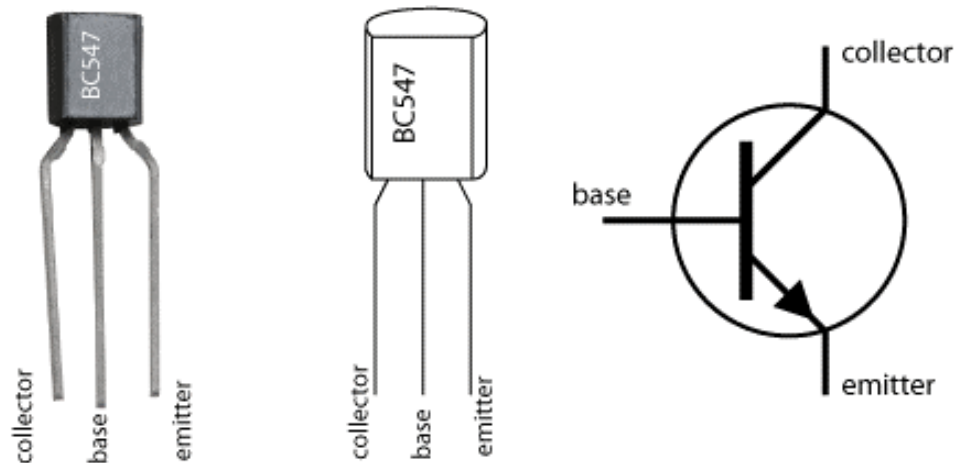


## Not Really a Datasheet: BC547

*Not Really a Datasheets are designed to help beginners start to work with components commonly used with Arduino microcontrollers. They contain very basic technical information and practical examples and illustrations.*

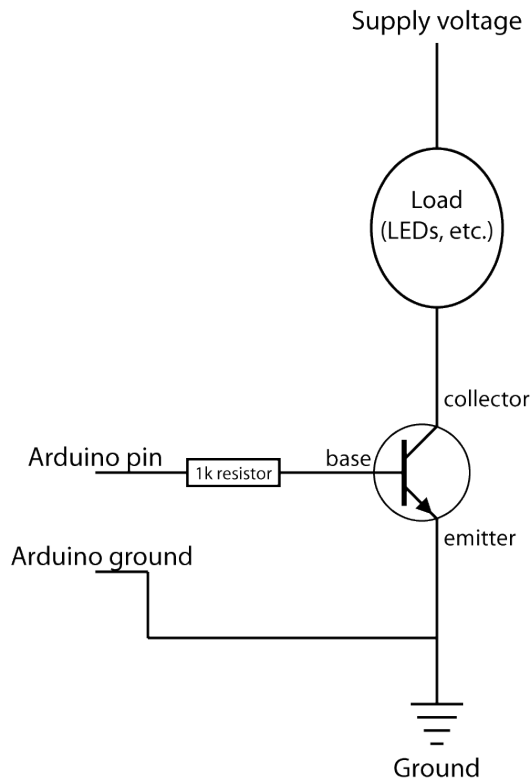
### What is it?



The BC547 is a small signal transistor. It is used to control outputs that require a higher voltage and/or more current than an Arduino pin can provide. However, these kinds of transistors are *not* good for controlling outputs that require a large amount of current (like many motors and some higher-current light sources).

### Can you give me an example?

Suppose you have an LED strip that requires 12 volts DC and 60 mA of current. You can't control these LEDs from an Arduino digital pin, because they require too much voltage and current. Here's where this kind of transistor comes in.



The transistor is placed so that it interrupts the flow of current between the LED strip (known as the *load*) and ground. When the *base* is connected to ground, no current flows between the collector and emitter, so no current flows through the LED strip. When a very small current is sent to the base, then the transistor allows current to flow from the *collector* to the *emitter*, and the LEDs light up. This means that you can switch a larger current on and off using a very small current.

### What do I probably need to know?

Use <b>DC current</b> .	Not AC.
Send less than <b>45 volts</b> from the <b>collector to the emitter</b> .	Often you will be using 9 or 12 volts, so you won't have to worry.
Send less than <b>100 milliamps</b> from the <b>collector to the emitter</b> .	If your device draws more current, you will burn out the transistor. Determine how much current your load requires before using this transistor. If in doubt, use a transistor that can handle larger current, such as the IRF520 MOSFET.
<b>Use a resistor</b> of 1 kilohm or more in series <b>between</b> the <b>Arduino pin</b> and the <b>base</b> .	You need to send a very small amount of current to the <i>base</i> as a signal. Less than 1mA will be enough to switch the transistor on. The 20 mA that an Arduino pin can send is too much and will burn out your transistor.
Put the <b>load between</b> the <b>power</b> supply and the <b>transistor</b> .	The flow of your large current should be power → load → transistor → ground. Don't put the load between the transistor and the ground.
You <b>can</b> use this component with PWM.	Because transistors can switch very quickly, you can use a PWM pin and the <code>analogWrite()</code> command.

### Any other details?

A transistor can be used in two main ways: as an electronic switch and as an amplifier. This sheet shows how to use a transistor as a switch. You can also control how much of a large current flows by sending different amounts of small current to the base, but that is a more complicated setup and outside the scope of this sheet.

The BC547 is an NPN transistor. This means that turning the base current on turns the collector-emitter current on. (This is the opposite of a PNP transistor, where turning the base current on turns the collector-emitter current *off*.)

The BC547 is one of many common 'small signal transistors.' Many transistors do a similar job to this one, and you can often replace one with another. Make sure that the transistor is called an NPN small signal transistor, and look in the datasheet for the pin diagram and the maximum current from the collector to the emitter. As long as you are using voltage in the 9-12V range and putting a 1-3 kilohm resistor in series between the Arduino pin and the base, you probably don't need to worry about maximum voltage or maximum base current.

For more general information about transistors, see this website:

<http://www.kpsec.freeuk.com/components/tran.htm>