(C-010-D) DC-DC Flyback Converter (Discrete)

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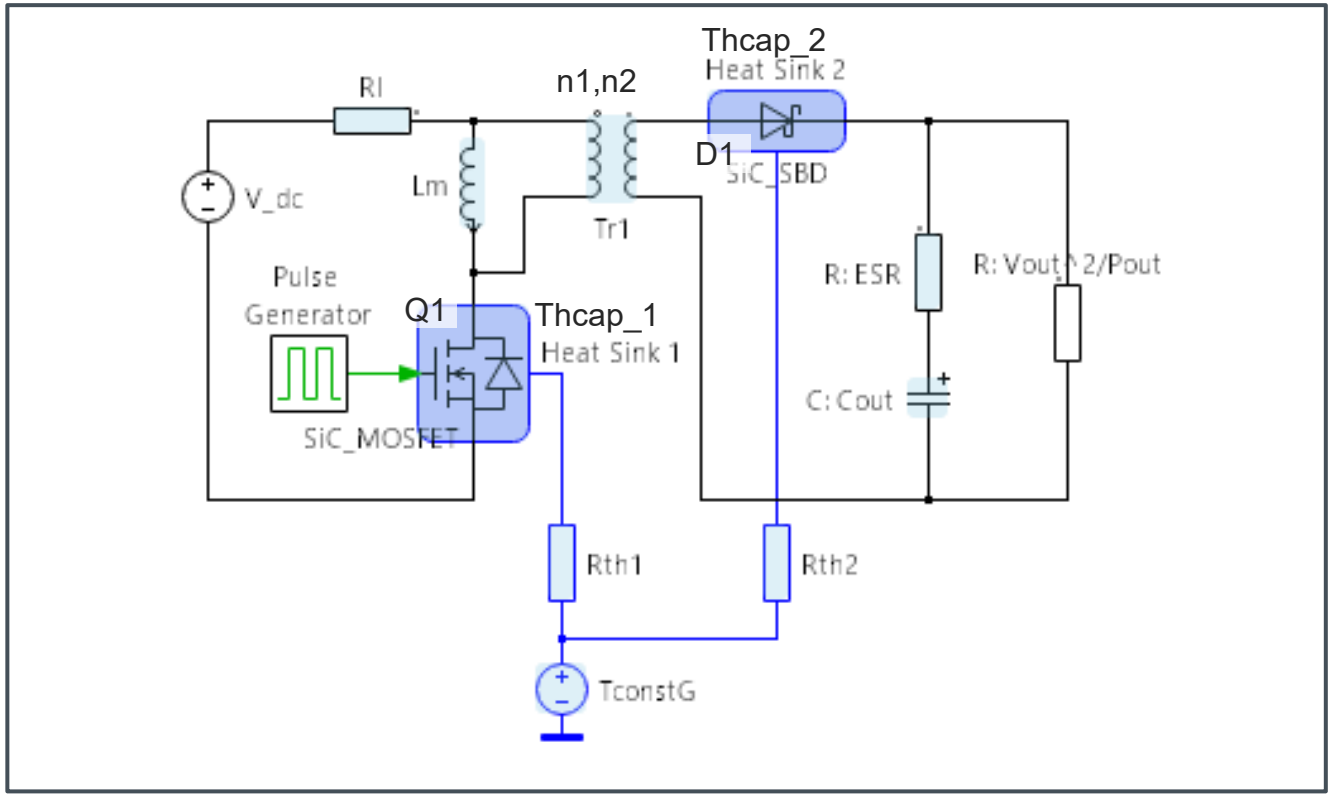
Simulation Parameters

Name	Content	unit	Default Value	Variable Range
Lm	Magnetizing Inductance	H	3m	1n ~ 1
Rl	Parasitic Resistance	Ω	5m	1u ~ 100m
Cout	Output Capacitor	F	500u	1n ~ 1
ESR	Equivalent Series Resistance	V	0.01	1u ~ 100m
n1	Primary coil	turns	15	1~100
n2 *	Secondary coil	turns	-2	-100~-1
Rc	Parasitic Resistance	Ω	10m	1u ~ 100m
Rth1,2	Thermal Resistance	K/W	0.3	1m ~ 100
Thcap_1,2	Thermal Capacitance	J/K	1m	1m ~ 100
TGND	Thermal GND Temperature	℃	25	-40 ~ 175

* For the secondary coil parameters, negative values must be entered.

