

Control your motors with L293D and Arduino

by [guibot](#) on April 26, 2009

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Author:guibot [author's website](#)
Designer & digital artist

Intro: Control your motors with L293D and Arduino

After long research and trial and error, I have came up to a new walkthrough regarding this nice chip, the L293D.

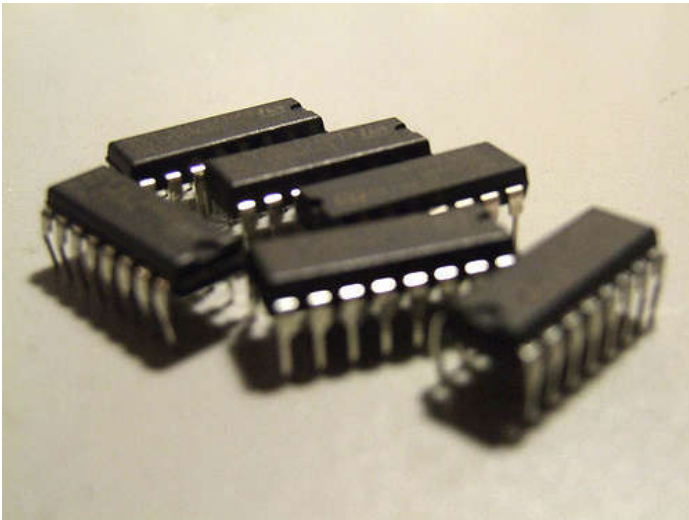
Each project is one project and each one has its own unique power configurations, so you must be aware of the best battery choice and how to distribute voltage through your robot.

I strongly advice you to read the following articles:

[Picking Batteries for your Robot](#)

[Once you've decided on batteries, how do you regulate the voltage](#)

L293D gives you the possibility to control two motors in both directions - [datasheet](#)



