Release Notes and
Installation Instructions
for

Agilent's Advanced Design System
LDMOS Discrete Parts Design Kit
Release v2002p0502

Rev 0

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I. INTRODUCTION

This current release of the LDMOS Discrete Parts Library for ADS v2002 has significant changes from previous releases. These changes are 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 98, 2000, NT 4.0, Solaris 2.7 and HPUX 10.2). This is because ADS v2002 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 February 2002). 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 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.

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. Part Name Changes

For this current release (v0502), several parts have changed names. They are as follows:

From	To
MRF9045M	MRF9045MR1
MRF281S	MRF281SR1
MRF281Z	MRF281ZR1
MRF282S	MRF282SR1
MRF282Z	MRF282ZR1
MRF284R1	MRF284

If you have existing designs with the old part numbers referenced in them, you must modify the part name reference before performing a simulation. For example, an existing design must be changed before it simulates correctly, as demonstrated in the following illustration:
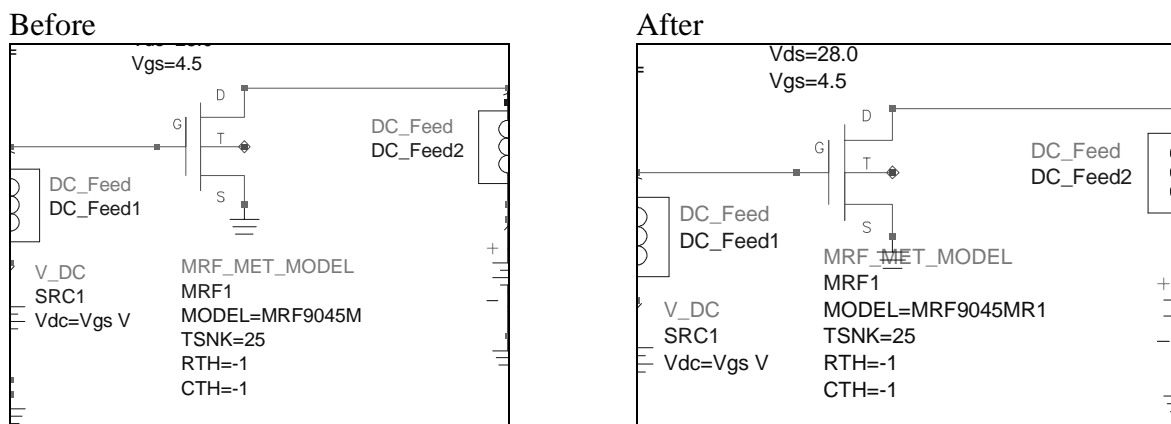
B. TechInclude Element

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 HPEESOFSIM 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:

MOT_TECH_INCLUDE
MTI

For more examples of using the TechInclude element, download the Customer Example Project from the website (PLEASE INSERT URL HERE) and review the Customer Project Read-Me section.

C. Cancelled Parts

For this release, the following list of parts have been labelled as cancelled:

MET Models	Root Models
MRF181SR1	MRF181SR1
MRF181ZR1	MRF181ZR1
MRF9060SR1	MRF9060SR1
	MRF6525-5R1
	MRF6525-10R1

If any of the preceding part names are referenced in existing designs and still 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.

