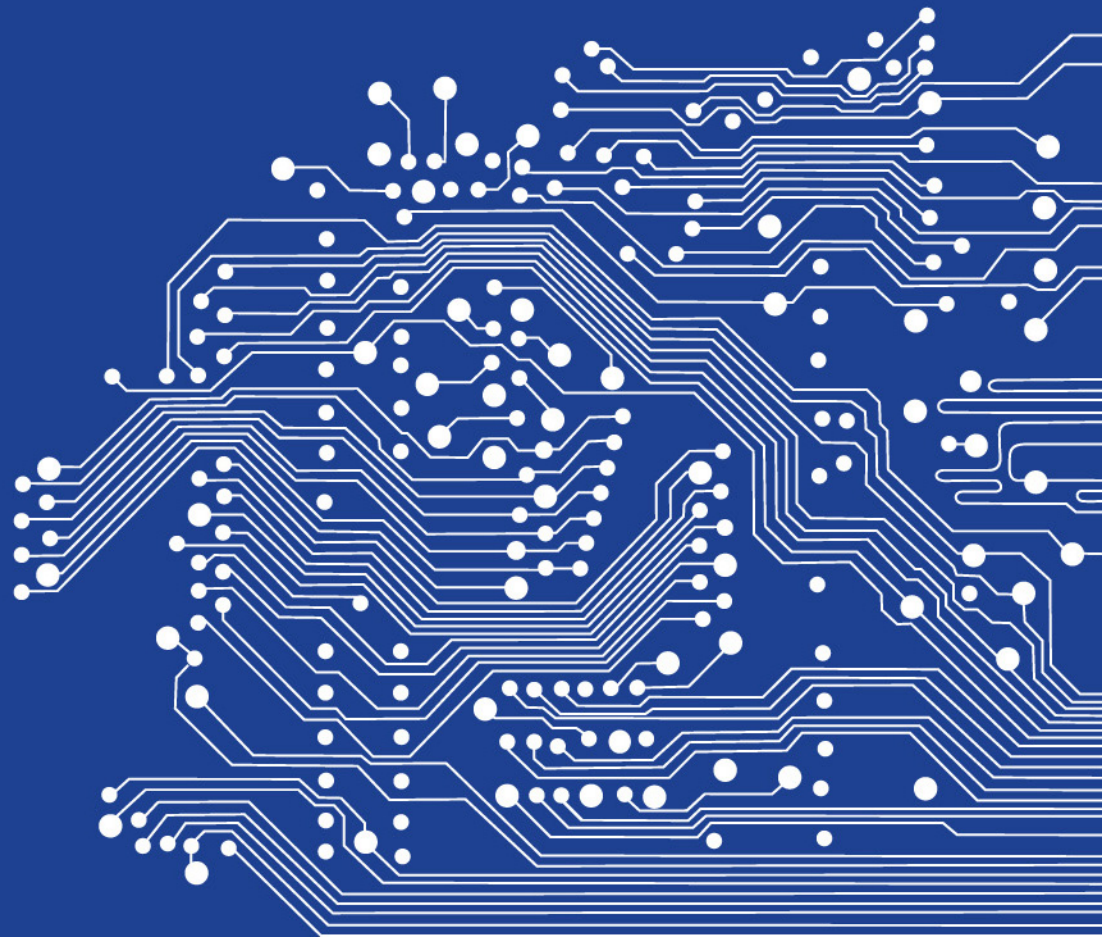
GE Critical Power
Power Module Wizard Tutorial - POLs

March 31, 2015



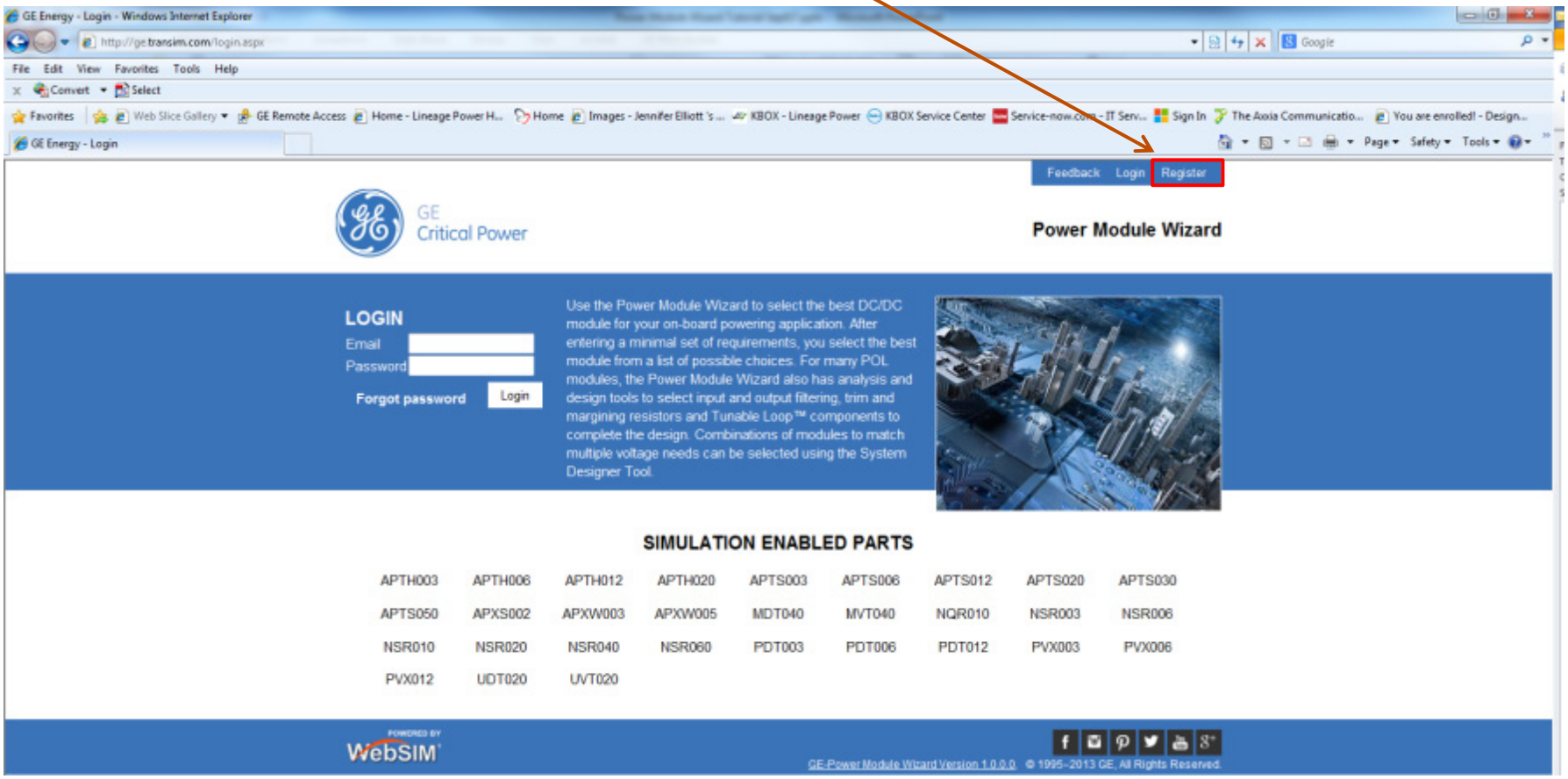
imagination at work

Outline

- Registration
- Module Selector
- Basic Requirements
- Run Selector
- Tunable Loop and Voltage Programming requirements
- Simulation Schematic
- Analysis of Schematic
- Editing Schematic
- Saving Schematic and Standalone applications
- Efficiency Estimation
- BOM
- Summary Report

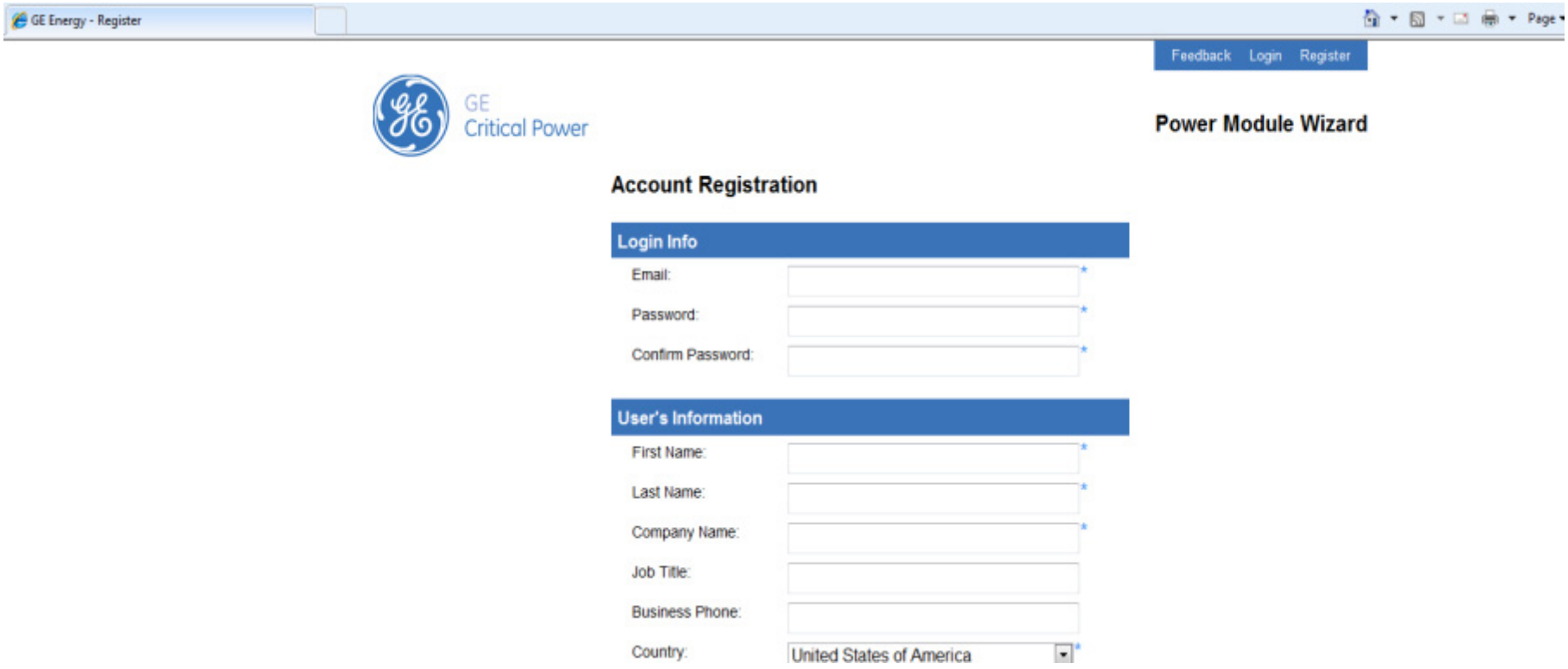
Registration

- Go to http://ge.transim.com to register as a user
- Click on the Register button



