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Analog eLab

# Importing a SPICE NetList into TINA9-TI

John Miller

## ABSTRACT

This application note describes the procedure for importing an unencrypted SPICE netlist into <u>TINA9-TI</u> (available at <u>www.ti.com/tina-ti</u>), creating a new macromodel based on the netlist, and placing a symbol to instantiate the macromodel in a TINA9-TI circuit schematic. This procedure applies to TINA9-TI only.

If you have an earlier version of TINA-TI, see the app note *Importing a SPICE Netlist into TINA7-TI* (lit number SLVA424).

The behavior of the macromodel can depend on the compatibility of the netlist entries with TINA-TI. It is possible that some Spice-based netlists may contain syntax or executable statements that are not compatible with TINA. If the Spice netlist is encrypted and cannot be imported directly into TINA, contact the E2E and Simulation and Models Forum for support (www.e2e.ti.com).

The next section provides an example of the step-by-step procedure for importing a Spice netlist to create a TINA-TI macromodel, and then creating an instance of the TINA macromodel on a circuit schematic. The example uses the netlist of an OPA830, a low-power, high-speed op amp with a rail-to-rail output. For additional TINA and/or simulation support, consult the Simulation and Models E2E forum at <a href="https://www.e2e.ti.com">www.e2e.ti.com</a>. For support on high speed amplifiers like the OPA830 consult the E2E High Speed Amplifier Forum at <a href="https://www.e2e.ti.com">www.e2e.ti.com</a>.

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Importing a SPICE NetList Into TINA9-TI

## TEXAS INSTRUMENTS

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# 1 Procedure

# 1. Importing a SPICE netlist file.

The netlist in question must be configured using a SPICE subcircuit statement, and the netlist file must have a .cir, .lib, or .mod extension. If the Spice netlist file has a different extension change the extension to .cir, .lib, or .mod before trying to import it into TINA-TI. To illustrate the procedure, an example is shown below using the netlist for the OPA830:

.SUBCKT OPA830 IN+ IN- VCC VEE VOUT

Note that this report does not address the details and best practices of generating Spice subcircuits. For more information on this topic, see the References section.

## 2. Confirming that the SPICE netlist will compile in TINA.

Some SPICE netlists may contain statements and/or formatting that is incompatible with TINA. To check for this, open TINA, and select the *File/Import/Pspice Netlist (\*.CIR)* menu tab as shown in Figure 1.

Navigate to the desired file and select it using the open directory window. A netlist editor window opens as shown in Figure 2. Select the check-box icon on the upper menu bar as indicated by the black arrow in Figure 2. If the netlist format and syntax are compatible with TINA, then a message that says "Successfully completed" appears in the lower margin of the window as shown in Figure 2.

Edit Insert View	Analysis T&M	Tools TI Utilities Help
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Open	Ctrl+O	
		≱ +
Open Examples		
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	Curr 5	
Save As		
Save All		
Close	Ctrl+F4	
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Export	•	· · · · · · · · · · · · · · · · · · ·
Import	•	XML
	· · · · ·	
Bill of Materials		Import TINA Libraries and Designs
Enter Macro		PSpice Netlist (*.CIR)
Page Setup		
Print Preview		
Print	Ctrl+P	
FILL	Cultr	
F. (4		
Exit		

# Figure 1. Menu Tabs for Importing a Netlist as a \*.CIR or \*.LIB or .MOD File

TEXAS INSTRUMENTS

🚛 <opa830.lib> - Netlist Editor</opa830.lib>	
File Edit. Analysis Help	
+ OFA830	*
<ul> <li>* (C) Copyright 2009 Texas Instruments Incorporated, A</li> <li>** This model is designed as an aid for customers of Texas TI and its licensors and suppliers make no warrantis</li> <li>** or implied, with respect to this model, including ti</li> <li>** merchantability or fitness for a particular purpose</li> <li>** provided solely on an "as is" basis. The entire risk</li> <li>** and performance is with the customer</li> </ul>	E
* Released by: Analog eLab Design Center, Texas Instrum * Part: OFA830 * Low Power, Single-Supply, Wideband Operational Amplfi Date: 2010-10-29 * Model Type: TINA * Simulator: TINA-TI * Simulator Version: 7.0.30.167 SF-TI Datasheet: SB05263F-AUGUST 2004-REVISED AUGUST 2008 * * 1st. version released on 2010-10-29	
* * * OPA830 SUBCIRCUIT * HIGH SPEED MONOLITHIC FULLY DIFFERENTIAL AMPLIFIER *	 
Line: 1 Col: 1 Successfully compiled.	

