

Hints for Proper Use of Pspice

(Reference: Baker, Li, & Boyce, *CMOS: Circuit Design, Layout, & Simulation*, IEEE Press, NY, 1998.)

The following is a list of common mistakes that can be made when learning to simulate circuits using SPICE.

1. The first line in a SPICE netlist must be a comment line. SPICE ignores the first line in a netlist file.
2. One megaohm is specified using 1MEG, not 1M, 1m, or 1 MEG.
3. One farad is specified by 1, not 1f or 1F. 1F means one femto-farad or 10^{-15} farads. Since SPICE ignores all characters after the multiplier, you can use 1fF for 10^{-15} farads.
4. Areas of MOSFET drains and sources are, in most cases, specified in terms of picometers squared. An area measuring 6 μm on one side and 9 μm on the other side is specified by 48p or 48E-12.
5. Voltage source names should always be specified with a first letter of V. Current source names should always start with an I.
6. Transient simulations display time data; that is, the x-axis in Probe is time. A jagged plot such as a sinewave that looks like a triangle wave or is simply not smooth is the result of not specifying a maximum print *step size* (in the Transient dialog box) or specifying a maximum print step that is too large. For example, in order to display a 1 kHz sinewave in SPICE, a maximum print step of 10u (ten microseconds) can be specified.
7. MOSFET widths and lengths are specified using the letter "u" for microns. A common mistake is to forget to include this letter. For example, a minimum-size MOSFET in the J&M default models is specified by L=1.6u W=3.2u not L=1.6 W=3.2. The latter means a MOSFET with a 1.6 meters length and a 3.2 meters width!
8. In general, the body connection of a p-channel MOSFET is connected to V_{DD} , and the body connection of an n-channel MOSFET is connected to V_{SS} . For example, in an n-well process, all n-channel bulk connections must be tied to V_{SS} . This matter is easily checked in the SPICE netlist.
9. Avoiding the power supply boundaries can often help convergence in a DC sweep. For example, sweeping a circuit from 0 to 5 V may not converge, but sweeping from 0.1 to 4.9 will.