Version Change History

Data	Updater	Version	Remark
2023-08-08	Makerbase	V1.00	Documentation is created.

Purchase link::
https://www.aliexpress.us/item/3256805639344627.html?spm=5261.ProductManageOnline.0.0.50dd2ddbs5vLYQ&gatewayAdapt=vnm2usa4itemAdapt

1. Product introduction

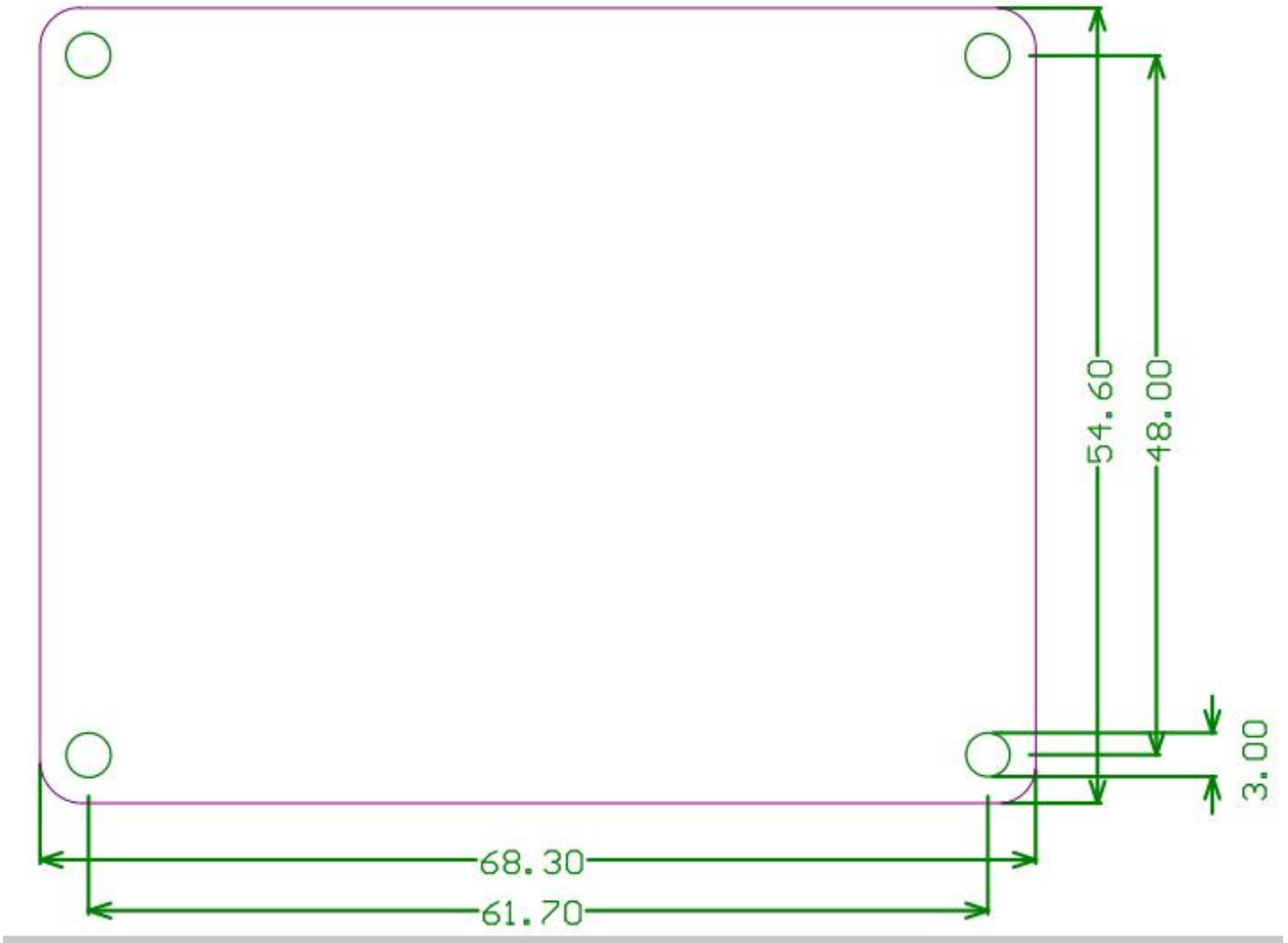
SimpleFOC MINI is an Arduino-compatible open source FOC project. After years of contributions from developers, it has become very mature in low-power BLDC applications. MKS MINI FOC is fully compatible with the Arduino interface, and supports a variety of sensor interfaces; users can easily use the SimpleFOClibrary library to control BLDC motors, to achieve smooth motor operation, high-precision positioning, etc. The encoder supports common IIC and ABI, PWM, HALL, SPI formats. By sampling the voltage of the sampling resistor connected in series with the motor, the online current of A and B phases is obtained to realize the current loop control, and a truly complete FOC algorithm is constructed.

