

Use of KSKelvin Subckt Symbol from Autogenerated Model

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Introduction

- Purpose
 - This guideline show step-by-step instruction to use Subcircuit Symbol from KSKelvin Symbol Library for Autogenerated Model in Qspice
 - Focus on subcircuit (.subckt) model of X-device
- Device model from Texas Instrument OPA462 is used for this demonstration
 - Website : <https://www.ti.com/product/OPA462>
 - Description : OPA462, 180-V, wide bandwidth (6.5 MHz), high-slew rate (25 V/ μ s) unity-gain stable op amp
 - OPA462 Pspice Model (Rev. D) : <https://www.ti.com/lit/zip/sbomav9>
- Prerequisite
 - Knowledge of X-device (subcircuit / .subckt) and method of Auto-generate Symbol in Qspice
 - Reader can learn importing model and subcircuit from following reference
 - Importing 3rd Party Models into Qspice by Mike Engelhardt : <https://www.qorvo.com/design-hub/design-tools/interactive/qspice#videos>
 - General Reference Guideline in KSKelvin's Github : <https://github.com/KSKelvin-Github/Qspice/tree/main/Guideline>

Preparation – Download KSKelvin's Subckt Symbol

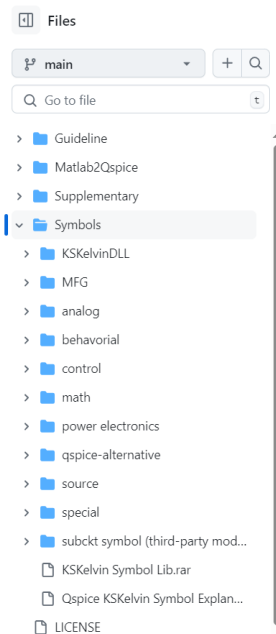
- Preparation

- Goto KSKelvin-Github Qspice

<https://github.com/KSKelvin-Github/Qspice>

- Goto Symbols folder

- [1] Download entire KSKelvin's Symbol Library from KSKelvin Symbol Lib.rar
- OR [2] Just goto sub-folder subckt symbol (third-party model) and download subckt model
- Extract .rar file or store .qsym symbol file in your local directory



