

# ELECTRONICS PROJECT

SPEED CONTROL OF DC MOTOR USING MOSFET

PROJECT BY:

GURRAM VARUN(181113108)

VUTU REVANTH REDDY(181113113)

# CONTROLLING THE SPEED OF DC MOTOR WITH MOSFET

**Project Name:** Controlling the speed of DC motor with the MOSFET

**INTRODUCTION:** The aim of this project is to control the speed of DC motor completely with the help of MOSFET. Since the voltage sources are available only in the certain numbers like 3V, 9V, 20V etc. It is difficult to control the speed of motor with the help of these batteries which provide constant voltage.

Consider a 12V DC motor is connected across the 12V battery. Since the supply is given 12V, the motor rotates at its maximum speed. If we want to decrease the speed of motor, which is dependent on the current flowing through the circuit, we have to add a high value resistor which has an equivalent resistance of motor to decrease the speed of motor to half. But it is always not possible to change the resistance of the circuit and hence controlling the current flow in the circuit. It can be possible to use a variable resistance like resistance pot to vary the resistance in the circuit, but in that case the voltage drop may not be equal to 12V and hence the voltage drop across the motor will be less than 12V. So, the motor is not working at the operating conditions, it was designed to operate.

By employing a MOSFET in the circuit, and using the resistance pot to control the gate-source voltage, one can control the current flowing through the output circuit connected across the drain-source. Thus, the better speed control characteristics can be obtained. Since the current is the only factor changing in the circuit, the motor is always provided with constant voltage drop across its terminals. The speed of the motor can be controlled by controlling the flowing current in the circuit.

## **COMPONENTS USED:**

1. N-type MOSFET-IRF540N
2. RESISTANCE POT-100k OHM
3. MOTOR-9v
4. CONNECTING RESISTORS-10K OHM
5. VOLTAGE SOURCE(DC BATTERY)

## **DESCRIPTION OF COMPONENTS:**

The aim of the MOSFET is to be able to control the voltage and current flow between the source and drain. It works almost as a switch. The working of MOSFET depends upon the MOS capacitor. The MOS capacitor is the main part of MOSFET. The semiconductor surface at the below oxide layer which is located between source and drain terminal. It can be inverted from p-type to n-type by applying a positive or negative gate voltages respectively. When we apply the positive gate voltage the holes present under the oxide layer with a repulsive force and holes are pushed downward with the substrate. The depletion region populated by the bound negative charges which are associated with the acceptor atoms. The electrons reach channel is formed. The positive voltage also attracts electrons from the n+ source and drain regions into the channel. Now, if a voltage is applied between the drain and source, the current flows freely between the source and drain and the gate voltage controls the electrons in the channel. Instead of positive voltage if we apply negative voltage , a hole channel will be formed under the oxide layer.

## **N- Channel MOSFET:**

The N-Channel MOSFET has a N- channel region between source and drain It is a four terminal device such as gate, drain , source , body. This type of MOSFET the drain and source are heavily doped n+ region and the substrate or body is P- type. The current flows due to the negatively charged electrons. When we apply the positive gate voltage the holes present under the oxide layer pushed downward into the substrate with a repulsive force. The depletion region is populated by the bound negative charges which are associated with the acceptor atoms. The electrons reach channel is formed. The positive voltage also attracts electrons from the n+ source and drain regions into the channel. Now, if a voltage is applied between the drain and source the current flows freely between the source and drain and the gate voltage controls the electrons in the channel. Instead of positive voltage if we apply negative voltage a hole channel will be formed under the oxide layer.

## **PROCEDURE:**

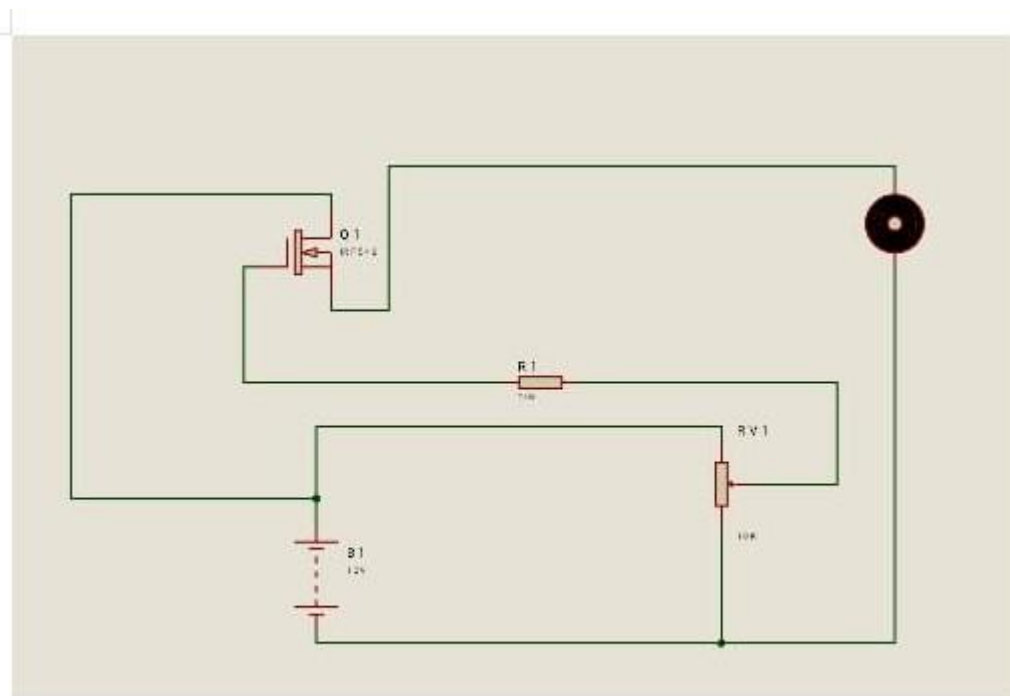
The battery is used to supply both  $V_{DS}$  and  $V_{GS}$ . The  $V_{DS}$  is directly provided by connecting the terminals of the battery across the drain and source terminals of MOSFET in series with the motor.

