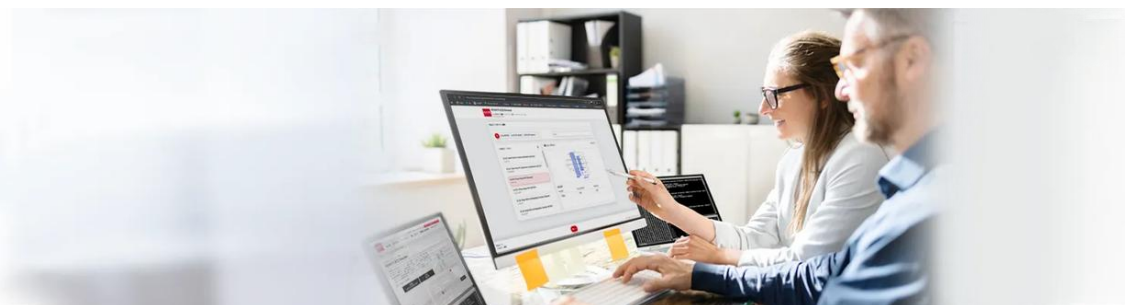


High-Speed Online Power Electronics Simulator

## ROHM PLECS Simulator



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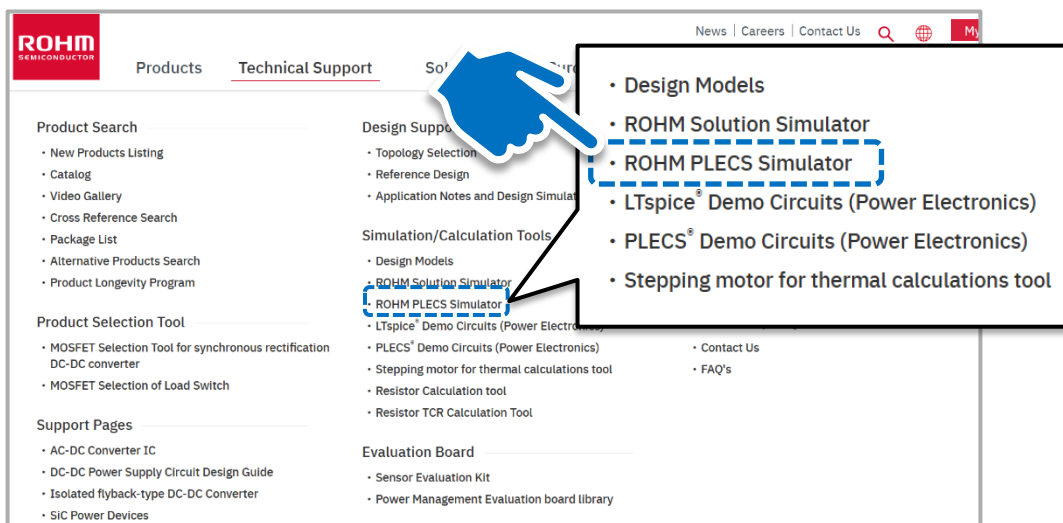
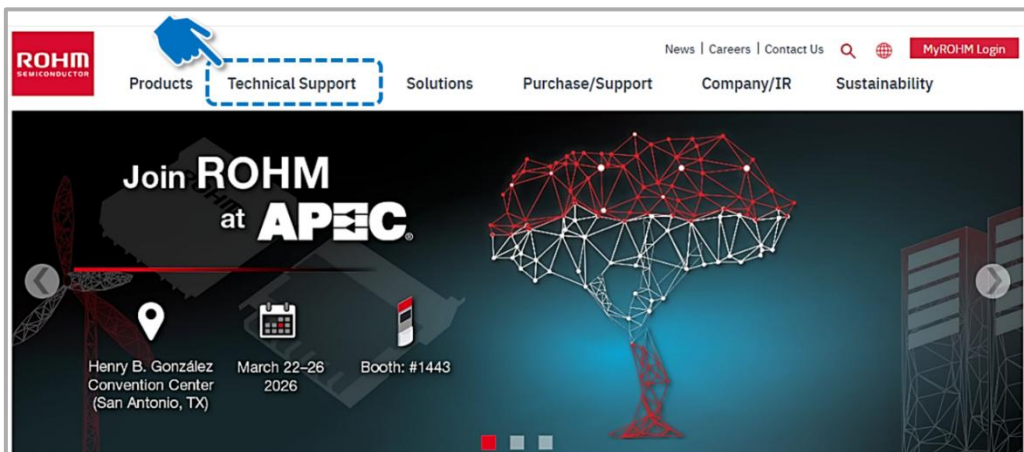
### 1. How to Access

Internet access and a registration for “MyROHM” are required in advance to use “ ROHM PLECS Simulator ”.

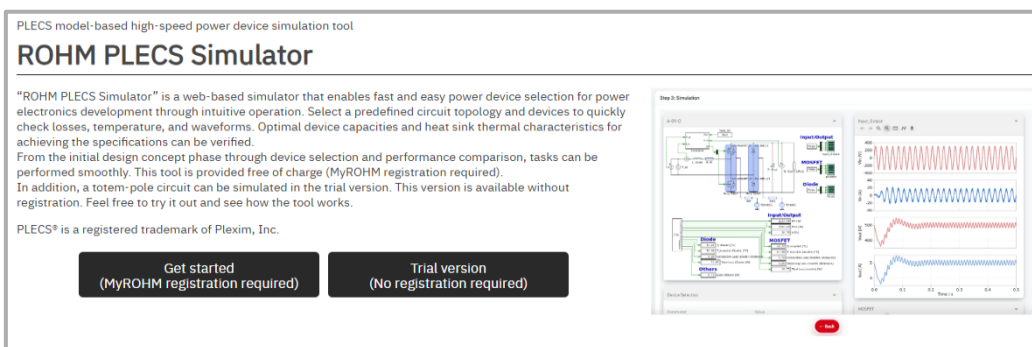
<https://www.rohm.com/login?redirect=/>

To start “ROHM PLECS Simulator”, please access from “Technical Support” in the top page of ROHM’s website.

