Microcontrollers Lab

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L298N motor driver circuit | code | how to use

👤 BILAL   📅 12 Months Ago   💬 2 Comments

L298N motor driver: Most of the **microcontrollers** operate on very low voltage (5v) and current while the **motors** require higher **voltages** and **current** So, the microcontrollers cannot provide them such higher current. For this purpose we use motor driver ICs. Motor driver is a little current amplifier. It takes a low current signal and gives out a high current signal which can **drive a motor**. It can also control the direction of motor. Motor drives are of many kind depending upon the maximum supply voltage, maximum output current, rated **power** dissipation, load voltage and number outputs etc. Here we are going to discuss motor driver L298N. It is used in **dc motor speed control project** and you can interface dc motor easy with microcontroller using this motor driver. and also in bluetooth controlled robot using pic microcontroller. you can check line follower robot for more about its applications.

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Features of L298 motor driver

L298N is an integrated circuit multi watt 15 package and capable of giving high voltage. It is a high current dual **full-bridge** driver which is designed as to accept standard TTL logic levels. It can drive inductive loads e.g **relays**, solenoids, motors (DC and stepping motor) etc.
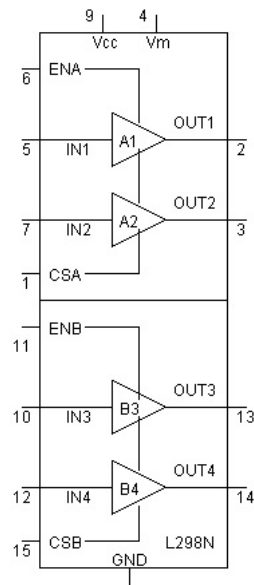
Its basic features are:

- Maximum supply voltage 46V
- Maximum output **DC current** 4A
- Low saturation voltage
- Over **temperature** protection
- Logical "0" Input Voltage up to 1.5 V

PIN DIAGRAM of L298N motor driver

The pin diagram in top view for L298N is given below:
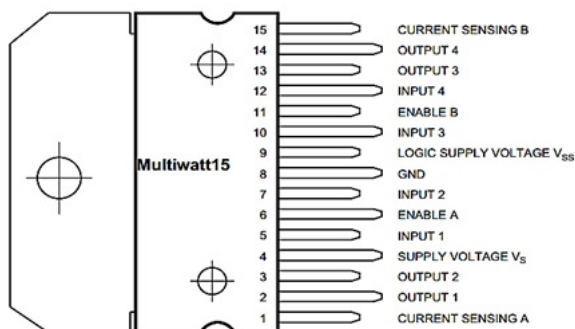
L298N motor driver internal circuit

PIN DESCRIPTION of L298N motor driver

Pin 1, 15	Sense A, Sense B	Sense resistor in between ground and this pin to control load current
Pin 2, 3	Out 1, Out 2	Bridge A outputs. Current flowing through load connected between these pins is monitored at pin 1
Pin 13, 14	Out 3, Out 4	Bridge B outputs. Current flowing through load connected between these pins is monitored at pin 15
Pin 5, 7	Input 1, Input 2	Inputs of Bridge A
Pin 10, 12	Input 3, Input 4	Inputs of Bridge B
Pin 4	Vs	Supply voltage for power output stages. Capacitor of 100nF must be connected between this pin and ground
Pin 6, 11	Enable A, Enable B	To enable/disable bridge A or bridge B
Pin 8	GND	Ground
Pin 9	VSS	Supply Voltage for the Logic Blocks. Capacitor of 100nF must be connected between this pin and ground

L298N consists of four independent power amplifiers. Two of them form H-bridge A while other two form H-bridge B. **One H bridge** is used to switch the polarity in controlling direction of DC motor. **Pair of H Bridge** is used to control a bi-polar stepper motor.

- Amp A1 and A2 => H Bridge A
- Amp B1 and B2 => H Bridge B

Basically L298N is used to drive inductive or magnetic loads, so there can come voltage spikes in output. To avoid that voltage spikes there should be some internal parasitic or Flywheel diodes. But it lacks them. We use externally these flywheel diodes. They can be 1N5819 schottky diodes or 1N4001 rectifier diodes.

Each bridge is provided with enable pins (ENA, ENB) and current sense pins (CSA, CSB). Current sense pins can be tied to ground but we can also insert low value resistor and its voltage reading is proportional to current. Both enable pins can be used at the same time which makes all for outputs active at the same time.All the four inputs and Enable pins work on 5v TTL logic which makes the connection easy with microcontrollers.