Name	Content	unit	Default Value	Variable Range
Test_time	Test time in simulation	s	0.3	100u ~ 0.5
fs	Switching Frequency	kHz	100	10k ~ 100k
Vin	Input Voltage	V	400	1 ~ 1000
Vout	Output Voltage	V	12	10 ~ 1200
Pout	Output Power	W	100	1~10k
Rg_on	Gate Resistance (Source)	Ω	4.7	0 ~ 100
Rg_off	Gate Resistance (Sink)	Ω	2	0 ~ 100
T_init	Initial Junction Temperature	℃	25	-40 ~ 175

Simulation Circuit



Default Deices

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

Simulation Screen Overview

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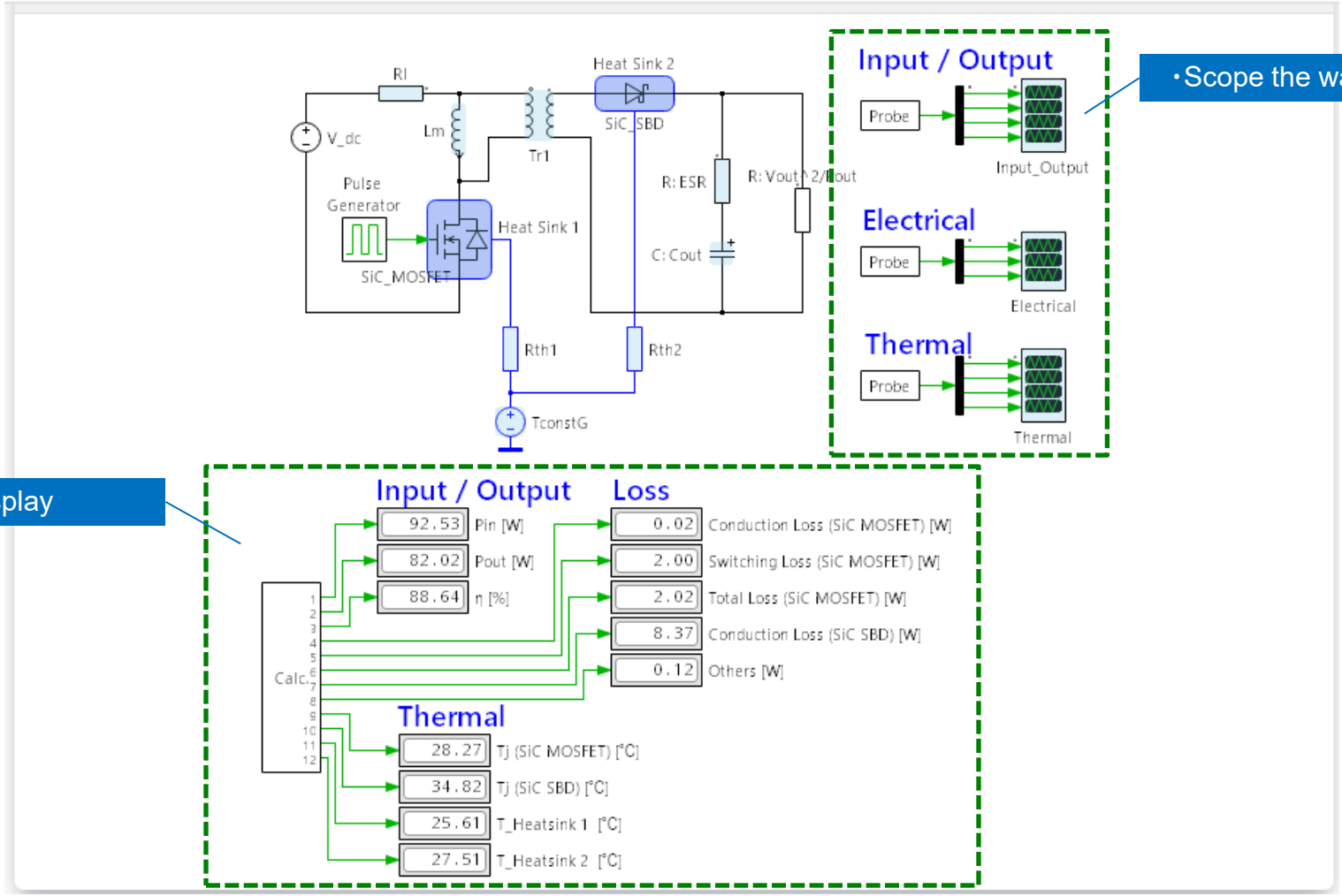
Schematic window



