# DC MOTOR SPEED CONTROL

## OBJECTIVE:

The DC MOTOR SPEED CONTROL CIRCUIT is primarily a 555 IC based PWM (Pulse Width Modulation) circuit developed to get variable voltage over constant voltage.

## ABSTRACT/WORKING:

When power is supplied, 555 TIMER generates PWM signal with a duty ratio based on the pot resistance ratio. Because of the pot and the diode pair, here the capacitor (which triggers the output) must charge and discharge through a different set of resistance and because of this, the capacitor takes a different time to charge and discharge. Since the output will be high when the capacitor is charging and is low when the capacitor is discharging, we get a difference between high output and low output, and thus the PWM occurs.
This modulated output of timer is fed to the signal pin of L239D H-bridge to drive the DC motor. With the varying PWM ratio we get varying RMS terminal voltage and so we obtain the speed. To change the direction of rotation, the PWM output of timer is connected to the second signal pin.

## INTRODUCTION:

Pulse Width Modulation is a great method for controlling the amount of power delivered to a load without dissipating any power. The circuit shown below can also be used to control the speed of a fan or to dim the brightness of DC lamps or LEDs.
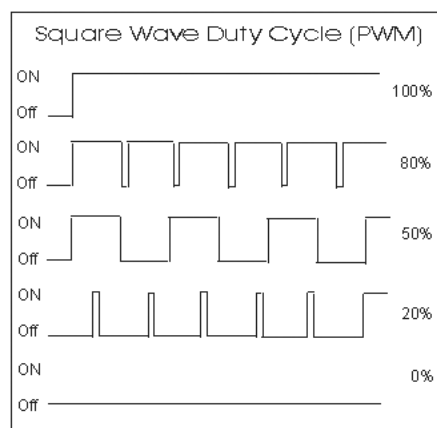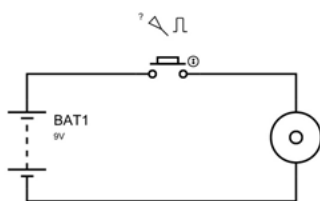
# HARDWARE REQUIREMENT/DESCRIPTION:

- +9v power supply
- Small DC motor
- 555 Timer IC
- 1K, 100R resistors
- L293D IC
- 100K -220K preset or pot
- IN4148 or IN4047 x 2
- 10nF or 22nF capacitor
- Switch

# CIRCUIT DIAGRAM:
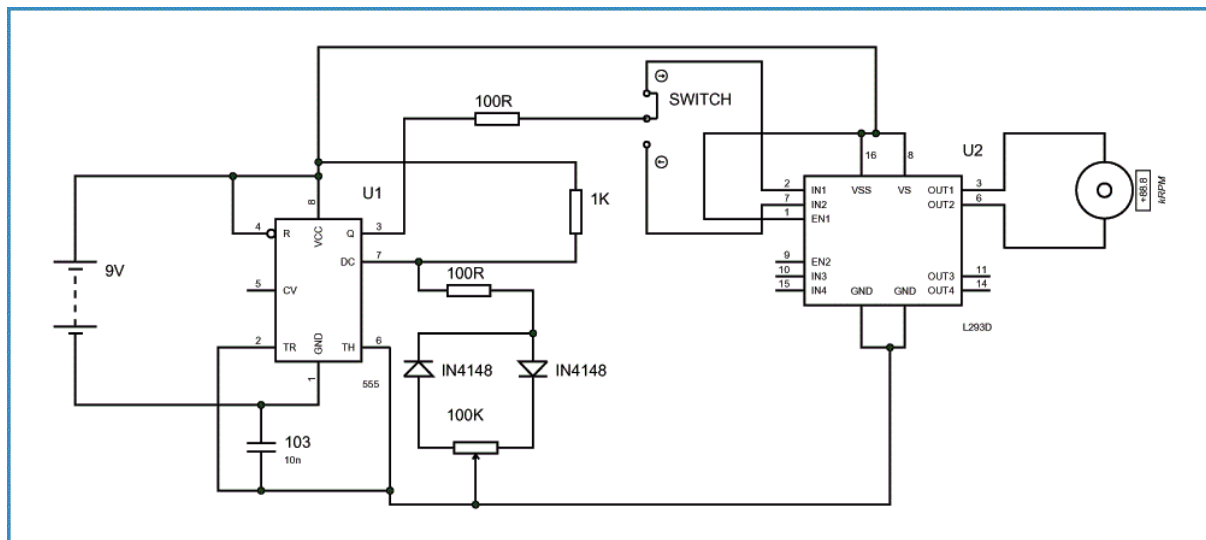


# DESIGN ISSUES:

- Maximum supply voltage should not exceed 9 volts.
- Circuit must be operated in proper temperature conditions, for example: circuit operation temperature-room temperature.
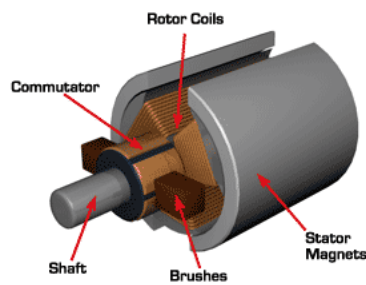- Timing tolerance should not exceed +10 sec for 1 min.

