# AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

## Faculty of Engineering

## Lab Report

# Experiment # 09

## Experiment Title: Implementation of a motor control system using Arduino: Digital input, outputs, and PWM

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| **Course Title:** | MICROPROCESSOR AND EMBEDDED SYSTEMS LAB | | |
| **Course Code:** | COE3104 | **Section:** | A |
| **Semester:** | Spring 2022-23 | **Degree Program:** | BSc in CSE/BSc in EEE |
| **Course Teacher:** | **Md. Ali Noor** | | |

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| FACULTY COMMENTS | **Marks Obtained** | |
| | **Total Marks** | |

# Table of Contents

## Experiment Title:

Implementation of a motor control system using Arduino: Digital input, outputs, and PWM.

## Objectives:

In this experiment we are going to familiarized with the Microcontroller based motor speed control using PWM signal using proteus. Because the Arduino is low cost. the main target is to show the control of motor through the application of PWM using microcontroller by proteus using the Arduino uno. The objective of this experiment is to get familiarized with Microcontroller based motor speed control.

## Introduction:

The objective of this experiment is to get familiarized with Micro controller-based motor speed control. Micro controller and Arduino are digital devices; they cannot give the analog output. Micro controller gives Zero and ONE as output, where ZERO is logical LOW and ONE is logical HIGH. In our case, we are using 5-volt version of the Arduino. So, it's logical ZERO is zero voltage, and logical HIGH is 5 voltages. Digital output is good for digital devices but sometimes we need the analog output. In such a case the PWM is very useful. In the PWM, output signal switches between zero and one, on high and fixed frequency. We became more acquainted with the Arduino, DC motor, and Motor Driver during the laboratory session. The aim of this experiment is to get acquainted with motor speed control based on microcontrollers. The ultimate purpose of this experiment is to learn how to simulate the DC motor speed and rotation power using Arduino. This experiment was carried out using the Proteus Technical 8 program. We get our desired result perfectly after the laboratory is finished, so the experiment was performed successfully.

## Equipment List:

1. Arduino board
2. Breadboard
3. LED lights (red, yellow, green)
4. Jumper wires
5. H-Bridge DC Motor Control
6. L298N Driver

