


Brushless click

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IC	Toshiba's TB6575FNG ^[1]
Interface	PWM,INT,AN and RST pins
Power supply	5V
Product page	www.mikroe.com/click/brushless ^[2]
Schematic	Brushless click schematic ^[3]

Brushless click carries Toshiba's TB6575FNG IC for driving 3-phase full-wave Brushless DC motors — which are ideal for powering flying drones. The click is able to safely drive external motors with up to 32V/2A.

The board features three pairs of onboard screw terminals. VBAT is for connecting an external 7-32V power supply. The other two are for connecting an external motor.

The IC controls the rotation speed by changing the PWM duty cycle by analog voltage.

Features and usage notes

Motor position detection error

Position detection is synchronized with the PWM signal generated in the IC. When the IC is used in a high speed motor a position detection error relative to the PWM frequency may occur. The detection is performed on the falling edge of the PWM signal. An error is recognized when the pin voltage exceeds the reference voltage.

MOSFET chips

Two types of MOSFET chips on board switch the output on and off (N-channel 40V and P-channel 30V). They are here for electronic motor control – switching the output on and off controls the voltage levels applied to the motor and this in turn determines the speed and rotation of the motor shaft.

To ensure a more secure connection there are three pairs of screw terminals - CON1 for the power supply and CON2 and CON3 for connecting to the motor. The U,V and W pins control the motor rotation direction. The Brushless click communicates with the target board MCU over the PWM pin, as well as INT, AN and RST pins.

The board is designed to use a **5V power supply** only.

Application:


Automotive industry, drones (because of the good power-to weight ratio of the motor), computers, medical equipment, HVAC systems, small home appliances, robotics, battery powered systems, small cooling fans in computers, toys, etc.

Key features:

- TB6575FNG driver for sensorless communication
- 5V power supply
- Overcurrent protection
- 20-mA current sink capability on PWM output pins
- MOSFET chips toggle the output on and off
- MCP6281 prevents phase reversal
- Lead angle control (7.5° and 15°)
- Forward/reverse rotation
- Input voltage -0.3 to $V_{DD} + 0.3V$
- Green LED indicates that power is on
- Operating temperature $-30^{\circ}C$ to $105^{\circ}C$

Pinout diagram

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

Notes	Pin	 mikroBUS™				Pin	Notes
Measures the voltage of the DC power supply	VSENSE	1	AN		PWM	16	PWM Duty cycle control
Motor direction	DIR	2	RST		INT	15	INT Rotation speed sensing output
	NC	3	CS		RX	14	NC
	NC	4	SCK		TX	13	NC
	NC	5	MISO		SCL	12	NC
	NC	6	MOSI		SDA	11	NC
This click works on 5V only	NC	7	+3.3V		+5V	10	+5V +5V power input
Ground	GND	8	GND		GND	9	GND Ground

Programming

This code snippet initializes required ports, ADC channels and PWM module. It also initializes TFT and sets motor direction. In an endless loop, if button is pressed, we increment or decrement current PWM duty by STEP, which consequently change the rotating speed of BLDC motor.

Code example

```
1 void main()
2 {
3   MCU_Init();
4   TFT_Init_ILI9341_8bit(320, 240); // TFT Init
5   TFT_BLED = 1;
6   DrawFrame();
7   MOTOR_DIR = CCW; // Setting motor direction to counter-clock-wise
8   while(1) {
9     if (GPIO_IDR.B3) { // button on PD3 pressed
10      Delay_ms(10);
11      current_speed = current_speed + STEP; // increment current_duty
12      if (current_speed > pwm_period) // if we increase current_duty greater then possible pwm_period value
13      {
14        current_speed = 0; // reset current_duty value to zero
15      }
16      PWM_TIM5_Set_Duty(current_speed, _PWM_NON_INVERTED, _PWM_CHANNEL1); // set newly acquired duty ratio
17    }
18    if (GPIO_IDR.B6) { // button on PD6 pressed
19      Delay_ms(10);
20      current_speed = current_speed - STEP;
21      if (current_speed < 0) // if we decrease current_duty greater then possible pwm_period value (overflow)
22      {
23        current_speed = pwm_period; // set current_duty to value of pwm_period
24      }
25      PWM_TIM5_Set_Duty(current_speed, _PWM_NON_INVERTED, _PWM_CHANNEL1); // set newly acquired duty ratio
26    }
27    Delay_ms(20);
28    // current_speed display
29    WordToStr(current_speed, txt);
30    TFT_Rectangle(150, 80, 250, 110);
31    TFT_Write_Text(txt, 150, 80);
32  }
33 }
```

Code examples for Brushless click, written for MikroElektronika hardware and compilers are available on Libstock [4].

Resources

- [Brushless click data sheet](#) ^[1]
- [Library](#) ^[4]
- [Brushless click schematic](#) ^[5]
- [mikroBUS™ standard specifications](#) ^[6]

References

- [1] <https://toshiba.semicon-storage.com/ap-en/product/linear/motordriver/detail.TB6575FNG.html>
- [2] <http://www.mikroe.com/click/brushless>
- [3] http://cdn-docs.mikroe.com/images/7/7a/Brushless_schematic_v100.pdf
- [4] <http://libstock.mikroe.com/projects/view/1951/brushless-click-example>
- [5] <http://cdn-docs.mikroe.com/images/e/e4/Brushless-click.pdf>
- [6] <http://www.mikroe.com/mikrobus/>
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