

(A-010-DOT) DC-AC Totem-Pole PFC Synchronous Rectification (DOT247)

PLECS Demo Circuit
Simulation Example



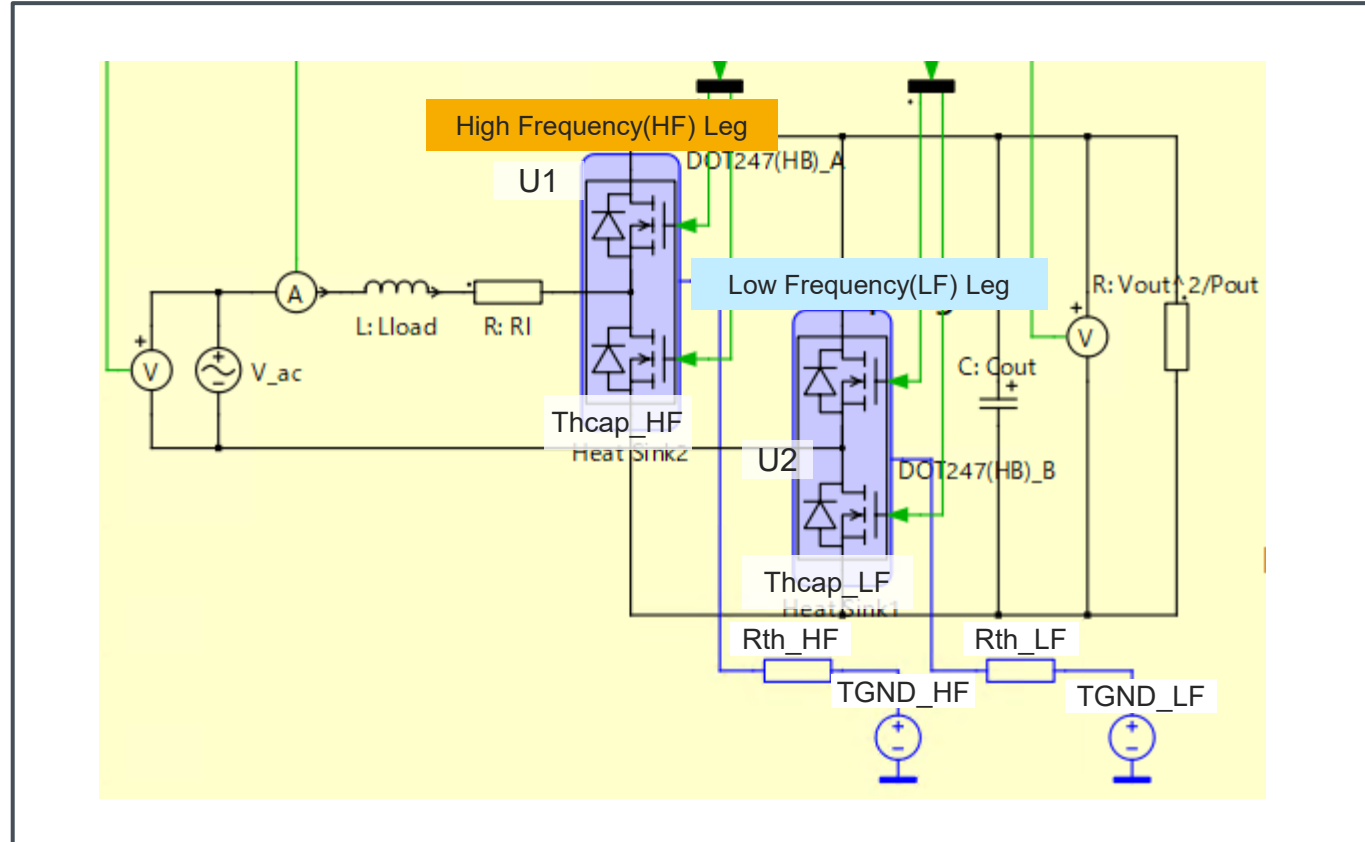
2026 May
68UG122E Rev.002

Simulation Parameters

Name	Content	unit	Default Value
Load	Inductive Load	H	330u
RI	Choke Resistance	Ω	5m
Cout	Output Capacitor Initial Voltage	F V	1m 500
Thcap_HF	Thermal Capacitance	J/K	0.1
Rth_HF	Thermal Resistance	K/W	0.5
TGND_HF	Thermal GND Temperature	$^{\circ}\text{C}$	25
Thcap_LF	Thermal Capacitance	J/K	0.1
Rth_LF	Thermal Resistance	K/W	0.5
TGND_LF	Thermal GND Temperature	$^{\circ}\text{C}$	25