・Scope the waveform

・Results display

Simulation Results

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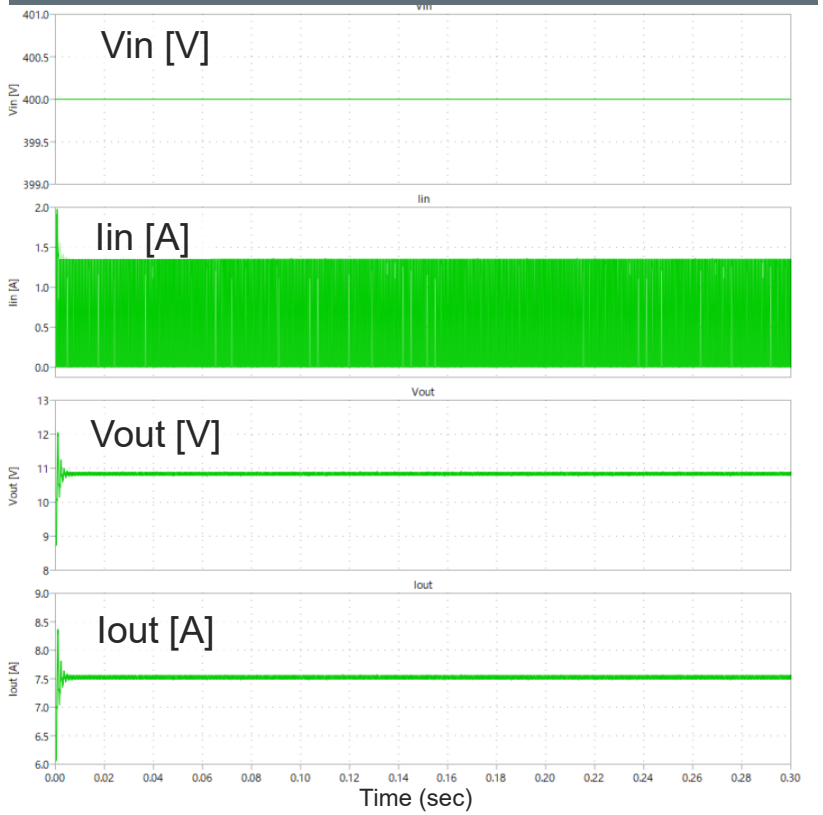
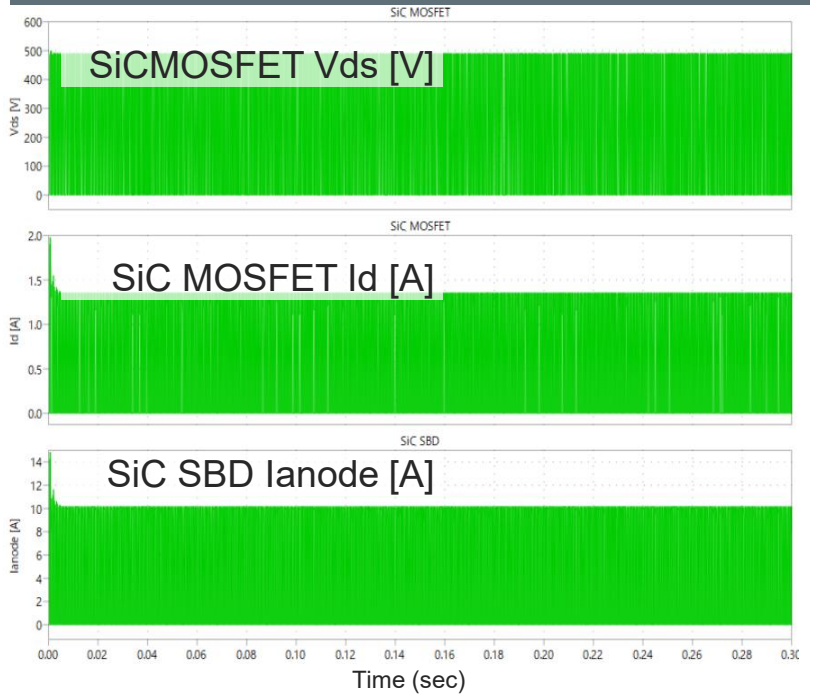
Input and Output



