(A-011-D) DC-AC Totem-Pole PFC Diode Rectification (Discrete)

PLECS Reference Circuit
Circuit Information

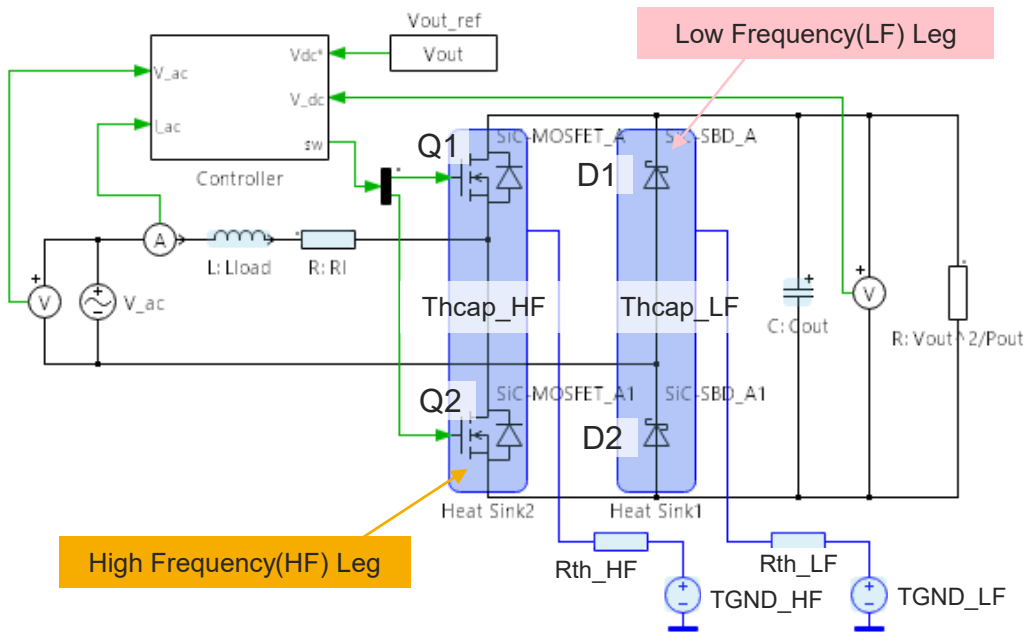
2026 March
68UG123E Rev.001

Simulation Parameters

	Name	Content	unit	Default Value	Variable Range
	L	Inductive Load	H	680u	1n ～ 1
	Rl	Parasitic Resistance	Ω	1m	1u ～ 100m
	C	Output Capacitor Initial Voltage	F V	470u 500	1n ～ 1 0 ～ 1200
High-Freq. Leg	Thcap_HF	Thermal Capacitance	J/K	0.2	1m ～ 100
High-Freq. Leg	Rth_HF	Thermal Resistance	K/W	2	1m ～ 100
High-Freq. Leg	TGND_HF	Thermal GND Temperature	℃	25	-40 ～ 175
Low-Freq. Leg	Thcap_LF	Thermal Capacitance	J/K	0.2	1m ～ 100
Low-Freq. Leg	Rth_LF	Thermal Resistance	K/W	2	1m ～ 100
Low-Freq. Leg	TGND_LF	Thermal GND Temperature	℃	25	-40 ～ 175

Name	Content	unit	Default Value	Variable Range
Test_time	Test time in simulation	s	0.5	100u ～ 0.5
fs	Switching Frequency	Hz	60k	10k ～ 100k
V_ac(rms)	Input Voltage Grid Frequency	V Hz	220 50	100 ～ 500 50 or 60
Vout (dc)	Output Voltage	V	500	300 ～ 1200
Pout	Output Power	W	2500	100 ～ 30000
Rg_on	Gate Resistance (Source)	Ω	4.7	0.1 ～ 100
Rg_off	Gate Resistance (Sink)	Ω	2.2	0.1 ～ 100
T_init	Initial Junction Temperature	℃	25	-40 ～ 175

Simulation Circuit



Default Devices

Name	Device Type	Part No.	Specification
Q1,2	SiC MOSFET	SCT4065DR	750V/ 25A/ 65mΩ/ TO-247-4L
D1,2	SiC Schottky Barrier Diode	SCS320AG	650V/ 20A/ TO-220ACGE

