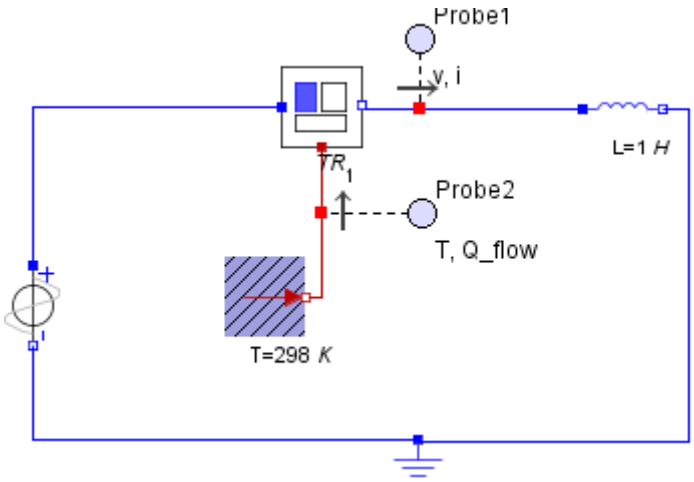
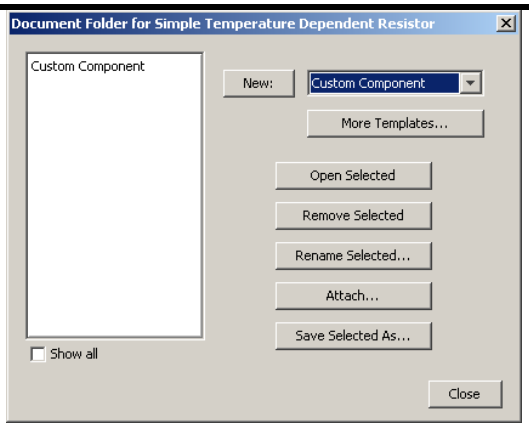
Creating a Simple Temperature-Dependent Resistor using Custom Components

In this tutorial, we will create a temperature dependent resistor whose resistance varies as

$$r(t) = 0.1\ T(t)^2$$

We will then use this in a MapleSim model. The final model will look like this:



Start MapleSim and click on **View Document Folder**	
Select *Custom Component* from the drop-down menu. Click **New...** Click **OK** Double-click on **Custom Component** in the list on the left. You will now switch into the Maple environment.	
Change the component name to **TempResistor**	

Under **Component Equations**, make the following change to **eq**, **params initialconditions**, and ***DynamicSystems***

Make sure you press **Enter** after every change.

$$eq := [v(t) = vp(t) - vn(t), r(t) = 0.1 \cdot T(t)^2, v(t) = i(t) \cdot r(t), q(t) = i(t) \cdot v(t)]$$

$$params := [\,]$$

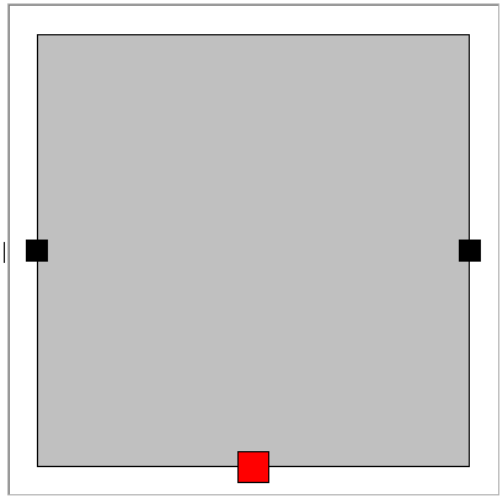
$$initialconditions := [\,]$$

$$sys := DynamicSystems[AlgEquation](eq, inputvariable = [vp(t), vn(t), i(t), T(t), v(t)], outputvariable = [r(t), q(t)])$$

Scroll down to **Component Ports**

Click ***Clear All Ports***

Click ***Add Port*** three times. You should end up with the diagram on the right.

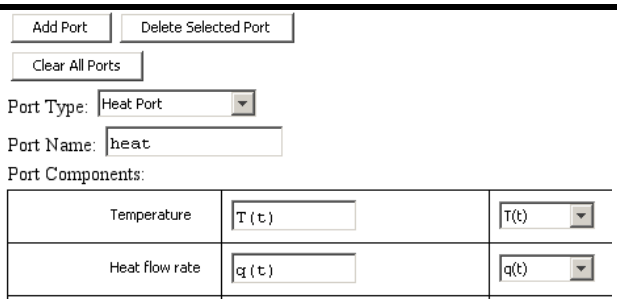


Click on the bottom port.

