

Lesson 20 DC Motor Control

Introduction

In this lesson, you will learn how to control a small DC motor using an Mega 2560 and transistor.

Hardware Required

- ✓ 1 * RexQualis Mega 2560
- ✓ 1 * Breadboard
- ✓ 1 * Breadboard Power Supply Module
- ✓ 1 * L293D IC
- ✓ 1 * Fan blade and 3-6v motor
- ✓ 5 * M-M Jumper Wire
- ✓ 5 * 9V 1A Adapter

Principle

Breadboard Power Supply

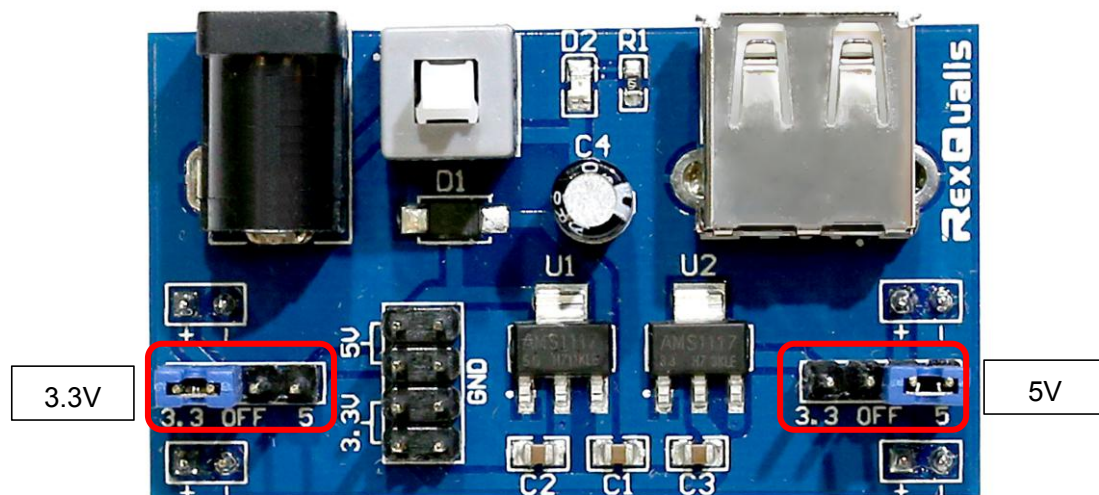
The small DC motor is likely to use more power than an Mega 2560 board digital output can handle directly. If we tried to connect the motor straight to an Mega 2560 board pin, there is a good chance that it could damage the Mega 2560 board. So we use a power supply module provides power supply.

Product Specifications:

- ✓ Locking On/Off Switch
- ✓ LED Power Indicator
- ✓ Input voltage:6.5-9v(DC) via 5.5mm x 2.1mm plug

- ✓ Output voltage:3.3V/5V
- ✓ Maximum output current:700 mA
- ✓ Independent control rail output.0v, 3.3v, 5v to breadboard
- ✓ Output header pins for convenient external use
- ✓ Size:2.1 in x 1.4 in
- ✓ USB device connector on board to power external device

Setting up output voltage:



The left and right voltage output can be configured independently. To select the output voltage, move jumper to the corresponding pins.

Note: power indicator LED and the breadboard power rails will not power on if both jumpers are in the “OFF” position.

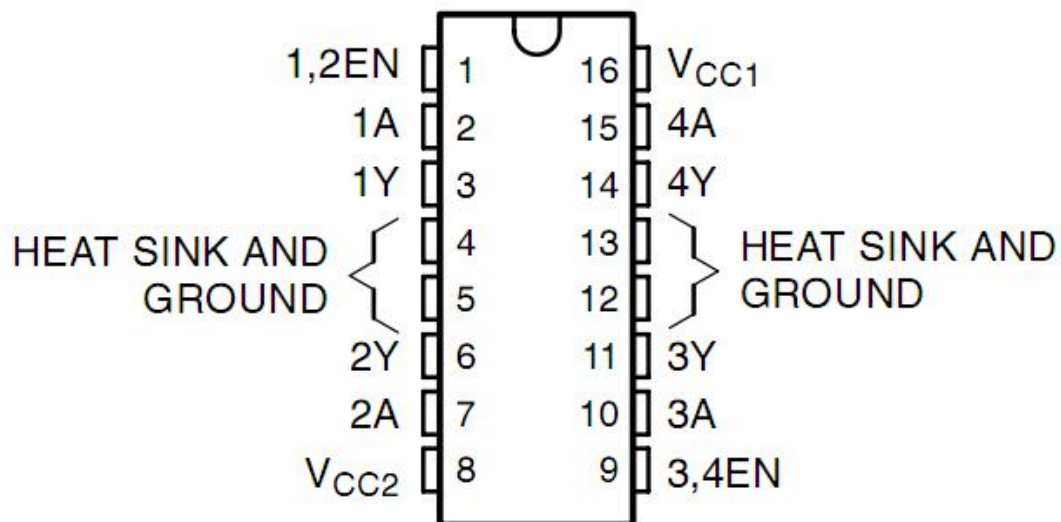
Important note:

Make sure that you align the module correctly on the breadboard. The negative pin(-) on module lines up with the blue line(-) on breadboard and that the positive pin(+) lines up with the red line(+). Failure to do so could result in you accidentally reversing the power to your project

L293D

This is a very practical chip that can independently control two DC motors. In this experiment, just half of the chip is used. Since most pins on the right side of the chip are used to control the second motor, they will not be used here.

L293D has two pins (V_{CC1} and V_{CC2}) for power supply. V_{CC2} is used to supply power for the motor, while V_{CC1} to supply for the chip. Since a small-sized DC motor is used here, connect both pins to +5V. If you use a high power motor, connect V_{CC2} to an external power supply. At the same time, the GND of L293D should be connected to that of the SunFounder Uno board.



DC Motor Specifications

- ✓ Voltage: 3-6V
- ✓ Main Size: length 25mm, thickness 15 mm, width 20mm
- ✓ Motor Shaft Length: 9mm, Shaft Diameter 2mm
- ✓ Rated Voltage: 3V
- ✓ Reference Current: 0.35-0.4A
- ✓ 3V Rotating Speed: 13000RPM

Code interpretation

#define E1 5 // Enable Pin for motor

#define I1 3 // Control pin 1 for motor

#define I2 4 // Control pin 2 for motor

void setup() {

pinMode(E1, OUTPUT);

pinMode(I1, OUTPUT);

pinMode(I2, OUTPUT);

}

void loop() {

analogWrite(E1, 153); **// Run in half speed**

digitalWrite(I1, HIGH);

digitalWrite(I2, LOW);

delay(10000);

// change direction

digitalWrite(E1, LOW);

delay(2000);

analogWrite(E1, 255); **// Run in full speed**

digitalWrite(I1, LOW);

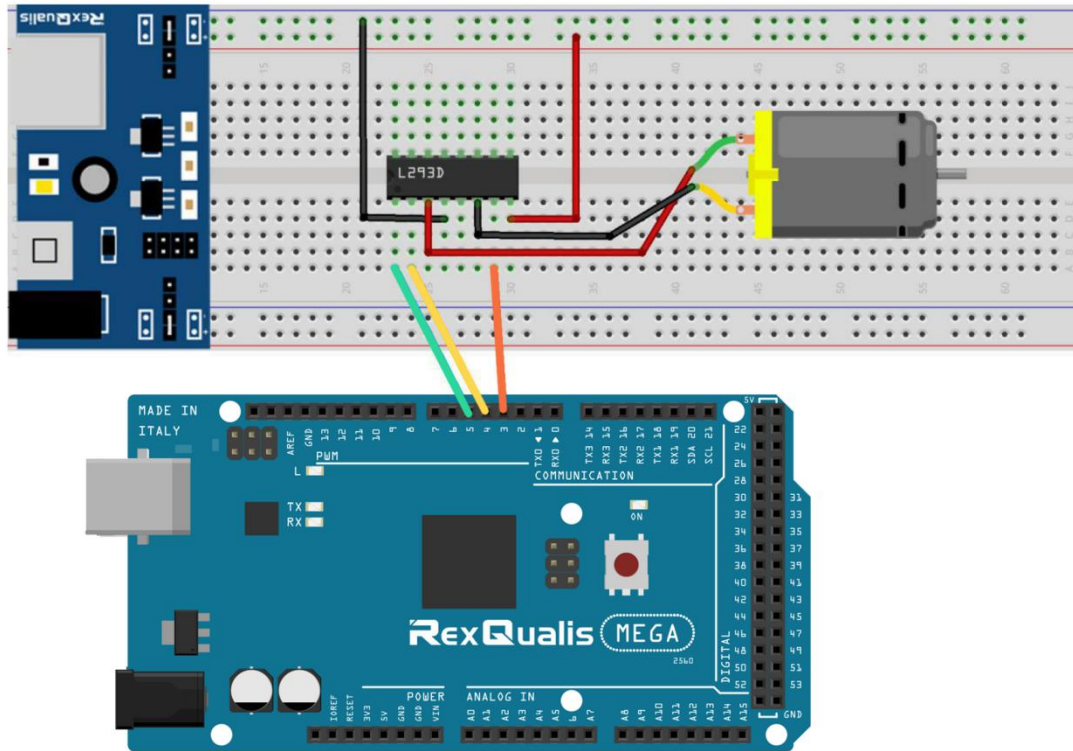
digitalWrite(I2, HIGH);

delay(10000);