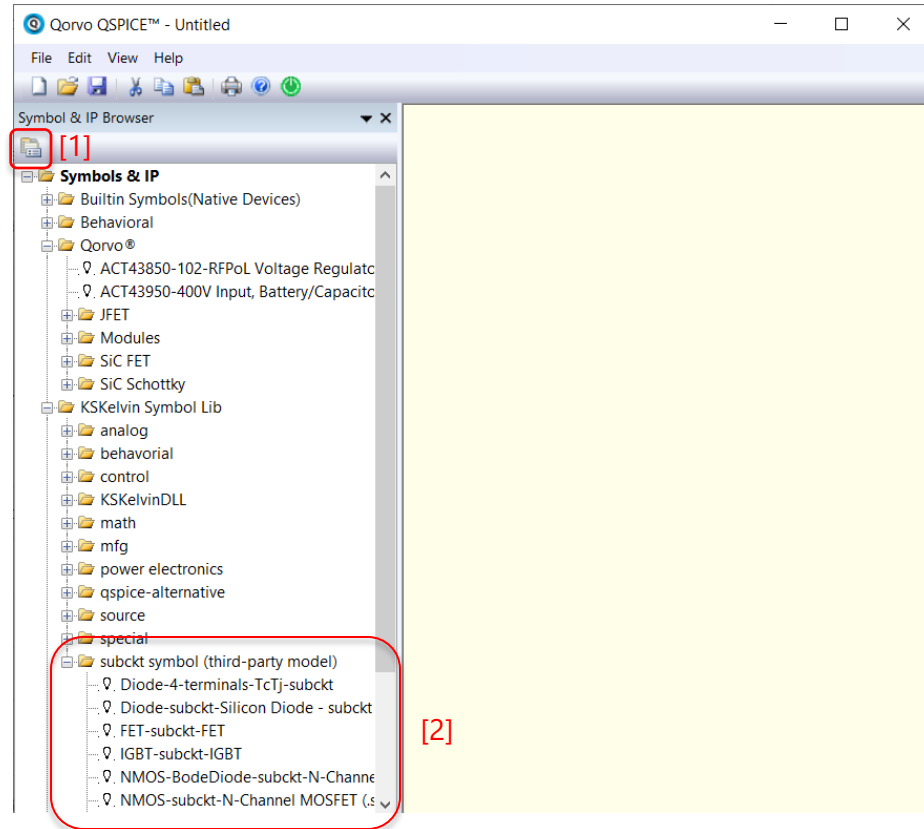
Qspice / Symbols

KSKelvin-Github rename generic symbol to subckt symbol 890516a · now History

Name	Last commit message	Last commit date
..		
KSKelvinDLL	Update Symbols Library	last week
MFG	MFG Qspice embedded subckt symbol	4 months ago
analog	Symbol Update	2 weeks ago
behavioral	Update Symbols Library	last week
control	Symbol Update	2 weeks ago
math	Symbol Update	2 weeks ago
power electronics	Symbol Update	2 weeks ago
qspice-alternative	Update Symbols Library	last week
source	Symbol Update	2 weeks ago
special	Update Symbols Library	last week
subckt symbol (third-party model)	rename generic symbol to subckt symbol	now
KSKelvin Symbol Lib.rar	Update Symbols Library	last week
Qspice KSKelvin Symbol Explanati...	Symbol Update	2 weeks ago

Preparation – Add Library Folder into Qspice

- Preparation
 - Open Symbol & IP Browser
 - View > Symbol & IP Browser
 - Add KSKelvin Symbol Lib
 - Click the Icon [1] and select symbol library folder
 - Now, you can browse the available subckt symbol [2]



Use KSKelvin Subckt Symbol from Autogenerated Model

Step 1 : Model Study

- Model Study
 - In general, model is named as .lib, .txt, .mod or .sub etc...
 - Use text editor to open and inspect the model
 - Only unencrypted model can be used for auto generate symbol in Qspice
 - [1] Identify the .subckt of device (in this example, OPA462), and confirm its pin sequence
 - [2] Verify if this subcircuit has dependent .subckt. If X-device can be found between .subckt and .ends, this device will call other subcircuit

```
OPA462.txt
70 * v. INPUT OFFSET VOLTAGE VS. TEMPERATURE
71 * w. INPUT COMMON-MODE VOLTAGE RANGE (Vcm
72 * x. INPUT OFFSET VOLTAGE VS. INPUT COMM
73 * y. INPUT/OUTPUT ESD CELLS (ESDin, ESDo
74 *****
75 .SUBCKT OPA462 IN+ IN- VCC VEE OUT [1]
76 *****
77 C_C1      N24458 N24659 20.4P
78 C_C10     N37029 N37037 18.72U
79 C_C13     0 N2425309 1F
80 C_C14     0 N2425287 1U
81 C_C15     0 N2425325 1F
82 C_C16     MID N56849 1F
83 C_C17     MID N57325 1F
84 C_C18     MID N59747 1F
85 C_C19     MID N59865 1F
86 C_C2      N25921 N25929 324.8P
87 C_C20     MID N65579 1F
88 C_C21     MID N65697 1F
89 C_C22     MID N68774 1F
90 C_C23     N72398 MID 1F
91 C_C24     MID N72391 1F
92 C_C25     MID N81574 1P
93 C_C26     MID N81664 1P
94 C_C27     MID SW_OL_OPA462 1N
95 C_C28     VCLP MID 1P
96 C_C29     VIMON MID 1P
97 C_C3      N27785 N27793 411.3P
98 C_C30     VOUT S MID 1P
99 C_C32     MID N2419074 23.5F
100 C_C33     MID N36262 7.0E-16
```

