# Arduino Lesson 12. DC Motor Reversing

Microcomputer Lab

# Objectives

In this lesson, you will start by :

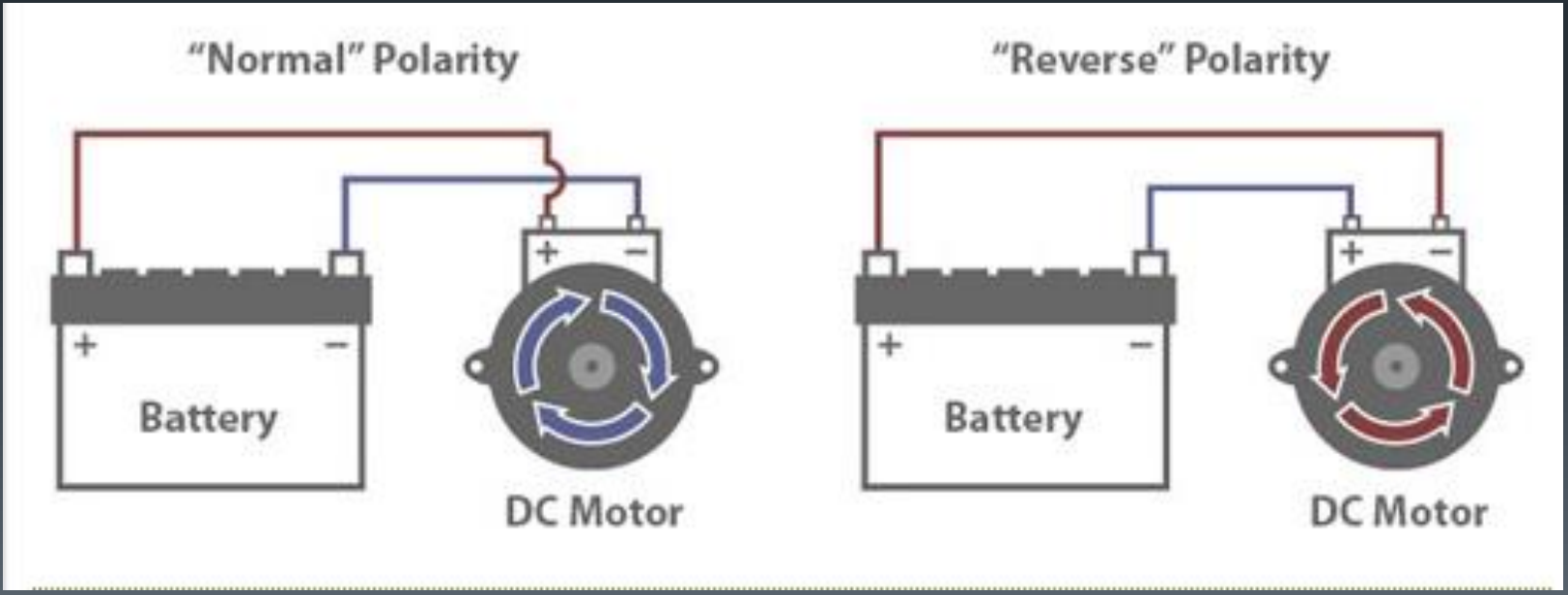
- Learn how to control both the **direction** and **speed** of a small **DC motor** using an **Arduino** and the **L293D** motor driver chip.
- We use a **pot** to control the speed of the motor and a **push button** to control the direction.

# Theory

- An analog signal can take values from **0 to 1023**, a digital signal has two values: ( **0/1**, OR **0 – 255** ).
- To convert analog value into digital value ( **PWM = analog / 4** ).
- Function to read analog signal is **analogRead(pin)**.
- Function to send deferent digital signal is **analogWrite(pin,value)**.
- A DC motor (Direct Current motor) is the most common type of motor.
- DC motors normally have just two leads, one positive and one negative.