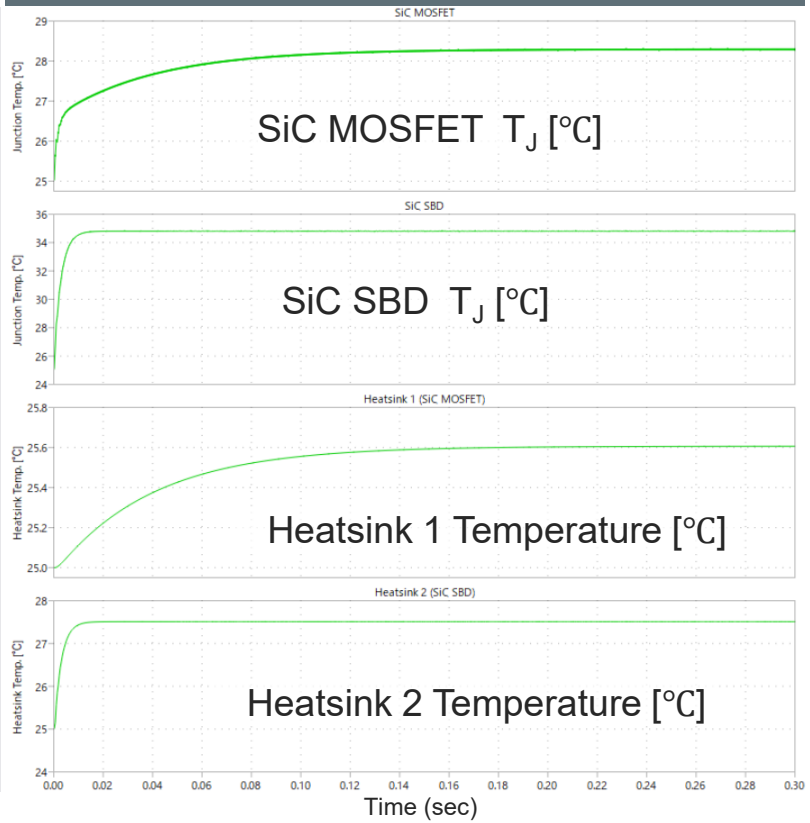
Contents	Results
Input Power : Pin	92.53 W
Output Power: Pout	82.02 W
Efficiency: η	88.64 %