The Cancelled version of these parts can *only* be found in the Component Library Browser under the Library heading, Motorola LDMOS Model Library.
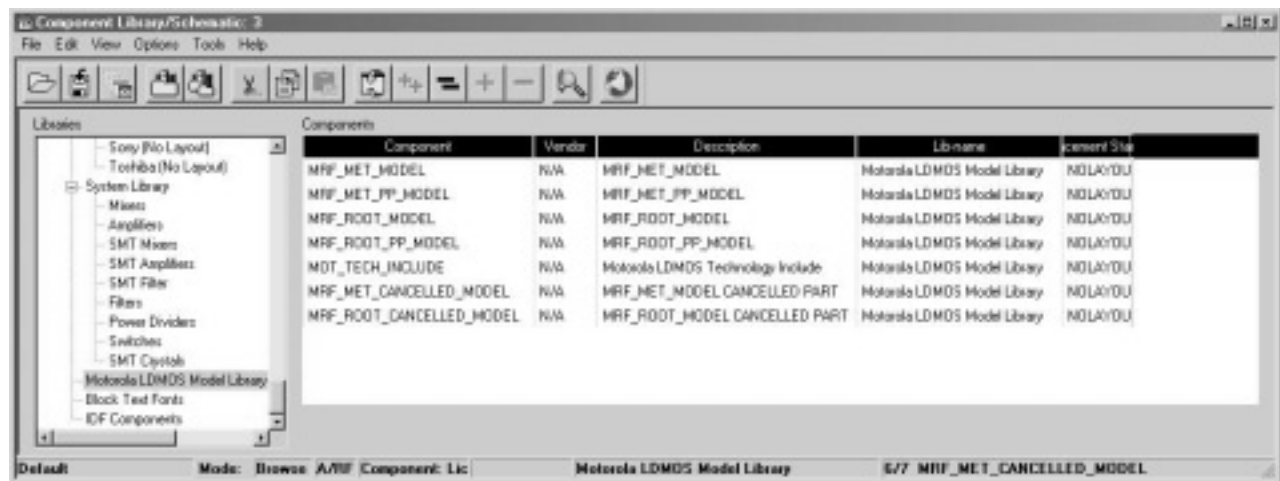
D. New Part Names

Some "S" versions of parts existing in the previous release of the library have been added to the Library. These parts are the MRF9180S, MRF21010S, MRF21060S and MRF21125S. These parts have been added to the MET and ROOT models lists and simulate the same as their non-"S" counterparts.

III. DESIGN KIT INSTALLATION

A. Download Design Kit

This section outlines the procedures necessary to install the new LDMOS Discrete Parts Design Kit v2002p0502 into ADS v2002. Prior releases of the Motorola RF LDMOS Custom Library used a Java installer for each specific platform. This is no longer required for ADS v2002.

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 v2002 Library and Installer Download Instructions, and download the ADS_MOT_LIBRARY_v2002p0502.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 February 2002) for ADS 2002 in the ADS 2002 documentation (specifically, page 2-5). If you are still unable 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 v2002 correctly installed and that you have root or administrative access to your ADS installation.