## Circuit Diagram:

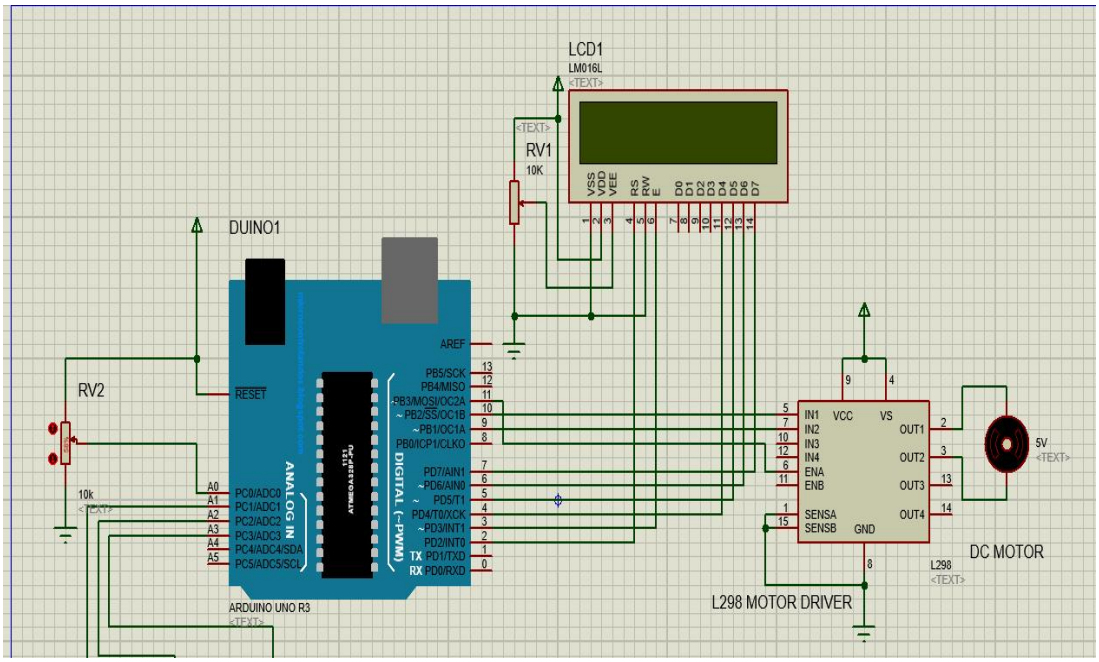


Fig:1 Circuit Diagram

## Code/Program:

```
int in1 = 8; //Declaring where our module is wired
int in2 = 9;
int ConA = 10;// Don't forget this is a PWM DI/DO
int speed1;
void setup()
{ Serial.begin(9600);
pinMode(8, OUTPUT);
pinMode(9, OUTPUT);
pinMode(10, OUTPUT);
}
void TurnMotorA(){ //A function to control the direction and speed
digitalWrite(8, LOW); //Switch between this HIGH and LOW states to change direction
```

```
digitalWrite(9, HIGH);
speed1 = analogRead(A0);
speed1 = speed1*0.2492668622; //Analog value is read from the potentiometer to calibrate it
analogWrite(ConA,speed1);// To activate the motor
}
void loop() {
int value = analogRead(A0); //declaring and reading value from the pin
value = value*0.2492668622; // doing calibration to change range from 0-1023 to 0-255 the number and is obtained by 255/1023
Serial.println(value);
TurnMotorA(); //one function that keeps looping you can add another one with a different direction or stop
}
```