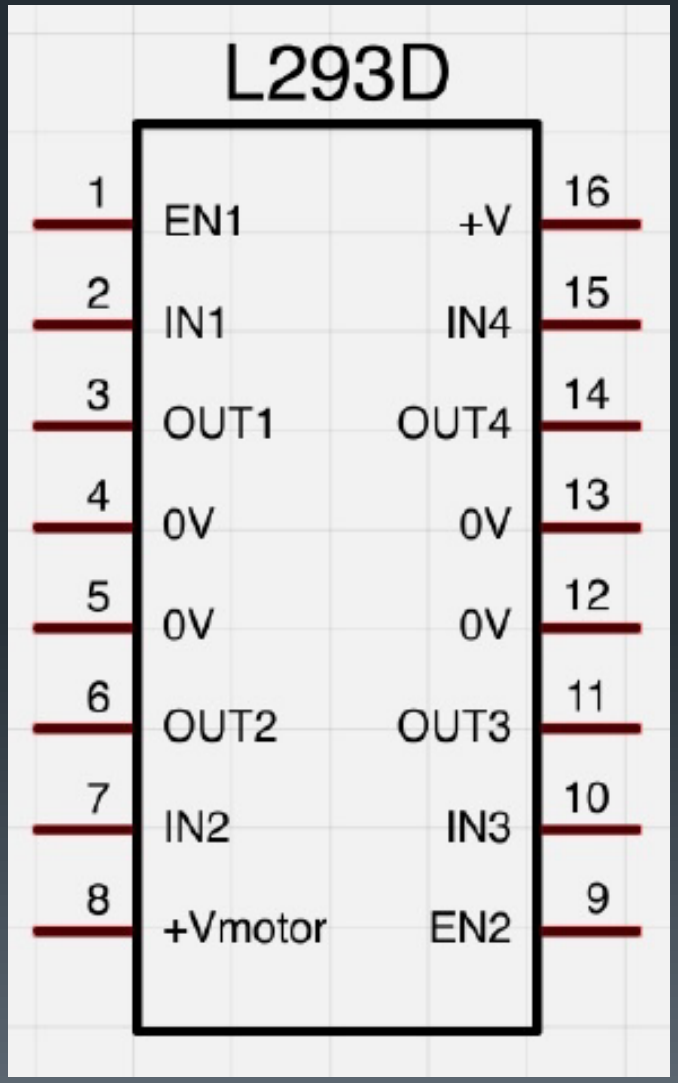
# DC motor Direction

- If you connect these two leads directly to a battery, the motor will rotate. If you switch the leads, the motor will rotate in the opposite direction.



# L293D

- This is a very useful chip.
- It can actually control two motors independently.
- We are just using half the chip in this lesson, most of the pins on the right hand side of the chip are for controlling a second motor.

