

Using SPICE Model in LTSPICE

AND90315/D

INTRODUCTION

This application note explains how to use SPICE models in the popular circuit simulator LTSPICE.

DOWNLOADING THE SPICE MODELS

The SPICE models are available on the product page under Technical Documentation, Simulation Models. The SPICE model file, symbol file, and SPICE options file are in a ZIP compressed file. Download the ZIP file and extract all contents. Note that the filename extension can be the default “.txt” or changed to anything else, such as “.lib” or “.sub”, and the model will still work.

Save the symbol files under the LTSPICE default symbol folder. The folder is by default under: C:\Users\YOUR_USER_NAME\Documents\LTspice\lib\sym

We recommend creating an “onsemi” folder and copying the .asy files into it.

CONFIGURATION OF LTSPICE

```
.options ABSTOL=1n
.options CHGTOL = 1p
.options ITL1= 150
.options ITL2 = 150
.options ITL4 = 500
.options RELTOL =0.001
```

Figure 1. Content of the “SPICE Options.txt” File

The “SPICE Options.txt” file contains the options to set numerical accuracy of the SPICE simulator. We recommend the values shown in Figure 1 based on the optimized trade-off between simulation accuracy and ease of convergence.

Once this file is downloaded, you can use the SPICE command “.inc” to include the file in your circuit file. We will show how to do this in later section.

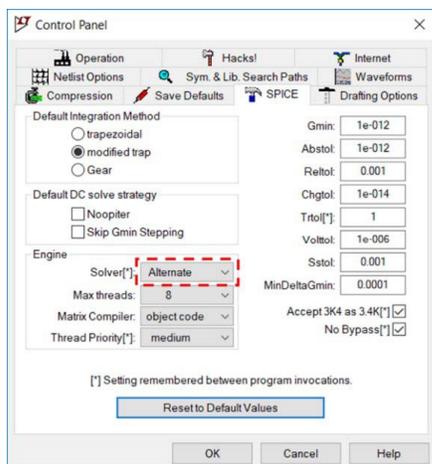


Figure 2. LTSPICE Control Panel Solver Setting

The last step is in the LTSPICE menu open “Tools → Control Panel”, and under the “SPICE” tab, change the solver to “Alternate” from “Normal”. Per LTSPICE manual, the “Alternate” solver runs at half the speed but with one thousand times more internal accuracy. We recommend this setting to enhance convergence and accuracy when simulating onsemi SiC Cascode JFET devices.

USING THE MODELS FOR SPICE SIMULATIONS

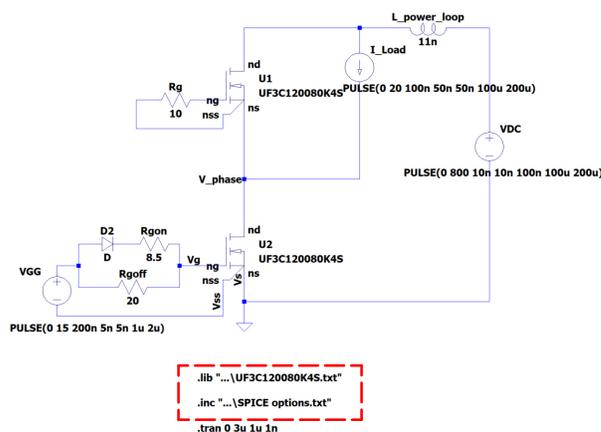


Figure 3. Example Half-bridge Double Pulse Circuit

Now let us use a simple half-bridge double pulse circuit to demonstrate how to build and simulate a circuit, as shown in Figure 3.

First type the “.lib” command to point to the location where the SPICE model file is saved. And type the “.inc” command and point to the “SPICE Options.txt” file.

Now let us insert the onsemi UF3C120080K4S device into the circuit. From menu, go “Edit → Component”. This should open the “Select Component Symbol” Window, as shown in Figure 4. The default directory you see should be C:\Users\YOUR_USER_NAME\Documents\LTspice\lib\sym

And you can locate the onsemi symbol files in the onsemi folder, if you have created one.

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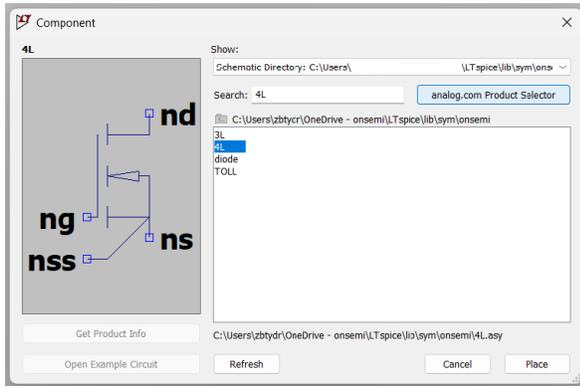


Figure 4. Selecting the onsemi Symbol

Because in this example the UF3C120080K4S part is SiC Cascode JFET in 4-lead TO247 package, we choose the symbol “4L”, as shown in Figure 4. The inserted symbol looks like Figure 5.