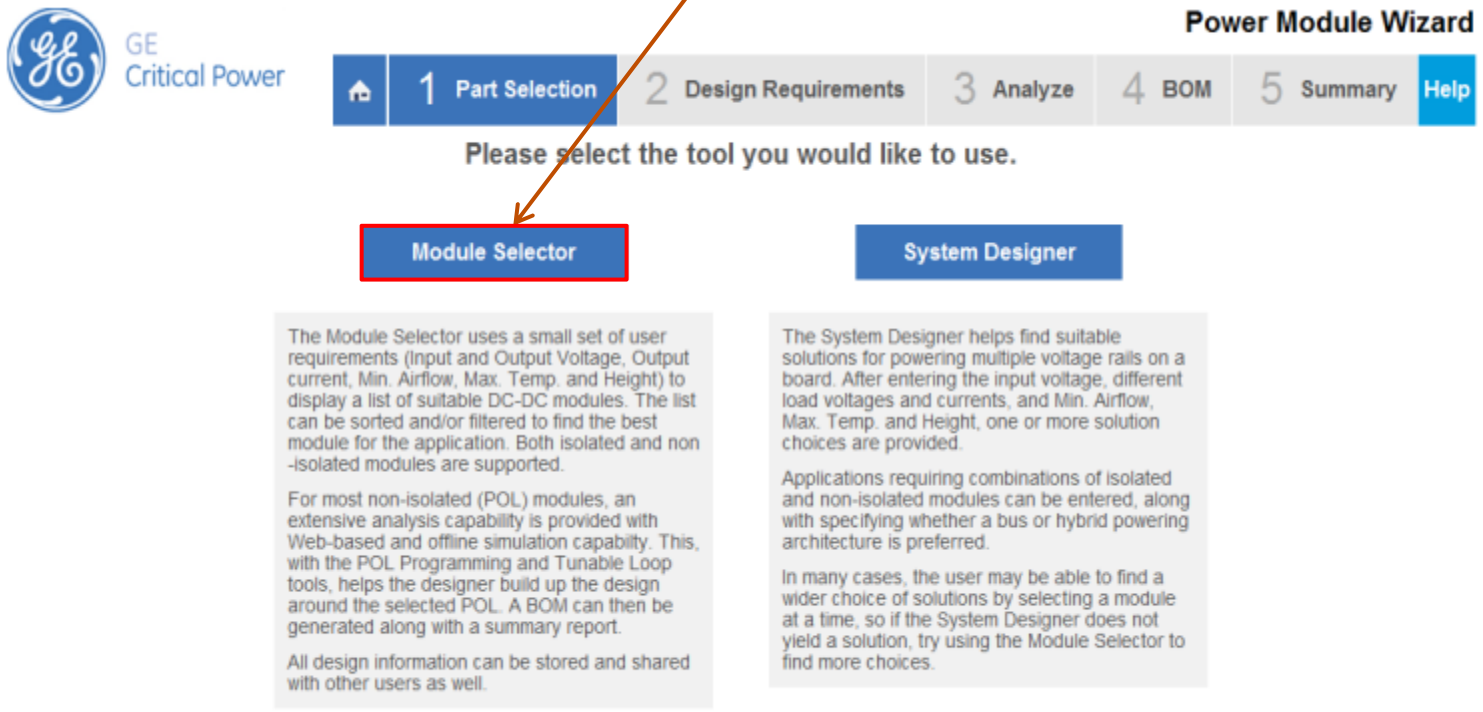
Registration

- Complete a short registration form to create an account



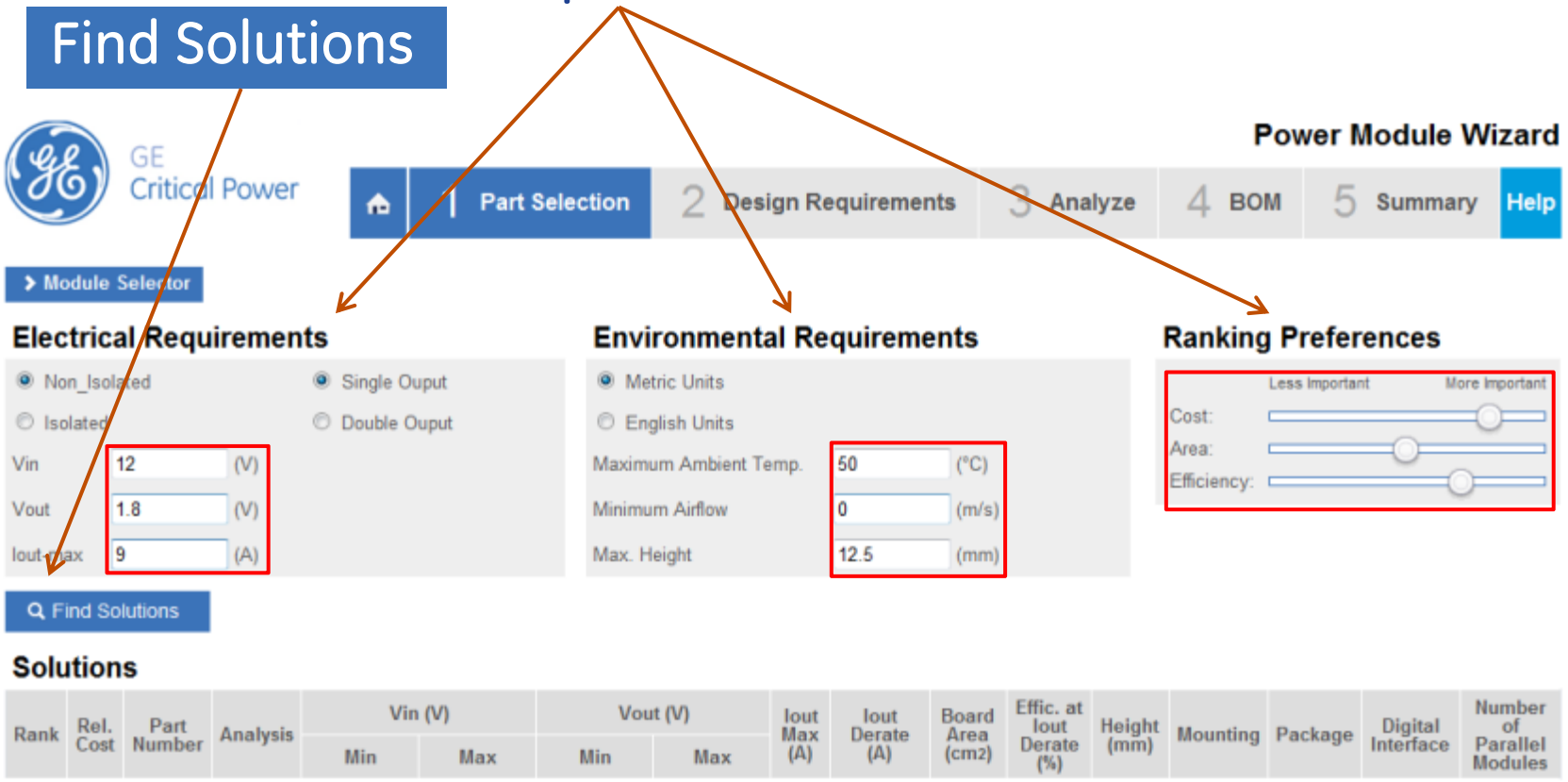
Begin with the Module Selector

- Start by clicking on **Module Selector**



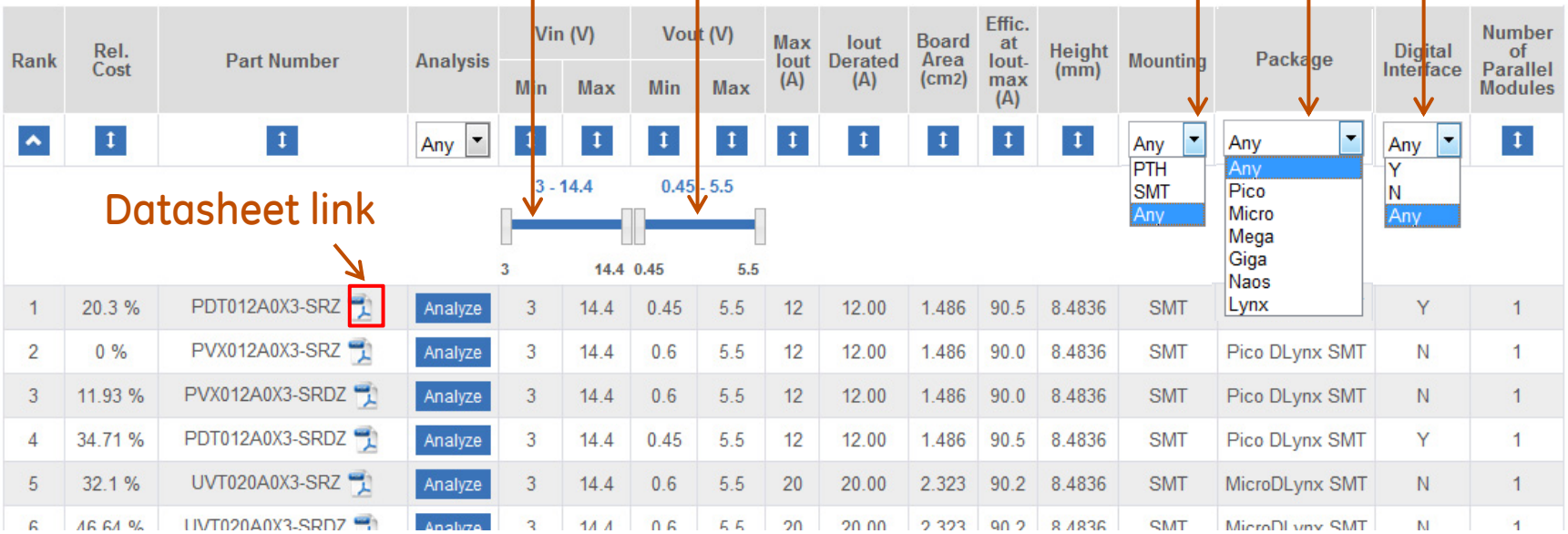
Basic Requirements

- Enter first level of requirements and then click on **Find Solutions**



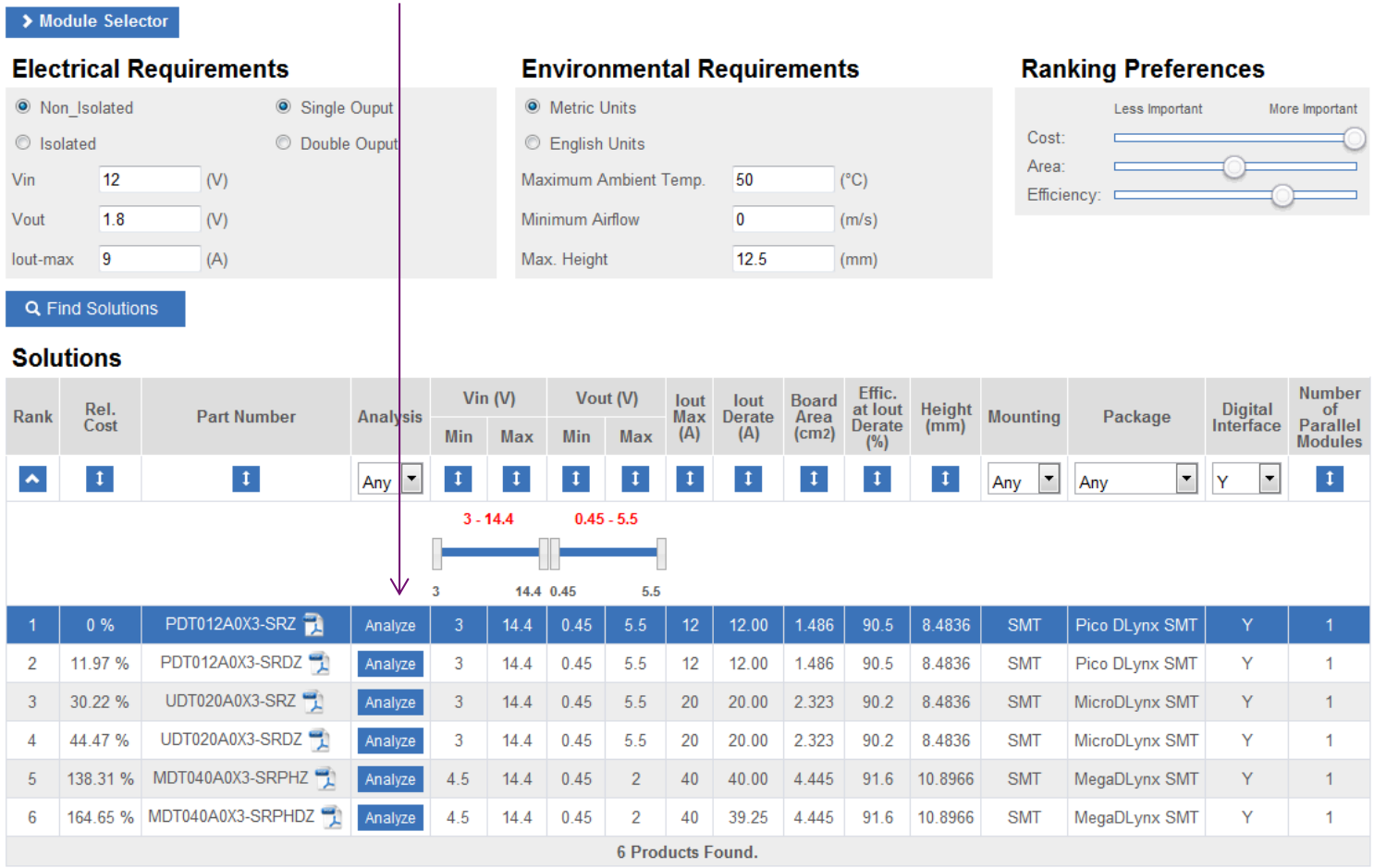
Filters available to sort product list

- The Listed set of Solutions can be filtered based on
  - Digital Interface,
  - Package Size,
  - Mounting
  - Output Voltage
  - Input Voltage



Solutions

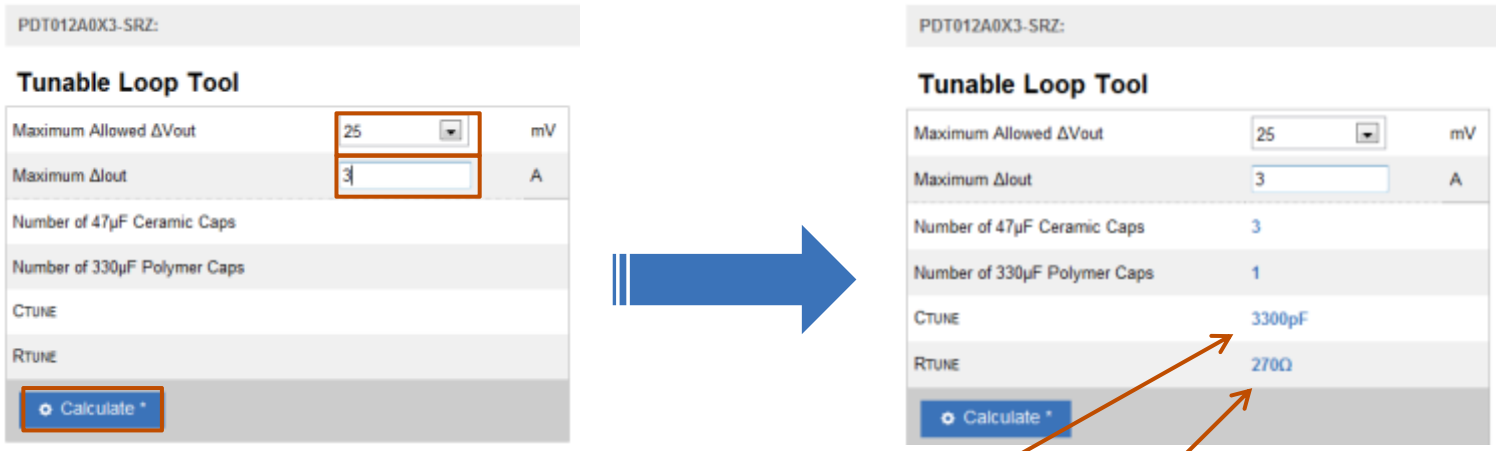
- Select the lowest cost solution offered
- Click on the Analyze function of the tool



Rank	Rel. Cost	Part Number	Analysis	Vin (V) Min	Vin (V) Max	Vout (V) Min	Vout (V) Max	Iout Max (A)	Iout Derate (A)	Board Area (cm2)	Effic. at Iout Derate (%)	Height (mm)	Mounting	Package	Digital Interface	Number of Parallel Modules
1	0 %	PDT012A0X3-SRZ	Analyze	3	14.4	0.45	5.5	12	12.00	1.486	90.5	8.4836	SMT	Pico DLynx SMT	Y	1
