ESP32 Camera 4WD Robot Car Kit

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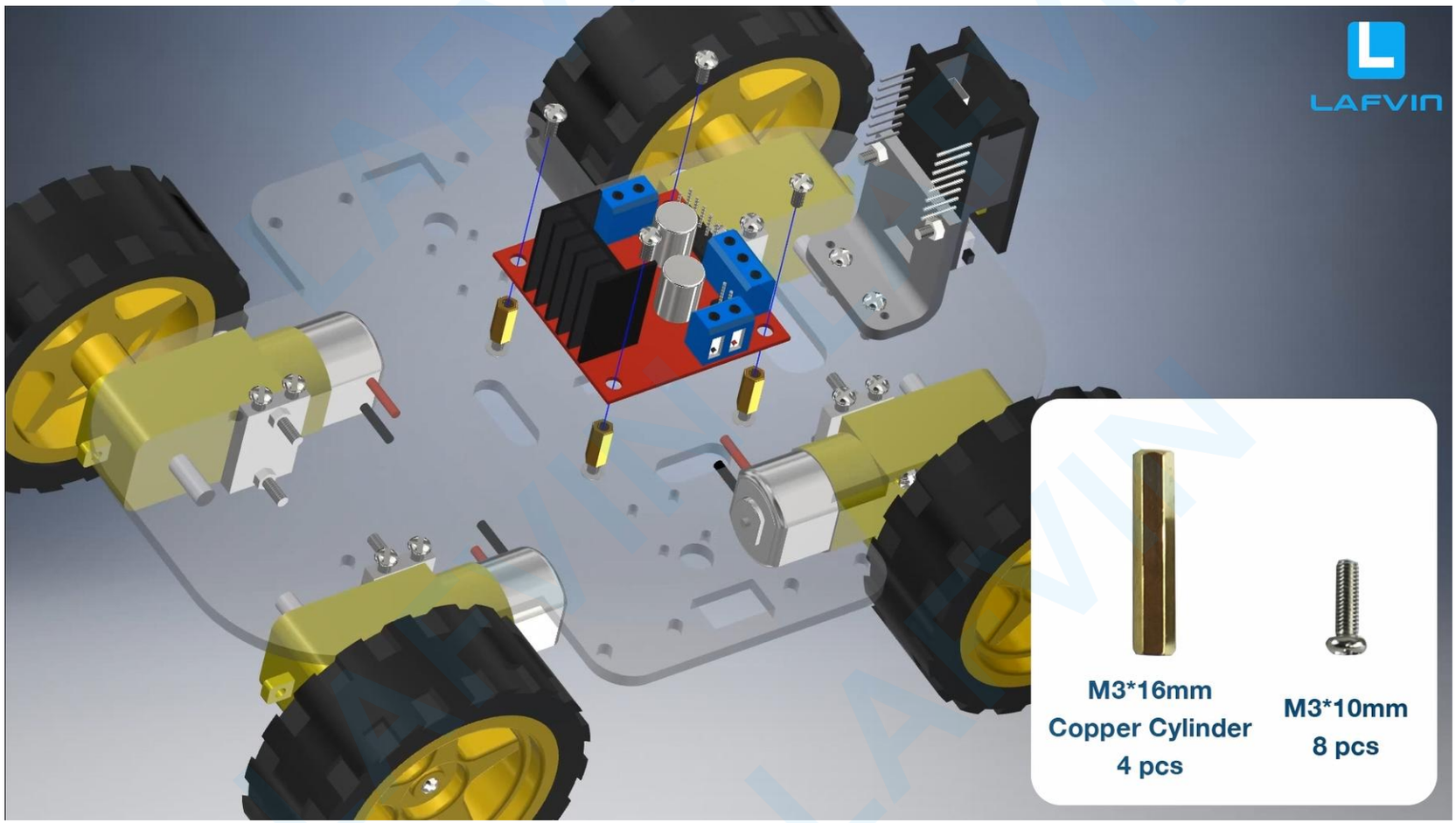
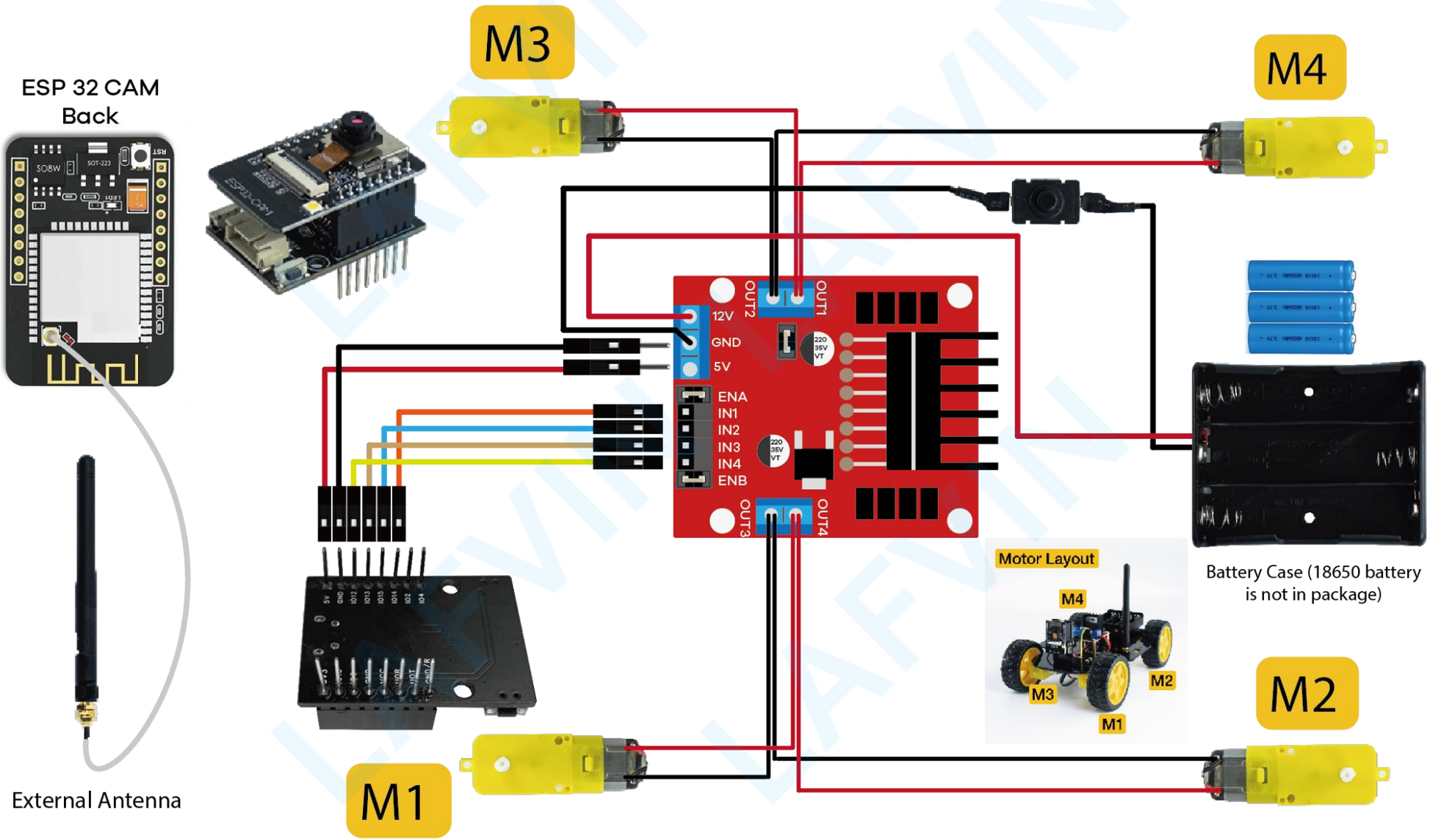
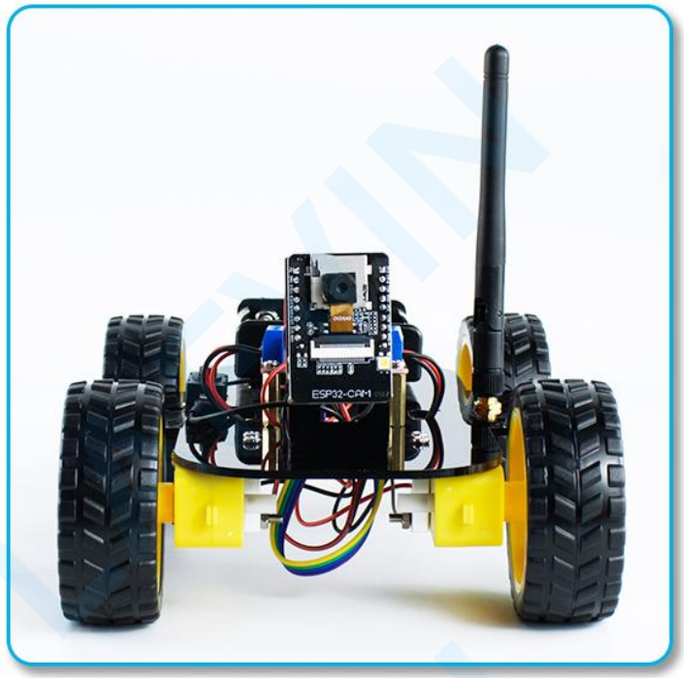
◆ Step 1:Assembly Tutorial

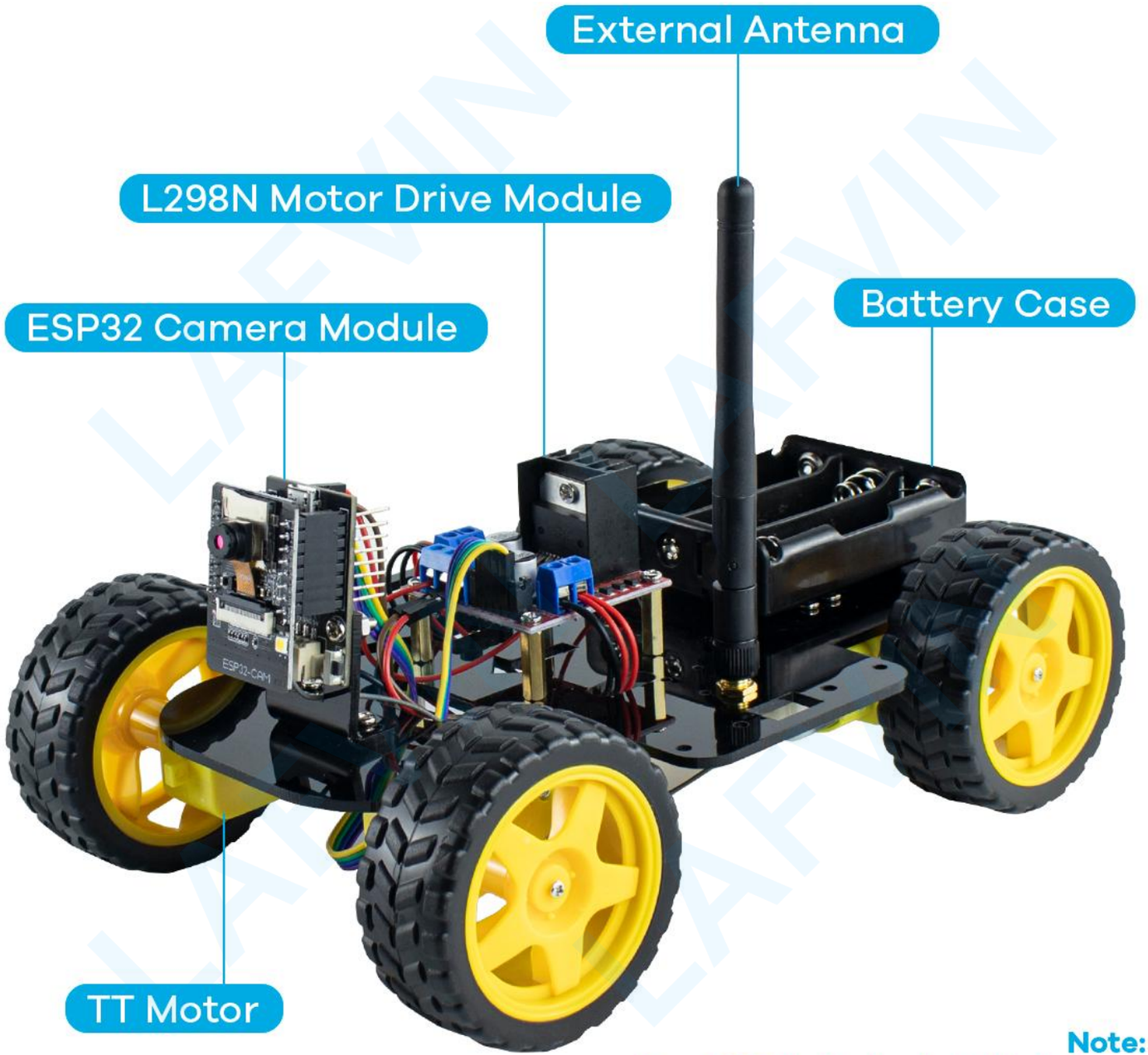
For more details refer to **Assembly Tutorial Video.mp4**