1.1 Hardware features

Size	54.6mm*68.3mm
Input voltage range	12-24V
Number of supported motors	2
Peak current	5A(2.5A per channel)

Driver chip	DRV8313
Master	ESP32 WROOM 32D
Encoders supported	IIC、ABI、SPI、HALL
Current Sense Resistor	10mR

1.2 Size



2. User's guidance

This section will briefly introduce MKS MINI FOC V1.0, and explain the relevant preparations before using MKS MINI FOC V1.0.

2.1 Necessary hardware

- PC with Windows
- MKS MINI FOC V1.0
- USB-B data line
- 12V-24V DC Power supply
- One or two gimbal motors
- One or two encoders (magnetic encoder, Hall encoder, etc.) Magnetic encoders are recommended

2.2 Hardware preparation

MKS MINIFOC has been fully tested before delivery. In order to ensure the quality of use, it is recommended that users check it before powering on for the first time.
Check content includes

1. Use a multimeter to check whether there is a short circuit between the positive and negative terminals of VIN on the driver board, as shown in Figure 1

2. Use a multimeter to check whether the 5V of the driver board is shorted to GND, as shown in Figure 2

3. Use a multimeter to check whether the 3.3V of the driver board is shorted to GND, as shown in Figure 3

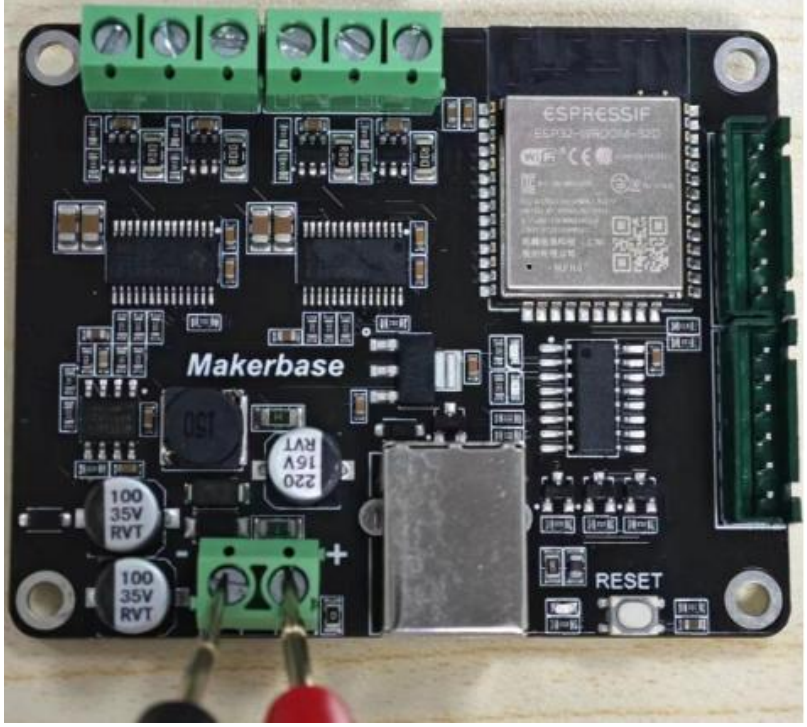


Figure 1 Measuring whether Vin is short-circuited

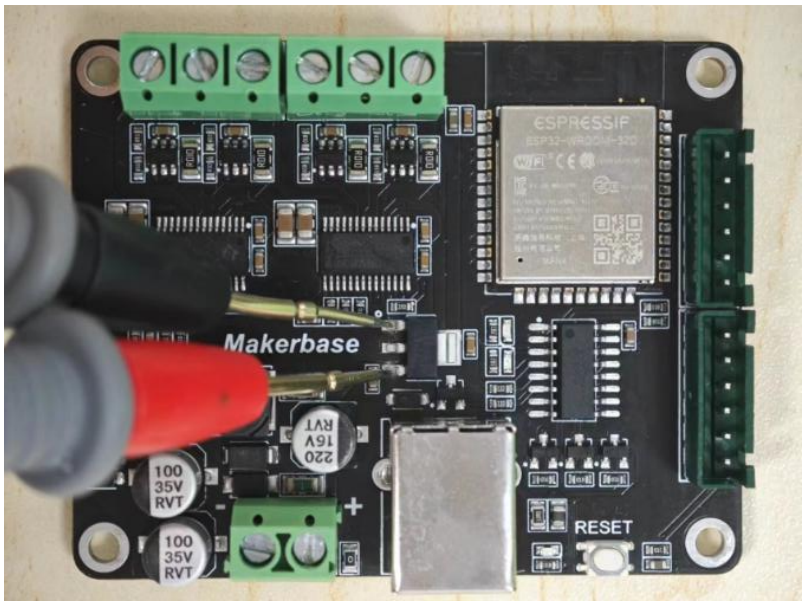


Figure 2 Measuring whether 5V is shorted-circuited

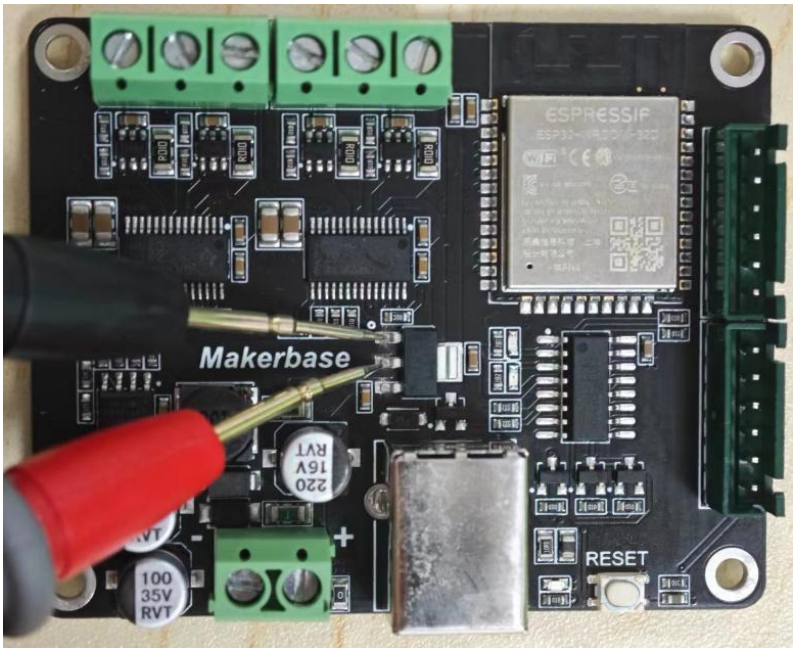


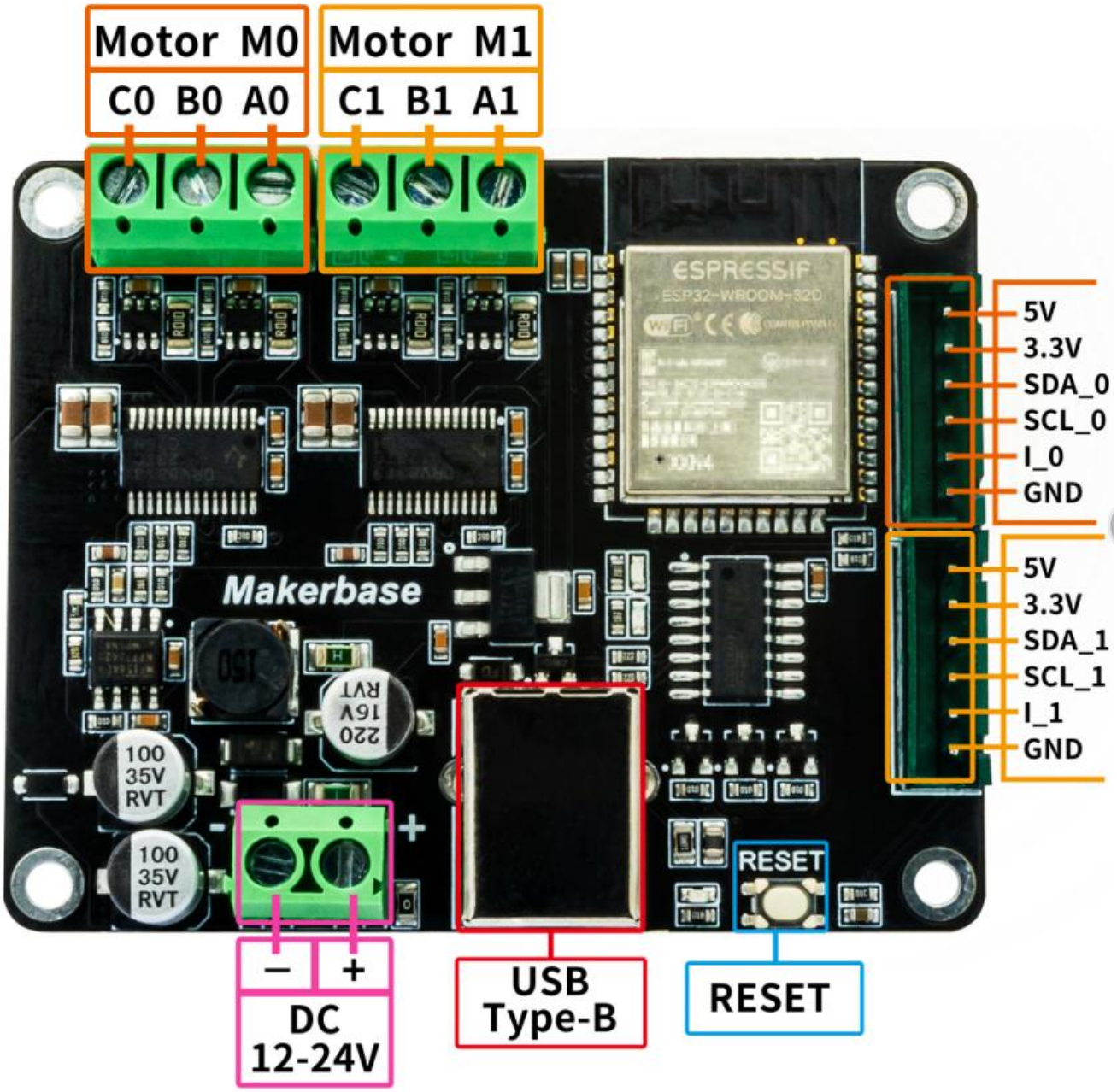
Figure 3 Measuring whether is short-circuited

After the above inspection is completed, connect the 12V-24V power supply to the VIN positive pole and negative pole of the motor driver board

Attention! Do not reverse the positive and negative poles of the power supply!

