

Bidirectional DC Motor PWM Controller using NE555 and MOSFET H Bridge

This project presents a bidirectional DC motor speed controller using PWM generated by an NE555 timer and a MOSFET H bridge. The goal was to design a low cost, fully discrete circuit able to control motor speed and direction while handling start up current safely.

Project Objectives

- Generate PWM using NE555
- Control motor speed with adjustable duty cycle
- Enable forward and reverse rotation
- Handle high start-up current safely
- Protect the circuit with fuse and NTC thermistor

Main Components

NE555 Timer

IRF3205 MOSFET

IRF4905 MOSFET

Potentiometer

NTC Thermistor

Electrolytic Capacitor

Fuse

DC Motor 7V

SPDT

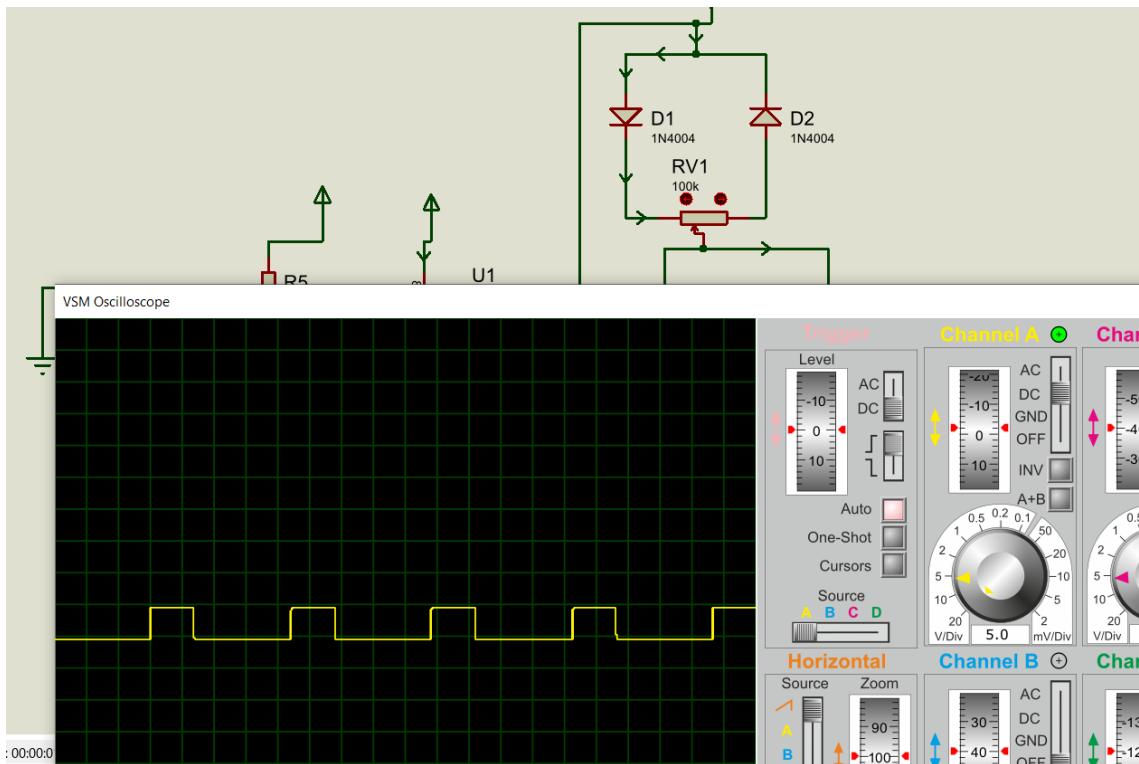
Circuit Description

The NE555 is configured as a PWM generator. The duty cycle is adjusted using a potentiometer and diode network, allowing independent charge and discharge paths for better PWM control. The PWM output drives an H bridge made from IRF4905 (P channel high side) and IRF3205 (N channel low side) MOSFETs. A switch selects motor direction by controlling which MOSFET pair is active. A large capacitor on the supply stabilizes voltage and reduces ripple.

The pchannel mosfet 4905 receive 8v on source and is on when volt on source > gate and it acts like a switch off when voltage on source is equal voltage on gate so this is the high side switches