Simulation Screen Overview

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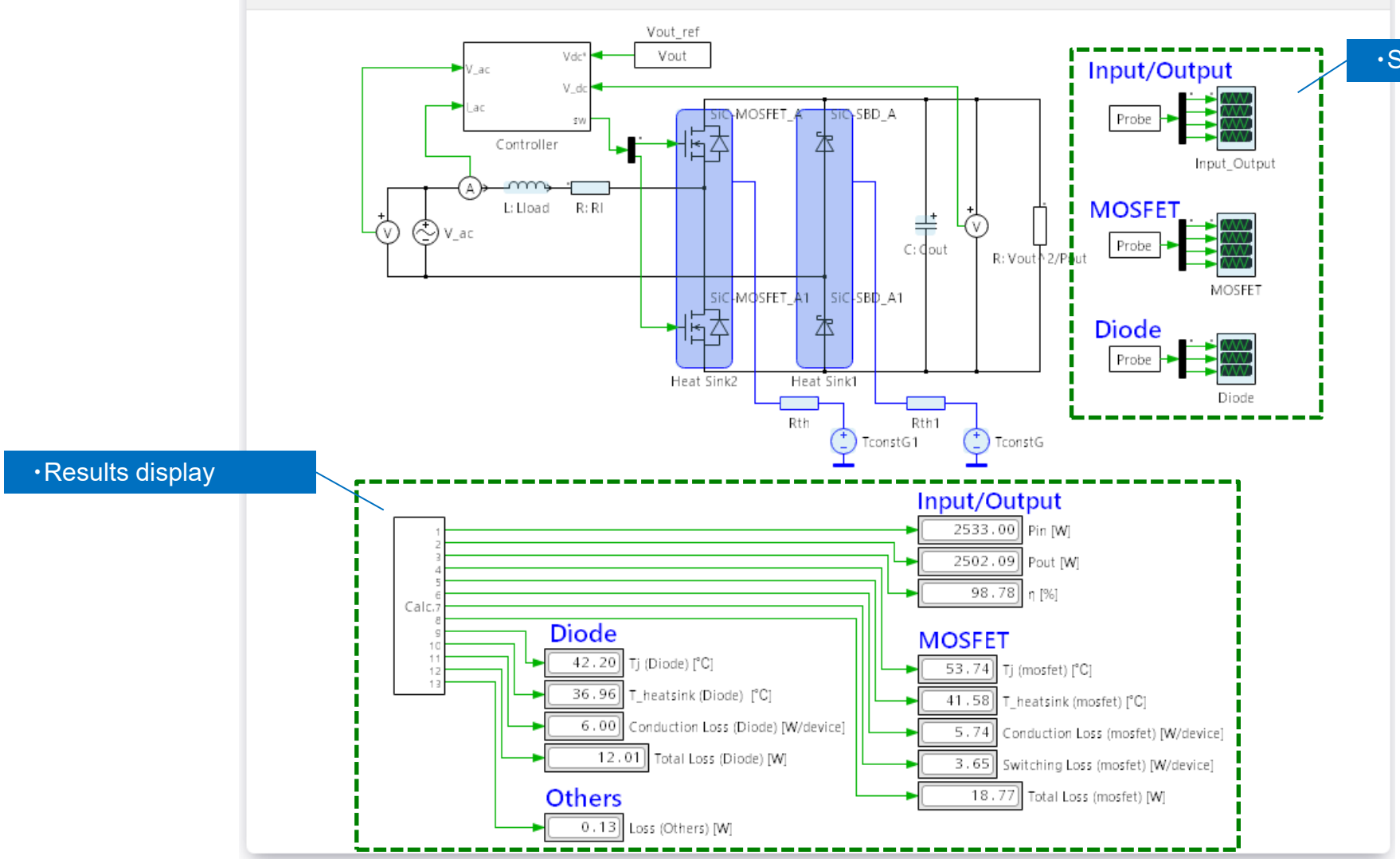
Schematic window



