

# EMBEDDED PROJECT ON DC MOTOR CONTROL USING TIVA LAUNCHPAD



Presented by-  
Lakshya

## **CONTENT**

<b>Sr. No.</b>	<b>Topic</b>	<b>Page No.</b>
1.	OBJECTIVE	03
2.	INTRODUCTION	04
3.	WORKING	05
4.	COMPONENETS USED	07
5.	CIRCUIT DIAGRAM OF L293D IC	10
6.	CIRCUIT DIAGRAM OF PROJECT	11
7.	CIRCUIT SCHEMATIC	12
8.	CIRCUIT DESCRIPTION	13
9.	APPLICATIONS	14
10.	CONCLUSION	15
11.	REFERENCES	16

## **OBJECTIVE**

The Objective of this project is to control the speed of DC Motor by using Tiva Launchpad.

## **INTRODUCTION**

- This project is about DC Motor interfacing with TM4C123GH6PM Launchpad. We learn how to control the speed of a DC Motor using Pulse width modulation(PWM) module of this TM4C123GH6PM launchpad.
- In this experiment we also understand about PWM peripherals to control a DC Motor with PWM.
- We are using Code Composer Studio to write program and upload code to TM4C123GH6PM launchpad.

## **WORKING:**

- The TM4C123GH6PM generates the PWM signal for DC motor control. The user can control the speed of the DC motor via a potentiometer interfaced to the GPIO of the process.
- When we rotate the potentiometer, then the speed of the motor varies accordingly. The TM4C123GH6PM launchpad generates control signals based on the input from the variable resistor but the motor can not process them directly so we are using an L293d motor driver IC. This IC provides the correct output signals so the motor can rotate perfectly.



## How we control the speed of motor?

- We use the method of Pulse Width Modulation (PWM) to control the speed of DC motor. The speed of rotation of motors is directly related to the input voltage. The higher the input voltage, the higher will be the rotational speed of the motor. But the voltage should be within the operating voltage range.
- When the duty cycle is 0%, the motor will stop completely because there is no voltage difference. When the duty cycle is 50%, the motor will rotate at half the speed of the maximum speed because the voltage is half the full voltage. When PWM is in 100% condition, the motor rotates with maximum speed because of the continuous output of PWM.

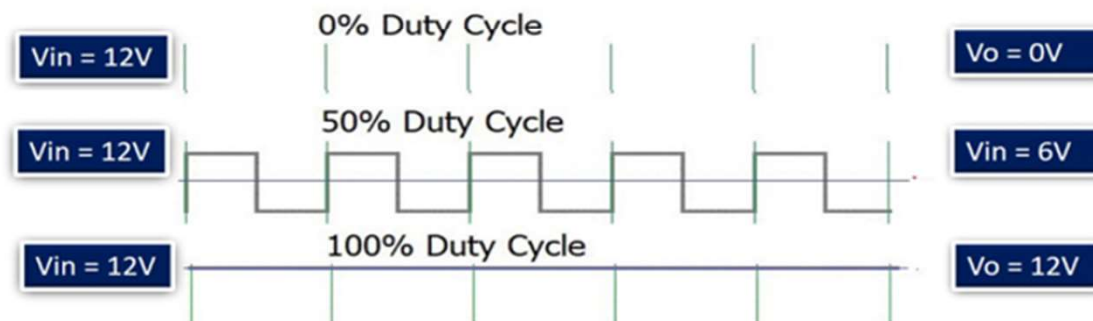


Fig 1- Duty cycle of PWM pulses.

## Components Used

### 1. TM4C123GH6PM

- It is a popular device which is used to make IOT & Embedded device projects.
- This microcontroller is designed around an ARM Cortex-M processor core. The ARM Cortex-M4F processor provides the core for a high performance and low cost platform.
- This processor meets the minimal memory implementation, reduced pin count and low power consumption while delivering an outstanding performance.

