(B-012-DOT) DC-AC 3-phase 3-Level NPC-Type-I Inverter (DOT247)

PLECS Reference Circuit
Circuit Information

2026 March
68UG130E Rev.001

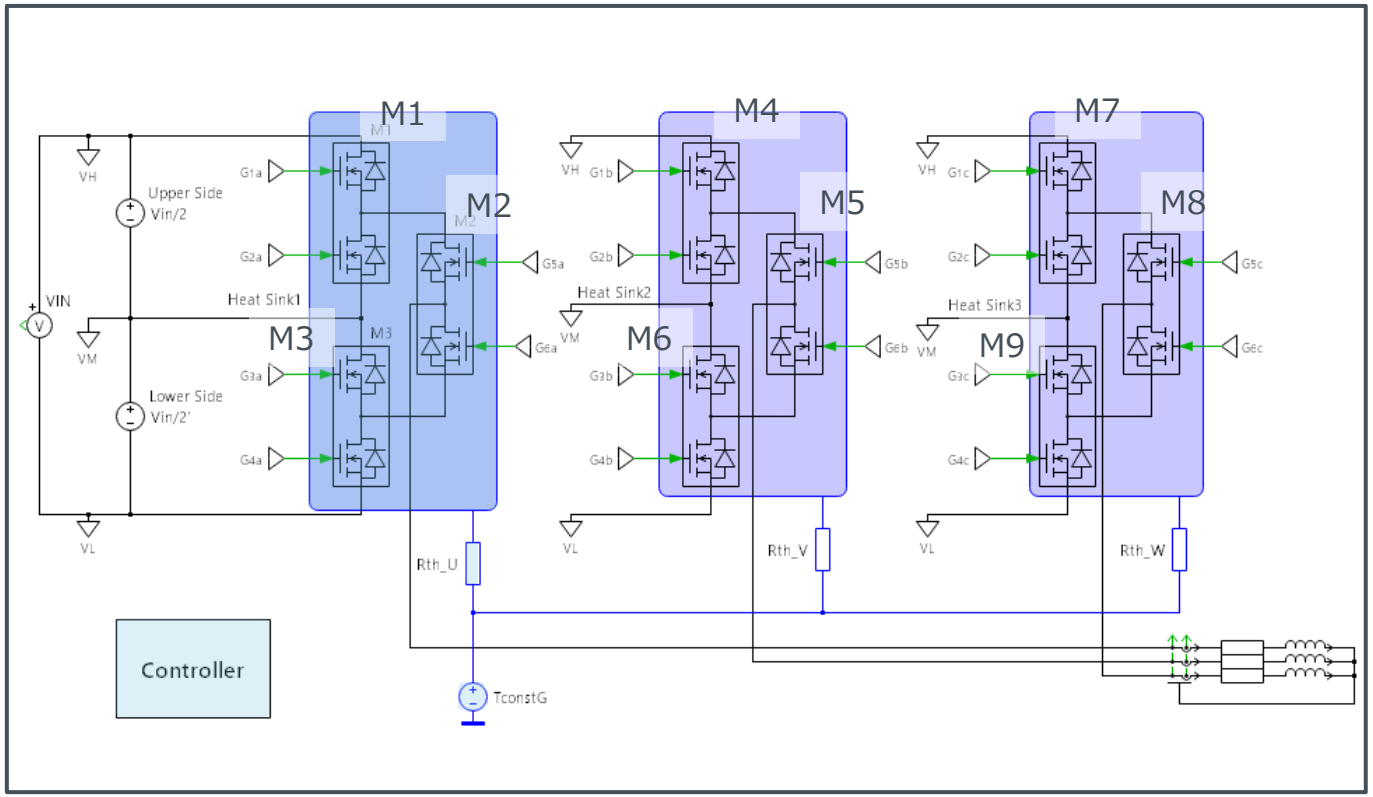
Simulation Parameters

	Name	Content	unit	Default Value	Variable Range
Controller	fs	Switching Frequency	kHz	10	1 ~ 1000
	DT	Deadtime	ns	1000	100 ~100k
	M	Modulation Factor	-	0.8	1m~1
	Thcap	Thermal Capacitance ※	J/K	0.1	1m ～ 100
	Rth	Thermal Resistance ※	K/W	0.5	1m ～ 100
	TGND	Thermal GND Temperature	℃	25	-40 ～ 175

