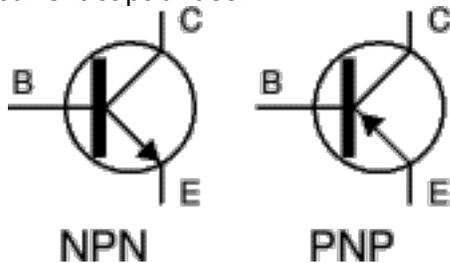


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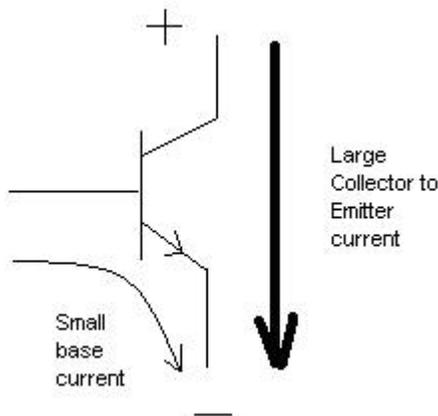
Electronics Lab, Electronic Components

Transistors

A transistor is essentially an amplifier which uses a small input signal to drive a large amount of voltage or current (the additional power comes from the external power supply). We will focus on one type of transistor for now, the NPN type. There are several other types, most notably the PNP. Both NPN and PNP are considered BJT (bipolar junction transistors) devices. They have opposite biasing polarities but very similar gain and current capabilities.



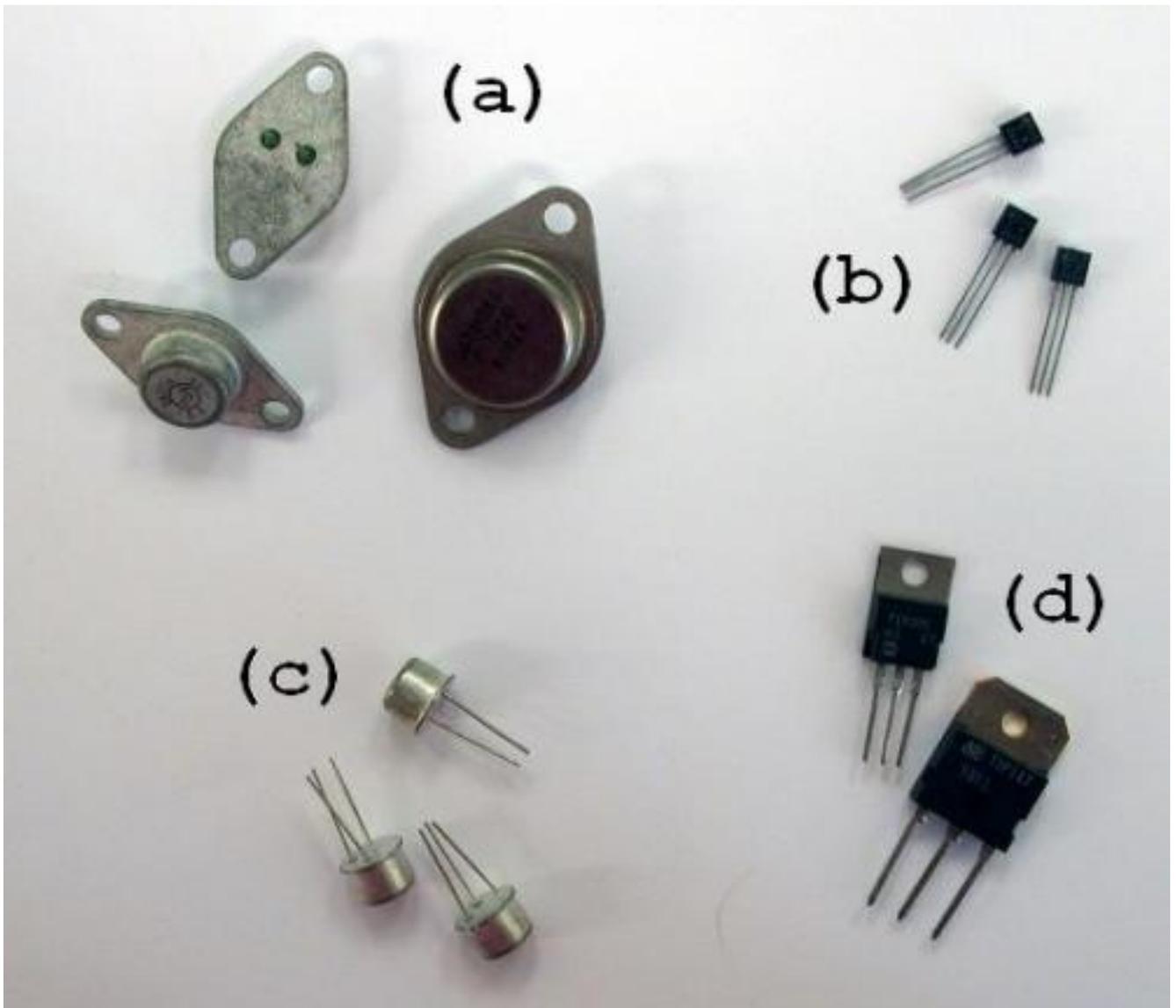
In considering the operation of an NPN transistor it may be helpful to think of the transistor as a valve where a voltage being applied to the base will cause a small current to flow between Base and Emitter. This is referred to as V_{BE} or in terms of current I_B . This small current will cause a larger proportional current to flow from Collector to Emitter, referred to as I_{CE} . The ratio of I_B to I_{CE} is determined by the transistors gain. The gain of a transistor is expressed as b or more commonly as H_{FE} . This yields $I_{CE} = H_{FE} I_B$.



To correctly bias a NPN transistor you will need to remember several rules of thumb:

1. The Emitter must be negative with respect to the Collector.
2. The Base must be positive with respect to the Emitter.
3. At least one diode drop is required to turn the transistor on.

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Transistors come with a variety of different case styles. Here are some of the varieties that can be found in W294 and W298.

(a) Surface mount transistors: The pins connect to B and E. C is the case itself. This type of transistor will usually need to be mounted to a heat sink.

(b), (c) and (d): Through hole transistors: Pins connect B, C and E. The metal tabs in package (d) are for mounting a heat sink.



Before you wire a transistor into your circuit, you must check to see which pins connect to B, C and E. You can do this by looking up the spec sheet of the specific transistor you are using.