



*Document can be found at <http://www.motorola.com/rf/models>
Go to MET and Root LDMOS Models for Agilent's ADS v2003,
Release Notes and Installation Instructions*

Release Notes and Installation Instructions for

Agilent's Advanced Design System LDMOS Discrete Parts Design Kit Release v2003cp0304

REV 0

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I. INTRODUCTION

Special Release Information: The ADS_MOT_LIBRARY_v2003cp0304 is an initial release of the LDMOS Discrete Parts Library that has been developed and verified in Agilent's Advanced Design System's version 2003c. The primary intent of this release is to migrate the LDMOS Discrete Parts Library from ADS v2003a into the ADS v2003c environment which is explained in more detail in Section III—Design Kit Installation (v2003cp0304). Retained for reference from the the LDMOS Discrete Parts Library (v2002cp0803) is Section II—Release Notes.

This current release of the LDMOS Discrete Parts Library for ADS v2003c has been implemented as follows:

- The Library is now implemented as an Agilent® EEsof® EDA Advanced Design System (ADS) Design Kit and should be installed according to Agilent's instructions on installing Design Kits.
- There is now only one Zip file for all of the major platforms that Motorola supports (Microsoft Windows 2000, NT 4.0, Solaris 2.7/2.8/2.9 and HP/UX 11.0/11.11). This is because ADS v2003c now allows the use of dynamically linked or shared-object libraries for distribution of user-compiled models. We are no longer required to provide a new simulator executable for each computing platform.
- The Design Kit was implemented per Agilent's instructions contained in the *Design Kit Development Manual* (dated December 2003). Therefore, the structure of our library has been modified per Agilent's requirements so that Agilent can help support installation and simulation issues in the future. Because of this modification, we must now use a new element called *TechInclude* (see “Release Notes, TechInclude Element” in this document). The *TechInclude* element is now required on all top-level schematics for simulation purposes.

The following paragraph has been retained for reference from the v2002cp0803 release and was included in the v2003ap1003 release:

- The Library has gone through several content changes:
 - Some parts have changed names.
 - Some parts have been cancelled and can only be simulated using a new "Cancelled" version of the element.
 - Some part names have been added, but these parts have the same models as those already existing in the previous release of the Library.
 - Some parts have been moved from the bulk availability into tape and reel availability only along with parts that have been migrated from the “S” to the “LS” or low gold configurations. Please read the Release Notes section of this document for detailed library release information.

The Motorola RF LDMOS Modeling Team highly recommends that you read through this document thoroughly to enable a smooth installation and transition to the new release.

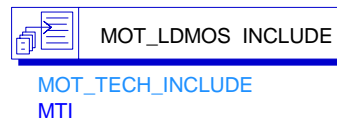
II. RELEASE NOTES

A. TechInclude Element

Because of the change from a totally customized library to an ADS Design Kit, a TechInclude element is now required. For this and future releases, you must insert the MOT_Tech_INCLUDE element at the top-level of all designs where simulation is performed. ADS only allows you to place one TechInclude element on any one design. If you do not place the TechInclude element at the top-level or if you place it within a subcircuit, a simulation error will occur. For example:

```
Error detected by HPEESOF SIM during netlist parsing
`MRF1` is an instance of an undefined element ...
```

The MOT_Tech_INCLUDE element is now the fifth element in the Motorola LDMOS Model Library palette and looks like the following when placed in a schematic:



For more examples of using the TechInclude element, download the Customer Example Project from the Motorola RF LDMOS website (<http://motorola.com/rf/models>). Go to Agilent EESOF's ADS. Right-click on the Agilent ADS v2003c Example Project hyperlink and review the Customer Project Read-Me section.

B. References to Parts Added to the (v2002cp0803) Library

The following table contains the new parts that were added to the LDMOS Discrete Parts Design Kit v2002cp0803 release.

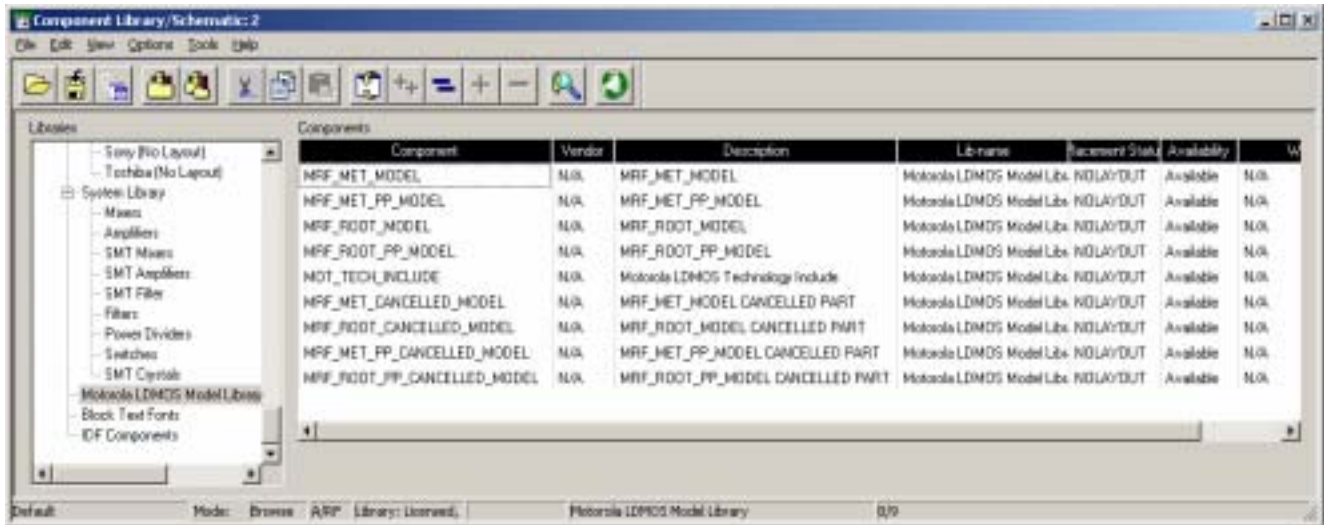
MRF372	MRF5P20180	MRF5S21130
MRF373ALSR1	MRF5P21180R6	MRF5S21130S
MRF373AR1	MRF5S19090LR3	MRF5S21150
MRF374A	MRF5S19090LSR3	MRF5S21150S
MRF18060ALSR3	MRF5S19100LR3	MRF5P21240
MRF18060BLSR3	MRF5S19100LSR3	MRF5P21240R6
MRF19085LSR3	MRF5S19030	MRF9060MBR1
MRF21060SR3	MRF5S19030S	MRF9060MR1
MRF21085LSR3	MRF5S19150	MRF9135L
MRF21085SR3	MRF5S19150S	MRF9135LSR3
MRF21120R6	MRF5S21090L	MRF9180R6
MRF21180R6	MRF5S21090LSR3	MRF9130L
	MRF5S21100LR3	MRF9130LSR3
	MRF5S21100LSR3	

C. Cancelled Parts

The following list of parts has been labeled as cancelled:

MET Models	Root Models
MRF182, MRF182S	MRF182, MRF182S
MRF183, MRF183S	MRF183, MRF183S
MRF185	MRF184, MRF184S
MRF9180S	MRF185, MRF186
MRF18090AS	MRF187, MRF187S
MRF19120S	MRF286, MRF286S
MRF19125S	MRF9180S
MRF21120S	MRF18090AS
MRF21180S	MRF19120S
	MRF19125S
	MRF21120S
	MRF21180S
	MRF6522_10R1
	MRF6522_5R1
	MRF6525_10R1
	MRF6525_5R1

If any of these part names are referenced in existing designs and need to be used, you will need to replace MRF_MET_MODEL/MRF_ROOT_MODEL elements with MRF_MET_CANCELLED_MODEL/MRF_ROOT_CANCELLED_MODEL elements, along with the MRF_MET_PP_MODEL/MRF_ROOT_PP_MODEL elements with MRF_MET_PP_CANCELLED_MODEL/MRF_ROOT_PP_CANCELLED_MODEL. The “Cancelled” version of these parts can *only* be found in the Component Library Browser under the Library heading, Motorola LDMOS Model Library.



