How to Create Sub-Circuits in PSpice

If there is a circuit that is large and consists of many small circuits, each of the small circuit can be converted into a sub-circuit as one-port network or two-port network, i.e. one set of terminals to be connected to rest of the circuit, generally output ports, or two sets of terminals to be connected to rest of the circuit, both input and output ports. Each of the sub-circuit can be represented by just a rectangular box with set of terminals coming out of the box as shown in figure 1,

Figure 1: AM Signal Generator as Sub-Circuit

Let’s create a MOSFET Common-Source Amplifier as shown in figure 2

Figure 2: MOSFET Common-Source Amplifier with Open Input and Output Terminals
From *Place* menu tab, choose *Hierarchical Port*. You can do the same by pressing *Place Port* button from toolbar. Choose *PORTLEFT-L/CAPSYM* and connect it to *Vout* and *PORTRIGHT-R/CAPSYM* and connect it to *Vin*, as shown in figure 3. Change Names of these ports to suitable names according to your circuit. Re-name your schematic and page to some suitable name, e.g. MOSFET_Amp

![Figure 3: MOSFET Common-Source Amplifier with Hierarchical Ports](image)

Create a new schematic under the same project, **make it root**, and open a new page. Re-name your schematic & page to a suitable name. From *Place* menu tab, choose *Hierarchical Block*. Under *Reference*, choose a name for your block, under *implementation type*, choose *Schematic View* and under *implementation name*, put down the actual name of the page that you have given to the MOSFET amplifier page; in our case it is *MOSFET_Amp*.

![Figure 4: Place Hierarchical Block Dialogue Window](image)
Once you submit, your mouse will change into a cross hair. Drag your mouse with left mouse button pressed, you will see a rectangle. Choose a suitable size for rectangle and release your mouse button. Your sub-circuit is ready!

![MOSFET Amplifier Sub-Circuit](image)

*Figure 5: MOSFET Amplifier Sub-Circuit*

If you double-click your sub-circuit, it will open the actual circuit enclosed in it. This sub-circuit can be used with any circuit as input and any circuit as output. Let’s connect a signal source at the input and a resistor at the output to observe the amplification.

![MOSFET Amplifier Sub-Circuit with Input Source and Output Load](image)

*Figure 6: MOSFET Amplifier Sub-Circuit with Input Source and Output Load*

Gain of the amplifier \( \frac{v_{out}}{v_{in}} \) is around 45 as can be seen from the following simulation.
Figure 7: Input (blue) and Output (red) Waveforms