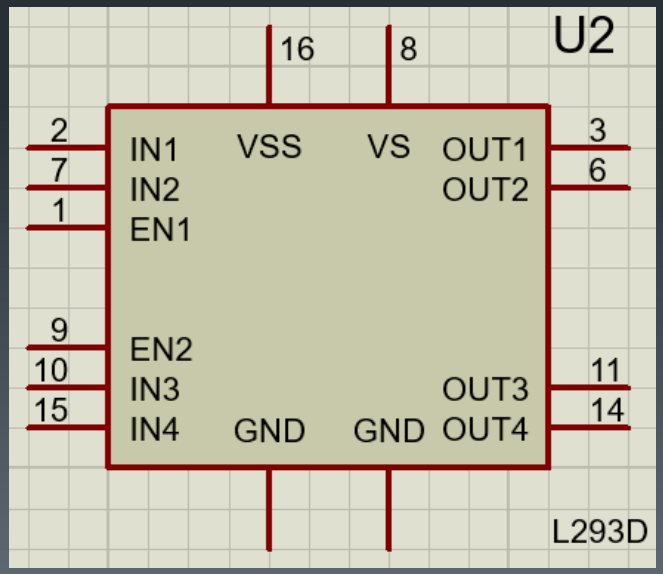


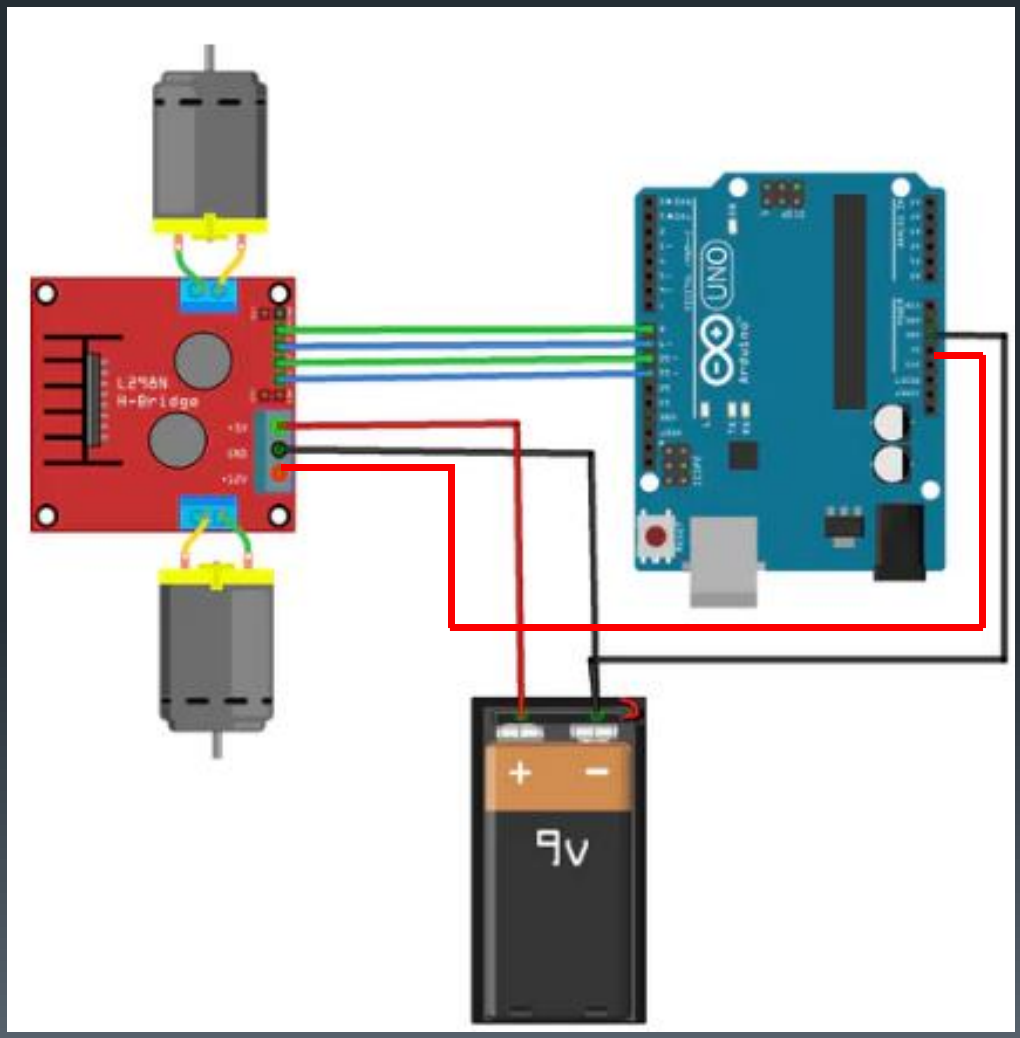

Pin Functions

| PIN | | TYPE | DESCRIPTION |
|---|---|---|---|
| NAME | NO. | | |
| 1,2EN | 1 | I | Enable driver channels 1 and 2 (active high input) |
| <1:4>A | 2, 7, 10, 15 | I | Driver inputs, noninverting |
| <1:4>Y | 3, 6, 11, 14 | O | Driver outputs |
| 3,4EN | 9 | I | Enable driver channels 3 and 4 (active high input) |
| GROUND | 4, 5, 12, 13 | — | Device ground and heat sink pin. Connect to printed-circuit-board ground plane with multiple solid vias |
| $V_{CC1}$ | 16 | — | 5-V supply for internal logic translation |
| $V_{CC2}$ | 8 | — | Power VCC for drivers 4.5 V to 36 V |

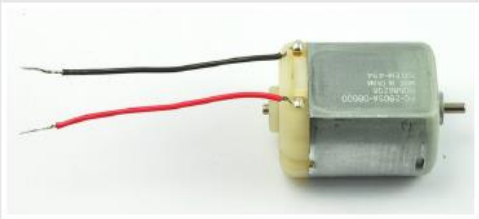
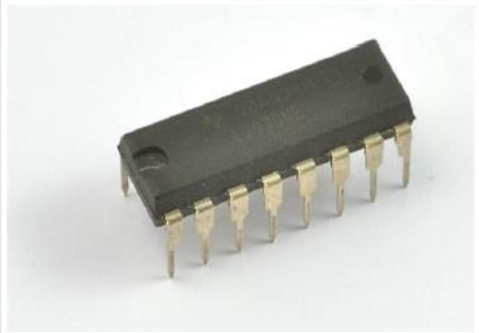
# L293D

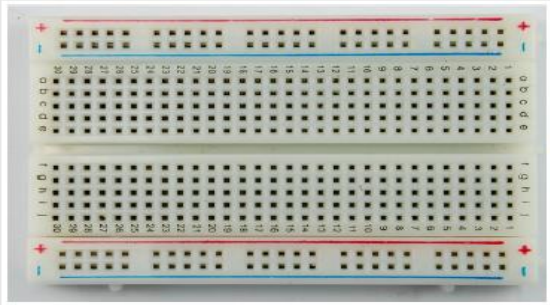
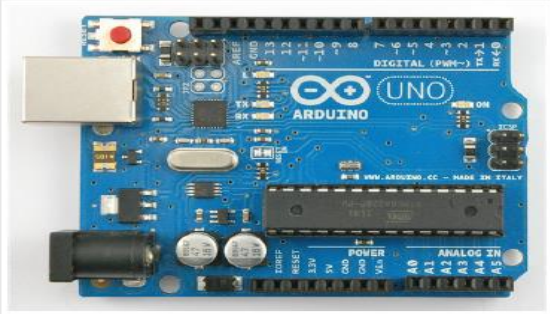
| Input A | Input B | Motor State |
|---|---|---|
| High | Low | Turns clockwise |
| Low | High | Turns anti-clockwise |
| High | High | Braking occurs |
| Low | Low | Braking occurs |