**Hardware Output Results:**

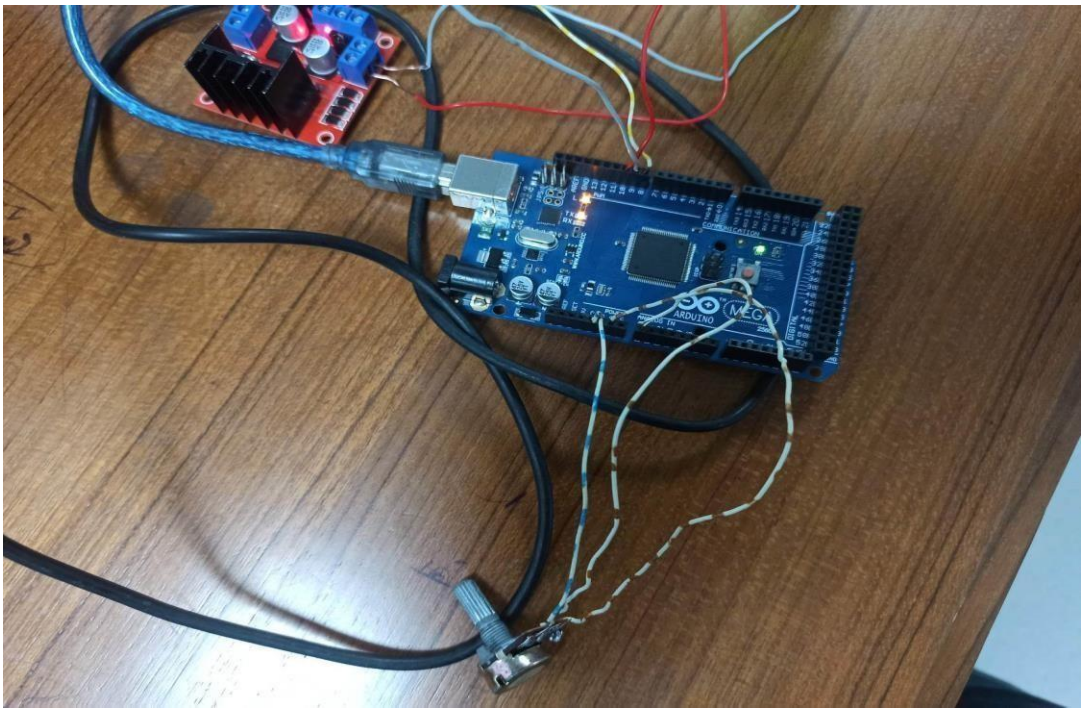

Fig: 1 Motor OFF