Electrical



Contents	Results
Conduction Loss (SiC MOSFET)	0.02 W
Switching Loss (SiC MOSFET)	2.00 W
Total Loss (SiC MOSFET)	2.02 W
Conduction Loss (SiC SBD)	8.37 W
Loss (Others)	0.12 W

Thermal



Contents	Results
Tj (SiC MOSFET)	28.27 ℃
Tj (SiC SBD)	34.82 ℃
T_Heatsink 1	25.61 ℃
T_Heatsink 2	27.51 ℃

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

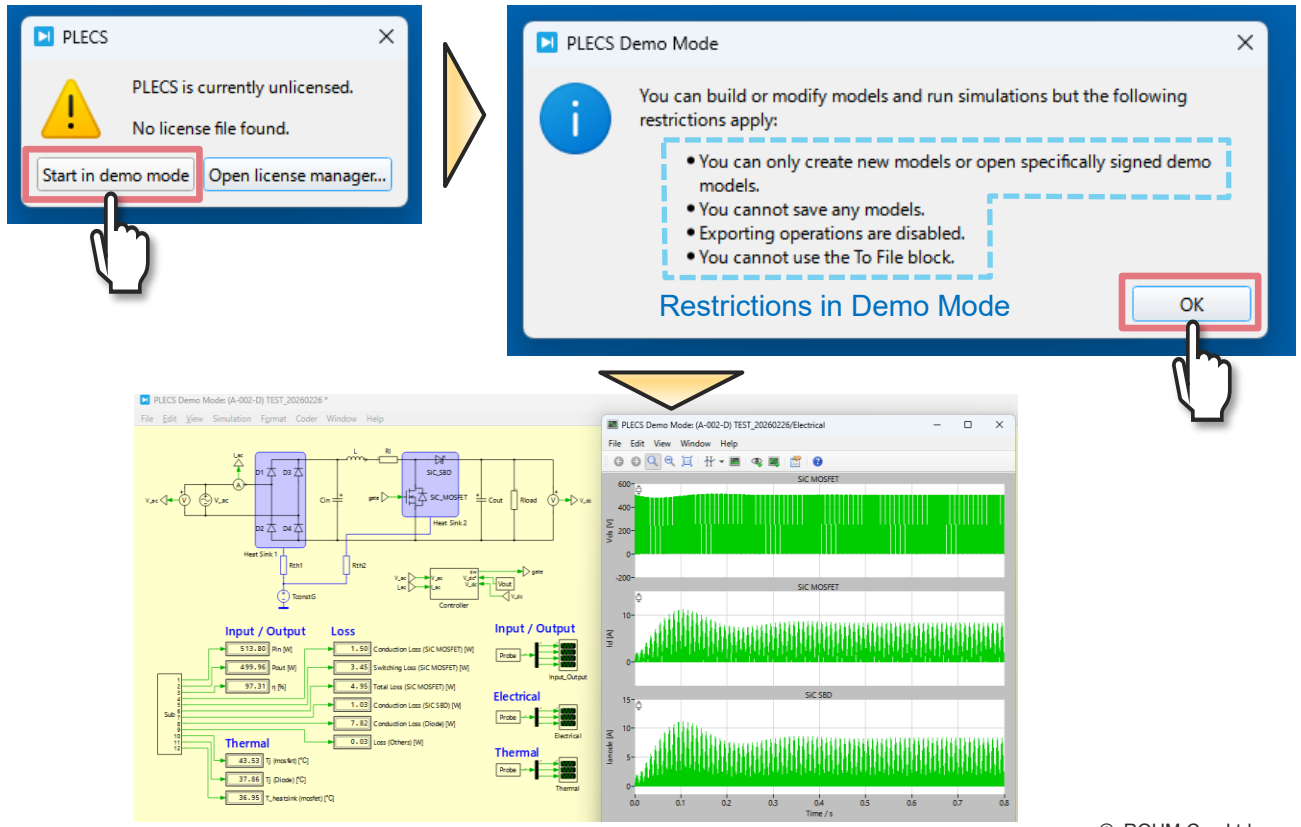
1. Obtaining the Software

