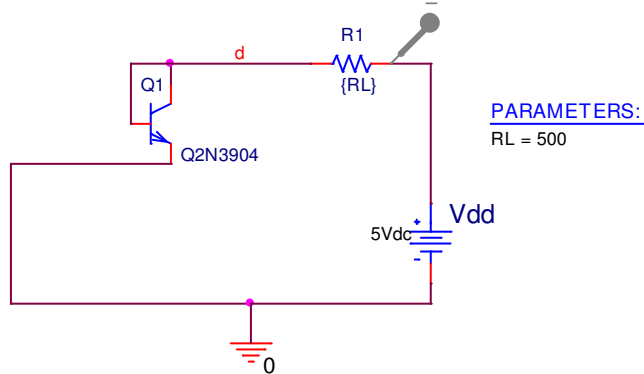


1. 50 points (BJT Diode characteristics and biasing)

The following circuit uses the emitter-base diode as an actual diode.

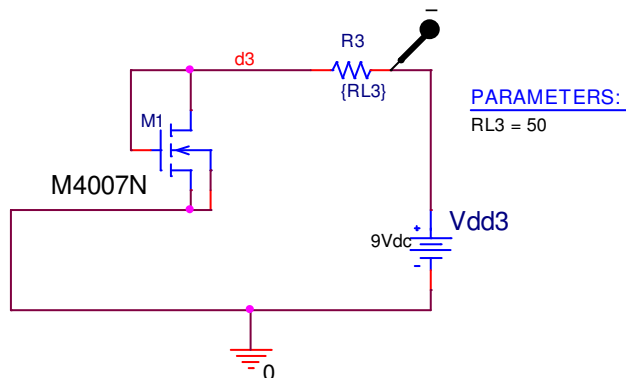


For it

- Fix the resistor at the default value and plot the diode current versus the diode voltage (voltage at node d) [set as x axis variable in the Plot menu] as Vdd is varied from 0 to 6V in small increments.
- Find the value of RL to give a diode current of 5mA when Vdd=5V. This can be done by varying Vdd through 5V up to 6V and finding the parameter value RL that gives the 5mA).
- Turn the transistor over so that the emitter lead is at the top (now the collector-base diode is the actual diode). Repeat parts a) & b) and compare the results.
- Repeat for pnp transistors and comment on the differences.

2. 50 points (MOS diodes and biasing)

Repeat Problem 1 above for MOS connected diodes, as per the following circuit. Here you can use a breakout MbreakN and save in its model the 4007 Nmos model from the course web page while also changing the transistor name that appears in the schematic to M4007N to associate the model with the picture. Also change the Vdd to 9V and the parameter default to a smaller value. Similarly for part d) with MbreakP.



3. 25 points (MOS calculations)

For the NMOS 4007, calculate using the model parameters the bias point with the default RL3.