<https://www.rohm.com/>



<https://www.rohm.com/simulator/plecs-simulator>



## 2. Select a Topology

1. Select a topology category.  
A: AC-DC PFC  
B: DC-AC Inverter  
C: DC-DC Converter

2. From the shown list, select a topology that you want to simulate.

3. Enter basic simulation conditions.  
※It is not mandatory if the default values are fine.

4. Click "Next" button once you have finished entering all the information.

## 3. Select Power Devices

1. Candidate power-device products are listed according to the basic simulation conditions that you have entered previous page.  
If you want to check the detailed device specification, click the "Part Number", and you can see the data sheet.

2. Select "check-box" left of the Part Number that you want to simulate.  
※"ROHM PLECS Simulator" allows you to select and simulate up to three products simultaneously.

3. Click "Back" or "Next" button, then you can return or proceed.

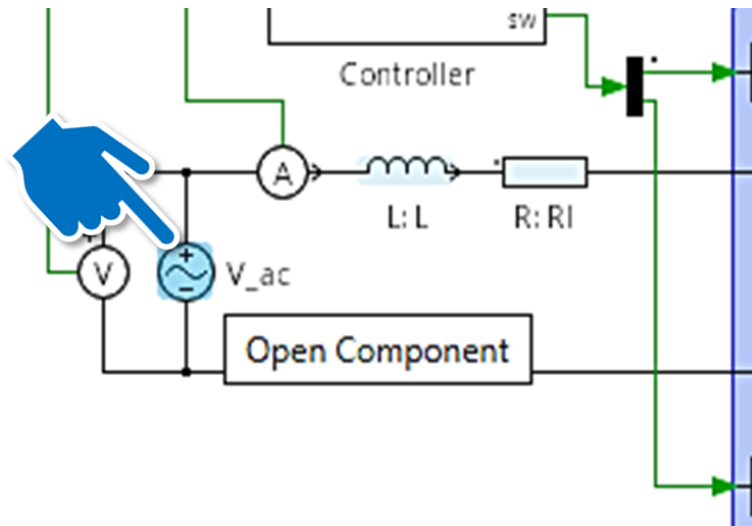
Select	Part Number	VDS [V]
<input checked="" type="checkbox"/>	SCT4090KWAHR	1200
<input type="checkbox"/>	SCT4090KR	1200
<input type="checkbox"/>	SCT4065DWAHR	750
<input type="checkbox"/>	SCT4065DR	750
<input type="checkbox"/>	SCT4065DLL	750
<input type="checkbox"/>	SCT4062KWAHR	1200
<input type="checkbox"/>	SCT4062KWA	1200
<input type="checkbox"/>	SCT4062KWZ	1200

Select	Part Number	Reve
<input type="radio"/>	SCS320AM	650
<input type="radio"/>	SCS320AJ	650
<input type="radio"/>	SCS320AG	650

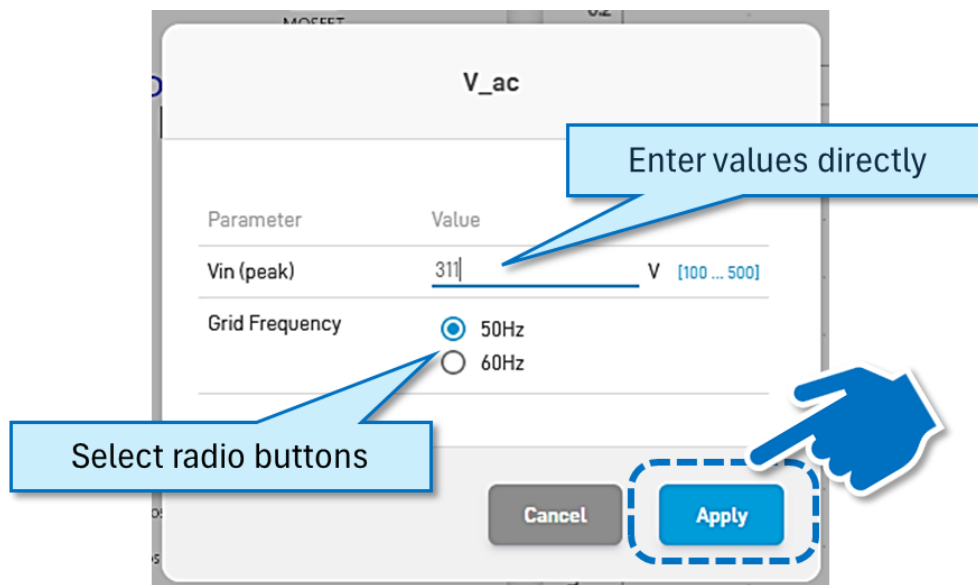
Parameter	Value
V <sub>DSS</sub>	1200V
R <sub>DS(on)</sub> (Typ.)	90mΩ
I <sub>D</sub>	19A
P <sub>D</sub>	88W

## 4. Configure Circuit Parameters (“Dialog” parameters)

1. Symbols whose parameters can be changed are colored light-blue in the circuit diagram.
2. Over your mouse cursor to the symbol that you want to change the parameter and the symbol color is turned to blue (e.g. “V\_ac” symbol in the below).
3. Click the mouse’s left button.