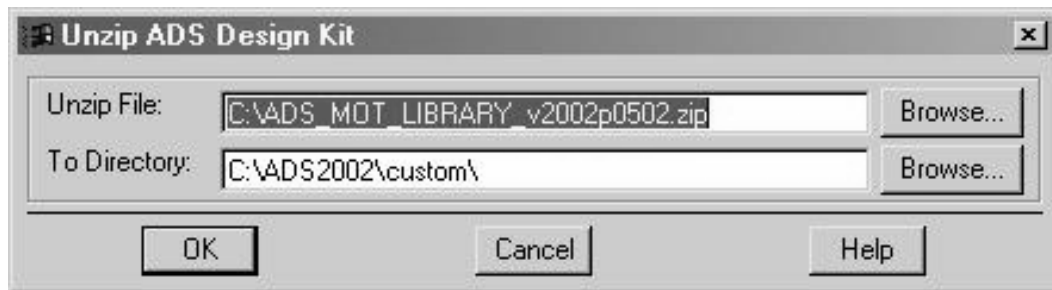### B. Install Design Kit

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:
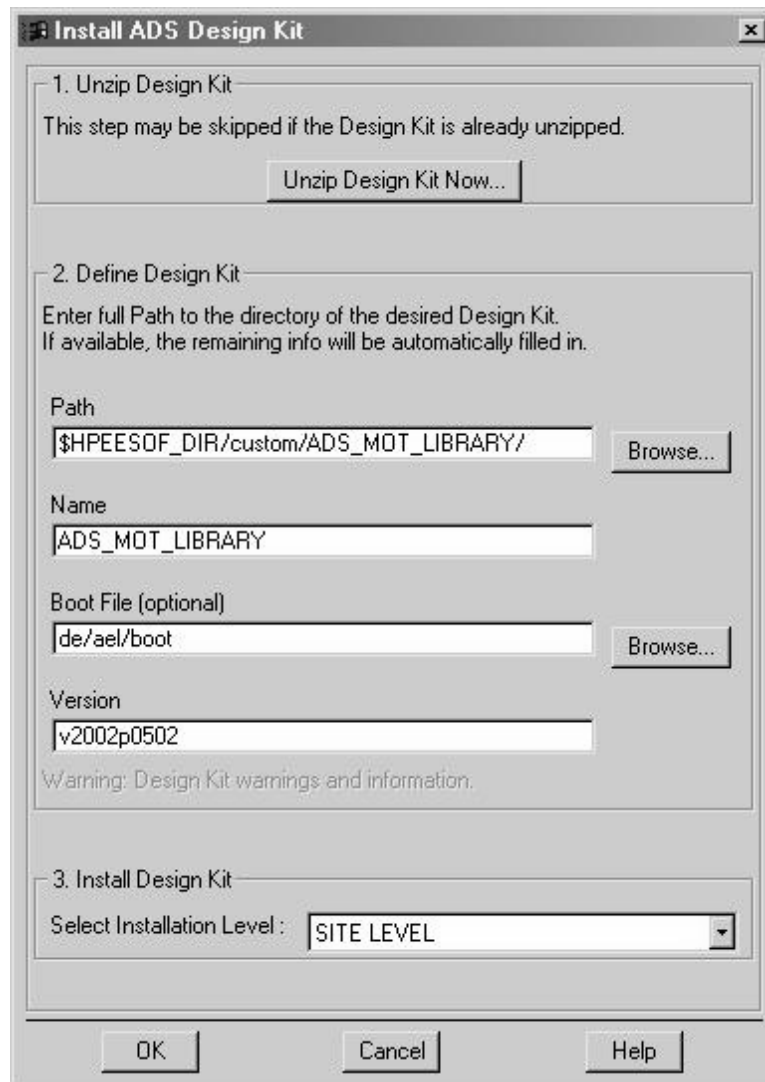

It is not necessary for you to manipulate any of the default values unless you want to perform some extra customization.

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**.

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If the installation was successful, the following dialog box will appear:
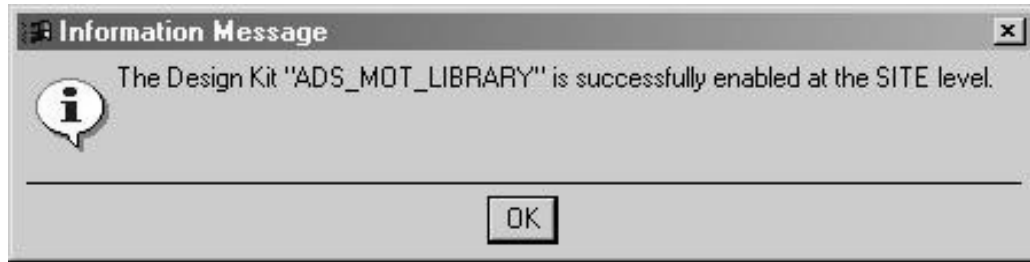
C. Verify Your Design Kit Installation