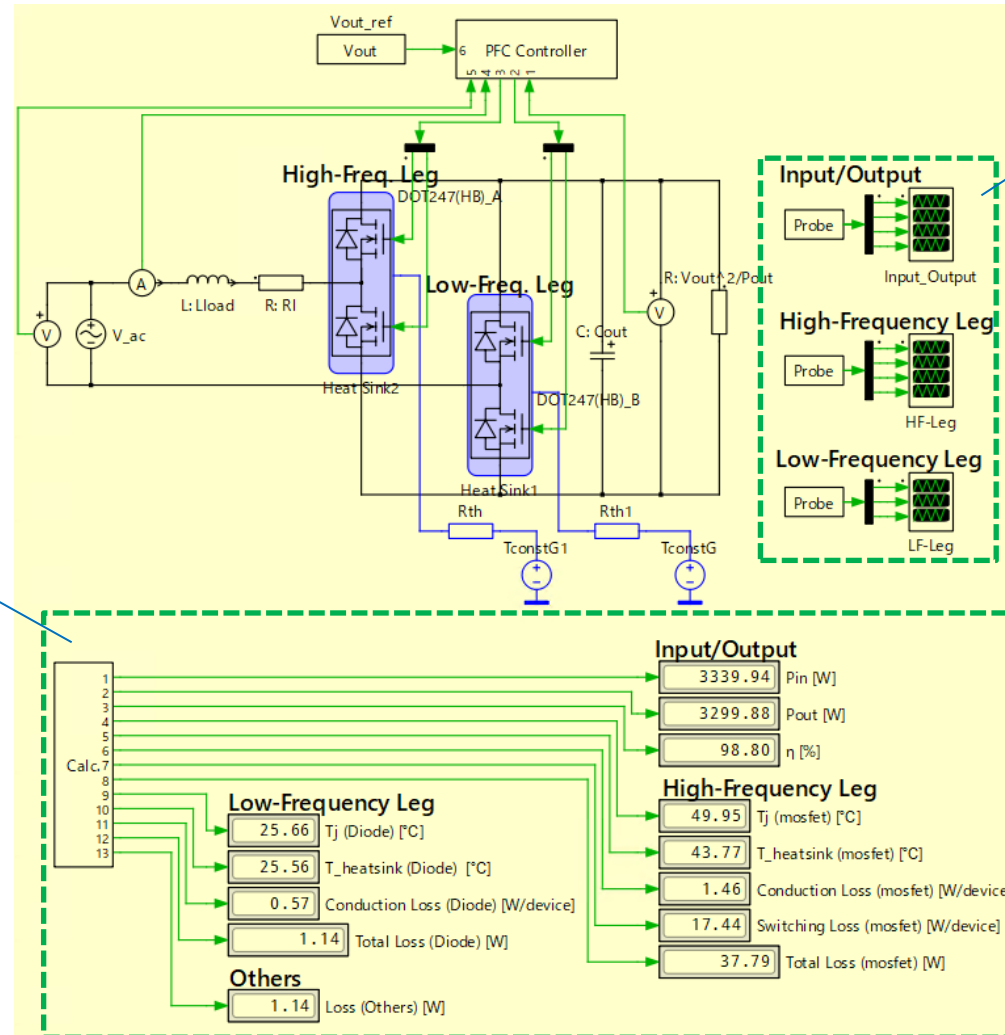
Name	Content	unit	Default Value
Test_time	Test time in simulation	s	0.5
fs	Switching Frequency	Hz	60k
V_ac (rms)	Input Voltage Grid Frequency	V Hz	220 50
Vout	Output Voltage	V	500
Pout	Output Power	W	3,300
Rg_on (HF)	Gate Resistance (Source)	Ω	15
Rg_off (HF)	Gate Resistance (Sink)	Ω	15
DT (HF)	Dead Time (HF)	s	200n
Rg_on (LF)	Gate Resistance (Source)	Ω	15
Rg_off (LF)	Gate Resistance (Sink)	Ω	15
DT (LF)	Dead Time (LF)	s	100n
T_init	Initial Junction Temperature	$^{\circ}\text{C}$	25