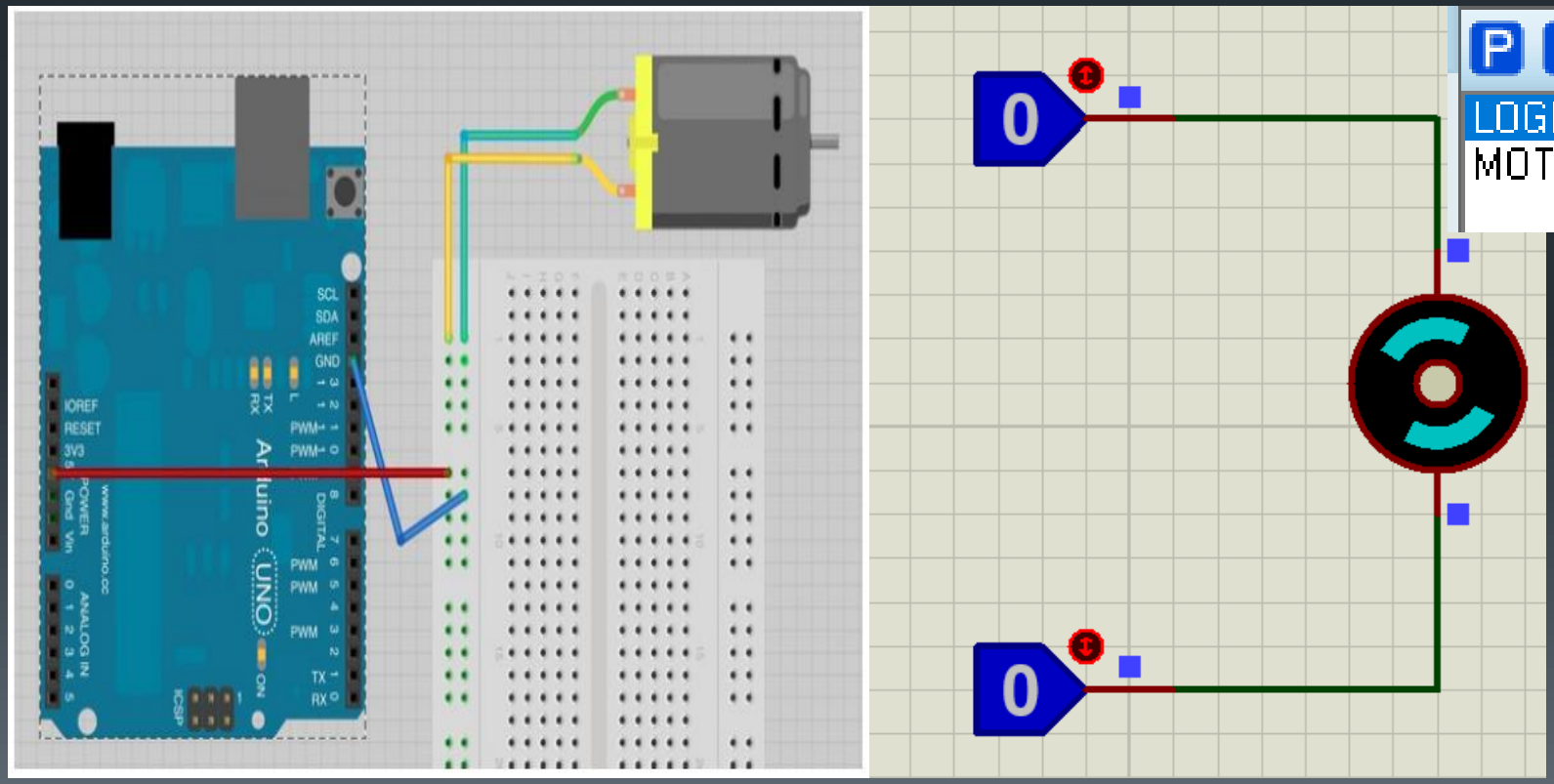
# Hardware Component

| | |
|---|---|
|  | Small 6V DC Motor |
|  | L293D IC |
|  | 10 kΩ variable resistor (pot) |

| | |
|---|---|
|  | Tactile push switch |
|  | Half-size Breadboard |
|  | Arduino Uno R3 |