2	11.97 %	PDT012A0X3-SRDZ	Analyze	3	14.4	0.45	5.5	12	12.00	1.486	90.5	8.4836	SMT	Pico DLynx SMT	Y	1
3	30.22 %	UDT020A0X3-SRZ	Analyze	3	14.4	0.45	5.5	20	20.00	2.323	90.2	8.4836	SMT	MicroDLynx SMT	Y	1
4	44.47 %	UDT020A0X3-SRDZ	Analyze	3	14.4	0.45	5.5	20	20.00	2.323	90.2	8.4836	SMT	MicroDLynx SMT	Y	1
5	138.31 %	MDT040A0X3-SRPHZ	Analyze	4.5	14.4	0.45	2	40	40.00	4.445	91.6	10.8966	SMT	MegaDLynx SMT	Y	1
6	164.65 %	MDT040A0X3-SRPHDZ	Analyze	4.5	14.4	0.45	2	40	39.25	4.445	91.6	10.8966	SMT	MegaDLynx SMT	Y	1

Tunable Loop Part Selection

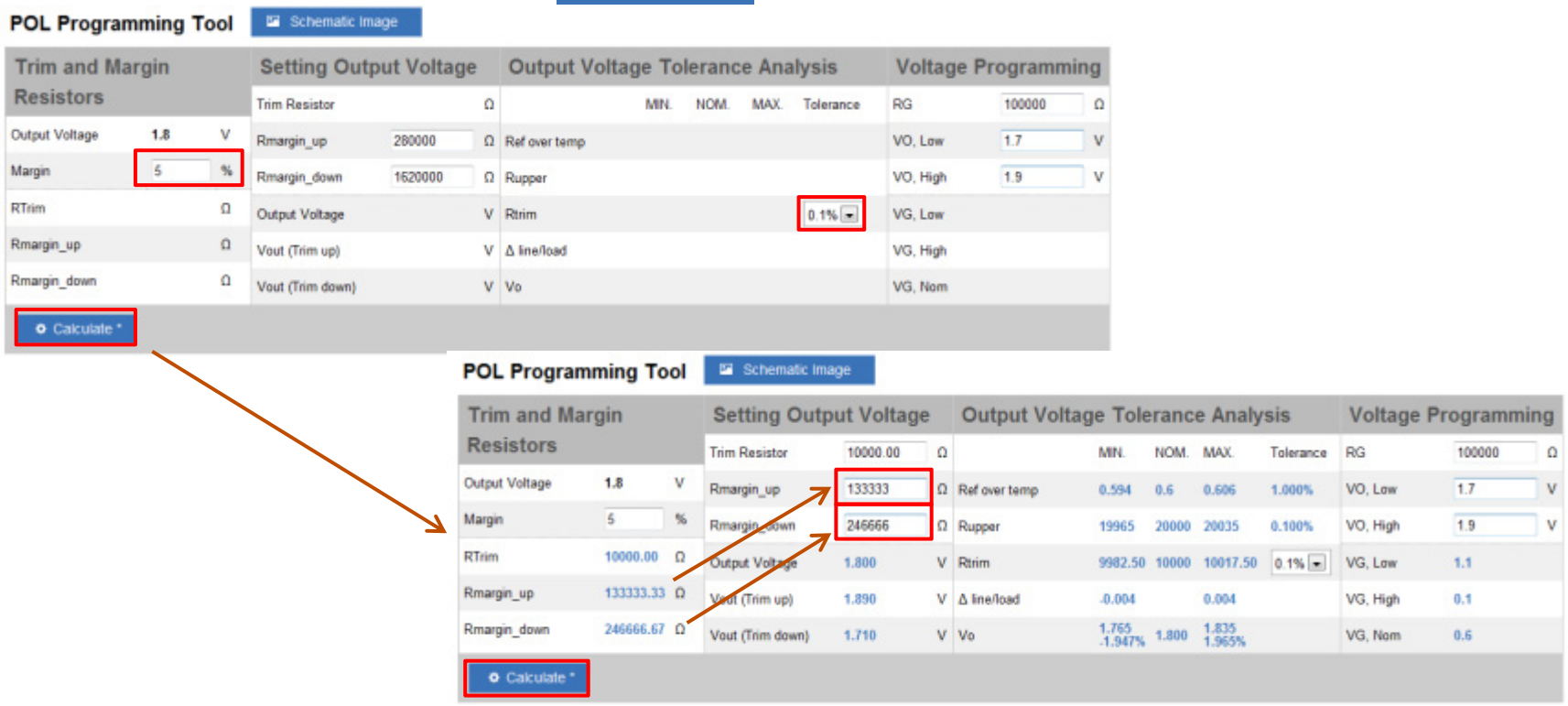
- Run the Tunable Loop Tool after changing the ΔVout to 25mV from the drop down selection and entering a ΔIout of 3A. Press the Calculate button after the above 2 steps



- The tool provides the Ctune and Rtune values to achieve the desired Δvout.

POL Programming Tool

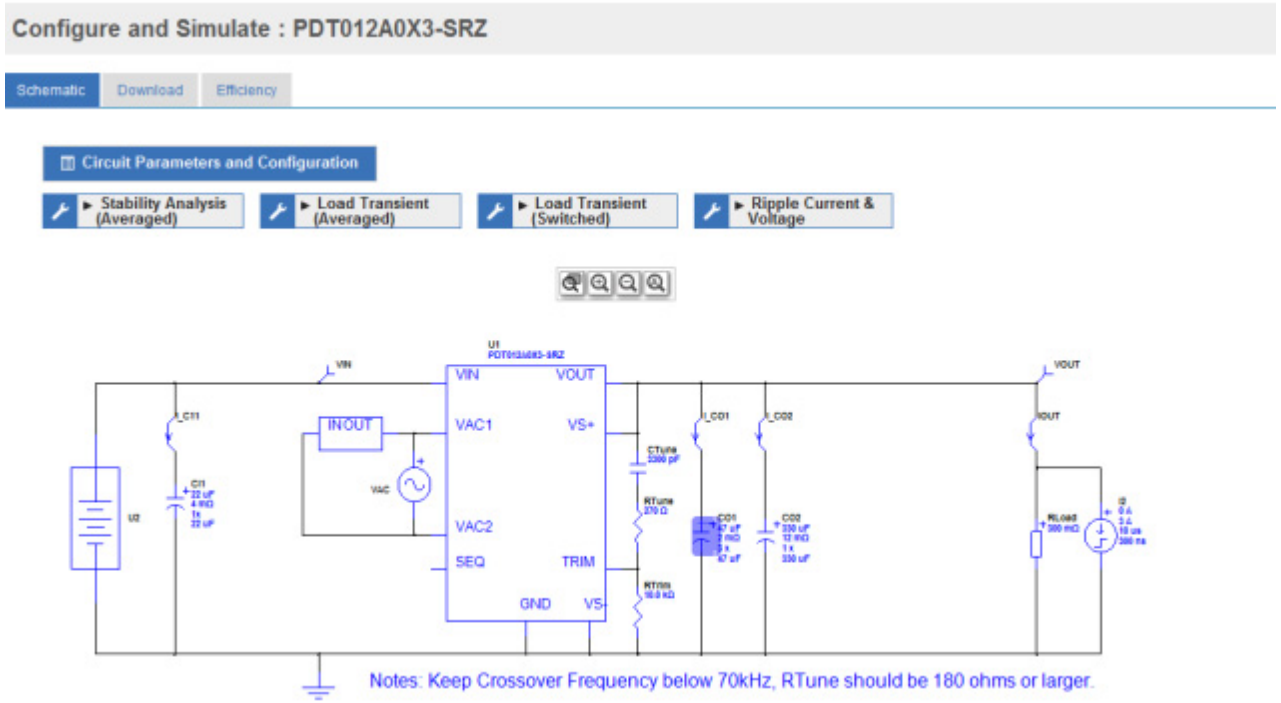
- Run the POL Programming Tool after changing the Margin to 5% and selecting the accuracy of the Rtrim resistor as 0.1% from the drop down selection 4.5mA. Press the Calculate button after the above 2 steps



