Wiring the L298N Full-Bridge Motor Driver For Dual-Motor Control

ECE492
Application Note

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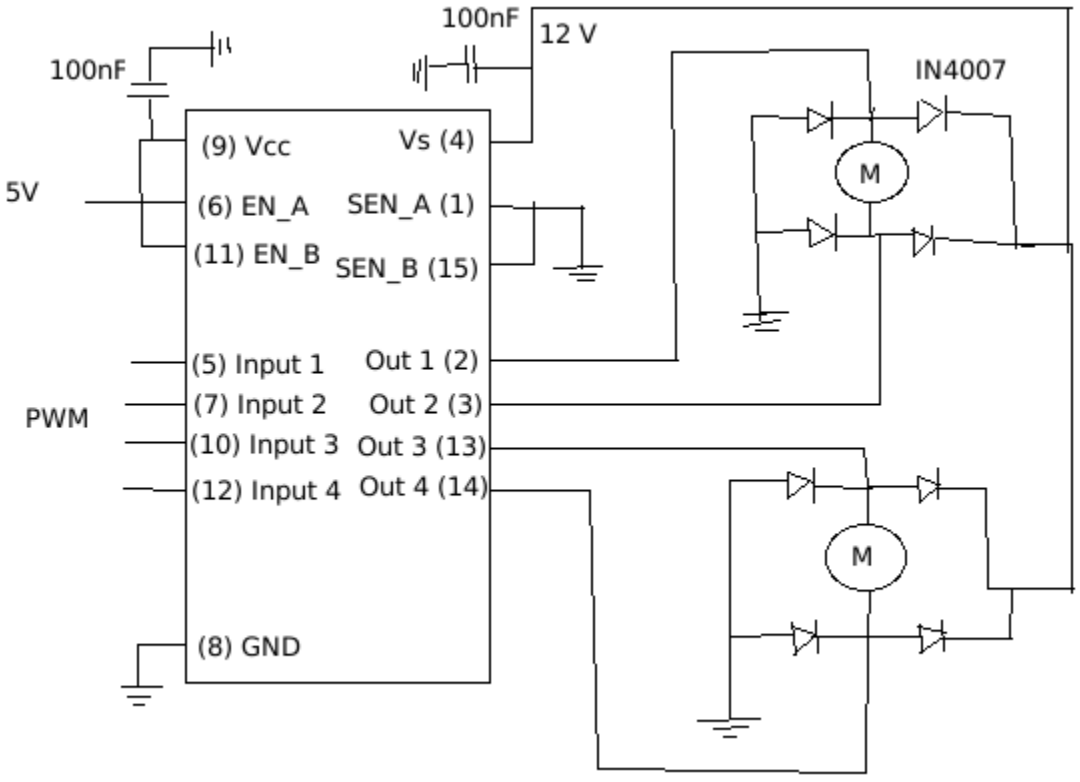
The L298N motor driver has the ability to run two motors independently, with up to 2A current to each motor, and supplies up to 50V. Each motor uses two input signals. It is also possible to link both outputs on the chip together to supply up to 4A current to a single motor, if required.

Input Logic Table:

Input 1	Input 2	Result
1 ('High' PWM)	0 ('Low' PWM)	Clockwise motion
0 ('Low' PWM)	1 ('High' PWM)	Counter-clockwise motion
1 ('High' PWM)	1 ('High' PWM)	Fast motor stop
0	0	Coast/Free

The input signals can be a direct logic “high” value between 2.3V – Vss (5V), and a “low” signal between 0 – 1.5V. A useful way to control the motors would be with Pulse-Width-Modulation (PWM) as the inputs, so the speed of the motors can be adjusted. This is especially important at start up, so that they can be slowly accelerated to avoid strain on the motors.



In the datasheet of L298N, it is strongly recommended to have the 100 nF capacitors as close to the L298 pins and GND as possible. This is probably ideal, but the circuit will still function with the capacitors several centimeters from the IC.

External diodes are a requirement when using this IC. When turning the motors on and off, a spike in current occurs, and these diodes protect the microcontroller from these current spikes. It is recommended to use fast changing diodes, such as Shottky diodes. 1N4XXX models shown in the circuit diagram above are slower than Shottky diodes, but are acceptable to use.

The Sense and Enable pins are important to wire properly and should not be overlooked. To enable functionality of either motor, the enable pins must be set to logic “high”. If set to low, the motors will always “coast,” regardless of the input signals. The SEN_A and SEN_B pins are used to measure the current running through each motor. (SEN_A monitors Out 1 and Out 2, SEN_B monitors Out 3 and Out 4.) To use these Sense pins, “Sense Resistors” are connected, which are then grounded. These pins will have a voltage potential, which you send to your microcontroller, and based on the resistance used and voltage read, one can determine the current. Please note that SEN_A, and SEN_B must use independent resistors. Adding resistors to these pins also affects the potential across the motor output pins, so using low resistance is recommended in order to give as much voltage to the motors as possible. (0.5 – 1 Ohm). If current monitoring is not required, the Sense pins must be connected directly to a common ground.

Using the L298N will inevitably cause a slight voltage drop from Vs. (ie sending 12V to Vs will not cause 12V across the motors.) Keeping the circuit compact with shorter wires, thicker wires, and faster diodes will contribute to a better voltage efficiency.

Running even one motor can cause plenty of heat on the L298N. The 2A of maximum current that the datasheet states is not achievable in the university labs. Running two motors with high current draw, can cause the chip to enter “thermal shutdown.” (The IC automatically turns off to protect its internal components.) This is observed as sporadic motor behavior. If the motors are expected to run for long periods of time, a heat sync should be attached to the IC.

Wiring the circuit above, we achieved ~10.5V across each of our motors with 100% duty cycle PWM. Each motor draws 300 mA of current.