Name	Content	unit	Default Value	Variable Range
Test_time	Test time in simulation	s	0.5	100μ ～ 0.5
Vin	Input Voltage	V	600	10~1200
Iout(peak)	Output Current (peak)	A	30	1~1000
fr	Output Frequency	Hz	50	50 ～ 1M
PF	Power Factor	-	0.9	0.5～1
Rg_on_HB	Gate Resistance (Source) ※	Ω	10	0.1 ～ 100
Rg_off_HB	Gate Resistance (Sink) ※	Ω	10	0.1 ～ 100
T_init	Initial Junction Temperature	℃	25	-40 ～ 175

※This setting is common to the U-V-W phases.

Simulation Circuit



Default Devices

Name	Device Type	Part No.	Specification
M1～M9	SiC Module (MOSFET)	SCZ4008DTA	750V/ 134A/ 8mΩ/ DOT247(Half Bridge)

Simulation Screen Overview

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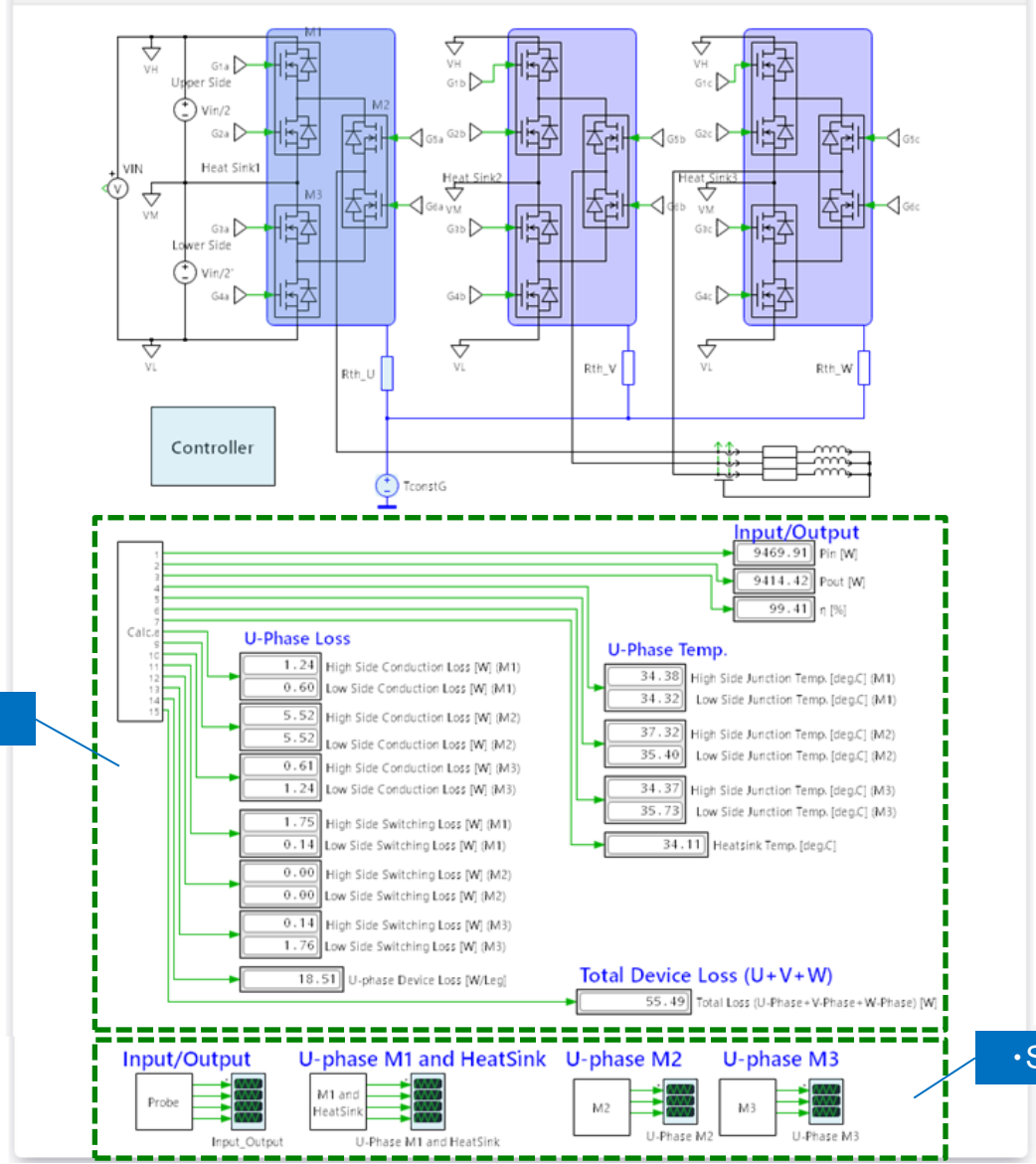
Schematic window