- Enter the tool calculated values of Rmargin_up and Rmargin_down in the corresponding fields under Setting Output Voltage and press Calculate again to get the Vout(Trim up)/Vout (Trim down) values

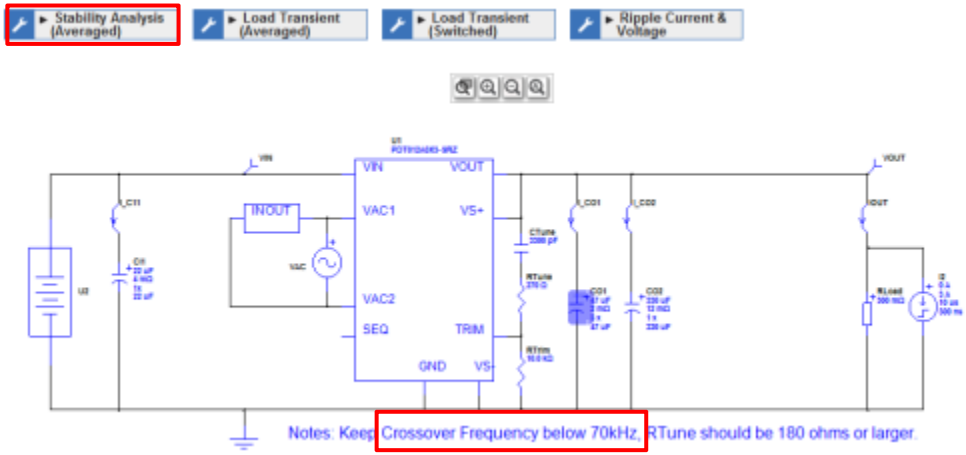
Schematic for Simulation

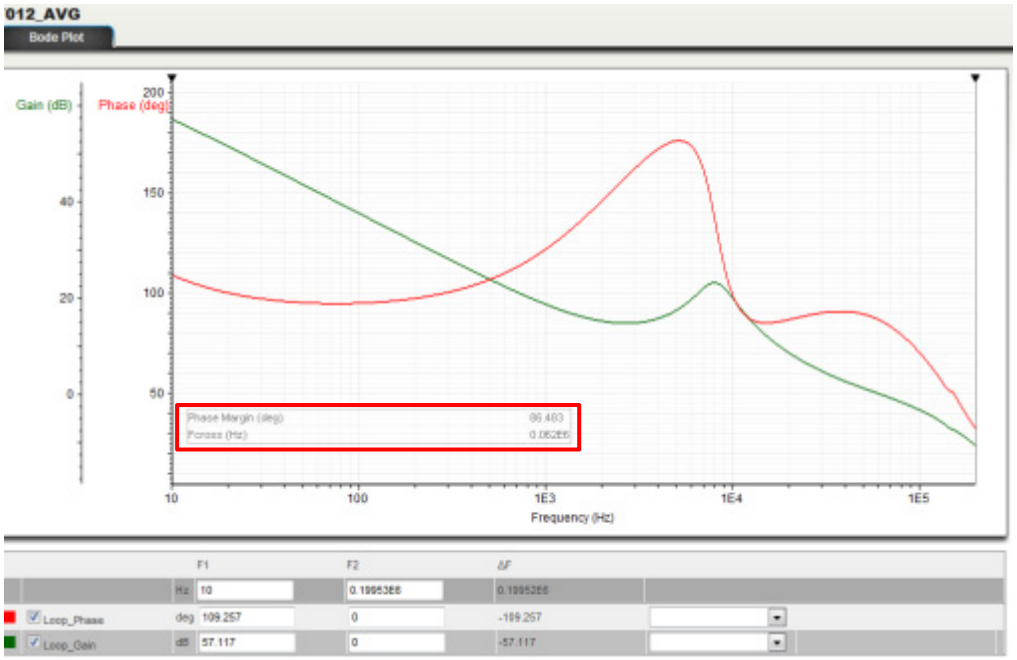
- Click on **Create Design** to generate schematic



Schematic Based Simulations

- Stability Analysis using Schematic

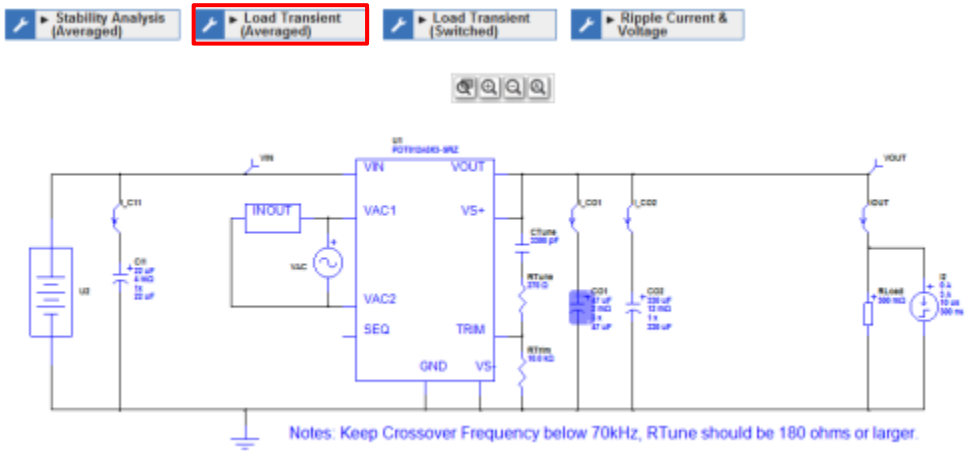




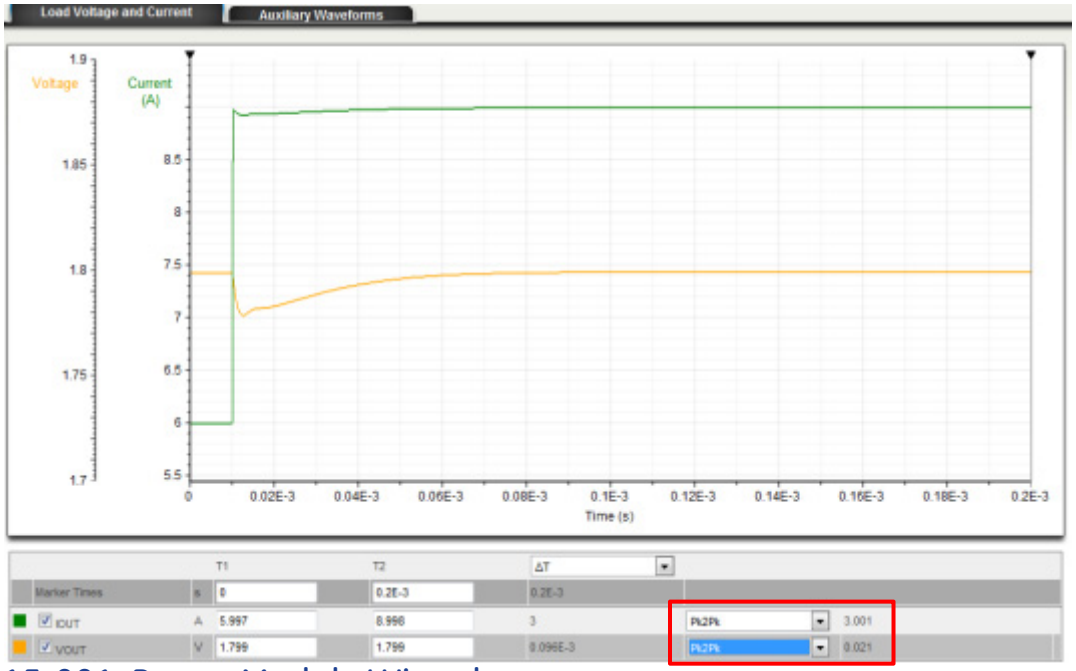
Check value of crossover frequency is below recommend value and phase margin >45 deg

Schematic Based Simulations

- Averaged load transient simulation using Schematic



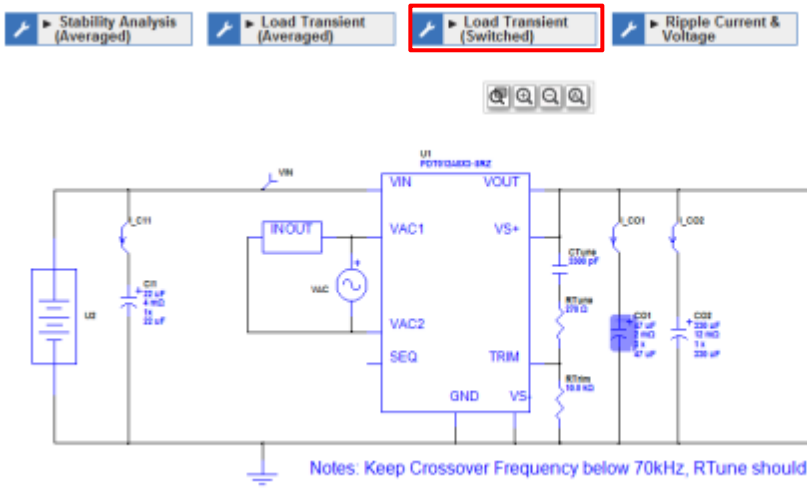
Check pk-pk value of Vout is below design requirement of 25mV by selecting PK-PK from the measurement drop down menu.



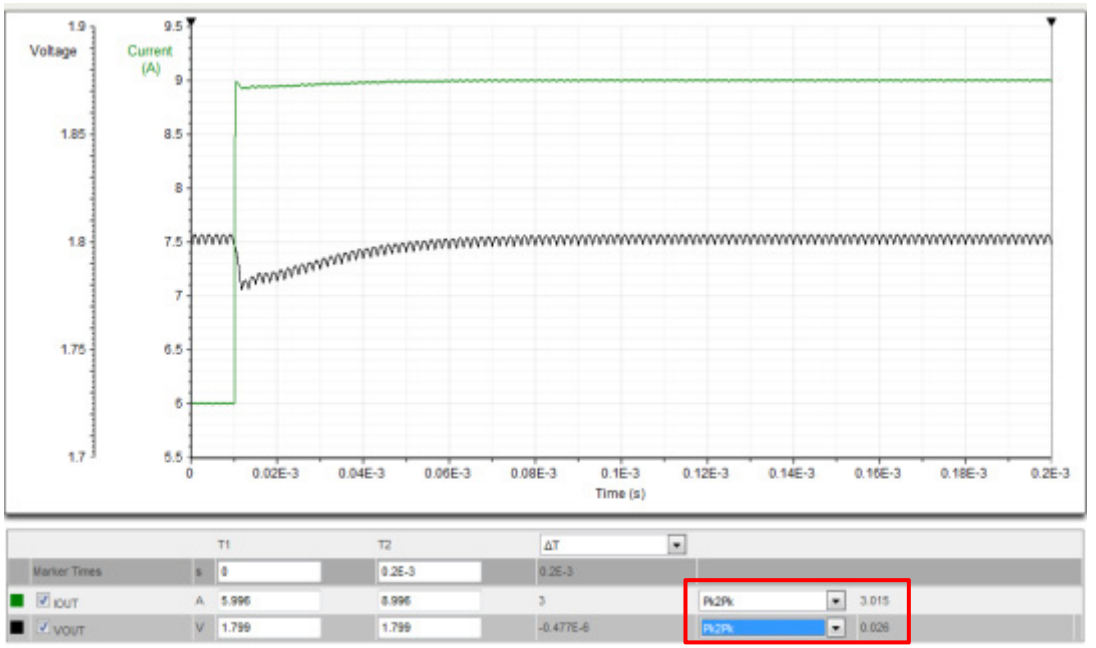
TM15-001: Power Module Wizard

Schematic Based Simulations

- Switched Load Transient simulation using Schematic



Check pk-pk value of Vout is close to design requirement of 25mV by selecting PK-PK from the measurement drop down menu.