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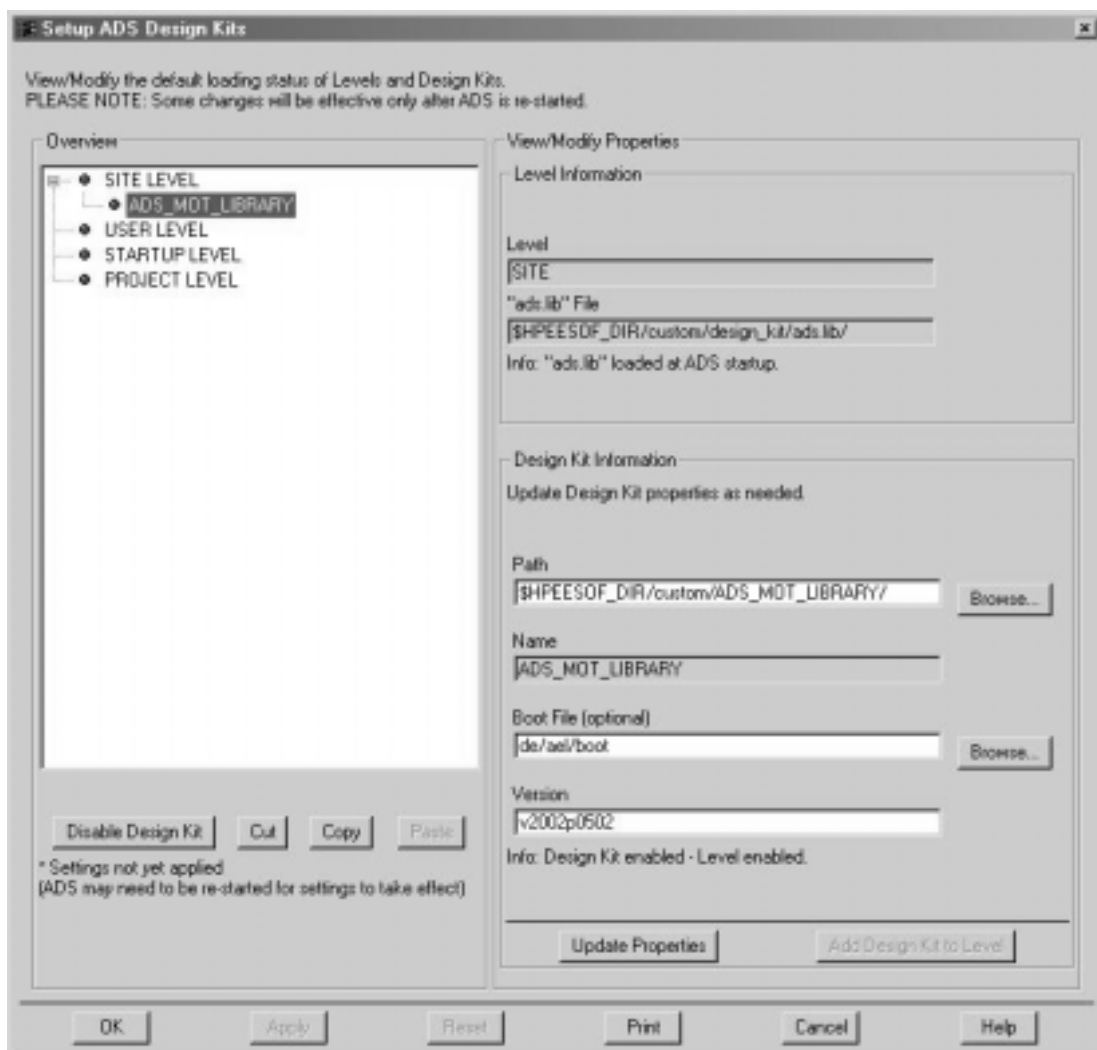

Click on **ADS_MOT_LIBRARY Design Kit** (it will be a subentry of the level where it was installed) to verify the installation paths, names, version, etc.

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:

Release Notes and Installation Instructions for ADS LDMOS Design Kit
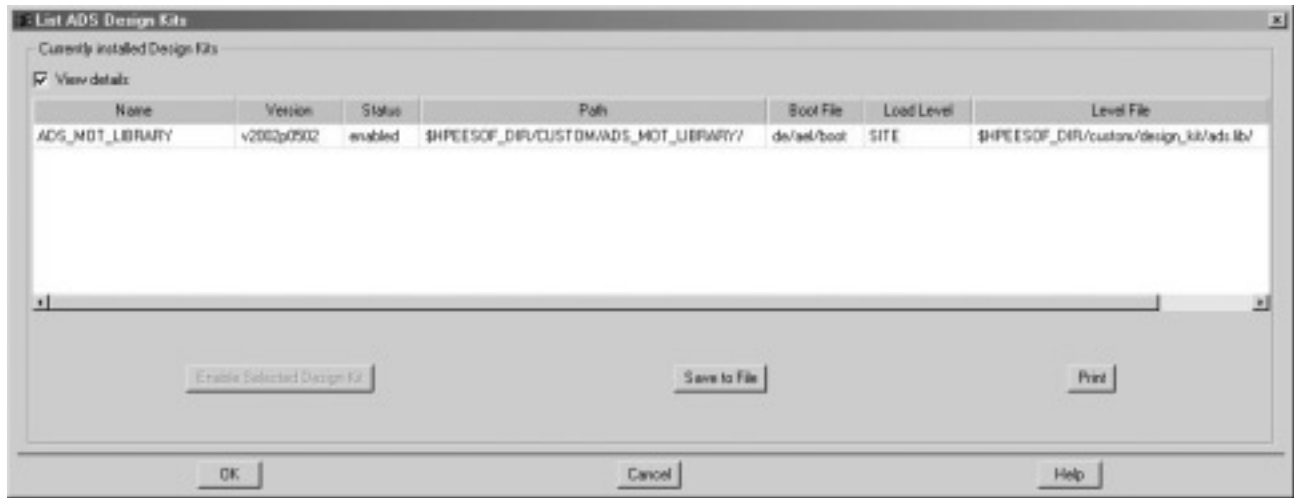
IV.   CUSTOMER PROJECT READ-ME

