

Figure 3: USCi Symbol Files in LTC... Sym/USCi Directory

To associate the UJ2D1205T SPICE file to a diode symbol, open the generic diode symbol in the LTC “Sym” folder, and save it in a folder just under the LTC “sym” folder using the devicename.asy (UJ2D1205T.ASY) naming convention (Figure 3).

To complete the association, open “Edit Attributes” from under the Edit menu (Figure 4). As the UJ2D1205T model is a subckt, change “D” in the prefix field to “X”, and in the value field, change “D” to the subckt name: UJ2D1205T. The Symbol and models are now associated by name.

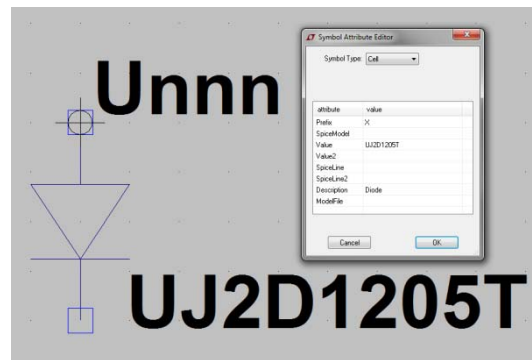


Figure 4: Edit Attributes

To use the device, just as in spice netlists, a .LIB statement needs to be added to a schematic to direct LTSPICE to the location of the spice file. Skipping ahead, Figure 6 shows several .LIB statements in a schematic.

The .LIB statements may seem tedious, but they are convenient when one wishes to simulate customized models of the same device without having to create a new device for each variation. Copy the spice file to a different location, modify it, and by swapping out different .LIB path statements, one can run simulations with different device parameters without creating new symbols, or affecting other schematics that rely on the original model.

1.3 Creating a Cascode Symbol

In the case of the cascode, an existing symbol does not exist. The cascode symbol can be created from scratch, but it is simpler to modify an existing symbol. For the cascode, the NMOS symbol is a good choice. Open the NMOS symbol from the LTC library, and save it as UJC1210K.ASY in the same USCi folder as the UJ2D1205T (Figure 3).

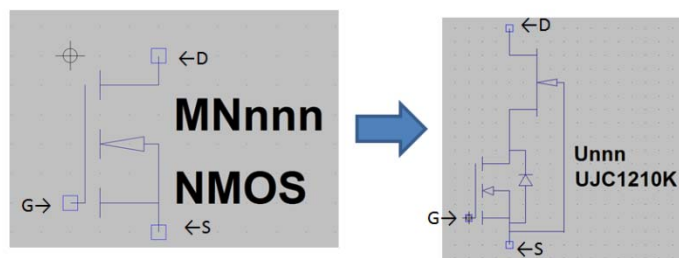


Figure 5: Converting NMOS Symbols to Cascode

With the newly renamed UJC1210K.ASY, a few cut, copy, and pastes can create a cascode symbol (Figure 5). The most important element in the symbol is that it has the same number of pins as the subckt, and they are in the same numeric sequence as listed in the SPICE model. The sequencing of the NMOS aligns with the UJC1210K.SUB subckt statement, so no change is required.

If there is any question of a pin’s name or number, a quick right click on a pin can confirm its name and sequence. To complete the symbol process, as with the UJ2D1205T, open up Edit Attributes and type “X” into the Prefix and the model name “UJC1210K” in the Value field.

This Symbol is now complete, and the device is ready to be used in a circuit. The .LIB statement requirements still apply. By the time this paper is posted, a cascode symbol may be available for download on the USCi website.

1.4 Double Pulse Tester

It is now time to use the devices. For those unfamiliar with a double pulse tester (Figure 6), it is a methodology used to measure the reverse recovery of a diode, or switching losses in a power device.

In operation, the Power Switch (UJC1210K, X2) is turned on, and the current ramps through the inductor, L1. The amount of time X2 is “on” sets the current for the measurements. When the test current is reached, X2 is cycled off/on.