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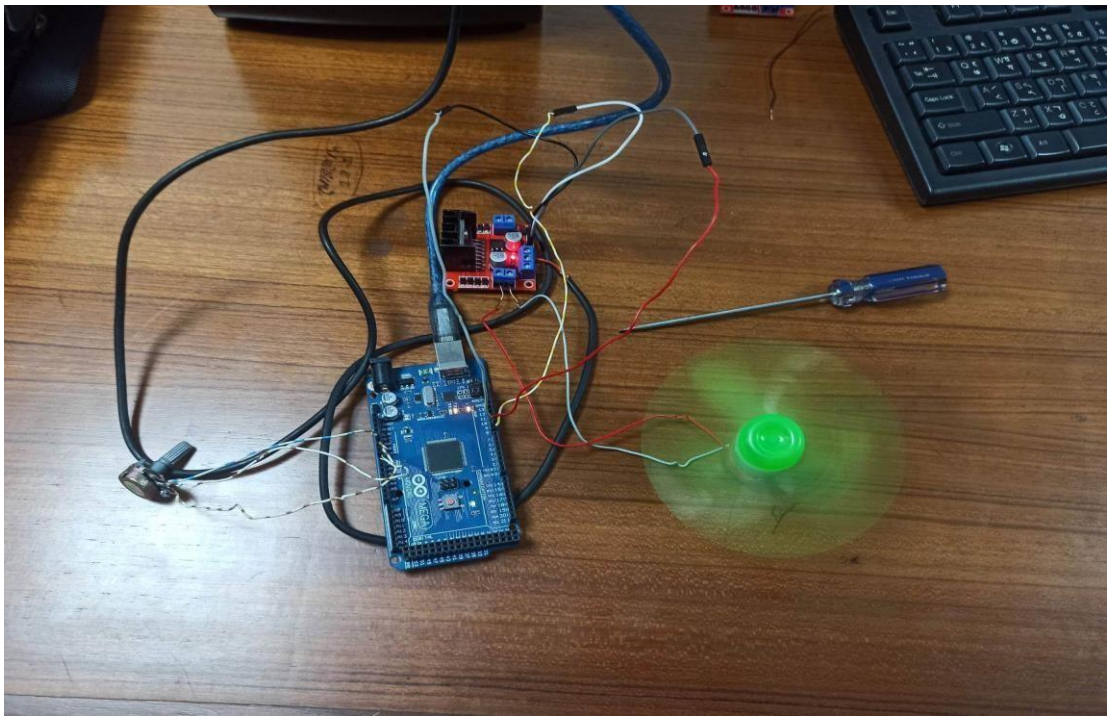
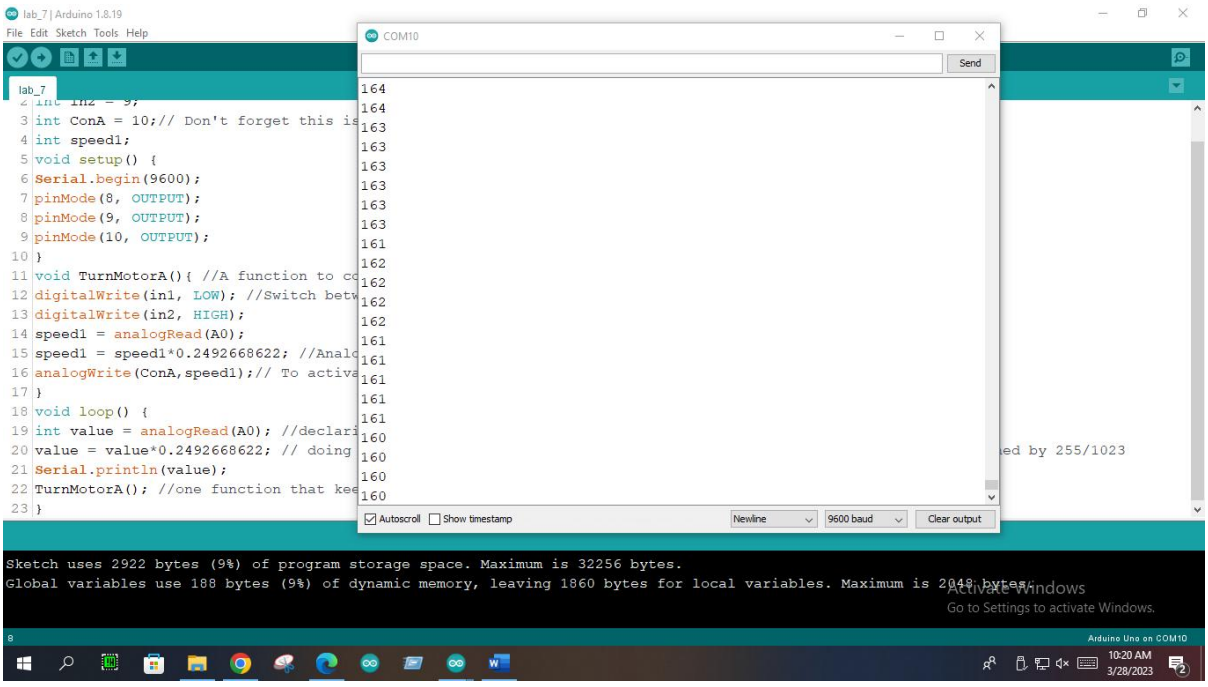