The *Read-Me First* document outlines how to install the latest Customer Example Motorola LDMOS project directory for ADS v2002 and how to use the examples provided successfully.

A. ADS v2002 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 v2002 Example Project hyperlink to download the customer_ads_v2002p0502_prj.zip file. Select Save Link/Target As to save the file to your desktop.
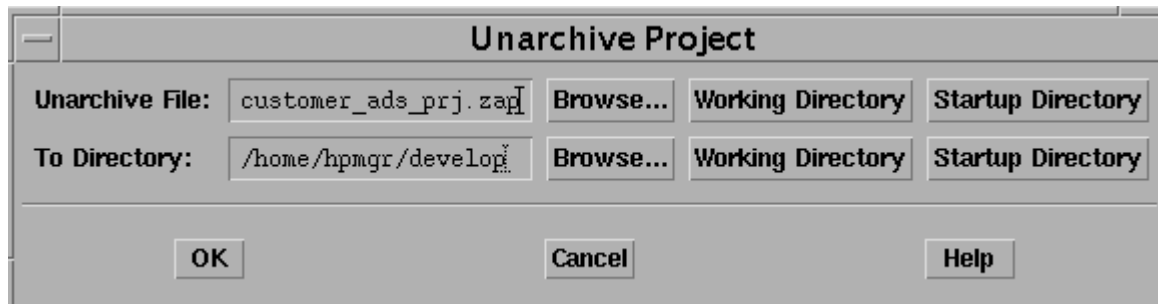
1. ADS v2002 Unix Users

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/2002
$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 is an ADS zap archive file called:

