

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

Simulation Parameters

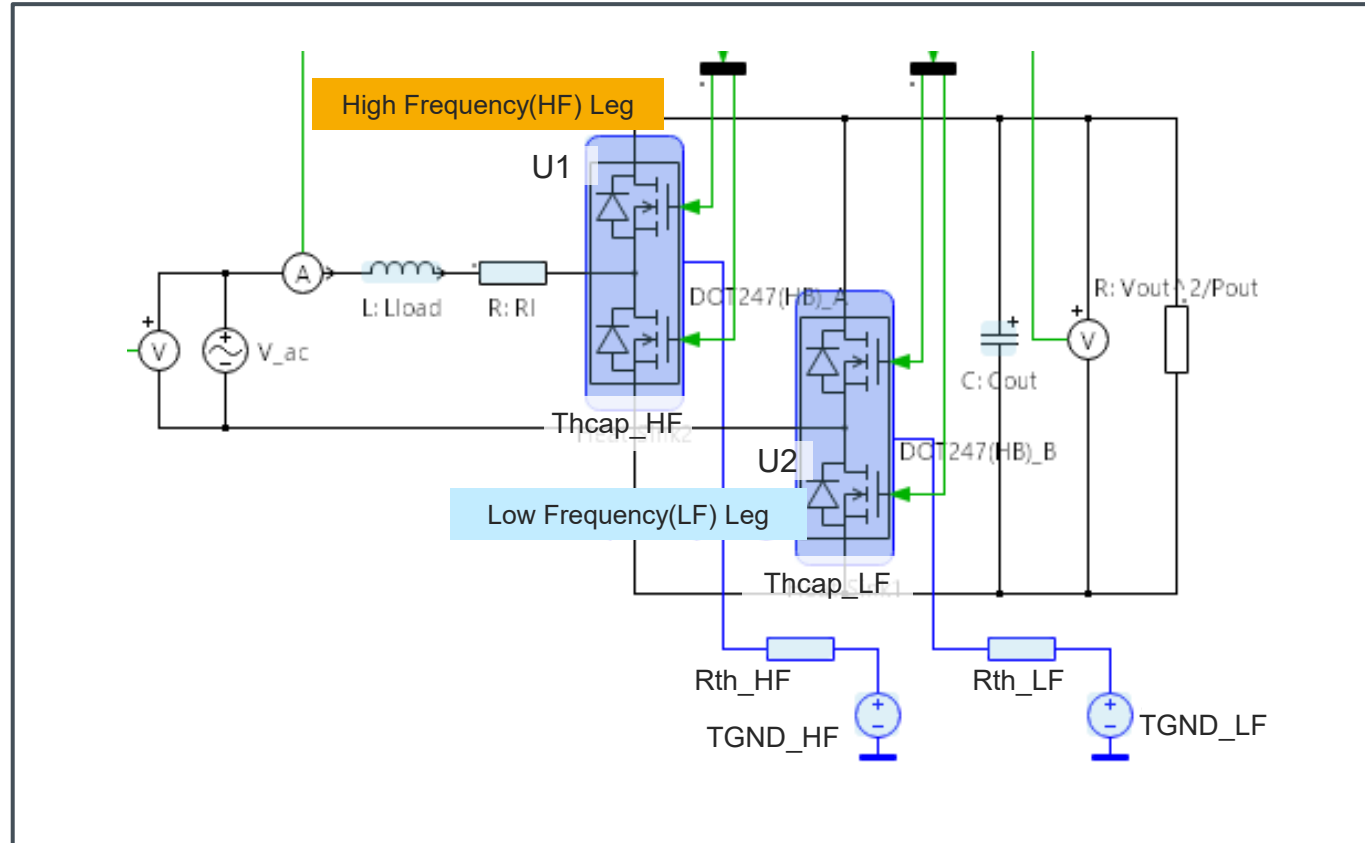
Name	Content	unit	Default Value	Variable Range
Lload	Inductive Load	H	120u	1n ~ 1
RI	Choke Resistance	Ω	1m	1u ~ 100m
Cout	Output Capacitor Initial Voltage	F V	2m 500	1n ~ 1 0 ~ 1200
Thcap_HF	Thermal Capacitance	J/K	0.2	1m ~ 100
Rth_HF	Thermal Resistance	K/W	2	1m ~ 100
TGND_HF	Thermal GND Temperature	°C	25	-40 ~ 175
Thcap_LF	Thermal Capacitance	J/K	0.2	1m ~ 100
Rth_LF	Thermal Resistance	K/W	2	1m ~ 100
TGND_LF	Thermal GND Temperature	°C	25	-40 ~ 175