・Results display

・Scope the waveform

Simulation Results 1

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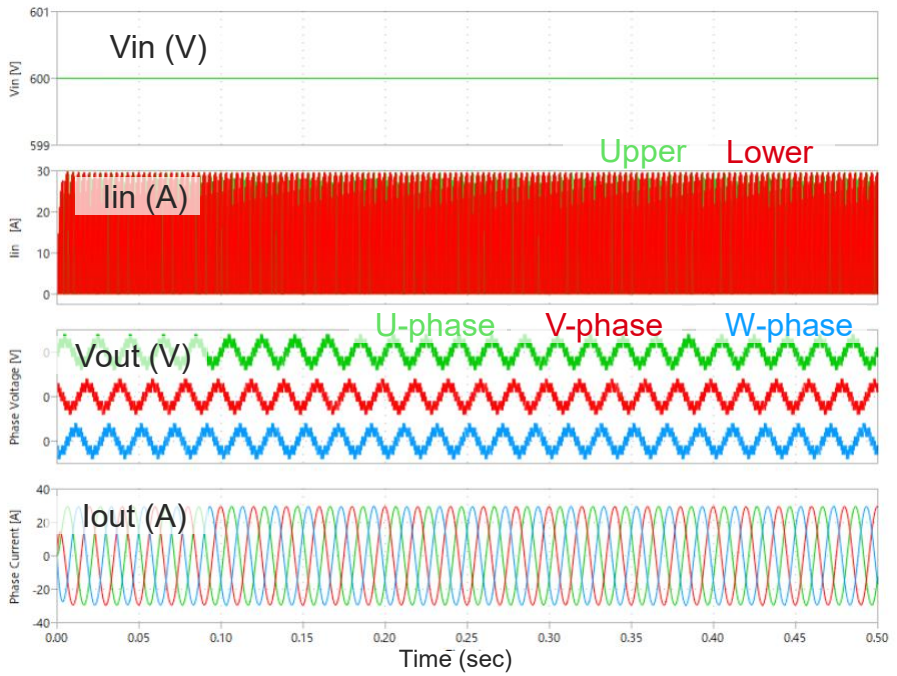
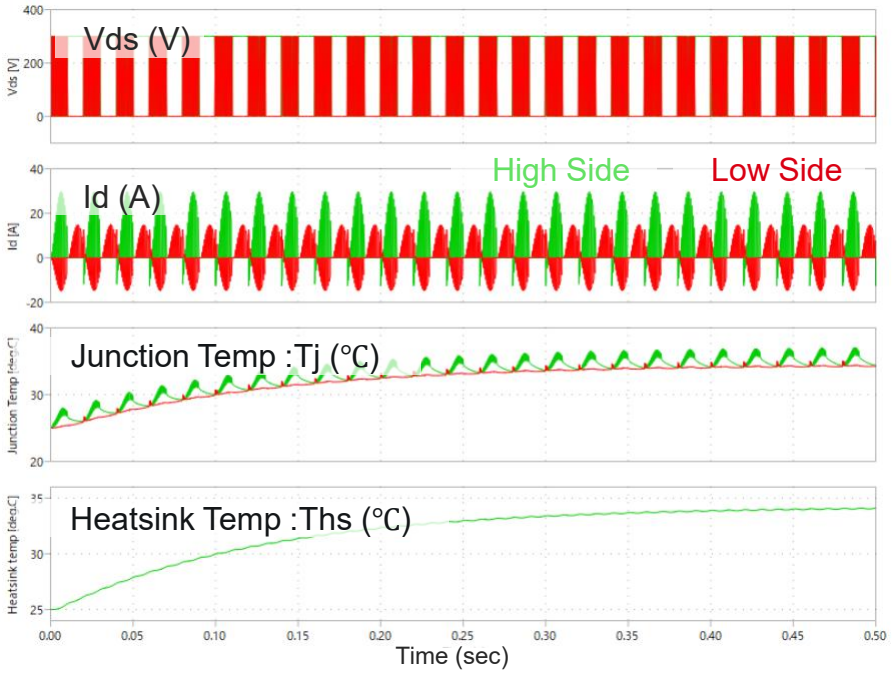
Input and Output



