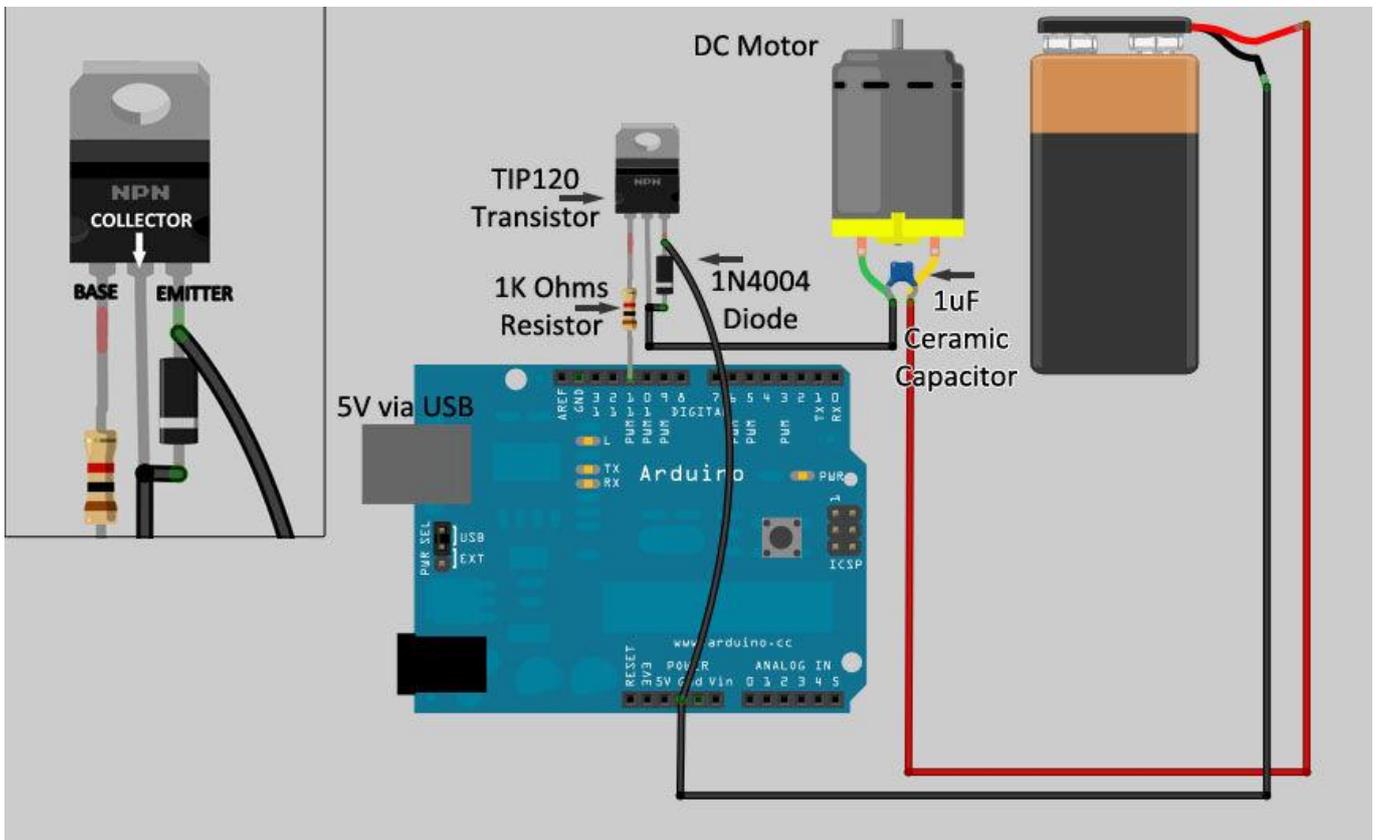
