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Stepper 9 Click





PID: MIKROE-5263

Stepper 9 Click is a compact add-on board that contains a bipolar stepper motor driver. This board features the TB67S581FNG, a two-phase bipolar stepping motor driver from Toshiba Semiconductor. Fabricated with the BiCD process, it supports a PWM constant-current control drive and steps resolution from full to 1/32 for less motor noise and smoother control. It has a wide operating voltage range of 8.2V to 44V with a maximum output current capacity of 2A, decay modes selection function, protection, and several anomaly detection indicators. This Click board™ makes the perfect solution for small stepping motors in various applications such as consumer electronics and industrial equipment.

Stepper 9 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?

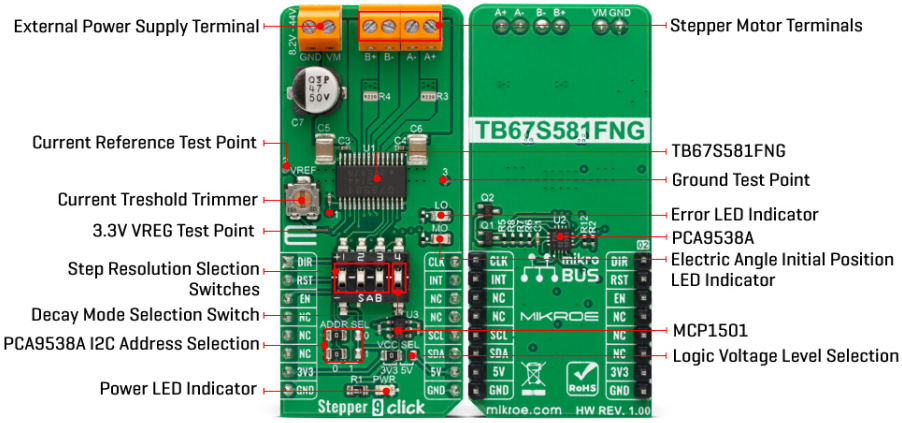
Stepper 9 Click is based on the TB67S581FNG, a two-phase bipolar stepping motor driver designed to control one bipolar stepping motor from Toshiba Semiconductor. The TB67S581FNG supports a PWM constant-current control drive and incorporates low on-resistance DMOS FETs, delivering a 2A maximum current. It can also provide a motor output voltage rating of around 40V and has integrated protection mechanisms such as over-current, over-temperature, and under-voltage lockout for error detection (red LO LED indicator). It supports full-step to 1/32 steps resolution for less motor noise and smoother control, with a built-in regulator that allows the motor to be driven by a single power supply.

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The current value in the PWM constant-current mode is set by the reference voltage obtained by the MCP1501, a high-precision voltage regulator. Also, the current threshold point of the TB67S581FNG, alongside MCP1501, can be set manually using an onboard trimmer labeled VREF. The TB67S581FNG supports various step resolution configurations through its control signals. These signals, like step resolution settings, sleep mode, or LO/MO indicators, are controlled through the PCA9538A port expander, which establishes communication with the MCU via the I2C serial interface. In addition to this digital way of setting, these functions can also be selected manually via a multifunctional switch by selecting a particular switch (1,2,3 – Step Resolution Setting; 4 - Decay Mode Control). The PCA9538A also allows choosing 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, alongside its interrupt feature routed to the INT pin of the mikroBUS™ socket.

The CLK clock signal, routed to the default PWM position on the mikroBUS™ socket, shifts the current step and electrical angle of the motor with its every up-edge, while the Enable pin, labeled as EN and routed to the default CS position, controls the state of the output A and B stepping motor drive channels. Besides, all circuits can be stopped using the Sleep function and thus enable power saving mode. A simple DIR pin routed to the default AN position on the mikroBUS™ socket allows MCU to manage the direction of the stepper motor (clockwise or counterclockwise) while the RST pin initializes an electrical angle in the internal counter to set an initial position. Achieving an initial electrical angle position is indicated via onboard orange LED labeled as MO.

The Stepper 9 Click supports an external power supply for the TB67S581FNG, which can be connected to the input terminal labeled as VM and should be within the range of 8.2V to 44V, while the stepper motor coils can be connected to the terminals labeled as B+, B-, A-, and A+.

This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the VCC SEL jumper. This way, both 3.3V and 5V capable MCUs can 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	Stepper
Applications	Can be used for small stepping motors in various applications such as consumer

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	electronics and industrial equipment
On-board modules	TB67S581FNG - two-phase bipolar stepping motor driver from Toshiba Semiconductor
Key Features	Low power consumption, capable of controlling one bipolar stepping motor, PWM controlled constant-current drive, operational in full, half, quarter, 1/8, 1/16, and 1/32 step resolutions, selectable decay mode, anomaly detection functions, and more
Interface	GPIO,I2C
ClickID	No
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Stepper 9 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Rotation Direction	**DIR**	1	AN	PWM	16	**CLK**	Step Clock
Electrical Angle Intilizing	**RST**	2	RST	INT	15	**INT**	Interrupt
Enable	**EN**	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
LD2	MO	-	Electric Angle Initial Position LED Indicator
LD3	LO	-	Error LED Indicator
JP1	VCC SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
JP2-JP3	ADDR SEL	Left	I2C Address Selection 0/1: Left position 0, Right position 1
SW1	POS 1-2-3	Middle	Step Resolution Setting Switch
SW1	POS 4	Middle	Mixed Decay Control

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			Switch
VR1	VREF	-	Current Threshold Trimmer

Stepper 9 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage VCC	3.3	-	5	V
External Supply Voltage VM	8.2	24	44	V
Maximum Output Voltage	-	-	50	V
Maximum Output Current	-	-	2	A
Maximum Step Clock Frequency	-	-	250	kHz

Software Support

We provide a library for the Stepper 9 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 Stepper 9 Click driver.

Key functions

- stepper9_set_direction This function sets the motor direction by setting the DIR pin logic state.
- stepper9_drive_motor This function drives the motor for the specific number of steps at the selected speed.
- stepper9_set_step_mode This function sets the step mode resolution settings.

Example Description

This example demonstrates the use of the Stepper 9 Click board™ by driving the motor in both directions for a desired number of steps.

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.Stepper9

Additional notes and informations

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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 MIKROE compilers.

mikroSDK

This Click board™ is supported with mikroSDK - MIKROE Software Development Kit, that needs to be downloaded from the LibStock and installed for the compiler you are using to ensure proper operation of mikroSDK compliant Click board™ demo applications.

For more information about mikroSDK, visit the official page.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

Downloads

Stepper 9 click example on Libstock

MCP1501 datasheet

TB67S581FNG datasheet

PCA9538A datasheet

Stepper 9 click 2D and 3D files

Stepper 9 click schematic

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