Contents	Results
Input Power : Pin	9.470 (kW)
Output Power: Pout	9.414 (kW)
Efficiency: η	99.41 (%)

U-Phase M1 and HeatSink



Contents	Results
Junction Temp: Tj (M1_HS)	34.38 (℃)
Junction Temp: Tj (M1_LS)	34.32 (℃)
Heatsink Temp: Ths	34.11 (℃)

Contents	Results
Conduction Loss: Pcond (M1_HS)	1.24 (W)
Switching Loss: Psw (M1_HS)	1.75 (W)
Conduction Loss: Pcond (M1_LS)	0.60 (W)
Switching Loss: Psw (M1_LS)	0.14 (W)

Simulation Results 2

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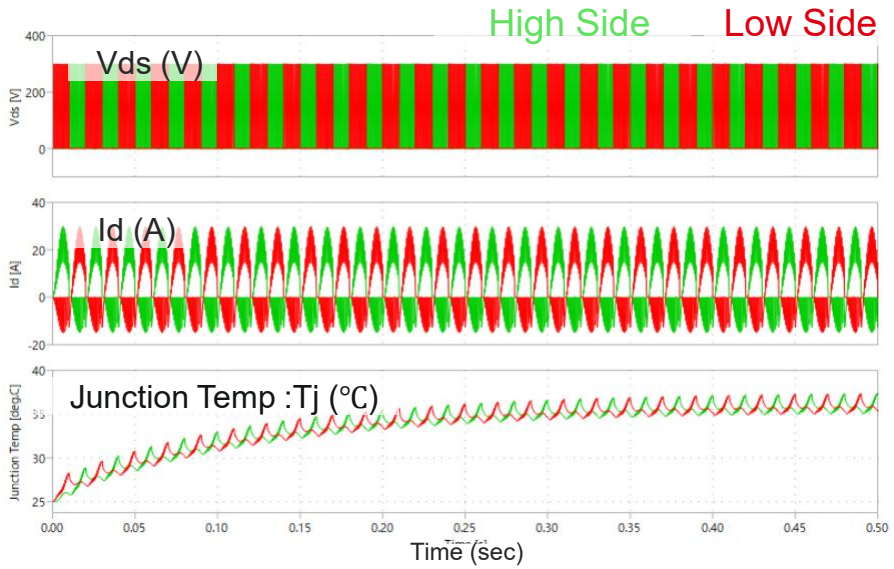
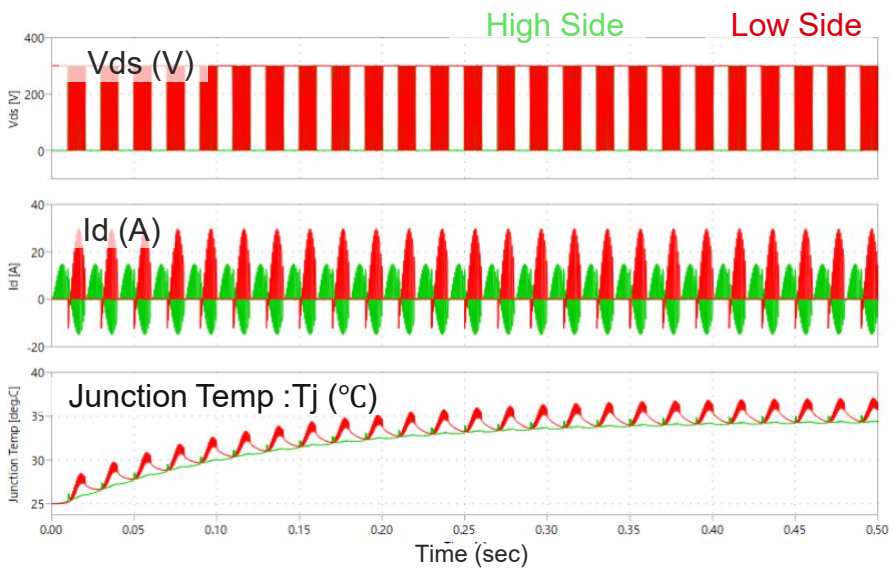
U-Phase M2