customer_ads_v2002p0502_prj.zap

c) Open ADS. From the File menu, select **Unarchive Project…** to unzap 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 v2002 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:\ads2002
   %HPEESOF_DIR%\bin\unzip
   customer_ads_v2002p0502_prj.zip
     Archive: customer_ads_v2002p0502_prj.z7ip
       inflating: customer_ads_v2002p0502_prj.zap
   ```

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

   c) Open ADS v2002. From the File menu, select **Unarchive Project…** to unzap 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 v2002 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.
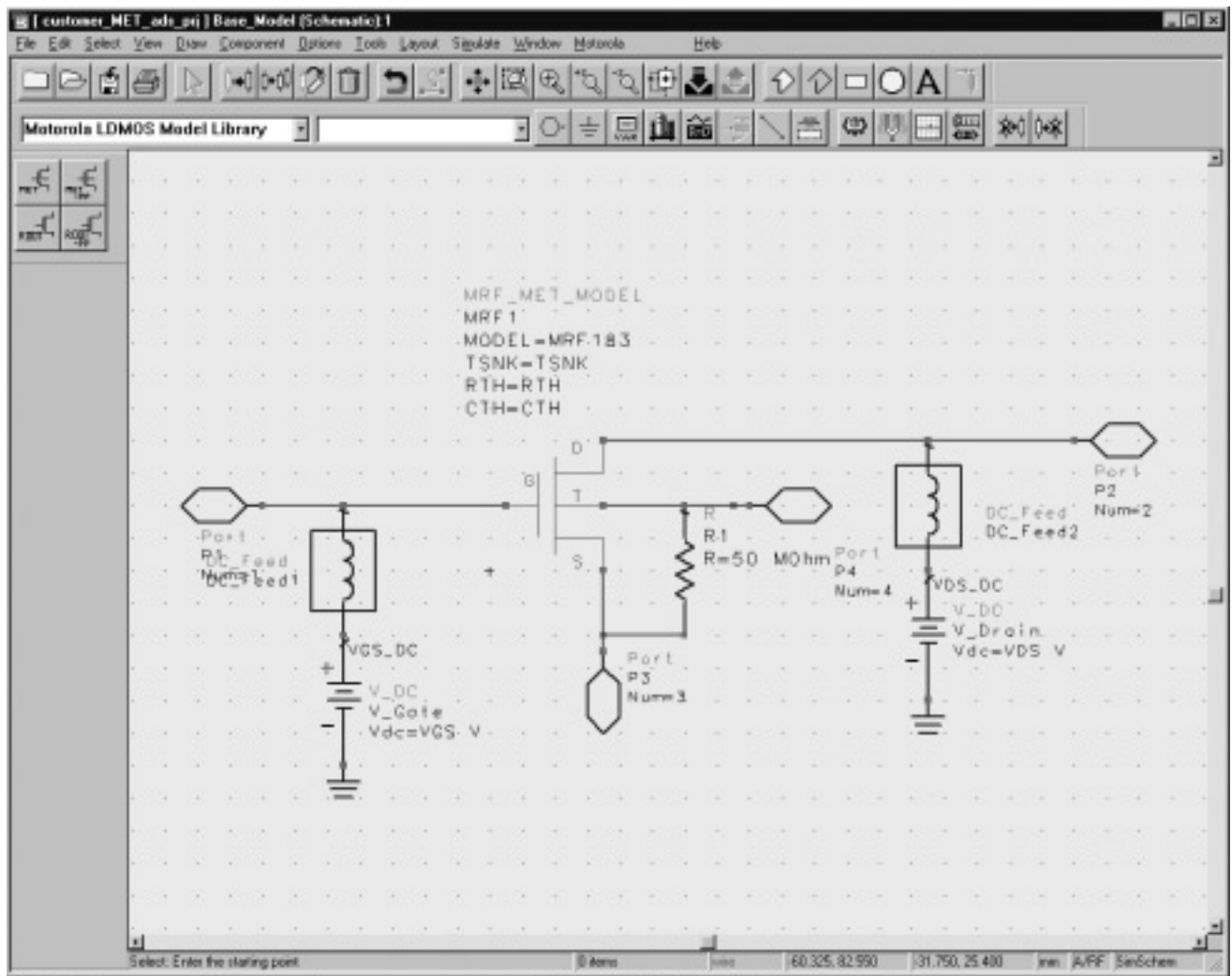
Figure 1. Schematic of Base_Model.dsn

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.
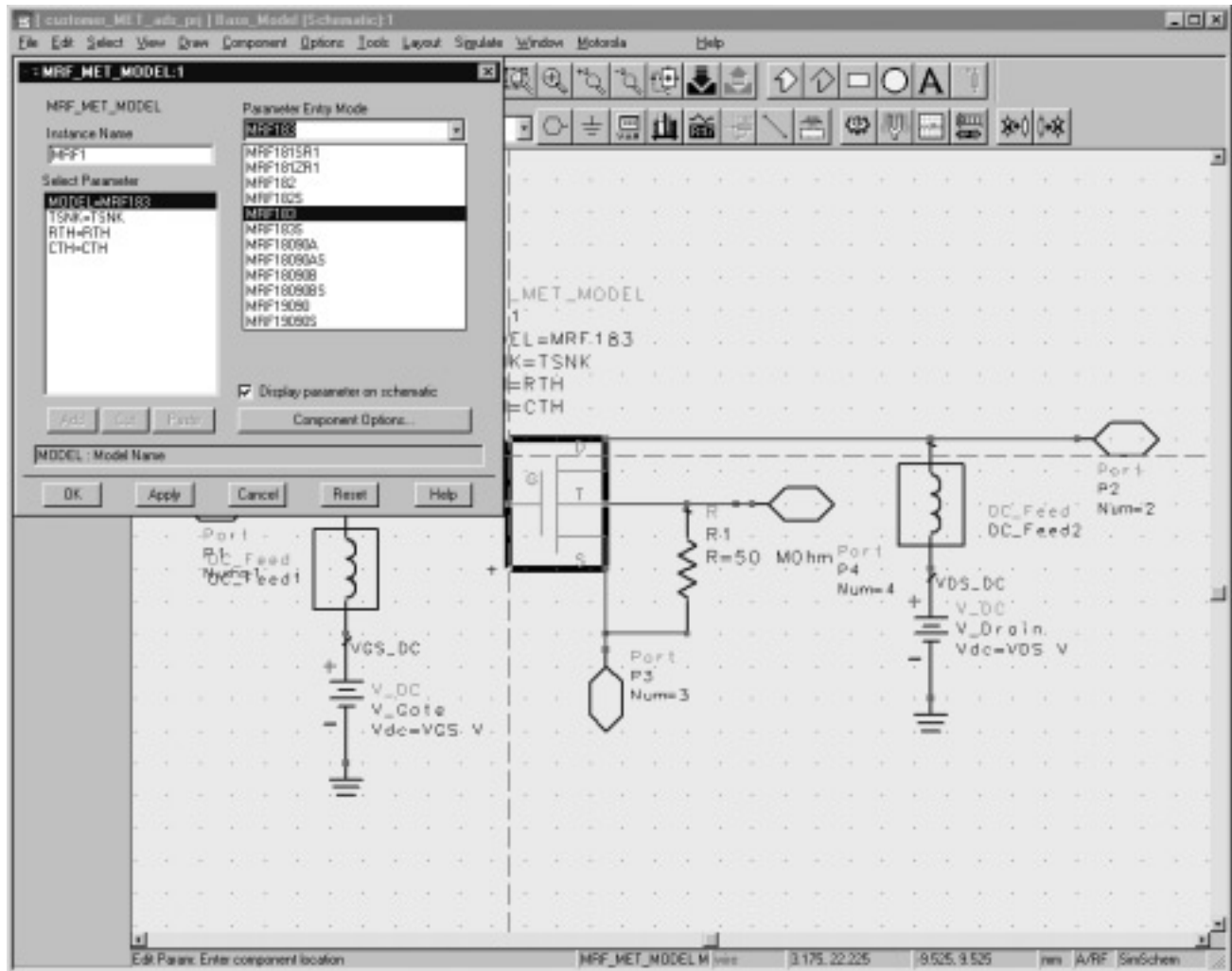

Figure 2. Selecting a New MET LDMOS Product Model

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.

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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.
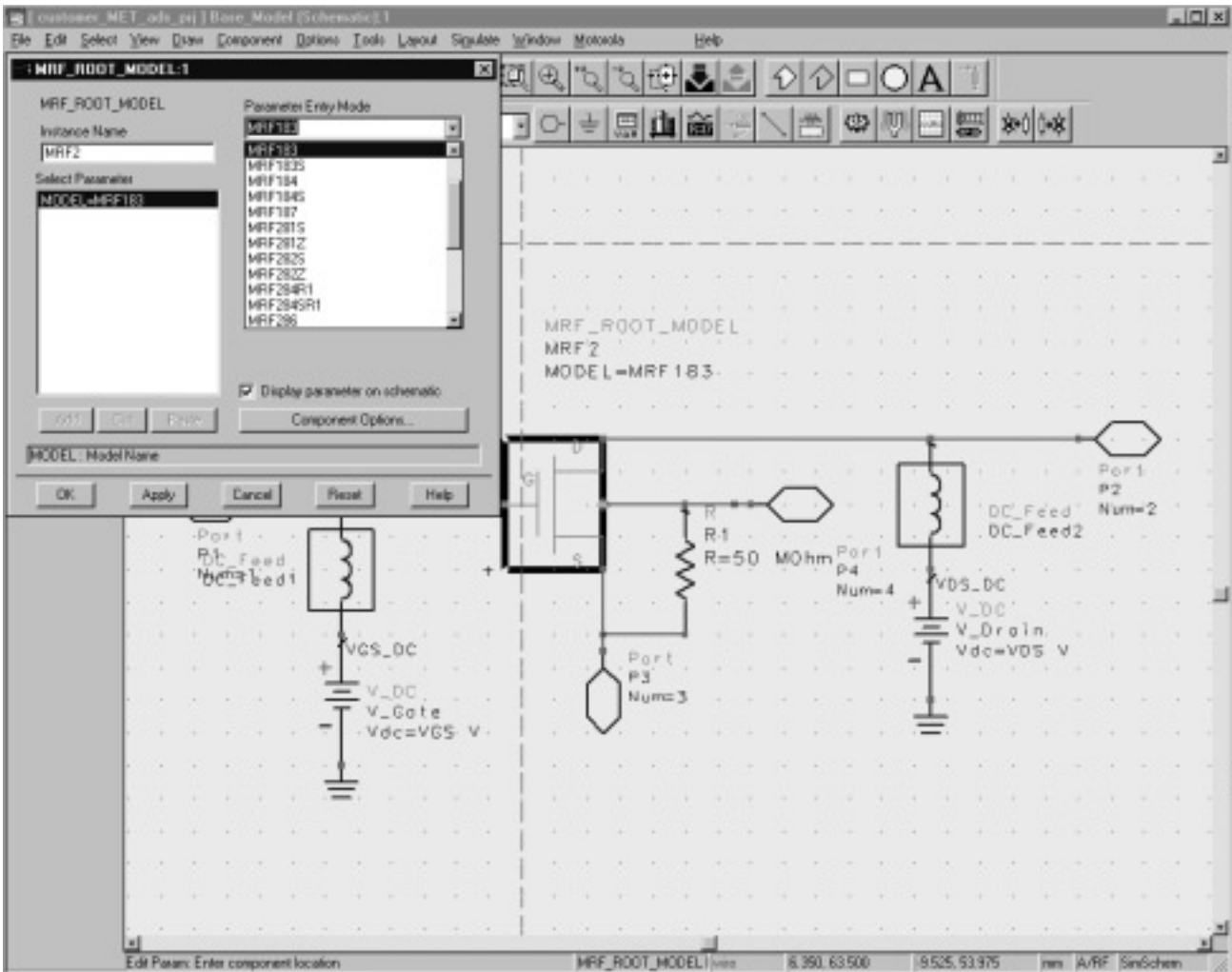

Figure 3. Selecting and Editing Choice of the MRF_ROOT_MODEL