Simulation Results

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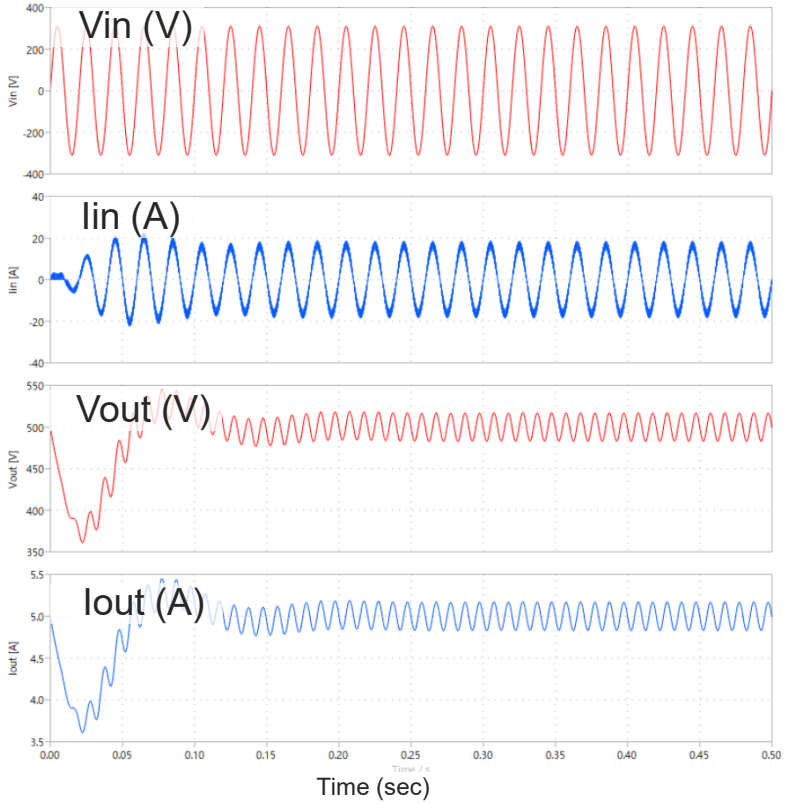
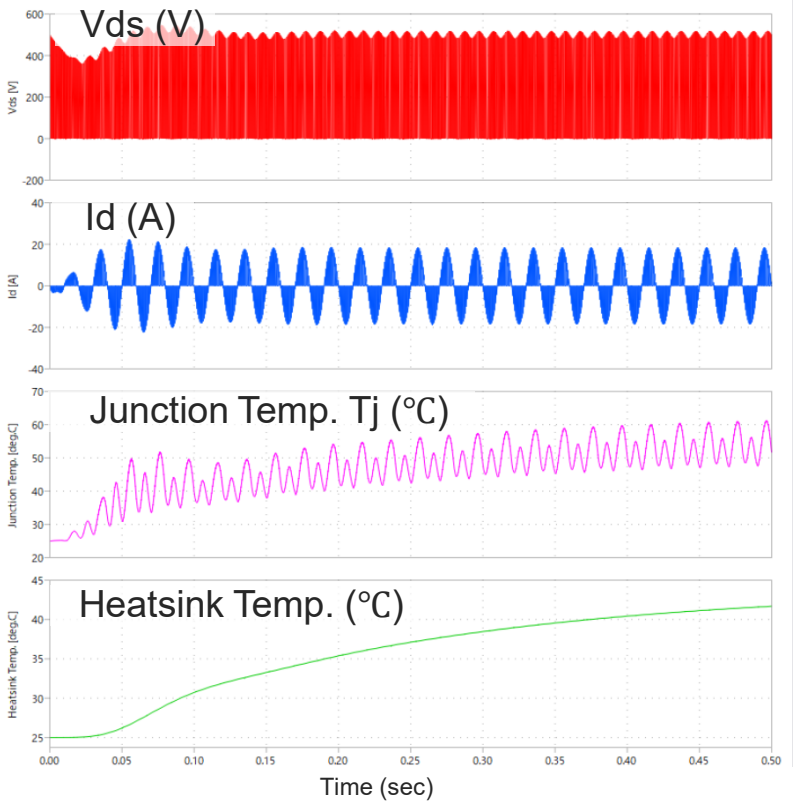
Input and Output