◆ Step 2:Wiring




ESP32-CAM

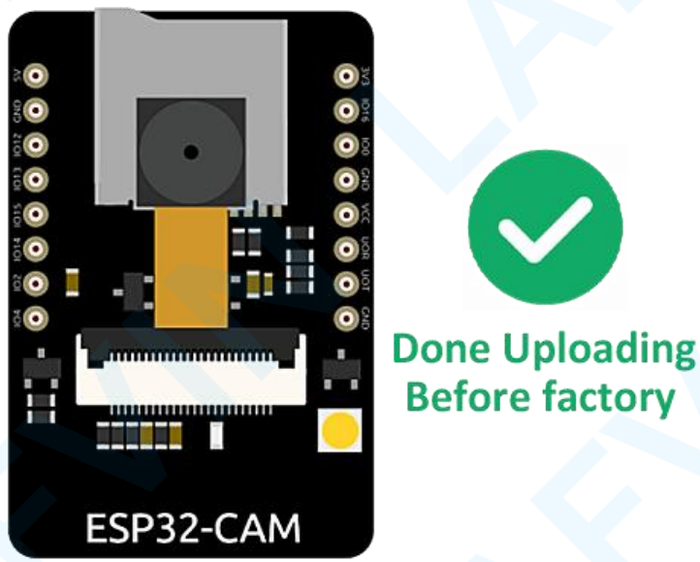


Note:
3pcs 18650 batteries due to limitations,
you have to buy them separately

◆ Step 3:Upload Main Code

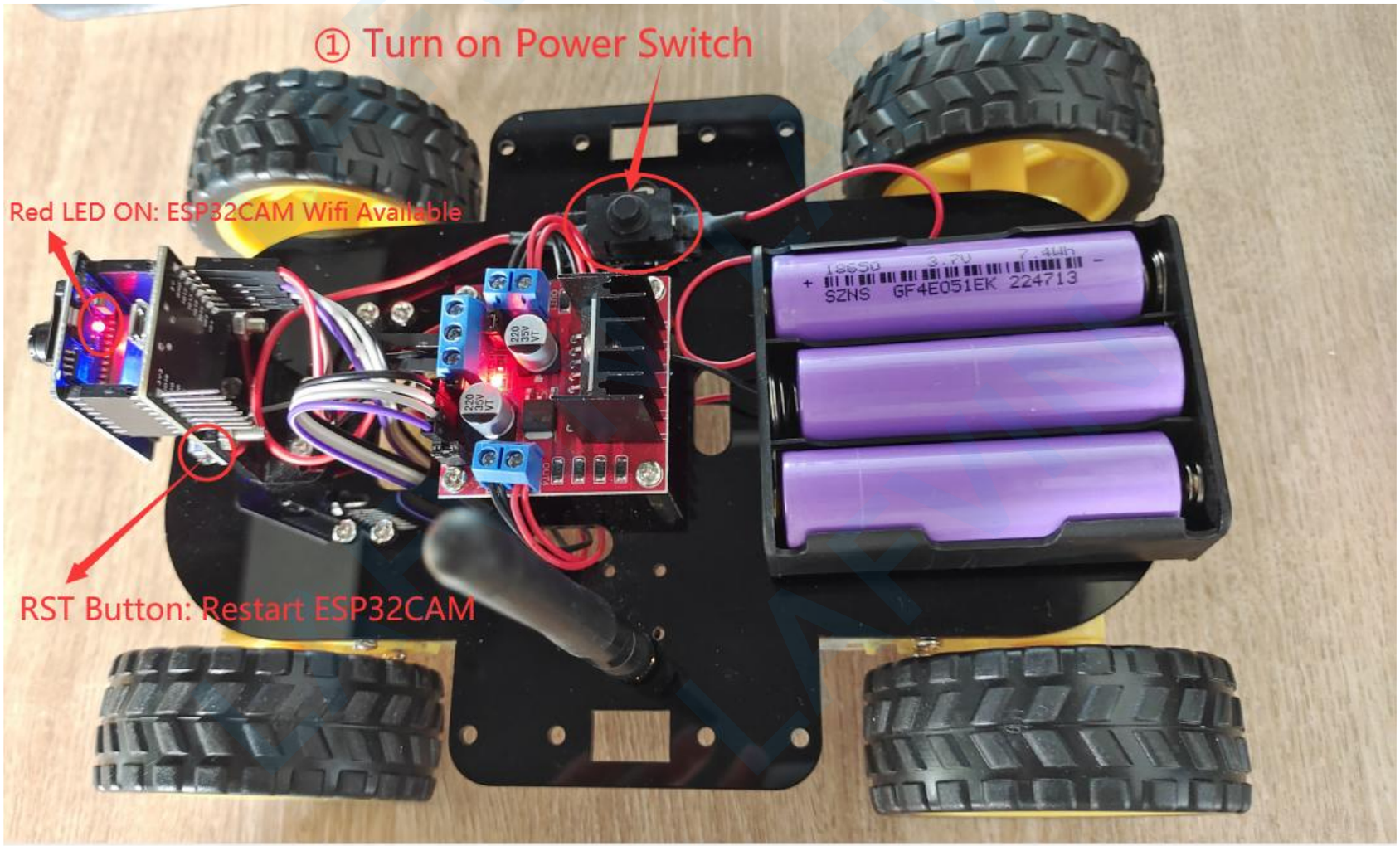
Tip: Since the program has been uploaded to the ESP32Cam before the factory, you can just skip this step and no need to upload it repeatedly.

Learn more about How to Upload Main Code

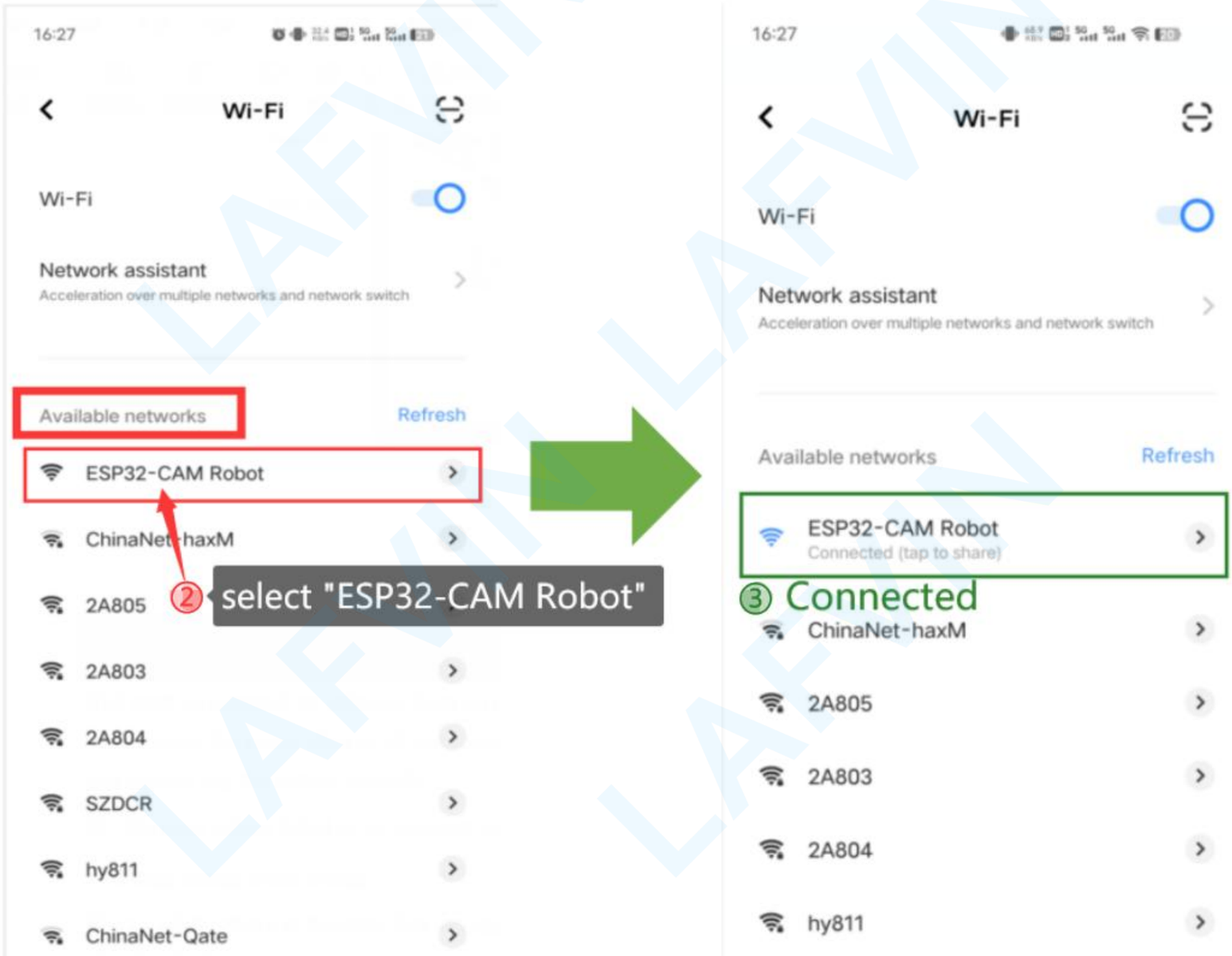


◆ Step 4:Mobile Device Connects to the ESP32-Cam Robot

Turn on the power switch. When the red LED light on the ESP32CAM board lights up, it means: ESP32CAM WiFi Available. If it does not light up, try restarting the ESP32CAM.



Mobile device connects to the wifi hotspot:ESP32-Cam Robot



Type and access the address "192.168.4.1" on your browser

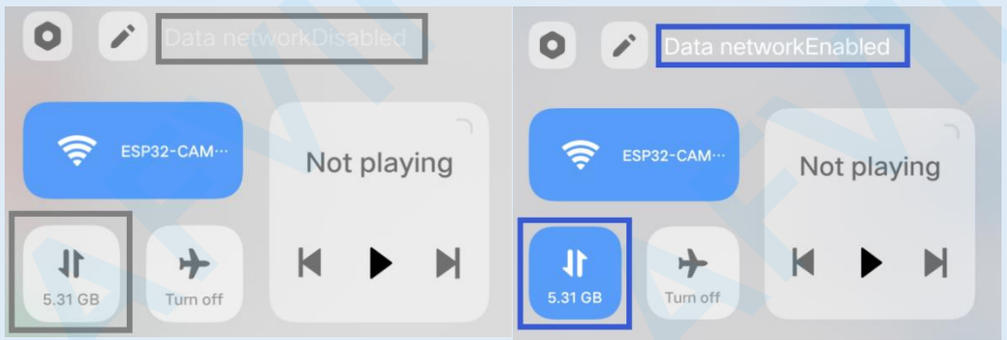
Tip:If the remote control web page fails to load,

The possible reasons are:

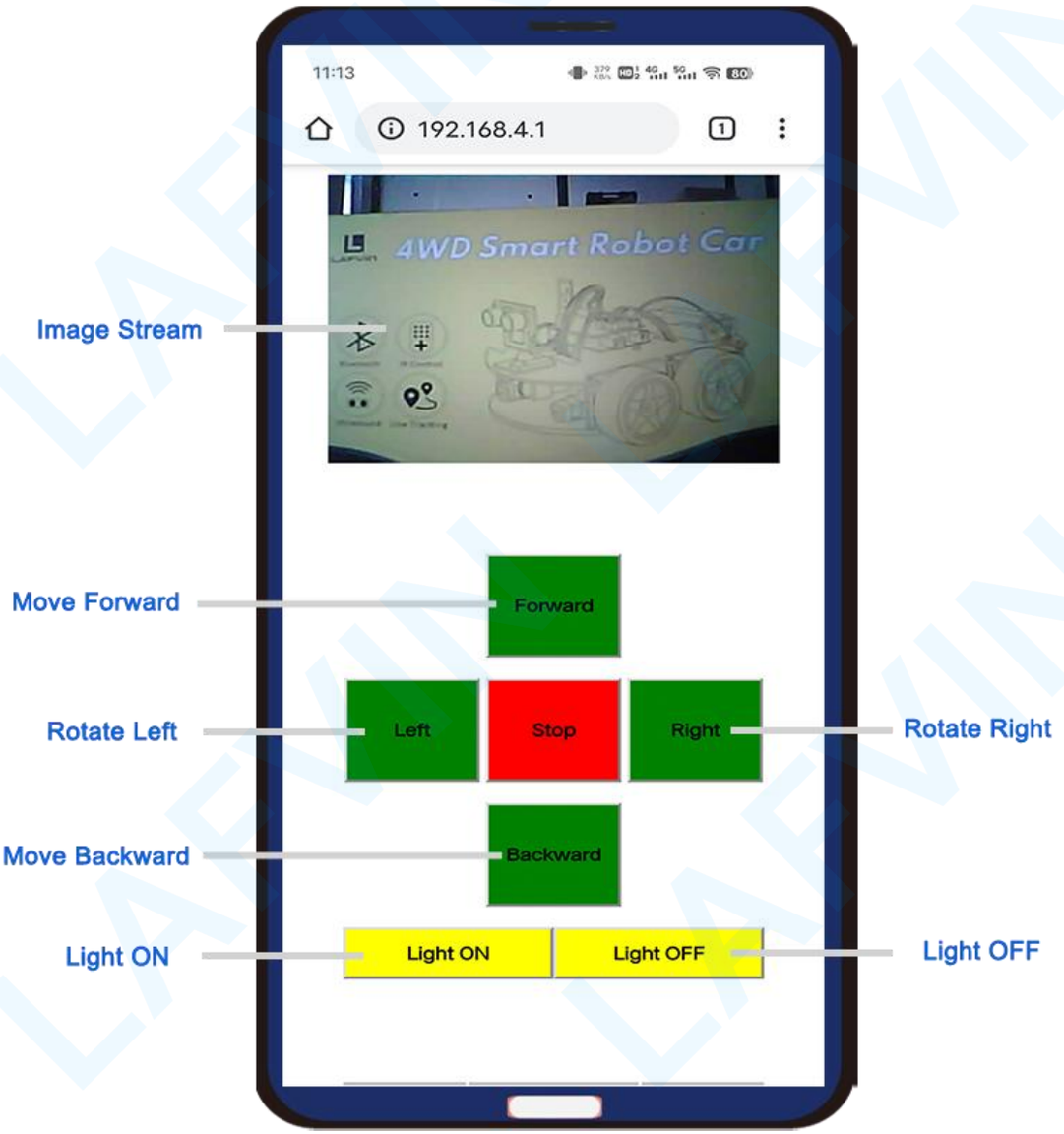
1) The battery is low. Make sure the total battery voltage is >11.1V

2) The wrong wifi device is connected, the correct device name: ESP32-CAM Robot

3)Because some mobile devices have the network assistant turned on by default. This may cause control instructions to be routed incorrectly. It is recommended that you turn off the mobile data network and only turn on the wifi network.