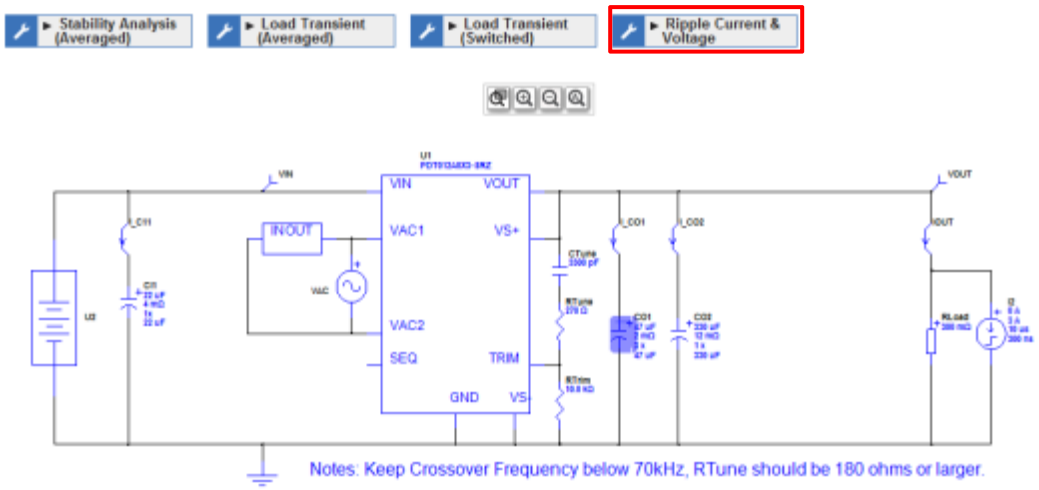


TM15-001: Power Module Wizard

imagination at work

Schematic Based Simulations

- Input Ripple Current and Voltage simulation based on schematic. Click on the Ripple Current and Voltage button

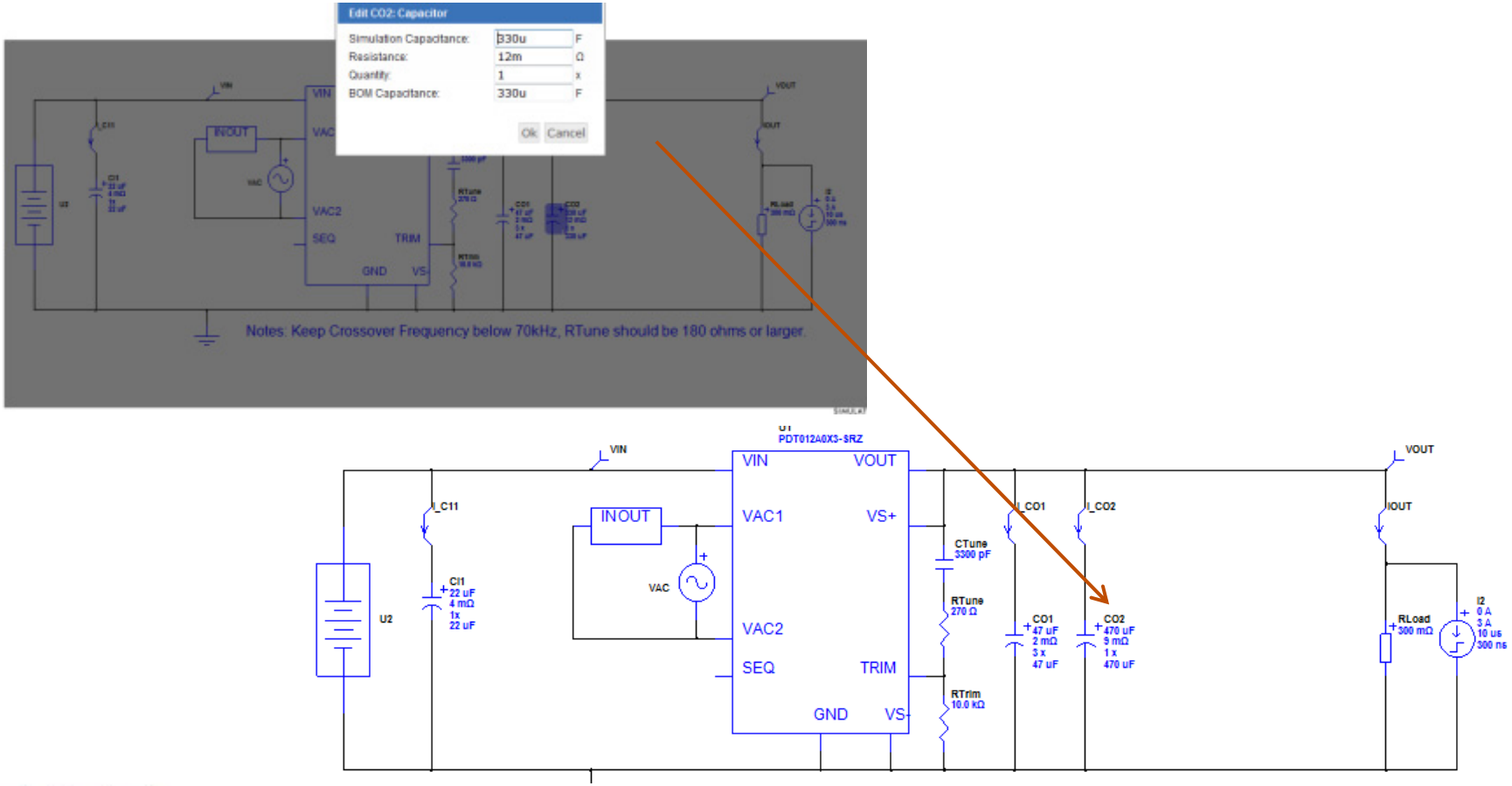


Schematic Based Simulations

- Click on the Auxiliary Waveforms Tab and select PK-PK from the measurement drop down menu for I-CI1 and VIN

Modifying Schematic

- Click on Capacitor Bank CO2 to bring up window to change capacitance, resistance, quantity associated with it. Values entered are 470uF capacitance, 9mohm ESR. Simulation Capacitance is derived from reviewing capacitance curves to check for correction to capacitance based on bias voltage, temperature, etc. Next run the simulations again to check for variance

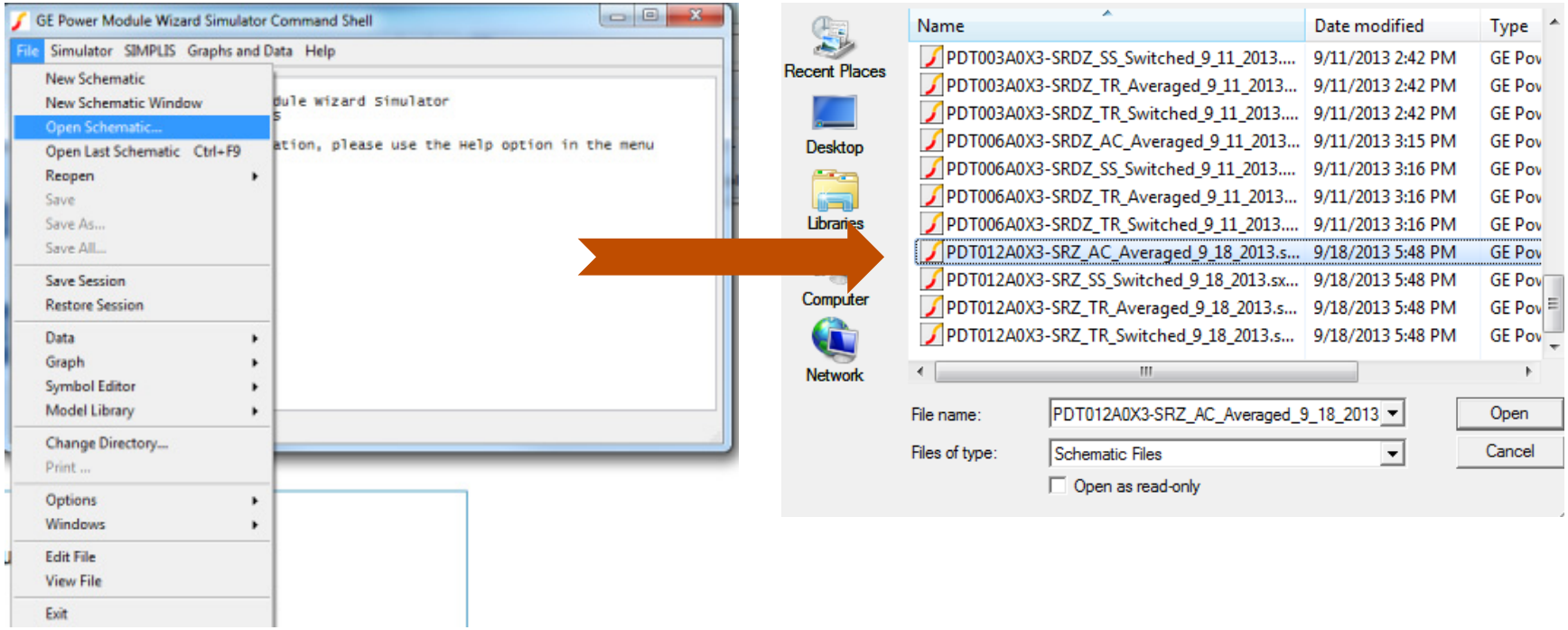


Download the schematic and simulation files

- Select the 'Download' Tab next to the 'Schematic' tab on the Screen. Click on the 'Download GE Power Module Wizard Simulator' to install a copy of the tool on the local hardware. Once that process is completed, download the Stability Analysis, Load Transient (Averaged), Load Transient (Switched) and Ripple Current and Voltage files on the local hard drive as well