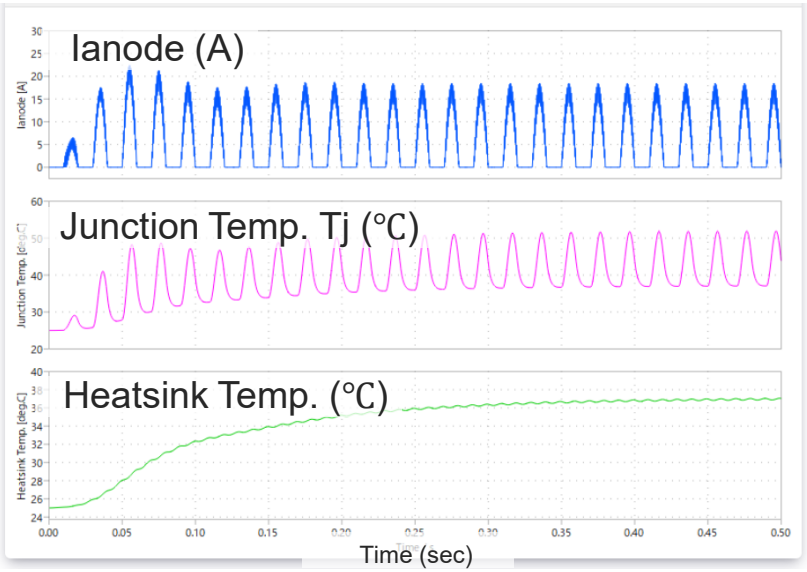
Contents	Results
Input Power : Pin	2533.00 (W)
Output Power: Pout	2502.09 (W)
Efficiency: η	98.78 (%)

MOSFET (HF leg)



Contents	Results
Junction Temp. Tj(mos)	53.74 (℃)
Heatsink Temp. T_hs(mos)	41.58 (℃)
Conduction Loss: Pcond(mos)	5.74 (W/device)
Switching Loss: Psw(mos)	3.65 (W/device)
Total Loss: Ptot(mos)	18.77 (W)

Diode (LF leg)



Contents	Results
Junction Temp. Tj(diode)	42.20 (℃)
Heatsink Temp. T_hs(diode)	36.96 (℃)
Conduction Loss: Pcond(diode)	6.00 (W/device)
Total Loss: Ptot(diode)	12.01 (W)

Preparation for Use

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To run this PLECS Reference Circuit, you must have the "PLECS" simulation software installed on your computer.