At this time, the green light of the power indicator light at the lower right corner of the driver board is on, indicating that the startup is normal

2.3 Interface



Encoder Interface Description

For the connection of other encoders, please refer to the notes of the routine and the wiring reference below

IIC interface (based on AS5600 as an example)

AS5600	MKS MINI FOC V1.0	ESP32 WROOM 32D
SCL	SCL_0(SCL_1)	IO19(IO23)
SDA	SDA_0(SDA_1)	IO18(IO5)
3.3V	3.3V	/
GND	GND	/
DIR	GND/3.3V/Dangling	/

Note: Any exchange of two phases of the motor can change the direction of rotation

SPI Interface

SPI Interface	MKS MINI FOC V1.0	ESP32 WROOM 32D
MISO	SDA_0	IO19
MOSI	SDA_1	IO23
SCLK	SCL_0	IO18
SS	SCL_1	IO5

Note: Interfaces I_0 (IO15) and I_1 (IO13) of MKS MINI FOC V1.0 can be used as chip select signals

ABI Interface

ABI Interface	MKS MINI FOC V1.0	ESP32 WROOM 32D
A0	SDA_0	IO19
B0	SCL_0	IO18
I0	I_0	IO15
A1	SDA_1	IO23
B1	SCL_1	IO5
I1	I_1	IO13