Simulation Circuit



Power Devices

Name	Device Type	Part No.	Specification
U1	SiC Power Module	SCZ4008DTA	750V/ 134A/ 8m Ω / DOT247(Half-bridge)
U2	SiC Power Module	SCZ4004DTA	750V/ 251A/ 4m Ω / DOT247(Half-bridge)



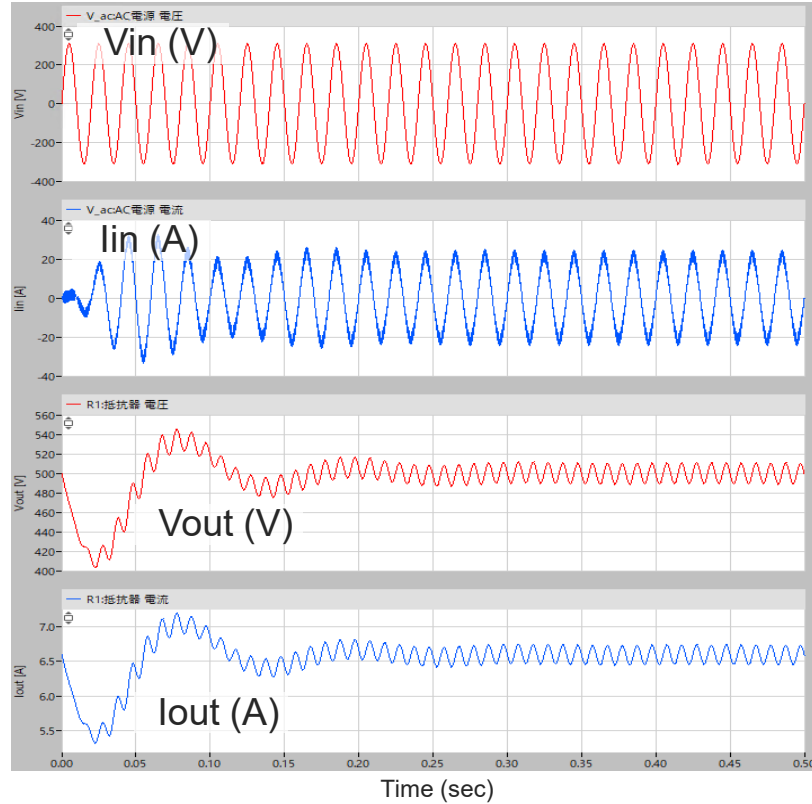
Scope of the waveform

Results display

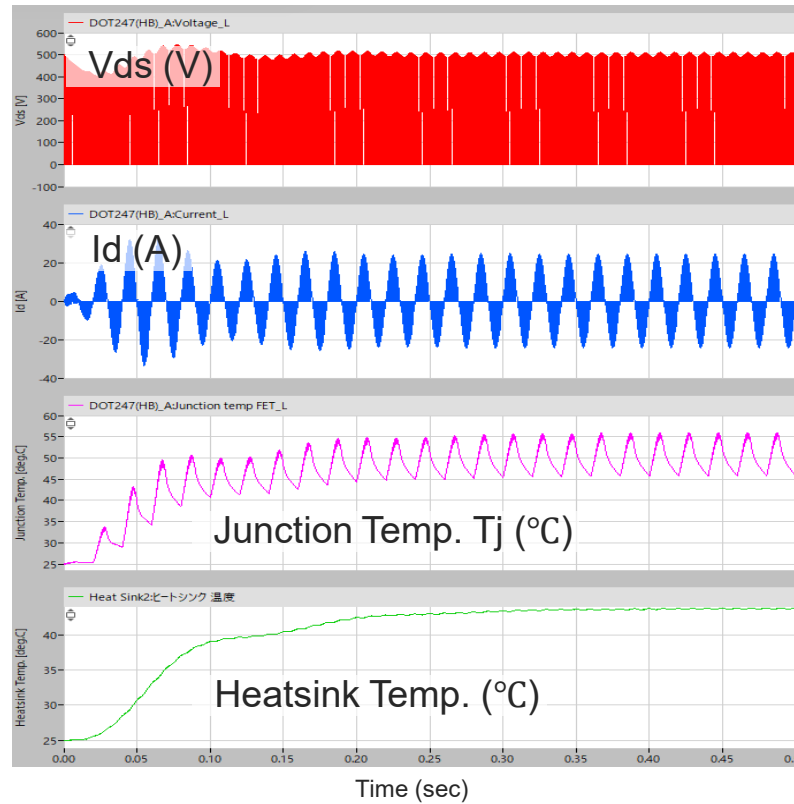
Simulation Mode: Start-UP

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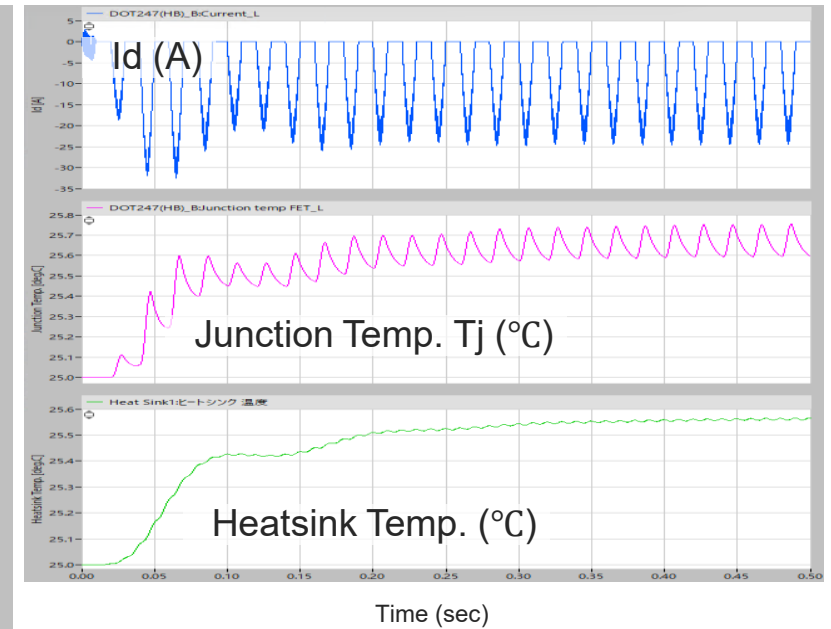
Input and Output



High-Frequency (HF) Leg



Low-Frequency (LF) Leg



Contents	Results
Input Power : Pin	3339.94 (kW)
Output Power: Pout	3299.88 (kW)
Efficiency: η	98.80 (%)

Contents	Results
Junction Temp. Tj (HF)	49.95 (°C)
Heatsink Temp. T_hs (HF)	43.77 (°C)
Conduction Loss: Pcond (HF)	1.46 (W/Leg)
Switching Loss: Psw (HF)	17.44 (W/Leg)
Total Loss: Ptot (HF: Leg1+Leg2)	37.79 (W)

Contents	Results
Junction Temp. Tj (LF)	25.66 (°C)
Heatsink Temp. T_hs (LF)	25.56 (°C)
Total Loss: Ptot (LF)	1.14 (W)