Contentsa	Results
Junction Temp: Tj (M2_HS)	37.32 (℃)
Junction Temp: Tj (M2_LS)	35.40 (℃)

Contents	Results
Conduction Loss: Pcond (M2_HS)	5.52 (W)
Switching Loss: Psw (M2_HS)	0.00 (W)
Conduction Loss: Pcond (M2_LS)	5.52 (W)
Switching Loss: Psw (M2_LS)	0.00 (W)

U-Phase M3



Contents	Results
Junction Temp: Tj (M3_HS)	34.37 (℃)
Junction Temp: Tj (M3_LS)	35.73 (℃)
Conduction Loss: Pcond (M3_HS)	0.61 (W)
Switching Loss: Psw (M3_HS)	0.14 (W)

Contents	Results
Conduction Loss: Pcond (M3_LS)	1.24 (W)
Switching Loss: Psw (M3_LS)	1.76 (W)
U-phase Device Loss (U+V+W)	18.51 (W/Leg)
Total Device Loss (U+V+W)	55.49(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.

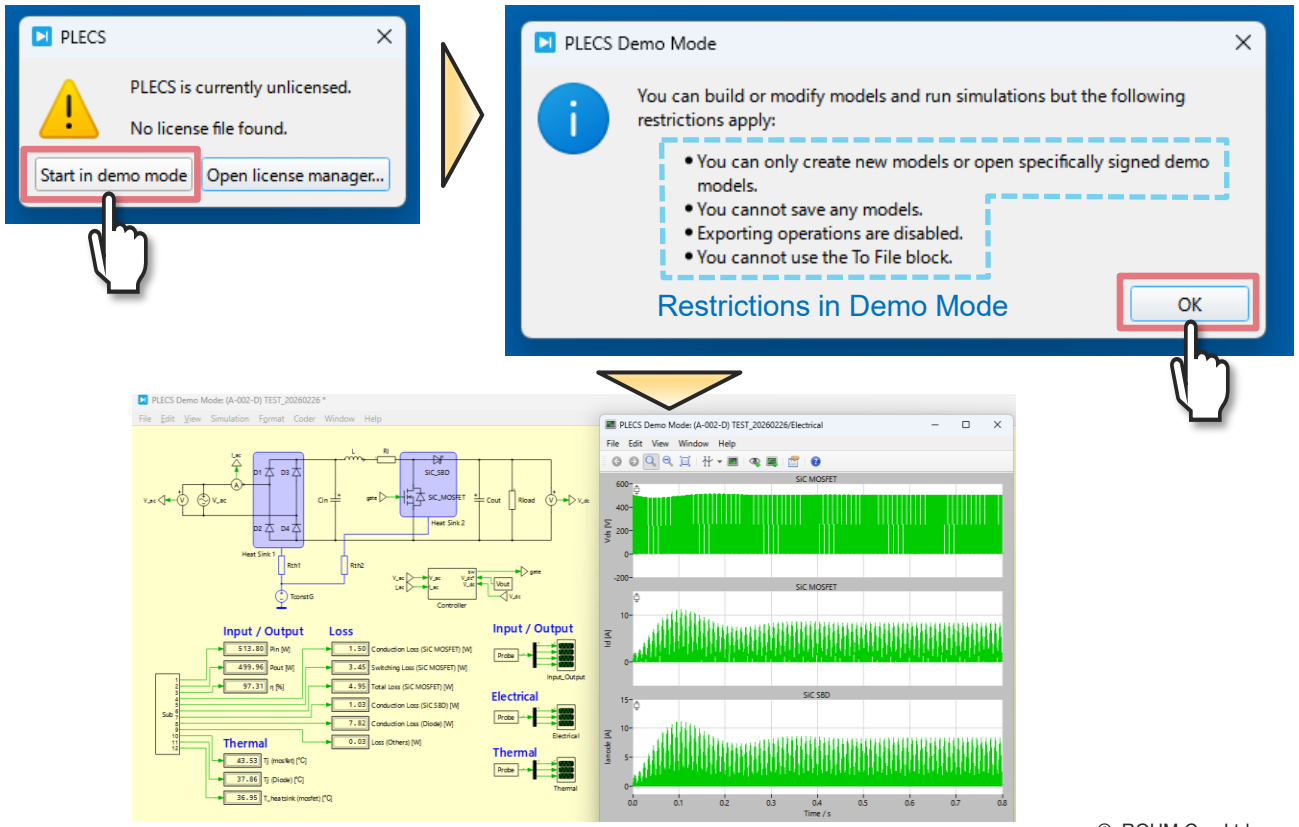
1. Obtaining the Software

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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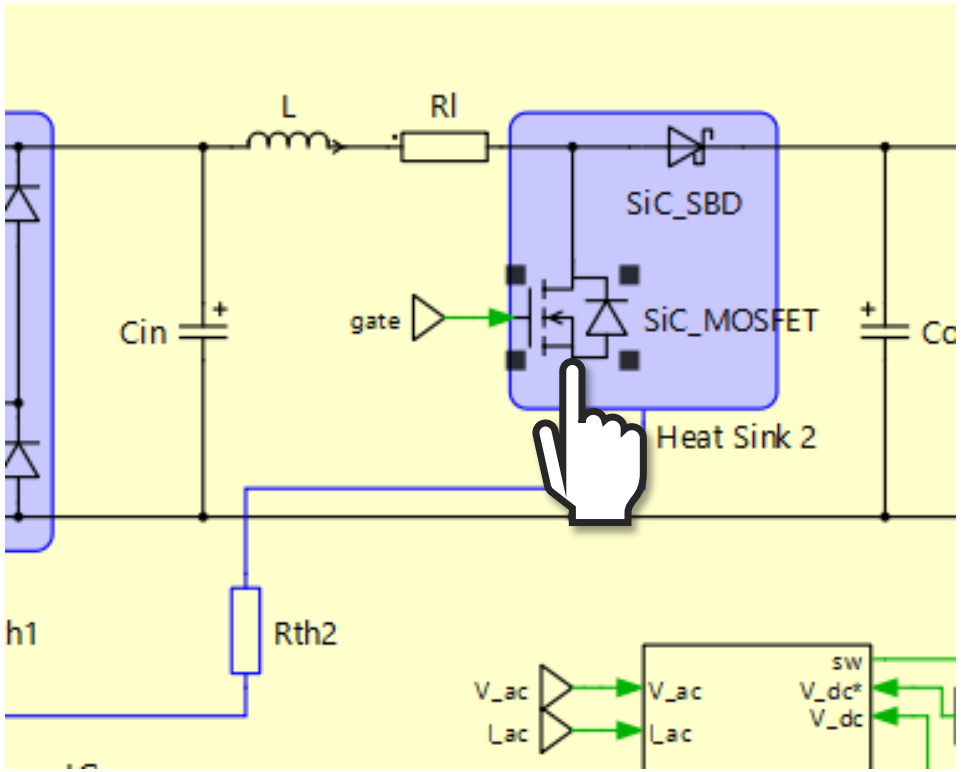
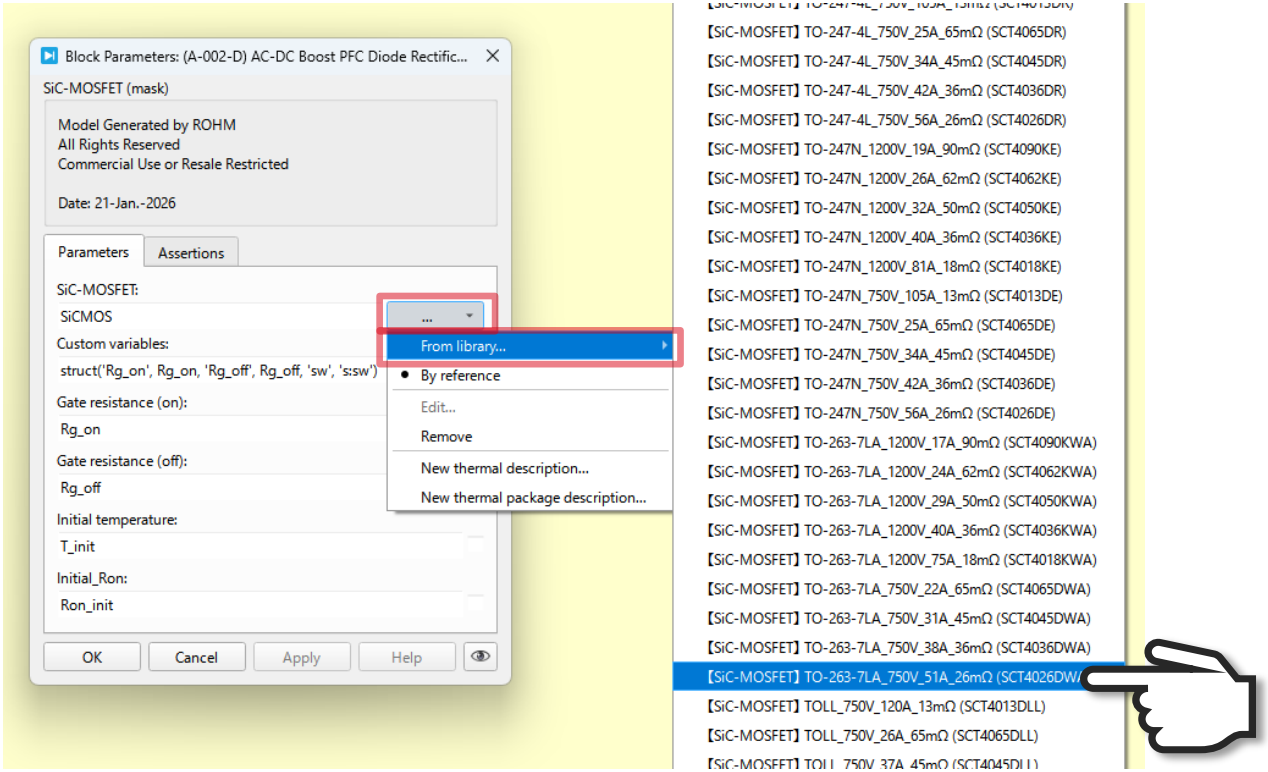
Schematic window





