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Agilent Technologies

MBP

TMI Aging Model Application

Application Note

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TMI Aging Model Application

Application Note

This application note describes how to implement a TSMC Modeling Interface (TMI) aging model in Model Builder Program (MBP). **Note**: This document was originally released for MBP V2011.1.0 in August 2011.

Introduction

TMI or TSMC Modeling Interface is a C-based modeling application programming interface (API) developed to support extensions of standard compact models. TMI is an add-on to standard models. Therefore, the compatibility and robustness of standard models dictated by the Compact Model Council (CMC) is retained when applied to different simulators and platforms.

MBP V2011.1.0 offers an environment for TMI reliability aging model simulation. With it, the user can measure the device performance degradation over time and evaluate the effects of stress.

This document provides information on how to run a TMI aging model simulation and optimization in MBP. 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.

Preparation

In preparation for using the TMI aging model application, all configuration files regarding TMI models must be placed under "*$MBP_HOME\etc\hspice\tmi*," where "*$MBP_HOME"* is the MBP installation path. The user needs to specify one directory as the TMI library path ("*TMIPath"*) on the computer. Then, a subfolder under "*TMIPath"* must be created to store the compiled, shared library file ("*libTMImodel.dll"*) according to different operating system (OS) platforms. For example, if the OS is a 32-bit version of Microsoft® Windows®, the library file should be placed under "*TMIPath/WIN/."*

Refer to Figure 1 for more information on the directory structure for shared libraries of different platforms.

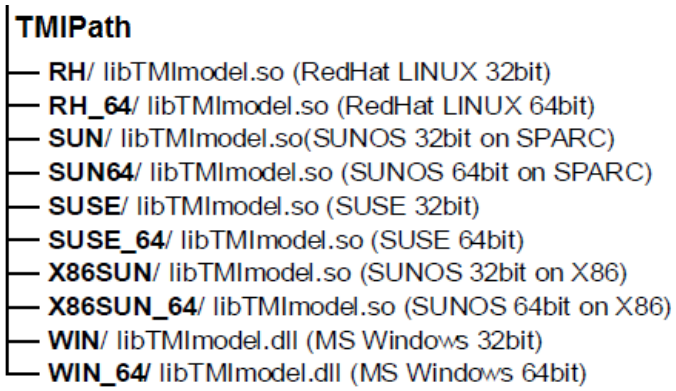

Figure 1. Directory structure for shared libraries of different platforms

In MBP, the data format for TMI aging analysis is the same as the MOS Reliability Analysis (MOSRA) data format. For more details, refer to the MBP user guide or "The MOSRA Model Support in MBP" Application Note.

Simulation and Parameter Extraction

MBP invokes the external simulator (Synopsys HSPICE) for TMI aging model simulation. The user must ensure HSPICE has been installed properly prior to the simulation. Then, the following steps must be followed.

Choose Model Type

Choose *Model -> Select Model* from the main menu and select *Reliability* in the Project Type. Then select one core model ("bsim4," in this example) in the upper *Core Model Selection* section and *tmi - default* in the lower *Reliability* section, as shown in Figure 2.

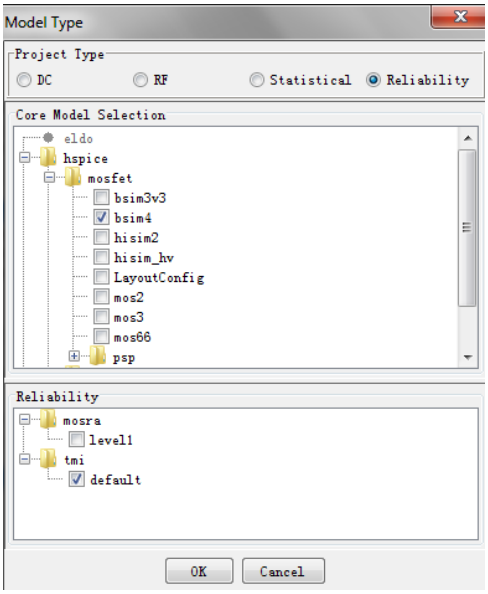

Figure 2. Choose model type

Set TMI library path

Choose *Extraction -> Options -> SPICE Options* from the main menu to set the TMI library path ("*TMIPath*") in the *Spice Options* window, as shown in Figure 3.

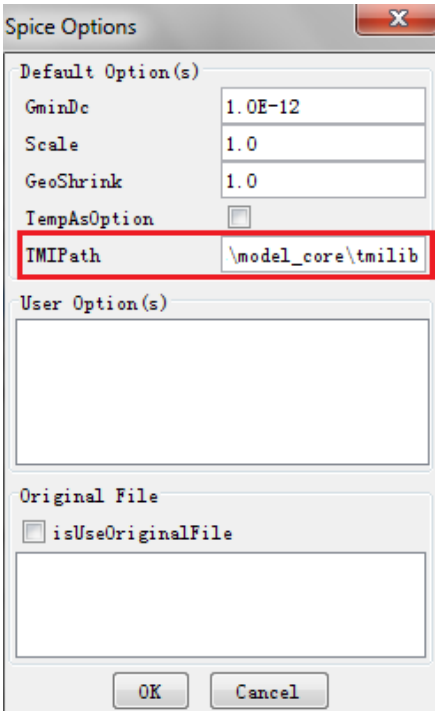

Figure 3. TMI path setting

In this example, we set "*d:\Accelicon\modelbuilder\etc\hspice\tmi\bsim4\default\model_core\tmilib*" as the "*TMIPath*." Finally, click *OK*.