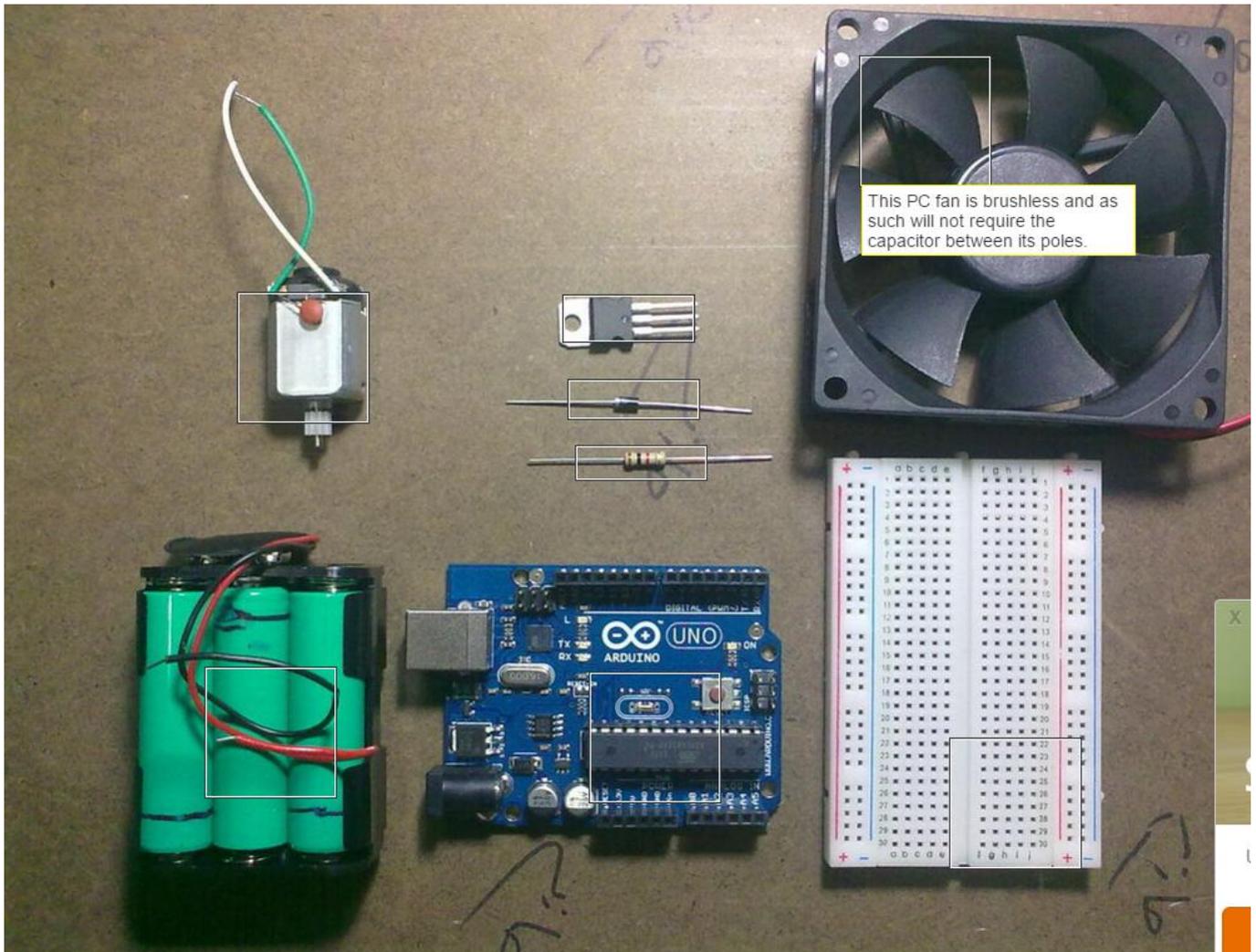