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.

V.   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

Under Unix, when starting ADS following the installation, the messages
 	
`Loading Motorola's ADSv2002p0502 LDMOS Model Library ...`
`Motorola's ADSv2002p0502 LDMOS Model Library Load Complete!`
 	
do not appear upon startup.
 	
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.
 	
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.
	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 v2002.
	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.

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 HPEESOFSIM during netlist parsing.`
`Error detected by HPEESOFSIM during netlist parsing`
`'MRF1' is an instance of an undefined model …'`
 	
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.
	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 v2002.
	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 2002 was installed after the Motorola LDMOS Model Library was installed, the Motorola LDMOS Model Library must be re-installed.

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.	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 v2002 custom/design_kit directory:
    ADS_MOT_LIBRARY | $HPEESOF_DIR/custom/ADS_MOT_LIBRARY | de/ael/boot.atf | v2002p0502

VI.   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.

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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.

VII. 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 v2002 installation, please contact Agilent EESof directly at 1-800-hpeesof (1-800-473-3763).

How to reach us:
USA/EUROPE/Locations Not Listed: Motorola Literature Distribution; P.O. Box 5405, Denver, Colorado 80217. 1–303–675–2140 or 1–800–441–2447

JAPAN: Motorola Japan Ltd.; SPS, Technical Information Center, 3–20–1, Minami–Azabu. Minato–ku, Tokyo 106–8573 Japan. 81–3–3440–3569

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre, 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong. 852–26668334

Technical Information Center: 1–800–521–6274

HOME PAGE: http://www.motorola.com/semiconductors/

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