Model Parameters Panel

As shown in Figure 4, the TMI aging parameters are sorted out in the *TMI Age* tab of the model card.

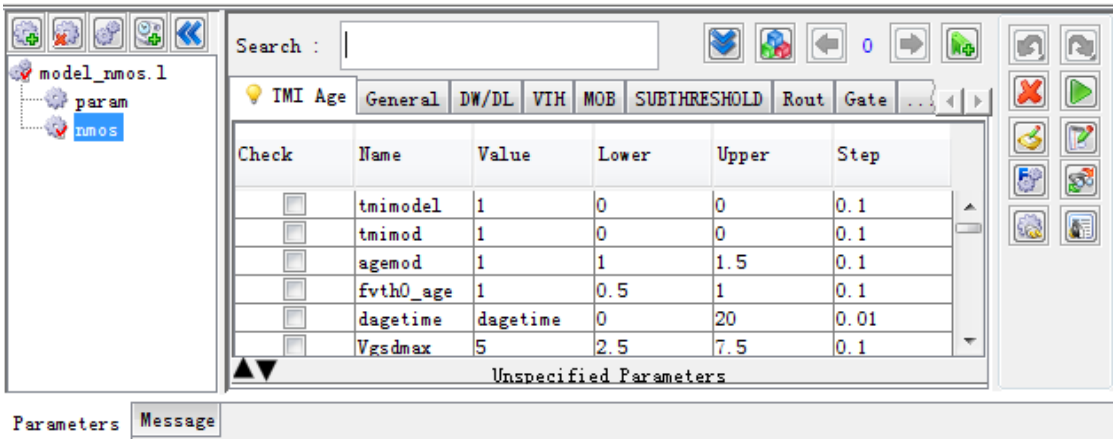

Figure 4. TMI aging parameters

Load Model and Data

In the main menu, choose *File->Model->Load* to load the model file. Next, choose *File->Data->Load* from the main menu to load the data file. The window with the TMI aging model and data is shown in Figure 5.

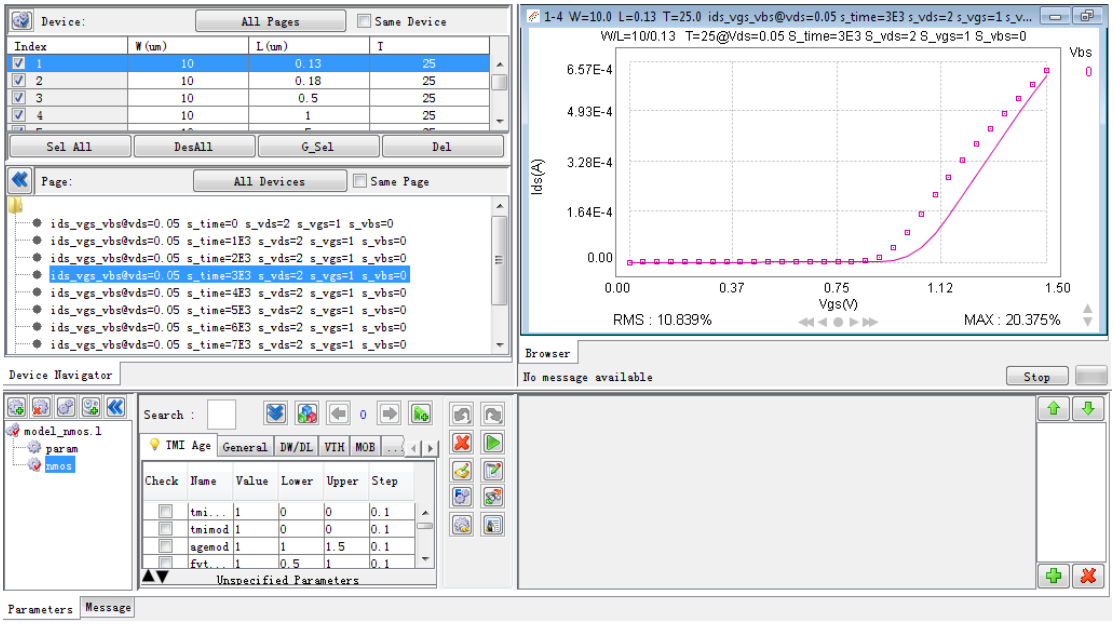

Figure 5. Load model and data

The user can now select model parameters and adjust them to fit the measurement data. MBP also allows the user to compare two different models. To do so, the user simply clicks the “Add” icon to append another model for comparison. Select the two models by pressing the *Ctrl* button and clicking

the “Compare” icon to compare them. The resulting window is shown in Figure 6.

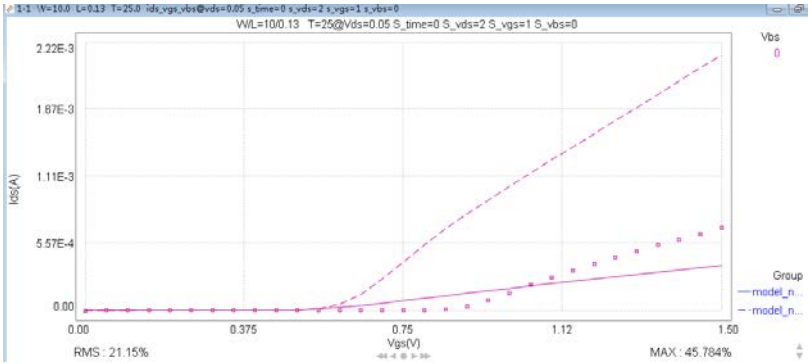

Figure 6. Compare two models

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