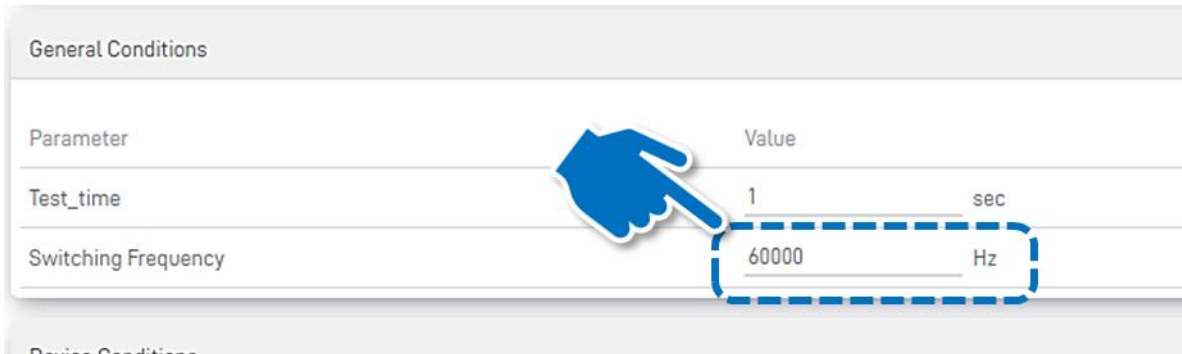
4. A new window like the below is opened.
5. You can change the parameters by entering the value directly\* or selecting radio buttons.
6. Push “Apply” button after configuring all parameters.



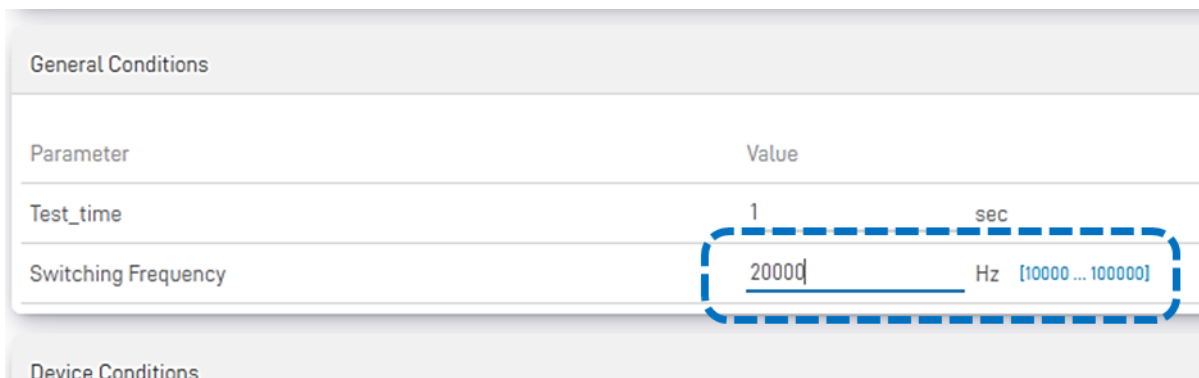
\*Note: Parameters can be entered directly are limited by Min. and Max. values to avoid unexpected system errors.  
(e.g. “Vin(peak)” is limited between 100 and 500V in the above.)

## 5. Configure Circuit Parameters (“Table” parameters)

1. Choose the parameter that you want change on the parameter tables (e.g. “60kHz” of Switching Frequency in the figure below.)

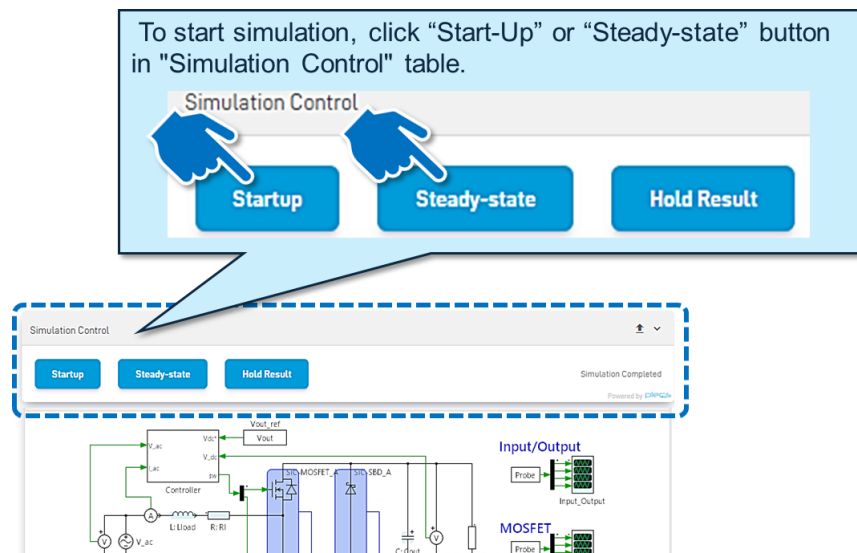


2. A blue under-line and variable range of the parameter are appeared.
3. Then, you can change the parameters by entering the value directly (e.g. “60kHz” was changed to “20kHz” in the figure below.)