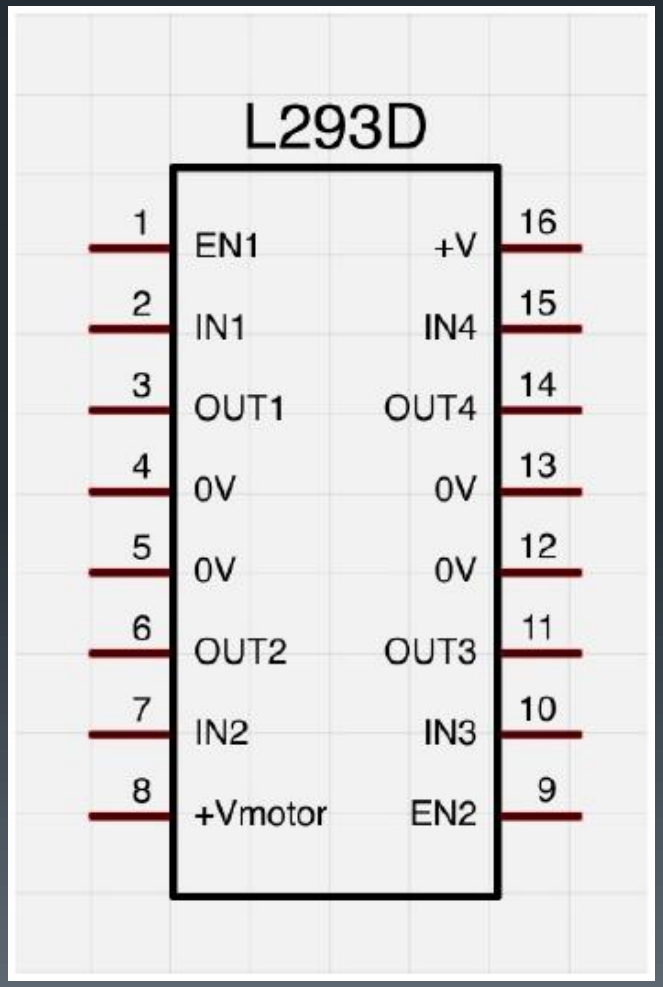
# Procedure - 1

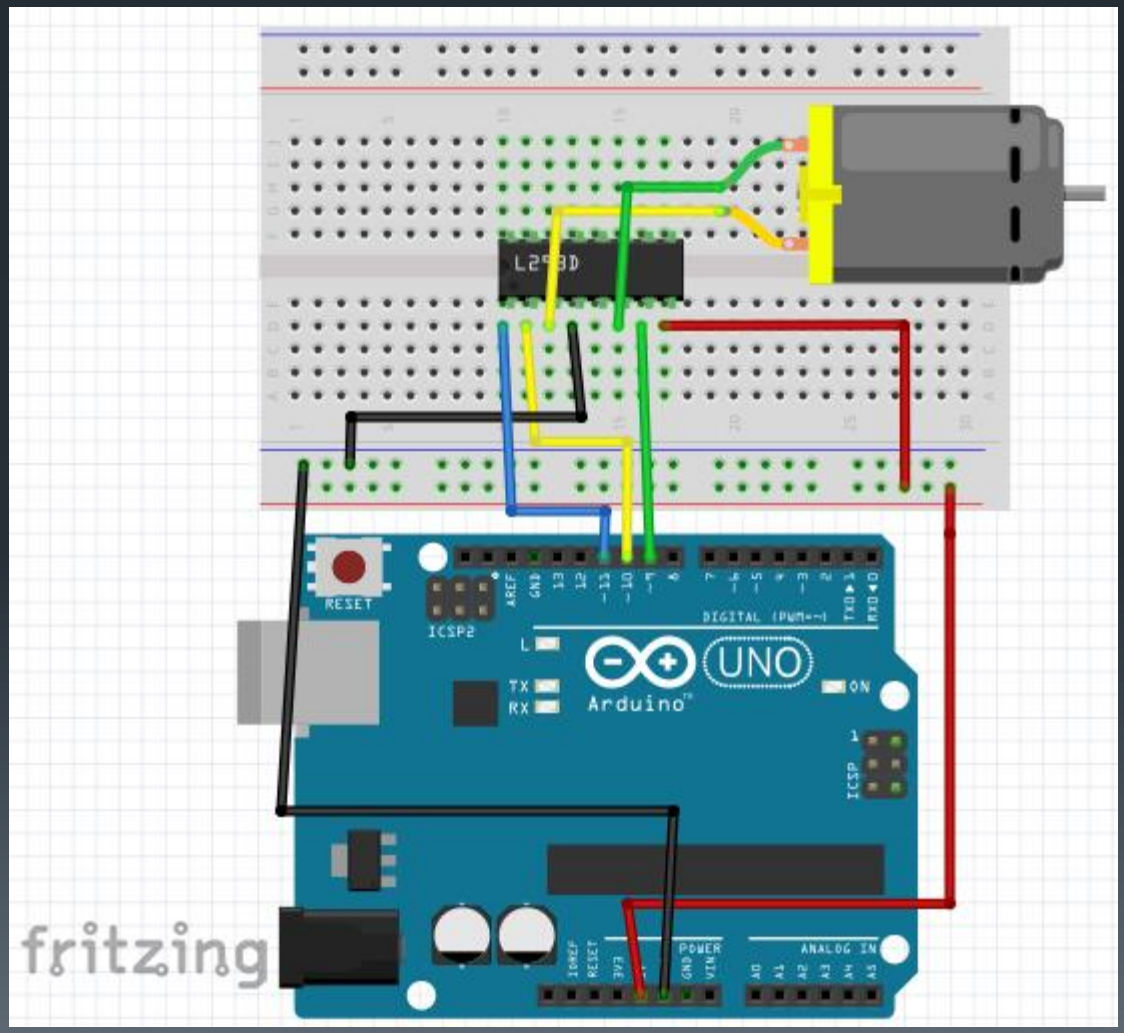
Before we get the Arduino board to control the motor, we should experiment with the Dc motor control idea how it works. We can start by just using the Arduino to supply 5V to the motor.



# Procedure - 2

Use DC Motor with the L293D motor control chip and Arduino to get an idea how it works.



