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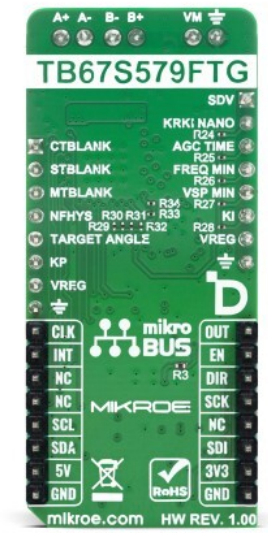
Stepper 29 Click



PID: MIKROE-6903

Stepper 29 Click is a compact add-on board for control of bipolar stepper motors in motion control, automation, robotics, and embedded positioning applications. It is based on the TB67S579FTG, a PWM chopper-type 2-phase bipolar stepper motor driver IC from Toshiba Semiconductor. This IC supports a motor supply operating range from 4.5V to 34V with up to 1.8A output current, enabling motor drive using a single VM supply thanks to the integrated internal regulator. It features manual current threshold adjustment, integrated protection mechanisms, configurable step resolutions up to 1/32 microstepping, flexible decay mode selection, and extended configuration through a I2C port expander for advanced driver control. This Click board is suitable for stepper motor control in office equipment and a range of commercial and industrial equipment. Stepper 29 Click features Advanced Microstepping with continuous sine-wave phase current for ultra-smooth, low-noise operation, even at full-step mode. It also includes AGC 2nd generation for automatic current regulation and integrated Stall Detection to prevent motor stalls.

For more information about **Stepper 29 Click** visit the official product page.

How does it work?

Stepper 29 Click is based on the TB67S579FTG, a PWM chopper-type 2-phase bipolar stepper motor driver IC from Toshiba Semiconductor. This driver supports a motor supply operating range from 4.5V to 34V. and can deliver up to 1.8A of output current, allowing control of a variety of stepper motors using a single VM power supply thanks to its integrated internal regulator. The TB67S579FTG is made as a monolithic IC using Toshiba’s BiCD process technology with DMOSFET output transistors for stable motor drive. The motor current level is defined by a reference voltage generated by the MCP1501 high-precision voltage reference,

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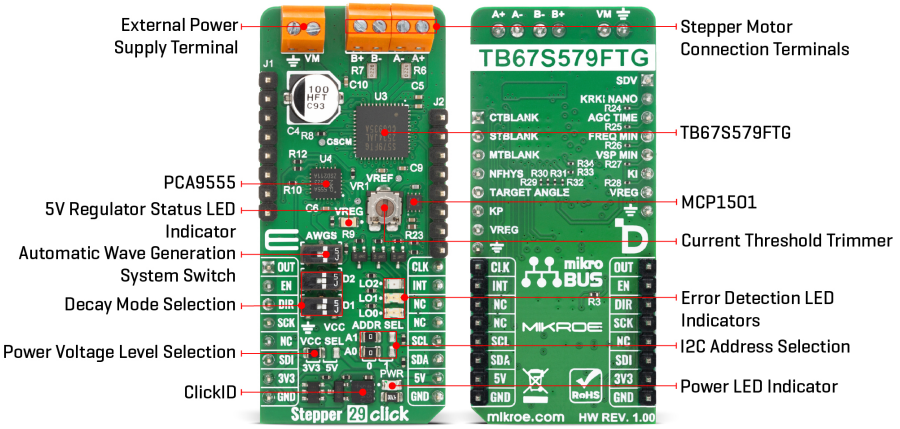
while the onboard VR1 trimmer allows manual adjustment of the current threshold to match the requirements of different motors. In addition, the driver integrates several protection mechanisms including over-temperature detection, overcurrent detection, open-load detection, stall detection, and under-supply voltage lockout.



The control of the Stepper 29 Click is managed through specific pins on the mikroBUS™ socket: The CLK clock signal, routed to the default PWM position, advances the motor's current step and electrical angle with each rising edge. The output enable pin, EN pin, controls the activation state of the output A and B stepping motor drive channels. Additionally, the DIR pin determines the rotation direction of the stepping motor, with a HIGH logic level indicating forward rotation and a LOW logic level indicating reverse rotation. By observing the AGC_OUT pin, the driver's internal reference signal indicates whether the output current is rising or falling, eliminating the need for direct motor current measurement.

Due to the limited number of pins on the mikroBUS™ socket for managing the TB67S579FTG, this board also uses the PCA9555A port expander. The PCA9555A allows choosing the least significant bit (LSB) of its I2C address by positioning SMD jumpers labeled as ADDR SEL to an appropriate position marked as 0 and 1, alongside control of RST pin that resets the electrical angle in the internal counter to an initial position, and interrupt feature (INT). The INT pin signals the host MCU in cases such as overcurrent and overtemperature conditions (in addition to LOx LED indicators for visual detection of these states), as well as the MO pin status that indicates the achievement of the initial electrical angle position.