Step 5:Web Remote Control ESP32-Cam Robot Car



The robot car is not moving? There may be the following reasons:

①It must be powered by 18650*3 batteries. Make sure the total battery voltage>11.1V.

Due to air transportation, the battery may not be included in the kit, you need to buy the battery yourself.

②Wrong wiring, loose wiring

If none of the above is the case. Press the **RST** button and the four motors will run.

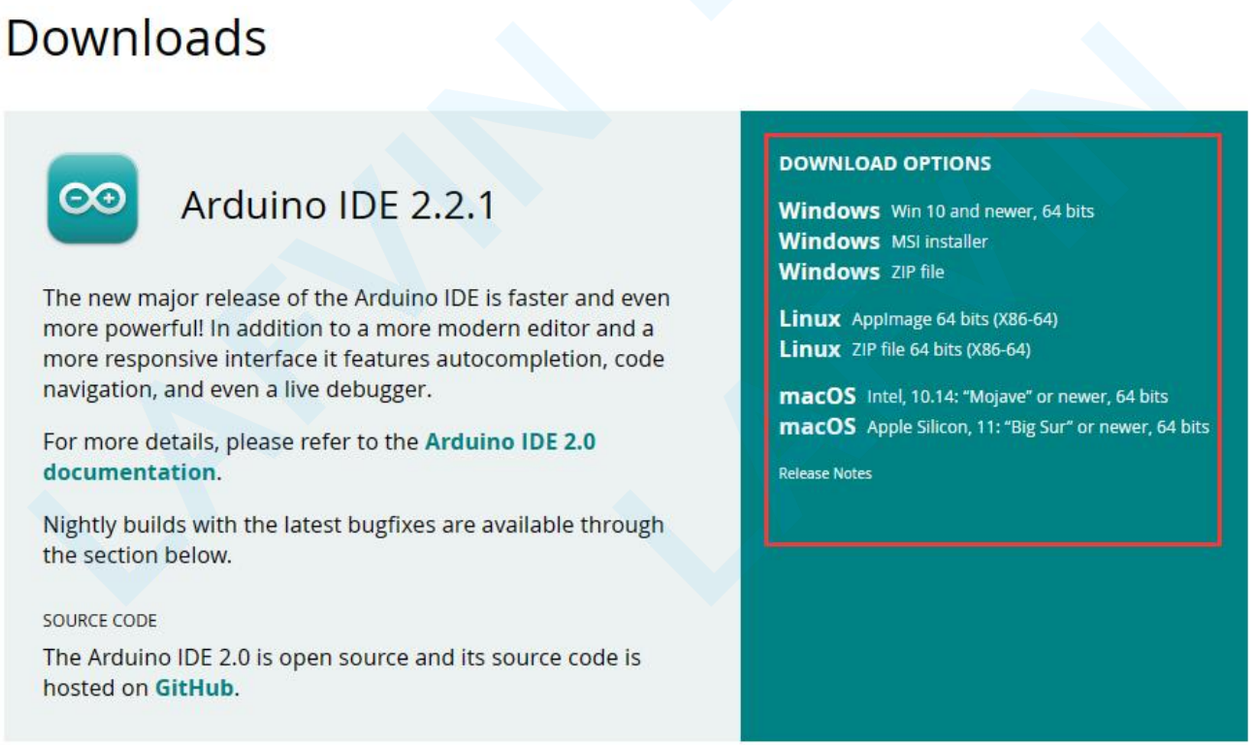
You can use the RST button to verify whether the motor and drive circuit wiring are correct.

How to Upload Main Code

Install Arduino IDE

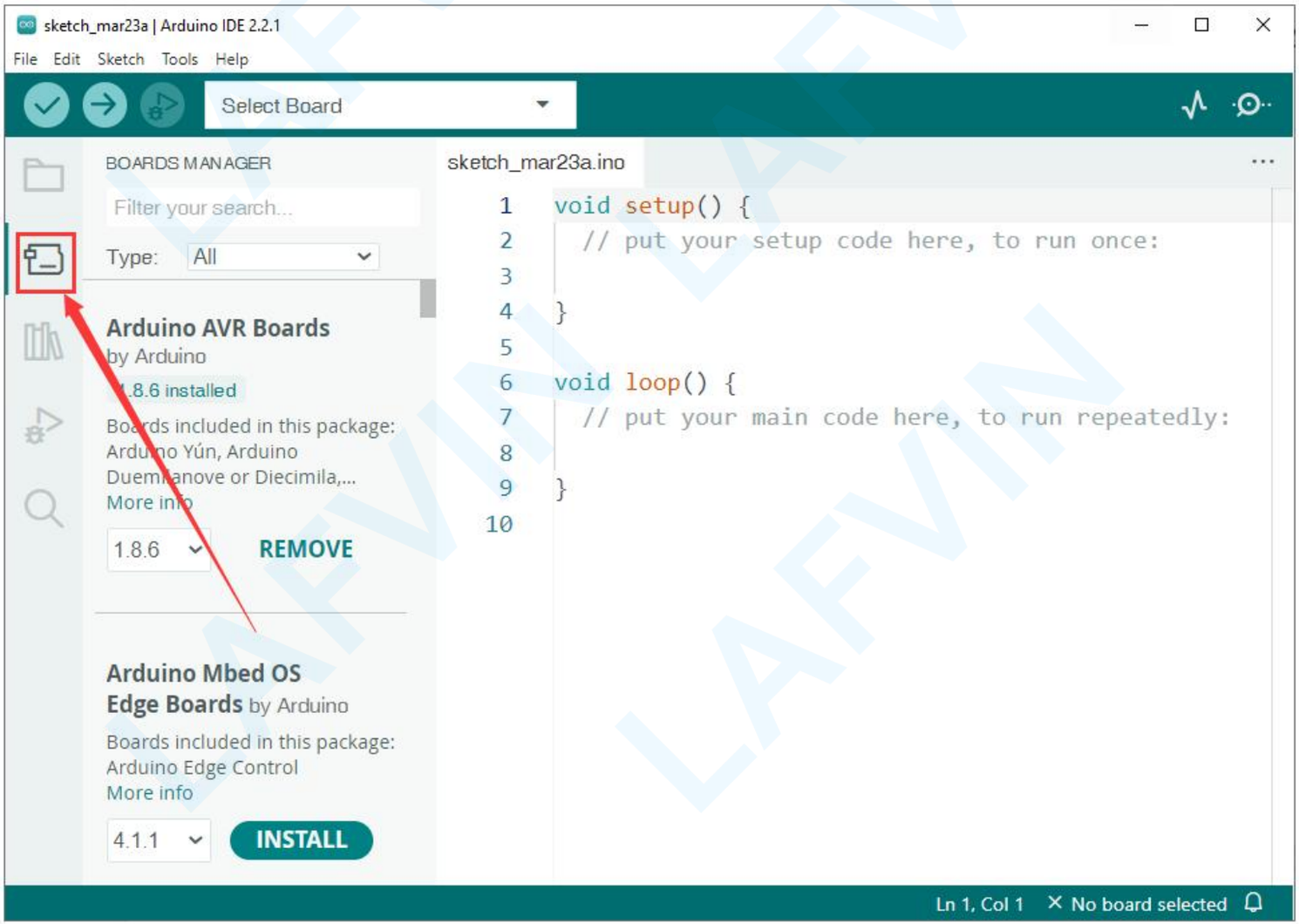
Go to https://www.arduino.cc/en/Main/Software. If you have questions about the installation of Arduino IDE, you can refer to Getting Started with Arduino products.

Tip: Before starting this installation procedure, make sure you have the latest version of the Arduino IDE installed in your computer. If you don't, uninstall it and install it again. Otherwise, it may not work.

