bjt_beta_ic.sqproj

2N3904 model
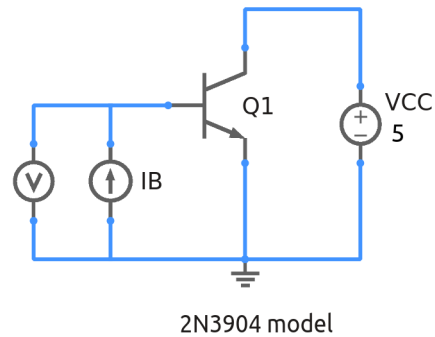
In a BJT, the current gain β varies as a function of the bias collector current I_C although we often ignore this dependence in circuit analysis. The purpose of this example is to illustrate this relationship.

Exercise Set

1. Run the simulation. Plot I_C and I_B (both on log scale) versus V_{BE}. The difference between the two curves (at a given V_{BE}) gives $\log \beta$.

2. Plot the output variable `ic_by_ib` (which is equal to β versus I_C (both on log scale). What is the approximate value of β for this transistor for I_C in the range $10\,\text{mA}$ to $100\,\text{mA}$?

References

1. B.G. Streetman and S.K. Banerjee, *Solid State Electronic Devices,* Pearson Education, 2006.

2. N. Dasgupta and A. Dasgupta, *Semiconductor Devices Modelling and Technology,* Prentice-Hall of India, 2004.