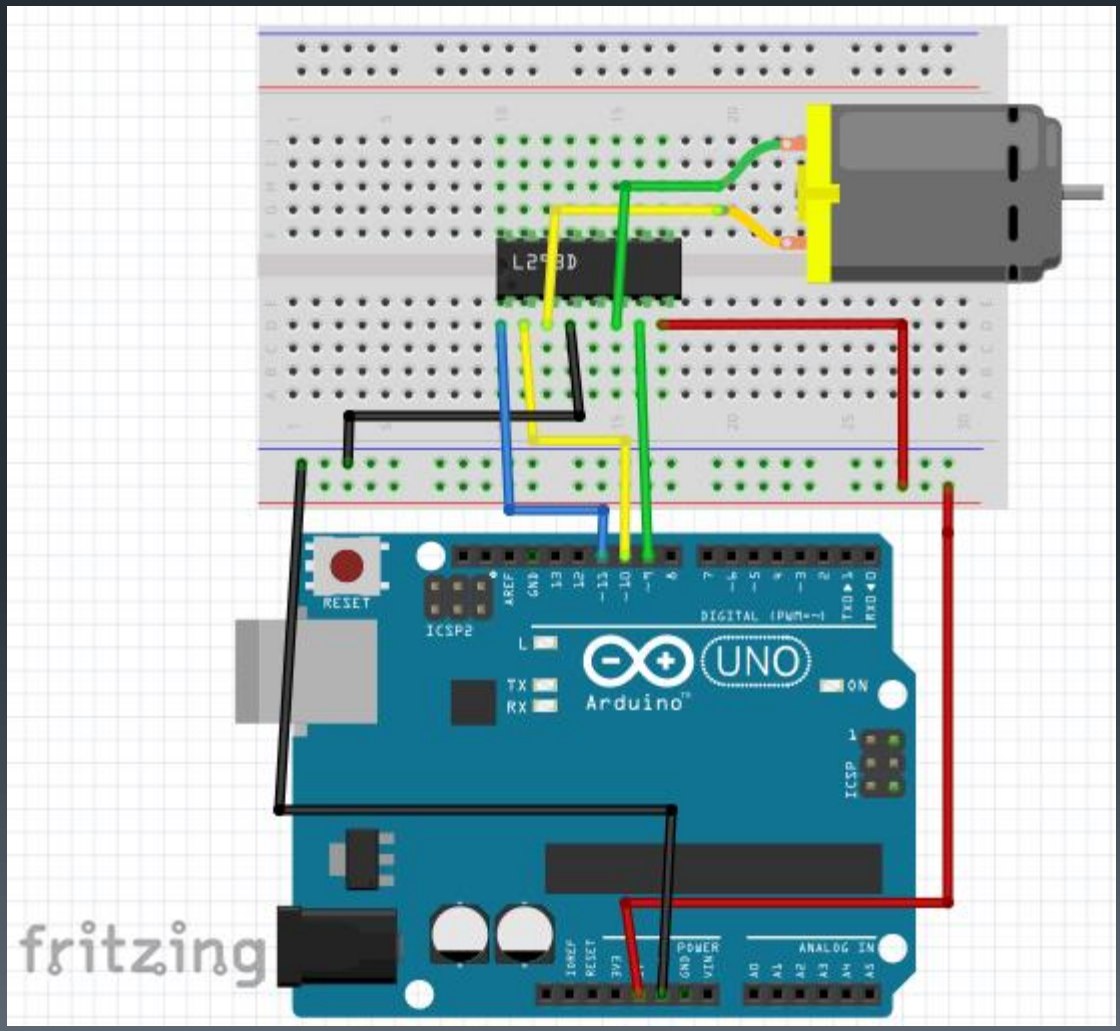
# Procedure - 2

Use DC Motor with the L293D motor control chip and Arduino to get an idea how it works.

```
int variable = 150;
```