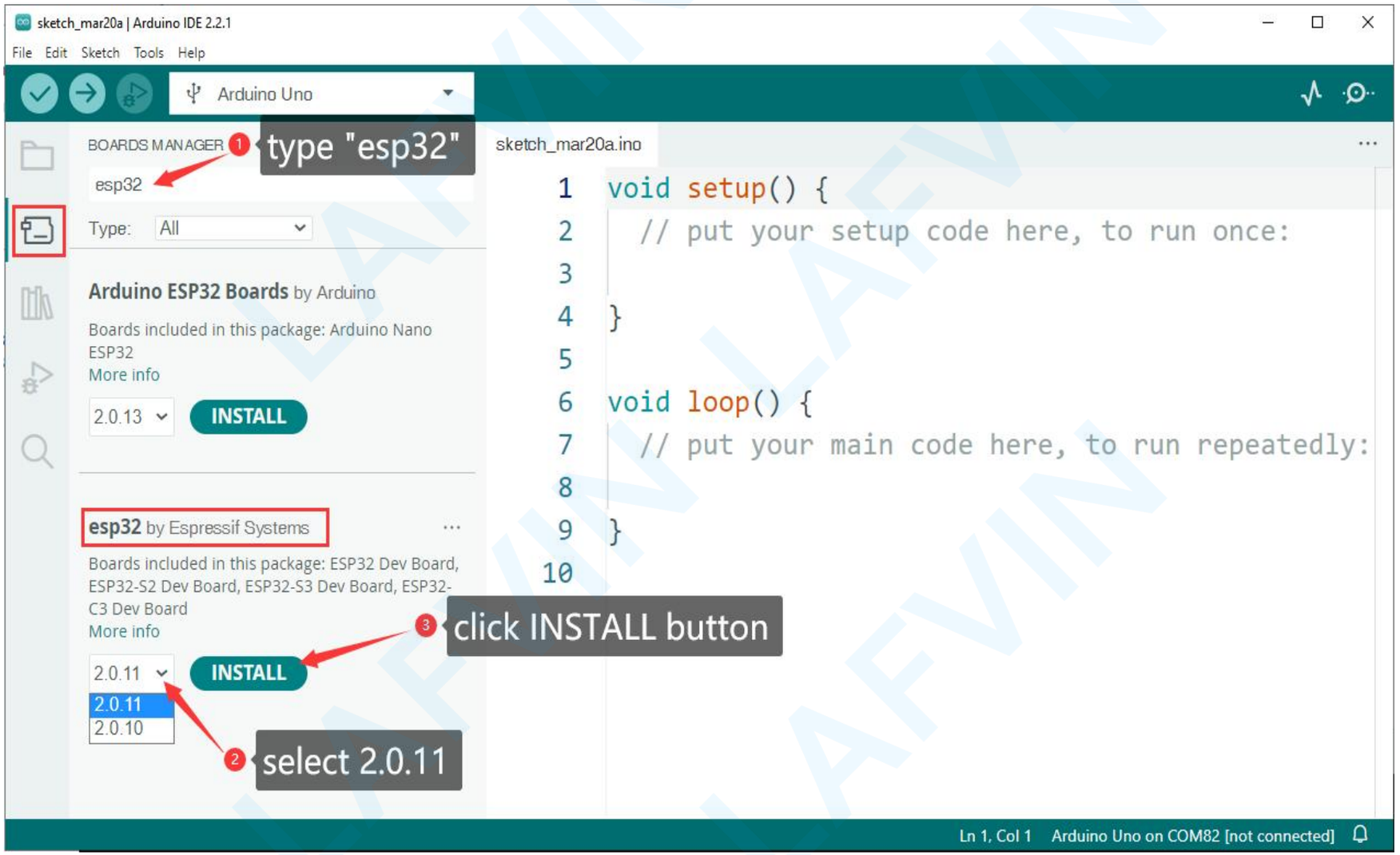


➢ Installing ESP32 Add-on in Arduino IDE

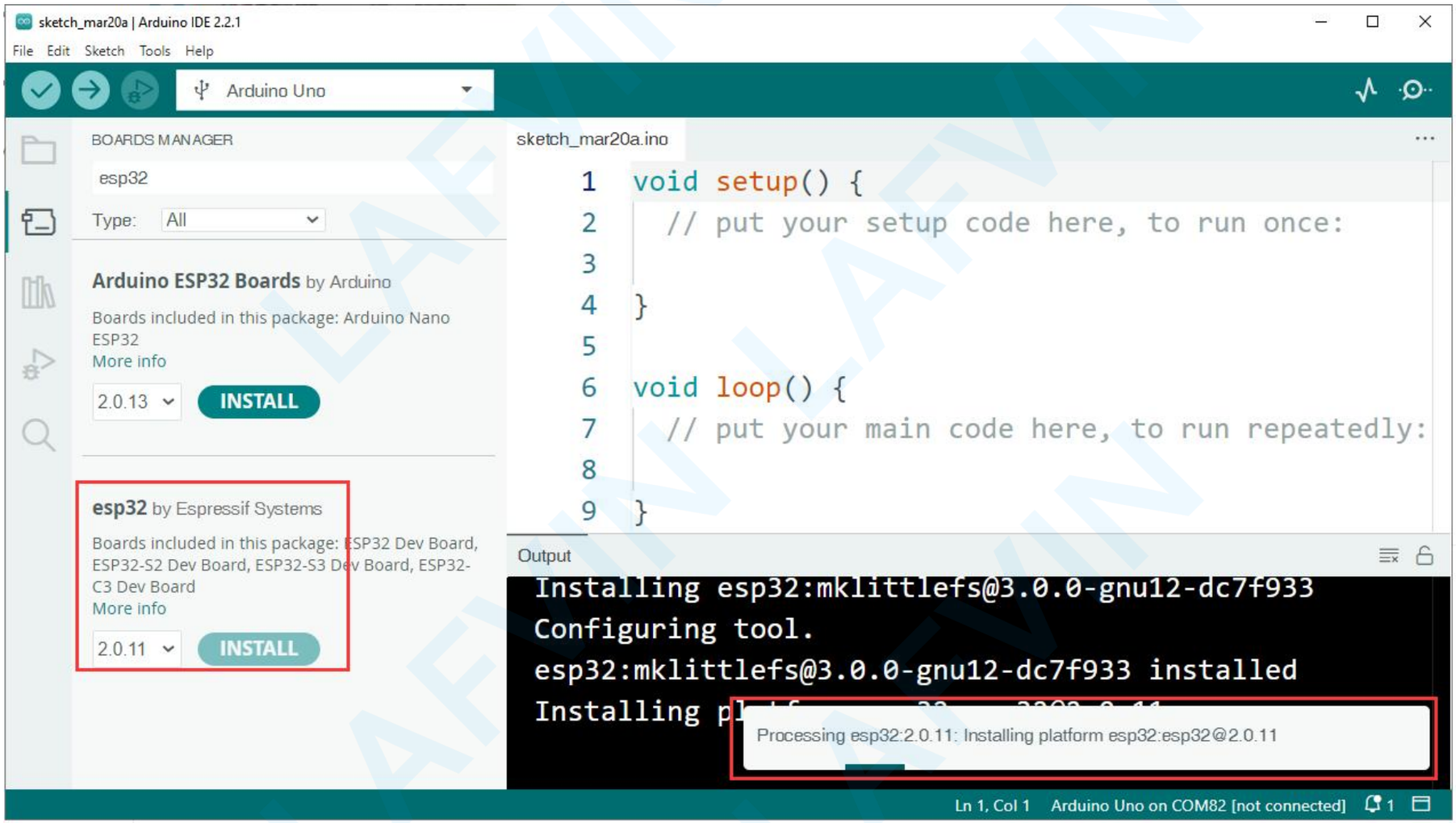
①Open the Boards Manager. You can go to **Tools > Board > Boards Manager**… or you can simply click the **Boards Manager** icon in the left-side corner.



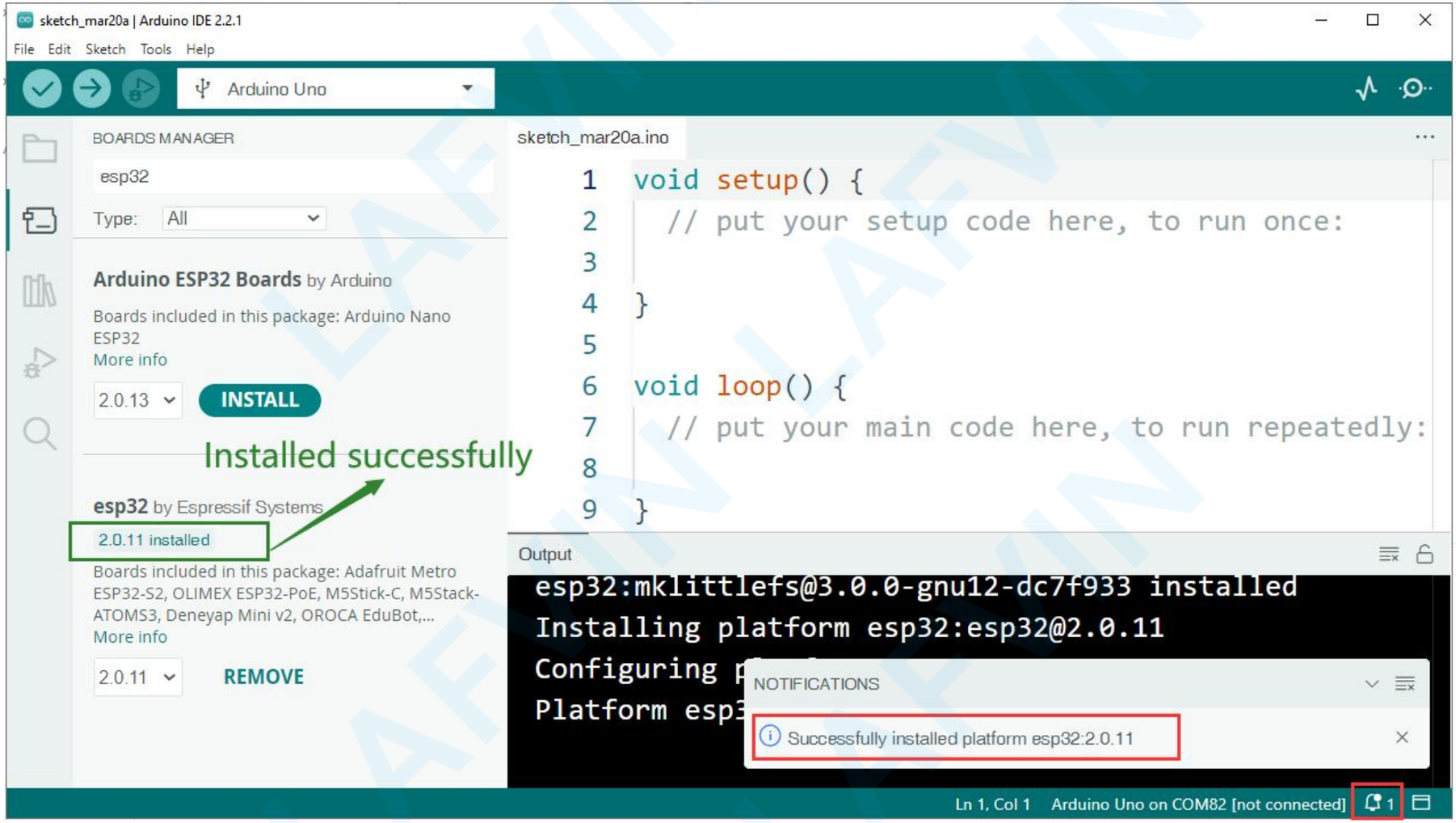
②Search for **esp32** and select 2.0.11 ,click the **INSTALL** button for **esp32 by Espressif Systems**.



③Installing, this will take a while



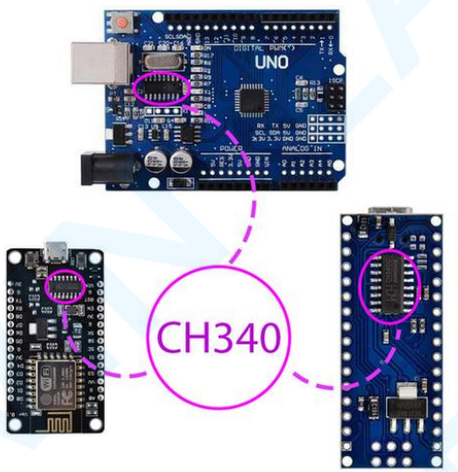
④Successfully installed platform esp32:2.0.11



➢ Install CH340 Driver

What is CH340 Driver?

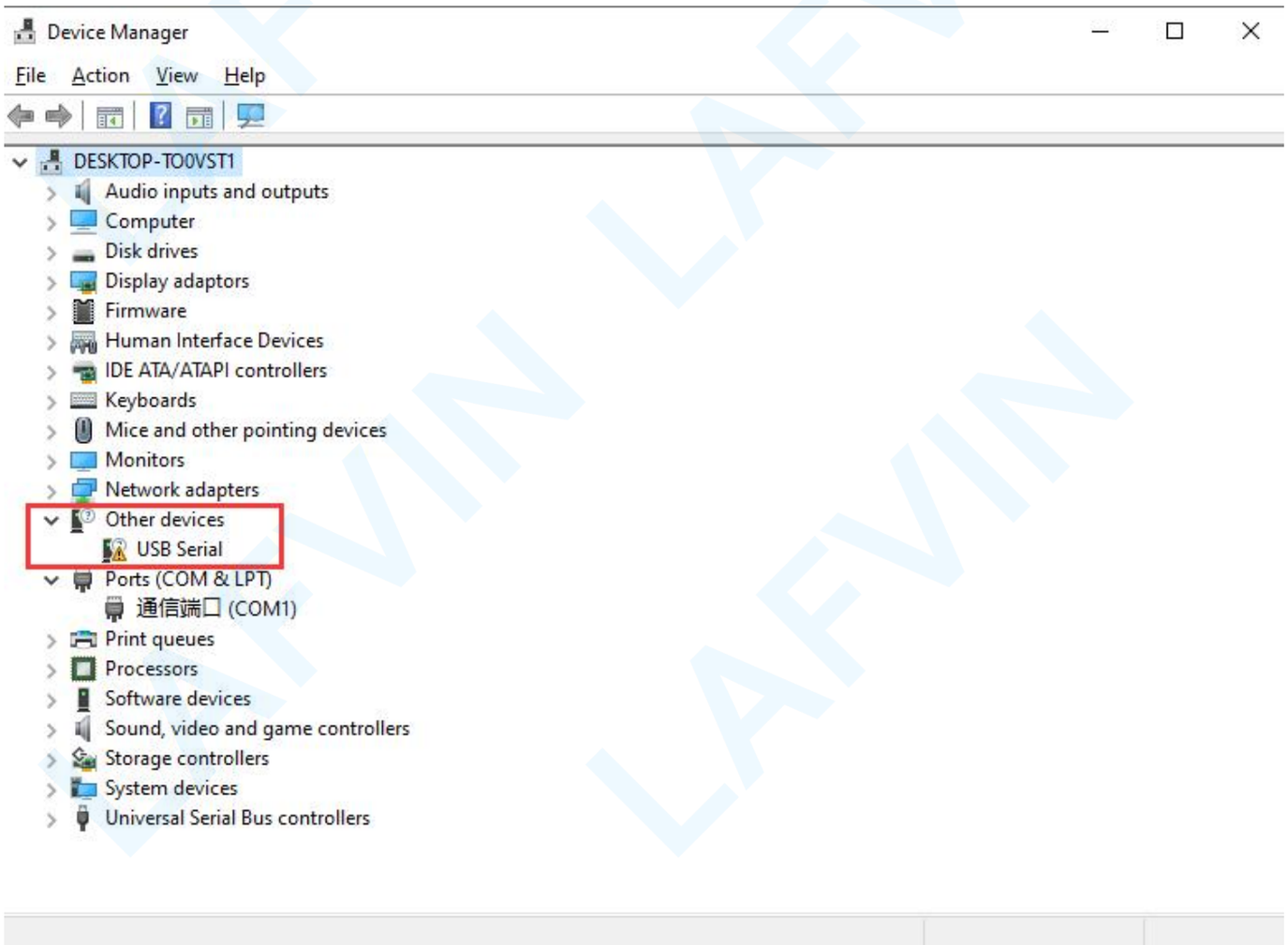
CH340 is a TTL (serial) to USB converter and vice versa. This chip has been used in some boards such as Arduino boards, ESP8266, etc. The boards using the CH340 chip,need a programmer in order to access the processor or to program them.But there is a downside. An extra driver must be installed before starting to work with boards having this IC.



So before uploading the code, you need to install the CH340 driver. Otherwise you won't be able to find the correct COM port in the Arduino IDE.If your computer has already installed the CH340 driver, you can skip this step.

If you connect your board to the computer before installing the driver, your computer will not recognize the board correctly and you will see following image in Device Manager.

To open **Device Manager**, search for it in the Windows Start menu.



Follow the steps below to install the CH340 driver:

① Downloading the driver

First, download the CH340 driver from the this link.