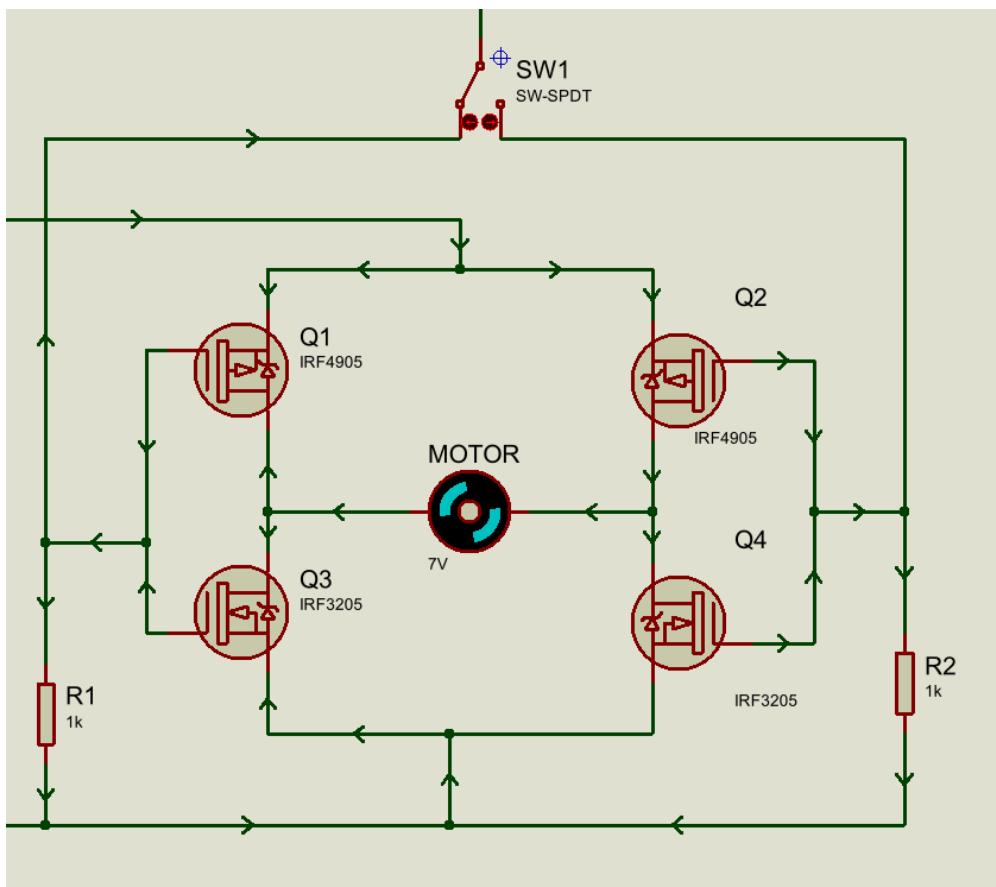
On the low side switch 3205 mosfets they pass to gnd so they are like a closed switch when the gate receives voltage but when not it's a open circuit

SIMULATION

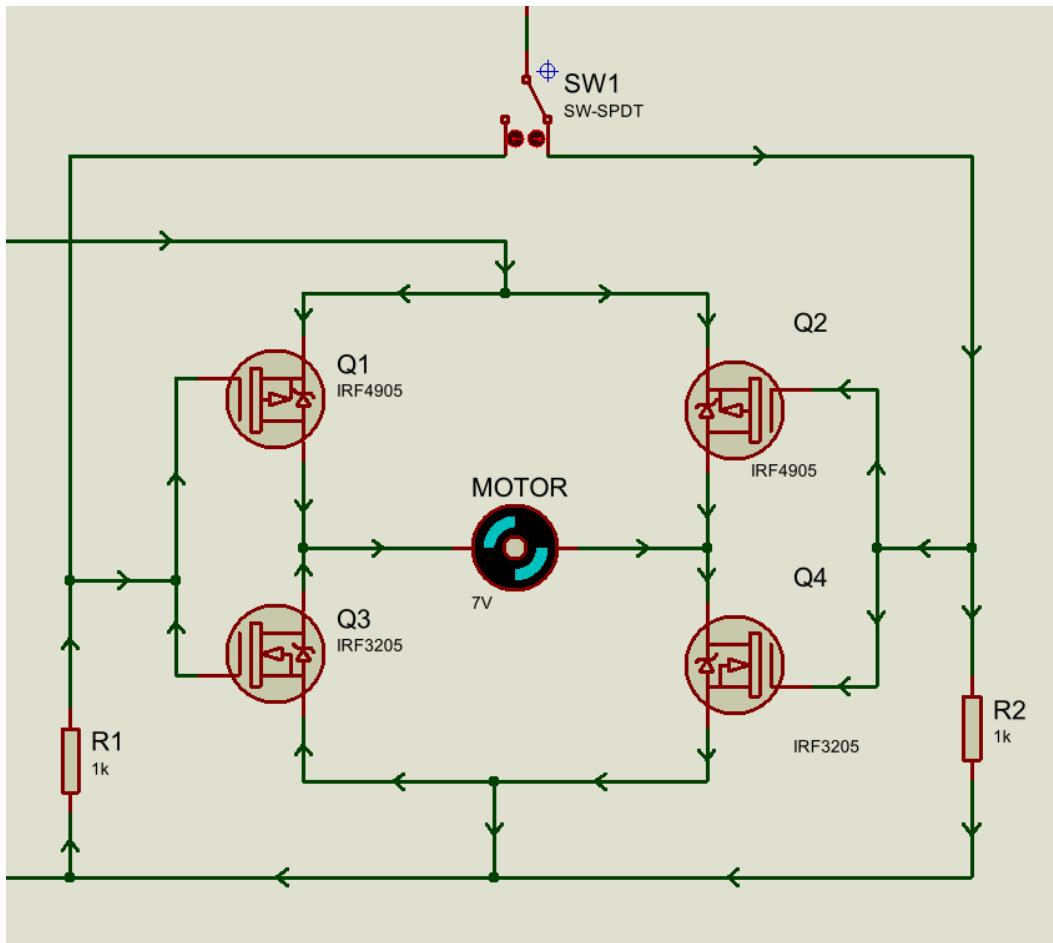


Oscilloscope showing duty cycle of PWM

MOTOR ON DIRECTION 1:



MOTOR ON DIRECTION 2



Problems Encountered and Solutions

During simulation, I had problems the simulation always failed so I started fixing it step by step by only trying motor with high side mosfet4905 then with only low side 3205 then with both. Then with other couple of mosfets. So the simulation worked fine then in practice it wasn't working so discovered some problems with wires not connecting with multimeter on bipper mode then starting again trying the circuit by small steps until the whole circuit worked fine.