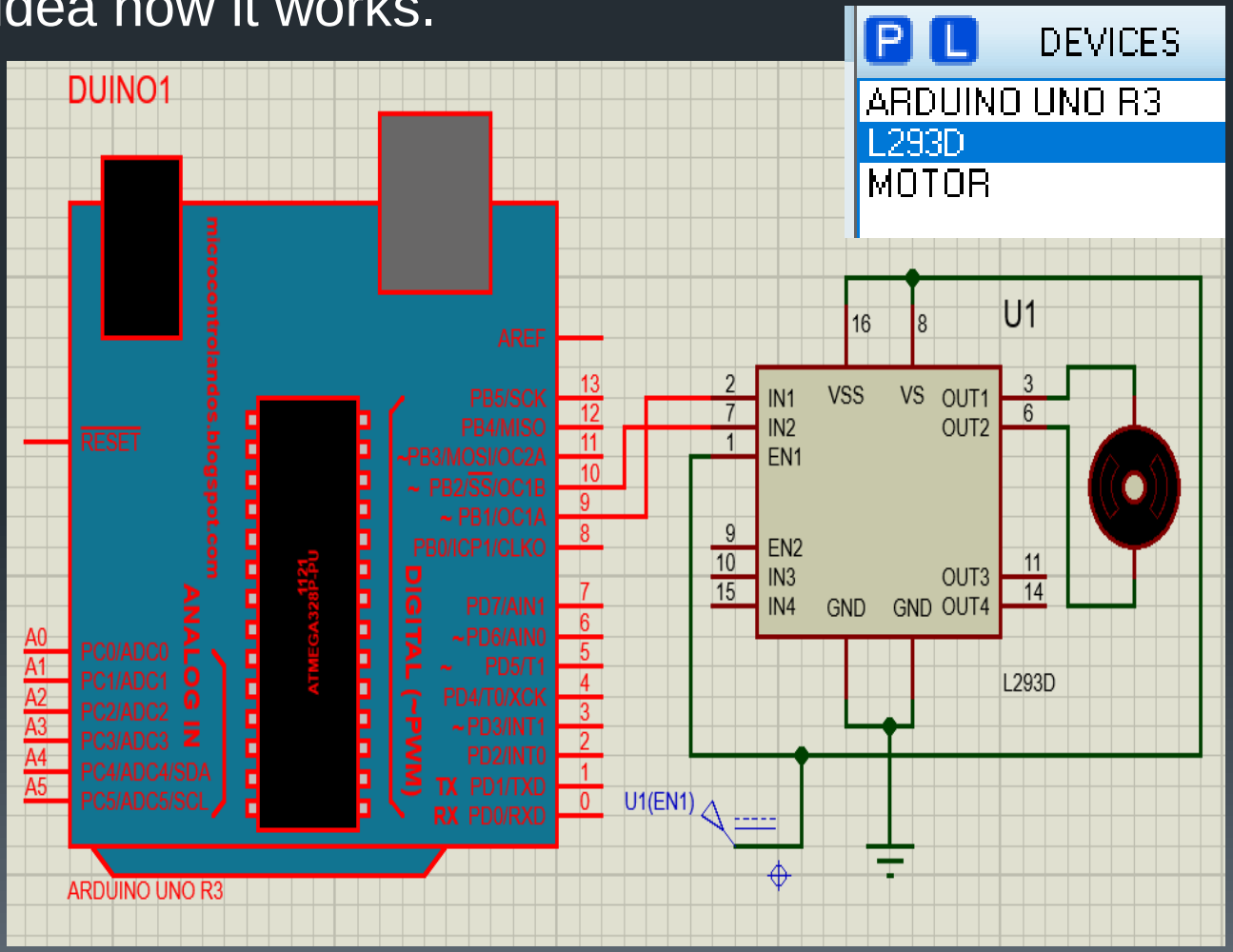
```
void setup()
{
}
```

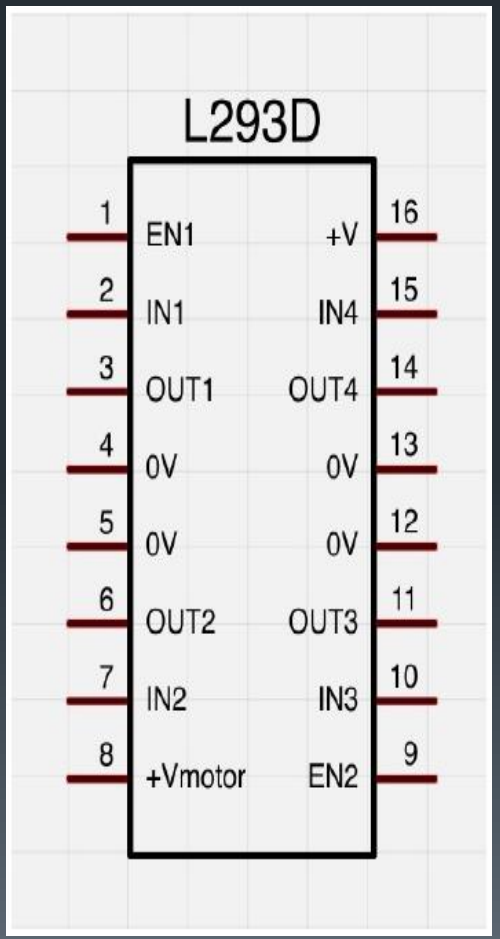
```
void loop()
{
analogWrite(9,variable);
analogWrite(10,0);
delay(50);
}
```



# Procedure - 2

Use DC Motor with the L293D motor control chip and Arduino to get an idea how it works.



# Procedure - 3

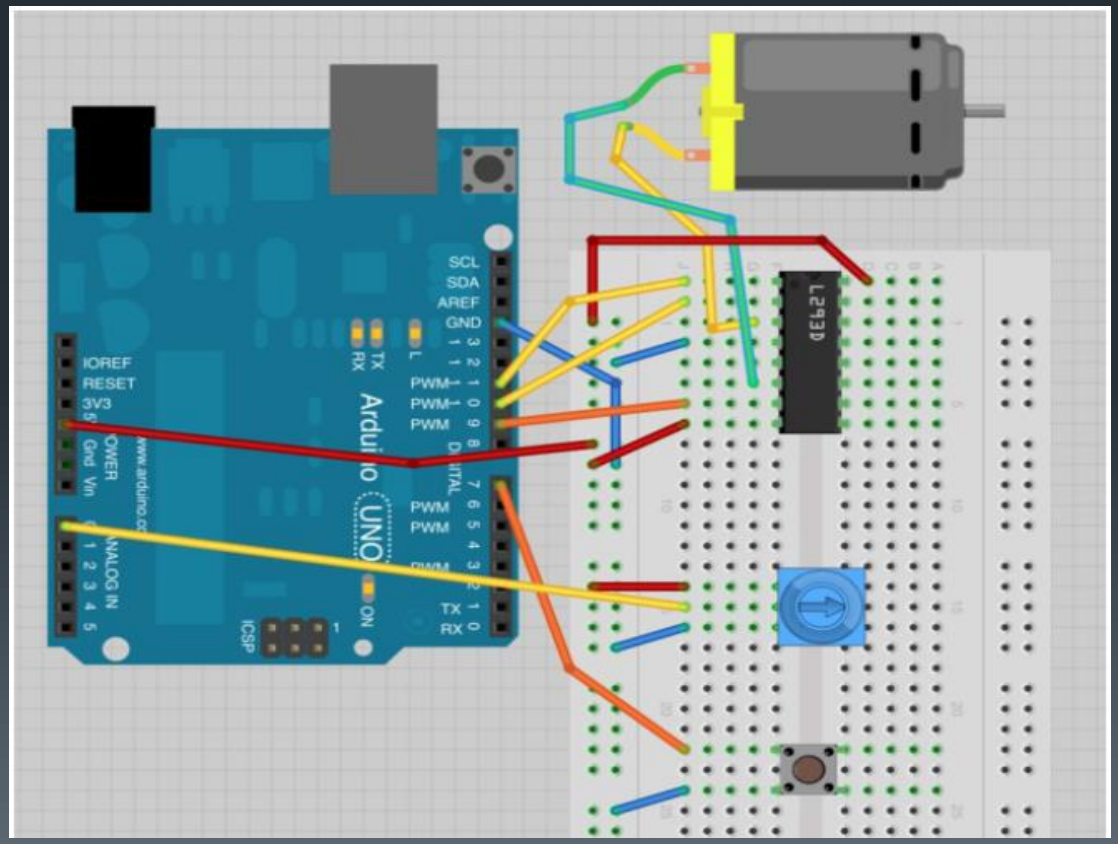
use a potentiometer to control the speed of the motor and a push button to control the direction. If the button is pressed, the motor will change his direction. The value of the ‘direction’ is just set from the switch pin value .

```
int enablePin = 11;
int in1Pin = 10;
int in2Pin = 9;
int switchPin = 7;
int potPin = 0;

void setup()
{
  pinMode(in1Pin, OUTPUT);
  pinMode(in2Pin, OUTPUT);
  pinMode(enablePin, OUTPUT);
  pinMode(switchPin, INPUT_PULLUP);
}

void loop()
{
  int speed = analogRead(potPin) / 4;
  boolean reverse = digitalRead(switchPin);
  setMotor(speed, reverse);
}

void setMotor(int speed, boolean reverse)
{
  analogWrite(enablePin, speed);
  digitalWrite(in1Pin, ! reverse);
  digitalWrite(in2Pin, reverse);
}
```