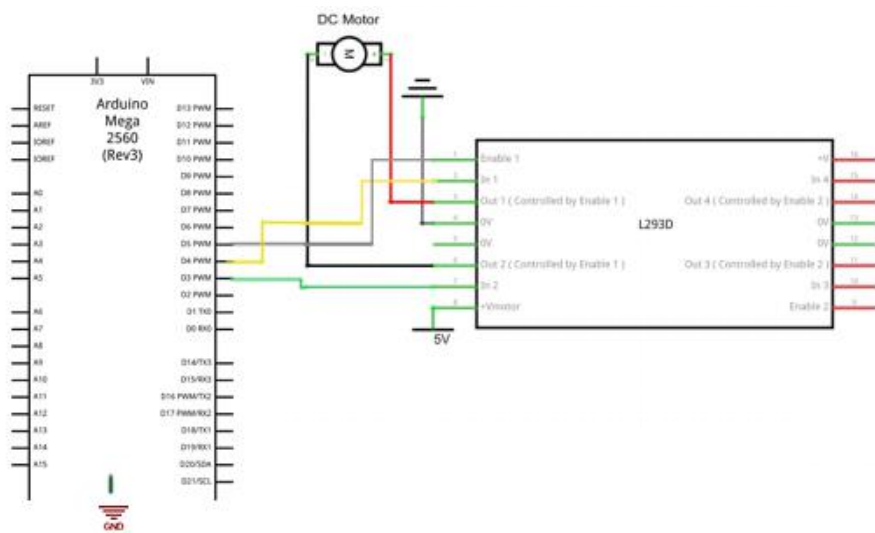
}

Experimental Procedures

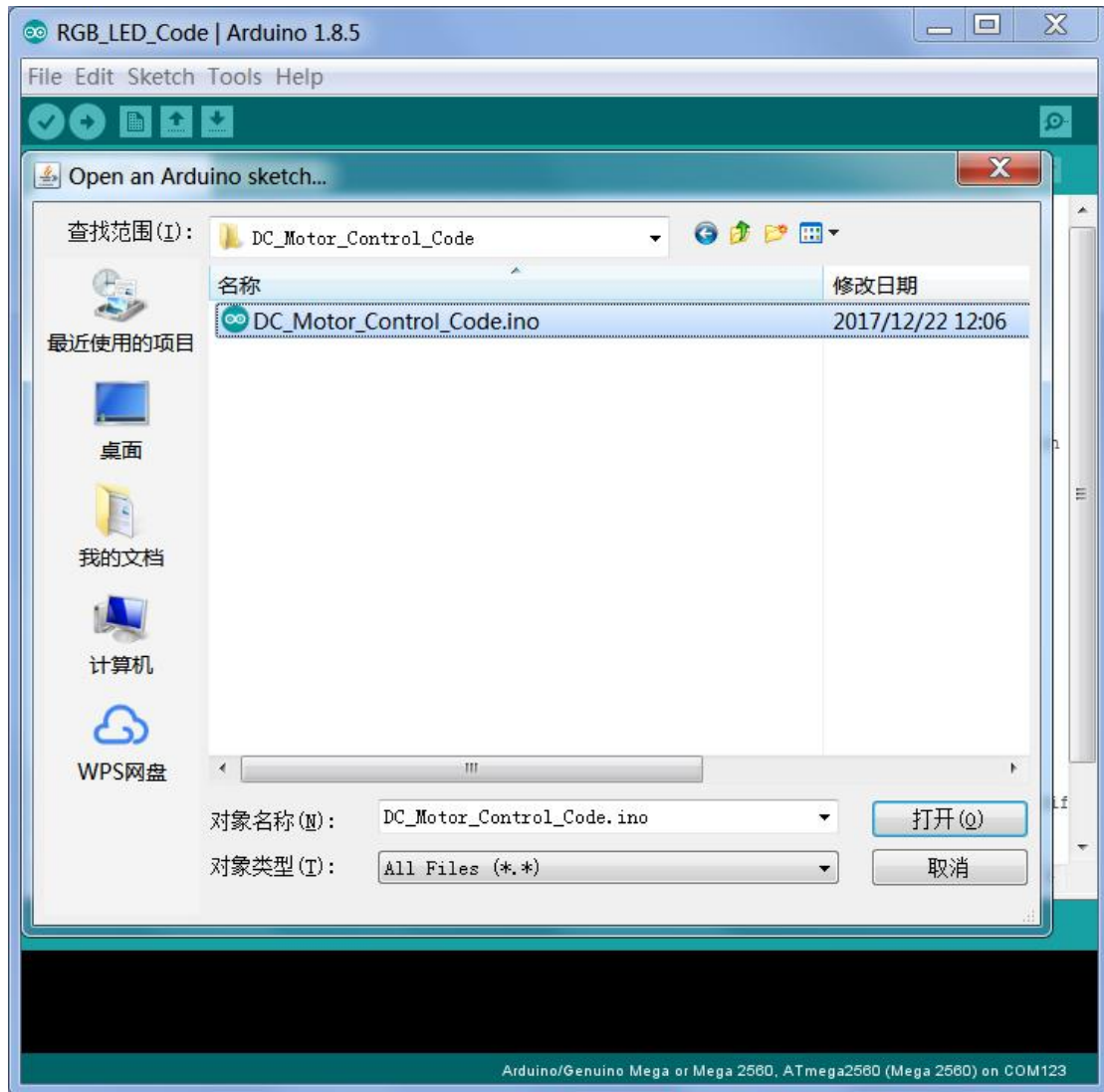
Step 1: Build the circuit



Schematic Diagram

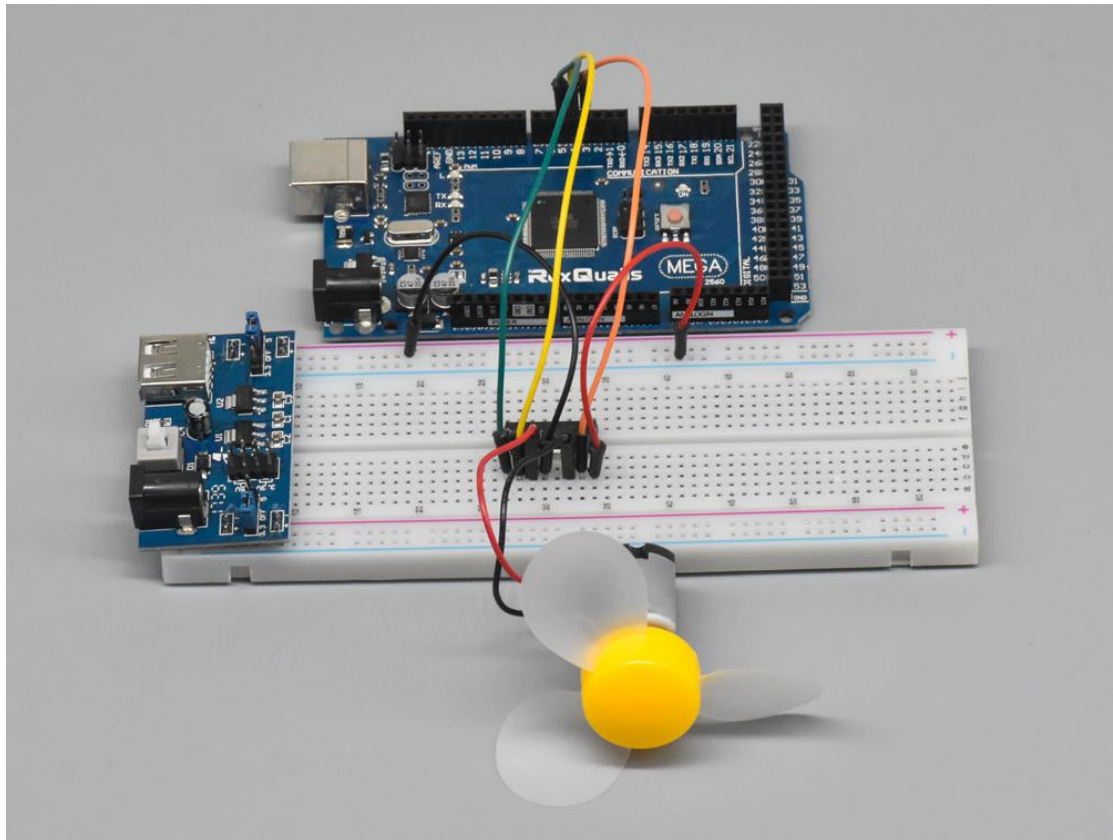


Step 2: Open the code: DC_Motor_Control_Code



Step 3: Attach Arduino Mega 2560 board to your computer via USB cable and check that the '**Board Type**' and '**Serial Port**' are set correctly.

Step 4: Upload the code to the RexQualis Mega 2560 board.



You can see the video of the experiment results on YouTube:

<https://youtu.be/uod6ZLb4ITg>

If it isn' t working, make sure you have assembled the circuit correctly, verified and uploaded the code to your board. For how to upload the code and install the library, check Lesson 0 Preface.