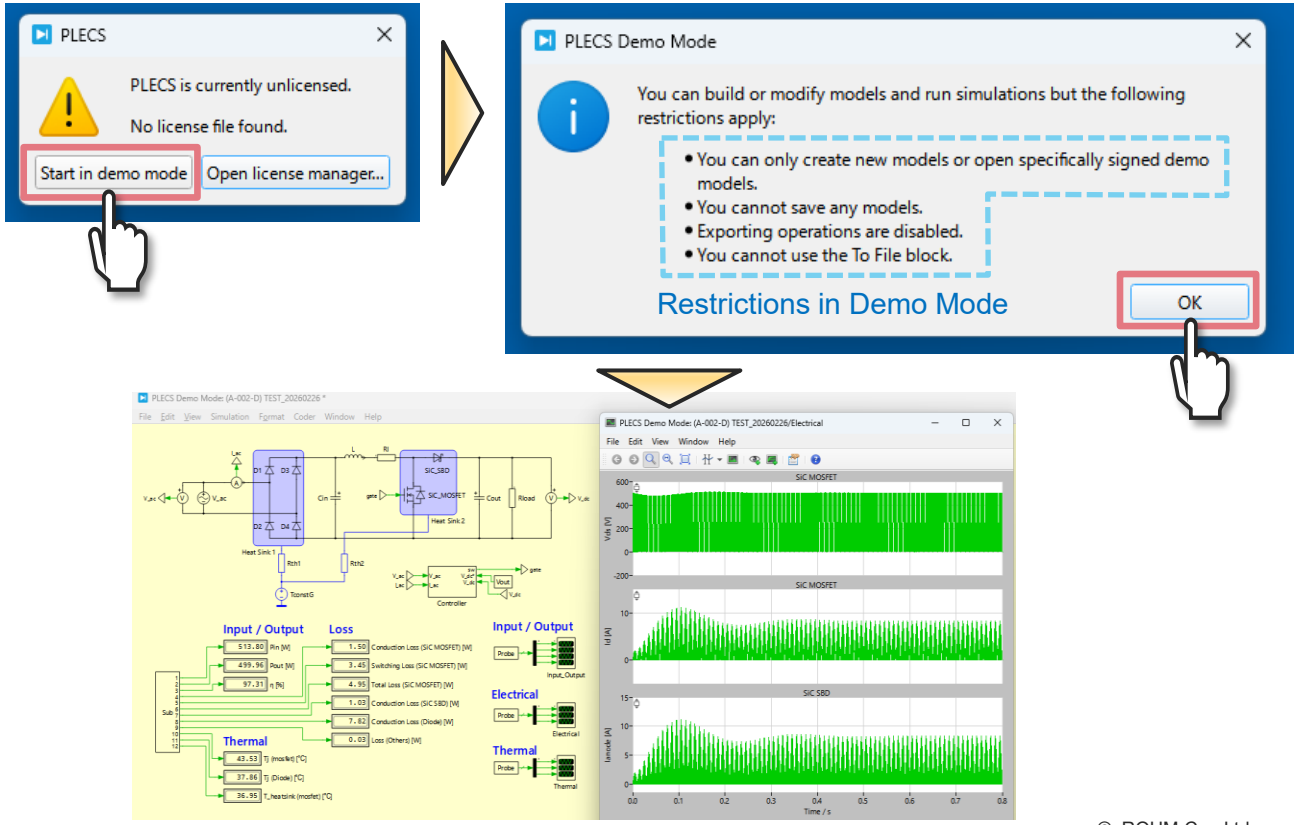
1. Obtaining the Software

If you do not have PLECS installed, please download the installer from the official website and complete the setup process.

https://www.plexim.com/download

2. Licensing (Using Demo Mode)