Under **Port Type** select **Heat Port**

In the drop-down box next to **Temperature**, select **T(t)**

In the drop-down box next to **Heat flow rate** select **q(t)**

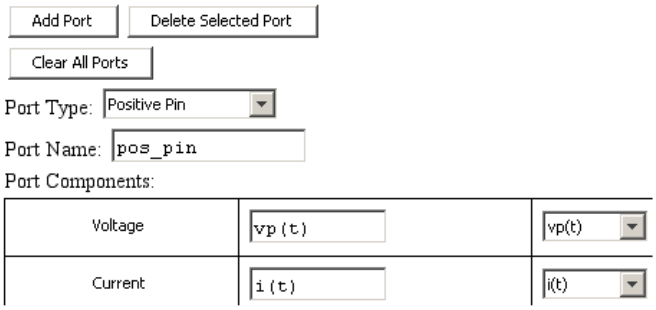


Click on the left port

Under **Port Type** select **Positive Pin**

In the drop-down box next to **Voltage**, select **vp(t)**

In the drop-down box next to **current** select **i(t**)

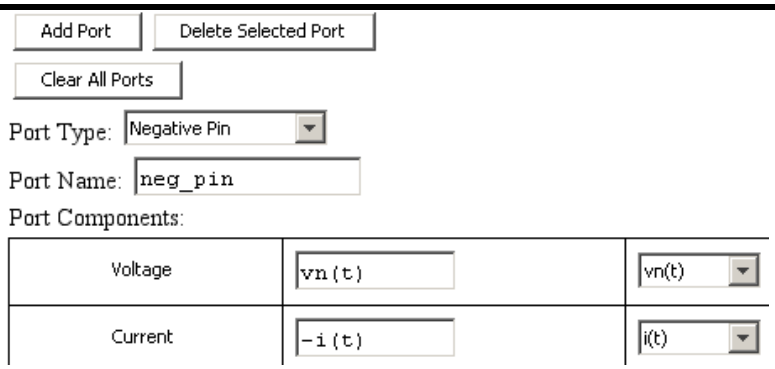


Click on the right port

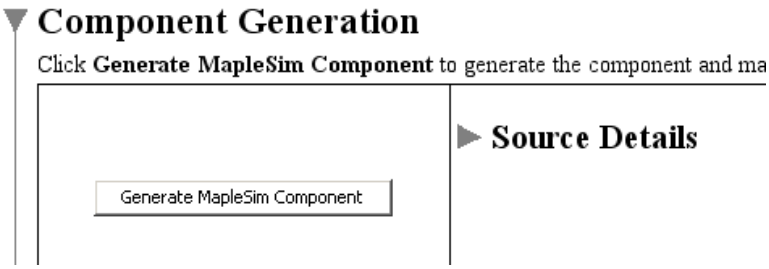
Under **Port Type** select **Negative Pin**

In the drop-down box next to **Voltage**, select **vn(t)**

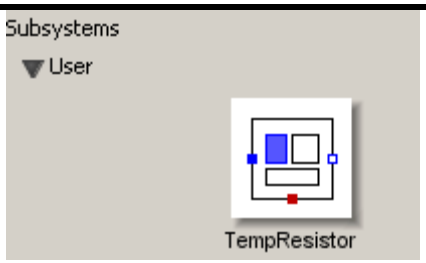
In the drop-down box next to **Current** rate select **i(t)**. Change this to **–i(t)**



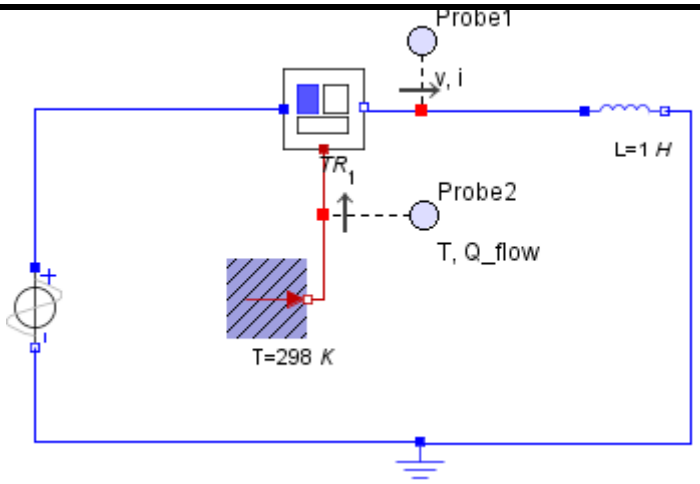
Under **Component Generation**, click on **Generate MapleSim Component**.



You should now find yourself back in the MapleSim environment. In the Subsystems pane you should find the Custom Component you've just created.



Create the following model and add Probes at the appropriate points.



Electrical > Analog > Sources > Sine Voltage

Electrical > Analog > Common > Ground

Electrical > Analog > Common > Inductor

Thermal > Boundary Condition Controls > Fixed Temperature (Change its temperature to 298K)

Click **Run Simulation**.