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

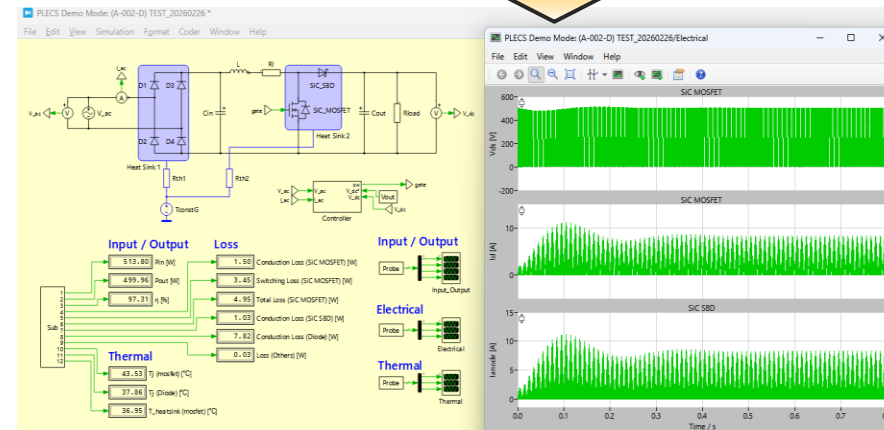
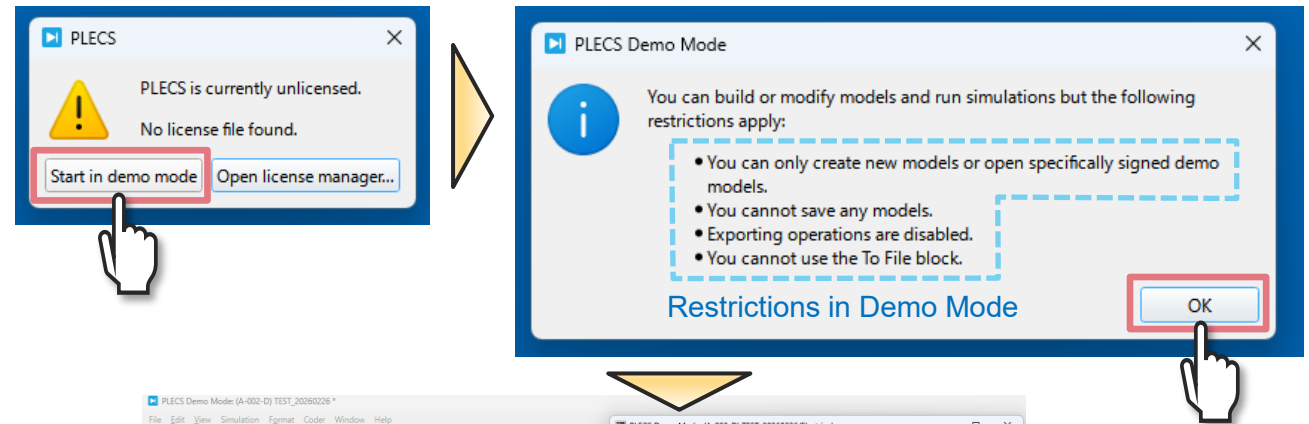
1. Obtaining the Software

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

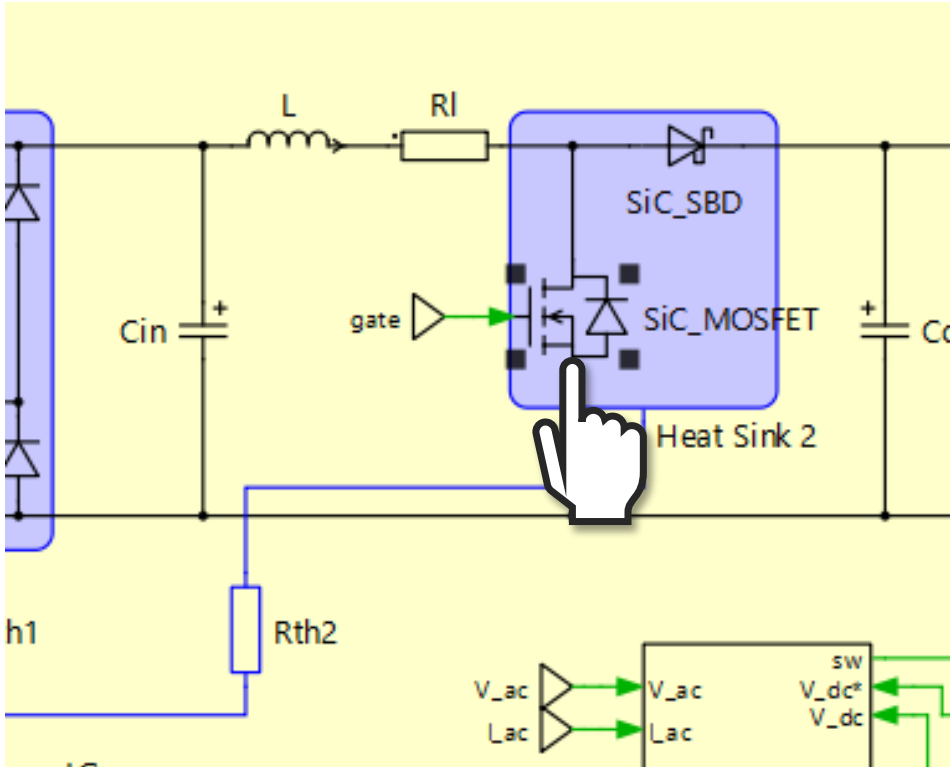
<https://www.plexim.com/download>

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.