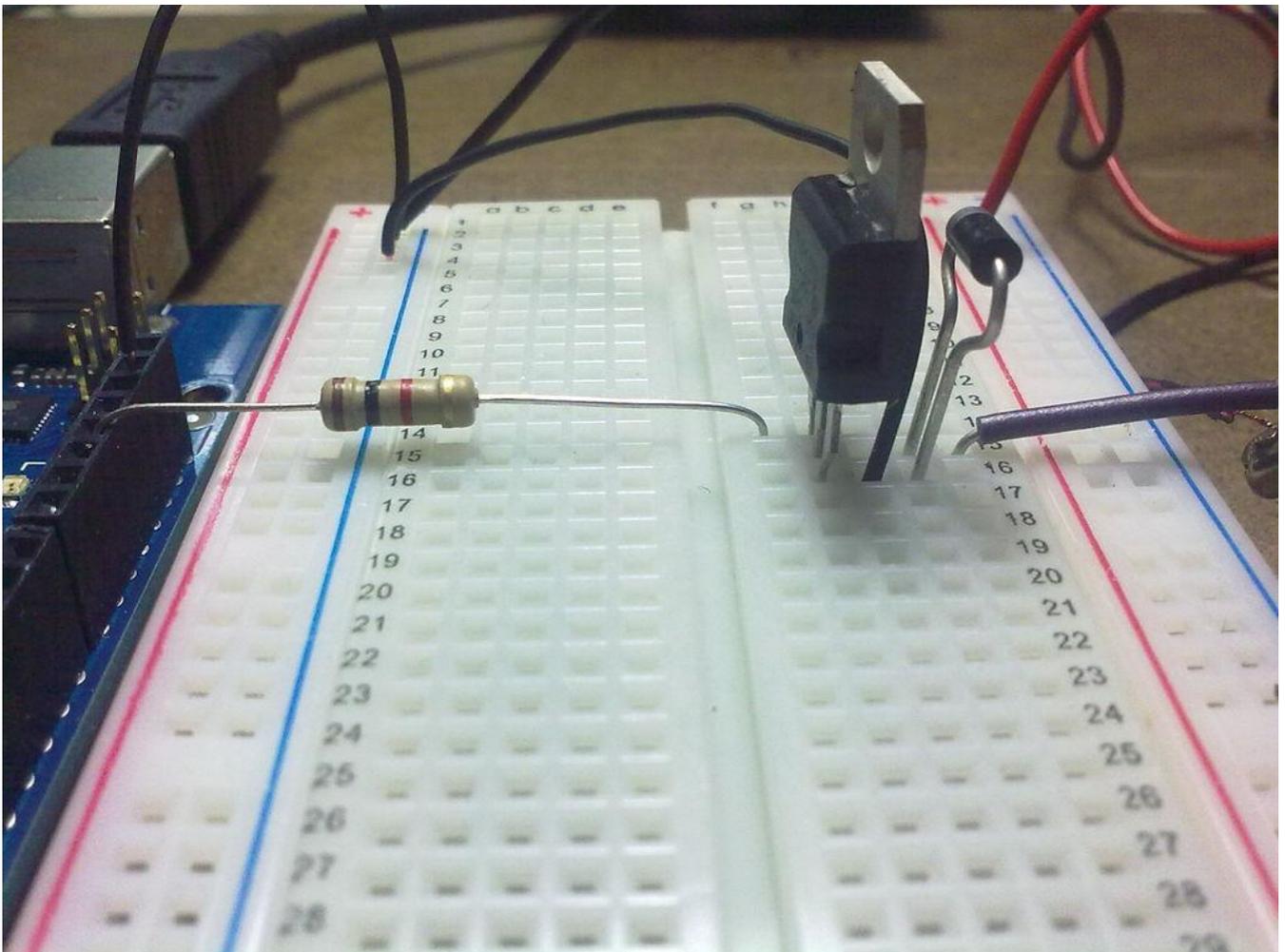