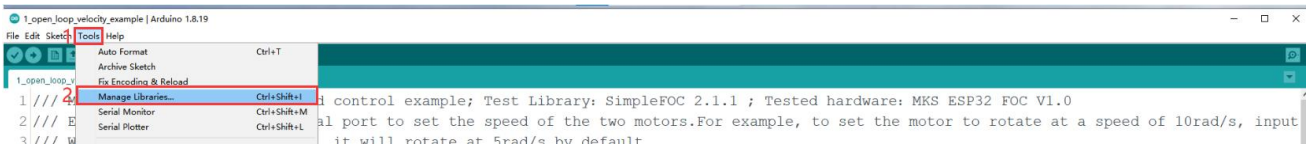
Hall encoder interface

Hall encoder interface	MKS MINI FOC V1.0	ESP32 WROOM 32D
HALL0_1	SDA_0	IO19
HALL0_2	SCL_0	IO18
HALL0_3	I_0	IO15
HALL1_1	SDA_1	IO23
HALL1_2	SCL_1	IO5
HALL1_3	I_1	IO13

If it is open loop, just skip this steps .

2.4 Programming environment configuration

Note: The library version used in this example is 2.1.1. If you have downloaded other versions, please click Tools => Manage Library



Search Simple FOC in the search box

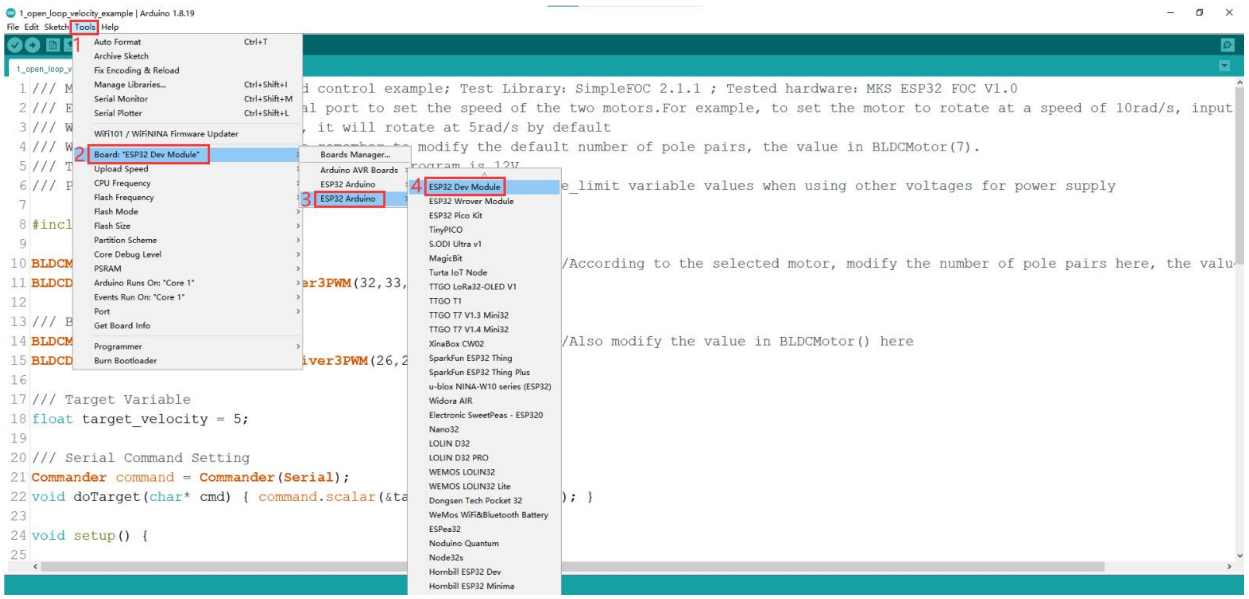
After selecting version 2.1.1, click Install

Then restart the Arduino.