D. References to (v2002cp0803) Part Name Changes

If you have designs using the old name, you will have to select the new nomenclature for simulations to run correctly.

Listed below are the parts that were offered as an “S” version in the previous release of the Library. These parts have been migrated to the low gold version of the part that has been added to this Library release, indicated by the “LS” prefix in the part name. These parts are offered only in the tape and reel formats, indicated by the R1 and R3 prefixes in the following table.

1. Migrated “S” Parts

Previous Part Name	New Part Name
MRF9045S	MRF9045LSR1
MRF9060S	MRF9060LSR1
MRF9080S	MRF9080LSR1
MRF18085AS	MRF18085ALSR3
MRF18085BS	MRF18085BLSR3
MRF284SR1	MRF284LSR1
MRF21010S	MRF21010LSR1

The parts in the following table are no longer offered in bulk but are currently available in the tape and reel formats.

2. Tape and Reel Only Parts

Previous Part Name	New Part Name
MRF9045	MRF9045R1
MRF9060	MRF9060R1
MRF18060A	MRF18060AR3
MRF18060AS	MRF18060ASR3
MRF18060BS	MRF18060BSR3
MRF19030	MRF19030R3
MRF19030S	MRF19030SR3
MRF19045	MRF19045R3
MRF19045S	MRF19045SR3
MRF19085S	MRF19085SR3
MRF19060S	MRF19060SR3
MRF284	MRF284R1
MRF21010	MRF21010R1
MRF21030	MRF21030R3
MRF21030S	MRF21030SR3
MRF21045	MRF21045R3
MRF21045S	MRF21045SR3

III. DESIGN KIT INSTALLATION (v2003cp0304)

A. Download Design Kit

This section outlines the procedures necessary to install the new LDMOS Discrete Parts Design Kit (v2003cp0304) into ADS v2003c.

Before you can install the Design Kit, you must first go to the Motorola RF LDMOS website (<http://motorola.com/rf/models>) Click Agilent's ADS v2003c Library and Installer Download Instructions, and download the ADS_MOT_LIBRARY_v2003cp0304.zip file by right-clicking on the file link and performing a Save Link/Target As to save the file to your desktop.

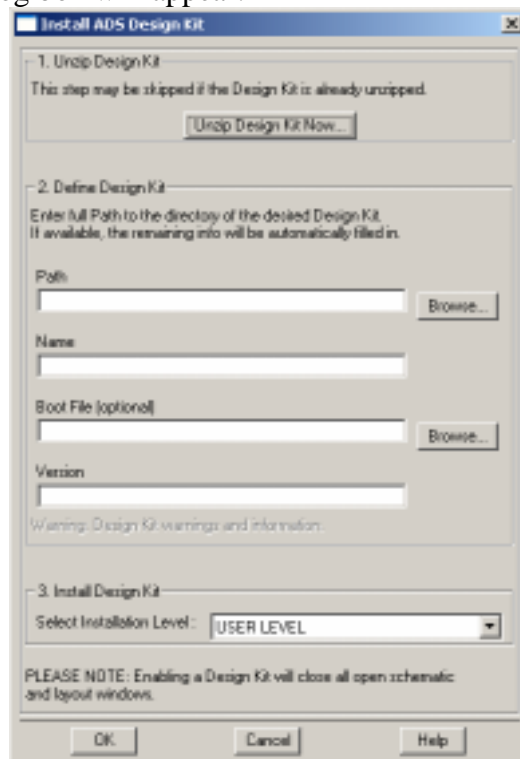
Next, follow the steps below to install the Library and verify your successful installation. If you are having problems with the installation, you can view the *Design Kit Installation and Setup Manual* (dated December 2003) for ADS v2003c in the ADS v2003c documentation (specifically, page 2-5). To install the Library successfully, go to the "Support" section of this document for information on how to get support from the Motorola RF LDMOS Modeling Team or from Agilent.

The following steps assume you currently have ADS v2003c correctly installed and that you have root or administrative access to your ADS installation. If ADS_MOT_LIBRARY_v2003ap1003 is currently installed and is enabled, please refer to Section IV—Removing Design Kits in ADSv2003c before continuing to Step B—Install Design Kit.

B. Install Design Kit

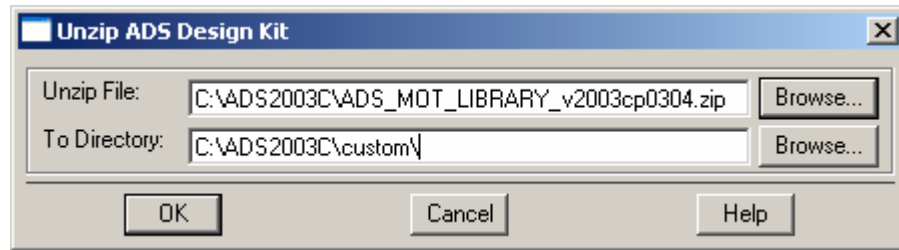
1. Choose DesignKit > Install Design Kit from the ADS Main Window.

The following dialog box will appear:



2. UnZip the Downloaded ADS Design Kit Zip File.

Click the **Unzip Design Kit Now** button. The following dialog box will appear:



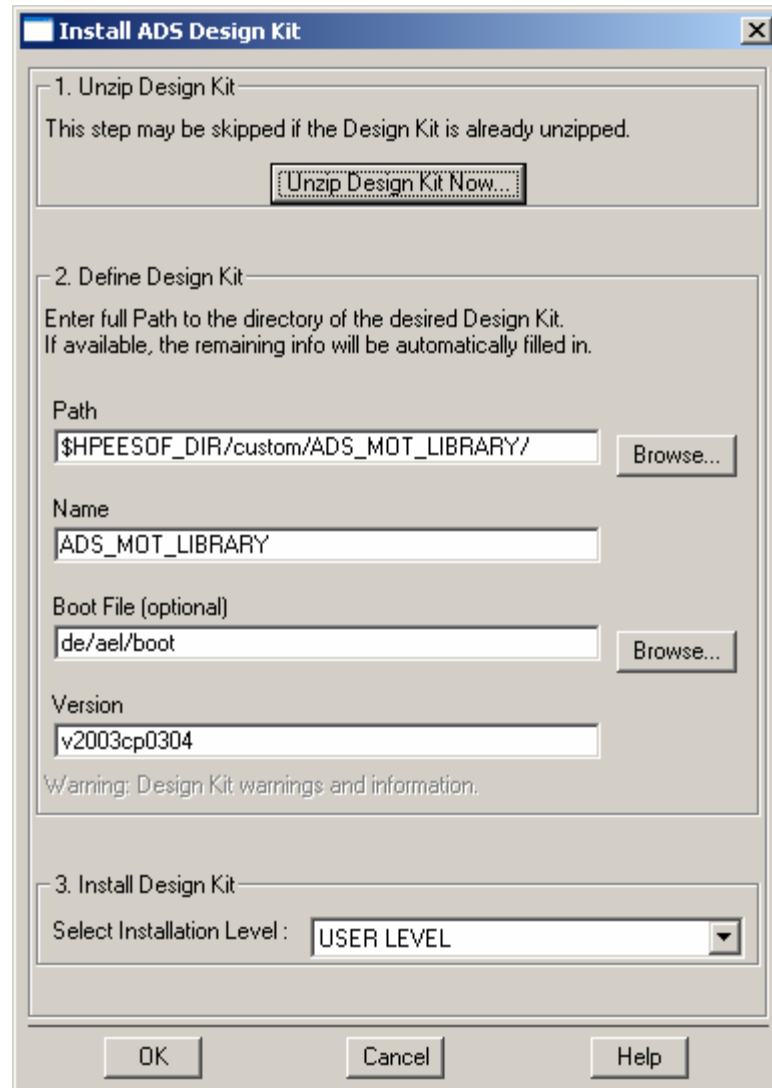
Enter the path to the Zip file. Enter the path for the **To Directory** field where you want the Design Kit to be located. Use the **Browse** buttons to help you locate the Zip file and To Directory locations. In the preceding example, the default ADS Custom directory was selected for a Site-Wide installation. (This path is highly suggested, but optional.)

