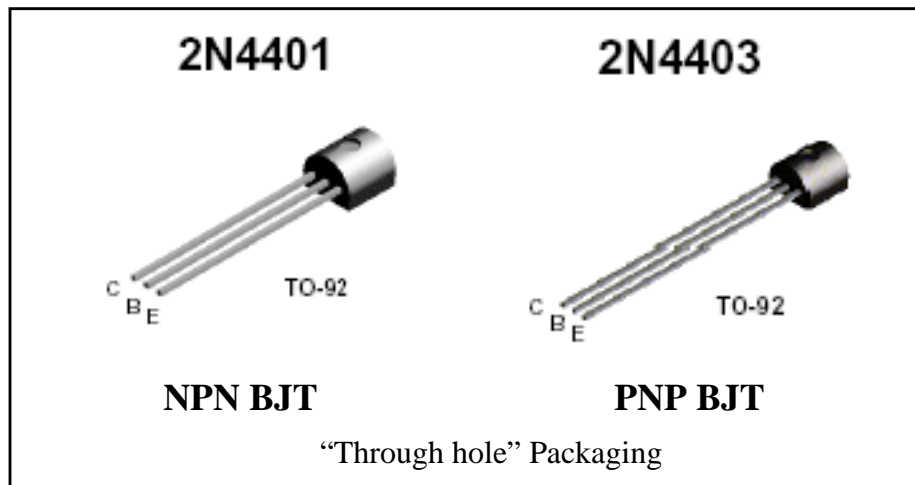
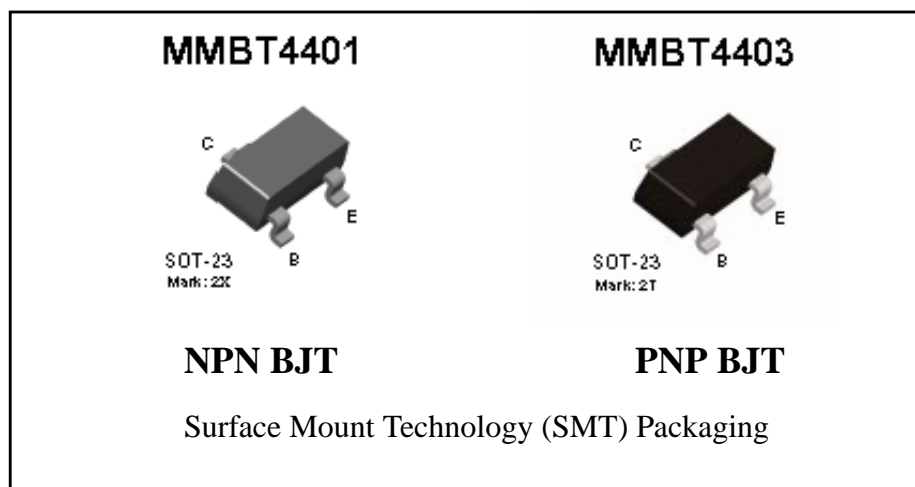


## Bipolar Junction Transistors (BJTs) - Structure

Transistors provide circuit designers with a compact and efficient means of controlling a current or voltage with a separate much smaller current or voltage. They are used for two primary purposes: to electronically switch signals on and off, and to amplify signals. Below are shown two common transistors in both their “through-hole” and surface mounted versions. The Tek-

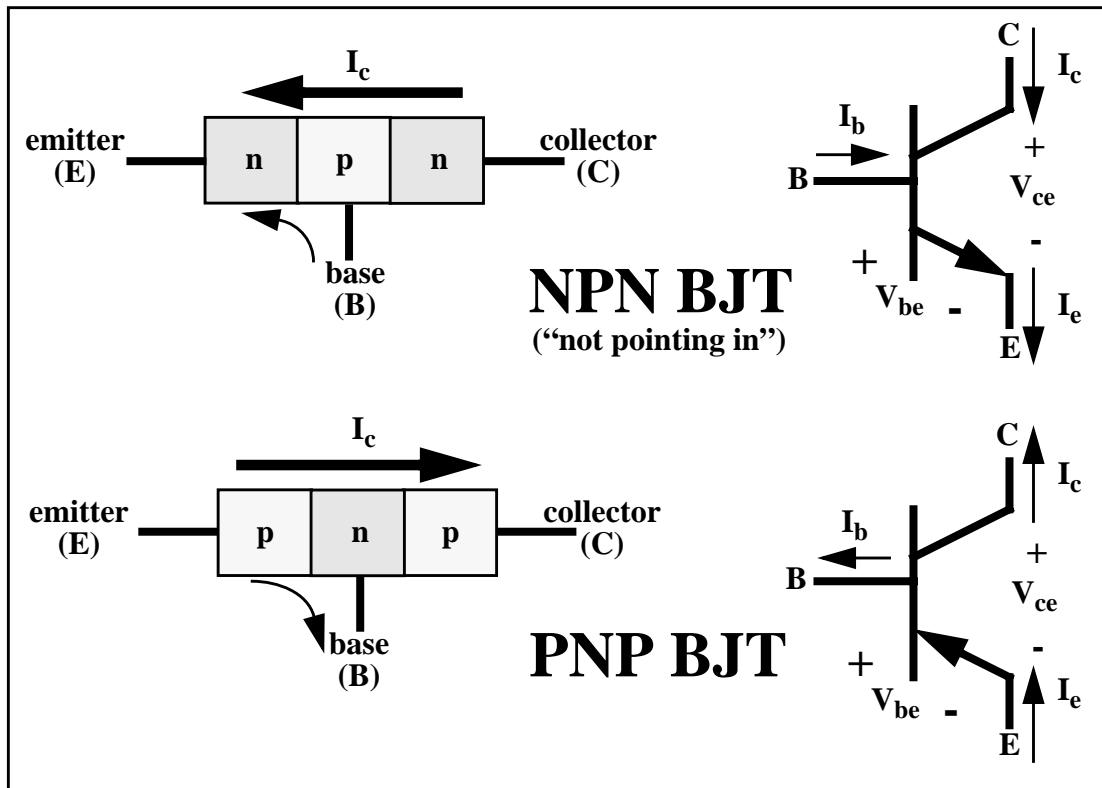


bot charger board uses the through hole parts while the motor control board uses surface mounted parts. Surface mounted parts are much smaller and can be placed on a printed circuit board and soldered in an entirely automated process.



The transistors shown above are packaged in an inexpensive black epoxy body. Other transistors may be packaged differently depending upon the amount of heat to be dissipated. The TO-92 or SOT-23 cases shown typically dissipate about one-half watt safely. Bigger cases, usually made of metal, can dissipate up to several hundred watts. Often the same transistor type is found in 3 or 4 different package styles.

The transistors we will examine are called bipolar junction transistors (BJTs). These transistors are described as *bipolar junction* transistors because they contain two pn-junctions; each one like a diode, but arranged back-to-back.



Shown above are the schematic symbols and reference voltage and currents for both NPN and PNP BJTs. Reference voltages and currents are defined identically for both NPN and PNP transistors, even though these symbols represent different types of transistor. You should become familiar with the voltages and currents around the BJT.

The separate PN junctions can be checked to test a BJT transistor. If the emitter-base, and collector-base junctions each show correct diode behavior, the BJT is not seriously damaged. This is a very simple test, but can form a "go-no-go" test for the BJT.