Besides these functions, the port expander also controls the DMODE pins, which set the step resolution to full, half-step, quarter-step, 1/8, 1/16, or 1/32, ADMD pin for mixed/auto decay mode control, and pins for controlling active gain control (AGC) configuration and automatic time setting. The Sleep mode function allows switching between power-saving mode and normal operation mode. By setting the Sleep mode and then returning to the normal operation mode, it is possible to recover from the forced OFF-state caused by the overheating or over-current detection circuit operation. The SCK and SDI serial interface pins program the TB67S579's internal configuration registers, allowing setup of AGC and Continuous Microstepping parameters.

The D1 and D2 switches controls the Decay mode. The selectable mixed decay function allows to switch between four decay modes MIXED, SLOW, FAST, and ADMD (Advanced Dynamic Mixed Decay). The AWGS switch realizes a pseudo-sine wave even with the input CLK of Full step. In a normal µStep, if the rotational speed is to be maintained at the same rate as during

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Full step, the CLK frequency must be increased according to the number of steps. By using this switch, the TB67S579FTG automatically completes the input CLK, so that µStep operation is possible even with the same CLK as the two-phase excitation. When AWGS is ON, the 1/32 Step operation is forced.

Stepper 29 Click also provides additional configuration flexibility through two unsoldered headers that expose extended control pins from the TB67S579FTG IC. These headers allow users to access internal driver configuration options related to stall detection behavior, micro-stepping gain control, and Active Gain Control (AGC) parameters, enabling fine tuning of motor performance depending on the application requirements. Additional pins are available for adjusting parameters such as blanking time settings, hysteresis control for current detection, and motor phase delay configuration, providing deeper control over the driver's internal operating characteristics. Both headers also expose the VREG output from the driver's internal 5V regulator, which can be used as a reference or auxiliary supply for external circuitry. When the internal regulator is active, the presence of this voltage is indicated by the blue VREG LED on the board.

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. Also, this 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	Ideal for stepper motor control in office, commercial, and industrial equipment, and other applications where low noise and minimal vibration are essential
On-board modules	TB67S579FTG - PWM chopper-type 2-phase bipolar stepper motor driver from Toshiba Semiconductor
Key Features	PWM chopper-type 2-phase bipolar stepper motor driver, wide motor supply range, adjustable current threshold, multiple step resolution modes from full-step to 1/32 microstepping, selectable decay modes, Active Gain Control (AGC) configuration support, pseudo-sine wave generation with automatic microstep completion, I2C port expander for extended control and configuration, integrated protection features, and Continuous Microstepping with internal sine-wave current generation
Interface	I2C,PWM,SPI
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V or 5V,External

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Pinout diagram

This table shows how the pinout on Stepper 29 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Output Current Monitor (AGC_OUT)	**OUT**	1	AN	PWM	16	**CLK**	Step Clock
Output Enable	**EN**	2	RST	INT	15	**INT**	Interrupt
Rotation Direction / ID COMM	**DIR**	3	CS	RX	14	NC	
Serial Clock	**SCK**	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	**SCL**	I2C Clock
Serial Data IN/OUT	**SDI**	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	VREG	-	5V Regulator Status LED Indicator
LD3-LD5	LO1-LO3	-	Error Detection LED Indicators
JP1	VCC SEL	Left	Power Voltage Level 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-SW2	D1-D2	-	Decay Mode Control Switch
SW3	AWGS	-	Automatic Wave Generation System Switch
VR1	VR1	-	Current Threshold Trimmer

Stepper 29 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
External Supply Voltage	4.5	-	34	V
Output Current	-	-	1.8	A

Software Support

Stepper 29 Click demo application is developed using the NECTO Studio, ensuring compatibility with mikroSDK's open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards

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featuring a mikroBUS™ socket.

Example Description

This example demonstrates the use of the Stepper 29 Click board by driving the motor in both directions for a desired number of steps.

Key Functions

- stepper29_cfg_setup This function initializes Click configuration structure to initial values.
- stepper29_init This function initializes all necessary pins and peripherals used for this Click board.
- stepper29_default_cfg This function executes a default configuration of Stepper 29 Click board.
- stepper29_set_direction This function sets the motor direction by setting the DIR pin logic state.
- stepper29_set_step_mode This function sets the step mode resolution settings.
- stepper29_drive_motor This function drives the motor for the specific number of steps at the selected speed.

Application Init

Initializes the driver and performs the Click default configuration.

Application Task

Drives the motor clockwise for 200 full steps and then counter-clockwise for 200 half steps and 400 quarter steps with a 1 second delay on driving mode change. Also monitors the output current which is set by the on-board potentiometer. All data is being logged on the USB UART where you can track the program flow.

Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following this tutorial.
- UART Terminal - Monitor data via the UART Terminal using a USB to UART converter. For detailed instructions, check out this tutorial.

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the NECTO Studio. The application code can also be found on the MIKROE GitHub account.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

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Downloads

Stepper 29 click example package

Stepper 29 click 2D and 3D files v101

Stepper 29 click schematic v101

TB67S579FTG datasheet