Click **OK**. A new directory called ADS_MOT_LIBRARY will appear within the directory path that you specified in the **To Directory** field. Within this new directory, you should see the following subdirectories:

- circuit
- de
- design_kit
- doc
- examples
- bin

3. Define the Design Kit.

When the Unzip procedure is complete, the following Install ADS Design Kit dialog box will reappear with default values specified for Path, Name, Boot File and Version:



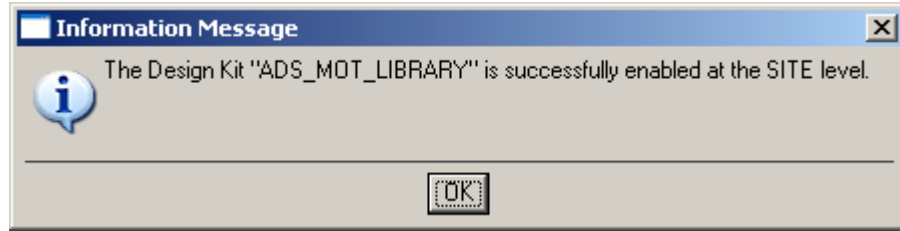
It is not necessary for you to manipulate any of the default values unless you want to perform some extra customization.

Note: Extra customization is not recommended.

4. Install the Design Kit.

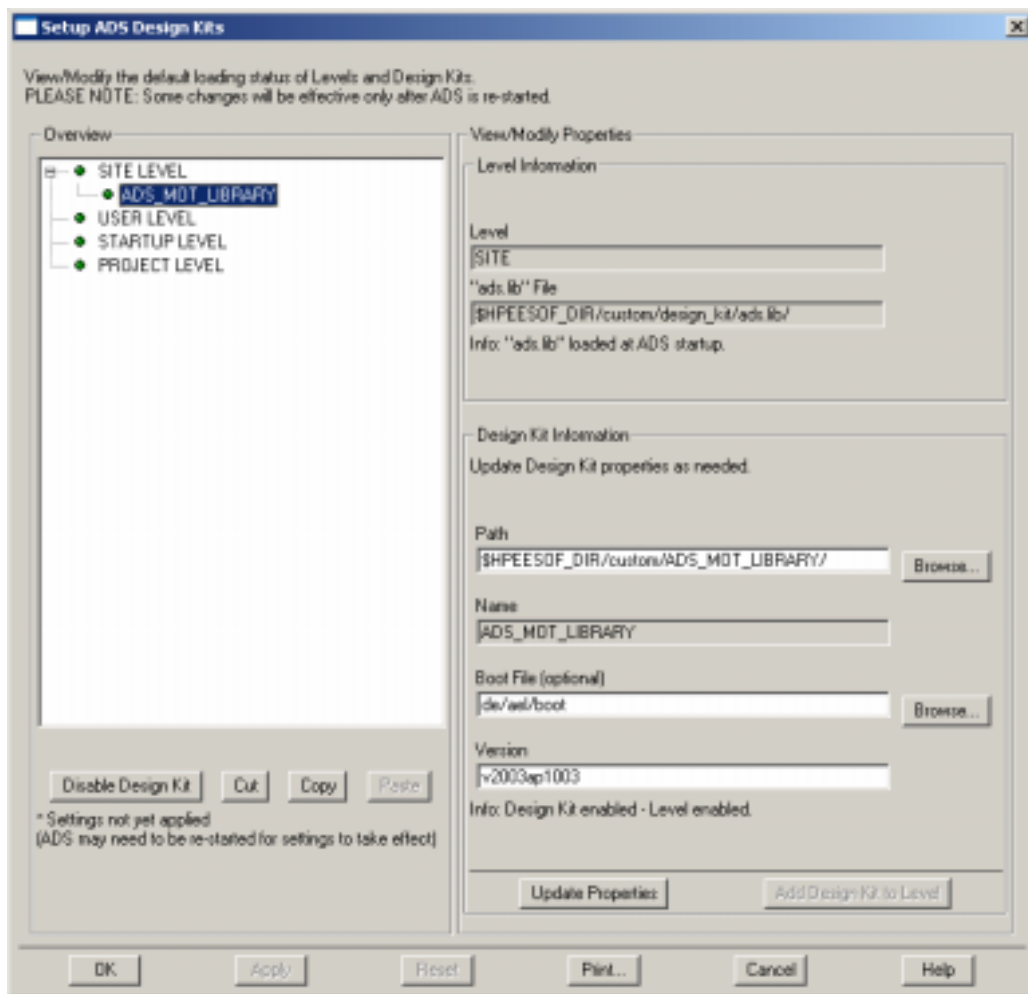
You will need to make a choice within the **Select Installation Level** field. In the example above, the Site Level or Site-Wide installation was selected because the Design Kit was Unzipped and installed in the ADS Custom directory. You can select “SITE LEVEL,” “USER LEVEL,” “STARTUP LEVEL” or “PROJECT LEVEL.” Review the *Design Kit Installation and Setup Manual* (page 2-14) and decide how the Design Kit will be used. We suggest that it be placed as a SITE LEVEL installation. After you make your selection, click **OK**.

If the installation was successful, the following dialog box will appear:



C. Verify Your Design Kit Installation

To verify your Design Kit Installation, choose **DesignKit > Setup Design Kits** from the main window. The following dialog box will appear:

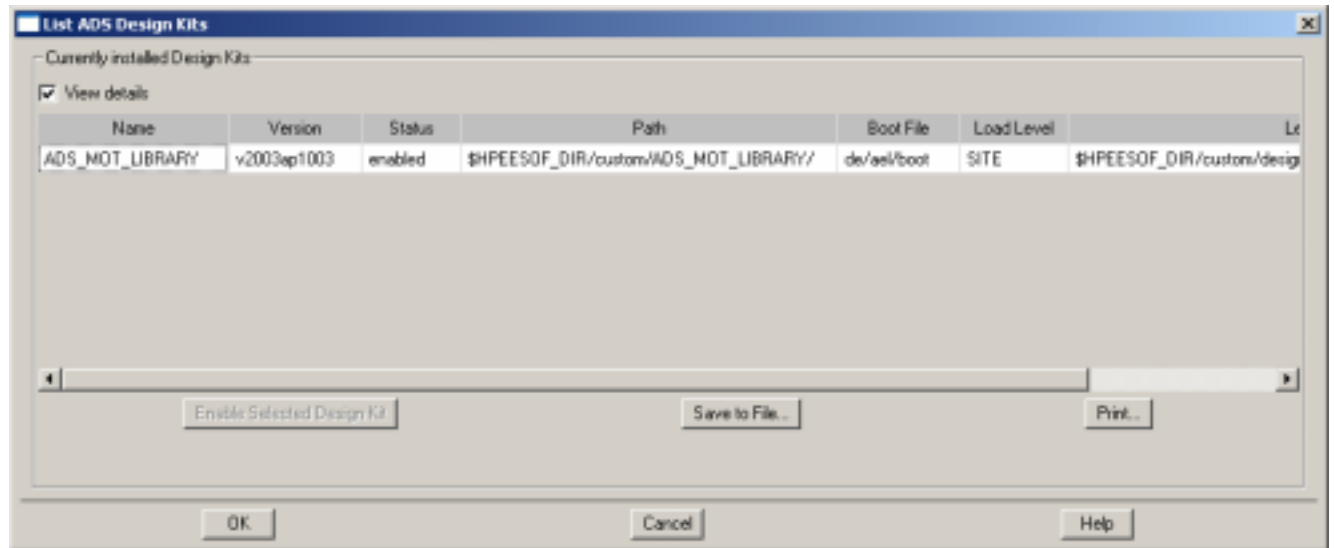


Click on **ADS_MOT_LIBRARY Design Kit** (it will be a subentry of the level where it was installed) to verify the installation paths, names, version, etc.