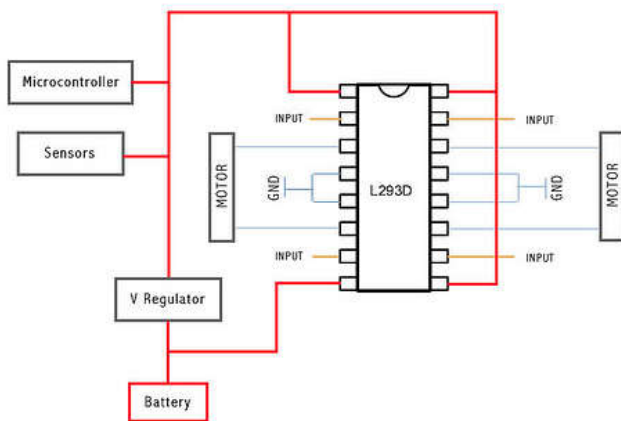
Step 1: Basic implementation

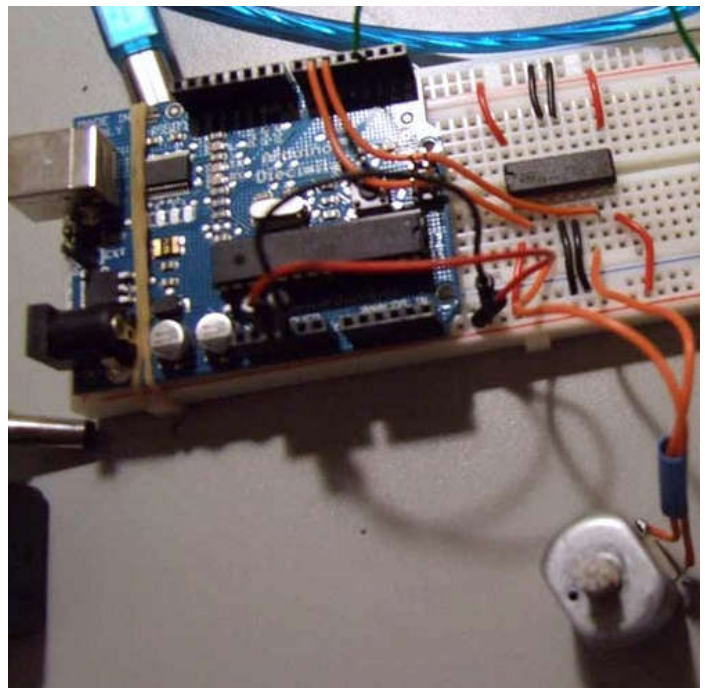
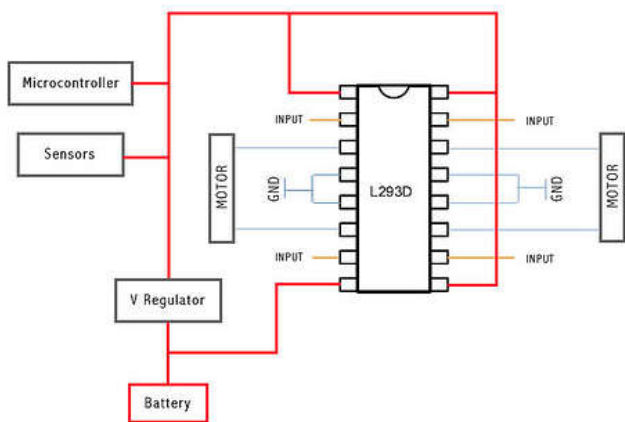
This is the most basic implementation of the chip.

As you can see, a 5V Voltage Regulator is between the battery and pins 1, 9, 16.

Pin 8 gets power before the VReg, if your motor needs for example 6V you should put 6V directly in this pin, all the other pins should not get more than 5V.

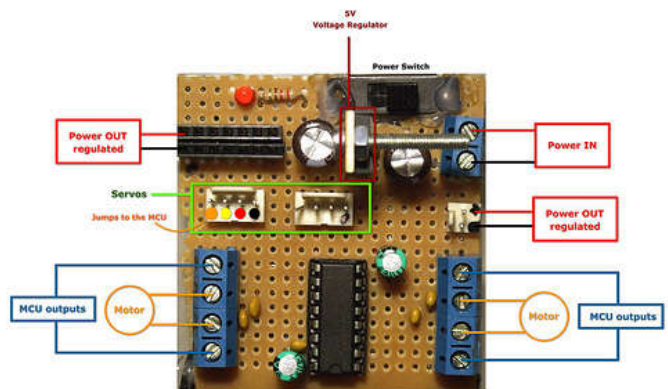
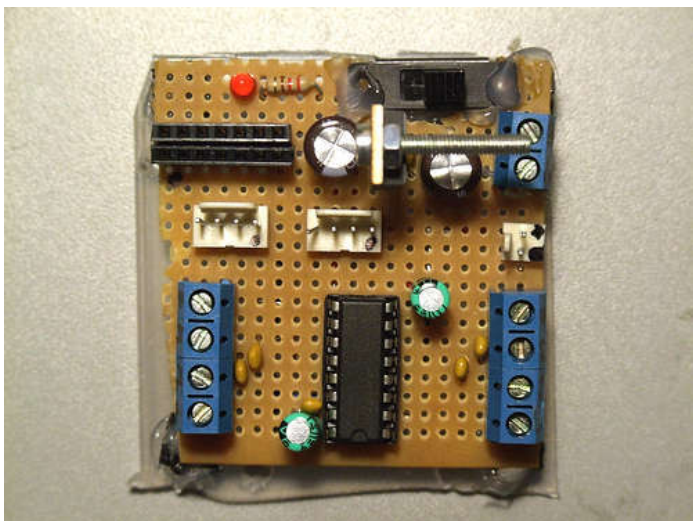
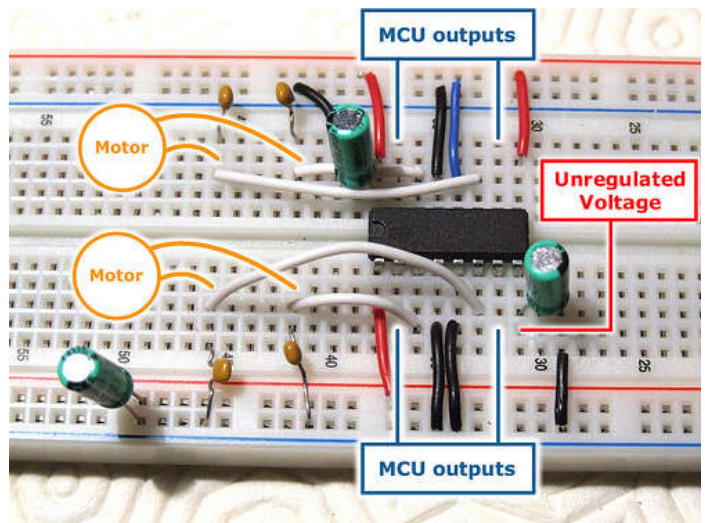
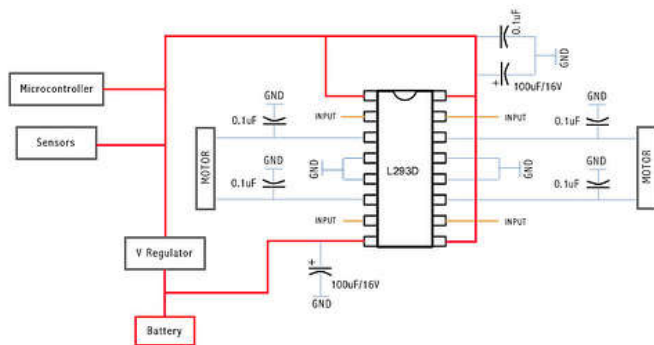
This will work with no problem at all, but if you want to do the right implementation take a look at the next example:





Step 2: Advanced implementation

This is the correct Implementation (with the capacitors), and note that pin 8 is feeded by unregulated voltage. This means that if your motors need more than 5V, you should power this pin with that amount of voltage, and the rest of the circuit with 5V.



Step 3: Arduino code

// Use this code to test your motor with the Arduino board:

// if you need PWM, just use the PWM outputs on the Arduino
// and instead of digitalWrite, you should use the analogWrite command

// ----- Motors
int motor_left[] = {2, 3};
int motor_right[] = {7, 8};

// ----- Setup
void setup() {
 Serial.begin(9600);

// Setup motors
int i;
for(i = 0; i < 2; i++){
 pinMode(motor_left[i], OUTPUT);
 pinMode(motor_right[i], OUTPUT);
}

}

// ----- Loop
void loop() {

drive_forward();
 delay(1000);
 motor_stop();
 Serial.println("1");

drive_backward();
 delay(1000);
 motor_stop();
 Serial.println("2");

turn_left();
 delay(1000);
 motor_stop();
 Serial.println("3");

turn_right();
 delay(1000);
 motor_stop();
 Serial.println("4");

motor_stop();
 delay(1000);
 motor_stop();
 Serial.println("5");
}

// ----- Drive

void motor_stop(){
 digitalWrite(motor_left[0], LOW);
 digitalWrite(motor_left[1], LOW);

digitalWrite(motor_right[0], LOW);
 digitalWrite(motor_right[1], LOW);
 delay(25);
}

void drive_forward(){
 digitalWrite(motor_left[0], HIGH);
 digitalWrite(motor_left[1], LOW);

digitalWrite(motor_right[0], HIGH);
 digitalWrite(motor_right[1], LOW);
}

void drive_backward(){
 digitalWrite(motor_left[0], LOW);
 digitalWrite(motor_left[1], HIGH);

digitalWrite(motor_right[0], LOW);
 digitalWrite(motor_right[1], HIGH);
}

void turn_left(){
 digitalWrite(motor_left[0], LOW);
 digitalWrite(motor_left[1], HIGH);

digitalWrite(motor_right[0], HIGH);

```
digitalWrite(motor_right[1], LOW);
}
```

```
void turn_right(){
digitalWrite(motor_left[0], HIGH);
digitalWrite(motor_left[1], LOW);
```

```
digitalWrite(motor_right[0], LOW);
digitalWrite(motor_right[1], HIGH);
}
```