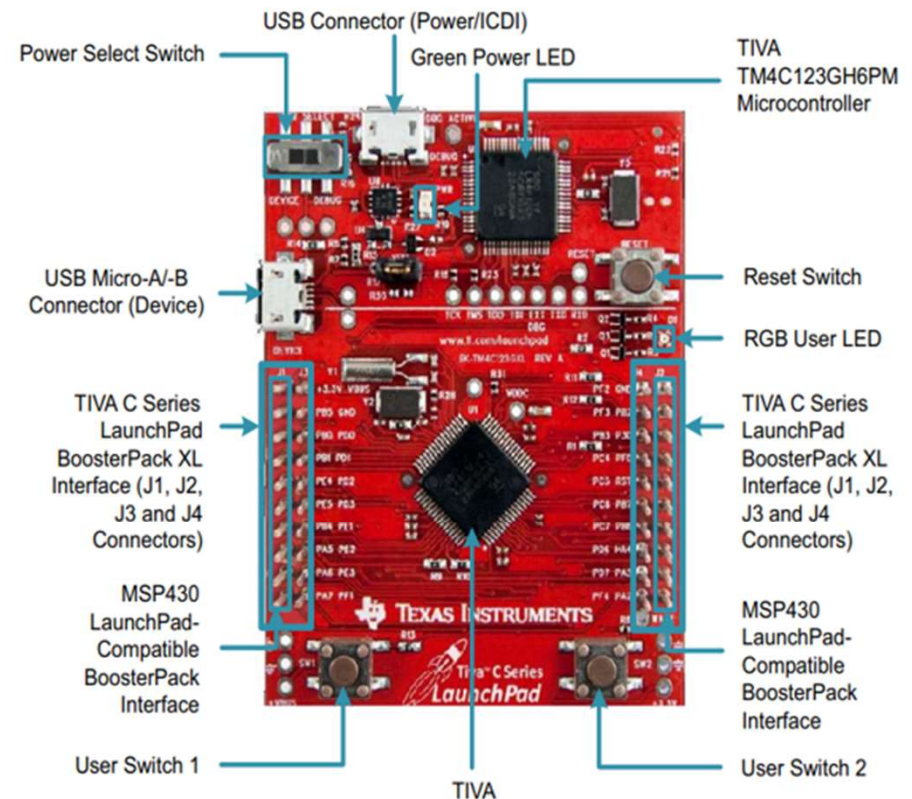


Fig 2- TM4C123GH6PM Circuit Diagram

## 2. 9 Volts DC Motor

- A DC Motor or Direct Current motor is an electrical machine that convert electrical energy into mechanical energy.
- DC series motor is suitable for both high and low power drives, for fixed and variable speed electric drives.



Fig 3- DC Motor

## 3. L293D Motor Driver IC

- The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor.
- In this IC there are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin present for each motor.

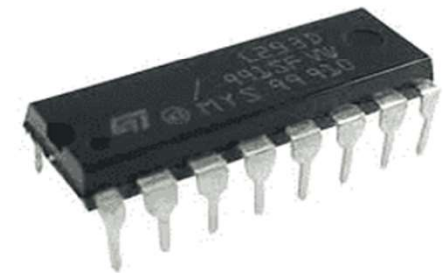


Fig 4- L293D Motor Driver IC



#### 4. 10k Potentiometer

- Potentiometer is very useful in changing the electrical parameters of a system. We use a single turn 10k Potentiometer with a rotating knob.
- These three-terminal devices can be used to vary the resistance between 0 to 10k ohms by simply rotating the knob.

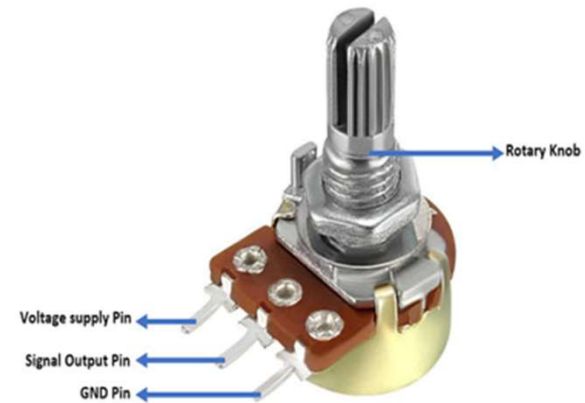


Fig 5- Potentiometer

#### 5. 7805 Voltage Regulator

- The 7805 Voltage Regulator IC is a commonly used voltage regulator that finds its application in most of the electronics projects.