WARNING: Typically, the SITE LEVEL is disabled (yellow button beside SITE LEVEL). If you installed the Design Kit at the SITE LEVEL, you must enable the SITE LEVEL by clicking **SITE LEVEL** and choosing **Enable Level**. Click **OK** to enable Design Kits within this level.

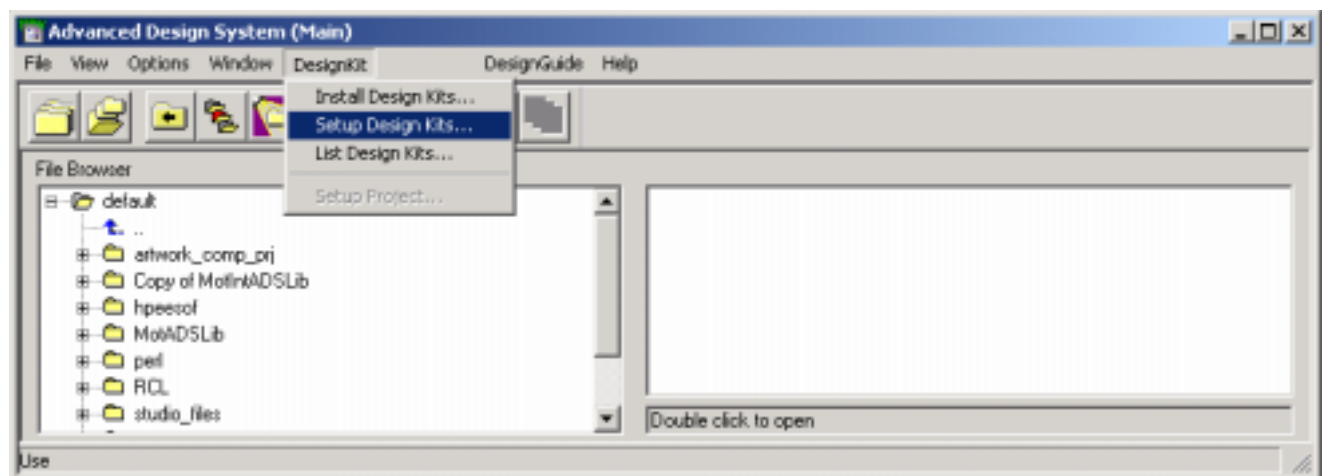
D. List Design Kits in Use and Enabled at Each Level

Choose **DesignKit > List Design Kits ...** to view these Design Kits. The following dialog box appears:

