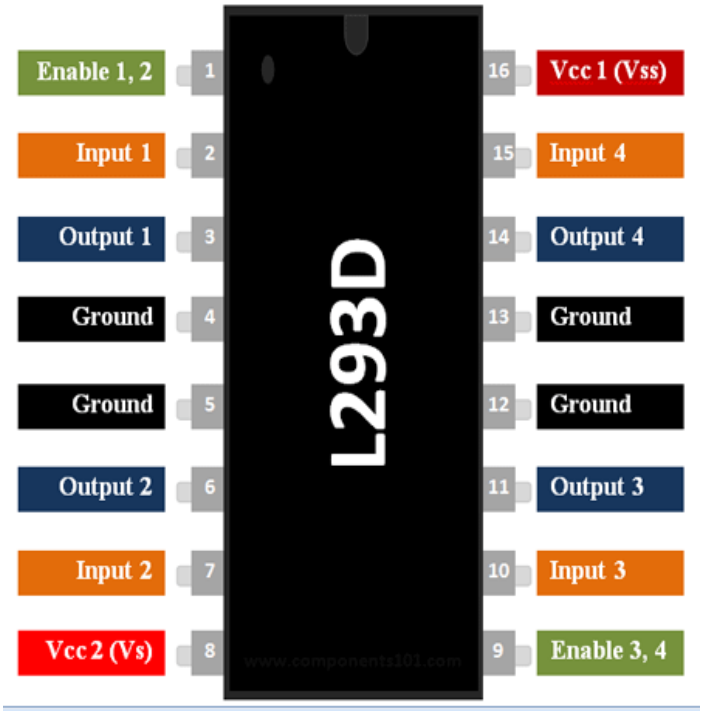
NIELIT, Gorakhpur

Course Name: A-level (1st Sem.) **Subject: IoT**

Topic: L293D Motor Driver IC **Date: 06.05.2020**



L293D Pin Configuration

Pin Number	Pin Name	Description
1	Enable 1,2	This pin enables the input pin Input 1(2) and Input 2(7)
2	Input 1	Directly controls the Output 1 pin. Controlled by digital circuits
3	Output 1	Connected to one end of Motor 1
4	Ground	Ground pins are connected to ground of circuit (0V)
5	Ground	Ground pins are connected to ground of circuit (0V)
6	Output 2	Connected to another end of Motor 1
7	Input 2	Directly controls the Output 2 pin. Controlled by digital circuits

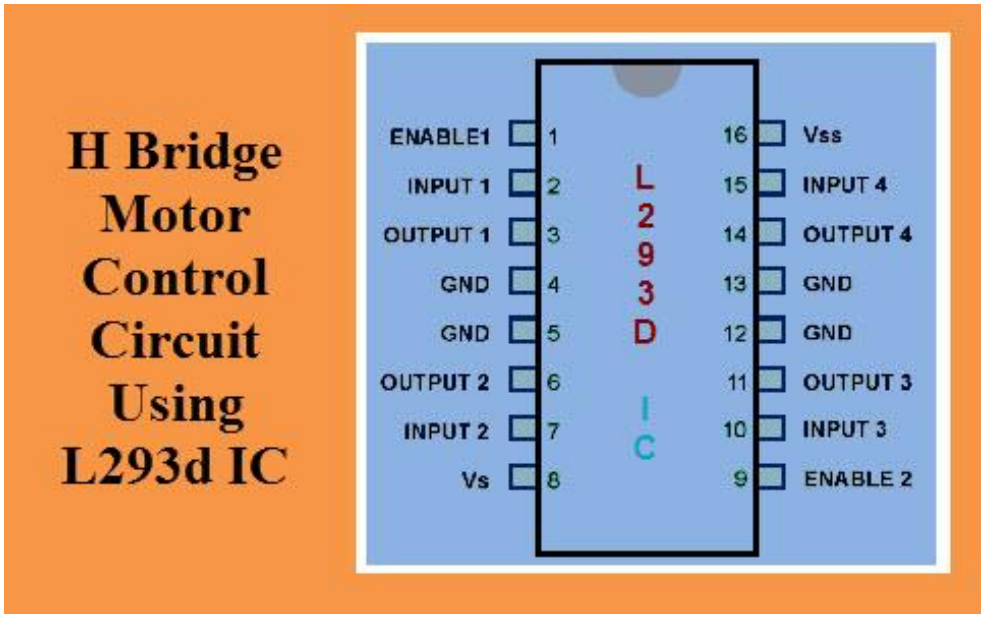
8	Vcc2 (Vs)	Connected to Voltage pin for running motors (4.5V to 36V)
9	Enable 3,4	This pin enables the input pin Input 3(10) and Input 4(15)
10	Input 3	Directly controls the Output 3 pin. Controlled by digital circuits
11	Output 3	Connected to one end of Motor 2
12	Ground	Ground pins are connected to ground of circuit (0V)
13	Ground	Ground pins are connected to ground of circuit (0V)
14	Output 4	Connected to another end of Motor 2
15	Input 4	Directly controls the Output 4 pin. Controlled by digital circuits
16	Vcc2 (Vss)	Connected to +5V to enable IC function