This reference circuit can be executed and viewed in "Demo Mode" even if you do not possess a paid license.



How to change the devices

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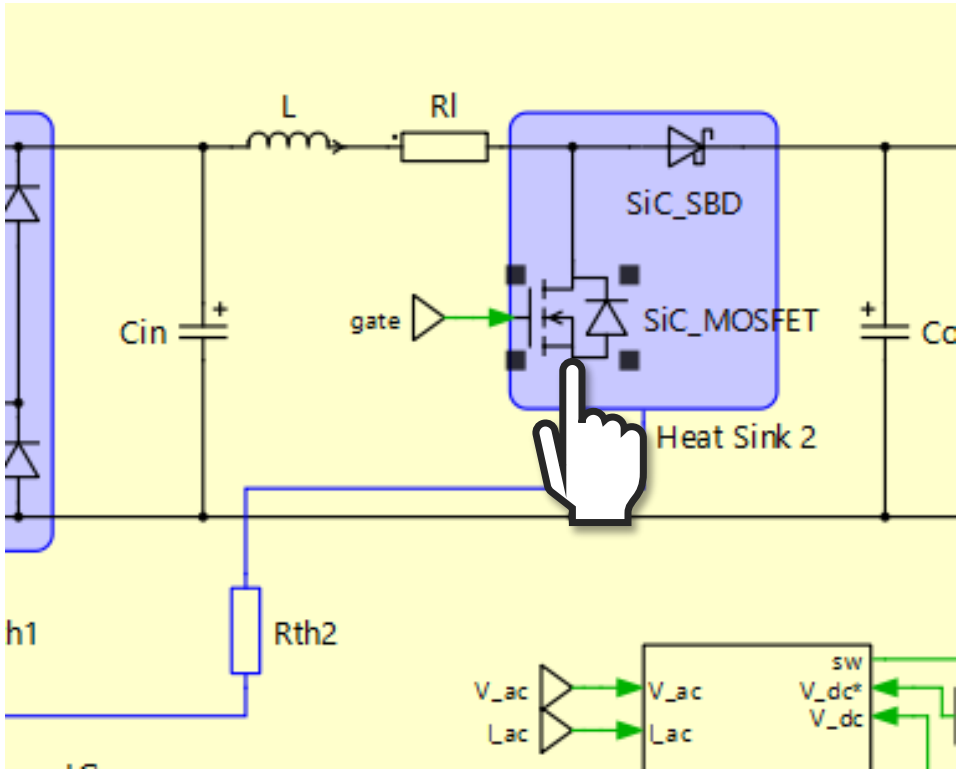
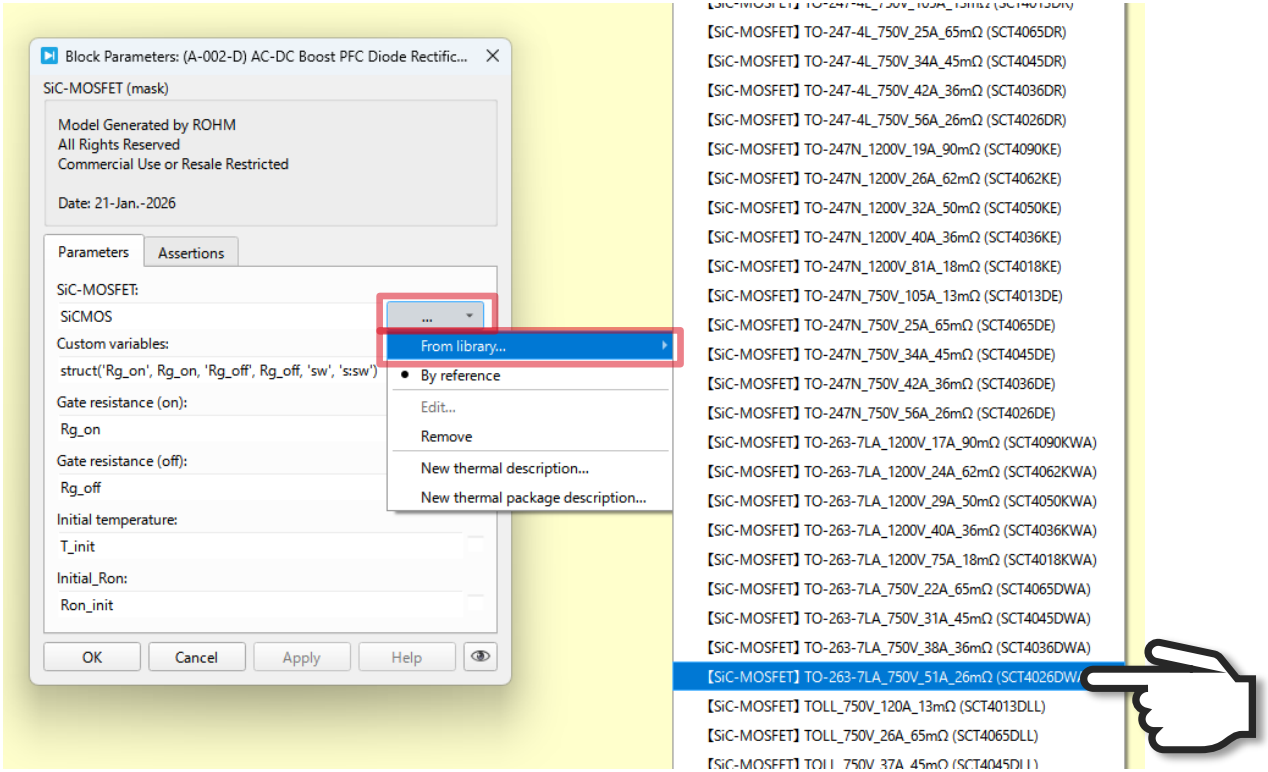
Schematic window