- ENA=5v, High logic (Amplifier A1 and A2 on)
- ENA=0v, Low logic (Amplifier A1 and A2 off)
- ENB=5v, High logic (Amplifier B1 and B2 on)
- ENB=0v, Low logic (Amplifier B1 and B2 off)

L298N motor driver working

Now consider an example. We will use H bridge motor diver IC L298N and two DCmotors. This IC is used to control these motors. What we want to do is to change the polarity of motors so they can run in either direction depending upon logic.

INPUTS: Four inputs are provided to the four power amplifiers of L298N. We can use push buttons and whenever specific push button is pressed, specific motor will start running. Two inputs will monitor each motor. Instead of push button, we can use logic toggle in proteus simulation for our ease.

Enable bits are used to select specific amplifier. ENA can select two amplifiers A1, A2 and similarly ENB can select two amplifiers B1, B2. While using as a bridge circuit, ENA selects bridge A and ENB selects bridge B. To drive both the motors by using H bridges, both enable bits are set high.

OUTPUTS: There are four outputs. The output for motor A is obtained from out1 out2 pins and similarly for motor Boutput is obtained from out3 out4 pins. L298N does not have built in protection diodes we usedexternal diodes to prevent the IC from getting damaged.

This IC is using two different voltages. On input side, 5v is given to the pin 9 (Vss), push buttons and enable bits.On output side,pin 4 (Vs) supplies the motors and it can be upto 46 volts.Here we are not using the current sensing scheme, so we have grounded those pins 1 & 15. Motors speed will be lower if low voltages are on output side.

simulation results of L298N motor driver

Enabling pin 6, if we give logic as:

Pin5=high, pin7 = low, motor A will start turning clockwise.

Pin5=low, pin7 = high, motor A will start turning anticlockwise

Pin5=high, pin7 = high, motor A will stop

Pin5=low, pin7 = low, motor A will stop

Enabling pin 11, if we give logic as:

Pin10=high, pin12 = low, motor B will start turning clockwise

Pin10=low, pin12 = high, motor B will start turning anticlockwise

Pin10=high, pin12 = high, motor B will stop

Pin10=low, pin12 = low, motor B will stop

In this example of proteus, we used toggle inputs. We can also change the toggle input settings in start if we have to run the motor continuously.In using push buttons, on side of buttons is attached with power supply and others are attached with inputs of L298N. As long as the button is pressed, the motor will keep running in specified direction according to the logic given through the button. Also use the heat sinks when doing practically.

Video lecture on L298N dc motor driver

HOW to use L298N dc motor driver

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Circuit diagram of L298N motor driver
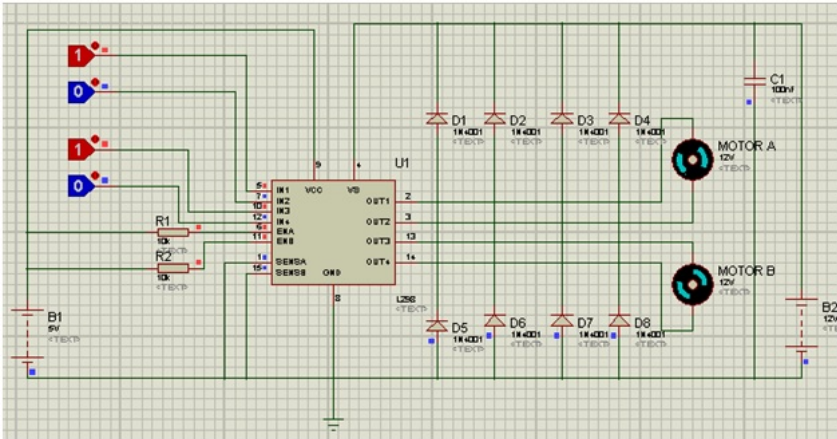
Here we have simulated the above example. At the present state, both motors are running in clockwise direction. If I invert both the logics, they will run in anti-clockwise direction. And if same logic is given to any motor's input, it will not be able to move in either direction and will stop.

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ABOUT THE AUTHOR

BILAL   More from this Author »

I have been providing project services to students and industry from last 4 years . Contact me if you want to hire me for your projects and engineering problems. Send me your project details at my email address: bilalmalikuet@gmail.com