NIS(V)3071 PSpice User's Manual

UM70107/D

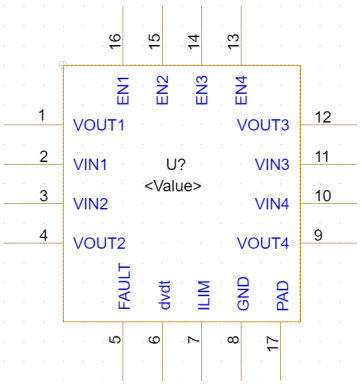


Figure 1. PSpice Model Block

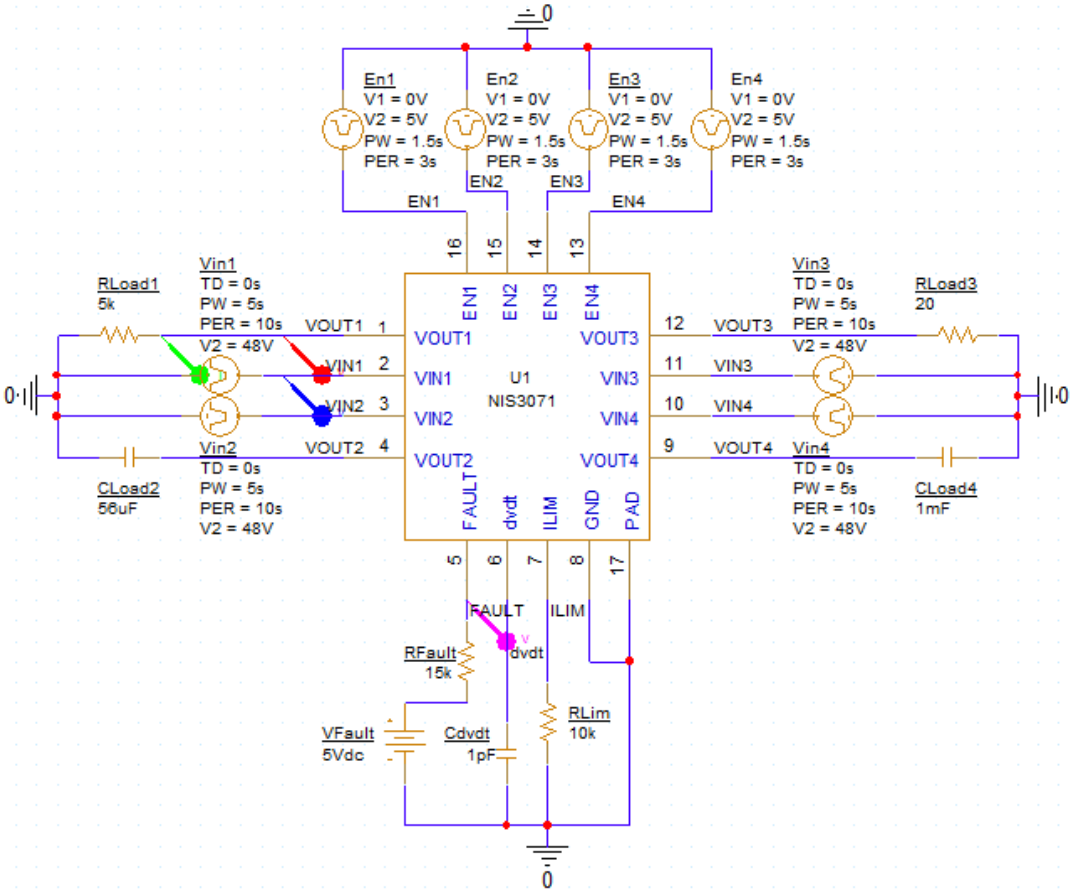
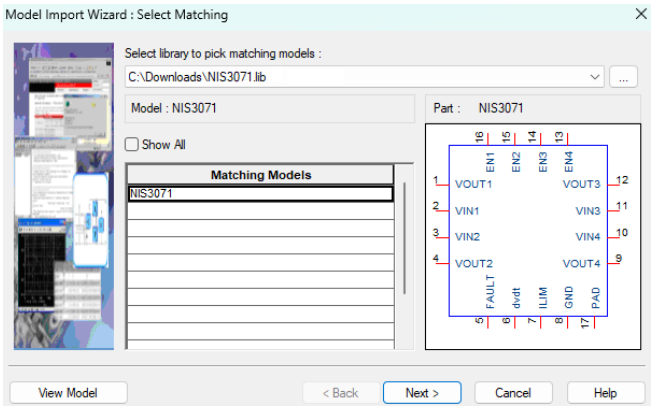