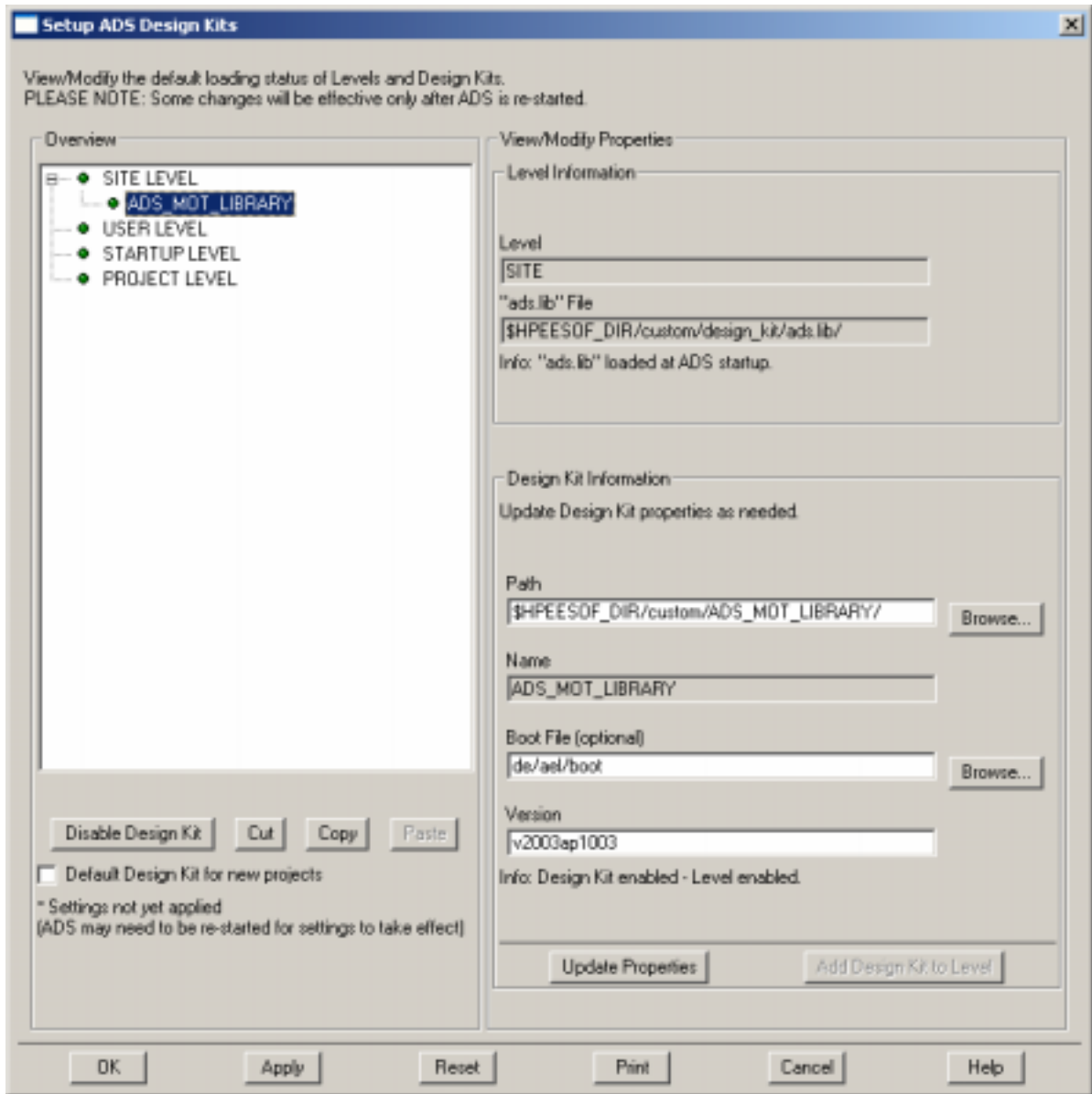


IV. REMOVING DESIGN KITS IN ADS V2003C

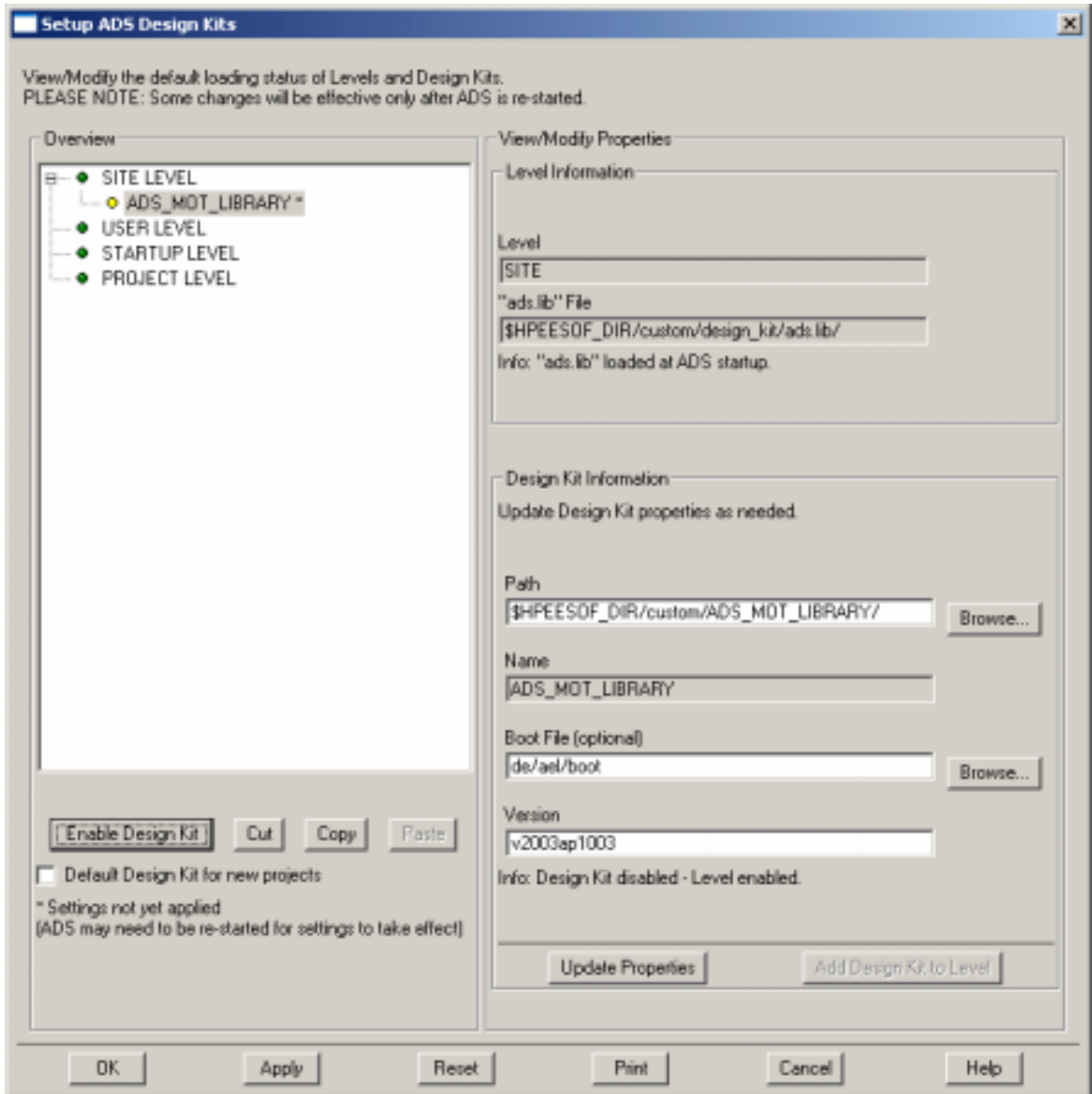
Agilent has not provided a path for users who have installed Design Kits to remove them when needed. So, the removal of the design kits is a manual process. However, you can disable a Design Kit by selecting the **Setup Design Kits... Menu** choice from the Design Kit menu in the main ADS window.



When the Setup Design Kits dialog box appears, as below, select the Design Kit to Disable and click **Disable Design Kit**.

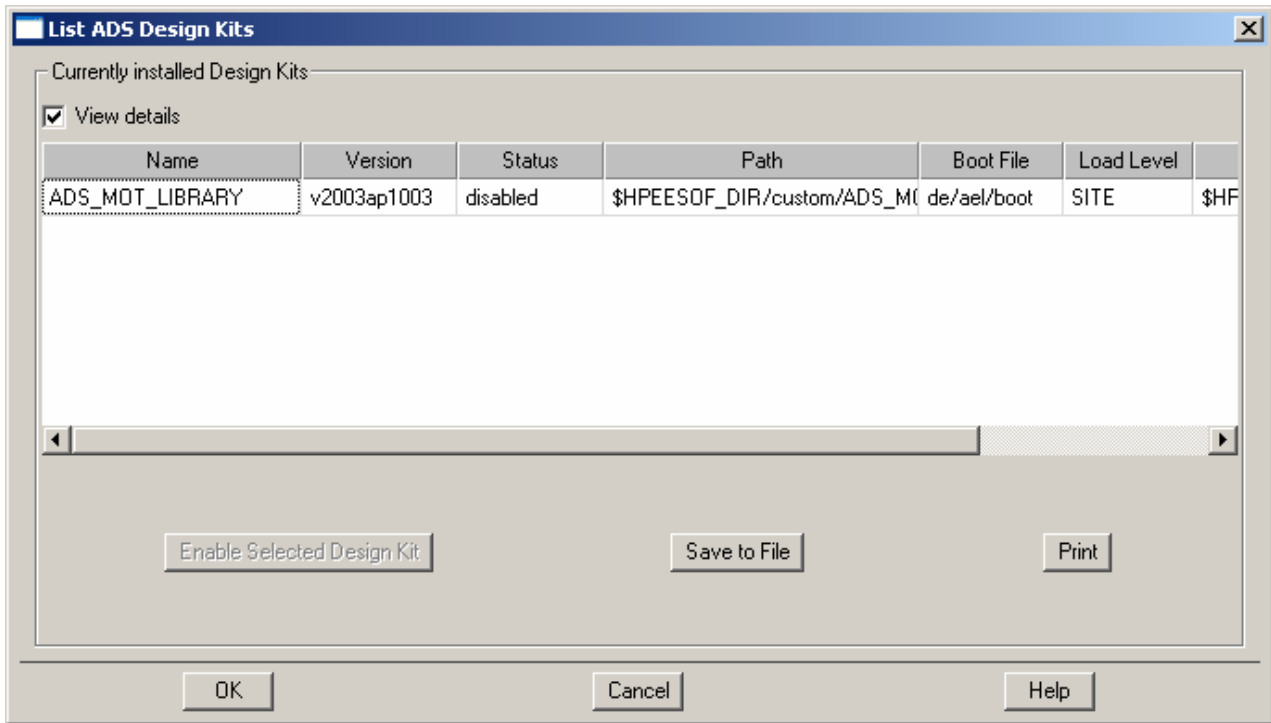


The Design Kit will appear in the dialog box, like the ADS_MOT_LIBRARY in following example:



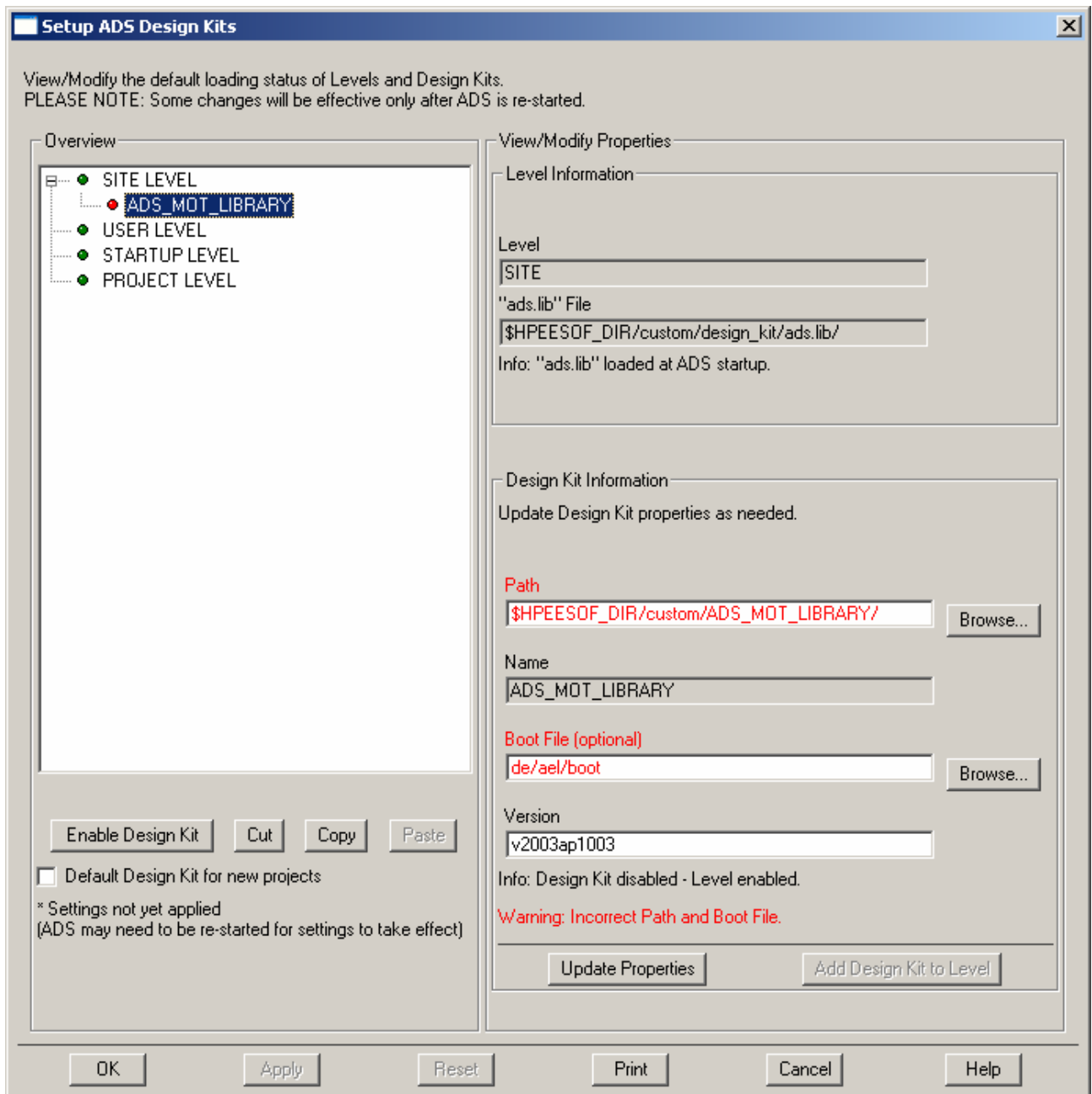
Note: You must then select Apply or OK and then restart ADS for the changes to take effect.