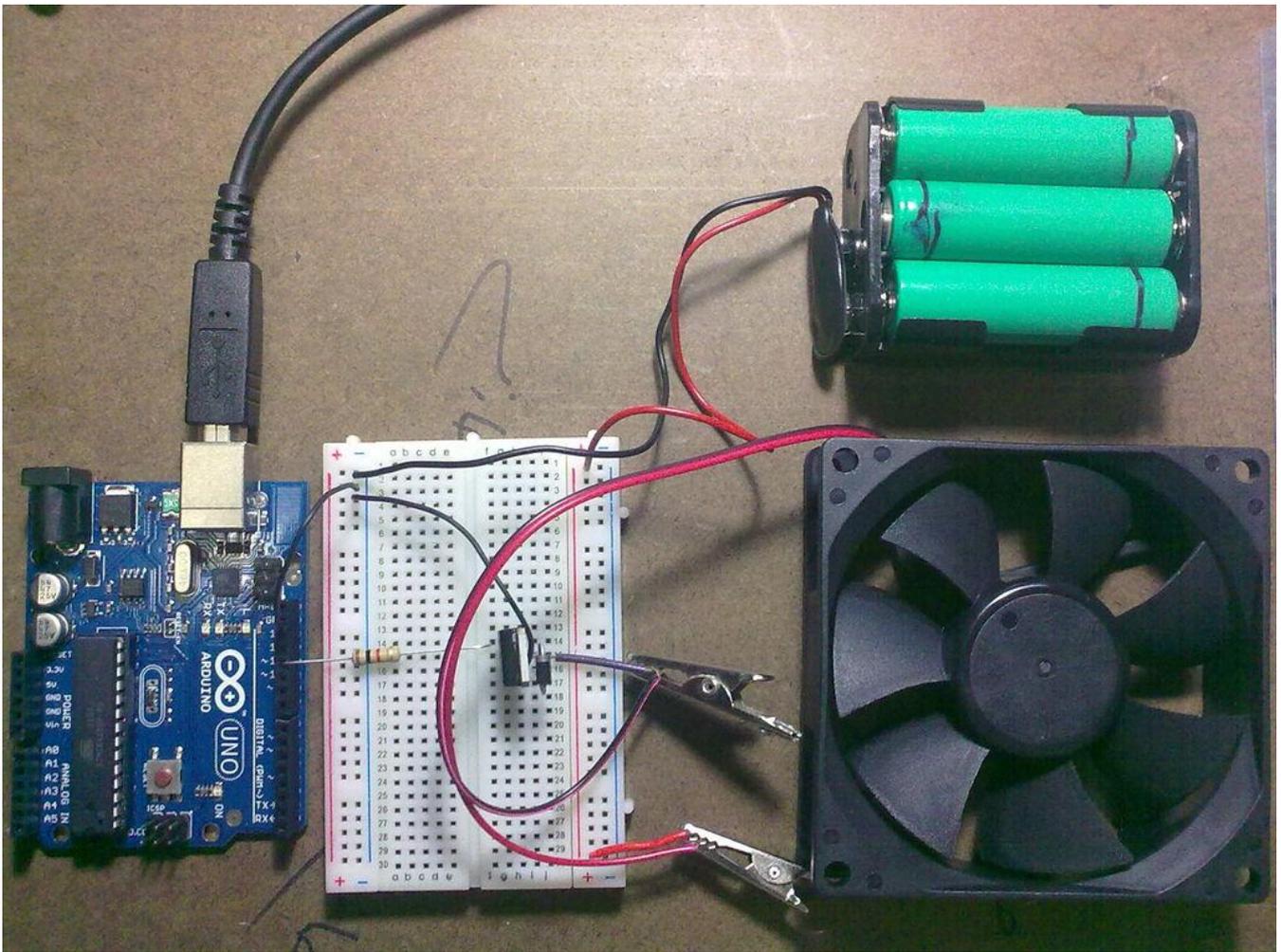