Figure 2. PSpice Model Set−Up

INSTRUCTIONS

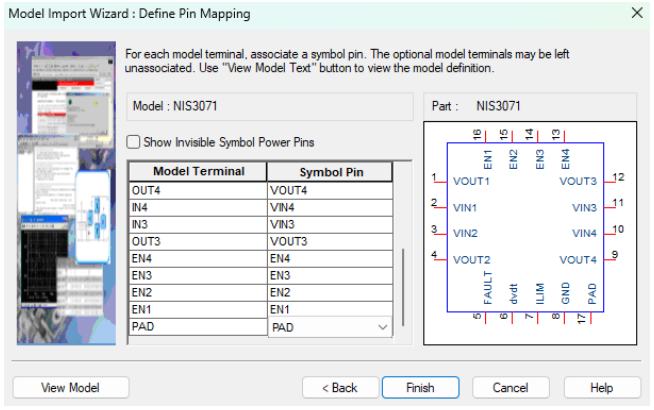
Attaching PSpice Model to Symbol

1. Create a symbol in OrCAD with the 17 pins defined in both the datasheet and Figure 1 above.
2. Choose “Associate PSpice Model” and select the NIS3071.lib file.
3. Select NIS3071 in the Matching Models section and click next.



4. Choose the correct symbol pin associated with each Model Terminal and then click finish.

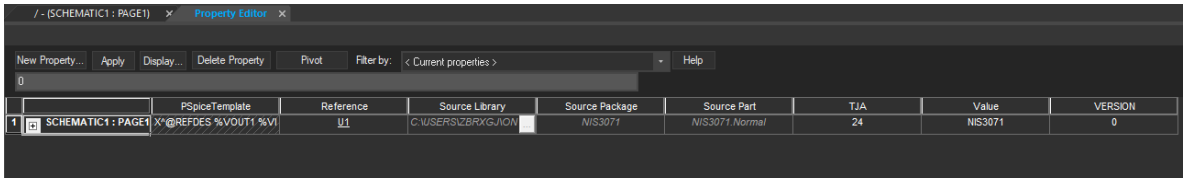
   NOTE: *The Model Terminals are named with the convention in the NIS3071 Datasheet.*



Setting Up Symbol

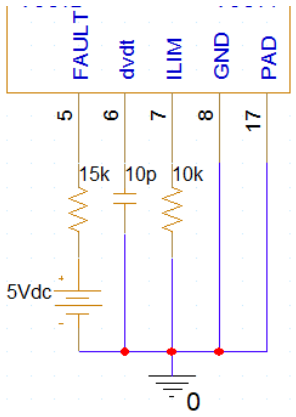
1. Place the symbol in your schematic, then double click to open the properties menu.
2. On the far−right side of the property editor, there is a text boxed labeled VERSION, set the value below to 1 for auto−retry version, or 0 for latching version of NIS3071.
3. The text box in the property editor labeled TJA is for the θ_{JA} value of the board being simulated, input the correct value in the textbox below.

