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Agilent Technologies

MBP

Generate and Tweak Corner Models

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Generate and Tweak Corner Models

Application Note

This application note describes how to generate and tweak corner models in Model Builder Program (MBP). **Note:** This document was originally released for MBP V2011.1.0 in July 2011.

Introduction

Device models are highly relevant to the actual fabrication process. Even a well-developed process has some variation and this variation is likely to affect device characteristics and circuit behavior. To account for this variation in semiconductor process, based on an initial set of typical and corner device models, the process-dependent model parameters needed to be tweaked.

MBP's integrated smart model tweaking module enables easy model retargeting; that is, adjustment of global or binning models according to new specifications. Both model cards and model libraries are well supported. For more information go to www.agilent.com/find/eesof or contact your local Agilent office. The complete list is available at: www.agilent.com/find/contactus.

Generate Corner Models

To generate corner models, choose *Utilities -> Corner Model* from the main menu. The window shown in Figure 1 will pop up.

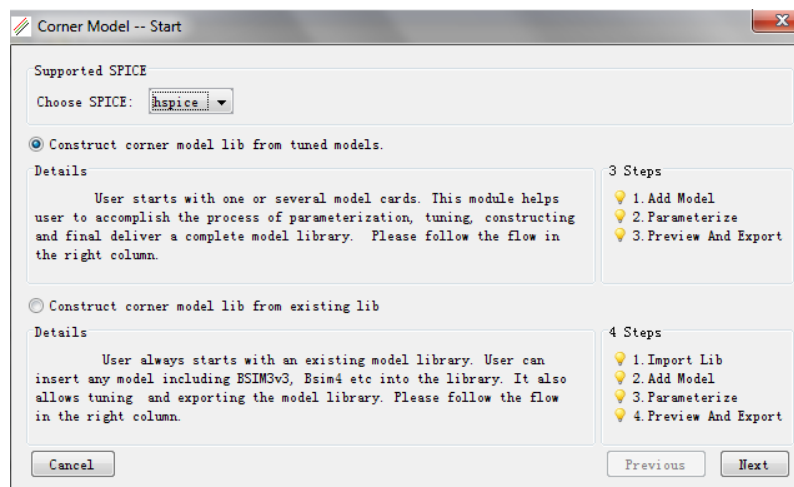


Figure 1. Corner model generation – start

MBP currently supports two external simulators: HSPICE and Spectre. Choose either one as the SPICE simulator. The user has the option to construct the corner model library from either tuned models or an existing library. In this document, we introduce the procedures to “Construct corner model lib from tuned modes.” The process of “Construct corner model lib from existing lib” is almost the same, except that it requires the additional step of importing a library. Click *Next*.

Then, select *Add Model* to load the model card. After that, click *Add default* in the popup *Set Group* window and select *OK*. Check the *Typical* box and click *Next*, as shown in Figure 2.

Figure 2. Corner model generation – step 1

In the popup window shown in Figure 3, choose the parameters (e.g., vth0, u0 and ags) and click *Next*.

Figure 3. Corner model generation – step 2

The corresponding corner model structure will now be built, as shown in Figure 4. Click *Export* to save the library.

Figure 4. Corner model generation – step 3

Tweaking Corner Models

Choose *Utilities* -> *Lib Parser* from the main menu. A warning message window will pop up. Click *Yes* to continue. In the *Lib Parser* tab, click *Load* to load the library just created. The tree structure of the library and the model parameters to be tweaked are listed as shown in Figure 5.

Figure 5. Corner library and model parameters

Define Tweaking Target

To define the tweaking target choose *Extraction* -> *Model Tweaking* from the main menu and switch to the *Target* panel. The window shown in Figure 6 will appear. In this window:

1. Click to add a tweaking target.
2. Assign a name to this target, “vth” for example.
3. Choose one built-in algorithm (to achieve the above target) from the drop-down list. Here, “vth_gm” means: to calculate the threshold voltage with the maximum transconductance method.
4. Input the bias conditions to perform the algorithm.
5. Click the *Apply* button to confirm.
6. Repeat steps 1 to 5 to add “Idsat” as another tweaking target.

Figure 6. Target panel

Define Target Devices

After defining the tweaking targets, switch to the *Tweaks* panel. Press the *Add device* button to add target devices to the list. The user can edit the instances such as “W,” “L” and “T,” in this case. Right-clicking on the table will pop up the instance parameter list. MBP allows the user to save or load device information, as shown in Figure 7.

Following the instances, the design target (suffixed by “_Des”, e.g., “vth_Des”), simulated value (suffixed by “_Sim”, e.g., “vth_Sim”), and their differences (e.g., “Error”) are listed. The user can choose the “error format” as either “Absolute” or “Relative.” The user needs to type in the value of the design target. The simulated value and “Error” will respond instantly once the user tunes the model parameters.

Model Tweaking

Select the proper parameters from the *Optimization/Parameter* window. The user can then start tweaking the model. MBP provides both manual and automated tuning. For the latter, make sure that the design targets are set, parameters are selected, the “optimize” items for tweaking target are checked, and the “Select” items for the target devices are checked (Figure 8). Then, click the *Optimize* button in the *Optimization* window. MBP will invoke its internal optimizer to proceed.

Figure 7. Tweaks panel

Figure 8. Automated optimization

If more than one target device is selected for automated tuning, the user can differentiate the importance between devices by specifying different “Weight” values. The device with the higher weight value normally generates higher accuracy.