# ARDUINO TRANSISTOR TIP120 E MOTORI DC





## THE TIP120 DARLINGTON TRANSISTOR

The TIP120 is an NPN Power Darlington Transistor.

It can be used with an Arduino to drive motors, turn lights on, and drive other high power gadgets.

The TIP120 acts as a power broker or gatekeeper between the Arduino realm and the high power realm composed of the PC fan and its battery pack. The Arduino can tell the TIP120 how much power to pass from the external battery pack to the PC fan but the Arduino does not share any of its power or share pins with the PC fan or its batteries.

The TIP120 is the go in between.

The TIP120 has three pins. One is called Base, which we will connect to any of the Arduino PWM pins. Through the Base pin, the Arduino can tell the TIP120 how much power to supply to the motor from the external battery pack. That's it. The TIP120 does the heavy lifting while Arduino sits back and gives orders through one of its PWM pins to the TIP120 Base pin telling it how much power to pass to the motor. The poor TIP120 has to then pass the requested power from the external power to the motor based on Arduino's request.

## THE PROJECT

In this tutorial, I will build a basic circuit in which I use an Arduino to control the speed of PC fan via the TIP120. You can take this basic circuit and replace the fan with other devices.

If you want to know more about Darlington transistors you can spend some time at Wikipedia [http://en.wikipedia.org/wiki/Darlington\\_transistor](http://en.wikipedia.org/wiki/Darlington_transistor) It's an interesting read but you don't really need to understand it to use the TIP120. Heck I don't know what most of this stuff means.

## THE SIDEKICKS

ENTER THE 1K RESISTOR & 1N4004 DIODE & 1UF CAPACITOR!

The TIP120 is a very robust item. It can handle lots of power (see specs) but the Arduino can't. So we must protect the Arduino from potential party crashers. For starters, we use a 1K Ohm resistor between the Arduino pins and the TIP120 Base pin. This is insurance against electric shorts. The TIP120 can handle 60V and 5A but I assure you the Arduino won't.

Then we have those DC motors. The internal brushes on toy/hobby DC motors generate lots of potentially harmful sparks and stray electricity that needs to be blocked. Instead of guessing which motor is safe and which is not, we simply add a \$.20 diode and \$.10 1uF ceramic capacitor to our circuit.

Some electromechanical devices such as solenoids may require different capacitors.

Placing the ceramic capacitor on the + & - poles of the motor will act as suppressor of sparks and surges generated by motor brushes, which can be harmful to your circuit.

*A small ceramic capacitor in the range of .01 to 0.1 uF is probably sufficient to offer protection from hobby DC motors. But If you are using brushless motors, such as the PC fan I am using in this tutorial, don't use a capacitor.*

As for the 1N4004 diode, it allows current to pass in one direction from positive to negative but will block any stray current that tries to go in the opposite direction, which might have undesirable effects on your circuit.

Unlike resistors which allow current to flow in both directions, diodes were designed to let current pass from positive into negative, not the other way around. When you look closely at those small diodes we use in our projects, you will see a ring on one end of the diode cylinder. This tough guy can block high voltage (400V) with high current (1A). Again, no need to understand all this stuff so long as you connect the circuit properly.

## PARTS

- TIP120 transistor (datasheet: <http://www.futurlec.com/Transistors/TIP120.shtml>) \$0.70
- Diode 1N4004 (datasheet: <http://www.futurlec.com/Diodes/1N4004.shtml>) \$0.20
- 1K Resistor (Brown, Black, Red, Gold) \$0.10
- 1uF ceramic capacitor to be used with hobby DC motors \$0.10
- Arduino UNO with IDE
- Breadboard
- PC fan or hobby DC motor
- 9V Alkaline or 7.2V NiMh batteries (6 X AA)
- Wires.

NOTE: I don't get commission or any perks from linking to Futurlec.com. I just like their service and prices so far.

## TEST SKETCH

// Define which pin to be used to communicate with Base pin of TIP120 transistor

```
int TIP120pin = 11; //for this project, I pick Arduino's PWM pin 11
```

```
void setup()
```

```
{  
  pinMode(TIP120pin, OUTPUT); // Set pin for output to control TIP120 Base pin  
  analogWrite(TIP120pin, 255); // By changing values from 0 to 255 you can control motor speed  
}
```

```
void loop()
```

```
{  
}
```

## CREDITS

I must thank <http://luckylarry.co.uk> for his super blog.