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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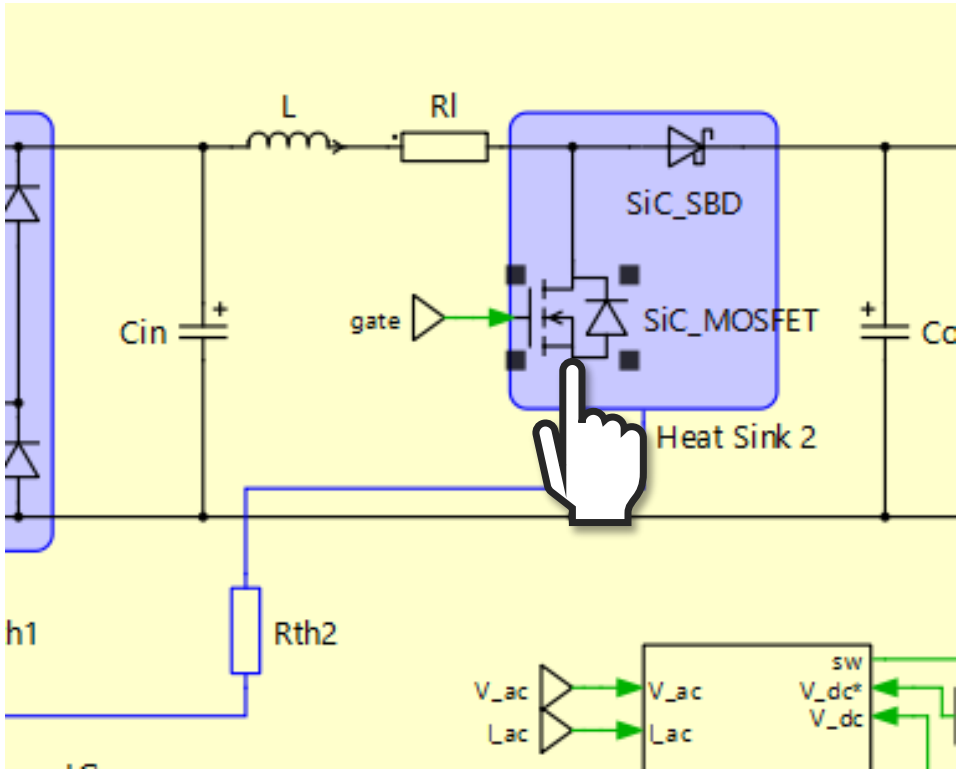
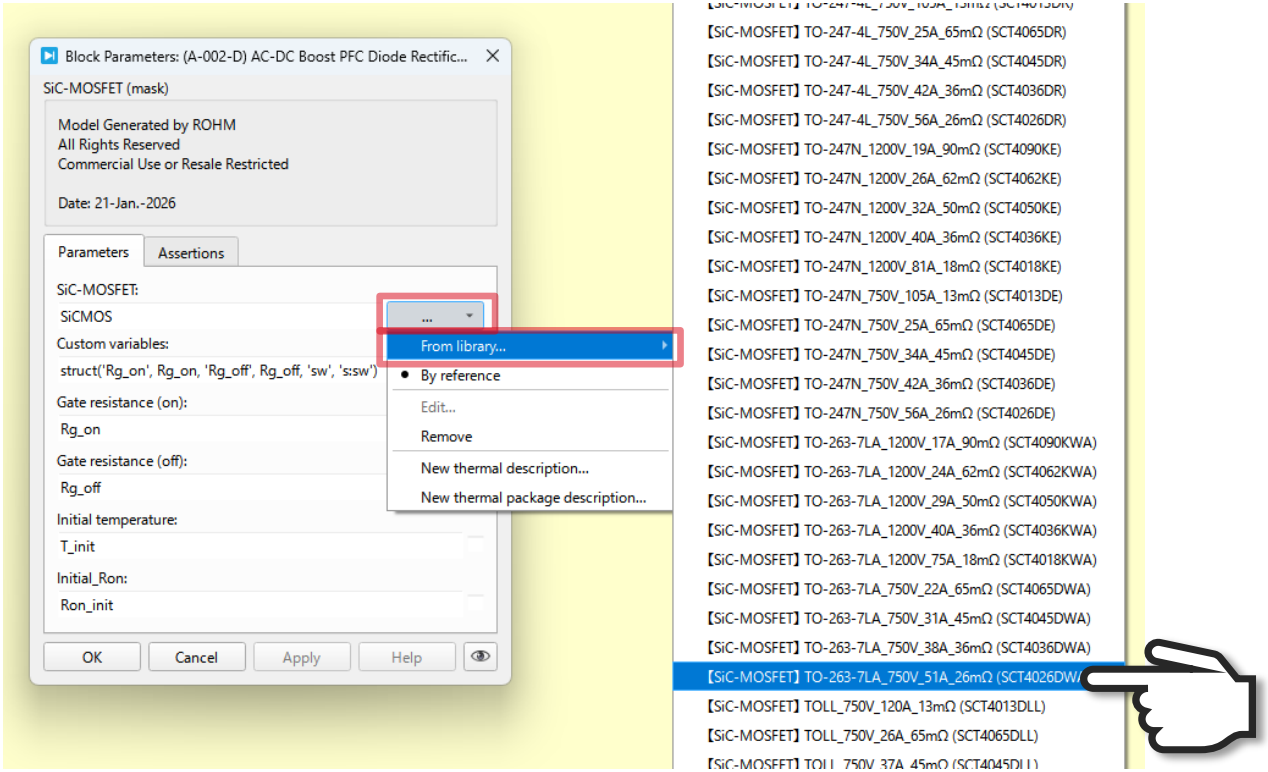
Schematic window