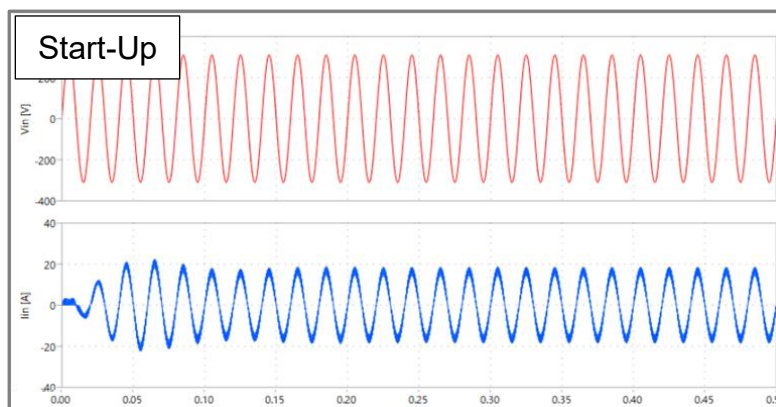


## 6. Run Simulation

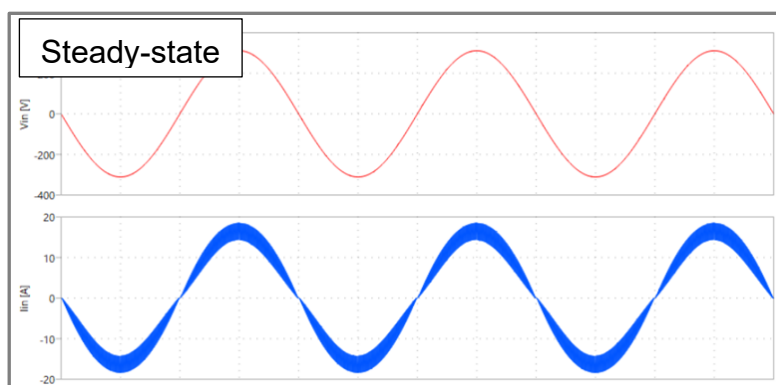
“ROHM PLECS Simulator” has two types of simulation modes (“Start-Up” and “Steady-state”). Please use the appropriate simulation mode depending on your needs.



- “Start-Up” mode simulates all transient process from the start time (0 sec) to the end time that you configured at “Test time” in “5.Configure Circuit parameters (Table parameters)”.

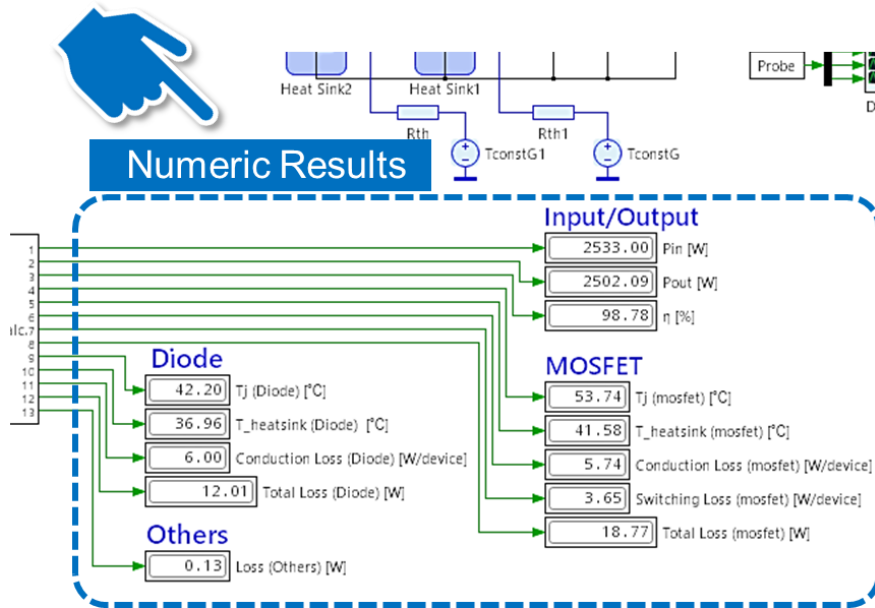


- On the other hand, “Steady-state” mode shows only the steady-state results.

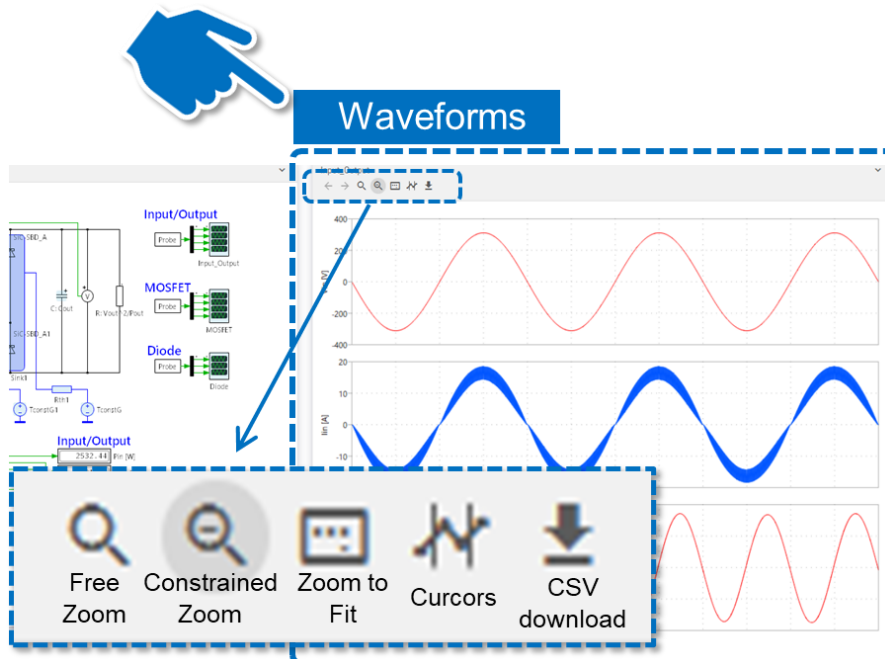


## 7. View Simulation Results

Numeric results (e.g. Power losses, Efficiency, Temperatures) are showed at the display blocks in the schematic window.



Waveforms are shown at the right side of simulation screen. You can Zoom-in and Zoom-out the waveforms and can also download the CSV data\* of waveforms.



