

### **Design Models**

# How to Create Symbols for PSpice Models

ROHM provides the SPICE models for simulating circuits. The model files include the library and symbol files. However, if a model is not provided with a symbol file, symbols need to be created. This application note describes how to create the PSpice symbols. Since the symbols vary with simulators, refer to the manual of the simulator to be used when creating the symbols for the simulators other than PSpice.

#### **Configuration of provided SPICE models**

The SPICE models can be downloaded from the product pages on the ROHM website. An example of the model files is shown below. In this example, the library file and the symbol file for PSpice are shown on the left and right, respectively. If two files are provided as in this example, the model can be registered and used with the simulator. However, the symbol files may not be provided for some products. In such cases, the symbol files need to be created.

Item	Library file	Symbol file for PSpice
File name	BD9E300.lib	BD9E300.olb
Extension	.lib	.olb
File format	Text	Binary

Table 1. Example of the model files. Product name: BD9E300EFJ-LB

#### How to create symbols

This section introduces two methods using the OrCAD PSpice Designer (Ver. 17.2). Select method A to perform a simulation immediately. Select method B normally.

- A. Create the symbols using the PSpice Model Editor
  - $\rightarrow$  To perform a simulation immediately. When the symbol shape is irrelevant.
- B. Create the symbol library of the OrCAD Capture
  - $\rightarrow$  To create symbol files compatible with the element functions and use them for other projects as well.

#### A. Create the symbols using the PSpice Model Editor

- 1. Start the PSpice Model Editor.
- 2. In the [File] menu, select [Export To Part Library...].

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 When the [Create Parts for Library] window is displayed, select a library file (.lib) in [Enter Input Model Library:] where the symbol is created. Next, in [Enter Output Part Library:], specify the location and symbol name (.olb) to save the symbol. Finally, clicking [OK] automatically creates the symbol.

Create Parts for Library	×					
Feter Ionut Model Library						
H:\Cadence\lib\SCT3060AL\sct3060al.lib Browse						
Enter Output Part Library						
H:\Cadence\lib\SCT3060AL\sct3060al.olb Browse						
OK Cancel Help						

4. To change the symbol shape, use the [Draw] menu on the right.

OrCAD Capture - Lite - [SCT3000AL.OLB - SCT3000AL]	
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#### B. Create the symbol library of the OrCAD Capture

For explanation, this section takes Nch Power MOSFET RD3G400GN as an example.

Library file name: rd3g400gn\_spice.lib

- 1. Start the PSpice Model Editor.
- 2. In the [File] menu, select [Model Import Wizard...].



3. When the [Model Import Wizard] window is displayed, specify a library file (.lib) in [Enter Input Model Library:] where the symbol is created. When a library file is selected with [Browse...], the location and symbol name (.olb) to save the symbol file are automatically entered in [Enter Destination Symbol Library:]. If no issue is found, click [Next].

Model Import Wizard : Sp	becify Library	×
	Model Import Wizard automatically associates symbols for all the PSpice models it recognizes. It facilitates the user to : - associate symbols for the PSpice models that could not be recognized automatically. - update existing symbols for the PSpice models. Enter Input Model Library :	
	H:¥Cadence¥lib¥RD3G400GN_spice¥rd3g400gn_spice.lib Browse	14
	Enter Destination Symbol Library :	
ALL AND	H:¥Cadence¥lib¥RD3G400GN_spice¥rd3g400gn_spice.olb Browse	
	< Back(B) Next(N) > Cancel Hel	o

4. When the [Associate/Replace Symbol] window is displayed, click [Associate Symbol].

Model Import Wizard : As	ssociate/Replace Symbol	×
	Destination Symbol Library : H:¥Cadence¥lib¥RD3G400GN_spice¥rd3g400gn_spice.olb You can do either of the following : (1) associate symbol for models without symbol, or (2) replace existing symbol for models.	
	Models with symbol Models without symbol Symbol :   Model Name	
$\rightarrow$	Associate Symbol	
View Model	< Back(B) Finish Cancel Help	

5. When the [Select Matching] window is displayed, click [...] in the [Select library to pick matching symbols:] field to specify the [breakout.olb] file. This symbol file is usually located in the directory where the OrCAD PSpice Designer is installed. For example, the file may be found in the following location.