Windows CH340 Driver

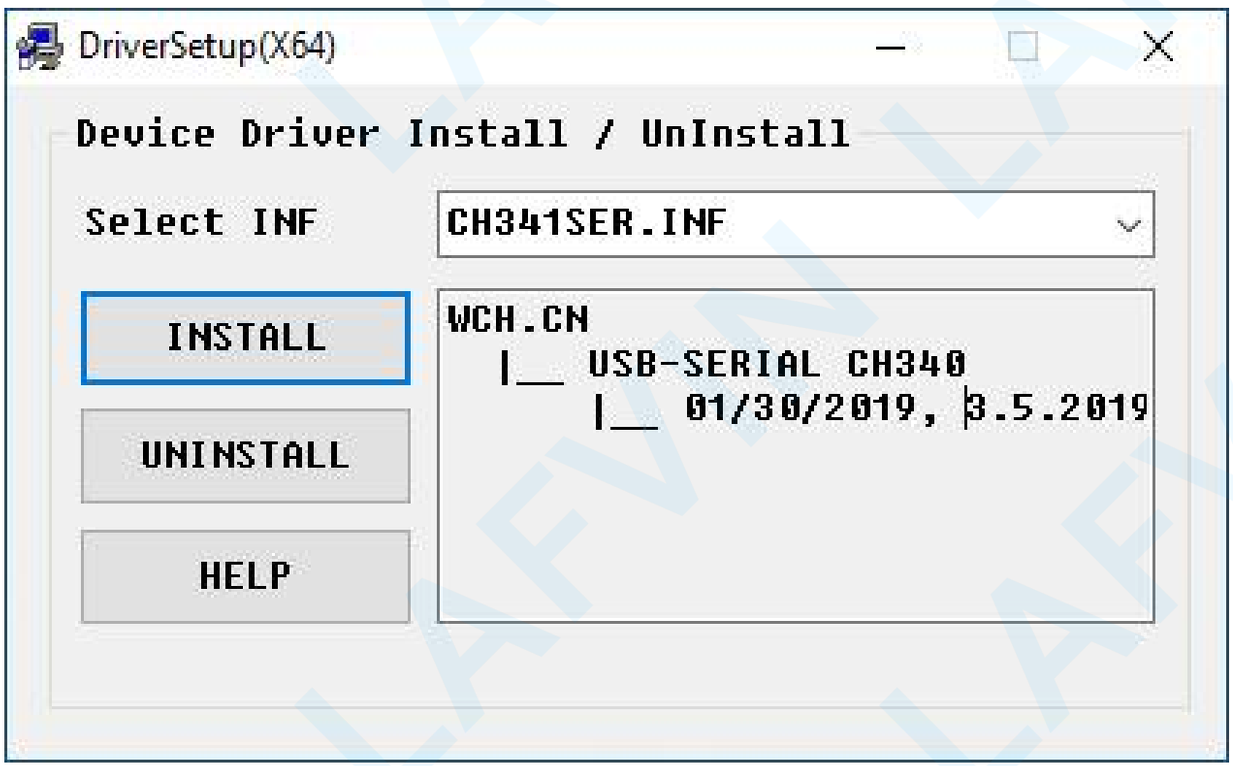
You can also download the latest version of the driver directly from the manufacturer's site google link

file name	file content
CH341SER.ZIP	CH340/CH341 USB to serial port Windows driver, supports Windows XP/Vista/7/8/8.1/10/11/ SERVER 2003/2008/2012/2016/2019/2022 -32/64bit, Microsoft WHQL Certified, supports USB to 3-line and 9-line serial port.
CH341SER_LINUX.ZIP	CH340/CH341 USB to serial port LINUX driver, supports 32/64-bit operation system.
CH341SER_MAC.ZIP	CH340/CH341 USB to serial port MAC OS driver, supports 32/64-bit operation system, contains instructions for use.

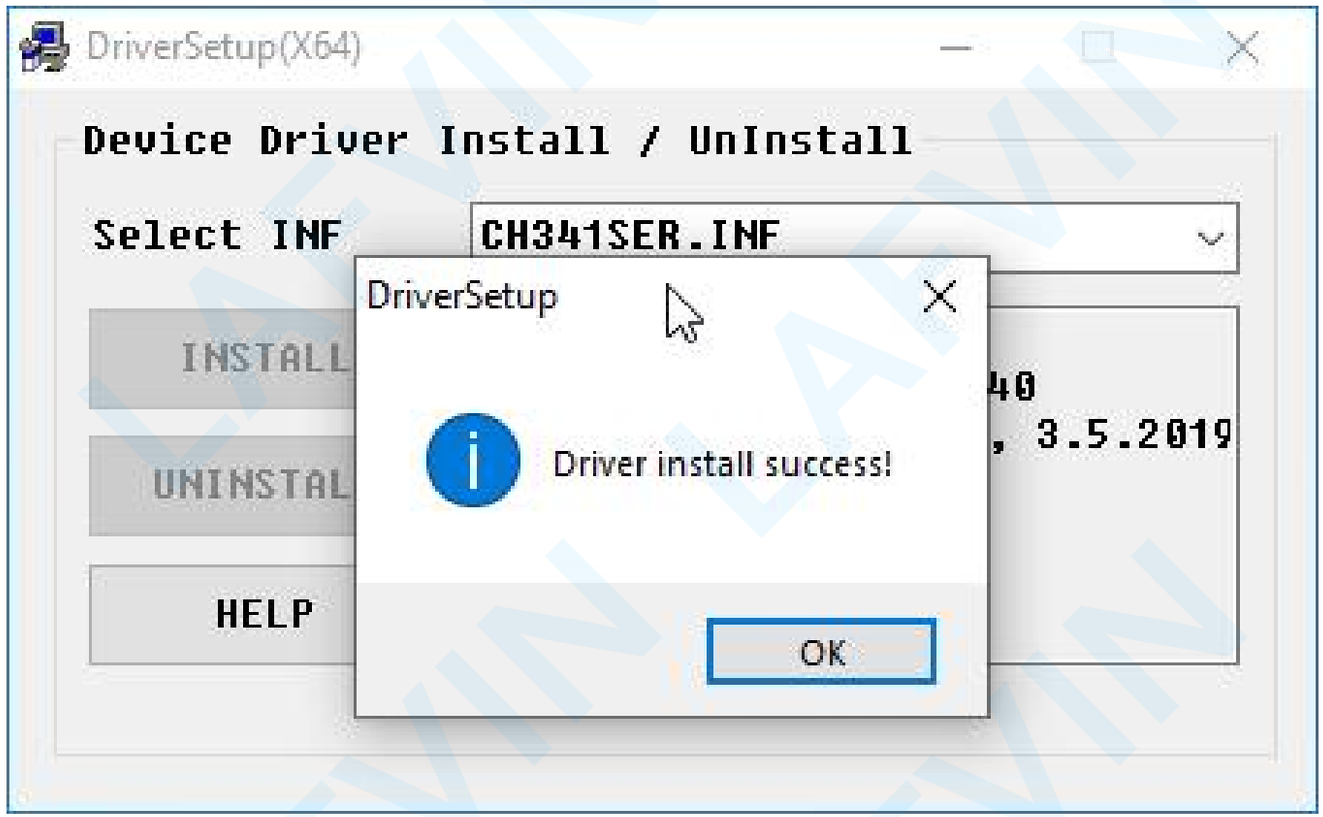
② Installing the driver

After downloading the driver, open it and click Install.

Tip: Before installing the driver software, you must connect the ESP8266 D1 WiFi UNO board to your computer with a USB cable



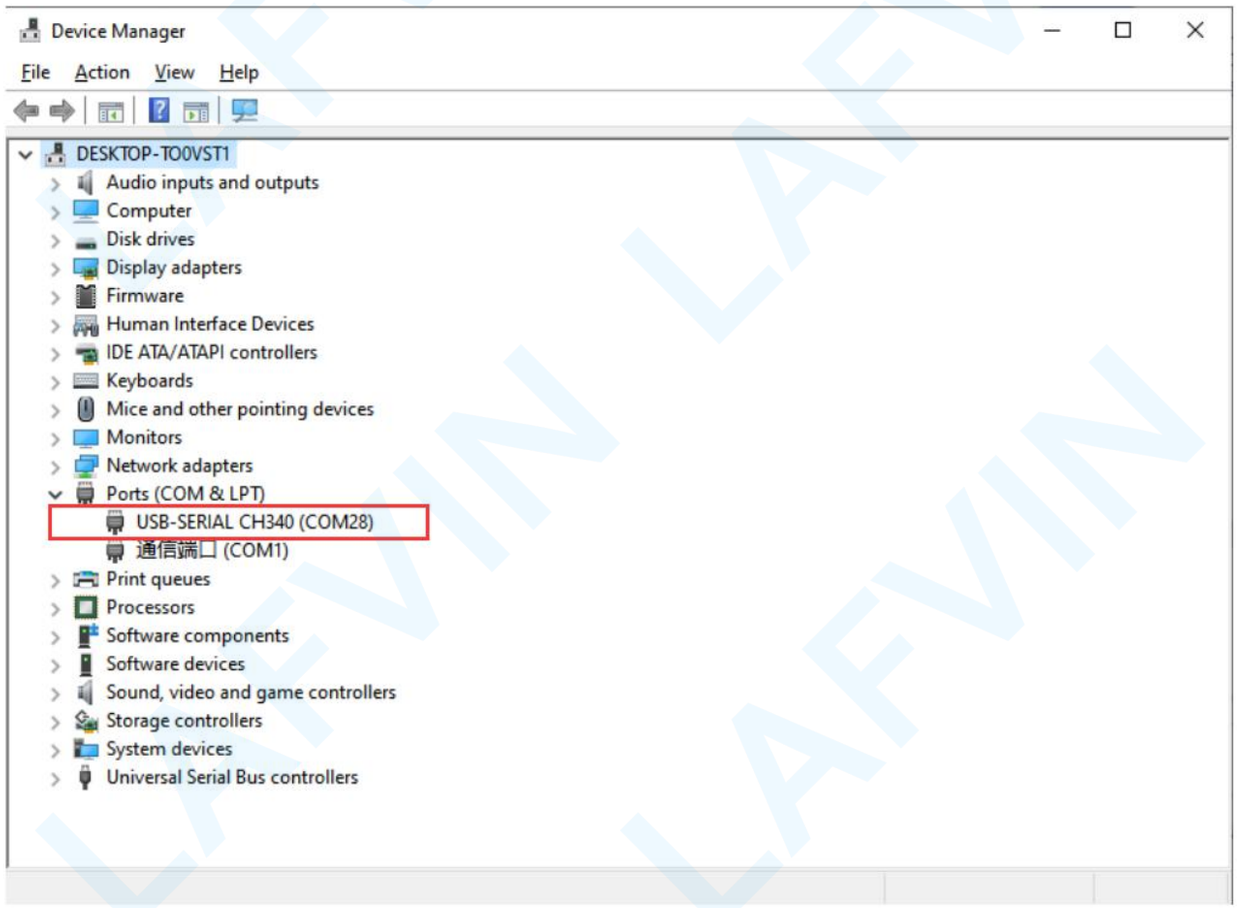
After successful installation you should see this message



Note： In some cases, you may need to reset Windows after the driver installation is complete.

③ Checking Correct Driver Installation in Device Manager

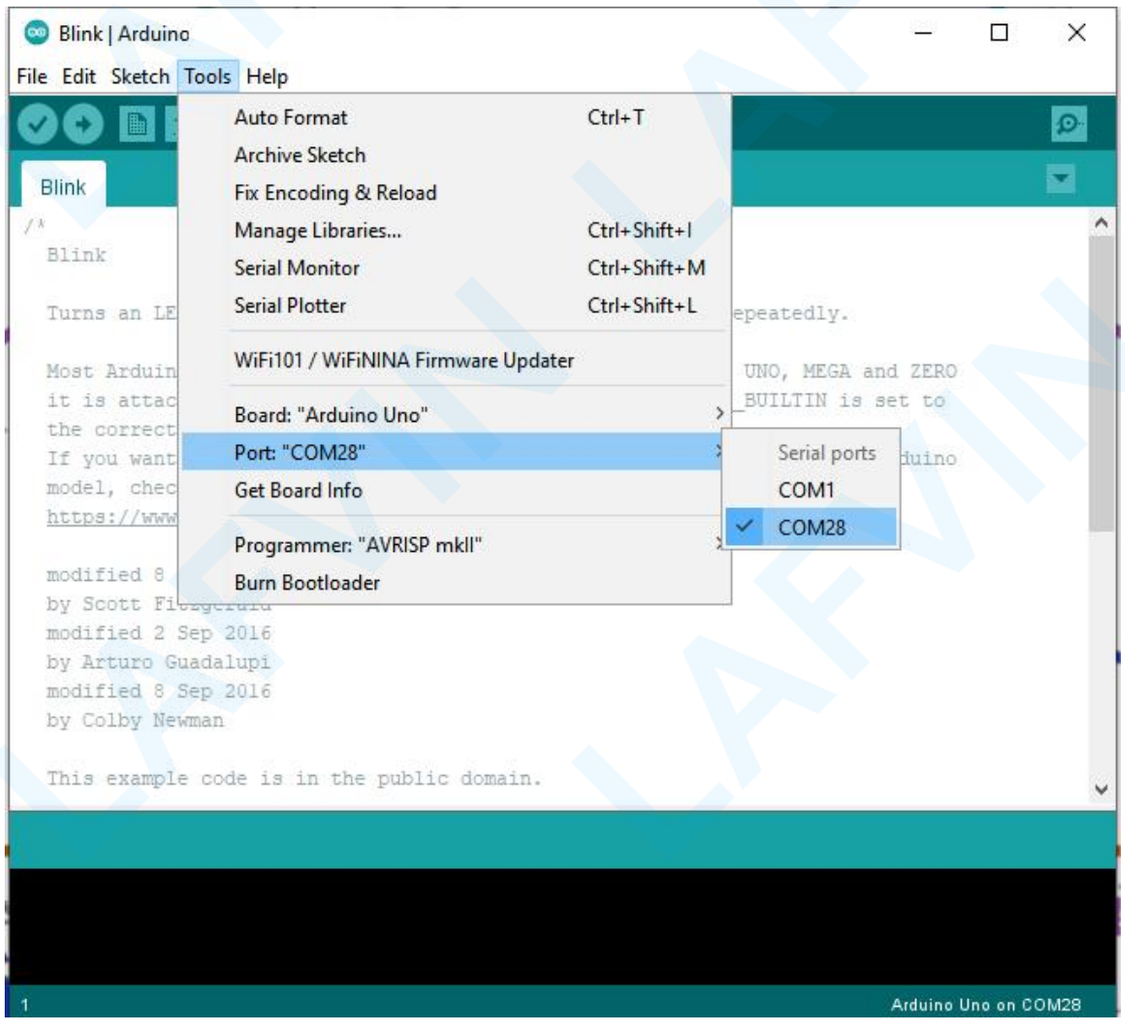
If your driver has been installed correctly, and if you connect your board to a computer, then you can see its name and port number in the Port section. For example, my Arduino board is connected to COM28.