# Procedure - 3

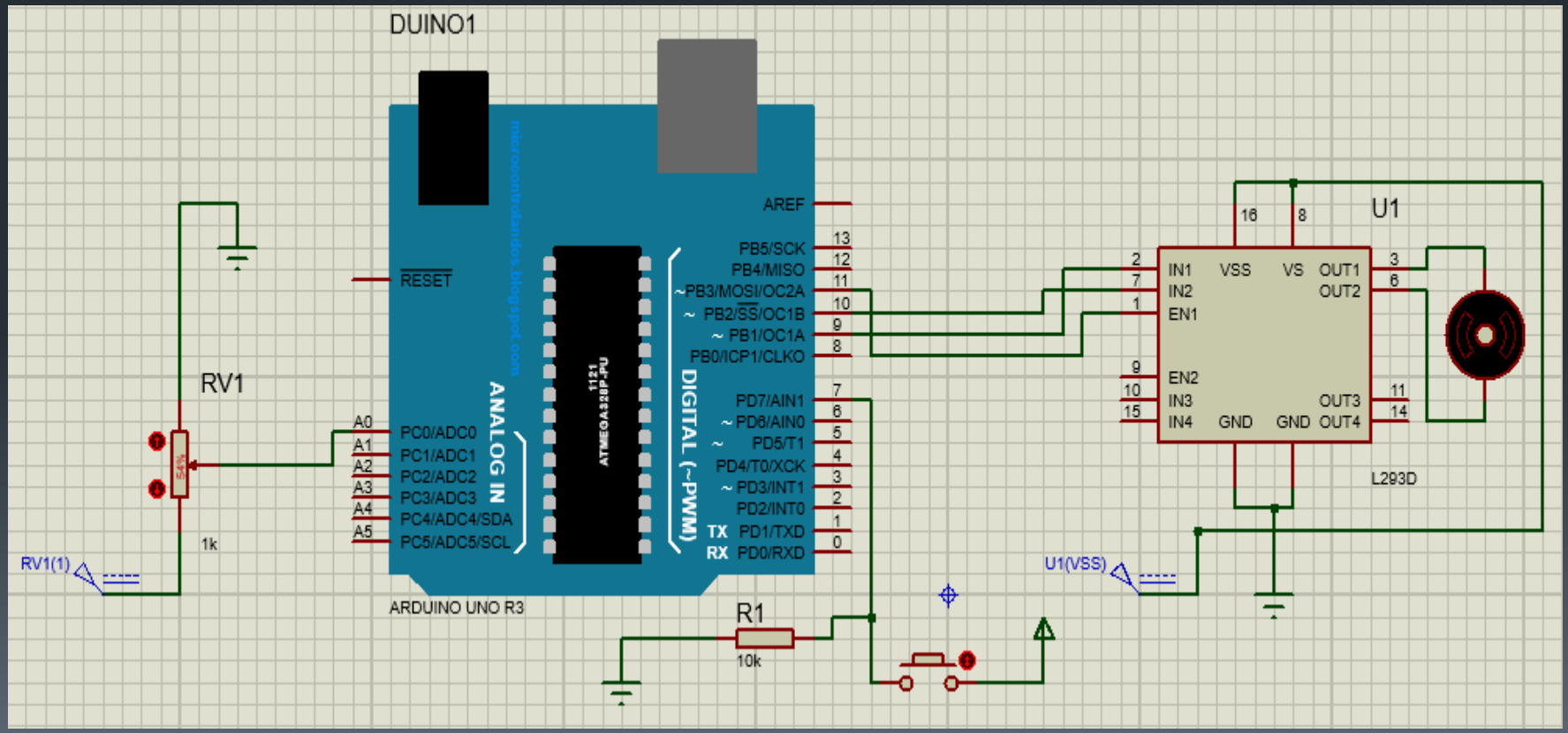
```
int in1pin=10;
int in2pin=9;
int switchpin=7;
int potpin=0;
int enablepin=11;
void setup()
{
pinMode(in1pin,OUTPUT);
pinMode(in2pin,OUTPUT);
pinMode(switchpin,INPUT_PULLUP);
}
void loop()
{

int speed=analogRead(potpin)/4;
boolean
directionpin=digitalRead(switchpin);
setMotor1(speed, directionpin);
}

void setMotor1(speed, directionpin)
{
  analogWrite(enablepin, speed);
  digitalWrite(in1pin,!directionpin);
  digitalWrite(in2pin,directionpin);
}
```

# Procedure - 3

use a potentiometer to control the speed of the motor and a push button to control the direction. If the button is pressed, the motor will run in forward, otherwise it will run in reverse. The value of the 'reverse' variable is just set to the value read from the switch pin.



# Discussion:

1. For procedure 2 tray to use 2 DC motors , 1’st motor turn clockwise and the 2’nd motor turns c-clockwise.

2. Try changing the procedure 3 to control the motor without using the switch so that it start’s in the forward direction, speed depend on reading pot value until it’s =128, and go into reverse direction, if reading value more than 128.