   NOTE: *This value is to show off the devices thermal shutdown feature.*

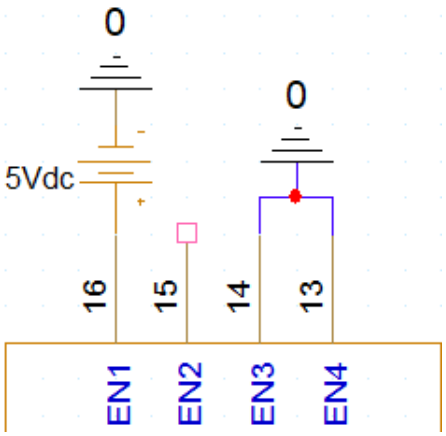


4. Connect a resistor to I_{lim} pin. The I_{th} and I_{CB} trip points are determined through this resistor value, so be sure to set them accordingly using the NIS3071 Datasheet.

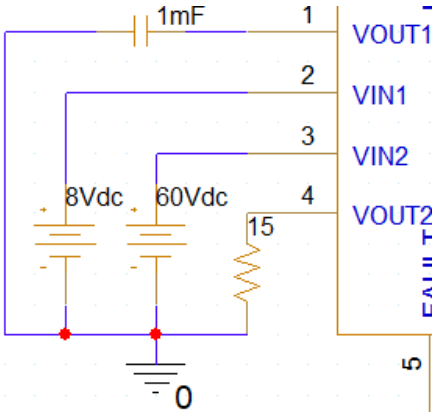
5. Connect a capacitor to the dvdt pin. The capacitor value (in pF) will determine the slew rate of the output when enabled, set this value using the NIS3071 Datasheet.
6. Connect a 5 V source to the FAULT pin through a 15 kΩ resistor to use the fault detection feature. Otherwise leave it open.
7. Connect GND and PAD pins to ground.