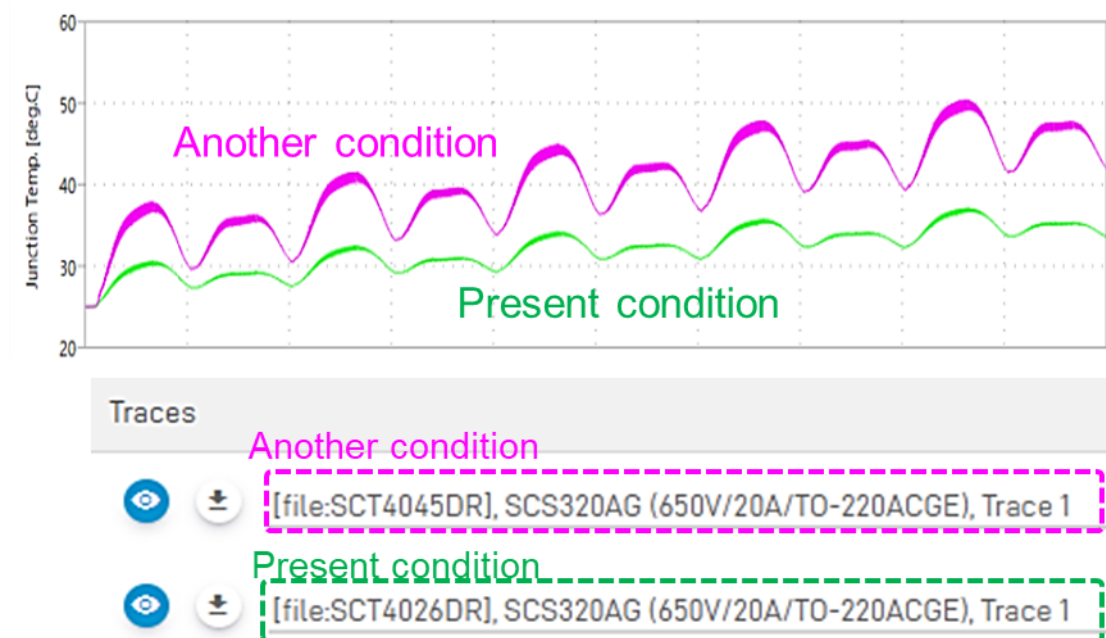
\*Note: CSV download option is only available for the data size less than 100MB.

## 8. Hold Result Option

If you want to keep the present waveforms and to compare to another condition's waveforms, click "Hold Result" button in "Simulation Control" table.



The present waveforms can be held, and after running another condition, its waveforms are going to be overwrapped in the same window.

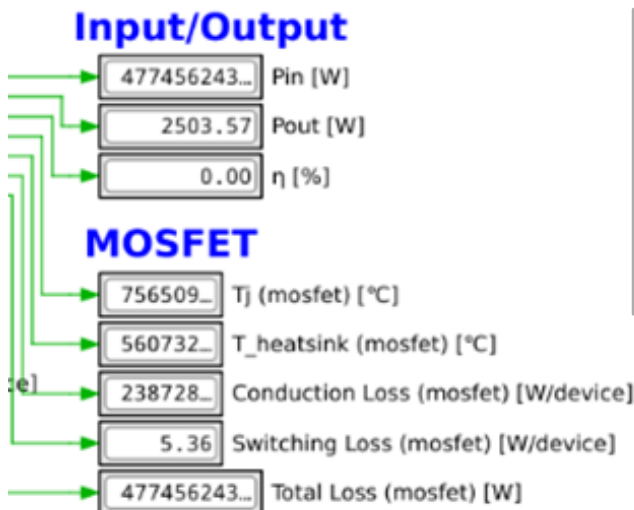


## 9. Troubleshooting Simulation Errors

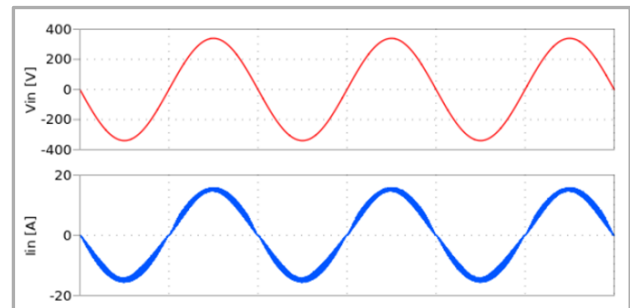
### 9-1. Abnormal Numeric Results (Steady-state mode)

When running a simulation in Steady-state mode, the numerical results in the display block may show abnormalities even though no particular abnormalities are observed in the waveforms.

#### ■ Example of Abnormal Numeric Results



Topology: A-011-D Totem-Pole PFC  
Simulation mode : Steady-state

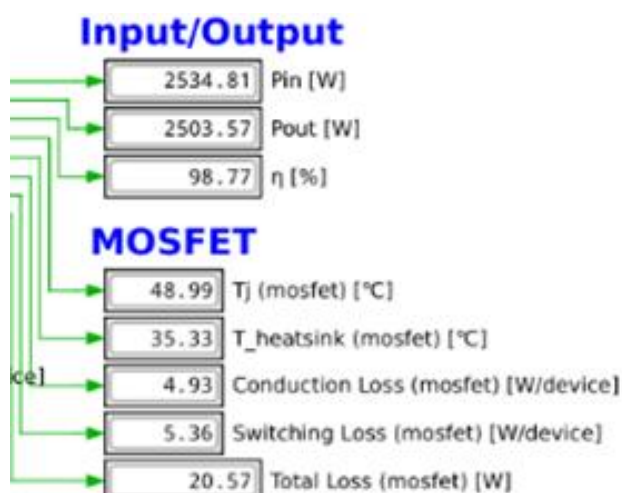


- SiC-MOSFET : SCT4065DR
- SiC-SBD : SCS320AG
- $V_{in\_ac}$ =240Vrms
- $V_{out}$ =400V
- $V_{c\_init}$ =500V (Initial voltage of Cout)
- $f_s$ =100kHz
- ※All the other conditions are Default.