④ Checking Correct Driver Installation in Arduino IDE

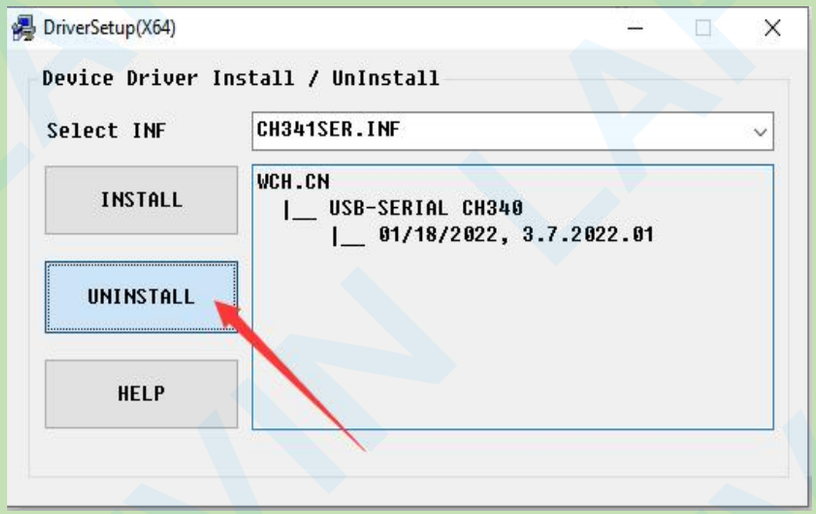
Open the Arduino IDE software. Go to the **Tools->Port:** menu , select the **COMx**.

Note that this port number must be the same as the number you saw in the previous step.



Tip: If you don't find the Arduino CH340 device in your computer's device manager or Arduino IDE, It means the driver software installation failed. You can try

①UNINSTALL the driver, restarting your computer, and then repeating the above steps.



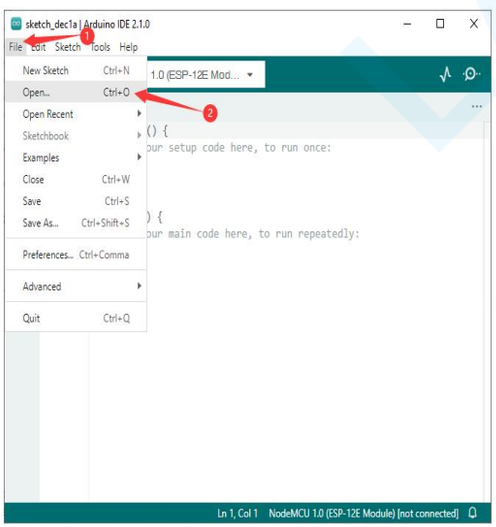
②Change the USB interface or change to another computer

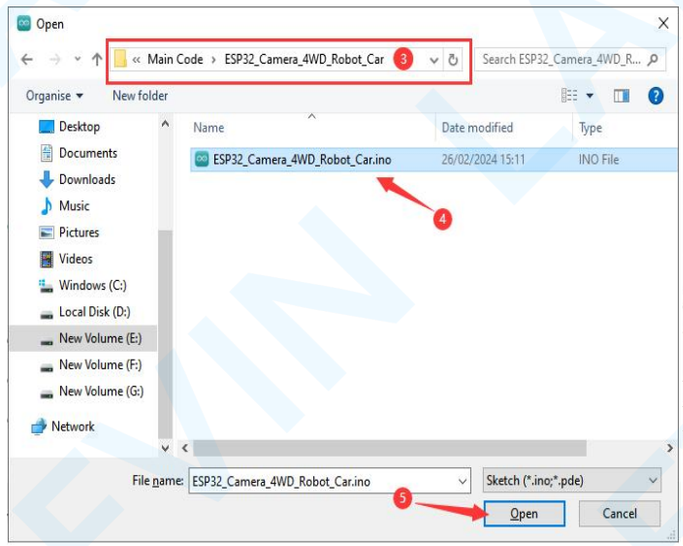
③Use a USB cable that can transfer data, not just power

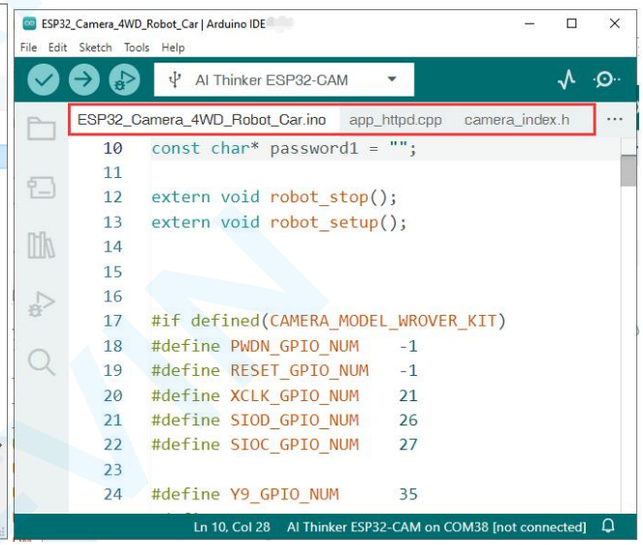
➢ Upload Code

①Start Arduino IDE, open the code in

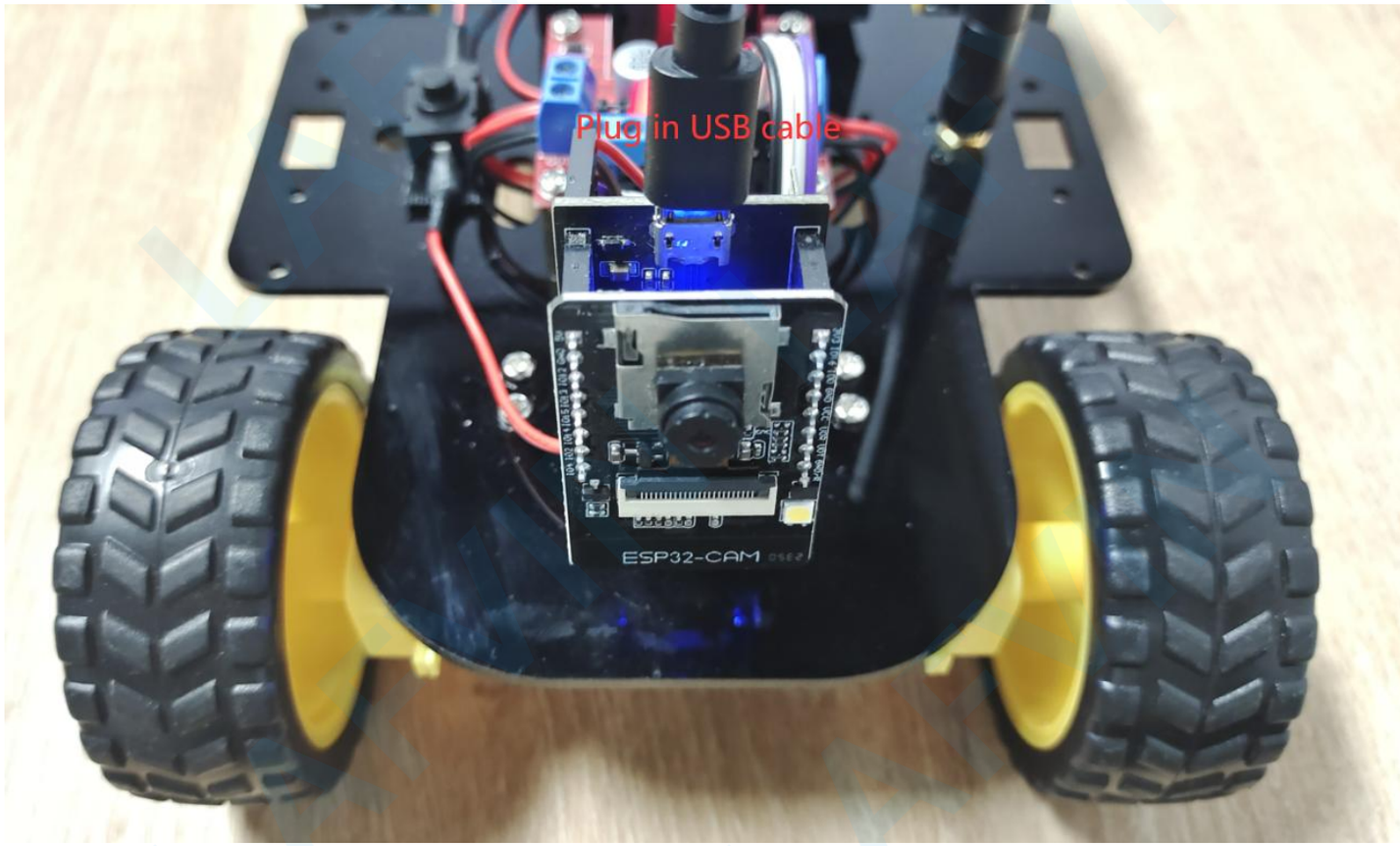
File->Open...->ESP32 Camera 4WD Robot Car Kit>Main Code>*ESP32_Camera_4WD_Robot_Car.ino*



