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Introduction To Modern Electronics – Lesson 7: The Transistor

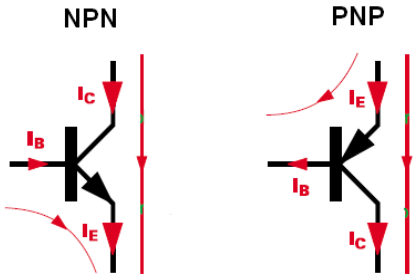
FORMULAS

The following formulas and information are meant to go with the online lesson found here:
http://www.pyroelectro.com/edu/basics/transistor/

THE BJT TRANSISTOR FORMULAS

The mathematical way to describe how electricity flows through transistors is a little tricky because of the $\boldsymbol{\beta}$ value seen in the formulas below. This $\boldsymbol{\beta}$ or 'beta' will usually be different on most BJT transistors that you use, even if they are the same transistor, due to the way that transistors are made.

Both NPN and PNP transistors follow the same two formulas describing how electrical current flows through them. The main difference is the direction that current flows as the red arrows indicate.



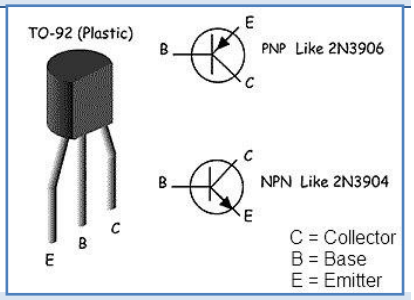
$$I_e = I_c + I_b$$

$$I_c = \beta * I_b$$

Search google and take a look at a *datasheet* of a 2n3904 or 2n3906 transistor and you'll see many electrical characteristics. Datasheets rarely tell you the exact value of the transistor's $\boldsymbol{\beta}$ (also called DC current gain or $\boldsymbol{h_{FE}}$), but they will tell you the minimum, typical or maximum value for it.

THE BJT TRANSISTOR PINOUT

One other thing you'll see in a transistor's *datasheet* is what is called the **pin-out**. The **pin-out** of a device tells you which pin correlates to what functionality. If you take a look to the right, you can see the **pin-out** of 2n3904/2n3906 transistors. The **pin-out** is actually the same for both devices, but remember from our experiments in the video that NPN vs. PNP have different functionality.



ADDITIONAL INFORMATION

If you have any questions about the formulas or information found in this document, please feel free to head on over to the forums and ask us some questions!
http://www.pyroelectro.com/forums/viewforum.php?f=22