PVT variations

[Pspice_ref_manual_1997]

PVT variations

- Performances of a device critically depend on *process, voltage and temperature* (PVT) variations
- Spice can help in evaluating these variations

Spice simulations: Tolerances

- In a .MODEL command,*[DEV [track&dist] <value>[%]] [LOT [track&dist] <value>[%]]* specifies
  - individual device (DEV)
  - device lot (LOT) parameter value deviations
- LOT tolerance: all devices that refer to the same model use the same adjustments to the model parameter
- DEV tolerances: each device varies independently
- % shows a relative (percentage) tolerance
  - if it is omitted, <value> is in the same units as the parameter itself

Spice simulations: Monte Carlo

- The .MC command causes a Monte Carlo (statistical) analysis of the circuit: multiple runs of the selected analysis (DC, AC, or transient)
  - first run: nominal values of all components
  - subsequent runs: variations on model parameters as specified by the DEV and LOT tolerances on each .MODEL

Spice simulations: Sensitivity/Worst-Case Analysis

- The .WCASE statement causes a sensitivity and worst-case analysis of the circuit
- Unlike .MC,
  - □ .WCASE varies only one parameter per run: PSpice calculates the sensitivity *of the output waveform* to each parameter
  - □ then, one final run is performed using all parameters varied so as to produce the worst-case waveform
- .WCASE is performed using variations on model parameters as specified by the DEV and LOT tolerances

Spice simulations: Voltage variations

- The parametric analysis can be used (.STEP command)

Spice simulations: Temperature

■ The .TEMP command sets the temperature at which all analyses are done

■ Alternatively, the parametric analysis can be used (.STEP command)

■ *Be sure that your devices are correctly modelled wrt temperature!*