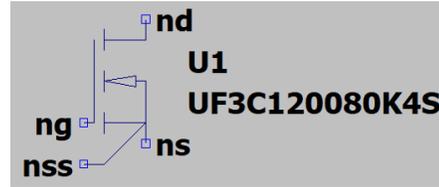


Figure 6. onsemi SiC Cascode JFET Symbol After Replacing with Correct Part Name

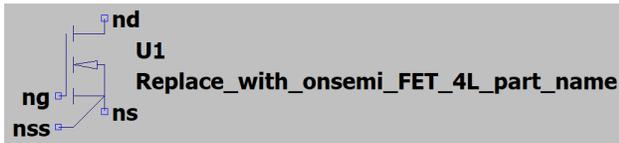


Figure 5. onsemi SiC 4L FET Symbol

Now right click the text “Replace_with_onsemi_FET_4L_part_name”, and type in the part name you would like to use.

After inserting the other circuit components and setting up the transient simulation, we can run the simulation and probe the V_{gs} , I_{ds} , and V_{ds} of the lower Cascode JFET:

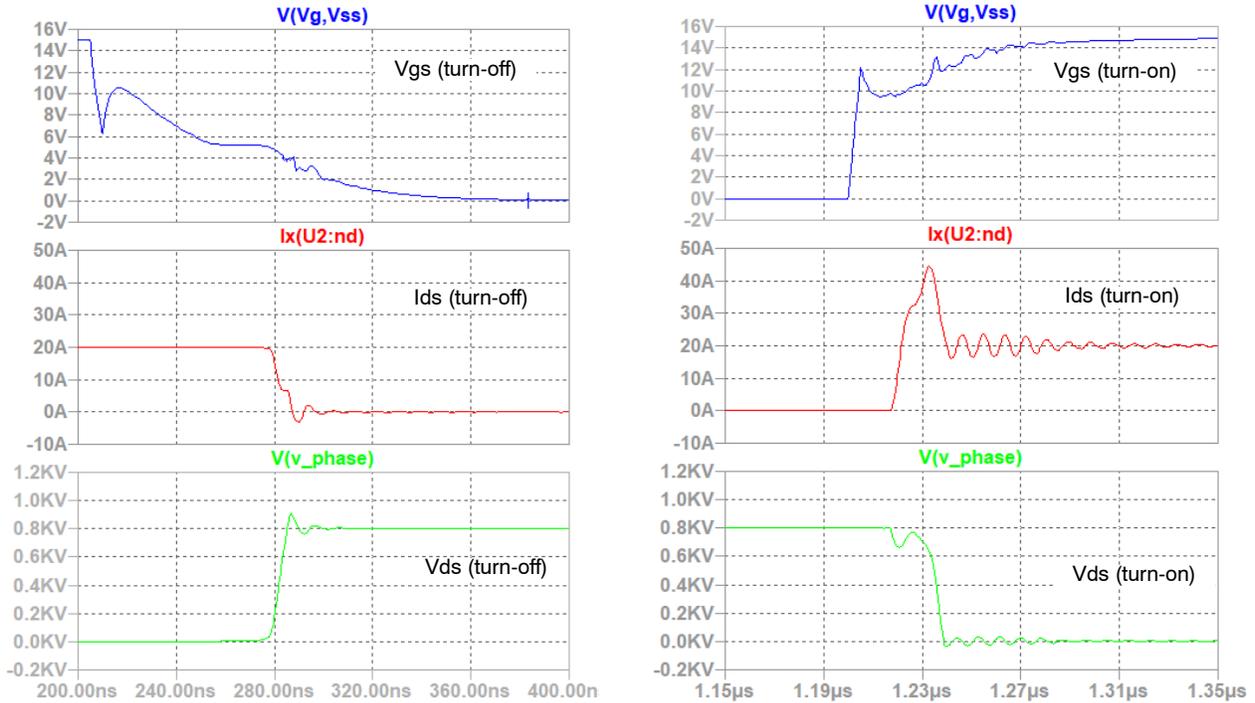


Figure 7. Switching Waveforms from LTSPICE Transient Simulations

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