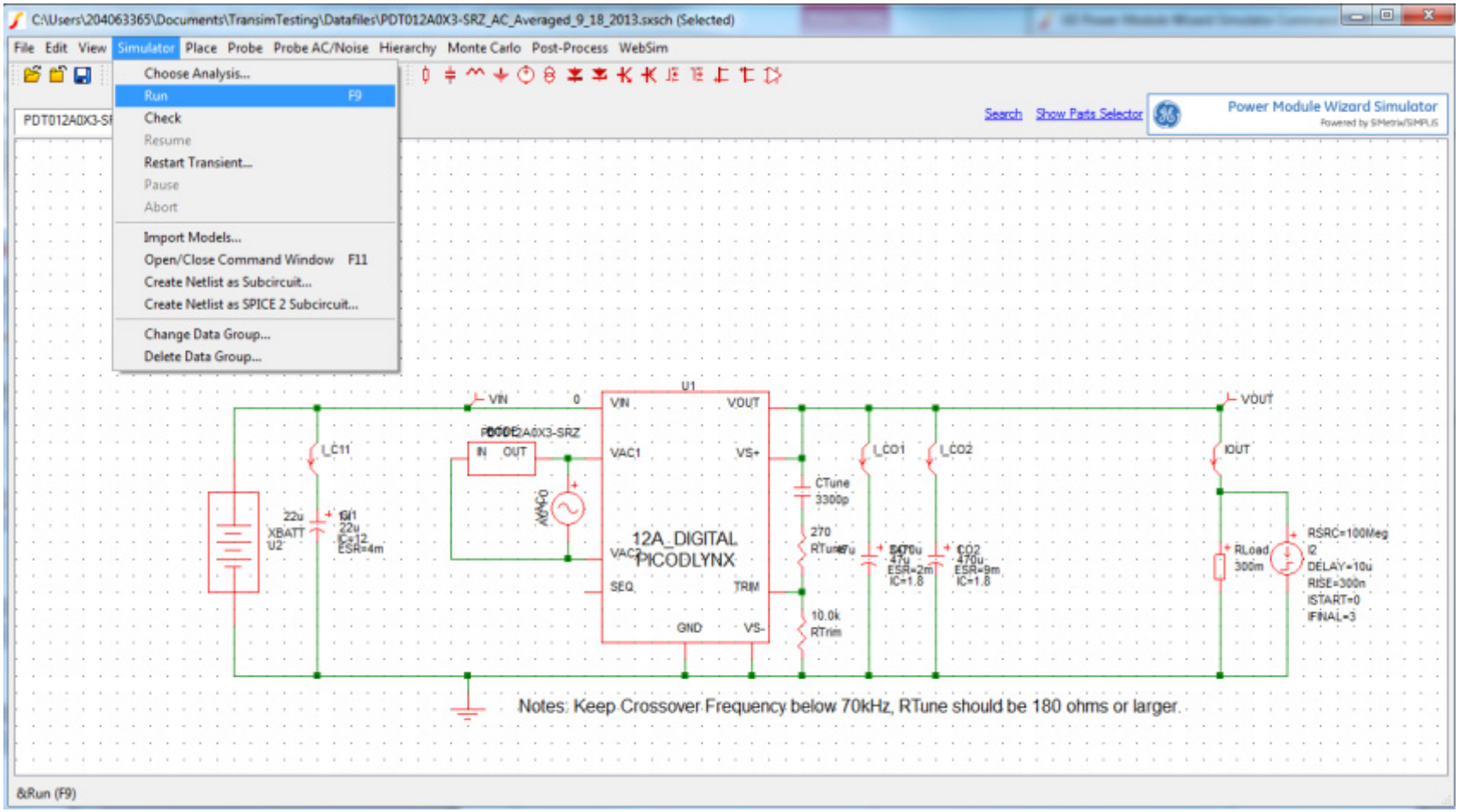
Using the downloaded tool and files

- Once the download is complete, start the GE Power Module Wizard Simulator. Then Under the drop down menu under ‘File’ select ‘Open Schematic’ and open the xxx_AC_Averaged_xxx file.



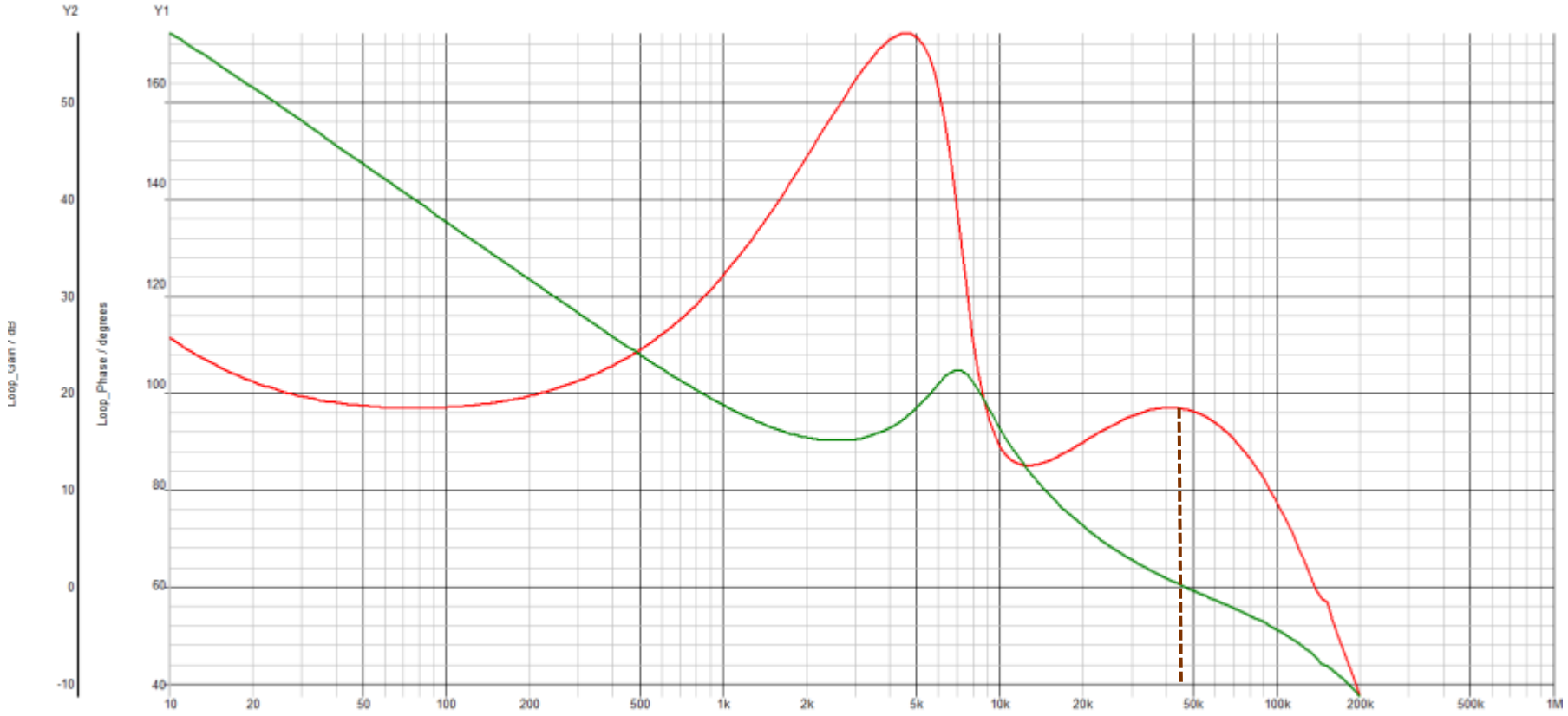
Using the downloaded tool and files

- Once the file is visible on the screen use Function key F9 or choose Run from the dropdown menu under the ‘Simulator’ Tab in the menu.



Using the downloaded tool and files

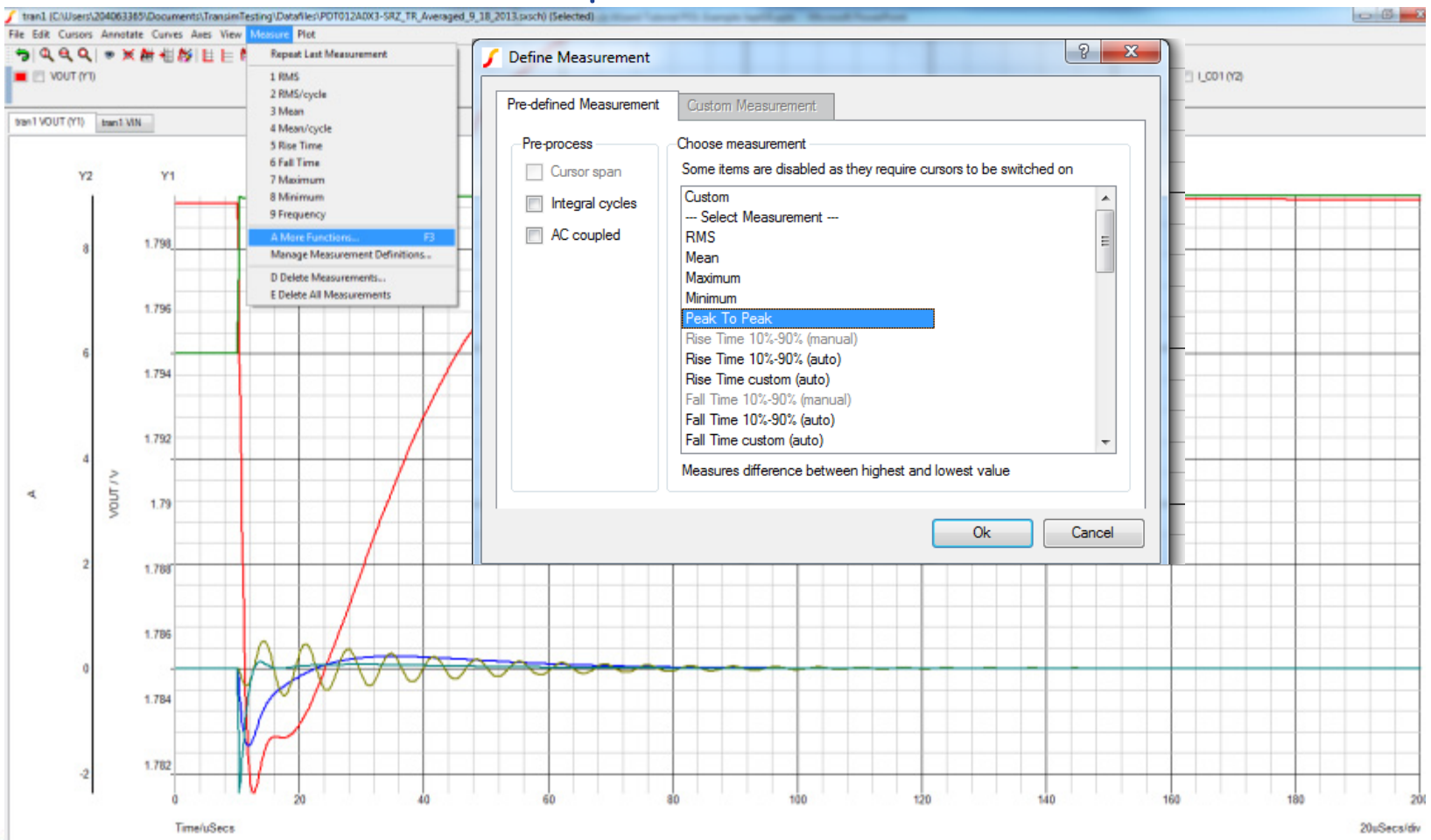
- Compare the results of the simulation with the online version. They should be the same



The values of crossover frequency and Phase Margin are close to the values of 46kHz and 95degrees from the online tool