8. Connect Enable Pins to controlling source, leave open for always on, or ground for always off.

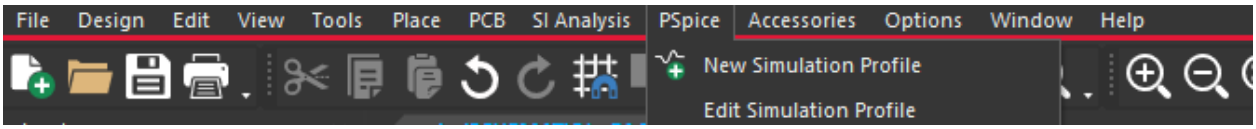


9. Connect Output Pins to a load and Input pins to a source.

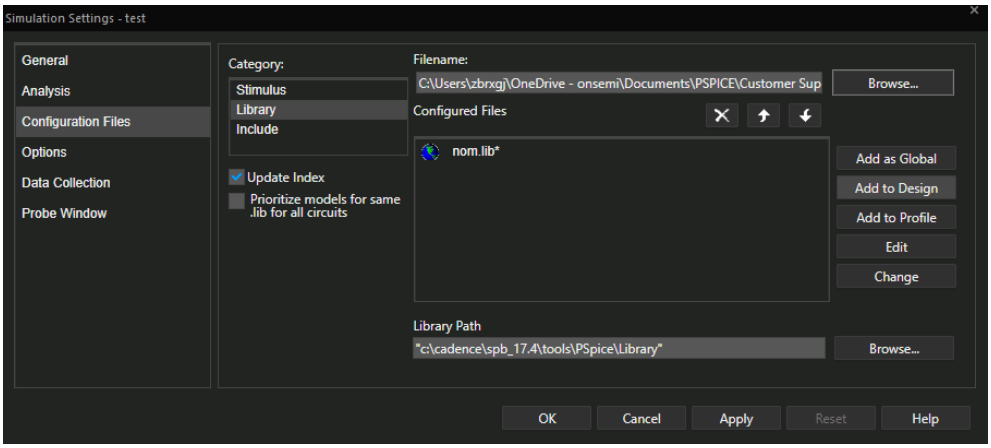


Simulating Device

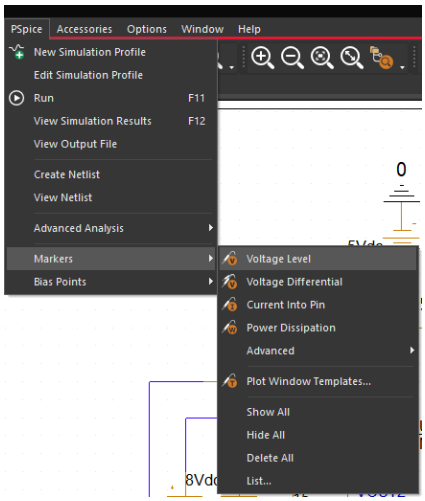
1. Select PSpice → New simulation profile.



2. Name the Simulation and click create.
3. Go to configuration files, select browse, and select the NIS3071.lib file.
4. Select “Add to Design”.



5. Set Up the analysis to be performed in the Analysis section, then click apply and OK.
6. Connect voltage probes to points of interest. It is recommended to connect to one of the input test points, one of the output test points, and to the fault pin test point.



Functionality Tests

Enable Testing

- The separate enables control whether each of the associated outputs are on (e.g. EN1 controls OUT1). The enables are pulled up internally but can also be pulled up to 5 V externally, as shown in Figure 3 below.

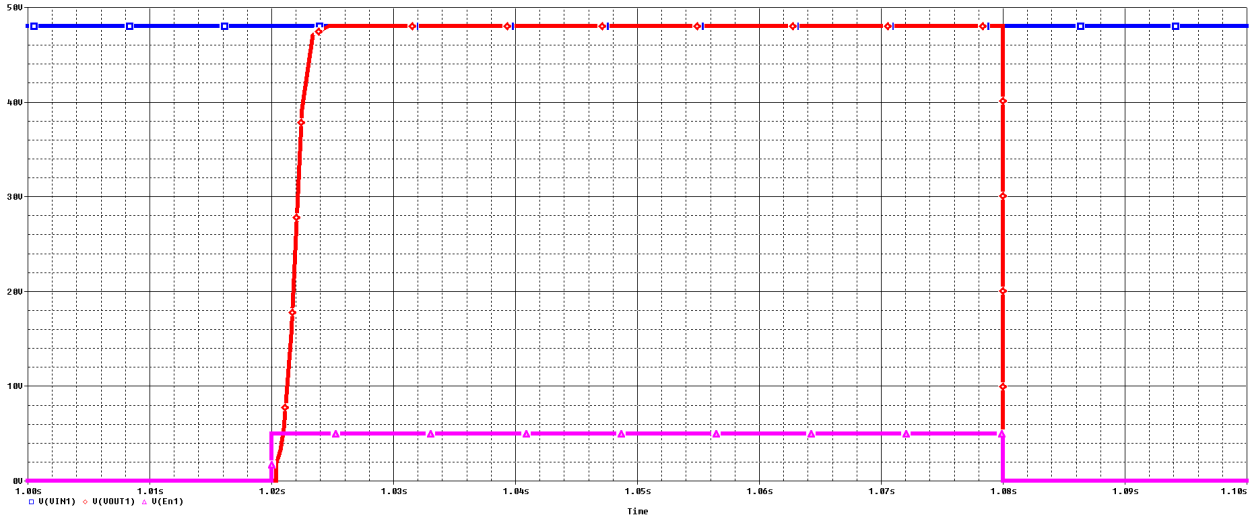


Figure 3. Turning on Output with Enable

Paralleling Channels

- This device allows for each of the 4 channels to operate independently of one another, or in parallel to increase the maximum supported load current. Each channel can have 2.5 A max of continuous current and will turn off independently due to fault conditions.