2.5 Routine modification

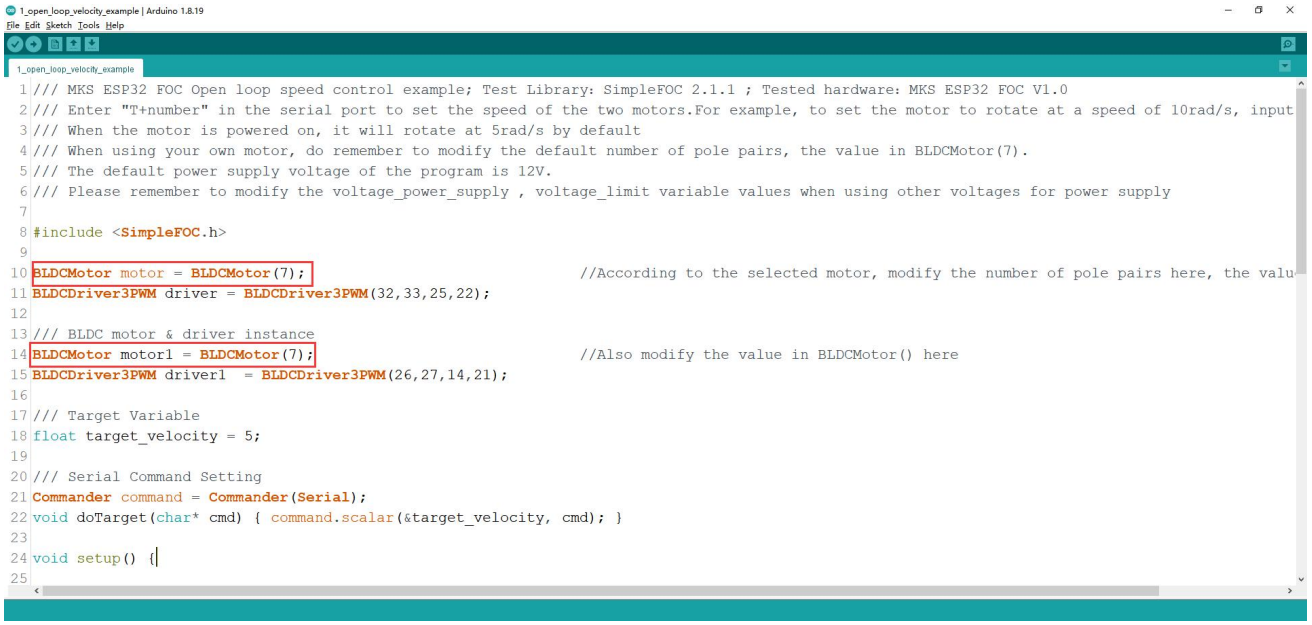
Here, take routine 1 dual-motor open-loop speed test as an example

1. Check the hardware connection, then power on the motherboard.
2. Open the example code with Arduino : 1_open_loop_velocity_example
3. Click tool=Board=ESP32 Arduino=ESP32 Dev Module。