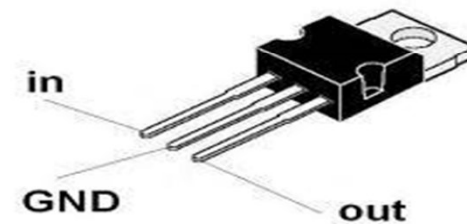


Fig 6- 7805 Voltage Regulator

## CIRCUIT DIAGRAM OF L293D IC

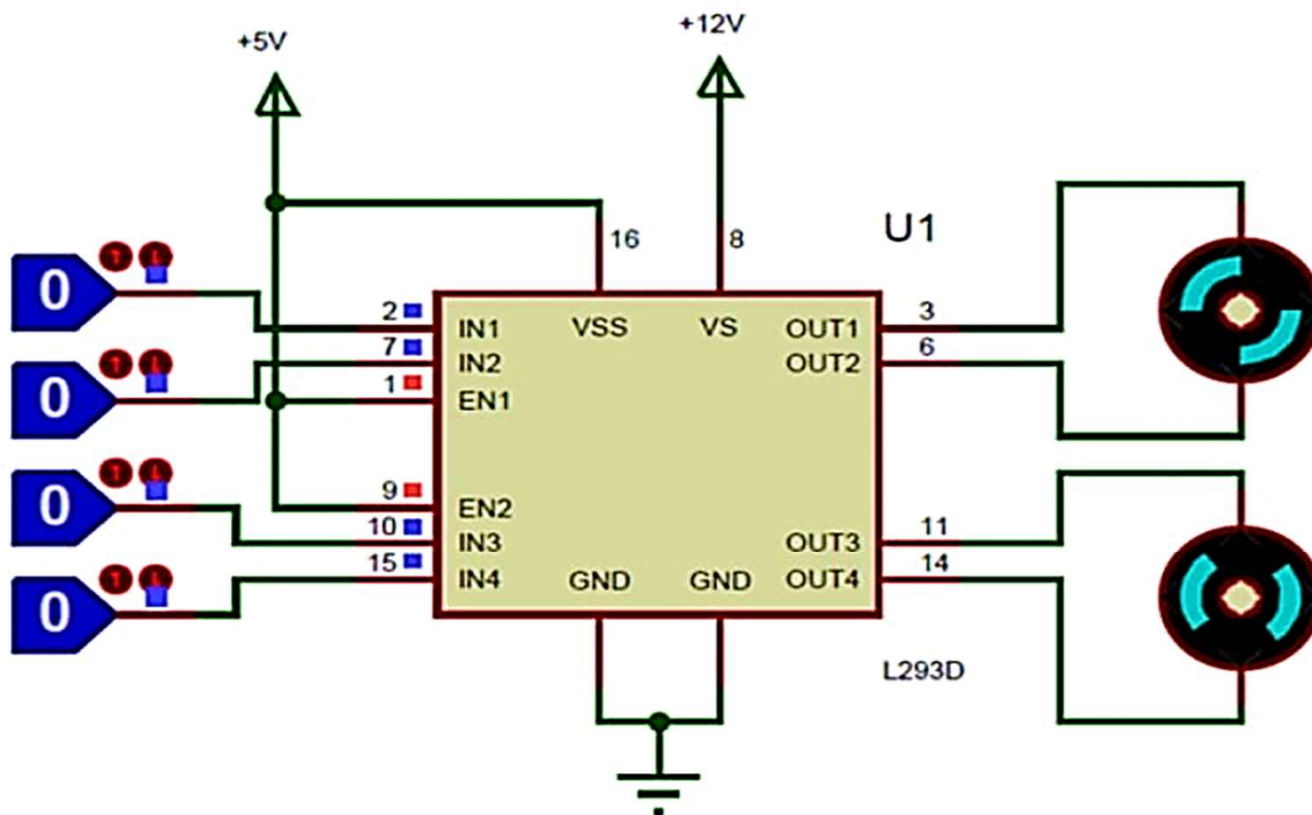


Fig 7- L293D IC Circuit Diagram

## CIRCUIT DIAGRAM

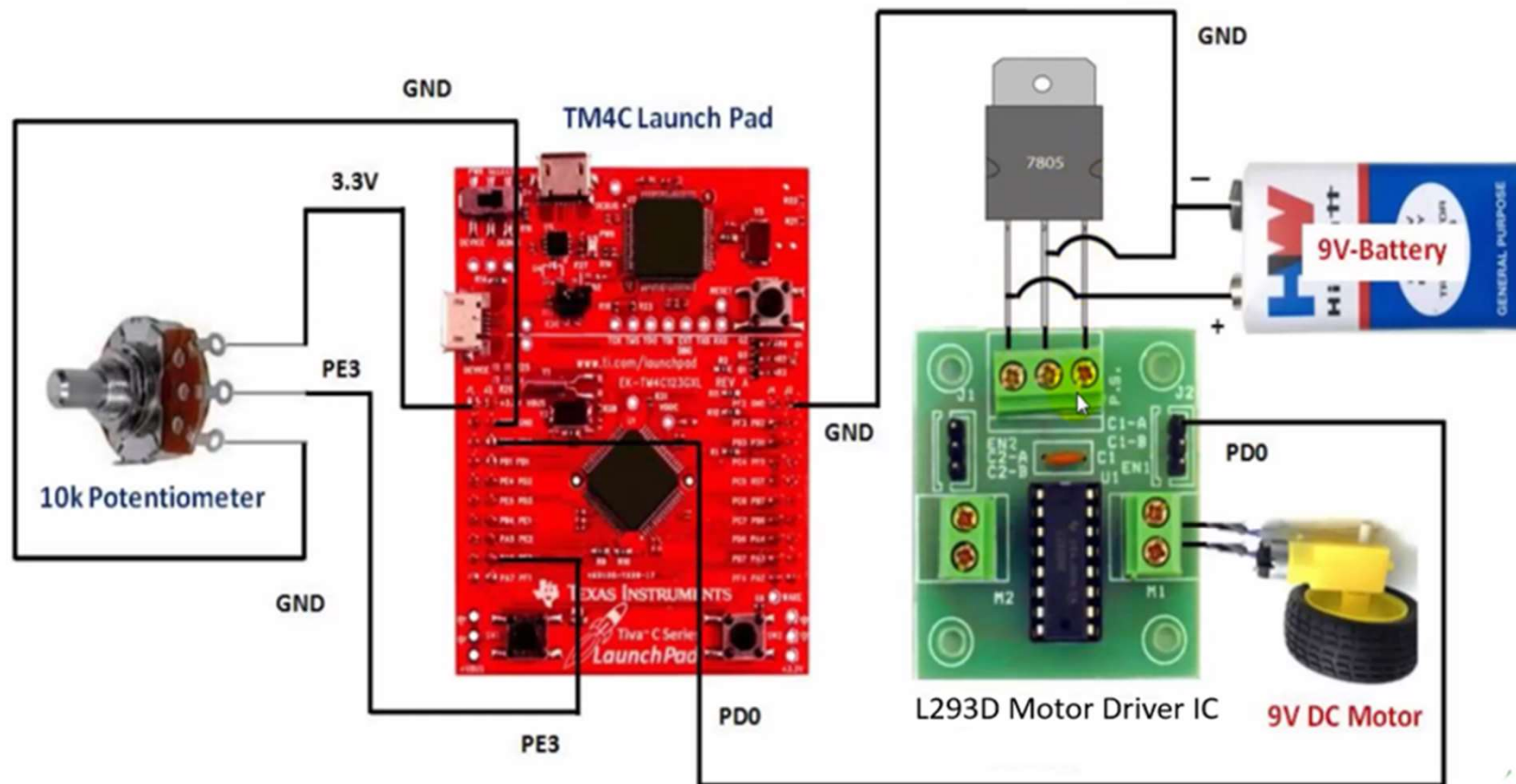


Fig 8- Circuit Diagram

## **CIRCUIT DESCRIPTION**

- In this circuit we connect the L293D Motor Driver IC with Tiva Launchpad and we connect the DC Motor with L293D driver at its output port.
- The output pin of potentiometer connected to the PE3 pin of the Tiva Launchpad, voltage supply pin connected to 3.3V power supply from the launchpad, then we connect the GND pin of potentiometer to Tiva Launchpad.
- We connect 8095 voltage regulator with the L293D Motor Driver IC to control the voltage and connect its GND pin to the Tiva Launchpad.



## **APPLICATIONS**

- This type of motor has simple construction and easy for design and maintenance because of which it can be used in toys.
- This motor is used in automotive applications.
- This motor is used in electrical appliances like fan, cooler etc.
- These type of motors used in elevators.

## **CONCLUSION**

The speed of DC Motor has been successfully controlled by using L293D Motor Driver IC and Potentiometer analog input.

## **REFERENCES**

- [1] Jaffri I, Zeeshan N, Shoaib Z and Oliver F 2015 Blue Steps: A Bluetooth Based Stepper Motor Control System ", School of Science and Engineering, Habib University, Karachi, Pakistan Electrical, Engineer Electronic Control, Sheffield Hallam University Sheffield (England UK: Journal of Embedded Systems) vol. 3 no 1
- [2] Vinod Kr S P and AK Pandey May-Jun 2013 Modeling and Simulation of Brushless DC Motor Using PWM Control Technique, Department of Electrical Engineering MMM Engineering College Gorakhpur (UP) Int. Journal of Engineering Research and Applications (IJERA), vol 3 issue 3
- [3] Zuhal 1988 Basic Power and Power Electronics Techniques (Jakarta: Gramedia)

Thank You