## CONCLUSION:

Thus, the DC MOTOR SPEED CONTROL CIRCUIT has been constructed and its working has been confirmed and verified.

## REFERENCES:

https://circuitdigest.com/electronic-circuits/dc-motor-speed-control

## APPENDIX:

### DC MOTOR:



A **DC motor** is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

### CAPACITOR (10nF or 22nF):

A **capacitor** is a passive two-terminal electrical component that stores electrical energy in an electric field. The effect of a capacitor is known as capacitance. While capacitance exists between any two electrical conductors of a circuit in sufficiently close proximity, a capacitor is specifically designed to provide and enhance this effect for a variety of practical applications by consideration of size, shape, and positioning of closely spaced conductors, and the intervening dielectric material.

Capacitance is defined as the ratio of the electric charge on each conductor to the potential difference between them. The unit of capacitance in the International System of Units (SI) is the farad (F), defined as one coulomb per volt (1 C/V). Capacitance values of typical capacitors for use in general electronics range from about 1 pF ($10_{-12}$ F) to about 1 mF ($10_{-3}$ F).

The capacitance of a capacitor is proportional to the surface area of the plates (conductors) and inversely related to the gap between them. In practice, the dielectric between the plates passes a small amount of leakage current. It has an electric field strength limit, known as the breakdown voltage. The conductors and leads introduce an undesired inductance and resistance.

## PRESET RESISTORS:



Preset resistors are used in circuits when it is necessary to alter the resistance. Dark/light and temperature sensors usually have these components as the preset resistor allows the circuit to be made sensitive (they can be turned up or down - reducing or increasing resistance).

## L293D IC:
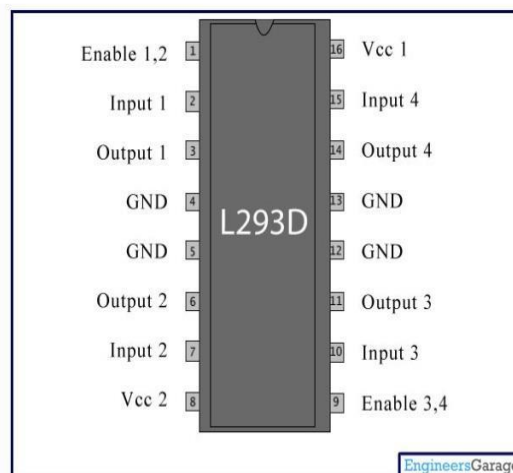
L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

## 555 TIMER IC:
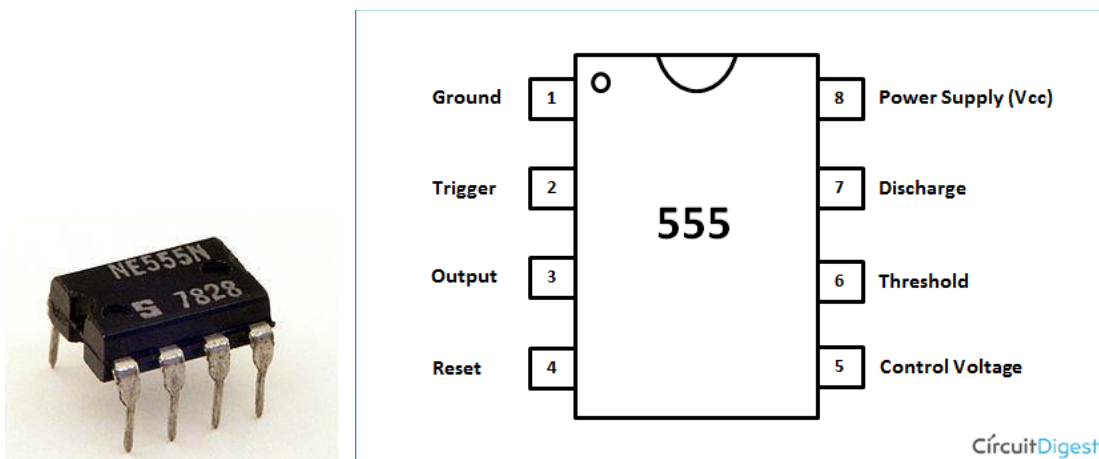


The **555 timer IC** is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element. Derivatives provide two or four timing circuits in one package.

The timer basically consists of two primary building blocks and they are:

1. Comparators (two) or two op-amp
2. One SR flip-flop (set reset flip-flop).

There are a lot of applications of this IC, such as, ASTABLE MULTIVIBRATOR, MONOSTABLE MULTIVIBRATOR, and BISTABLE MULTIVIBRATOR.

# SWITCH:

A **switch** is an electrical component that can "make" or "break" an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch removes or restores the conducting path in a circuit when it is operated. It may be operated manually, for example, a light switch or a keyboard button, may be operated by a moving object such as a door, or may be operated by some sensing element for pressure, temperature or flow.

# DC MOTOR SPEED CONTROL CIRCUIT

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