

## **H-Bridge: Test Using Multimeter**

To test whether the H-Bridge is working properly or not using multimeter follow the steps below:

1. Insert IC into the breadboard. Make sure that IC is inserted properly into breadboard. You can verify it using continuity test in the multimeter.

1.1. Test continuity between the pins of the IC and the holes of the breadboard.

1.2. If you get a beep then you can sure that IC is fitted strongly into breadboard and the portion of breadboard you are using is good.

2. Apply  $V_{ss}=5V$ (Pin 16) .

2.1. The first thing to apply when you connect an IC is applying  $V_{cc}$  and ground.

2.2. Remember  $V_{ss}$  should be in the range of 4.5V to 7V

3. Now connect ground at Pins 4, 5, 12, 13.

3.1. Remember if you use multiple supplies, you should short circuit all grounds and this ground is applied to the Pins.

4. Now  $V_{ss}$  and Gnd applying is over.

5. Now apply +5V to chip enable pins. Chip enable pins are pin1, 9.

6. Here we are trying to use both channels, at least test both channels of the IC so that we can test whether IC is good or not.

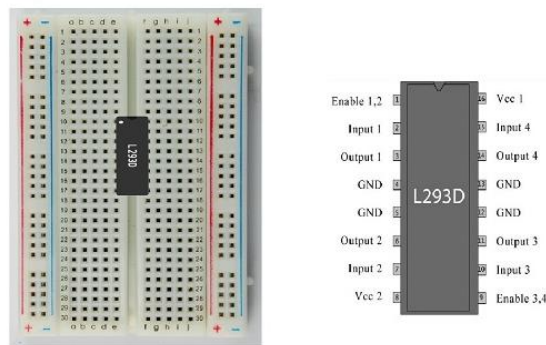
7. Apply  $V_c$  at Pin8.

7.1. For testing the IC you can apply  $V_c = V_{ss} = 5V$ .

7.2. When you connect the motor you should apply  $V_c > V_{ss}$  or may it can be equal also.

The following test are done for each channels separately.

In the following explanation I refer '1' as +5V( $V_{ss}$ ) and '0' as ground.



8. Apply Input 1 = Input 2 = 0 (ie, ground) and connect multimeter to output 1 and ground of the circuit.

8.1. Now test output 1 and output 2 voltages.

8.2. Both should be zero at this condition.

9. Apply Input 1 = 1 and Input 2 = 0 and check voltages at output 1 and output 2.

9.1. Remember your multimeter's one lead should be ground. Then you should get one output 1 =  $V_c$  and other output 2 = 0.

10. Apply Input1=0 and Input2=1 and check voltages at output1 and output2.

10.1. Then output1=0 and output2=Vc. That is this case is should be reverse of the previous case, motor will rotate in opposite direction.

11. Apply Input1=1 and Input2=1 and check voltages at output1 and output2.

11.1. Then output1=output2=Vc. This is the braking case.

12. Test conditions 8-11 for both channels to test the IC is good. You should test it thoroughly so that a repetition is not needed. If your IC is not working, repeat steps 1-11 to make sure IC is bad.

13. The most problems occurring are breadboard problems, IC not inserted properly, applying Vss and Vc wrongly (this can sometimes cause problems to IC), not disabling chip inhibit, absence of common ground.

14. If you are applying Vc=Vss = +5V, then you can use two LED's to see outputs.

15. When chip inhibit is enabled, ie chip is not working the outputs will be high impedance, you can test high impedance using an LED.

15.1. First connect the cathode of LED to ground through a series resistor of 330ohm and test the output.

15.2. LED will not glow.

15.3. Now apply 5V to the anode of the LED and apply output to the cathode through a series resistor of 330 ohm. Now also LED won't glow.

15.4. Now you can assure that the output is high impedance.

16. Before connecting motor to the outputs of L293D, first test the motor is working with the desired  $V_c$  by applying  $V_c$  and ground directly to the two leads of the motor. Confirm this first, then connect the motor.