The required value of resistance can be selected depending on the ratings of battery and the motor. The resistance pot is connected across the battery source and the output terminal is connected to the gate terminal of the MOSFET. Thus, the circuit is provided with a variable  $V_{GS}$  which can be varied with the potentiometer.

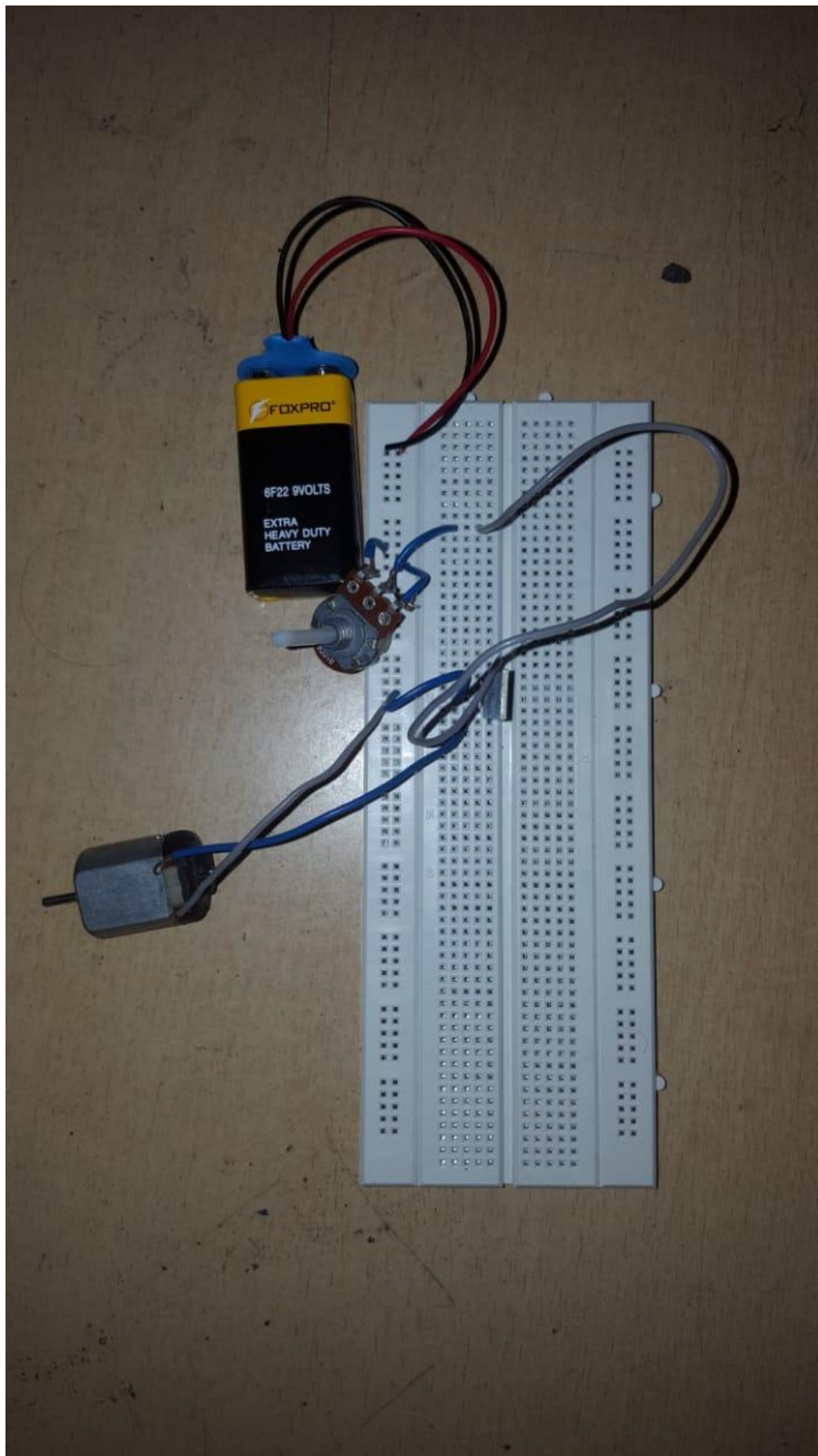
### WORKING:

1. **To increase the speed of motor:** The potentiometer can be varied so that the voltage across gate-source terminals can be varied and thus, the value of current flowing in the motor can be controlled. Decreasing  $V_{GS}$ , leads to increase in current  $I_D$  and hence the speed of the motor increases.
2. **To decrease the speed of motor:** By increasing the  $V_{GS}$ , we can decrease the value of  $I_D$  and hence the speed of motor decreases.

### CIRCUIT DIAGRAM:



MOSFET SPEED CONTROL



## **LIMITATIONS:**

Since the circuit employs the MOSFET and any error in circuit connections can lead to a completely different operating conditions of the motor.

## **CONCLUSION:**

We have controlled the speed of motor by making the use of voltage dependent characteristics of the MOSFET, which provides a very efficient way to control the current flow in the motor.

## **REFERENCE:**

1)Speed Control of DC motor using MOSFET

Ahmad Mursyid, Ramli(2015) *speed control of DC Motor Using MOSFET. Project Report. UTeM, Melaka, Malaysia.(Submitted)*

<http://eprints.utm.edu.my/17585/>

2) <http://ethesis.nitrkl.ac.in> › ...PDF

Web results

Speed Control of DC Motor using MOSFET ... - EThesis @ NIT Rourkela