Fig: 2 Motor moving fast



## Simulation Output Results:

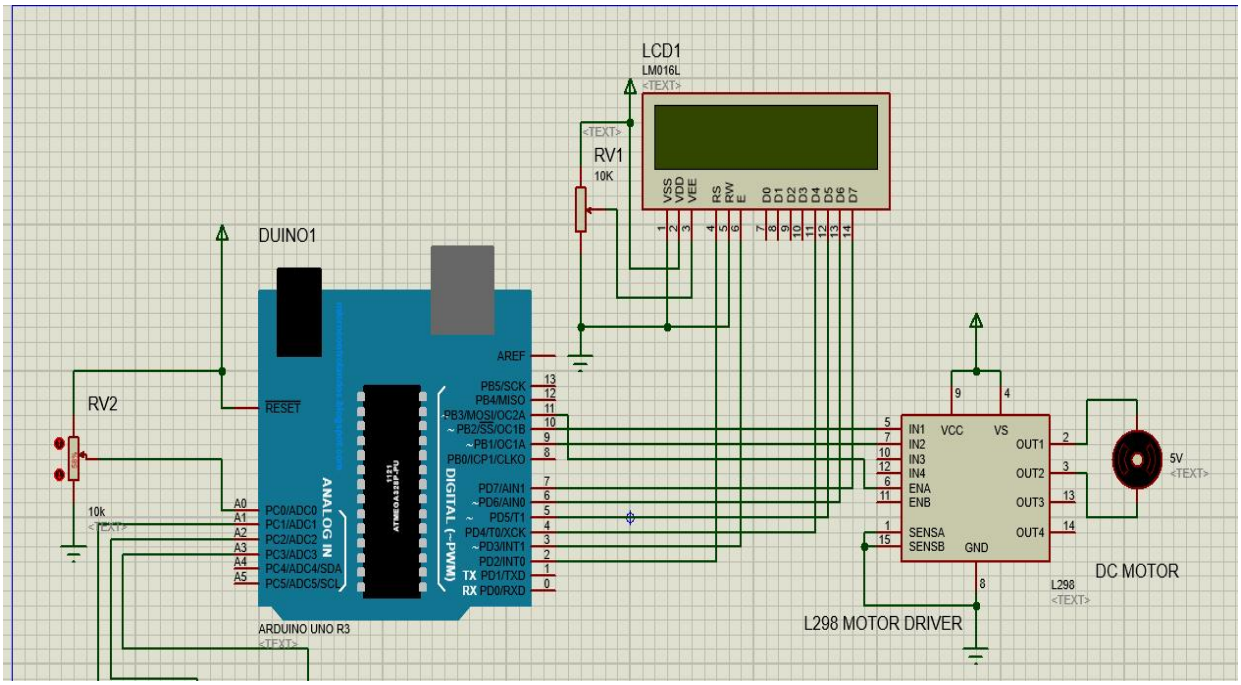



Fig: 3 Motor OFF

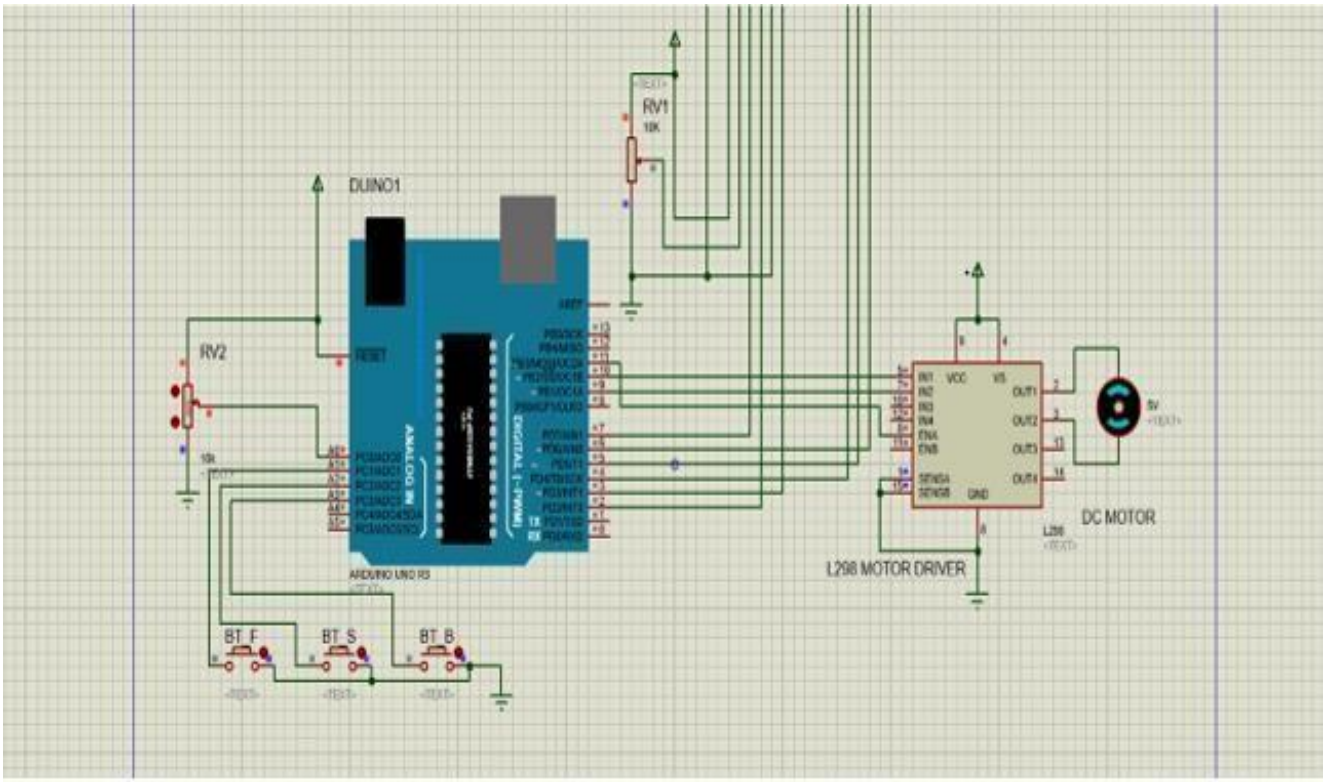



Fig: 4 Motor moving slowly

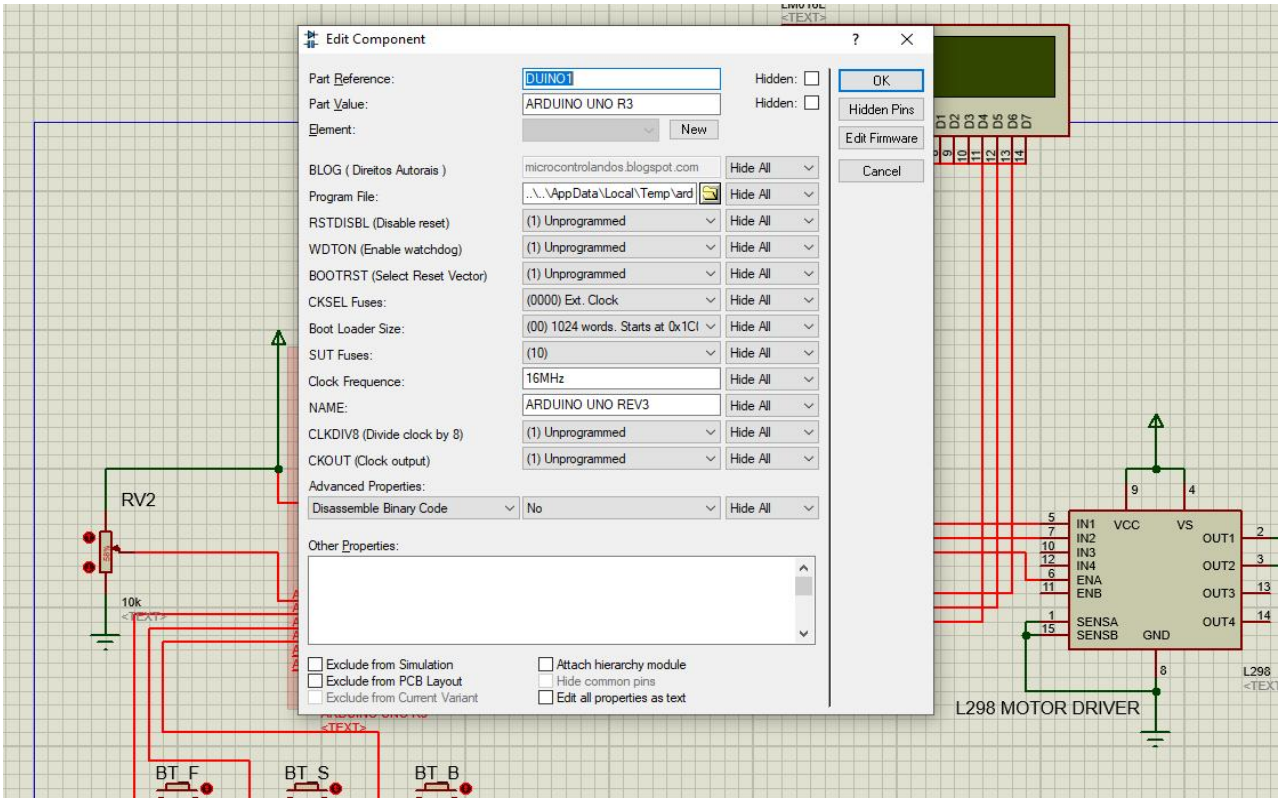



Fig: 5 ino.hex file

Thus, speed in LCD display along with speed of M1 motor (sign is +) can be varied by increasing or decreasing the percentage of duty cycle using POT-HG. When push button is pressed, the direction of Motor M1 gets altered with same speed (sign is minus (-)). Note that under the Motor Control heading there are actually two shields. These are identical except that the first has the board configured and populated with two DC motors and the second is configured and populated with one stepper motor. In the real hardware of course, you would need to configure and populate the shield manually according to which project you were programming the Arduino with. You should notice that in the Project Tree you now have two motors with associated methods. As always, you can program the physical board at any time via the upload button.

**Discussion:**

You have completed this experiment and know that you are familiar with microcontroller-based motor speed control. Microcontrollers and Arduino are digital devices. Analog output is not possible. The microcontroller outputs ZERO and ONE. ZERO is logic LOW and ONE is logic HIGH. In our case we are using the 5-volt version of the Arduino. Therefore, a logic 0 is zero voltage and a logic high is 5 voltages. Digital output is suitable for digital equipment, but there are times when analog output is required. PWM is very useful in such cases. For PWM, the output signal switches between 0 and 1, at a high fixed frequency, and the equivalent circuit was modeled using proteus software. The source code is written in the programming language C++. I was able to see the results of both the simulation and the lab experiment, and found that the simulation and the lab experiment were identical. Finally, the experiment was a success and the goal was achieved. We have completed this whole experiment successfully. There were a few issues during the running time of simulation. To solve the problem, we have chosen short running time though we can get the output quickly. After that we got out desirable output correctly and completed the experiment. We have got a brief idea about proteus visual designing by doing this experiment. We have learnt to make embedded systems and the Implementation of a traffic control system using Drag - Drop – Play method. This knowledge will be very helpful for our future.

**References:**

[1].https://www.arduino.cc/.
[2].https://howtomechatronics.com/tutorials/arduino/arduino-dc-motorcontrol tutorial-l298n-pwm-h-bridge