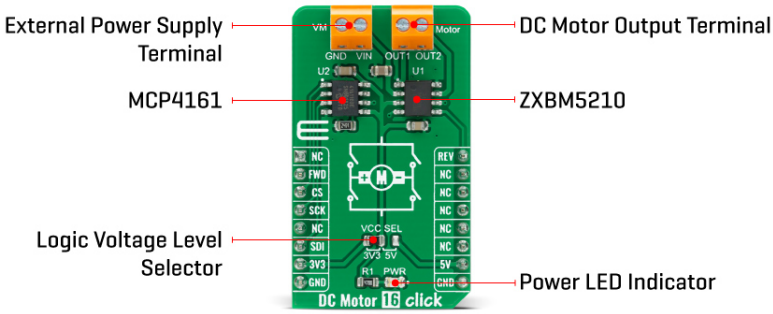
during mode changes, the signal change should be completed within 125µs.



The ZXBM5210 also possesses three modes of motor speed control: VREF speed control mode, PWM speed control mode, and motor speed control by adjusting the supply voltage. Motor speed can be controlled by adjusting the duty cycle of the PWM signal while keeping the supply voltage pin at the nominal motor voltage or can be controlled by varying the supply voltage while the FWD and REV pins are set to either a logic high or low depending on needed motor direction. In PWM Mode the input voltage on the Vref pin of the ZXBM5210 must be greater than or equal to the supply voltage value.

The motor speed of the ZXBM5210 can be controlled by adjusting the DC voltage on the Vref pin. For this purpose, the DC Motor 16 click employs the MCP4161 digital potentiometer from Microchip, which allows setting the corresponding voltage value via the SPI serial interface. The potentiometer terminal B is fixed to the Zero-Scale wiper value (which corresponds to a wiper value of 0x00 for both 7-bit and 8-bit devices), while the potentiometer terminal A is fixed connected to the Full-Scale wiper value (which corresponds to a wiper value of 0x100 for 8-bit devices or 0x80 for 7-bit devices). For this reason, it was chosen that when the user selects 0x100 as the desired value, the value on the Vref pin takes the value of supply voltage from the mikroBUS™ (VCC), while in the case of selecting 0x00 on the Vref pin value is equal to the 0.2*VCC. In this mode, FWD and REV pins are only used for direction control, and therefore high-frequency PWM control signal should not be applied to those pins.

This Click board™ is designed to be operated with both 3.3V and 5V logic voltage levels that can be selected via VCC SEL jumper. This allows for both 3.3V and 5V capable MCUs to use the SPI communication lines properly. However, the Click board™ comes equipped with a library that contains 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 a reversible DC motor and actuator drive, remote control motorized toy applications, home appliances, handheld power tools, and many more.
On-board modules	DC Motor 16 Click is based on the ZXBM5210,

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	a single chip solution for driving a single-coil reversible direct current (DC) fans and motors from Diodes Incorporated.
Key Features	Low power consumption, wide supply voltage range, under/over voltage protection, over current limit, thermal shutdown capability, and many more.
Interface	GPIO,SPI
ClickID	No
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 DC Motor 16 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	**REV**	Reverse Direction PWM Control Signal
Forward Direction	**FWD**	2	RST	INT	15	NC	
SPI Chip Select	**CS**	3	CS	RX	14	NC	
SPI Clock	**SCK**	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
SPI Data IN	**SDI**	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
JP1	VCC SEL	Left	Power Supply Voltage Selection 3V3/5V: Left position 3V3, Right position 5V

DC Motor 16 Click electrical specifications

Description	Min	Typ	Max	Unit
External Supply Voltage	3	-	18	V
FWD and REV Pin Voltage	-0.3	-	7	V
Maximum Output Current	-	700	1200	mA
PWM Speed Control Signal Frequency	8	25	100	kHz
Operating Temperature Range	-40	-	+85	°C

Software Support

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We provide a library for the DC Motor 16 Click on our LibStock page, as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika development boards.

Library Description

The library covers all the necessary functions to control DC Motor 16 click board. There are functions for controlling motor speed, direction, starting and stoping.

Key functions:

- void dcmotor16_set_direction(uint8_t dir) - Set motor direction
- void dcmotor16_ctrl_vref(uint16_t value) - Control motor VRef (speed)
- void dcmotor16_stop(void) - Motor stop

Examples description

The application is composed of three sections :

- System Initialization - Initialization SPI module and all necessary GPIO pins
- Application Initialization - Initialization driver init
- Application Task - Start motor example with change motor direction and speed

The full application code, and ready to use projects can be found on our LibStock page.

Other mikroE Libraries used in the example:

- SPI Library
- UART Library

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™

mikroSDK

Click board™ Catalog

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Click boards™

Downloads

ZXBM5210 datasheet

MCP4161 datasheet

DC Motor 16 click schematic

DC Motor 16 click example on Libstock

DC Motor 16 click 2D and 3D files

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