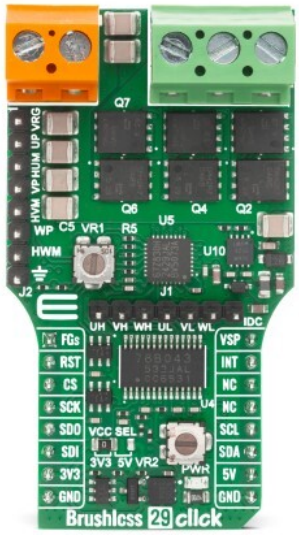
MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

Brushless 29 Click





PID: MIKROE-7085

Brushless 29 Click is a high-current three-phase BLDC motor control board for precise operation in embedded and industrial systems. It features the TC78B043FNG sine-wave PWM controller and TB67Z830HFTG gate driver from Toshiba Semiconductor. The board accepts an external motor power supply of 6V to 48V and delivers up to 10A RMS and 20A peak. An onboard step-down regulator supplies the TC78B043FNG, whose specified VCC operating range is 6V to 23V. SPI direct control of the TC78B043FNG and an I2C expander enable motor configuration, speed adjustment, direction control, rotation feedback, fault indication selection, and configurable protection, while onboard potentiometers and jumpers provide manual tuning and setup. Motor, power, and Hall connectors simplify system integration. The board is suitable for fans, pumps, power tools, robotics, industrial equipment, and automated motion systems.

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

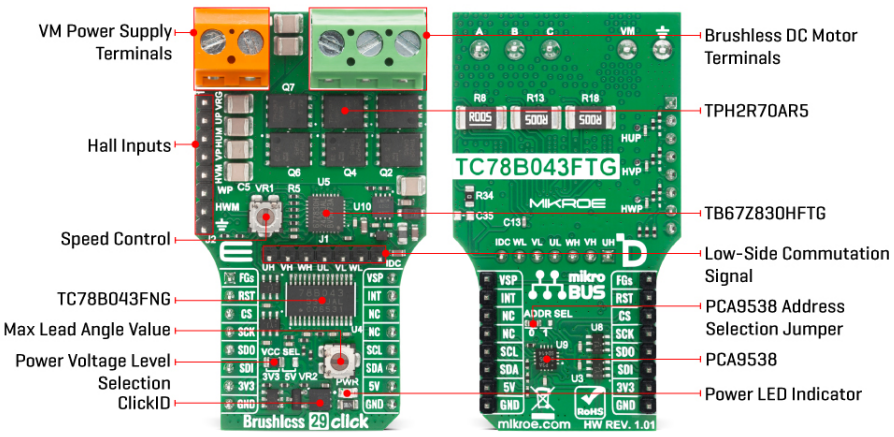
How does it work?

Brushless 29 Click is based on the TC78B043FNG, a sine-wave PWM drive controller for three-phase brushless DC motors from Toshiba Semiconductor. The controller generates six high-side and low-side commutation signals for driving a three-phase power stage and uses three differential Hall-signal input pairs to determine the motor rotor position. Both Hall elements and digital Hall ICs are supported. Its high-resolution sine-wave drive and sine-wave startup control help reduce motor noise and vibration while enabling efficient operation across a wide speed range. The TC78B043FNG also supports forward and reverse rotation, selectable rotation-pulse output, programmable acceleration and deceleration behavior, and speed commands supplied as an analog voltage, PWM duty cycle, or SPI data. These capabilities make the board suitable for Hall-sensored BLDC motors used in fans, pumps, power tools, industrial equipment,

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robotics, and similar motion-control applications.



The TC78B043FNG contains nonvolatile memory for storing motor-control parameters, allowing its behavior to be adapted to the characteristics of the connected motor. The FNG variant includes initial settings suitable for common motor types, while SPI access allows the host MCU to configure drive mode, startup behavior, speed-command source, rotation direction, output duty, automatic or fixed lead-angle control, rotation-pulse generation, and protection behavior. Integrated protection functions include supply undervoltage detection, current limiting, overcurrent detection, thermal shutdown, Hall-position signal monitoring, high-speed lead-angle limiting, and motor-lock protection. The controller's six commutation outputs are connected to the TB67Z830HFTG three-phase gate driver, which controls six TPH2R70AR5 100V N-channel power MOSFETs arranged as three half-bridges. This external power stage is specified for output currents of up to 10A RMS and 20A peak, while low-value shunt resistors and the IDC path provide current information for limiting and protection.

Brushless 29 Click communicates with the host MCU through SPI and I2C interfaces. The TC78B043FNG serial interface operates through the SCK, SDI, and SDO lines mapped to the SCK, MOSI, and MISO pins of the mikroBUS™ socket, while the CS pin controls the communication-mode routing. Since the controller shares its RES, VSP, and FG pins with the serial clock, data-input, and data-output functions, onboard 74LVC1G3157 analog switches automatically route these signals between SPI communication and normal I/O control. When I/O control is selected, the PWM pin provides the VSP speed command as either an analog voltage or a PWM signal, while the AN pin provides the FG rotation-pulse output, which can also be configured to report selected fault conditions. The board also uses a PCA9538A eight-bit GPIO expander, communicating through the SCL and SDA pins at up to 400kHz. The expander controls the TC78B043FNG reset, speed-source selection, motor direction, and gate-driver enable signals while monitoring fault and regulator power-good states. Its reset input is connected to the RST pin, and its interrupt output is available on the INT pin. The CS pin is also shared with the onboard ClickID communication circuitry.