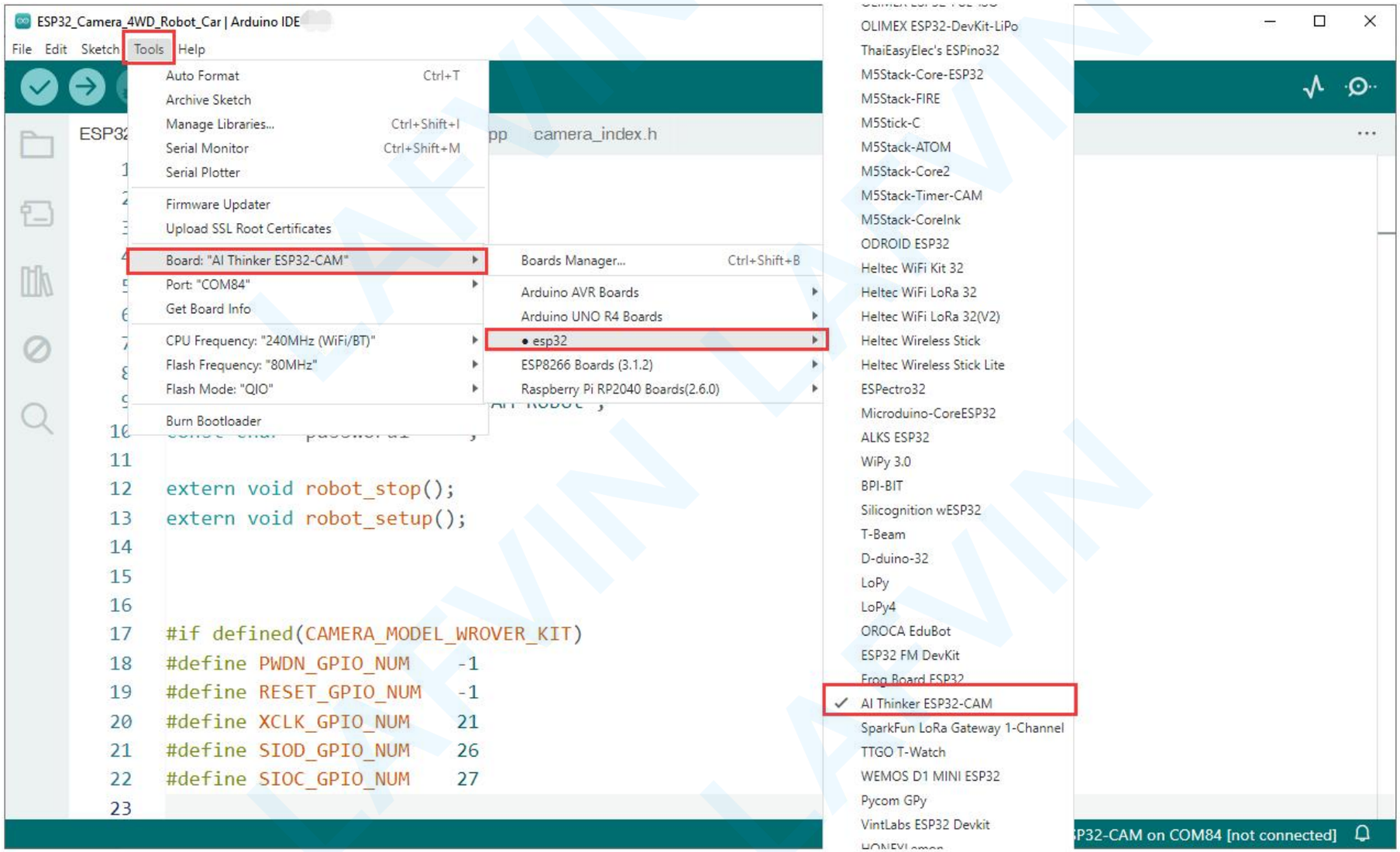




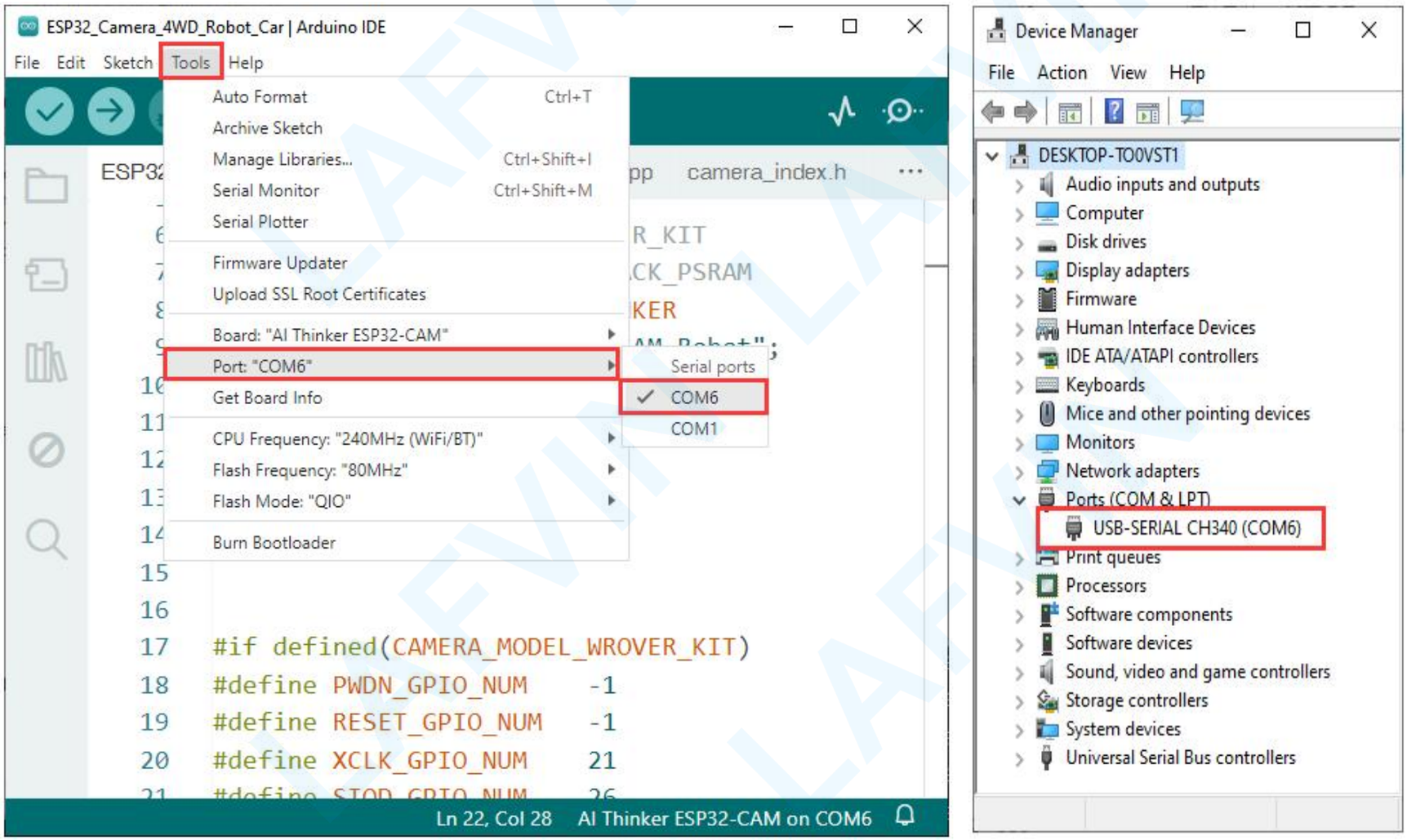
②Use USB cable to connect the ESP32CAM board to the computer.(It may be that the power supply of the USB interface of the computer is insufficient, you can turn on the power switch of the robot car at the same time.)



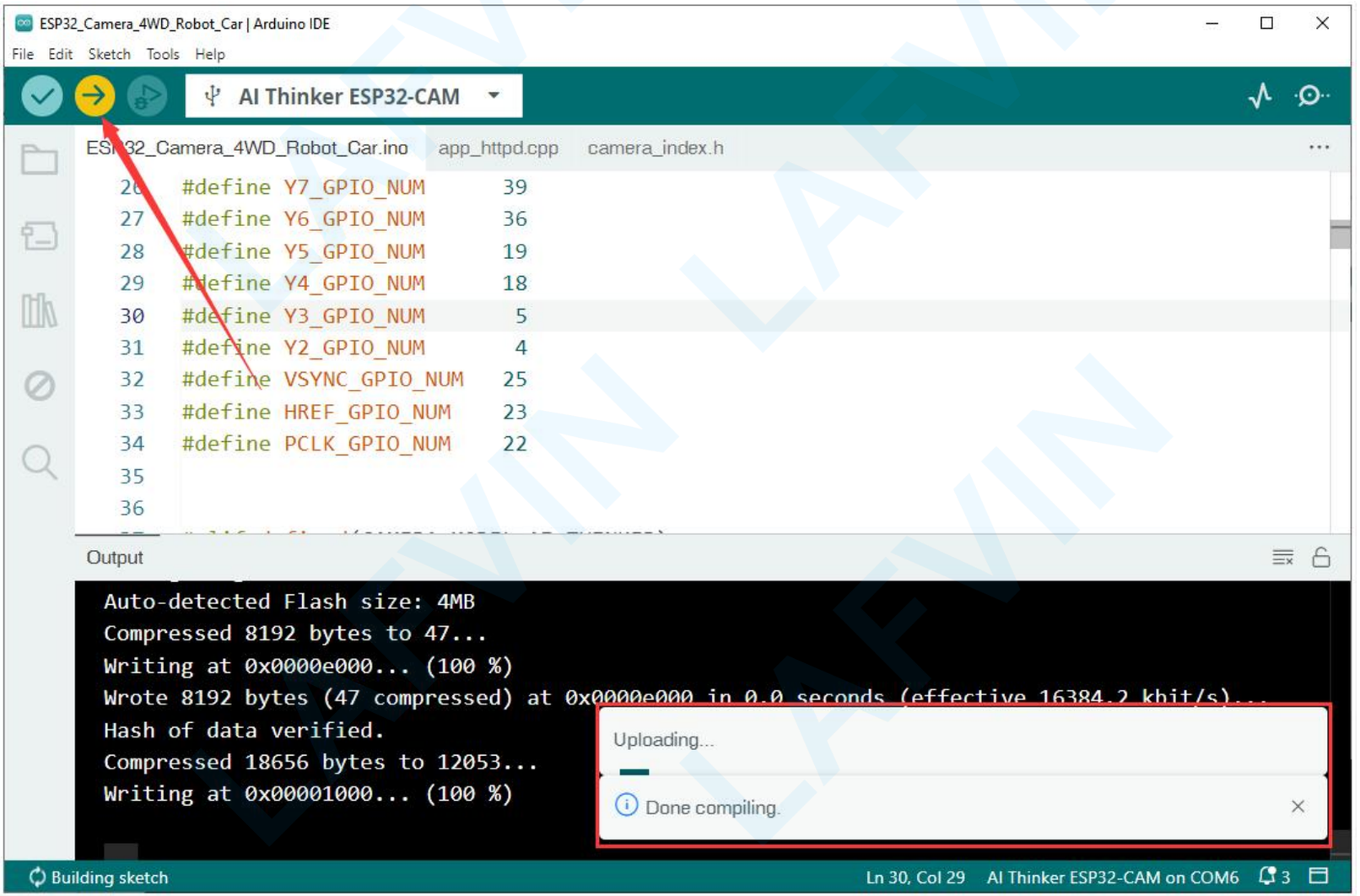
③Select your Board in **Tools > Board menu>esp32>AI Thinker ESP32-CAM**



④Select the Port (if you don’t see the COM Port in your Arduino IDE, you need to Install the CH340 Drivers)

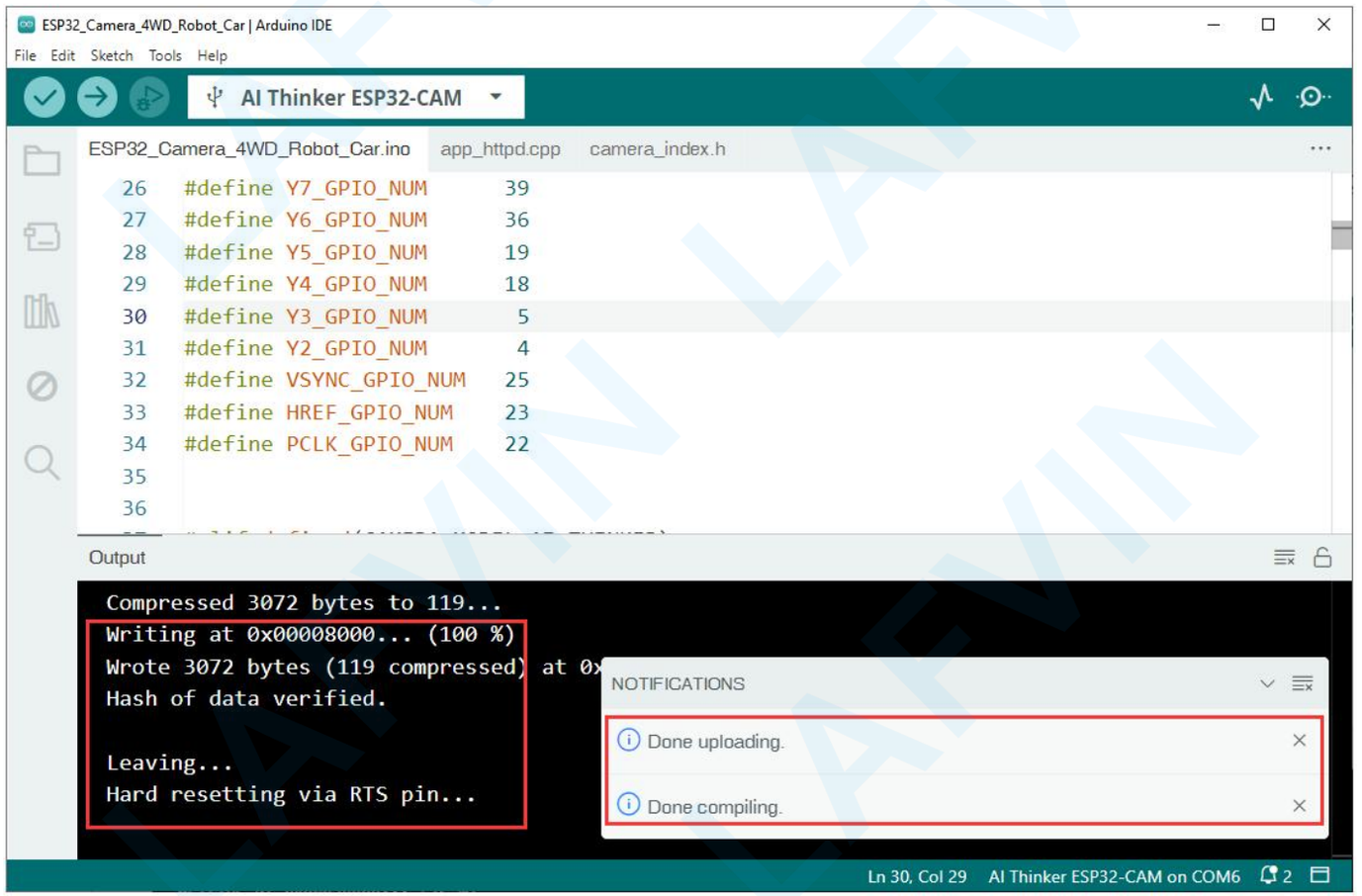


⑤Click the **Upload** button in the Arduino IDE. Wait a few seconds while the code compiles and uploads to your board.



If everything went as expected, you should see a "**Done uploading**." message.If the Arduino IDE reports errors maybe you missed some steps. Arduino getting started guide is as follows

Errors when uploading a sketch Getting Started with Arduino products

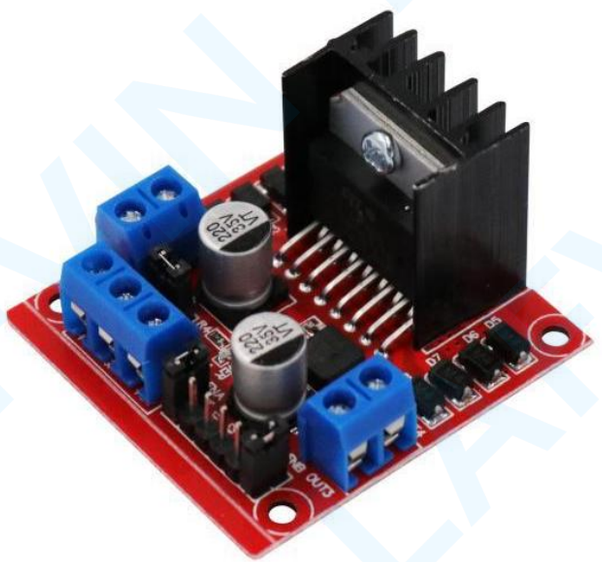


L298N Motor Driver

There are many ways to control a DC motor. The method we'll use here is suitable for most hobbyist motors, that require 6V or 12V to operate.