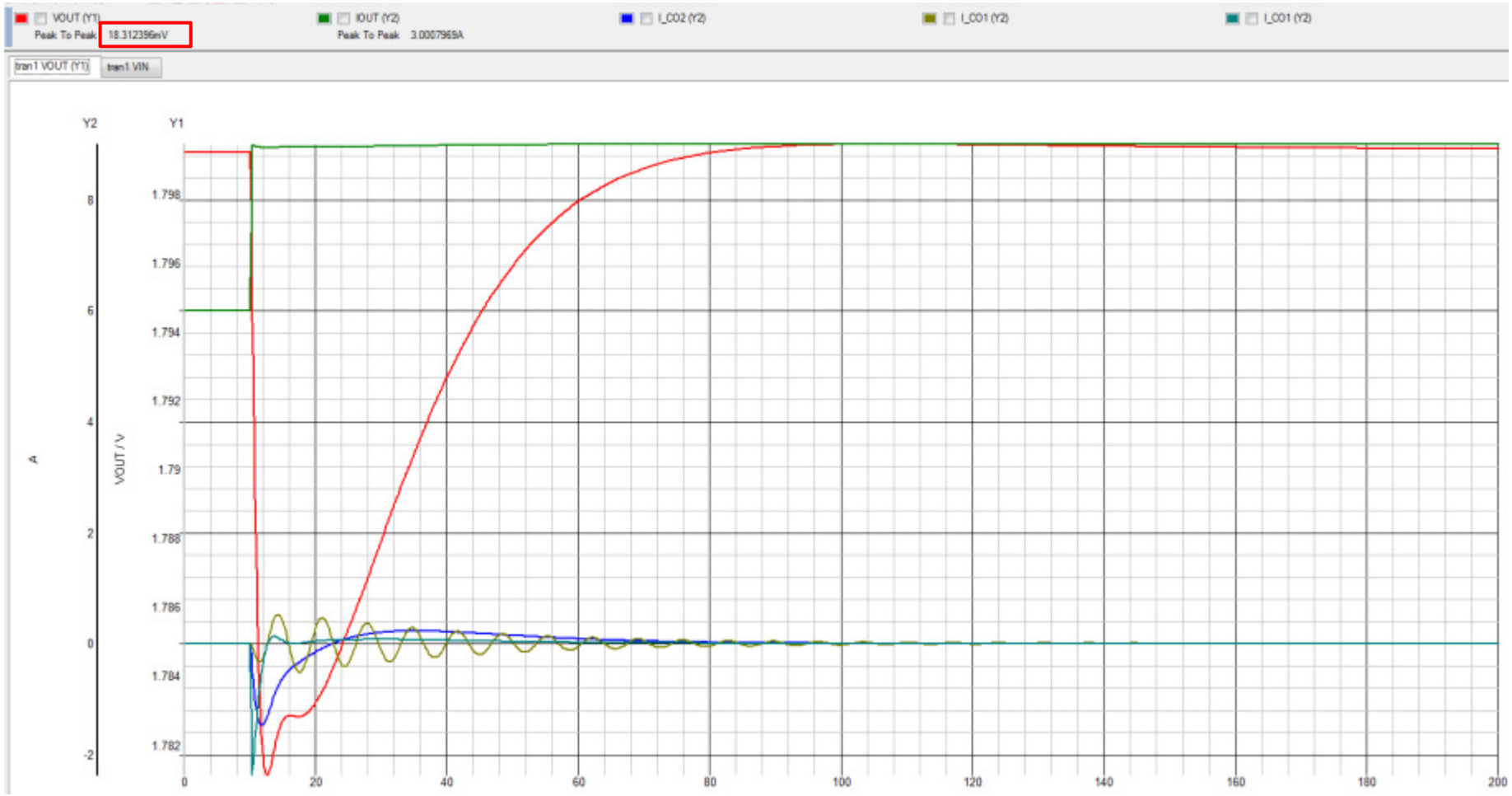
Using the downloaded tool and files

- Close the existing simulation file. Go to the drop down menu under ‘File’ select ‘Open Schematic’ and open the xxxx_TR_Averaged_xxx file. Run the simulation as before. In the Plot Window go to the Measure Tab and select More Functions from the drop down menu and then select Pk-Pk value



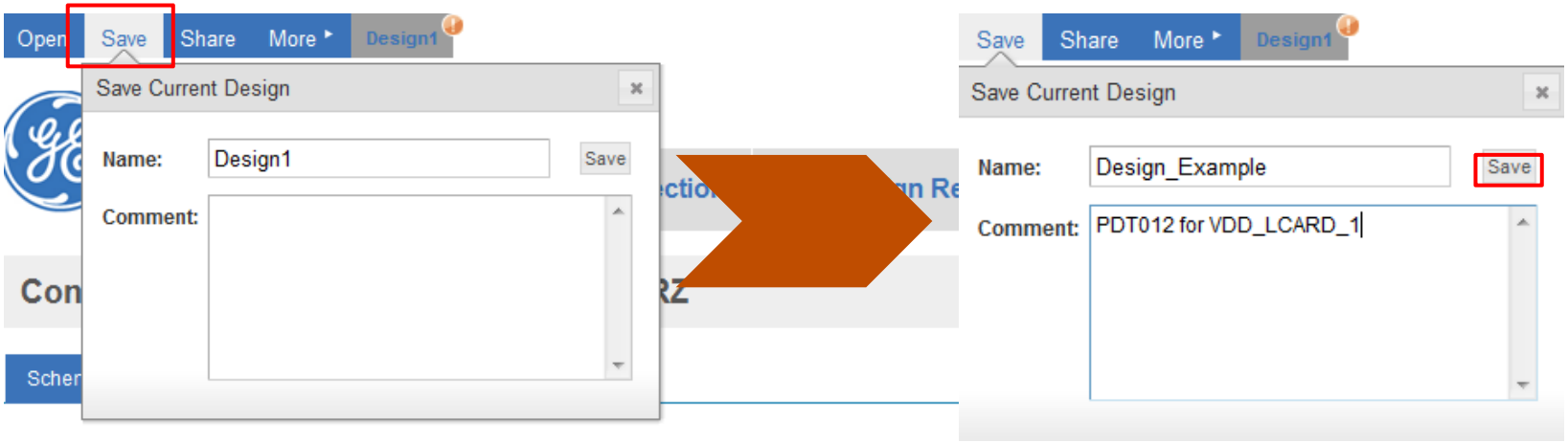
Using the downloaded tool and files

- Compare the results of the simulation with the online version. They should be the same – 18mV



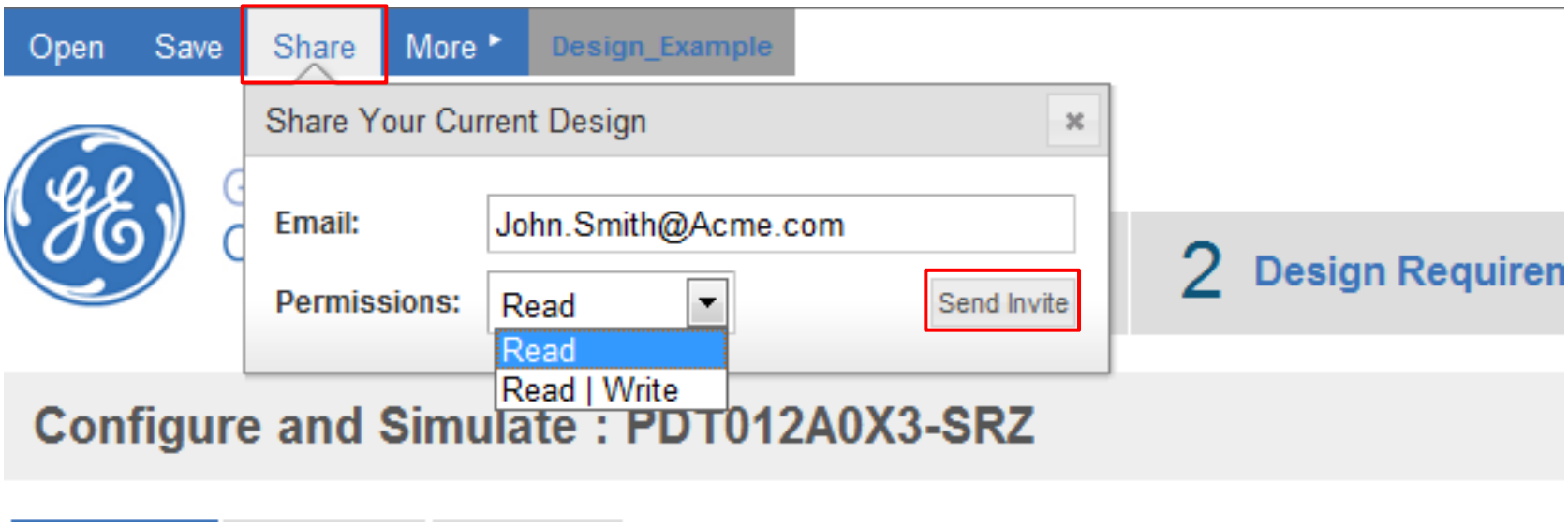
Saving the Simulation

- Click on the Save Tab on the top left corner of the screen. In the pop-up window enter the name and comments, if any, for the design . Once the Save button is pressed a small Tab with the design name appears after the tab marked ‘More’



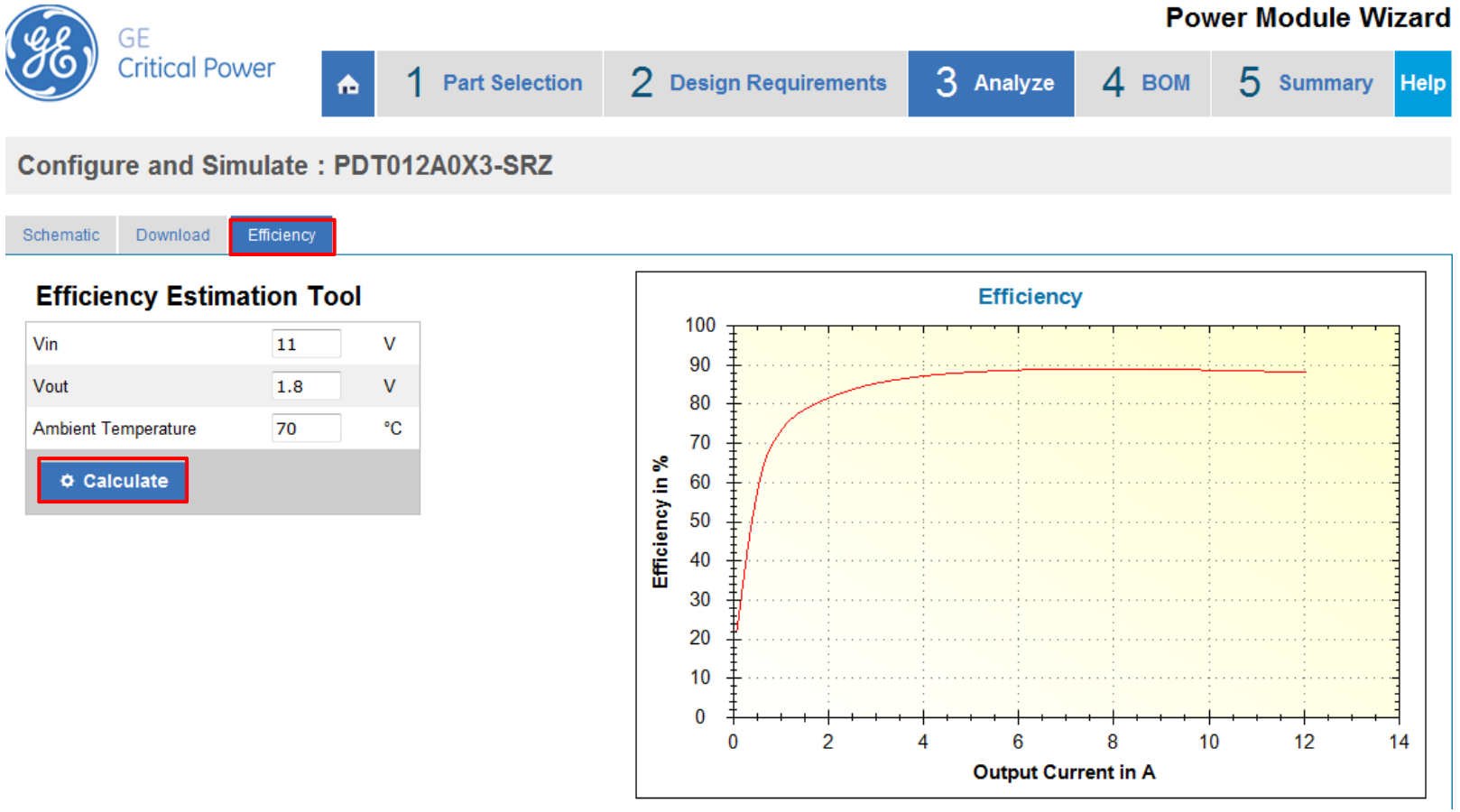
Sharing the Simulation

- Click on the Share Tab on the top left corner of the screen. In the pop-up window enter the destination email. The tool also allows the user to create a permission level of read or read/write for the recipient.