Two onboard potentiometers provide direct adjustment of important motor parameters. VR1 sets the analog speed command, while VR2 provides an analog setting for the maximum or fixed lead-angle value, depending on the selected lead-angle mode and configuration. The VCC SEL jumper selects either the 3.3V or 5V mikroBUS™ rail as the board's logic supply, with the 3.3V position selected by default. The ADDR SEL jumper sets the PCA9538A address-selection input to logic 0 or 1, with position 0 selected by default. The eight-pin J2 header provides the VREG supply, ground, and the HUP/HUM, HVP/HVM, and HWP/HWM differential inputs required

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for connecting the three Hall channels. The seven-pin J1 header exposes the UH, VH, WH, UL, VL, and WL commutation signals together with the IDC signal for monitoring, testing, or connection to external circuitry. A three-position screw terminal connects the motor phases A, B, and C, while a separate two-position terminal accepts the external VM supply and ground. The board also includes a PWR LED for visual power indication and ClickID support for automatic identification by a compatible host system.

Brushless 29 Click uses both the 3.3V and 5V rails from the mikroBUS™ socket, with the active logic rail selected through the VCC SEL jumper. The motor power stage requires a separate external VM supply from 6V to 48V connected to the dedicated screw terminal; the motor must not be powered from the mikroBUS™ supply rails. An onboard MCP16364 step-down regulator derives the internal nominal 12V control rail from VM, while the TC78B043FNG generates a regulated 5V VREG output for its control and Hall-interface circuitry. Brushless 29 Click comes with a software library containing easy-to-use functions, along with a ready-to-use code example that can be downloaded and used as a reference for further development.

Specifications

Type	Brushless
Applications	Ideal for applications such as industrial fans and pumps, power tools, robotics, automated machinery, and high-current BLDC motor control systems
On-board modules	TC78B043FNG - sine-wave PWM drive controller and TB67Z830HFTG - three-phase gate driver for BLDC motors from Toshiba Semiconductor
Key Features	Sine-wave PWM motor control, six onboard 100V N-channel MOSFETs, up to 10A RMS and 20A peak output current, 6V to 48V external motor supply, Hall element and Hall IC support, analog, PWM, or SPI speed control, adjustable lead-angle control, rotation feedback, comprehensive motor protection, and more
Interface	Analog,GPIO,I2C,PWM,SPI
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V,5V,External

Pinout diagram

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

Notes	Pin	mikroBUS				Pin	Notes
Rotation Pulse	**FG**	1	AN	PWM	16	**VSP**	Speed Control

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Reset	**RST**	2	RST	INT	15	**INT**	Interrupt
SPI CS/ID COMM	**CS**	3	CS	RX	14	NC	
SPI Clock	**SCK**	4	SCK	TX	13	NC	
SPI Data Output	**SDO**	5	MISO	SCL	12	**SCL**	I2C Clock
SPI Data Input	**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
JP1	VCC SEL	Left	Voltage Selection
VR2	VR2	-	Maximum Lead Angle Value
VR1	VR1	-	Speed Control
JP2	ADDR SEL	Left	I2C Address Selection for PCA9538
J1	J1	-	High-side and low-side commutation signal outputs and IDC
J2	J2	-	Hall Inputs

Brushless 29 Click electrical specifications

Description	Min	Typ	Max	Unit
Microbus Supply Voltage	3.3	-	5	V
VM Supply Voltage	6	-	48	V
Output Current RMS	-	-	10	A
Output Current Peak	-	-	20	A

Software Support

Brushless 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 featuring a mikroBUS™ socket.

Example Description

This example demonstrates motor speed and direction control with Brushless 29 Click. It sweeps the common motor speed command from zero to maximum and back to zero in both directions using the selected PWM or SPI speed mode.

Key Functions

- brushless29_cfg_setup This function initializes Click configuration structure to initial values.
- brushless29_init This function initializes all necessary pins and peripherals used for this Click board.
- brushless29_default_cfg This function executes a default configuration of Brushless 29 Click board.
- brushless29_run_motor This function sets the rotation direction and applies a common

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0 to 512 speed command through the selected speed control mode.
- brushless29_stop_motor This function clears the speed command and disables the motor gate driver.

Application Init

Initializes the communication and applies the default motor-control configuration.

Application Task

Reads the controller status, runs a stepped motor-speed sweep clockwise, waits for the motor to stop, and repeats the sweep counter-clockwise.

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

Click boards™

ClickID

Downloads

Brushless 29 Click example package

Brushless 29 Click 2D and 3D files v101

Brushless 29 Click schematic v101

TC78B043FNG datasheet

TB67Z830HFTG datasheet

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