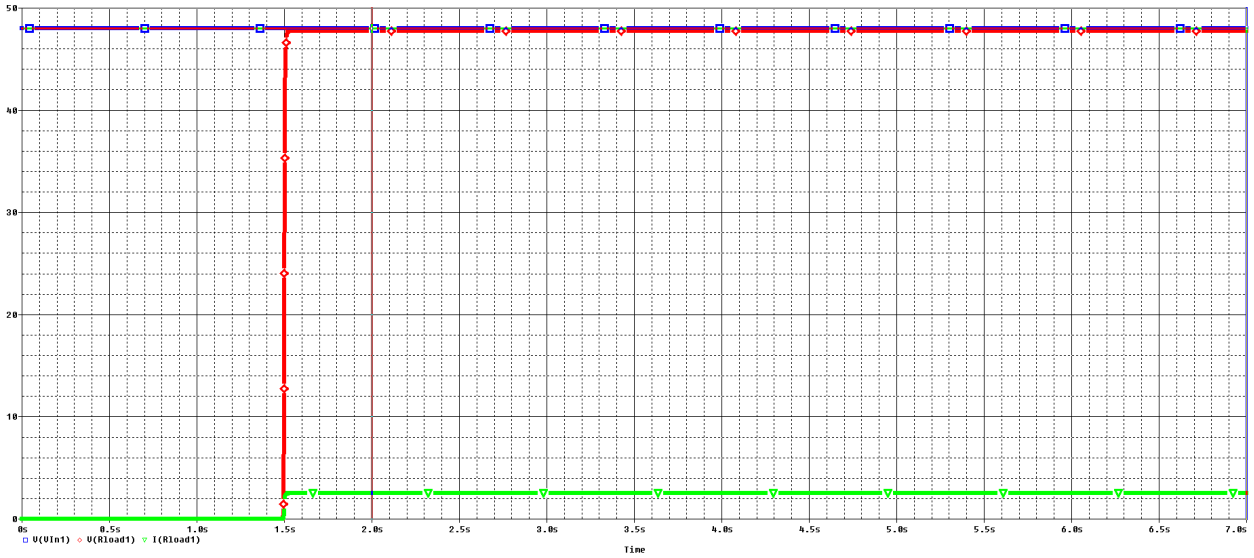


Figure 4. Channel 1 with 2.5 A Continuous Current

Under Voltage Lock Out

- This device will automatically disconnect the output when the input voltage is below 6 V as can be seen in Figure 5 below.