The root cause of this error is likely that the initial voltage of output capacitor  $C_{out}$  is set to an unstable condition,  $V_{c\_init} = 500V$ , relative to the target output voltage  $V_{out} = 400V$ . Therefore, this error can often be resolved by correcting the initial conditions to a stable condition.

The figure below shows an example that this error was resolved by correcting the initial condition to  $V_{c\_init} = 400V (=V_{out})$ .

#### ■ Resolving error example by correcting $V_{c\_init}$



Topology: A-011-D Totem-Pole PFC  
Simulation mode : Steady-state

- SiC-MOSFET : SCT4065DR
- SiC-SBD : SCS320AG
- $V_{in\_ac}$ =240Vrms
- $V_{out}$ =400V
- $V_{c\_init}$ =400V (Initial voltage of Cout)
- $f_s$ =100kHz
- ※All the other conditions are Default.

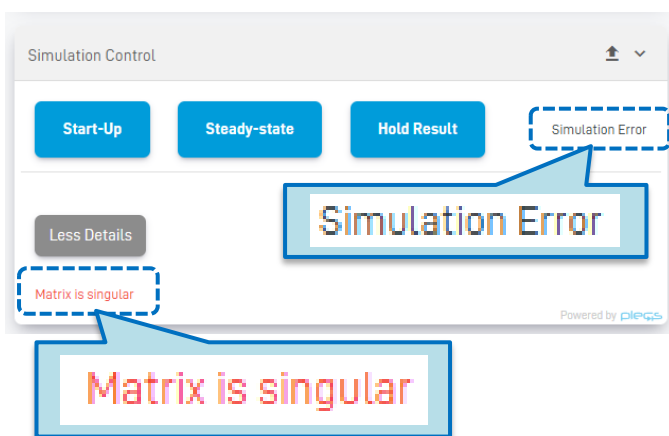
In addition to correcting  $V_{c\_init}$ , the following measures are also useful to resolve this error.

- Simulating by “Start-Up” mode.
- Reducing the Dead Time in the extent with no short-circuit current.

### 9-2. Matrix is singular (Steady-state mode)

For Steady-state mode, "Matrix is singular" error may occur due to instability in the initial circuit conditions. When this error occurs, an error message is displayed in the “Simulation Control” table, as shown in the figure below, and the simulation process stops.

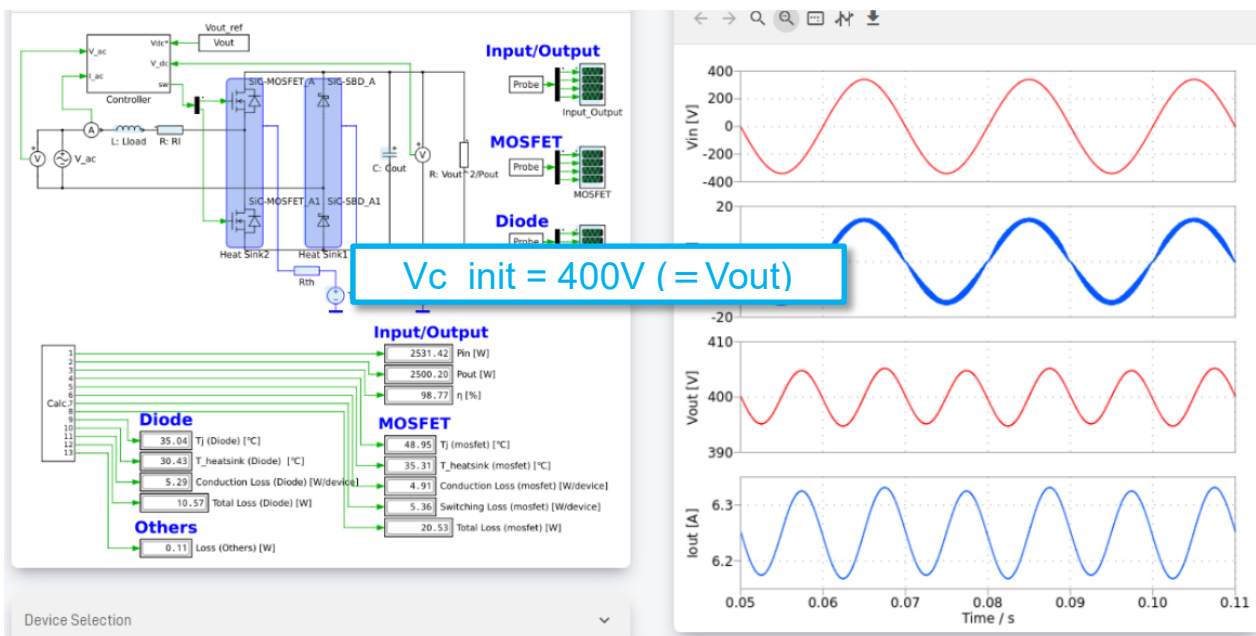
#### ■ “Matrix is singular” error example



Topology: A-011-D Totem-Pole PFC  
Simulation mode : Steady-state

- SiC-MOSFET : SCT4065DR
- SiC-SBD : SCS320AG
- $V_{in\_ac}$ =240Vrms
- $V_{out}$ =400V
- $C_{out}$ =2mF
- $V_{c\_init}$ =500V ( $\neq V_{out}$ )
- $f_s$ =100kHz
- ※ All the other conditions are Default.