Figure 2. Netlist Editor Window Used to Check Netlist Compatibility with TINA



Procedure

## 3. Creating the TINA-TI macromodel.

Open TINA9-TI and select the *Tools/New Macro Wizard* menu tab. A window should appear, as shown in Figure 3.

New Macro Wizard		×
Select the source of the ma	acro.	
Macro Name		
New Macro 🖌	Enter the macromodel nam	ne
C Empty circuit		
C Current circuit		
From file		
C From the Web		1
Browse		
Defaults	VHDL	Click the folder icon and navigate to the directory
Label: SCK#	Generate VHD	with the netlist.
Parameters:		L component
Help	< Back Next >	Cancel
	1	

## Figure 3. New Macro Wizard Start Window

Fill in an entry in the *Macro Name* field, and then click the folder icon to the right of the empty *From File* field. A pop-up directory window opens. Navigate to the folder containing the Spice netlist file and click on the file icon. For this example, the *New Macro Wizard* window should appear as shown in Figure 4.



New Macro Wizard
Select the source of the macro.
Macro Name
0PA830
C Empty circuit
C Current circuit
<ul> <li>From file</li> </ul>
C:\Local Directory\OPA830.lib
C From the Web
Browse
Defaults
Label SCK#
Parameters:
Help < Back Next > Cancel

Figure 4. New Macro Wizard Window with Entries

Leave the other fields as they are shown here and click the Next button. The next pop-up window (Figure 5) shows the netlist. Click the arrow on the right side of the top text field, and a list of the netlist's subcircuits are displayed. Select the appropriate subcircuit that represents the macromodel and click the *Next* button.

More than one subc Select the one you	ircuits or models found need from the list.	in the file.	
0PA830		•	
OPA830 IDEAL_D_0 RNOISE_FREE_0 RNOISE_FREE_1 VCVS_LIMIT_0 VCVS_LIMIT_1 VCVS_LIMIT_2 FEMT_0			
<pre>** merchantabi ** provided so ** and perform</pre>	with respect to lity or fitness is lely on an "as is ance is with the	for a particul: " basis. The + customer	Select the downward arrow and a drop-down list of the netlist subcircuits will appea
*			
The second s Second second sec	Analog eLab Des:	lgn Center, Te:	
<ul> <li>Part: OPA830</li> <li>Low Power, S</li> <li>Date: 2010-1</li> <li>Model Type:</li> </ul>	ingle-Supply, Wid 0-29 TINA		
<ul> <li>Part: OPA830</li> <li>Low Power, S</li> <li>Date: 2010-1</li> <li>Model Type:</li> <li>Simulator: T</li> <li>Simulator Ve</li> </ul>	ingle-Supply, Wid 0-29 TINA	leband Operatio	
* Part: OPA830 * Low Power, S * Date: 2010-1 * Model Type: * Simulator: T * Simulator Ve	ingle-Supply, Wid 0-29 TINA INA-TI rsion: 7.0.30.26	leband Operatio	
<ul> <li>Part: OPA830</li> <li>Low Power, S</li> <li>Date: 2010-1</li> <li>Model Type:</li> <li>Simulator: T</li> <li>Simulator Ve</li> </ul>	ingle-Supply, Wid 0-29 TINA INA-TI rsion: 7.0.30.26	leband Operatio	

# Figure 5. List of Subcircuits Found in the Macromodel Netlist

Highlight the subcircuit that serves as the main call function for the macro.

# 2 Assigning a Symbol

The next step is to pick a symbol for the macromodel. There are two options for creating a macro symbol:

- 1. Let TINA auto generate a symbol This option may be best for a unique model, or a model with a large number of I/Os.
- 2. Pick a suitable symbol from the existing TINA symbol library This option may be preferred if the model is for a common device, such as a five-pin op amp.