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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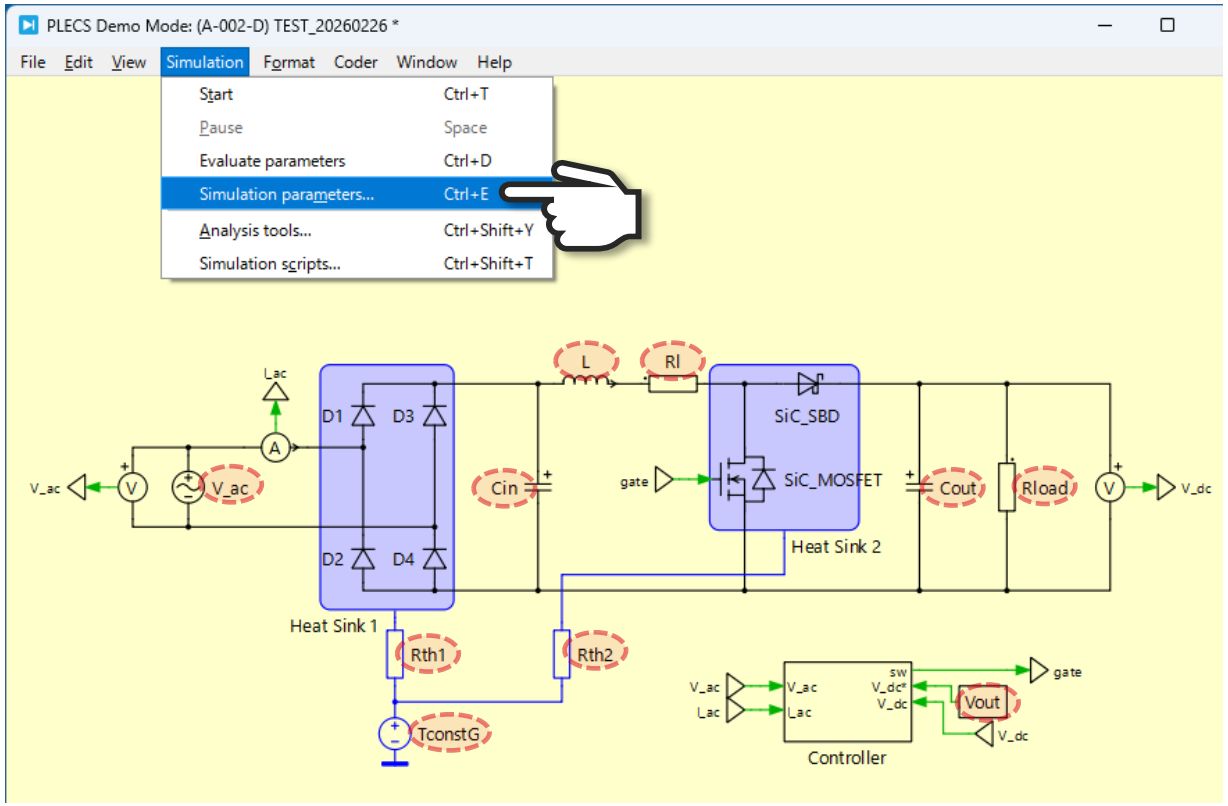
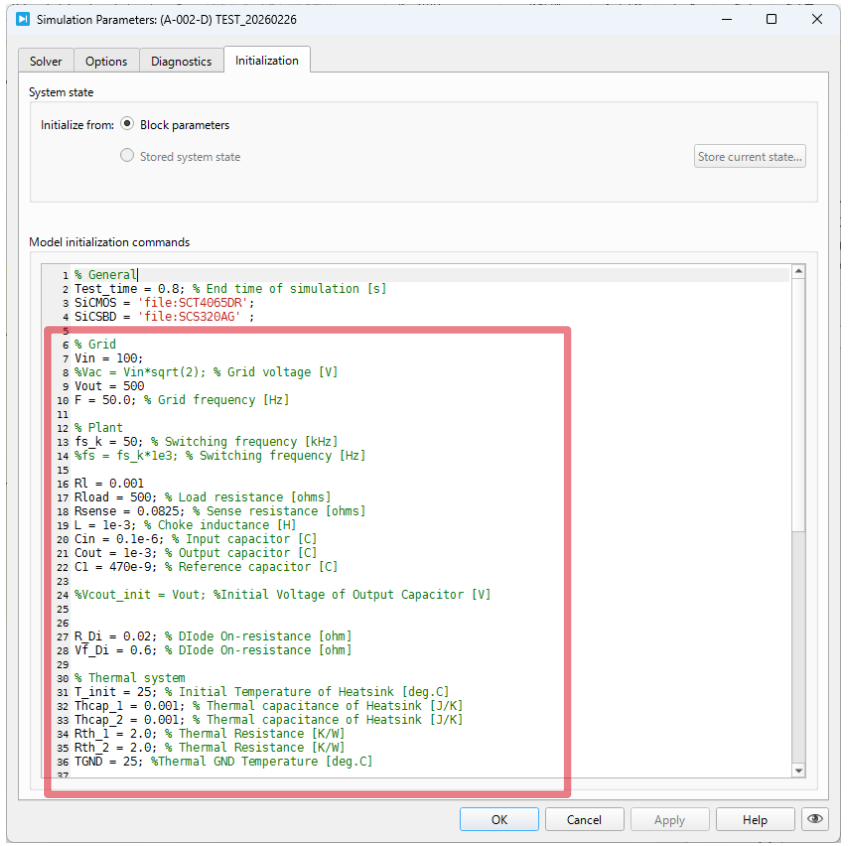
Schematic window





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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