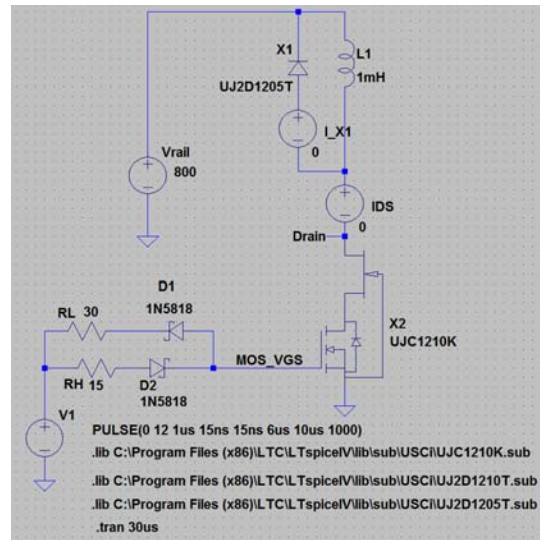


Figure 6: Double Pulse Circuit

Some results are shown In Figure 7. Eon, Eoff and Q_{RR} are quantified, and a selection of waveforms are shown. Although it is always best to consider simulations as “relative” vs. “absolute”, a bevy of useful information can still be pulled from the data. By adding layout considerations into the schematic/simulation, the designer can continue to hone a collection of circuits that mimic the real work, and shorten design time. A well thought out simulation may highlight a nuance that needs to be accounted for in a system design, and thus be caught early and save days if not weeks of development time. In the power/analog world, simulations are not a substitute for the real lab experience, but they can make that lab experience much more pleasant.

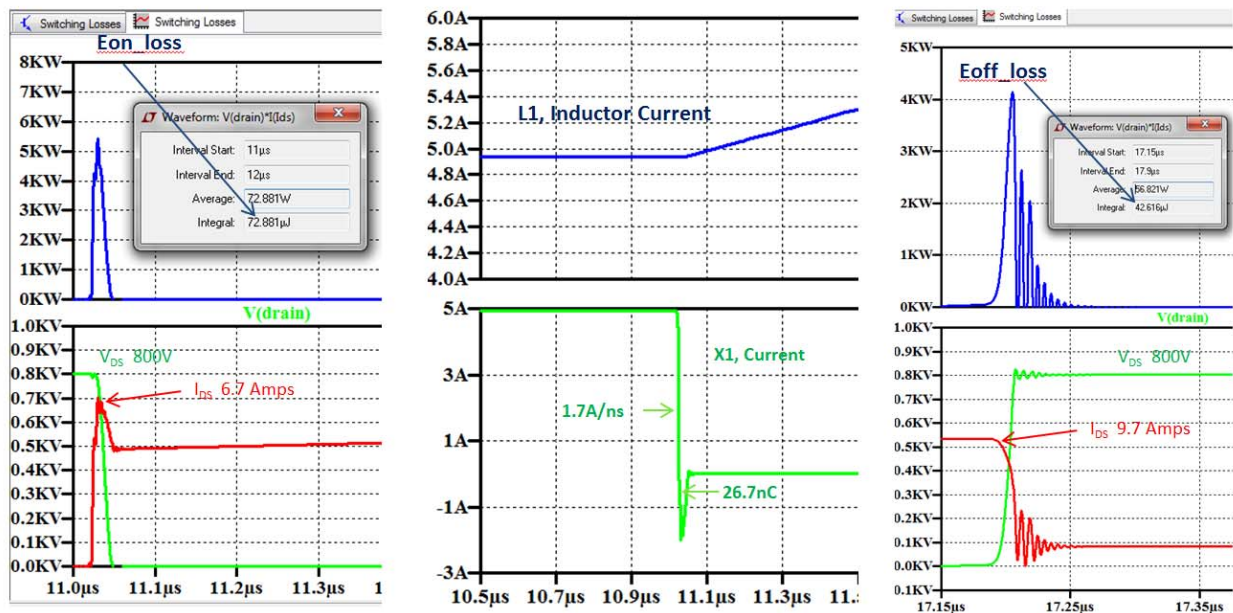


Figure 7: Switching Dynamics