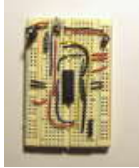
Related Instructables



Simple Robotics Breadboard by doctek



Cellphone Operated Robot by avadhut10001



Stepper Motor Module by carlyn



Physiotherapist Robotic Arm.. by Nirzaree



Cellphone operated Robot by Nitin Sharma



Arduino + Game maker Rover by cooldog

Comments

45 comments

Add Comment



moose4987 says:

May 15, 2010. 4:33 PM [REPLY](#)

so, say i were to use a motor to turn a solar panel... if i used the voltage from the solar panels which vary from 6-9 volts to power the arduino, could i also use that unregulated voltage to power the L293?



chris27 says:

Mar 2, 2010. 4:06 PM [REPLY](#)

Hey, sorry to bump an old thread, but I'm thinking of using four PICAXE 08-M chips as slaves for DC motor control via PWM, routed through a L293D (four mono-directional motors). The only example I've seen of this kind of setup (http://www.phanderson.com/picaxe/pwm_stamp.html) seems to suggest that in order to change the duty cycle of the PWM out, you have to pull pin 4 low, then pulse a certain number of times in 100ms, then pull pin 4 high again. Is that true? If so, it's only possible to change the motor speed a maximum of 10 times per second - which isn't very useful when making minute adjustments to respond to gyro stabilisation. Anyone know of a better way to achieve this?

Cheers



felixk says:

Jan 13, 2010. 1:43 AM [REPLY](#)

Great Job! :)

I noticed that in the final breadboard (Page 3 of the downloadable pdf), you have included servo control and a couple of extra capacitors that are not in the system diagram. Any chance of a complete schematic of this circuit?

Thanks



mani.atice says:

Jun 8, 2009. 9:36 PM [REPLY](#)

Hi,

I'm new to electronics (follow instructions level) and this instructable helped me a lot on bringing two motors to life with my arduino.

I have a basic question: is it better to use the *5V arduino output* or a *regulated current from the ext source* (as shown on this instructable) for the **L293D logic input** ?

Thank you



icecreamterror says:

Aug 20, 2009. 10:46 AM [REPLY](#)

ext source, always better with the Arduino.



comodore says:

Apr 28, 2009. 3:44 PM [REPLY](#)

Hi I like your Instructables very much! Great job! I have a question that I think you may know the answer to. I need a small chip like this one that I can program and put it in a circuit so when it activates by a sensor (in my case I want to put a light sensor (LDR))When light hits the light sensor It turns on a motor for a period of time (lets say 5 seconds). Then when the sensor finds it self in the dark it turns on the motor (again for 5 sec) BUT IN THE opposite DIRECTION. All in All When there is lite it turns on the motor for 5 sec on one side (lets say left) when there is no light it turns the motor for 5 sec (on the oposite side, right) Do you know such a chip that will enable me to program it and make it do what I described??? Thank you! Stanislav



emmjul says:

May 14, 2009. 4:16 AM [REPLY](#)

You can use the same setup, simply save the states of the ldr and you can check if there was light before and have the arduino reverse the motor->

```
if ( pin 1 = high)
{
  turn right
  5 sec
}
if (pin 1 = low)
{
  turn left
  5 sec
}

else
{
  do nothing
}
```

Hope I could help



comodore says:

May 14, 2009. 11:17 AM [REPLY](#)

THANK YOU SO MUCH!!! OK, so I just upload this to the Arduino? On what pins do I connect the motor, LDR, power??? I needed someone to write the code because I am a complete n00b in programming... THANK YOU! Could you please now just help me, to say, put it together, like on what pins do I connect the motor, LDR, power... Can I remove the ATmega chip and use it with out the Arduino board, connecting the components directly to the chip? Thank you!