Features

- Can be used to run Two DC motors with the same IC.
- Speed and Direction control is possible
- Motor voltage Vcc2 (Vs): 4.5V to 36V
- Maximum Peak motor current: 1.2A
- Maximum Continuous Motor Current: 600mA
- Supply Voltage to Vcc1(vss): 4.5V to 7V
- Transition time: 300ns (at 5Vand 24V)
- Automatic Thermal shutdown is available
- Available in 16-pin DIP, TSSOP, SOIC packages

H-Bridge Motor Control Circuit Using L293d Motor Driver IC

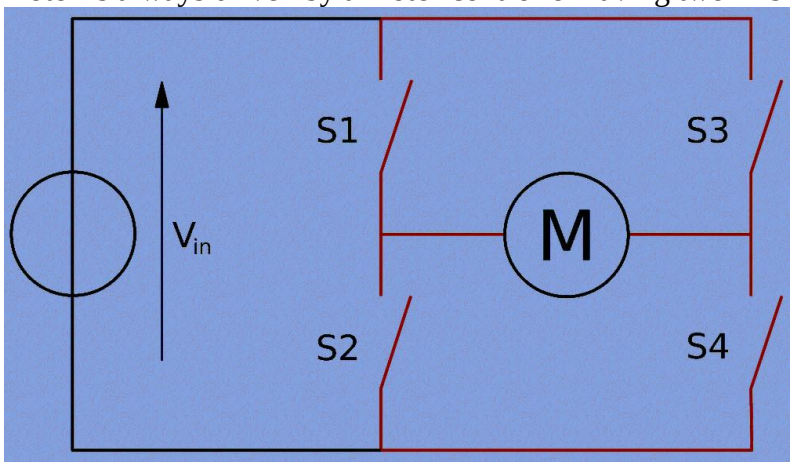
Common DC gear head motors need current above 250mA. There are many integrated circuits like ATmega16 Microcontroller, 555 timer IC. But, IC 74 series cannot supply this amount of current. When the motor is directly connected to the o/p of the above ICs then, they might damaged. To overcome this problem, a motor control circuit is required, which can act as a bridge between the above motors and ICs (integrated circuits). There are various ways of making H-bridge motor control circuit such as using transistor, relays and using L293D/L298.



H Bridge Motor Control Circuit Using L293d IC

H-Bridge Circuit

A H bridge is an electronic circuit that allows a voltage to be applied across a load in any direction. H-bridge circuits are frequently used in robotics and many other applications to allow DC motors to run forward & backward. These motor control circuits are mostly used in different converters like DC-DC, DC-AC, AC-AC converters and many other types of power electronic converters. In specific, a bipolar stepper motor is always driven by a motor controller having two H-bridges



H-Bridge Circuit

- A H-bridge is fabricated with four switches like S1, S2, S3 and S4. When the S1 and S4 switches are closed, then a +ve voltage will be applied across the motor. By opening the switches S1 and S4 and closing the switches S2 and S3, this voltage is inverted, allowing invert operation of the motor.

- Generally, the H-bridge motor driver circuit is used to reverse the direction of the motor and also to break the motor. When the motor comes to a sudden stop, as the terminals of the motor are shorted. Or let the motor run free to a stop, when the motor is detached from the circuit. The table below gives the different operations with the four switches corresponding to the above circuit.

S1	S2	S3	S4	Operation
1	0	0	1	Motor moves right
0	1	1	0	Motor moves left
0	0	0	0	Motor free runs
0	1	0	1	Motor brakes
1	0	1	0	Motor brakes
1	1	0	0	Short Power Supply
0	0	1	1	Short Power Supply
1	1	1	1	Short Power Supply