You can then verify the disabled Design Kit, by selecting the **List Design Kits... Menu** choice from the Design Kit menu in the main window as shown below:



The directory for the Design Kit still exists even though it is disabled. ADS v2003c **will not** let the user unZip a new Design Kit over the old one with the same name when going through the install procedure. **The user must manually delete the directory tree of the DesignKit before installation can begin on an update.** For example, the owner of the ADS v2003c installation directory would have to go to the ADS custom directory and delete the disabled Design Kit directory tree DesignKitName/ in a command window or file manager program.

After deleting the Design Kit directory tree and restarting ADS, the Setup DesignKits dialog box will appear with a **red bullet** and **red text** because the path no longer exists as shown on the next page:



You can then select the DesignKit, click **Cut** to remove the kit completely and then click **OK** to activate the changes. After restarting ADS v2003c again, the disabled/deleted Design Kit will no longer appear in the List of Design Kits window.

This tedious procedure will probably be changed in future releases of ADS.

V. CUSTOMER PROJECT READ-ME

The *Read-Me First* document outlines how to install the latest Customer Example Motorola LDMOS project directory for ADS v2003c and how to use the examples provided successfully.

A. ADS v2003c Users: Installing the customer_ads_v2002p0502_prj directory

Before you can install the Customer Example project directory, you must first go to the Motorola RF LDMOS website (<http://motorola.com/rf/models>). Go to Agilent EESOF's ADS. Right-click on the Agilent ADS v2003c Example Project hyperlink to download the customer_ads_v2002p0502_prj.Zip file. Select Save Link/Target As to save the file to your desktop.

1. ADS v2003c Unix Users

- a) Download the customer_ads_v2002p0502_prj.zip file.
- b) UnZip the downloaded file by using ADS's Unzip utility found in the bin directory of the ADS installation directory. For example, from a Unix csh shell command prompt:

```
setenv HPEESOF_DIR /rf/apps/ads/2003c
$HPEESOF_DIR/bin/unzip customer_ads_v2002p0502_prj.zip
  Archive:  customer_ads_v2002p0502_prj.zip
    inflating: customer_ads_v2002p0502_prj.zap
```

This creates a file in an ADS zap archive file called:

```
customer_ads_v2002p0502_prj.zap
```

- c) Open ADS. From the File menu, select **Unarchive Project...** to unzip the directory.



- d) The new project directory is called customer_ads_v2002p0502_prj.

The directory is just like any other ADS project directory and is ready to use. Choose **Open Project** from the File directory to open this project.

2. ADS v2003c PC Users

- a) Download the customer_ads_v2002p0502_prj.zip file.
- b) UnZip the downloaded file by using ADS's Unzip utility found in the bin directory of the ADS installation directory. For example, from a DOS prompt:

```
set HPEESOF_DIR=C:\ads2003c
%HPEESOF_DIR%\bin\unzip customer_ads_v2002p0502_prj.zip
Archive: customer_ads_v2002p0502_prj.zip
  inflating: customer_ads_v2002p0502_prj.zap
```

The result is an ADS zap archive file called customer_ads_v2002p0502_prj.zap.

- c) Open ADS v2003c. From the File menu, select **Unarchive Project...** to unzip the directory.



- d) The new project directory is called customer_ads_v2002p0502_prj.

The directory is just like any other ADS project directory and is ready to use. Choose **Open Project** from the File directory to open this project.

B. Using the customer_ads_v2002p0502_prj Project Directory

The following instructions assume that you are using ADS v2003c for Unix or PC and currently have the customer_ads_v2002p0502_prj project already open. A schematic file called Base_Model.dsn is used as device under test (DUT), within all of the example test schematics (at the lowest subcircuit level, see Figure 1) except for the Main_Transient, Main_1HB_Loadpull and Main_2HB_Loadpull designs. Therefore, it is easy to replace the current product model by editing the FET element and selecting a new model from the list. You can also replace the MET LDMOS model with a Root LDMOS model from the Motorola LDMOS Models palette and select the appropriate model from the list given.