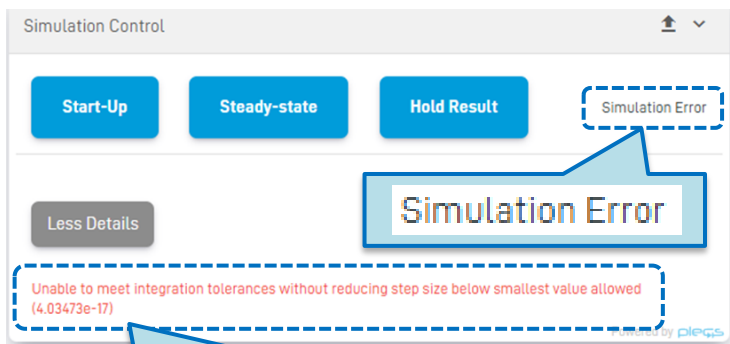
This error, same as error 9-1, can often be resolved by stabilizing the circuit's initial conditions. The figure below shows an example that the error was resolved by correcting the initial condition from  $V_{c\_init} = 500V (\neq V_{out})$  to  $400V (=V_{out})$ .



### 9-3. Unable to meet integration tolerances

When extremely rapid changes or discontinuities occur, the simulation tolerances are exceeded, may result in simulation errors like shown in the figure below (regardless of the simulation mode “Steady-state” or “Start-Up”).

Under the conditions shown in the figure below, the output capacitance is too large ( $C_{out} = 20mF$ ) and the initial voltage is too low ( $V_{c\_init} = 0V$ ), so a rush-current flow at simulation-start, which can be the root cause as this error.

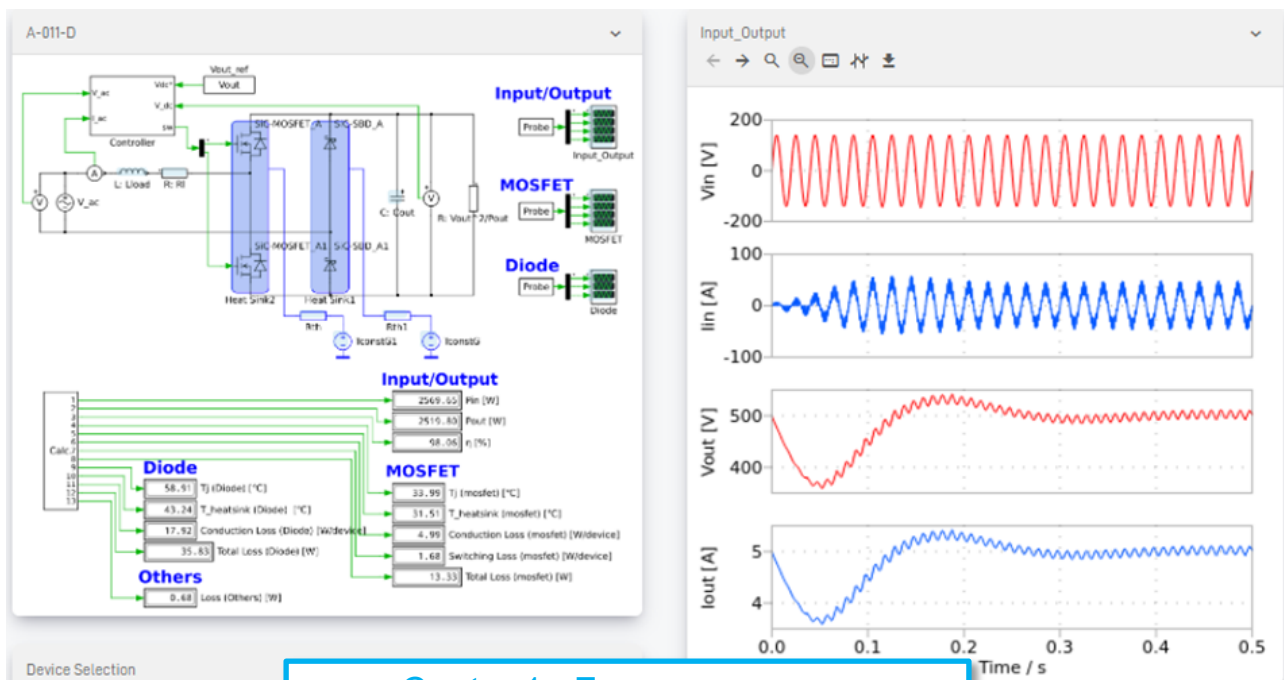


Unable to meet integration tolerances without reducing step size below smallest value allowed

Topology: A-011-D Totem-Pole PFC  
Simulation mode : Start-Up

- SiC-MOSFET : SCT4013DR
- SiC-SBD : SCS320AG
- $V_{in\_ac} = 100V_{rms}$
- $V_{out} = 500V$
- $C_{out} = 20mF$
- $V_{c\_init} = 0V$
- $f_s = 10kHz$
- ※ All the other conditions are Default.

Generally, this error can be resolved by adjusting the circuit conditions to prevent rapid changes or discontinuities. For example, the figure below shows an example that the error is resolved by lowering  $C_{out}$  to  $1mF$  and applying  $500V$  to  $V_{c\_init}$  to suppress a rush-current.

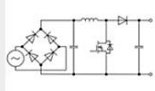


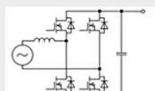




•  $C_{out} = 1mF$   
•  $V_{c\_init} = 500V (= V_{out})$

## 10. Supplementals

All the original “PLECS circuits” in “ROHM PLECS Simulator” can be downloaded from ROHM’s website. Therefore, if you have a “PLECS license”, you can also run or modify these PLECS circuits on your PC.

<https://www.rohm.com/support/plecs>

Circuit Models for PLECS					
ROHM provides PLECS models for circuit simulation. Please utilize them for preliminary verification using circuit simulation.					
AC-DC PFC	DC-AC Inverter	DC-DC Converter			
Category	Topology	NO.	Simulation circuit name	Circuit Models zip download	Document download
Boost PFC		A-002-D3	AC-DC Boost PFC Vin=200V Iin=2.5A CCM (Equipped with TO247-N Package)		
		A-010-DOT	AC-DC Totem-Pole Bridgeless PFC Vin=200V, Iin=100A, Synchronous FETs (Equipped with DOT-247 Package)		


To run or modify\* these PLECS circuits downloaded from the above, you must have installed “PLECS” simulation software on your PC and inquired its license\*”. For more information, please visit the official website of Plexim.Inc.