In either case, the symbol may be modified later using the TINA9-TI symbol editor that is found in the Windows\TINA9-TI start menu.

Highlight the subcircuit that serves as the main description of the model, and click the *Next* button as shown in Figure 5.



# 2.1 Auto Generate a Symbol

After selecting the main subcircuit in the previous step, the next pop-up window allows the choice of *Auto* generate shape or Load shape from library as shown in the upper left of Figure 6. Select *Auto* generate shape and TINA generates a symbol with the model pins located on the left and right sides of the default rectangular shape.

ew Macro Wizard	and the second se	X
Select the sha	pe you want to assign:	
<ul> <li>Auto generate</li> </ul>	shape	
C Load shape from the state of the state	om library	
All		-
Autoshape		
	IN+ - IN+	
		-
r ⊫Filter		
	igested shapes only.	
( Notice:	: If you can't find the shape you are looking heck this checkbox. )	
Search:		
Number of pins		
All		-
Shape type:		
All		
JA.		<u> </u>
Help	< Back Next >	Cancel

Figure 6. Symbol Selection Using the Auto Generate Option

Clicking the Next button allows the user to save the completed TINA9-TI macromodel to a local directory. In this example, the default name is OPA830.TSM



## 2.2 Load Shape From Library

If this option is selected, then a symbol may be chosen from the internal libraries of TINA symbols. This can be a convenient option for common macros with standard pin-outs such as 5-pin or 6-pin amplifiers. Figure 7, Figure 8, and Figure 9 show the steps after selecting this option.

Figure 7 shows the default pop-up window for this example. TINA has identified the macro as a five-pin device and has picked a list of candidate symbols from its internal libraries. The displayed symbol is associated with a five pin comparator. Clicking on the downward arrow on the right side of the symbol shows the other candidates, as shown in Figure 8.

w Macro Wizard		×
elect the shape you w	vant to assign:	
🔿 Auto generate shape		
Load shape from library		
All		-
<comparator5co></comparator5co>	In- * In+ * V+ V+	•
Filter ✓ Show suggested shap (Notice: If you ca. for, uncheck this of Search:	n't find the shape you are looking	
Number of pins		
All		-
Shape type:		
All		•
Help	< Back Next >	Cancel

Figure 7. Initial Pop-up Window for Shape Selection From Internal Libraries



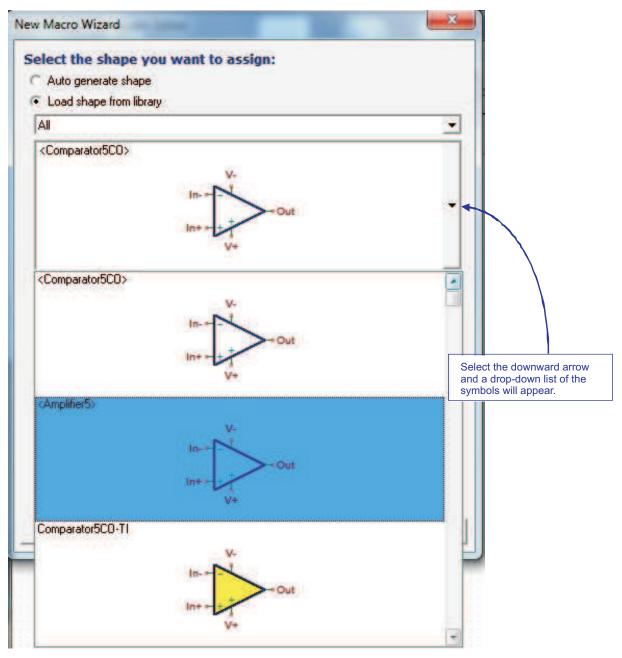


Figure 8. List of Devices.

# TINA has attempted to select likely candidates by cross-referencing the netlist I/Os with the internal symbol libraries.

If a suitable symbol does not appear, try unselecting the check-mark field *Show suggested shapes only* as shown in Figure 9. For this example it expanded the list of displayed symbols from about 50 to over 200.