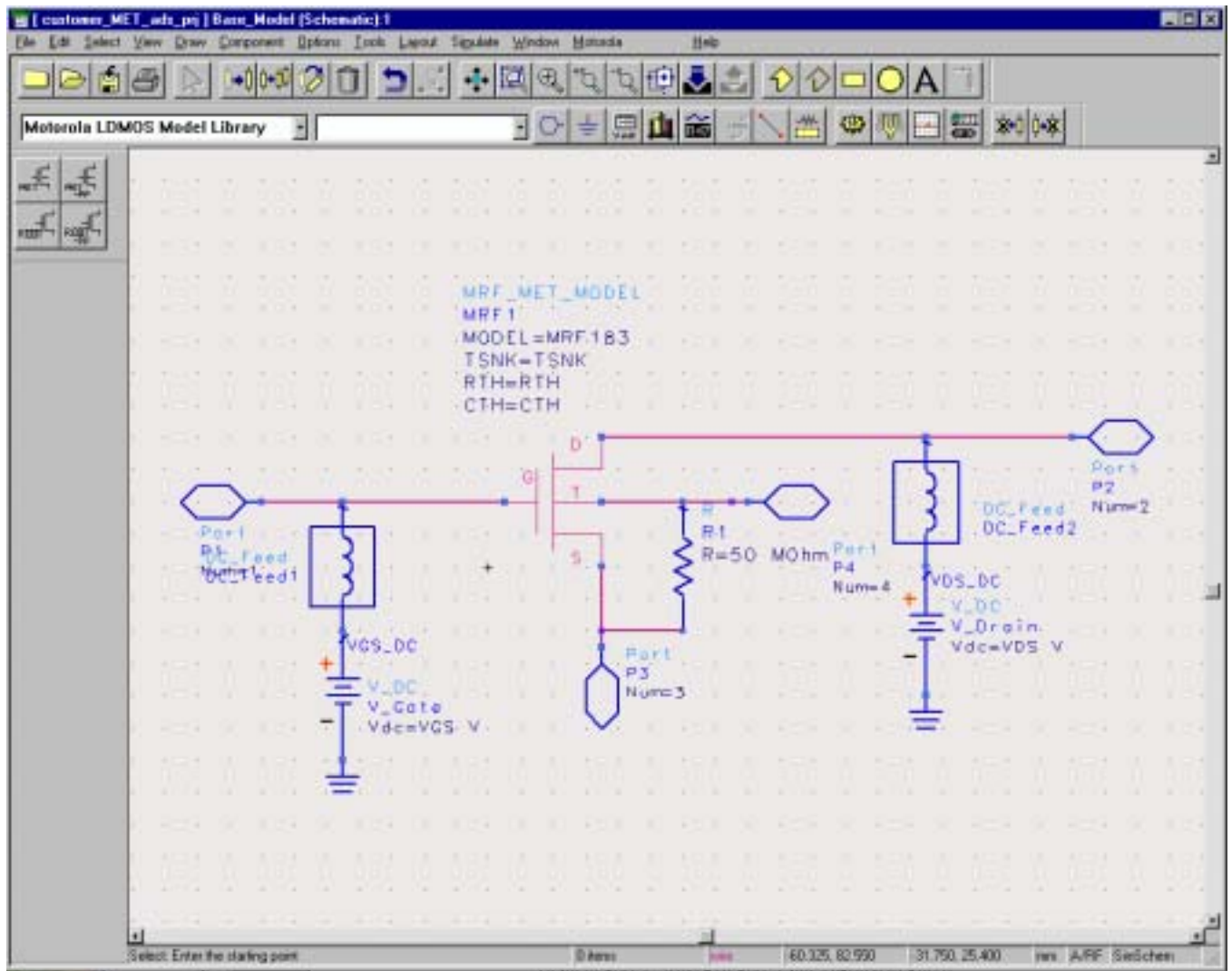


Figure 1. Schematic of Base_Model.dsn

Notice that Base_Model has as its parameters TSNK, RTH, CTH, VDS and VGS. Therefore, any test circuit that uses Base_Model as its DUT is able to pass thermal parameters to the MET LDMOS model as well as bias information.

Note: Keep these parameters in mind when replacing the given MET LDMOS model with another MET or Root LDMOS model. Setting TSNK, RTH and CTH to a value of -1 tells the simulator to use the default value of the model.

1. Selecting a New MET LDMOS Product Model.

A Library and Palette Group—the Motorola LDMOS Model Library—has been created with all of the current product models. Select a model type by clicking the **Component Library** icon and then clicking **Motorola LDMOS Model Library**.

There are four model types:

- MRF_MET_MODEL—MET LDMOS Model
- MRF_MET_PP_MODEL—MET LDMOS Push-Pull Model
- MRF_ROOT_MODEL—Root LDMOS Model
- MRF_ROOT_PP_MODEL—Root LDMOS Push-Pull Model

Figure 2 illustrates how to edit the current MRF_MET_MODEL and select a new product model to simulate inside the Base_Model design.

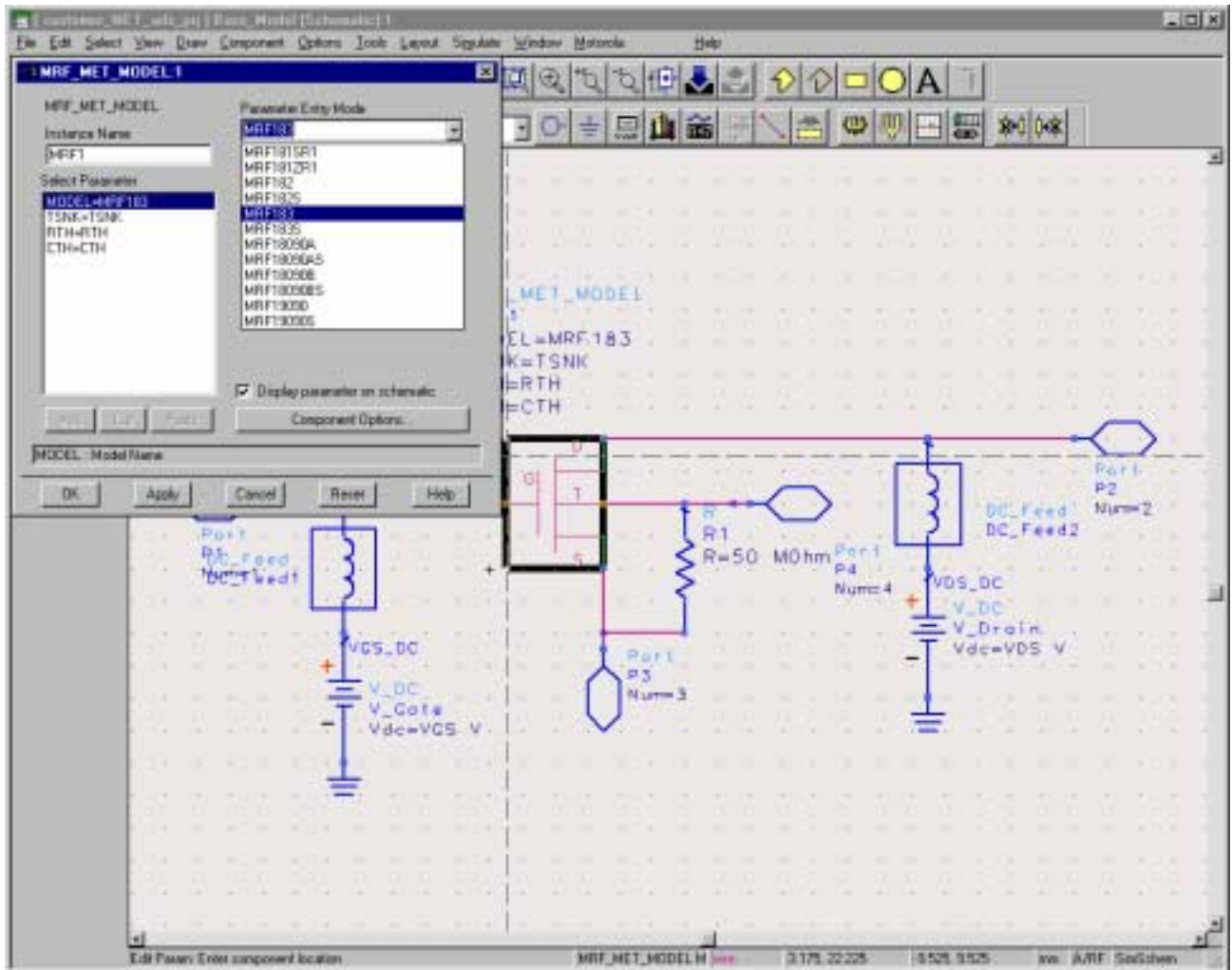


Figure 2. Selecting a New MET LDMOS Product Model

2. Selecting a Root Product Model.

The preceding procedure can also be used to select a Root LDMOS model from the palette or library group and replace the present MRF_MET_MODEL element. Because the Root model has no temperature component, the Fourth Node of Base_Model remains unconnected. However, this is not a problem when simulating. The parameters of Base_Model, TSNK, RTH and CTH do not affect the circuit when the Root LDMOS model is used.

Figure 3 shows how to replace the MRF_MET_MODEL with a new MRF_ROOT_MODE and how to edit and select a new product model from the list given.