emmjul says:

May 15, 2009. 7:52 AM [REPLY](#)

no you can't, it's just pseudocode so you can get an idea what you have to program, sadly I don't own an arduino so I can't write it for you. sry



comodore says:

May 22, 2009. 2:11 AM [REPLY](#)

Well... Thanks any way... Thanks, you helped me! :D



dagenius says:

Apr 30, 2009. 5:08 PM [REPLY](#)

If that is all you are looking to do, then a pickaxe 08-M coupled with the circuit in this instructable should do the trick. the cheapest 08-M that I found was about \$3.00 USD.



comodore says:

May 2, 2009. 9:36 AM [REPLY](#)

And how do you program them? Thanks!



dagenius says:

May 13, 2009. 5:49 PM [REPLY](#)

the chips have a serial in, serial out(also a in0), and a ground to share with a serial cable. They do take a little more diy to use, because the breakout boards sold on the internet are terrible, and you can make one much smaller, cheaper, and funner with a perf board, solder, pic, and various components. The pic must be programmed with a certain resistor setup that can be found all over the internet.



comodore says:

May 14, 2009. 11:10 AM [REPLY](#)

Ah ok thanks! I think I am going to use an arduino, that is the arduino chip thanks!



guibot says:

Apr 28, 2009. 7:55 PM [REPLY](#)

The Arduino board is fully programable, you can see more info at www.arduino.cc



comodore says:

Apr 29, 2009. 8:00 AM [REPLY](#)

Yea, but I need something smaller, much much smaller like a chip...



narnian says:

May 1, 2009. 5:46 PM [REPLY](#)

Any of the microcontrollers whether PIC or AVR can do this. But you will still need support components for regulating power and possibly programming interface, so yes the Arduino is a little big, but you may find you need the same components in any case.



comodore says:

May 2, 2009. 3:30 PM [REPLY](#)

Well, maybe, but the problem is I can't fit the Arduino into the case... I think that I just program the chip and solder all the components... I would save much space... So should I use this chip? How do I actually program it, the chip that is? As I said, I need something small..like a bug circuit with the programed chip that turns on the motor when it gets a signal for a defined amount of time... Thanks!



guibot says:

Apr 29, 2009. 8:54 AM [REPLY](#)

there are arduino clones of many sizes, or can build your customized arduino only with the essencial components, I have build one for this project

check the following links:

http://store.fundamentallogic.com/ecom/index.php?main_page=index&cPath=15

<http://www.arduino.cc/en/Main/ArduinoBoardNano>



comodore says:

Apr 30, 2009. 5:12 AM [REPLY](#)

Thank you!



Eirinn says:

May 2, 2009. 1:29 AM [REPLY](#)

Once you've programmed the arduino you can remove the chip, add a crystal and it can act alone with a power source - you don't always need a smaller arduino ;)



comodore says:

May 2, 2009. 3:32 PM [REPLY](#)

Great, that is good to hear... I am new in programing and electronic... :P Why do I need a crystal, actually what does a crystal do??? How should it be connected? What chip should I use? Thank you!



Eirinn says:

May 3, 2009. 1:54 AM [REPLY](#)

I recommend the Arduino Duemillanove, it's relatively easy to use and program and the crystal (i have no idea besides this) is just to make it functional outside the board it's in. The arduino Duemillanove uses the AtMega328. ps: a "crystal" is just a component like a resister or capacitor, it's not a diamond or a ruby :P



comodore says:

May 5, 2009. 1:04 PM [REPLY](#)

I have the Arduino Duemillanove ... Are there types of crystals, if yes, which type should I use??? Are there separate chips that you can buy, without the whole board? On the chip it self hod do I know where should I hock up the sensor, power, motor, crystal... Yes, I am a n00b! ;) Thank you!