Location of the [breakout.olb] file: C:\Cadence\SPB\_17.2\tools\capture\library\pspice

	C:¥Cadence¥SPB_17.2¥tools¥capture¥library¥pspice¥breakout.olb ~								
	Model : RD3G400GN		Part : JbreakN						
	Show All								
A DECEMBER OF THE OWNER OWNE	Matching Symbols	^							
Approximation and a second second	POT	_	,						
and the second s	RbreakP3	_							
	JbreakP	_							
	MbreakN3D	_							
	QDarBreakN	_							
and principles	Dbreak3								
A REAL PROPERTY AND ADDRESS	QbreakN3								
CO. / Commission	MbreakP3D								
	QDarBreakP								
	QbreakN								
	QVBICN								
	QbreakP								
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 In the list of symbols displayed in [Matching Symbols], select an appropriate symbol and click [Next]. In this example, [MbreakN3D] is selected for the Nch MOSFET model.

r <u>10</u>	Select library to pick matching symbols :				
A set of the set of th	C:¥Cadence¥SPB_17.2¥tools¥capture¥librar	y¥pspice¥breakou	t.olb		~
And	Model : RD3G400GN		Part :	MbreakN3D	
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1284	Lbreak				
	MbreakN				
	MbreakN3D	1			
•	QbreakP4	<b>\</b>		l l l l l l l l l l l l l l l l l l l	1
	P				

Regarding the question of which symbol included in [breakout.olb] should be used, any symbols can be used if the number of terminals matches. The usage examples are shown below.

Device	BREAKOUT symbol
Diode	Dbreak
	1
Diode (2 in 1)	Dbreak3
Nch MOSFET	MbreakN3D

Device	BREAKOUT symbol
Pch MOSFET	MbreakP3D
	>
Dinalar NDN	ObrookN
BIPOIAI INPIN	QDreakin
Bipolar PNP	ObreakP
	QUICAN

7. When the [Define Pin Mapping] window is displayed, perform mapping of the terminal names of the SPICE model and the pin names of the symbol. Basically, the terminal names and order of the SPICE model are arranged as follows.

Diode	: 1. A (Anode), 2. K (Cathode)
MOSFET	: 1. D (Drain), 2. G (Gate), 3. S (Source)
Bipolar transistor	: 1. C (Collector), B (Base), 3. E (Emitter)

However, in rare cases, the order might be different for equivalent circuit models (subcircuit models). Therefore, it is necessary to check the description in the library file. As an example, the description in the library file for Nch MOSFET RD3G400GN is shown on the right. Since "D", "G", and "S" are arranged in the order of 1, 2, and 3, the basic description is confirmed.



8. In the [Symbol Pin] field of the [Define Pin Mapping] window, assign the pin names in the order confirmed previously. When the assignment is completed, click [Save Symbol].

Model Import Wizard : Define Pin Mapping	×
For each model terminal, associate a symbol pin. The optional model terminals may be left unassociated. Use "View Model Text" button to view the model definition.	
Model: RD3G400GN Part: MbreakN3D	
Symbol Power Pins	
View Wodel < Back(B) Save Symbol Cancel Help	

9. In the [Associate/Replace Symbol] window, click [Finish].

Model Import Wizard : As	ssociate/Replace Symbol	×
	Destination Symbol Library : H:¥Cadence¥lib¥RD3G400GN_spice¥rd3g400gn_spice.olb You can do either of the following : (1) associate symbol for models without symbol, or (2) replace existing symbol for models.	
	Model Name         Symbol Name           RD3G400GN	
	Replace Symbol	
View Model	< Back(B) Finish Cancel	Help