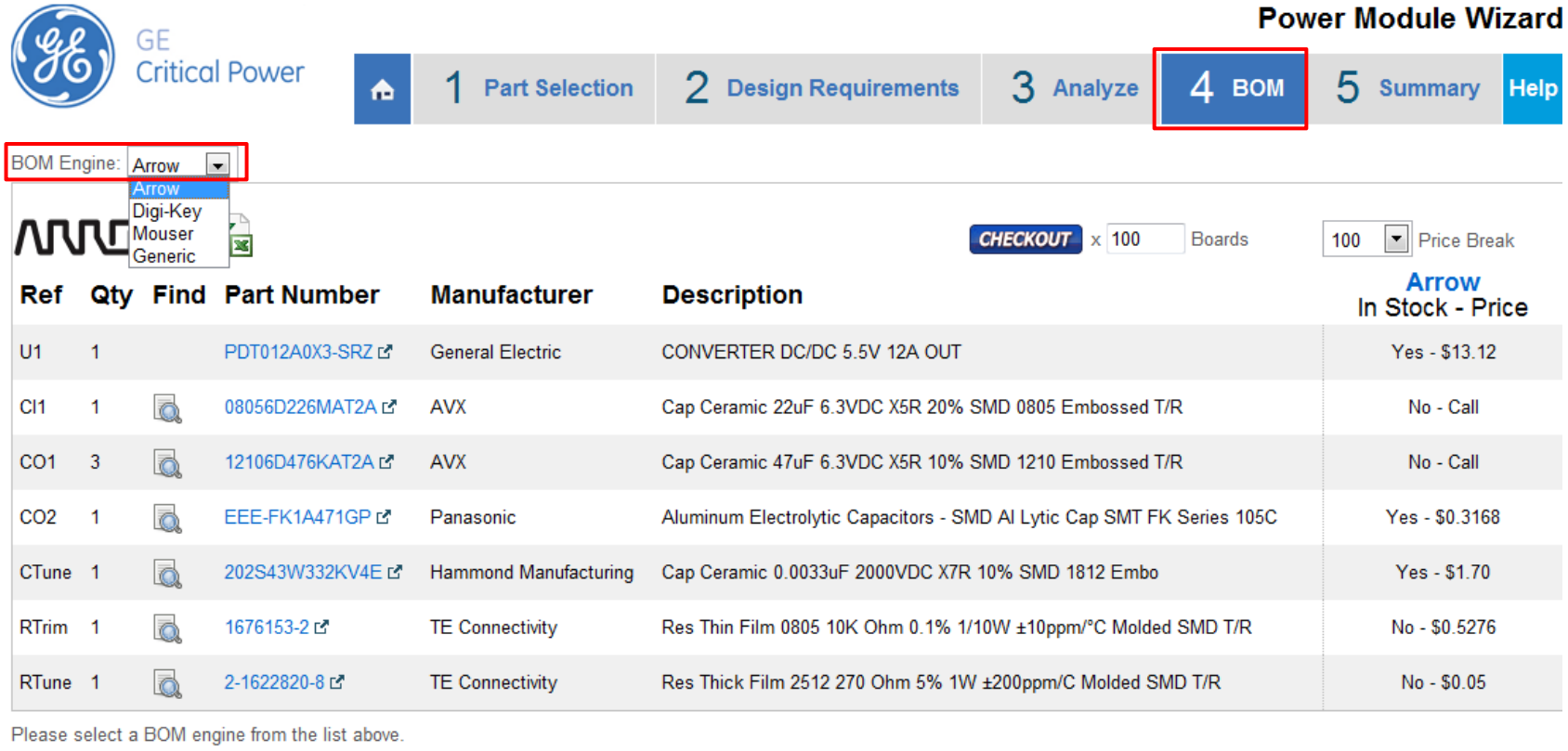
Efficiency for specific operating conditions

- Click on the Efficiency Tab next to the Schematic and Download Tab on the screen. Overwrite the input voltage as 11V and the ambient temperature as 70°C. Then press the Calculate button for the tool to simulate the efficiency curve for the specified conditions



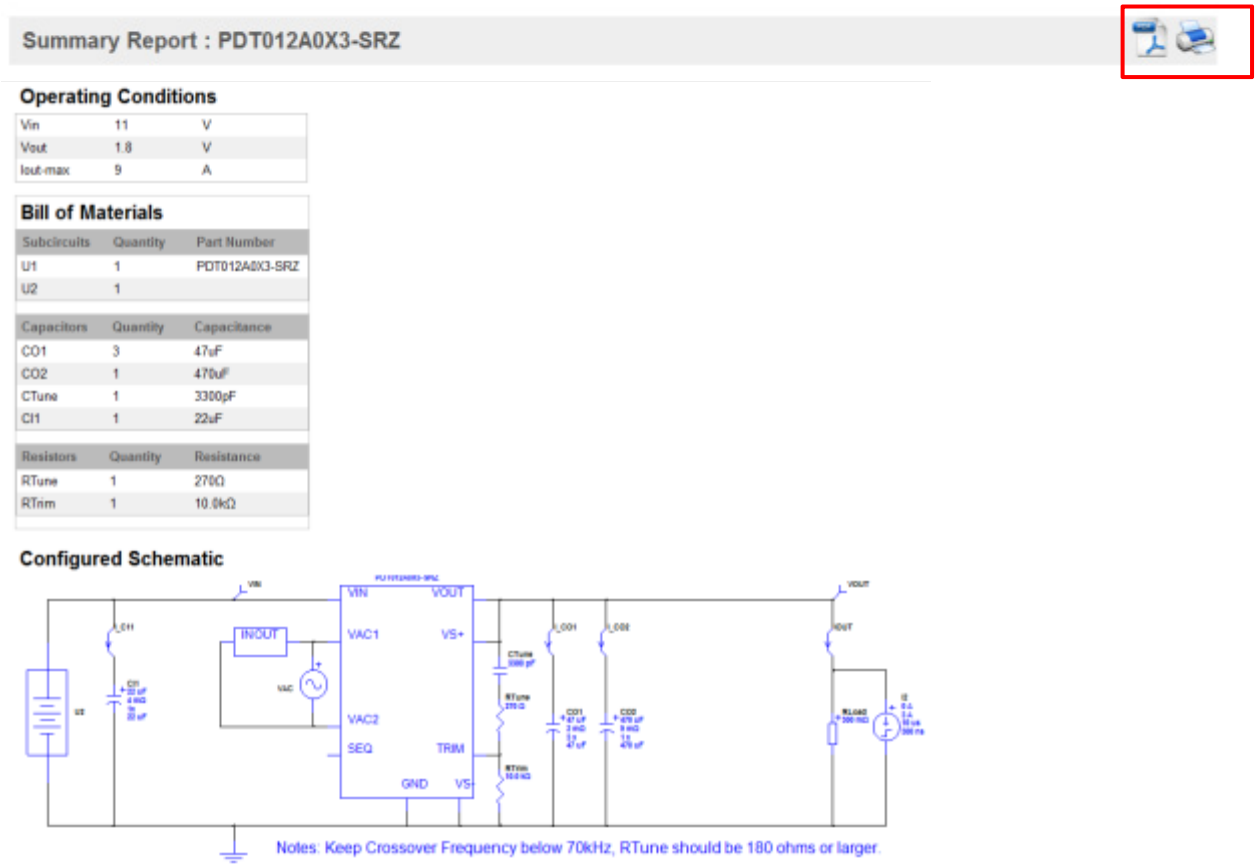
BOM for final schematic

- Click on the BOM Tab on the top right corner of the screen next to the Analyze and Summary Tab on the screen. The tool generates a part list based on pricing from Arrow. Using the BOM Engine drop down menu on the left corner of the screen, a different distributor can be selected for pricing comparison



Summary Report – Part 1

- Click on the Summary Tab on the top right corner of the screen. The tool generates a report listing the operating conditions, BOM, Schematic, Waveforms for Stability Analysis, Switched Load Transient, Averaged Load Transient and Ripple Current and Voltage . The report can be printed or converted to pdf for storage



Summary Report : PDT012A0X3-SRZ

Operating Conditions

Vin	11	V
Vout	1.8	V
Iout-max	9	A

Bill of Materials

Subcircuits	Quantity	Part Number
U1	1	PDT012A0X3-SRZ
U2	1	

Capacitors	Quantity	Capacitance
CO1	3	47uF
CO2	1	470uF
CTune	1	3300pF
CI1	1	22uF

Resistors	Quantity	Resistance
RTune	1	270Ω
RTrim	1	10.0kΩ

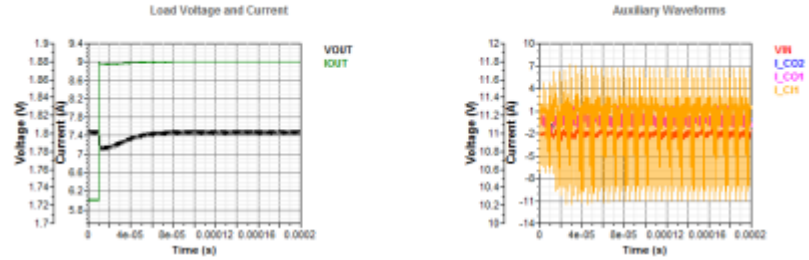
Configured Schematic

Notes: Keep Crossover Frequency below 70kHz, RTune should be 180 ohms or larger.

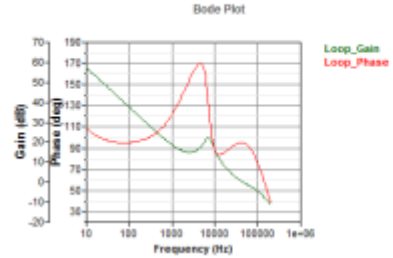
Summary Report – Part 2

Waveforms

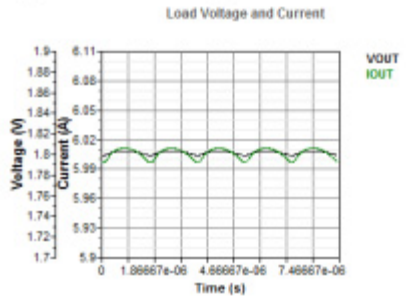
Load Transient (Switched) Results

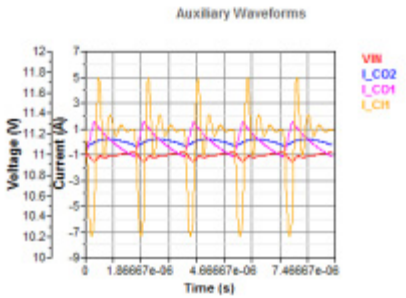


Stability Analysis (Averaged) Results



Ripple Current & Voltage Results





Load Transient (Averaged) Results