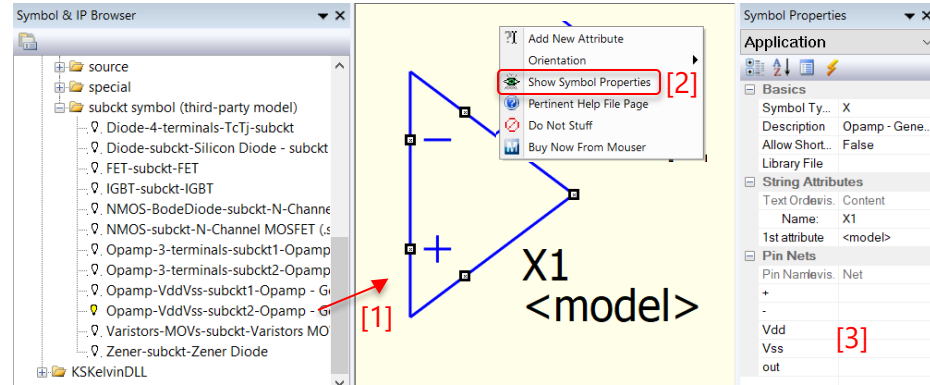
```
OPA462.txt
241 X_U31      N32510 MID MID CLAMP AOL_2_OPA
242 + INEG=-5.5
243 X_U32      N37037 MID MID N46041 ZO_SRC_C
244 + INEG=-100E3
245 X_U35      N56849 N57325 CLAW_CLAMP MID C
246 + INEG=-1.5E1
247 X_U36      N24207 MID FEMT_OPA462 PARAMS:
248 X_U37      ESDN MID FEMT_OPA462 PARAMS: I
249 X_U4 [2]   N25397 N24207 VOS_DRIFT_OPA462
250 X_U5      ESDN ESDP VCC VEE ESD_IN_OPA46
251 X_U6      N28678 MID N32236 MID N31389 M
252 .ENDS OPA462
253 *
254 .SUBCKT BLOCK_DC_H1_OPA462 1 2 3 4
255 H_H1      3 4 VH_H1 1K
256 VH_H1     1 2 0V
257 .ENDS BLOCK_DC_H1_OPA462
258 *
259 .SUBCKT BLOCK_DC_H2_OPA462 1 2 3 4
260 H_H2      3 4 VH_H2 1
261 VH_H2     1 2 0V
262 .ENDS BLOCK_DC_H2_OPA462
263 *
264 .SUBCKT BLOCK_DC_H3_OPA462 1 2 3 4
265 H_H3      3 4 VH_H3 -1
266 VH_H3     1 2 0V
267 .ENDS BLOCK_DC_H3_OPA462
268 *
269 .SUBCKT BLOCK_DC_S1_OPA462 1 2 3 4
270 S_S1      3 4 1 2 _S1
271 RS_S1     1 2 1G
```

other subcircuit

Use KSKelvin Subckt Symbol from Autogenerated Model

Step 2 : Confirm Equivalent Subckt Symbol

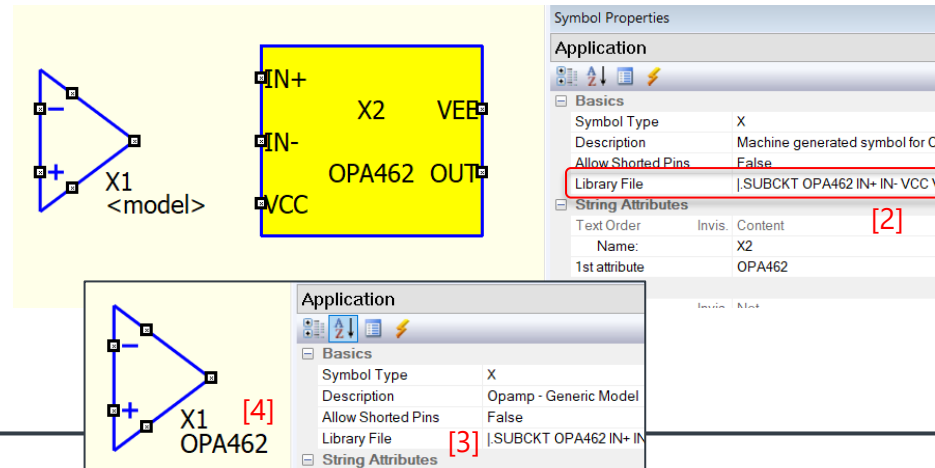
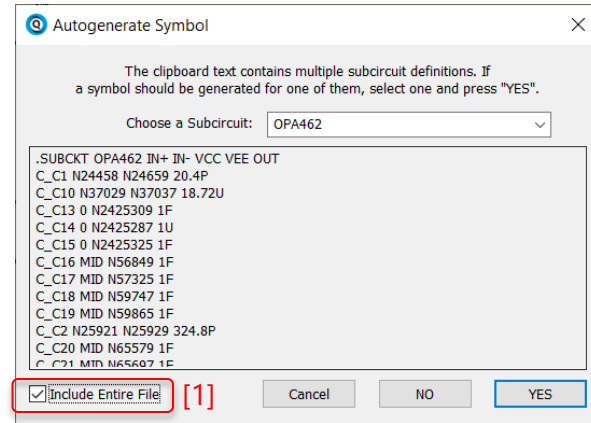
- Confirm Equivalent Subckt Symbol
 - In previous step, we confirm OPA462 is opamp model with 5 pins in order of IN+, IN-, VCC, VEE and OUT
 - .SUBCKT OPA462 IN+ IN- VCC VEE OUT
- [1] Drag "Opamp-VddVss-subckt2" into schematic
- [2] Right click on device, select **Show Symbol Properties**
- [3] In Pin Nets, confirm pin sequence match with .subckt model
 - Exact pin name is not important, only pin order (sequence) is important! Spice correlate a .subckt and its symbol through pin order
 - In general, 3rd party model opamp follow this same order, however, if there are additional pins or different pin order, user has to build corresponding symbol by themselves