10. When the log window is displayed, confirm that no error has occurred.

FO(ORSCH-1132): Log File	Error File
STATUS: PSpice Model Impo	t Wizard for "Capture" (17.2.0.d001)
STATUS:	
INFO: LIB driven flow	
INFO: Input File: H:¥Caden	e¥lib¥RD3G400GN_spice¥rd3g400gn_spice.lib
INFO: Output File: H:¥Cade	nce¥lib¥RD3G400GN_spice¥rd3g400gn_spice.olb
STATUS:	
STATUS: Identifying matchin	g symbols automaticallystarted at Friday, April 16, 2021 13:22:18
STATUS:	
INFO: Symbol "RD3G400GN	" already exists for model "RD3G400GN".
STATUS:	,
STATUS: Completed identifyi	ng matching symbols automaticallyat Friday, April 16, 2021 13:22:18
STATUS:	
INFO: Symbol "RD3G400GN	" updated for model "RD3G400GN"
TATUS O Error moreogoe O	Naming mersages
STATUS: 0 EITOF Messages, 0	wanning messages

11. Confirm that the symbol file (.olb) is created in the specified folder. This completes the creation of the symbol file (.olb).

	rd3g400gn_spice.err	2021/04/16 13:37	ERR File	1 KB
	//////////////////////////////////////	2019/08/23 11:08	LIB File	1 KB
$\rightarrow$	👫 rd3g400gn_spice.olb	2021/04/16 13:36	OLB File	8 KB

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From here, the usage of the symbol file (.olb) is explained.

- 12. Open the project file in the OrCAD Capture.
- 13. First, add the symbol to the library. Right-click on the [Library] folder in [Design Resources] and select [Add File] from the pop-up menu. When the file selection window is displayed, select the created [.olb] file. Confirm that the symbol is added to the [Library] folder.



14. Alternatively, while the circuit diagram is open, select [Place] and then [Parts] in the menu bar. The [Place Part] window is displayed on the right edge. In the [Libraries:] field, clicking the [Add Library] icon displays the [Browse File] window. Select the created [.olb] file.



15. The added symbol file (.olb) is displayed in the Part List. Double-click the part to place the symbol on the circuit diagram.

Place Part		ф <b>х</b>	
Part	₽ 🖓		
RD3G400GN			
Part List:	Y		
RD3G400GN		$\leftarrow$	Double-click to place the symbol on the circuit diagram
- Libraries:		1	
BBEAKOUT	GEX		
Design Cache			
RD3G400GN_SPICE			

16. Next, link the library file (.lib) to the project. In the menu bar of the circuit diagram, select [PSpice] > [New Simulation Profile] to open a new simulation profile. When the [New Simulation] window is opened, enter an appropriate simulation name in [Name:] and click [Create].

New Simulation	×
Name:	Create
frequency_response	Cicdic
	Cancel
Inherit From:	
none 🗸	
Root Schematic: SCHEMATIC1	

To open an existing simulation profile, select [PSpice] > [Edit Simulation Profile] in the menu bar.

17. When the [Simulation Settings] window is opened, select [Configuration Files] in the left column and select [Library] in the [Category:] field. Next, click [Browse...] to select the library file (.lib).

General	Category:	Filename:	
Analysis	Stimulus	H:\Cadence\lib\RD3G400GN_spice\rd3g400gn_spice.lib	Browse
Configuration Files	Library Include	Configured Files	
Options Data Collection Probe Window	Update Index	omd.lib*	Add as Glob Add to Desi Add to Profi
		Library Path "C:\Cadence\SPB_17.2\tools\PSpice\Library"	Change Browse

18. According to your purpose, select one of the [Add...] buttons in the right column to add the library file.

- a. [Add as Global]: The library file is linked to all project files of OrCAD.
- b. [Add to Design]: The library file is linked only to this project file.
- c. [Add to Profile]: The library file is linked only to this simulation profile.

19. Click the [Apply] button and then the [OK] button to complete the setting.

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