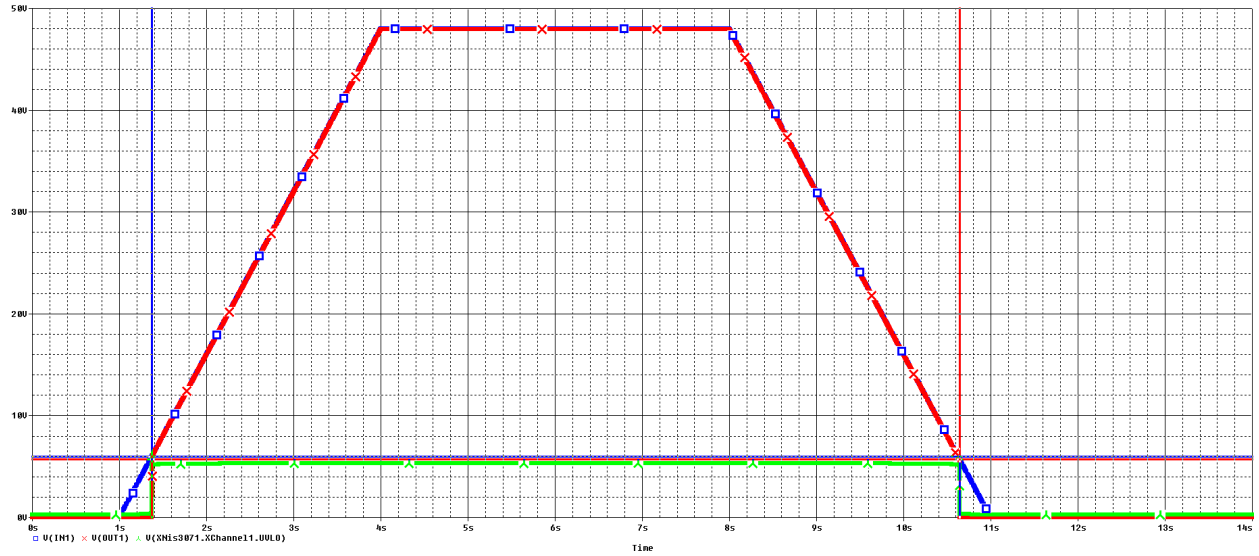


Figure 5. Slow Input Ramp to Show UVLO

Variable Slew Rate

- The turn on time (or slew rate) of the output can be adjusted by connecting a capacitor from the dvdt pin to ground. Refer to the NIS3071 data sheet for figures that will assist in selecting the correct capacitance for a given slew rate.

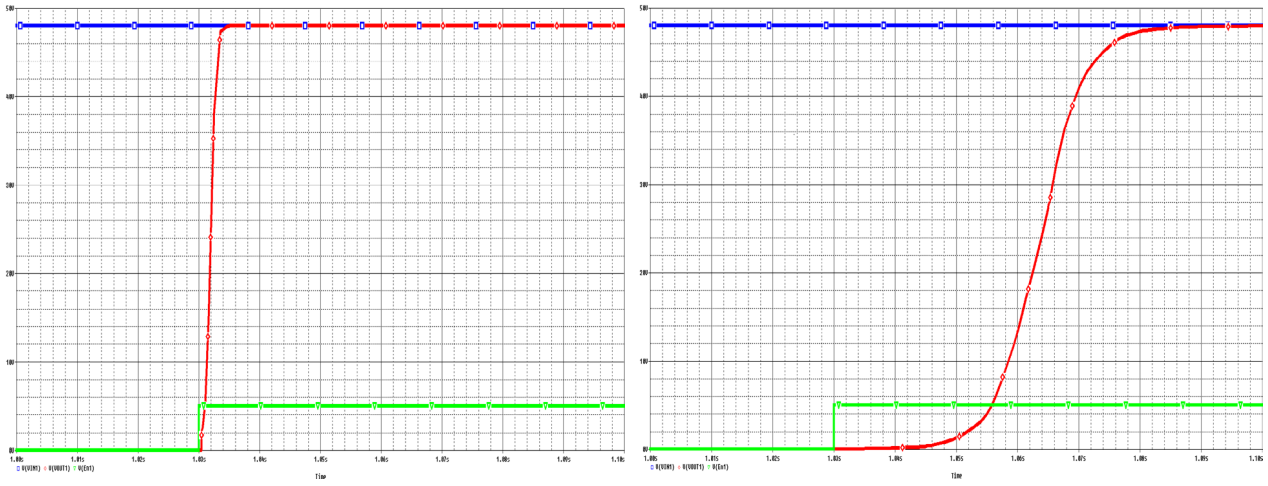


Figure 6. Turn on Time for Increasing DVDT Capacitance

I_{TH}

- I_{TH} is a threshold current that, when reached or exceeded for longer than 1.5 ms, will turn off the eFuse channel. The value of I_{TH} is set by R_{Lim} and that relationship can be seen in Figure 7 below.