Use KSKelvin Subckt Symbol from Autogenerated Model

Step 3 : Transfer one line embedded subckt

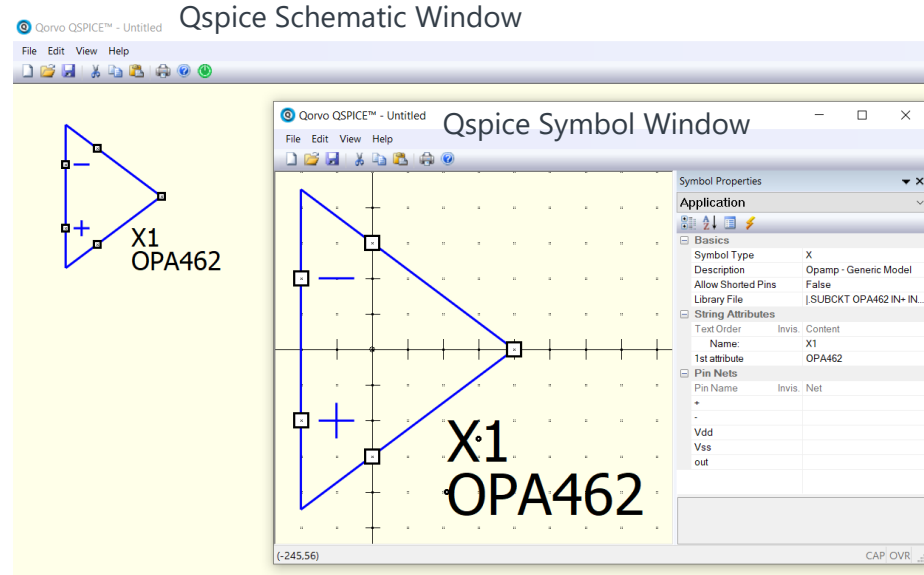
- Transfer one line embedded subckt
 - Go back to .subckt library file which opened with text editor
 - Select all text (or parent subckt and its all dependence) and copy it with Ctrl-C
 - Go back to Qspice schematic, Ctrl-V to paste subcircuit text
 - Autogenerate Symbol window will pop up, ensure **Include Entire File** [1] is selected if subcircuit has dependence. Select **YES** to autogenerate the symbol
 - Right click on autogenerated symbol, select **Show Symbol Properties**. In Library File, a one line embedded subckt syntax is generated
 - Click on this line, Ctrl-A > Ctrl-C, to select all and copy the text
 - Click on Subckt Symbol (X1 in this example), past it with Ctrl-V into Library File [3]
 - Finally, change <model> name in X1 to match .subckt name, which is OPA462 [4]
 - Device X1 is now available to be used for simulation purpose



Appendix

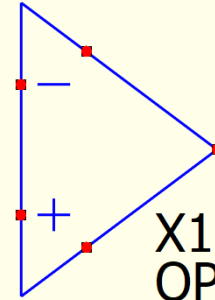
Appendix A : Save as Symbol (.qsym)

- Save as Symbol (.qsym)
 - The embedded subcircuit symbol created in this document can be saved as a Qspice symbol (.qsym) for other projects
 - In schematic window, hover mouse cursor over X-device, Ctrl-C to copy it
 - **File > New Symbol** to open a blank symbol window
 - In Symbol window, Ctrl-V to paste it
 - **File > Save** to save it as a .qsym



Appendix B : Subckt symbol with model file

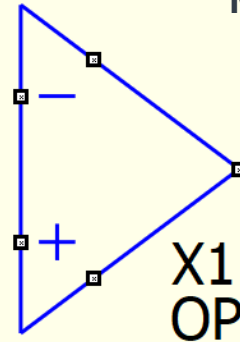
- Subckt symbol with model file
 - You may want to use subcircuit symbol to directly read from model file, which is particularly useful if modification or troubleshoot of library file is required
 - Follow step 1 and 2 in above procedure
 - Method 1
 - Change <model> name to match .subckt name
 - Use text to add .lib <model file name>
 - Method 2
 - Change <model> name to match .subckt name
 - In Symbol Properties, put <model file name> into Library File



Method 1

X1
OPA462

.lib OPA642.txt



Method 2

X1
OPA462

Symbol Properties		
Application		
Basics		
Symbol Type		X
Description		Opamp - Generic Model
Allow Shorted Pins		False
Library File		OPA642.txt
String Attributes		
Text Order	Invis.	Content
Name:		X1
1st attribute		OPA462
Pin Nets		
Pin Name	Invis.	Net
+		