If the list is too long to search easily, check the box *Show suggested shapes only* and select a single symbol library in the top-most field as shown in Figure 10 and Figure 11.



Auto generate shape				
<ul> <li>Load shape from library</li> </ul>				
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	In - V- In+ - V+		-	
Filter				
( Notice: If you	can't find the shape you	ı are looking	If a suitable syn appear, un-cheo Show suggeste	ck the
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Show suggested sh (Notice: If you of for, uncheck this Search:	can't find the shape you	ı are looking	appear, un-cheo	ck the
Show suggested sh (Notice: If you of for, uncheck this Search: Number of pins	can't find the shape you	ı are looking	appear, un-cheo	ck the
Show suggested sh (Notice: If you of for, uncheck this Search: Number of pins All	can't find the shape you	ı are looking	appear, un-cheo	ck the
Show suggested sh (Notice: If you of for, uncheck this Search: Number of pins	can't find the shape you	ı are looking	appear, un-cheo	ck the

Figure 9. Uncheck the Show Selected Shapes Box to Expand the Search of Internal Libraries.



<ul> <li>Auto generate shape</li> <li>Load shape from library</li> </ul>	¥.	
All		
All		
DEVICES MCU NS TEXAS		Selecting the downward an will show a drop-down list the internal symbol librarie
TINAICS	P 1	
	V+	
Filter		_
Show suggested s	can't find the st symbols, check the suggested shapes	e Show
Search:		
Number of pins		
Number of pins		
A MARKAN AND A PARTY AND A PARTY AND A		
All		

Figure 10. Narrow the Search of the Symbol Libraries from all to one of the internal libraries, if the symbol list is too long to be easily searched.



Assigning a Symbol

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<ul> <li>Auto generate shape</li> <li>Load shape from libra</li> </ul>		
TEXAS	Selecting the TEXAS symbol database will narrow the search to this library.	•
Comparator5C0-T1	InOut	-
	V+	
Filter Show suggested (Notice: If yo for, uncheck t Search:	shapes only u can't find the si his checkbox, )	
Show suggested (Notice: If yo for, uncheck t	u can't find the si	
Show suggested (Notice: If yo for, uncheck t Search:	u can't find the si	
Show suggested (Notice: If yo for, uncheck t Search: Number of pins	u can't find the si	

Figure 11. Narrowed the Search of the Symbol Libraries from All to one (TEXAS).

After selecting a default or library symbol, click the Next button. The next window allows you to crossreference the symbol pins and the subcircuit pins (netlist) as shown in Figure 12. The netlist is shown in the lower window with the netlist subcircuit pins appearing in blue font. The figure in the upper diagram shows the macro wizard's educated guess on the pin assignments between the symbol and the netlist's subcircuit (selected in Figure 5).



Assigning a Symbol

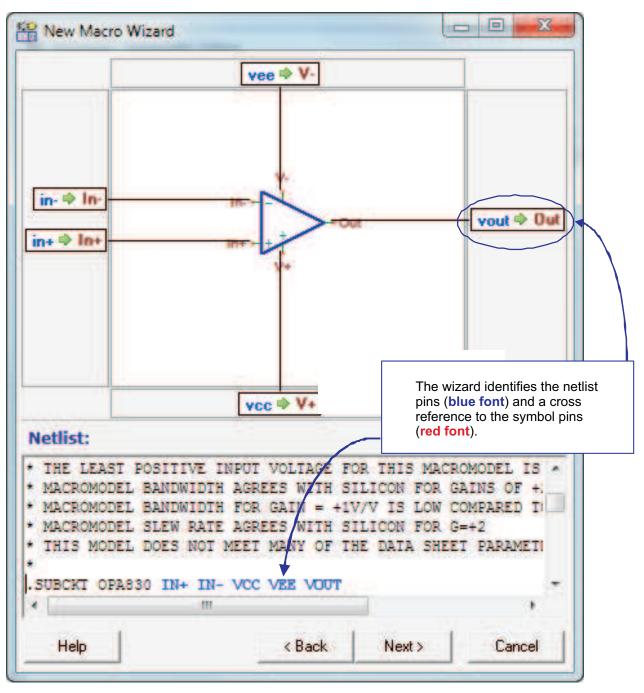


Figure 12. Default Cross-Reference Between Symbol Pins and Netlist I/Os

If any pin assignments need to be changed, this can be done by clicking and dragging the individual white boxes (showing the pin-to-pin translations) to new locations. Selecting the boxes often causes them to move to the margin at the bottom of the image as shown in Figure 13. From this location, the boxes can be dragged-and-dropped to the red contact points on the symbol pins, creating the new pin assignments.