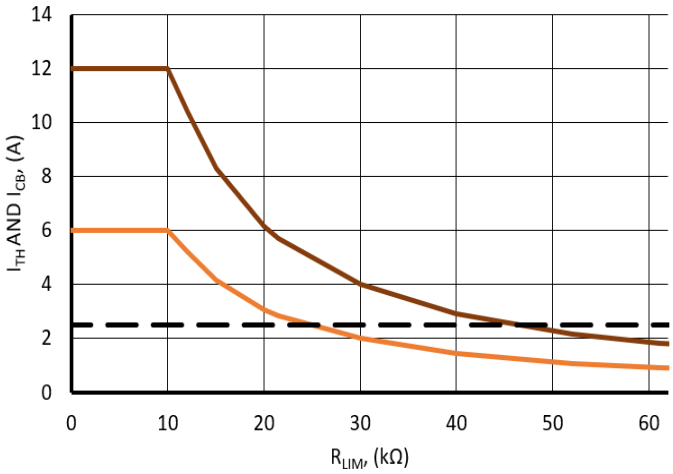


Figure 7. Current Trip Level Increasing R_{Lim} Resistance

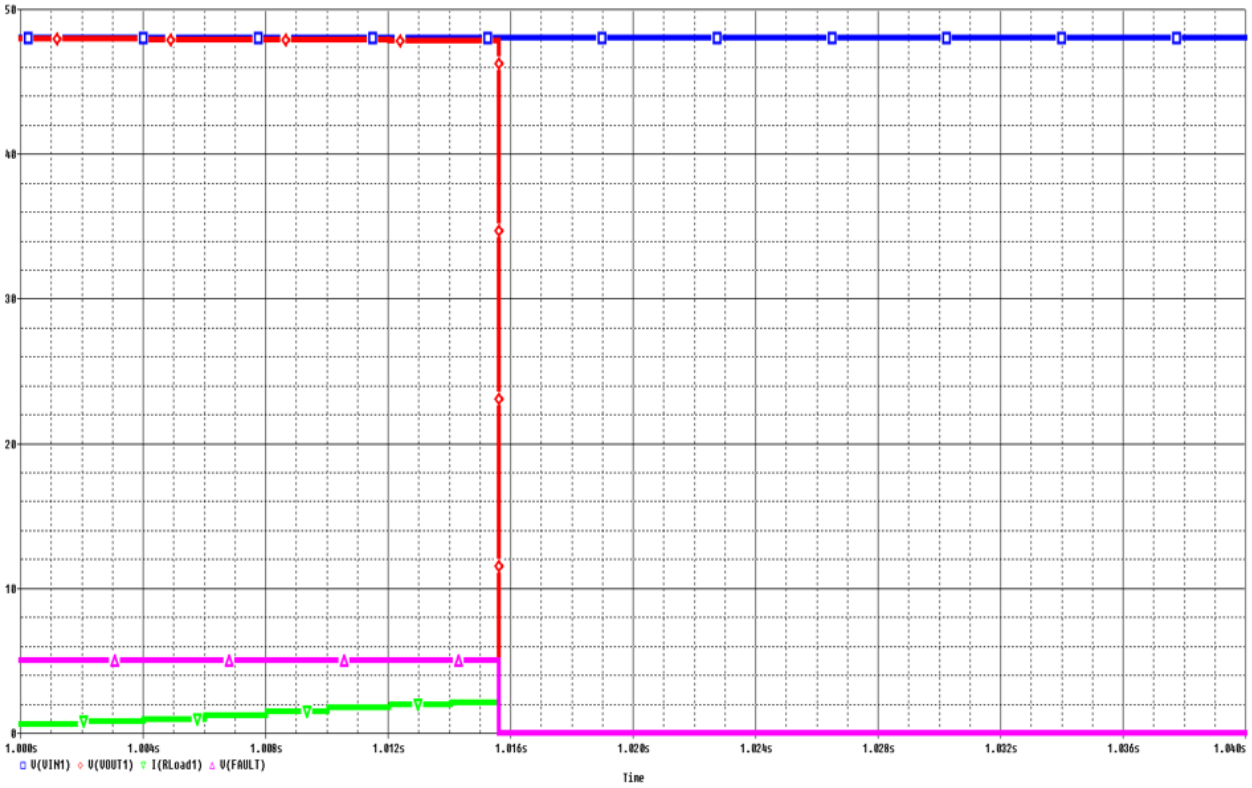


Figure 8. Output Turn Off due to I_{TH} Event (R_{lim} = 30 kΩ)

I_{CB}

- ICB is a threshold current that, when reached or exceeded will turn off the eFuse channel within 6 µs. The value of I_{CB} is set by R_{Lim} and that relationship can be seen in Figure 7 above.