Schematic window



Block Parameters: (A-002-D) AC-DC Boost PFC Diode Rectific... X

SiC-MOSFET (mask)

Model Generated by ROHM
All Rights Reserved
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Date: 21-Jan.-2026

Parameters Assertions

SiC-MOSFET:
SiCMOS

Custom variables:
struct('Rg_on', 'Rg_on', 'Rg_off', 'Rg_off', 'sw', 'sw')

Gate resistance (on):
Rg_on

Gate resistance (off):
Rg_off

Initial temperature:
T_init

Initial Ron:
Ron_init

OK Cancel Apply Help

- From library...
- By reference
- Edit...
- Remove
- New thermal description...
- New thermal package description...

[SiC-MOSFET] TO-247-4L_750V_25A_65mΩ (SCT4065DR)
[SiC-MOSFET] TO-247-4L_750V_34A_45mΩ (SCT4045DR)
[SiC-MOSFET] TO-247-4L_750V_42A_36mΩ (SCT4036DR)
[SiC-MOSFET] TO-247-4L_750V_56A_26mΩ (SCT4026DR)
[SiC-MOSFET] TO-247N_1200V_19A_90mΩ (SCT4090KE)
[SiC-MOSFET] TO-247N_1200V_26A_62mΩ (SCT4062KE)
[SiC-MOSFET] TO-247N_1200V_32A_50mΩ (SCT4050KE)
[SiC-MOSFET] TO-247N_1200V_40A_36mΩ (SCT4036KE)
[SiC-MOSFET] TO-247N_1200V_81A_18mΩ (SCT4018KE)
[SiC-MOSFET] TO-247N_750V_105A_13mΩ (SCT4013DE)
[SiC-MOSFET] TO-247N_750V_25A_65mΩ (SCT4065DE)
[SiC-MOSFET] TO-247N_750V_34A_45mΩ (SCT4045DE)
[SiC-MOSFET] TO-247N_750V_42A_36mΩ (SCT4036DE)
[SiC-MOSFET] TO-247N_750V_56A_26mΩ (SCT4026DE)
[SiC-MOSFET] TO-263-7LA_1200V_17A_90mΩ (SCT4090KWA)
[SiC-MOSFET] TO-263-7LA_1200V_24A_62mΩ (SCT4062KWA)
[SiC-MOSFET] TO-263-7LA_1200V_29A_50mΩ (SCT4050KWA)
[SiC-MOSFET] TO-263-7LA_1200V_40A_36mΩ (SCT4036KWA)
[SiC-MOSFET] TO-263-7LA_1200V_75A_18mΩ (SCT4018KWA)
[SiC-MOSFET] TO-263-7LA_750V_22A_65mΩ (SCT4065DWA)
[SiC-MOSFET] TO-263-7LA_750V_31A_45mΩ (SCT4045DWA)
[SiC-MOSFET] TO-263-7LA_750V_38A_36mΩ (SCT4036DWA)
[SiC-MOSFET] TO-263-7LA_750V_51A_26mΩ (SCT4026DWA)
[SiC-MOSFET] TOLL_750V_120A_13mΩ (SCT4013DLL)
[SiC-MOSFET] TOLL_750V_26A_65mΩ (SCT4065DLL)
[SiC-MOSFET] TOLL_750V_37A_45mΩ (SCT4045DLL)