Hover your mouse cursor over the device symbol that you want to change and double-click the left button of the mouse.

Click "..." > "From library..." to view the list of available devices and you can select a favorite device from these.

If the model you need is not in the list, please refer to the application note "How to Use PLECS Models".

How to change the simulation parameters

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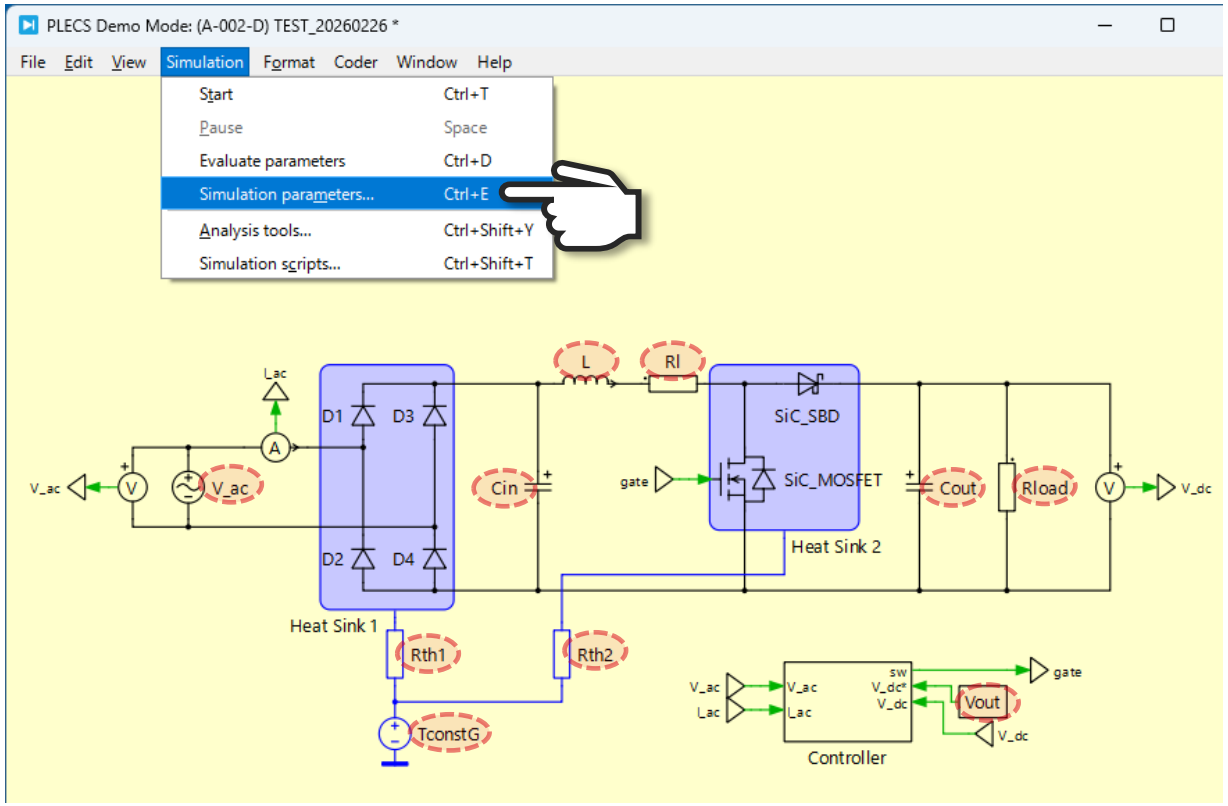
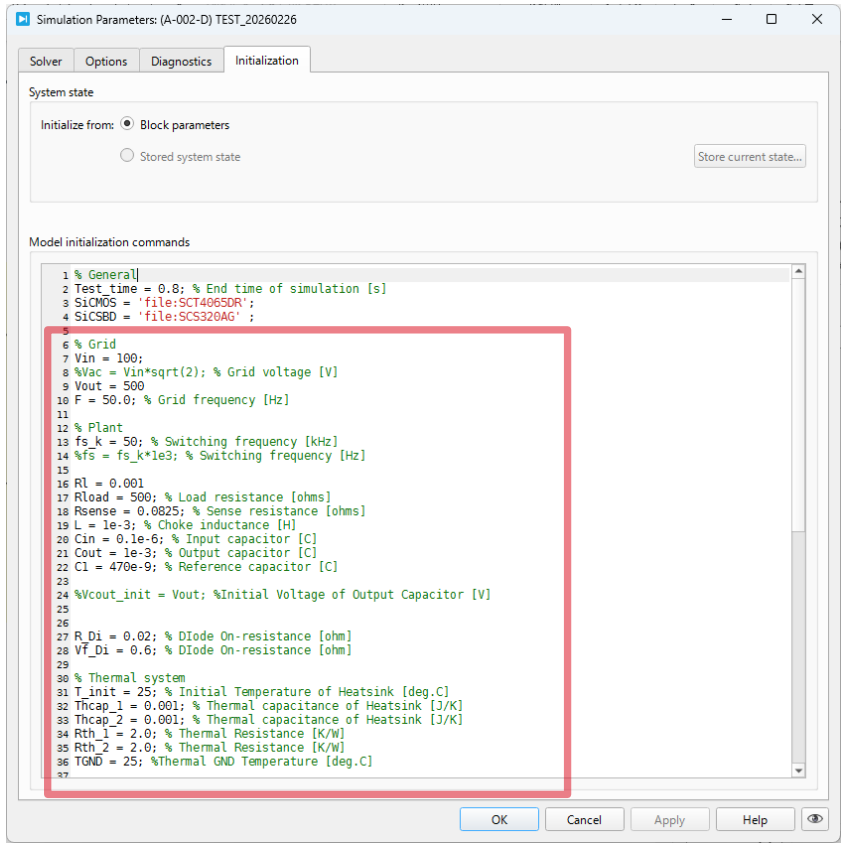
Schematic window





All simulation parameters are parameterized. To modify them, go to the menu, select “Simulation parameters...” , and edit the values within "Model initialization commands."

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