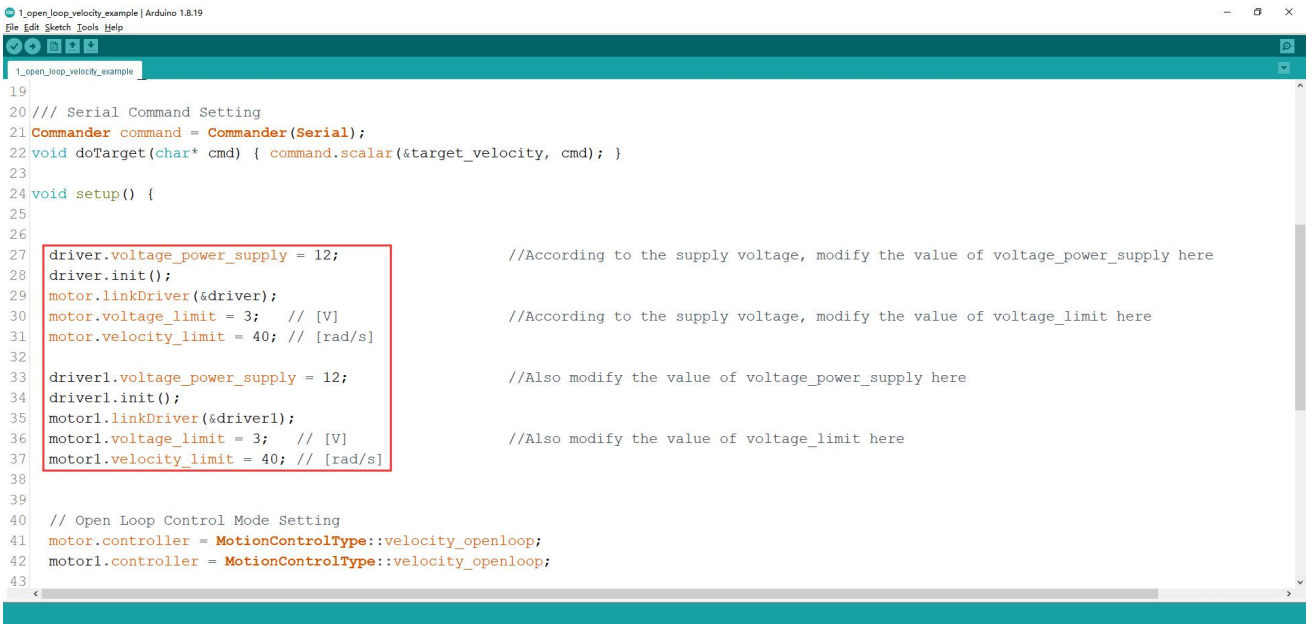


4.Users can choose other motors to test this routine. If so, some parameters in the code need to be modifie

①In line 10 and 14, modify the value of the default number of pole pairs according to the number of pole pairs of the selected motor, that is, the value in the brackets of "BLDCMotor(7)".



② Lines 27-37, modify the values of voltage_power_supply and voltage_limit according to the power supply voltage of the selected motor.

