

Hints, Tips and Solutions

Colin Shaw, Applications and Support Engineer

Noise Simulations

Introduction:

A customer had 3 elements with identical current and voltage applied.

- A. W/L = 10um/2um M=4
- B. W/L = 40um/2um M=1
- C. W/L = 10um/2um 4 devices in parallel

1. If the MOS model file has the parameters: noia, noib, noic, Af, Kf and nlev=0 will *SmartSpice* ignore the BSIM III noise parameters (noia, noib and noic) and simply use AK and KF?

There are various ways to calculate the noise. If the model card includes the key word "nlev" then parameters Af & Kf are used. If this key word does not appear in the model card then the parameters noia, noib and noic are used for noise level calculations.

2. If smartspice does ignore noia, noib, noic when nlev is set to nlev=0, then, why do these three cases I have in the netlist not have the same identical noise?

Noise is calculated by the addition of a current source (ind) which is equal to the combination of a flicker (1/f) noise contribution and shot noise. ind=flicker + shot

$$(\text{flickernoise})^2 = \frac{\text{KF} \cdot \text{ids}^{\text{AF}}}{\text{Cox} \cdot (\text{Leff})^2 \cdot f} \quad \text{NLEV}=0$$

$$(\text{flickernoise})^2 = \frac{\text{KF} \cdot \text{ids}^{\text{AF}}}{\text{Cox} \cdot \text{Leff} \cdot \text{Weff} \cdot f} \quad \text{NLEV}=1$$

$$(\text{flickernoise})^2 = \frac{\text{KF} \cdot \text{gm}^{\text{AF}}}{\text{Cox} \cdot \text{Leff} \cdot \text{Weff} \cdot f^{\text{AF}}} \quad \text{NLEV}=2 \text{ or greater}$$

If I_{DS} is the current feed to each case (A,B,C) then

For A. $\text{ids} = I_{\text{DS}} / 4$ For each device

B. $\text{ids} = I_{\text{DS}}$ " "

C. $\text{ids} = I_{\text{DS}}/4$ " "

If AF=1 then

$$4 \cdot \frac{(I_{\text{DS}})^{\text{AF}}}{(4)} = I_{\text{DS}} = 4 \cdot \frac{(I_{\text{DS}})^{\text{AF}}}{(4)} \text{ Case A, B, C}$$

Then yes the noise level for all 3 cases is the same but this is a special case and if AF != 1 then you get different noise levels for the 3 cases A, B & C. In this particular case the customer had a model card that contained the parameter AF=1.72. Under these circumstances a difference of $I^{0.72}$ which is what was seen in the simulation.

If I delete nlev=0 in the model file and substitute it with "noimod=2" then, why are the thermal and flicker (1/F) noises of all three cases not identical?

Large Rawfile Handling in SmartView

1. Files greater than 2Gbyte must be on a local disk of the PC (ie C: or D: not a network drive) otherwise *SmartView* cannot read beyond the 2Gbyte limit. This is a OS restriction.
2. The incremental loading must be enabled. That is *SmartView* will only load data from the rawfile as it is required. This will limit th memory usage of *SmartView* .
3. In 32 bit applications (all current PC apps) have a 2GByte memory limit. No application can use more than 2Gbyte of memory. this is a hard limit, only a 64bit OS can get round this problem.
4. No 32bit application can control more than 2Gbyte of system memory. Once the total amount of data loaded reaches 2Gbyte, *SmartView* will stop. The 64 bit version on Solaris and Linux will work beyond this point.

Call for Questions

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