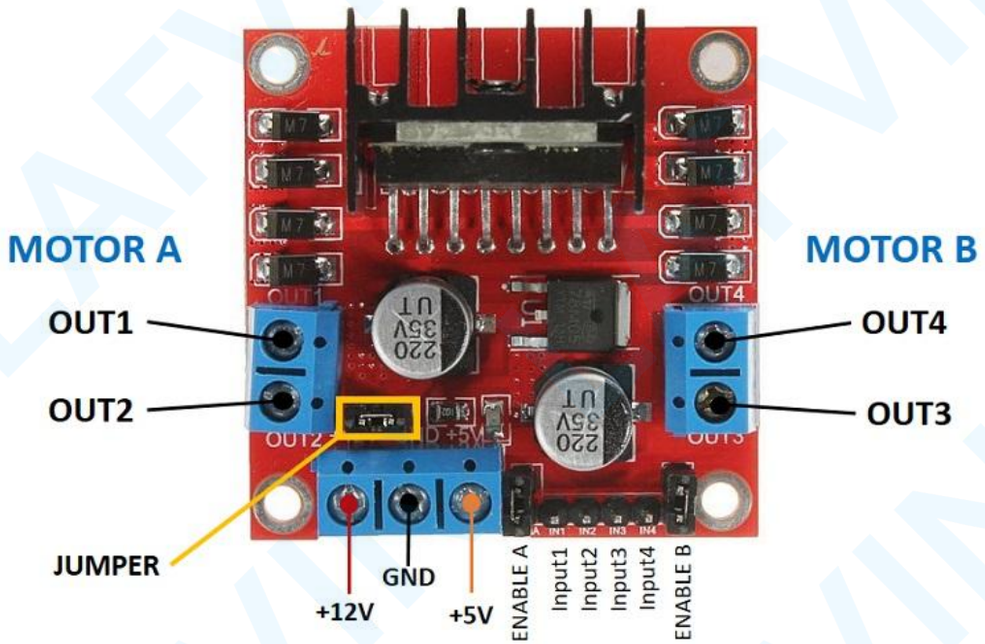
We're going to use the L298N motor driver that can handle up to 3A at 35V. Additionally, it allows us to drive two DC motors simultaneously, which is perfect to build a robot.

The L298N motor driver is shown in the following figure:



L298N Motor Driver pinout

Let’s take a look at the L298N motor driver pinout and see how it works.



The motor driver has a two terminal block in each side for each motor. OUT1 and OUT2 at the left and OUT3 and OUT4 at the right.

- **OUT1**: DC motor A + terminal
- **OUT2**: DC motor A – terminal
- **OUT3**: DC motor B + terminal
- **OUT4**: DC motor B – terminal

At the bottom you have a three terminal block with +12V, GND, and +5V. The +12V terminal block is used to power up the motors. The +5V terminal is used to power up the L298N chip. However, if the jumper is in place, the chip is powered using the motor's power supply and you don't need to supply 5V through the +5V terminal.

Note: if you supply more than 12V, you need to remove the jumper and supply 5V to the +5V terminal.

It's important to note that despite the +12V terminal name, with the setup we'll use here (with the jumper in place) you can supply any voltage between 6V and 12V. In this tutorial will be using 4 AA 1.5V batteries that combined output approximately 6V, but you can use any other suitable power supply.

In summary:

- **+12V**: The +12V terminal is where you should connect your power supply
- **GND**: power supply GND
- **+5V**: provide 5V if jumper is removed. Acts as a 5V output if jumper is in place
- **Jumper**: jumper in place – uses the motors power supply to power up the chip. Jumper removed: you need to provide 5V to the +5V terminal. If you supply more than 12V, you should remove the jumper

At the bottom right you have four input pins and two enable terminals. The input pins are used to control the direction of your DC motors, and the enable pins are used to control the speed of each motor.

- **IN1:** Input 1 for Motor A
- **IN2**: Input 2 for Motor A
- **IN3**: Input 1 for Motor B
- **IN4**: Input 2 for Motor B
- **EN1**: Enable pin for Motor A
- **EN2**: Enable pin for Motor B

There are jumper caps on the enable pins by default. You need to remove those jumper caps to control the speed of your motors.

Control DC motors with the L298N

Now that you're familiar with the L298N Motor Driver, let's see how to use it to control your DC motors.

Enable pins

The enable pins are like an ON and OFF switch for your motors. For example:

- If you send a **HIGH signal** to the enable 1 pin, motor A is ready to be controlled and at the maximum speed;
- If you send a **LOW signal** to the enable 1 pin, motor A turns off;
- If you send a **PWM signal**, you can control the speed of the motor. The motor speed is proportional to the duty cycle. However, note that for small duty cycles, the motors might not spin, and make a continuous buzz sound.

SIGNAL ON THE ENABLE PIN	MOTOR STATE
HIGH	Motor enabled
LOW	Motor not enabled
PWM	Motor enabled: speed proportional to duty cycle

Input pins

The input pins control the direction the motors are spinning. Input 1 and input 2 control motor A, and input 3 and 4 control motor B.

- If you apply LOW to input1 and HIGH to input 2, the motor will spin forward;

- If you apply power the other way around: HIGH to input 1 and LOW to input 2, the motor will rotate backwards. Motor B can be controlled using the same method but applying HIGH or LOW to input 3 and input 4.

Controlling 2 DC Motors – ideal to build a robot

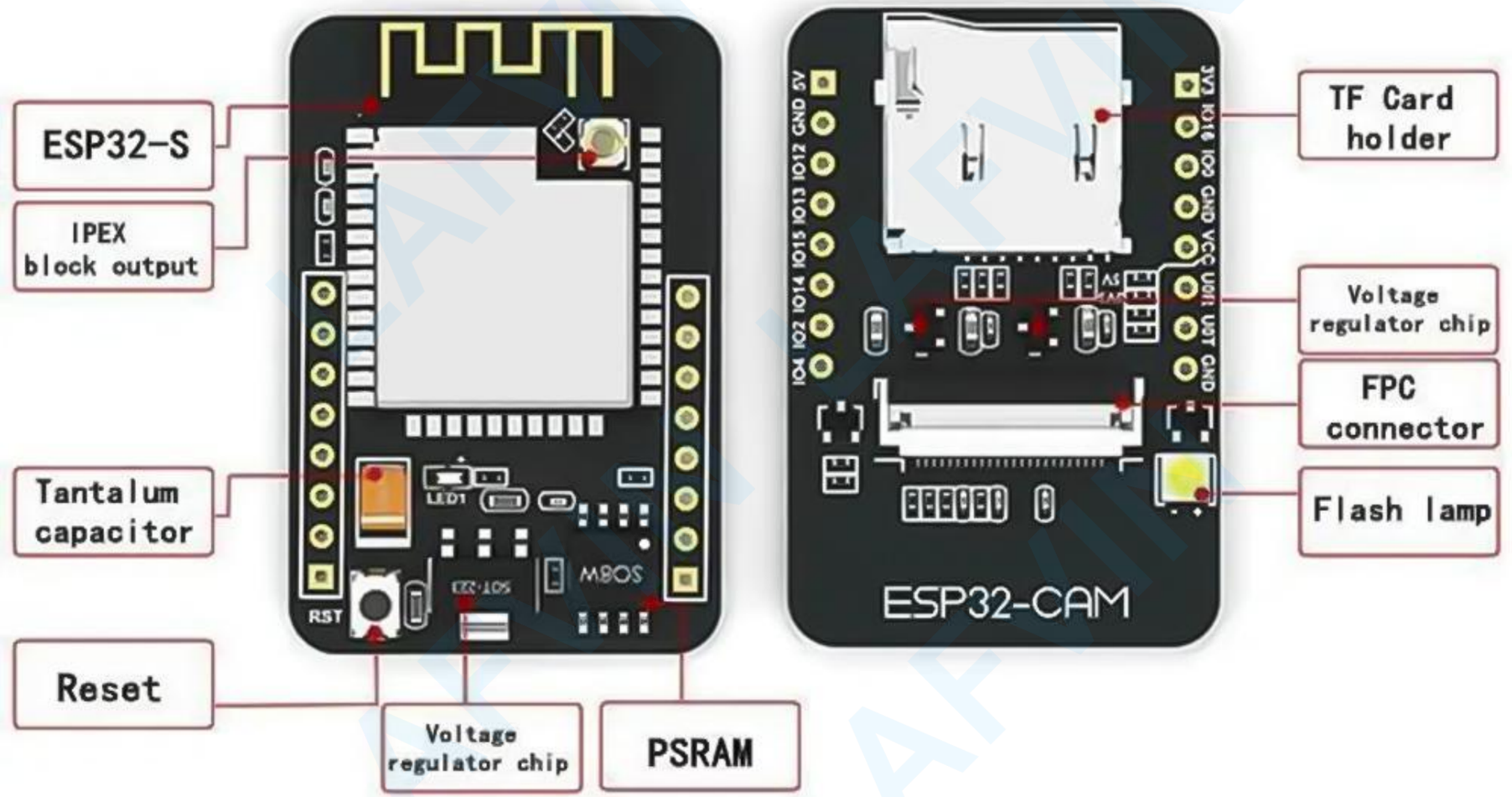
If you want to build a robot car using 2 DC motors, these should be rotating in specific directions to make the robot go left, right, forward or backwards.

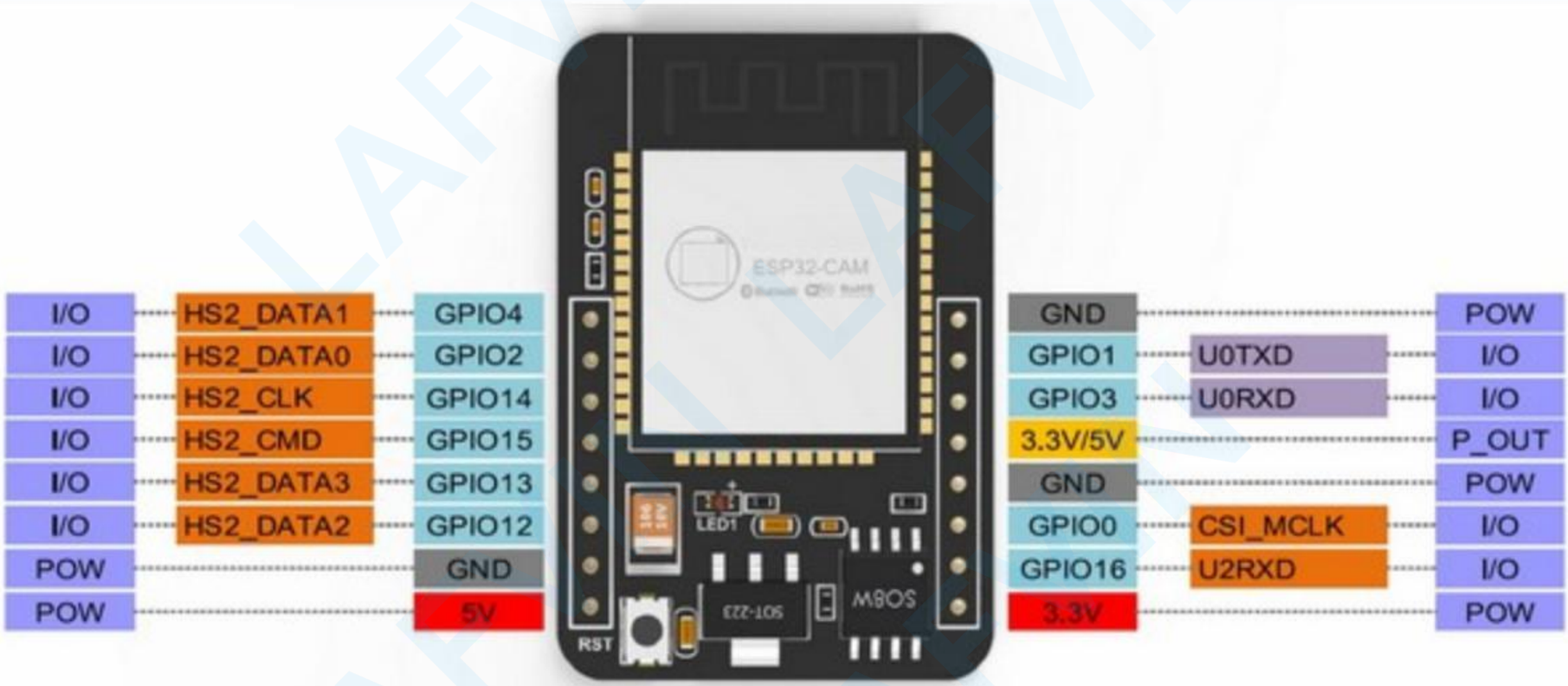
For example, if you want your robot to move forward, both motors should be rotating forward. To make it go backwards, both should be rotating backwards.

To turn the robot in one direction, you need to spin the opposite motor faster. For example, to make the robot turn right, enable the motor at the left, and disable the motor at the right. The following table shows the input pins' state combinations for the robot directions.

DIRECTION	IN 1(D2)	IN 2(D4)	IN 3 (D7)	IN 4(D8)
Forward	0	1	0	1
Backward	1	0	1	0
Rotate_Right	1	0	0	1
Rotate_Left	0	1	1	0
Stop	1	1	1	1

ESP32-CAM Specifications




I/O
I/O
I/O
I/O
I/O
I/O
POW
POW
HS2_DATA1
HS2_DATA0
HS2_CLK
HS2_CMD
HS2_DATA3
HS2_DATA2
GPIO4
GPIO2
GPIO14
GPIO15
GPIO13
GPIO12
GND
5V
ESP32-CAM
LED1
RST
GND
GPIO1
GPIO3
3.3V/5V
GND
GPIO0
GPIO16
3.3V
U0TXD
U0RXD
CSI_MCLK
U2RXD
POW
I/O
I/O
P_OUT
POW
I/O
I/O
POW

The ESP32-CAM is based upon the ESP32-S module, so it shares the same specifications. It has the following features:

- 802.11b/g/n Wi-Fi
- Bluetooth 4.2 with BLE
- UART, SPI, I2C and PWM interfaces
- Clock speed up to 160 MHz
- Computing power up to 600 DMIPS
- 520 KB SRAM plus 4 MB PSRAM
- Supports WiFi Image Upload
- Multiple Sleep modes
- Firmware Over the Air (FOTA) upgrades possible
- 9 GPIO ports,Built-in Flash LED

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