Transistors

Please do the following exercises individually.

Graphical symbols

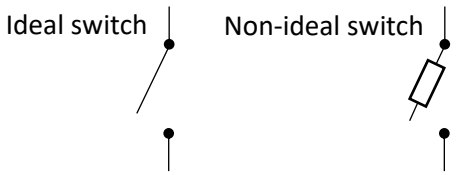
Please draw the graphical symbol of a NPN BJT and an N-channel MOSFET. Do not forget to label the leads.

NPN and PNP transistors

Please describe the main differences between NPN and PNP transistors.

Transistor as switch

Transistors are non-ideal switches. Even closed they have a certain resistance.



A BC547 has a voltage drop of 0.2 V at a collector current of 0.1 A. Please calculate the resistance of this non-ideal switch in closed state.

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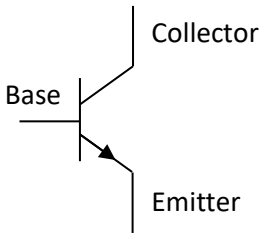

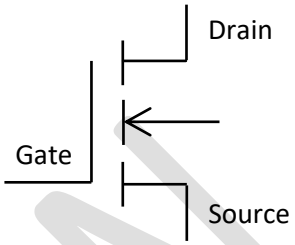

NPN and PNP transistors

Please describe the main differences between NPN and PNP transistors.

Both transistors are bipolar. The sequence of junctions is n-p and p-n with NPN transistors and p-n and n-p with PNP transistors.

Both transistors need a base current. The base current of a NPN transistor flows into the base. The base current of a PNP transistor flows out of the base.

Both transistors need a voltage difference between Base and Emitter. U_{BE} is positive with NPN transistors and negative with PNP transistors.

If used as switch NPN transistors are active high and PNP transistors are active low.

Transistor as switch

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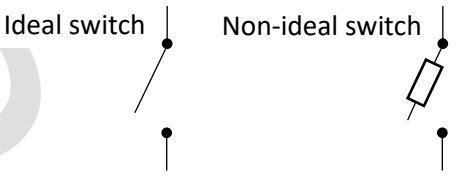

A BC547 has a voltage drop of 0.2 V at a collector current of 0.1 A. Please calculate the resistance of this non-ideal switch in closed state.

R = U/I = 0.2 V / 0.1 A = 2 Ω