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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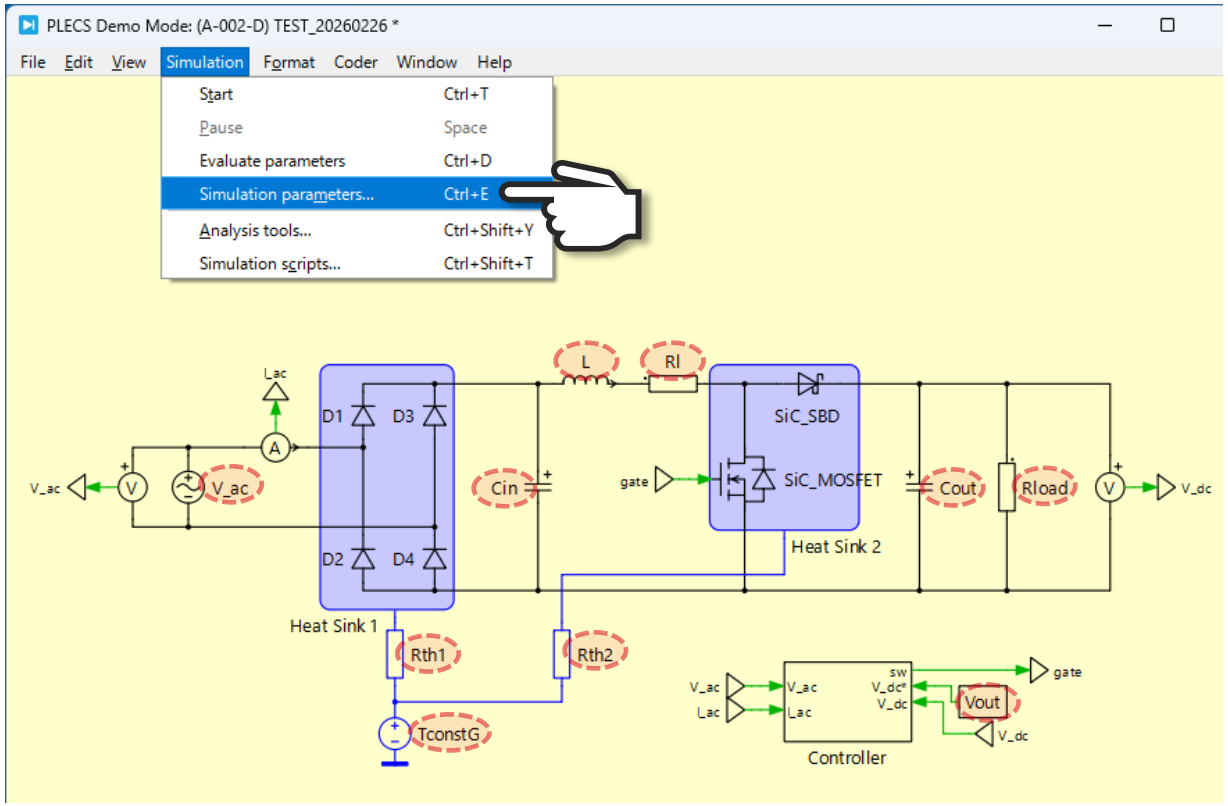
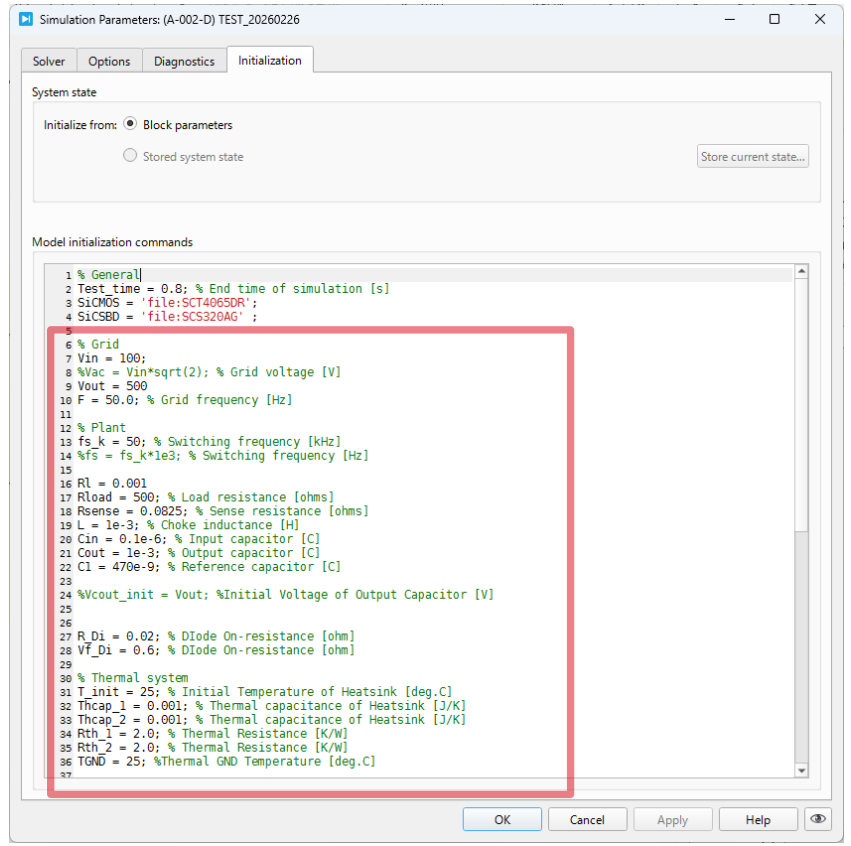
Schematic window





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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