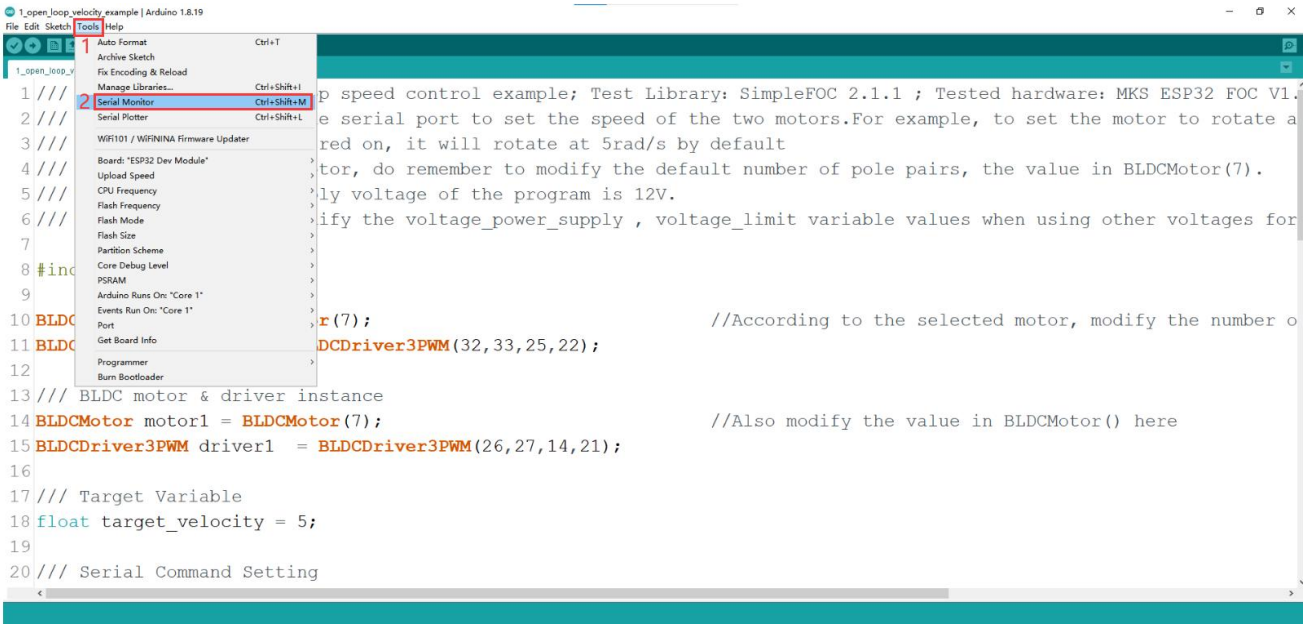


2.5 Routine test

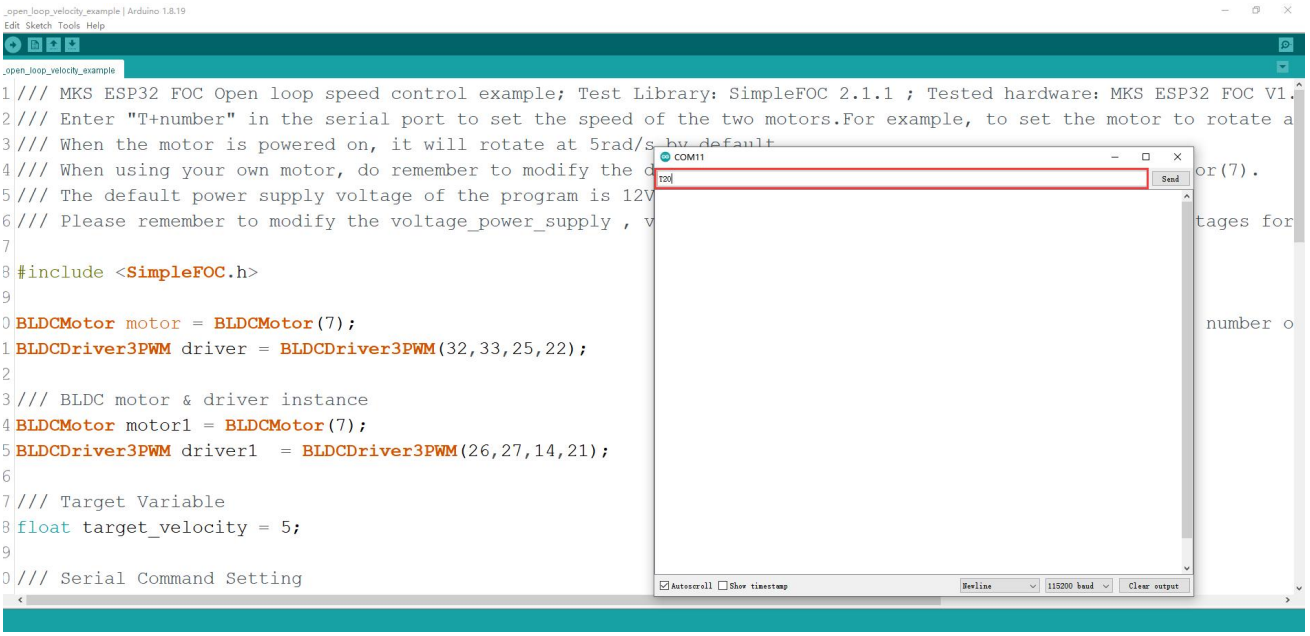
1. After modifying the program, click the upload button in the upper left corner

2. After the compilation is successful, the motor will rotate at a speed of 5rad/s by default.

3. Click tool=>Serial monitor, open the serial window



4.Enter the box command in the serial port window and click send to control



Enter the "T+Number" command to control the speed of the two motors.

For example, input T10, the motor will rotate at a speed of 10rad/s.

For example, input T20, the motor will rotate at a speed of 20rad/s.

For example, input T40, the motor will rotate at a speed of 40rad/s.

3.Common problems and solutions

3.1 An error occurs at I2Ctwo.begin

Solution: add UL after 400000.

3.2 When using routine 3 IIC dual encoder test (AS5600), the value printed by the serial port will not be updated

Solution: Add sensor0.update() and sensor1.update() to the loop, this is where the new version of the SimpleFOC library needs to be modified.

3.3 When printing data through the serial port, the printed ones are question marks or other special symbols

When printing data through the serial port, the printed ones are question marks or other special symbols.

3.4 Wiring problem with hall encoder

Solution: Check the relevant wiring notes in the Hall encoder test (5-wire) code and wire according to the notes.

3.5 After the power-on program runs, the serial port keeps reporting errors and restarts

Solution: Check whether the installed simplefoc library is version 2.2.2, and if so, change it to version 2.2.1.

3.6 Program burning error

Solution: Check whether the com port is selected correctly, and check whether the cable used to connect the computer and esp32 is a data cable.

3.7 When using the dual motor control routine, the serial port input command motor control does not respond.

Solution: check whether there is a newline character added when the serial port debugging assistant enters the command and whether the baud rate setting is correct.

3.8 Hall encoder wiring problem when using Hall motor

Solution: Check the relevant wiring notes in the Hall encoder test (5-wire) code and wire according to the notes.

3.9 After the power-on program runs, the motor does not rotate and the serial port displays MOT: Failed to notice movement

Solution: Check whether the motor wiring is connected stably, whether there is an open circuit, and then check whether the motor encoder wire is connected incorrectly.