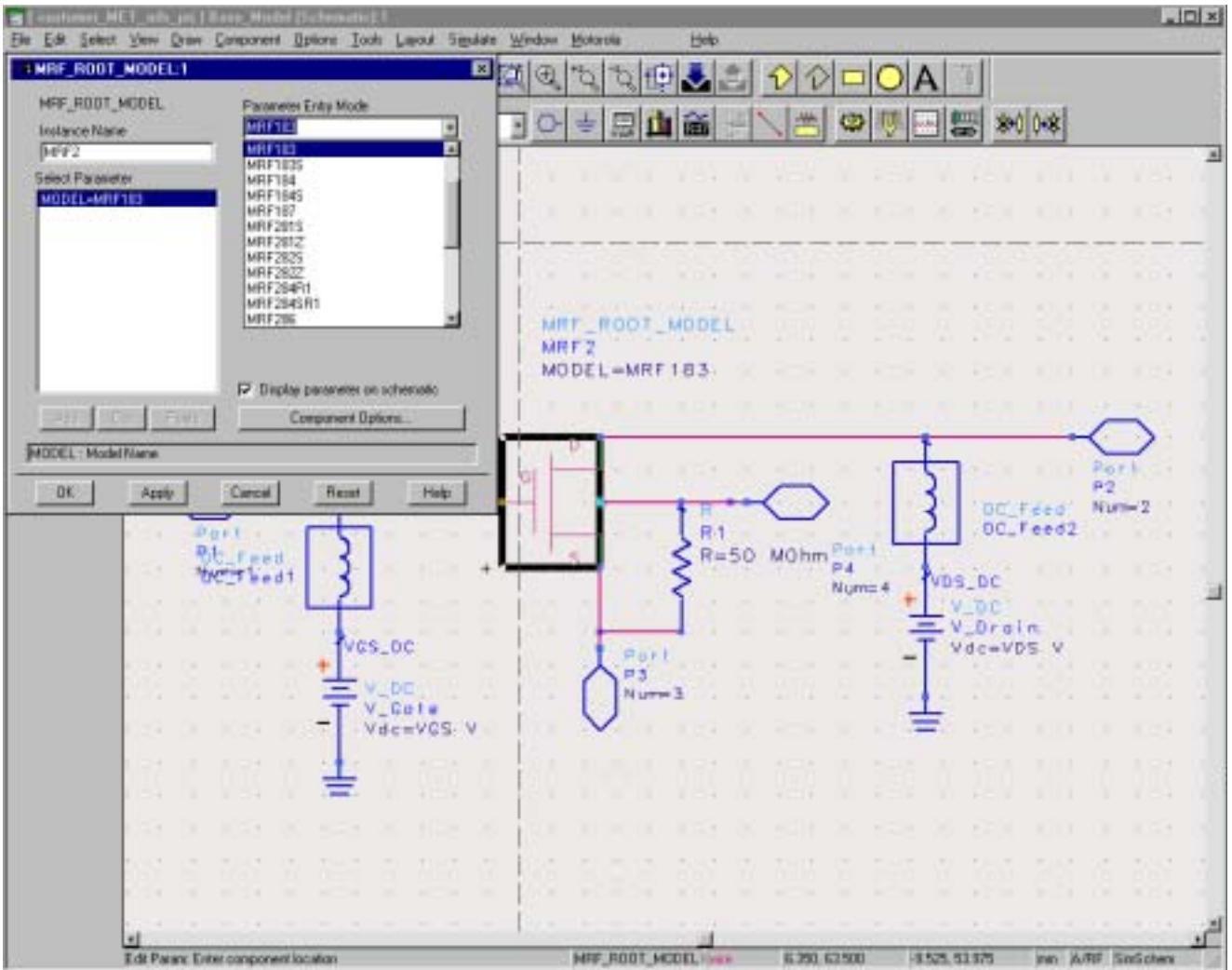


Figure 3. Selecting and Editing Choice of the MRF_ROOT_MODEL

3. Simulating Product Models Correctly.

As stated previously, the Base_Model.dsn schematic is the DUT for all of the example test schematic designs except for the Main_Transient, Main_1HB_Loadpull and Main_2HB_Loadpull designs. By following the preceding procedure for selecting the desired product model, each example test circuit is ready to simulate. Before performing a simulation, however, be sure to adjust the frequency, bias and power stimulus controls for your desired test setup. The VAR block in each test bench may also contain some variables that affect the test setup and may also need to be modified.

Note: The new MOT_TECH_INCLUDE element has been placed at all top-level simulation schematics, which is now a requirement of the new Design Kit structure.

VI. TROUBLESHOOTING ADS INSTALLATION PROBLEMS

Please verify that the LDMOS Model Design Kit Library was installed correctly by going through the installation procedures outlined in this document before trying to troubleshoot problems.

Following is table of common problems and solutions to help you complete your installation if you are having problems.

Problem	Possible Solution
<p>Under Unix, when starting ADS following the installation, the messages Loading Motorola's ADSv2003cp0304 LDMOS Model Library ... Motorola's ADSv2003cp0304 LDMOS Model Library Load Complete! do not appear upon startup.</p> <p>Under PC or Unix, after ADS is open, the Motorola LDMOS Model Library does not appear in the schematic palette or within the Component Library Browser window.</p> <p>Under PC or Unix, the Motorola LDMOS Model Library palette exists within the schematic window. However, when picking and placing an element, I get several message windows saying that the component symbol is not found.</p>	<ol style="list-style-type: none"> 1. Check that the ADS_MOT_LIBRARY directory and all of its subdirectories are present in the ADS Custom directory. 2. Verify that you are running ADS v2003c. 3. Verify that the design_kit directory exists within the Custom directory and that the ads.lib file exists and is similar to the file shown in the footnote below.
<p>Under PC or Unix, the Motorola LDMOS Model Library palette exists within the schematic window, and I can pick and place model parts to the schematic. However, when I try to simulate, I get the following simulation error messages within the simulator window: Warning detected by HPEESOF SIM during netlist parsing. Error detected by HPEESOF SIM during netlist parsing 'MRF1' is an instance of an undefined model ...'</p> <p>Under PC or Unix, the Motorola LDMOS Model Library palette exists within the schematic window, and I can pick and place model parts to the schematic. However, when I try to simulate, a window pops up indicating OPEN_SIMULATOR ERROR.</p>	<ol style="list-style-type: none"> 1. Verify that the MOT_Tech_INCLUDE element exists in your top-level circuit that you are trying to simulate. 2. Check that the ADS_MOT_LIBRARY directory and all of its subdirectories are present in the ADS Custom directory. 3. Verify that you are running ADS v2003c. 4. Verify that the design_kit directory exists within the Custom directory and that the ads.lib file exists and is similar to the file shown in the footnote below. 5. If ADS 2003c was installed after the Motorola LDMOS Model Library was installed, the Motorola LDMOS Model Library must be re-installed.
<p>Under PC or Unix, I have done everything above, and nothing seems to have an effect. The Motorola Library does not load at all or partially loads with errors.</p>	<ol style="list-style-type: none"> 1. Verify that all references to the ADS_MOT_LIBRARY environmental variable have been removed from your ADS startup wrapper script. 2. If all else fails, see the "Support" section in this document about starting a Customer Service Request or contacting Agilent.

* Example ads.lib file contained within the ADS v2003c custom/design_kit directory:

ADS_MOT_LIBRARY | \$HPEESOF_DIR/custom/ADS_MOT_LIBRARY | de/ael/boot.atf | v2003cp0304

VII. KNOWN PROBLEMS

The following are known problems associated with the MET LDMOS model. This section will be updated regularly, as new problems are discovered and resolved. If you find a problem with the MET LDMOS, do not hesitate to let the Motorola RF Modeling Team know. We will do our best to solve all problems or supply workarounds in a timely manner.

ADS v2003c

1. The model may experience some convergence problems under two-tone conditions for some specific values of IF (f2-f1) impedance terminations. Problems have been experienced when the IF termination is close to an open (high impedance) condition.
2. Even though all of the different simulation types have been coded in the senior modules (linear, nonlinear, AC, noise and transient), the noise section of the code has not been tested.
3. Simulator convergence issues have been noticed by some customers using Harmonic Balance simulations (LSSP, HB1Tone, HB2Tone, etc.) with ideal 50 ohm terminations on the input and output. Because of the low input and output impedances of some devices, it is suggested that lower input and output impedance terminations, around 5 ohms, be used to eliminate convergence problems.

VIII. SUPPORT

If you have difficulties installing or using the LDMOS Discrete Parts Design Kit, please feel free to contact the Motorola RF Modeling Team by selecting **LDMOS Model Help** from our main Motorola RF LDMOS Model web page (<http://motorola.com/rf/models>). Follow the procedure for submitting a Customer Service Request. We will be glad to contact you and help you with your problems.

If you feel the problem is with your ADS v2003c installation, please contact Agilent EESof directly at 1-800-hpeesof (1-800-473-3763).

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