After completing any changes, press the *Next* button and save the TSM file to a local directory to complete the macro.



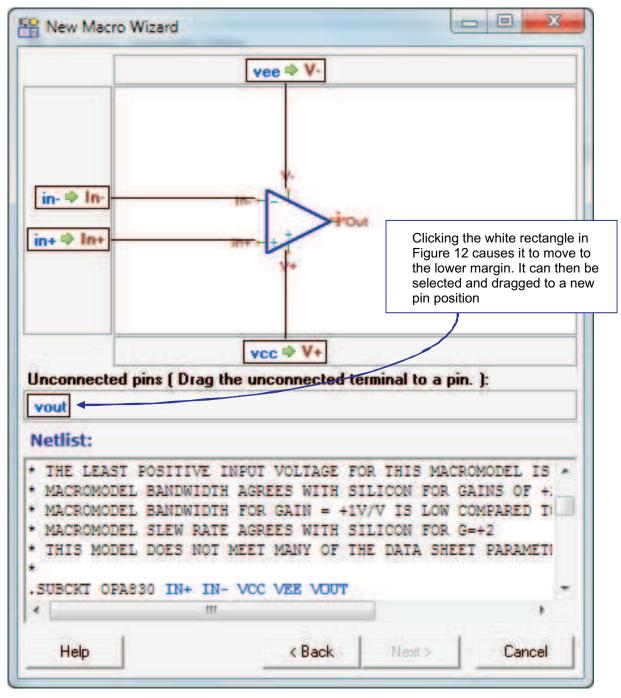


Figure 13. Clicking on the Netlist's V<sub>out</sub> pin moves it to the gray strip so it can then be placed on a different symbol pin.



# 2.3 Placing an instance of the new macromodel in a TINA-TI circuit schematic

After the new macromodel file (\*.TSM) has been created and saved, the macromodel may be instantiated (placed) into a circuit schematic by first selecting the Insert or Macro menu tab (see Figure 14). Next, navigate to the directory containing the macromodel file, select the desired macromodel file (OPA830.TSM in this example) and select the Open button. The window closes, and the mouse cursor shows the outline of the auto-generated shape. Left-click the mouse once the cursor is in the desired position in the schematic window and the shape should appear as shown in Figure 15.

💁 Noname - S	chematic Editor		- <b>·</b> ×
File Edit In:	sert View Analysis T&M Tools	TI Utilities Help	
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	Wire Ctrl+Space		
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Noname			
-€©¶ <u>Exit</u>			X: 265 Y: 0

Figure 14. Initial Step to Add a Macro to a Schematic.