<https://www.plexim.com/download>



\*Notes: For “Modifying” and “Saving” circuits, “Paid” or “Trial” license is mandatory.  
For just “Running” and “Viewing” the circuit, “Demo Mode (No-license)” is available.


▶ PLECS

 PLECS is currently unlicensed.  
No license file found.

Start in demo mode Open license manager...

➔

▶ PLECS Demo Mode

 You can build or modify models and run simulations but the following restrictions apply:

- You can only create new models or open specifically signed demo models.
- You cannot save any models.
- Exporting operations are disabled.
- You cannot use the To File block.

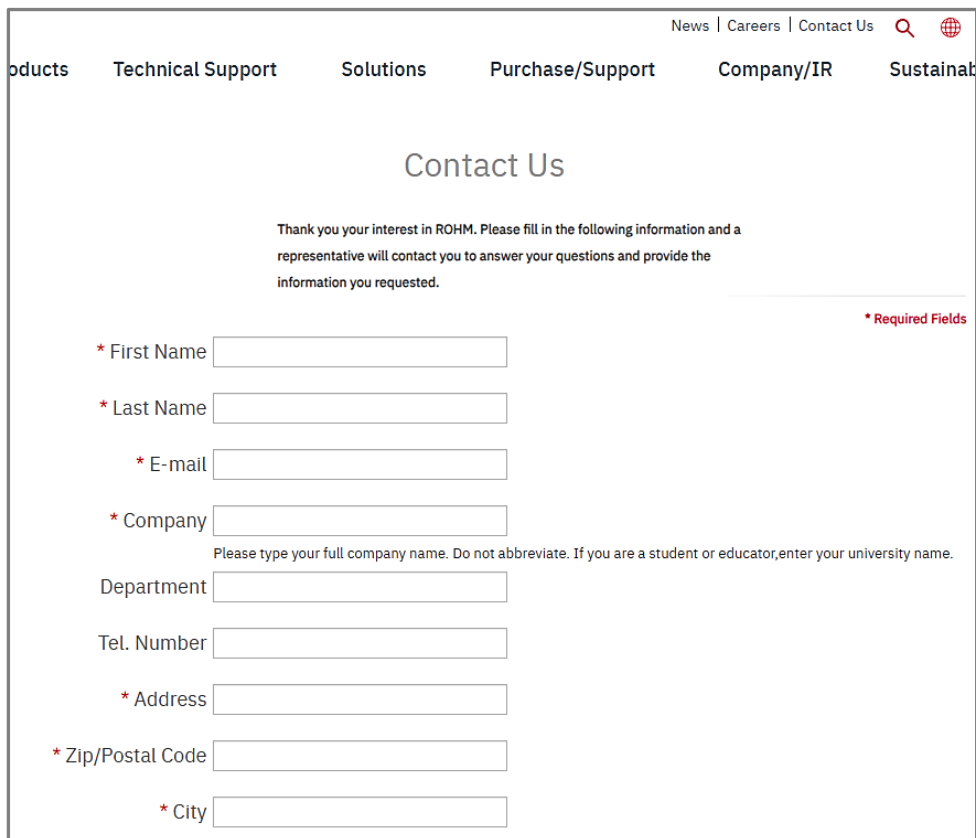
OK

Restrictions in Demo Mode

## 11. Contact Information

If you have any questions, comments, or need support\* with “ROHM PLECS Simulator”, please contact us from the below.

<https://www.rohm.com/contactus>



The screenshot shows the 'Contact Us' page on the ROHM website. At the top, there is a navigation bar with links for 'Products', 'Technical Support', 'Solutions', 'Purchase/Support', 'Company/IR', and 'Sustainat'. The main heading is 'Contact Us'. Below the heading, a message reads: 'Thank you your interest in ROHM. Please fill in the following information and a representative will contact you to answer your questions and provide the information you requested.' To the right of this message is a red asterisk and the text '\* Required Fields'. The form contains several input fields: '\* First Name', '\* Last Name', '\* E-mail', '\* Company', 'Department', 'Tel. Number', '\* Address', '\* Zip/Postal Code', and '\* City'. A note below the 'Company' field states: 'Please type your full company name. Do not abbreviate. If you are a student or educator, enter your university name.'

\*Notice: Technical support might be subject to a fee.

### Notice

- 1) The information contained in this document is intended to introduce ROHM Group (hereafter referred to as ROHM) products. When using ROHM products, please verify the latest specifications or datasheets before use.
- 2) ROHM products are designed and manufactured for use in general electronic equipment and applications (such as Audio Visual equipment, Office Automation equipment, telecommunication equipment, home appliances, amusement devices, etc.) or specified in the datasheets. Therefore, please contact the ROHM sales representative before using ROHM products in equipment or devices requiring extremely high reliability and whose failure or malfunction may cause danger or injury to human life or body or other serious damage (such as medical equipment, transportation, traffic, aircraft, spacecraft, nuclear power controllers, fuel control, automotive equipment including car accessories, etc. hereafter referred to as Specific Applications). Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses, or losses incurred by you or third parties arising from the use of ROHM Products for Specific Applications.
- 3) Electronic components, including semiconductors, can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against physical injury, and damage to any property, which a failure or malfunction of products may cause.
- 4) The information contained in this document, including application circuit examples and their constants, is intended to explain the standard operation and usage of ROHM products, and is not intended to guarantee, either explicitly or implicitly, the operation of the product in the actual equipment it will be used. As a result, you are solely responsible for it, and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses, or losses incurred by you or third parties arising from the use of such information.
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More detail product informations and catalogs are available, please contact us.

## ROHM Customer Support System

<https://www.rohm.com/contactus>