Eirinn says:

May 6, 2009. 8:20 AM [REPLY](#)

I will answer you honestly; i don't know. But googling goes a long way ;)



comodore says:

May 7, 2009. 1:22 AM [REPLY](#)

:P Thanks!



guibot says:

May 2, 2009. 4:11 PM [REPLY](#)

this might interest you
<http://lab.guilhermemartins.net/?p=539>



comodore says:

May 3, 2009. 4:03 PM [REPLY](#)

Thanks!



guibot says:

May 7, 2009. 2:20 AM [REPLY](#)

and this :)
<http://lab.guilhermemartins.net/?p=817>



comodore says:

May 7, 2009. 3:22 AM [REPLY](#)

Thanks! x2 :D



lordofthedonuts says:

Apr 29, 2009. 12:47 PM [REPLY](#)

Nice to see some folks from LMR on insturctables, keep up the good work!



ticapix says:

Apr 28, 2009. 11:07 PM [REPLY](#)

Thanks for the article :) Can you explain or give to link which explain why you put capacitors ? (and why this way ?) Diodes aren't good ?



Wyle_E says:

Apr 28, 2009. 11:45 PM [REPLY](#)

The capacitors from the motor leads to ground absorb noise generated by the motors. Motors are notorious for generating spikes that interfere with nearby logic and sensor circuits. The big capacitor across the battery smooths the supply voltage, keeping the internal resistance of the battery from dragging the bus voltage down when the current into the circuit suddenly increases (like when you start a motor). The parallel pair of capacitors from +5V to ground filter the logic-circuit supply. The big electrolytic capacitor soaks up low-frequency trash, but isn't so good at handling high-frequency noise, like that generated by fast-switching logic. The .1 microfarad capacitor is a ceramic or polyester type that handles the high frequencies.



ticapix says:
thanks Wyle_E :)

Apr 29, 2009. 12:09 AM [REPLY](#)



kurtbadelt says:

Hi. i have one like this but i used diodes instead of capacitors. whats the difference? should i migrate to caps?

Apr 28, 2009. 11:18 AM [REPLY](#)



guibot says:

If you are using the L293D you don't need the diodes since they are already inside the IC. Certify you are using the 'D' version. The caps are a good practice, they are used to stabilize the voltage. The diodes are for kickback protection.

Apr 28, 2009. 12:48 PM [REPLY](#)



e-Killer says:

what I have to do if i need PWM support? just using pwm outputs from arduino to inputs on this schematic?

Apr 27, 2009. 6:29 PM [REPLY](#)



guibot says:

instead of `digitalWrite (pin , HIGH);` you should use `analogWrite (pin , 255);` // value from 0 to 255

Apr 28, 2009. 9:53 AM [REPLY](#)



capt.tagon says:

Adafruit produces a motor shield using two L293D ICs. You might be able to read through the library for it to see how the motor is controlled for PWM. The schematic for the shield is also provided. I plan on implementing the information in this article for a project where the Adafruit shield is a little overkill as I only need 1 motor control.

Apr 28, 2009. 7:35 AM [REPLY](#)

<http://www.ladyada.net/make/mshield/download.html>



xchip says:

"This means that if your motors need more than 5V, you should power this pin with that amount of current, and the rest of the circuit with 5V." you seem to mix the concepts "voltage" and "current"

Apr 28, 2009. 3:07 AM [REPLY](#)



guibot says:

you are right, thanks :)

Apr 28, 2009. 9:51 AM [REPLY](#)



amando96 says:

very good 'ible :) whenever i need to use one of these IC's i will certainly follow these instructions :)

Apr 28, 2009. 4:18 AM [REPLY](#)



Marcel1 says:

I think we can use pwm in pins 1 and 9 instead of the 5v this way we only use 2 pwm pins from arduino

Apr 28, 2009. 3:28 AM [REPLY](#)



Soldier6575 says:

5 Stars. Great Job.

Apr 26, 2009. 4:49 PM [REPLY](#)



guibot says:

Thanks :)

Apr 26, 2009. 5:16 PM [REPLY](#)