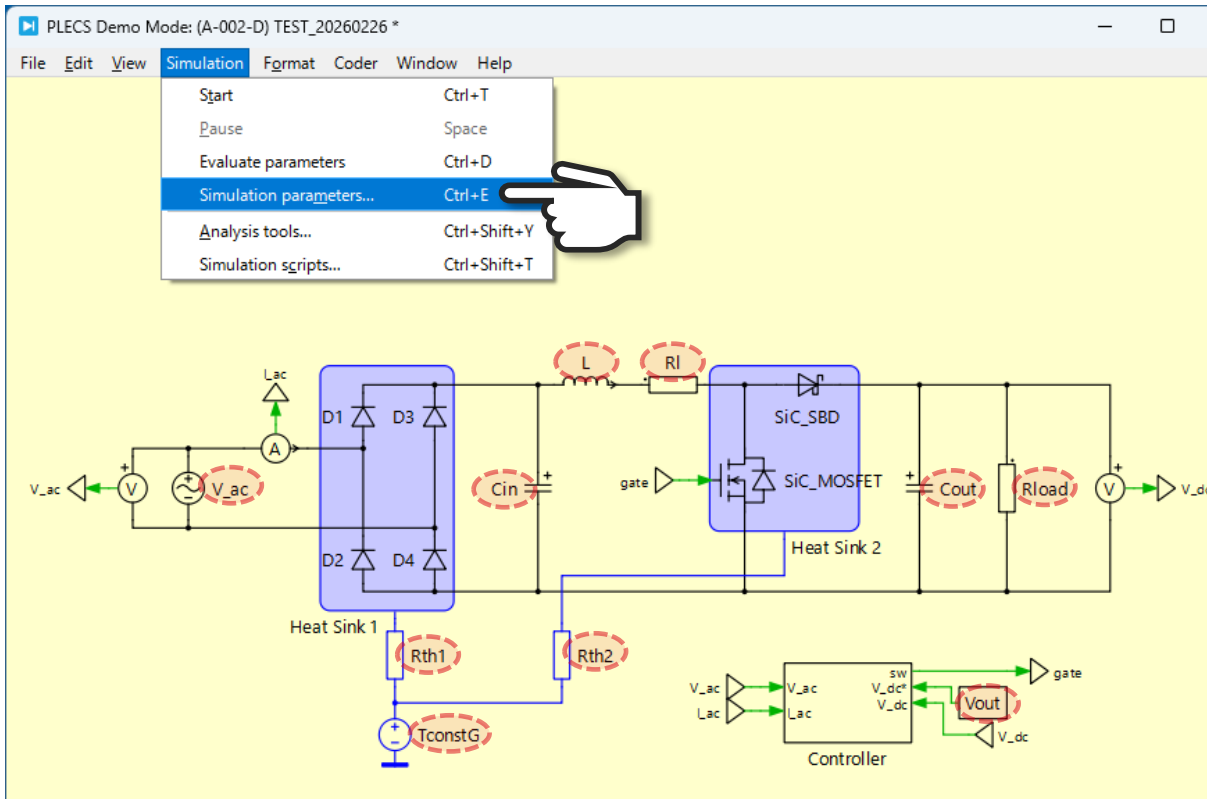
Hover your mouse cursor over the device symbol that you want to change and double-click the left button of the mouse.

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

Schematic window



The 'Simulation Parameters' dialog box is shown with the 'Initialization' tab selected. The 'Model initialization commands' section contains the following code:

```
1 % General|
2 Test time = 0.8; % End time of simulation [s]
3 SiCMOS = 'file:SC14065DR';
4 SiCSBD = 'file:SCS320AG';
5
6 % Grid
7 Vin = 100;
8 %Wac = Vin*sqrt(2); % Grid voltage [V]
9 Vout = 500
10 F = 50.0; % Grid frequency [Hz]
11
12 % Plant
13 fs_k = 50; % Switching frequency [kHz]
14 %fs = fs_k*1e3; % Switching frequency [Hz]
15
16 Rl = 0.001
17 Rload = 500; % Load resistance [ohms]
18 Rsense = 0.0025; % Sense resistance [ohms]
19 L = 1e-3; % Choke inductance [H]
20 Cin = 0.1e-6; % Input capacitor [C]
21 Cout = 1e-3; % Output capacitor [C]
22 C1 = 470e-9; % Reference capacitor [C]
23
24 %Wcout_init = Vout; %Initial Voltage of Output Capacitor [V]
25
26
27 R_Di = 0.02; % Diode On-resistance [ohm]
28 Vf_Di = 0.6; % Diode On-resistance [ohm]
29
30 % Thermal system
31 T_init = 25; % Initial Temperature of Heatsink [deg.C]
32 Thcap_1 = 0.001; % Thermal capacitance of Heatsink [J/K]
33 Thcap_2 = 0.001; % Thermal capacitance of Heatsink [J/K]
34 Rth_1 = 2.0; % Thermal Resistance [K/W]
35 Rth_2 = 2.0; % Thermal Resistance [K/W]
36 TGN0 = 25; %Thermal GND Temperature [deg.C]
37
```

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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