Assigning a Symbol

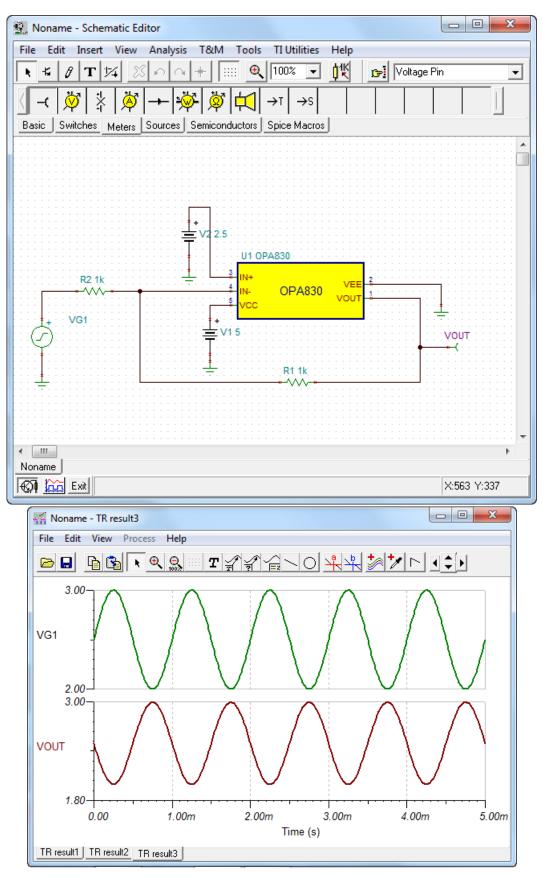
www.ti.com

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Figure 15. Newly Created Macromodel Placed (Instantiated) in a Schematic Window.

Complete the circuit by inserting and connecting additional components, and run the desired simulations. An example of a final schematic and the probe window showing the output waveform from a transient simulation appear below in Figure 16.





### Figure 16. Final Schematic



Assigning a Symbol

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Figure 16 Shows the macromodel shape and additional components, and probe windows showing the output waveform from a transient simulation.

**Viewing the Netlist** – If the netlist is unencrypted, it is possible to view the macromodel netlist in TINA. To do this, left-click the macromodel symbol and select *Enter Macro* in the pop-up menu The netlist viewer window opens within the TINA application window as shown in Figure 17. The schematic can still be viewed by selecting the appropriate tab on the lower left corner of the TINA application window. To close the netlist viewer select the *File/Close* menu tab.

Noname:U1 [MACRO]> - Netlist Viewer	
File Edit Analysis Help	
* OPA830	<u>^</u>
* (C) Copyright 2009 Texas Instruments Incorporated. All rights reserved	1. *****
<pre>** This model is designed as an aid for customers of Texas Instruments. ** TI and its licensors and suppliers make no warranties, either express ** or implied, with respect to this model, including the warranties of ** merchantability or fitness for a particular purpose. The model is ** provided solely on an "as is" basis. The entire risk as to its qualit ** and performance is with the customer ************************************</pre>	
· ·	
Line: 1 Col: 1	
Noname U1	
	X:579 Y:330

NOTE: The tabs for the schematic window and the viewer window (lower left).

#### Figure 17. Netlist viewer window

If the netlist is encrypted, it is not be possible to view the netlist content from within TINA, or any other text viewer. As an example, Figure 18 shows the netlist view of the TPS6300 macromodel. If the Spice netlist is encrypted and cannot be imported directly into TINA, please contact the E2E/Simulation and Models Forum for support.

TEXAS INSTRUMENTS

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🞇 <noname:u1 [macro]=""> - Netlist Viewer</noname:u1>	- D ×
Eile Edit Analysis Help	
*TPS63000	<b>_</b>
* * * * * * * * * * * * * * * * * * * *	
* (C) Copyright 2009 Texas Instruments Incorporated. All rights reserved.	
** This model is designed as an aid for customers of Texas Instruments. ** TI and its licensors and suppliers make no warranties, either expressed ** or implied, with respect to this model, including the warranties of ** merchantability or fitness for a particular purpose. The model is ** provided solely on an "as is" basis. The entire risk as to its quality ** and performance is with the customer	
*****	
* ** Released by: Analog eLab Design Center, Texas Instruments Inc. * Part: TPS63000 * Date: 03/29/2010 * Model Type: Transient * Given True	
* Simulator: TINA * Simulator Version: 7.0.80.96 SF-TI	
* EVM Order Number: TPS63000EVM-148	
* EVM Users Guide: SLVU156 - March 2006	
* Datasheet: SLVS520B - March 2006, Revised July 2008 * Model Version: Final 1.00 +	
· ************************************	
*	
* Updates: *	
* Final 1.00	
* Release to Web.	
* *************************************	
* Encrypted macro. Content can't be viewed.	
<u>त</u>	• •
Line: 1 Col: 1	
Noname U1/	

Figure 18. Netlist editor display for an encrypted netlist

# 3 References

1. Vladimirescu, V. (1994). The Spice Book. John Wiley and Sons, Inc. New York. ISBN 0-471-60926-9

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DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		
	TI 505 0		

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