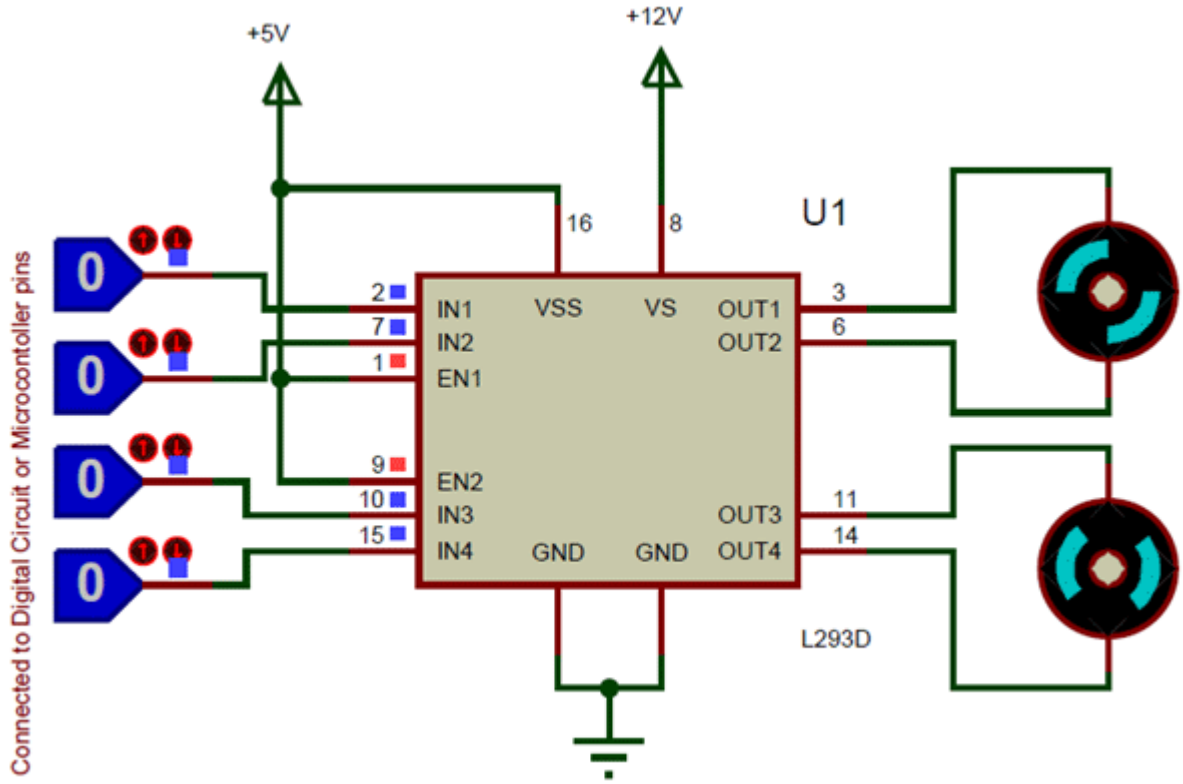
Operation of the H-Bridge

Where to use L293D IC

The L293D is a popular 16-Pin **Motor Driver IC**. As the name suggests it is mainly used to drive motors. A single **L293D IC** is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. So if you have motors which has operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or even Micron rollers like Arduino, PIC, ARM etc.. this IC will be the right choice for you.

How to use a L293D Motor Driver IC

Using this L293D motor driver IC is very simple. The IC works on the principle of **Half H-Bridge**, let us not go too deep into what H-Bridge means, but for now just know that H bridge is a set up which is used to run motors both in clock wise and anti clockwise direction. As said earlier this IC is capable of running two motors at the any direction at the same time, the circuit to achieve the same is shown below.



All the Ground pins should be grounded. There are two power pins for this IC, one is the Vss(Vcc1) which provides the voltage for the IC to work, this must be connected to +5V. The other is Vs(Vcc2) which provides voltage for the motors to run, based on the specification of your motor you can connect this pin to anywhere between 4.5V to 36V, here I have connected to +12V.

The Enable pins (Enable 1,2 and Enable 3,4) are used to Enable Input pins for Motor 1 and Motor 2 respectively. Since in most cases we will be using both the motors both the pins are held high by default by connecting to +5V supply. The input pins Input 1,2 are used to control the motor 1 and Input pins 3,4 are used to control the Motor 2. The input pins are connected to the any Digital circuit or microcontroller to control the speed and direction of the motor. You can toggle the input pins based on the following table to control your motor.

Input 1 = HIGH(5v)	Output 1 = HIGH	Motor 1 rotates in Clock wise Direction
Input 2 = LOW(0v)	Output 2 = LOW	
Input 3 = HIGH(5v)	Output 1 = HIGH	Motor 2 rotates in Clock wise Direction
Input 4 = LOW(0v)	Output 2 = LOW	

Input 1 = LOW(0v)	Output 1 = LOW	Motor 1 rotates in Anti-Cl Direction
Input 2 = HIGH(5v)	Output 2 = HIGH	
Input 3 = LOW(0v)	Output 1 = LOW	Motor 2 rotates in Anti -C Direction
Input 4 = HIGH(5v)	Output 2 = HIGH	

Input 1 = HIGH(5v)	Output 1 = HIGH	Motor 1 stays still
Input 2 = HIGH(5v)	Output 2 = HIGH	
Input 3 = HIGH(5v)	Output 1 = LOW	Motor 2 stays still
Input 4 = HIGH(5v)	Output 2 = HIGH	

Applications

- Used to drive high current Motors using Digital Circuits
- Can be used to drive Stepper motors
- High current LED’s can be driven
- Relay Driver module (Latching Relay is possible)