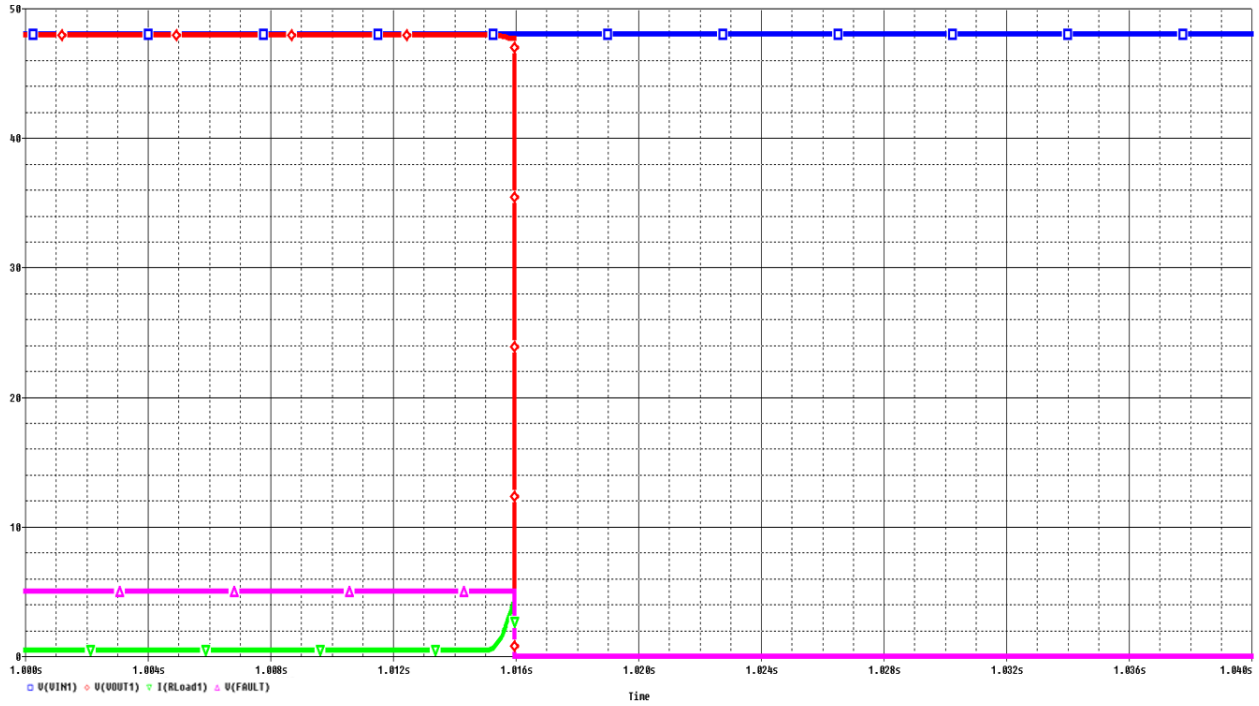


Figure 9. Output Turn Off due to I_{CB} Event (R_{lim} = 30 kΩ)

Thermal Shutdown

- When the temperature of the eFuse reaches 175°C, it will enter thermal shutdown to protect itself from damage. In this model, the temperature of the device is determined by both the ambient temperature set in the simulation profile and the total power dissipation of the device ($T_J = T_A + Pd \times \theta_{JA}$). The power dissipation is internally calculated, but the θ_{JA} value of the board must be set manually, as described in the "Setting up Symbol" section of this document.

ADDITIONAL INFORMATION

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