Name	Content	unit	Default Value	Variable Range
Test_time	Test time in simulation	s	0.5	100u ~ 100
fs	Switching Frequency	Hz	60k	10k ~ 100k
V_ac (rms)	Input Voltage Grid Frequency	V Hz	220 50	100 ~ 500 50 or 60
Vout	Output Voltage	V	500	300 ~ 1200
Pout	Output Power	W	3,300	100 ~ 30,000

Rg_on (HF)	Gate Resistance (Source)	Ω	10	0.1 ~ 100
Rg_off (HF)	Gate Resistance (Sink)	Ω	4.7	0.1 ~ 100

DT (HF)	Dead Time (HF)	s	200n	0 ~ 1m
Rg_on (LF)	Gate Resistance (Source)	Ω	10	0.1 ~ 100
Rg_off (LF)	Gate Resistance (Sink)	Ω	10	0.1 ~ 100
DT (LF)	Dead Time (LF)	s	100n	0 ~ 1m
T_init	Initial Junction Temperature	°C	25	-40 ~ 175

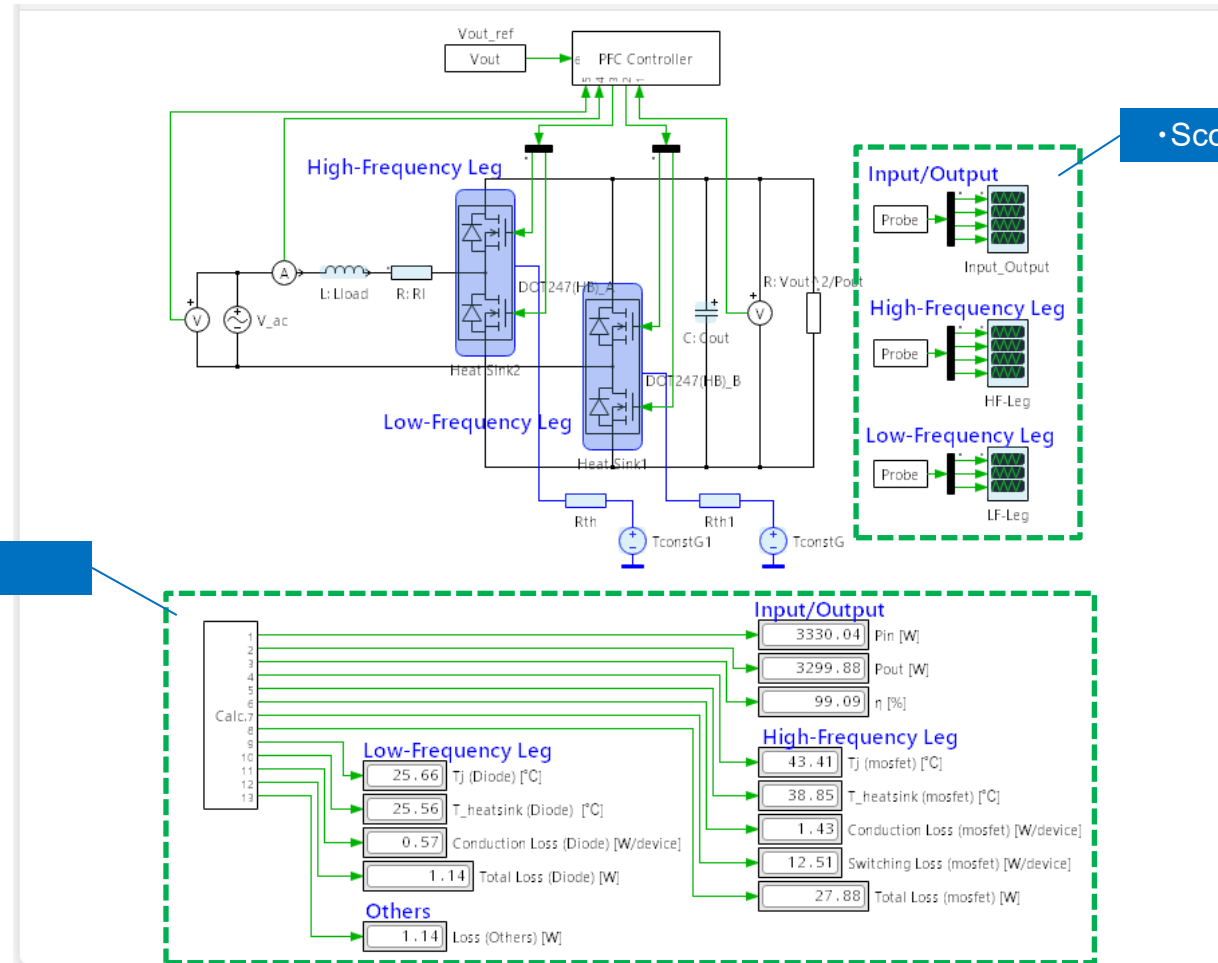
Simulation Circuit



Default Devices

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

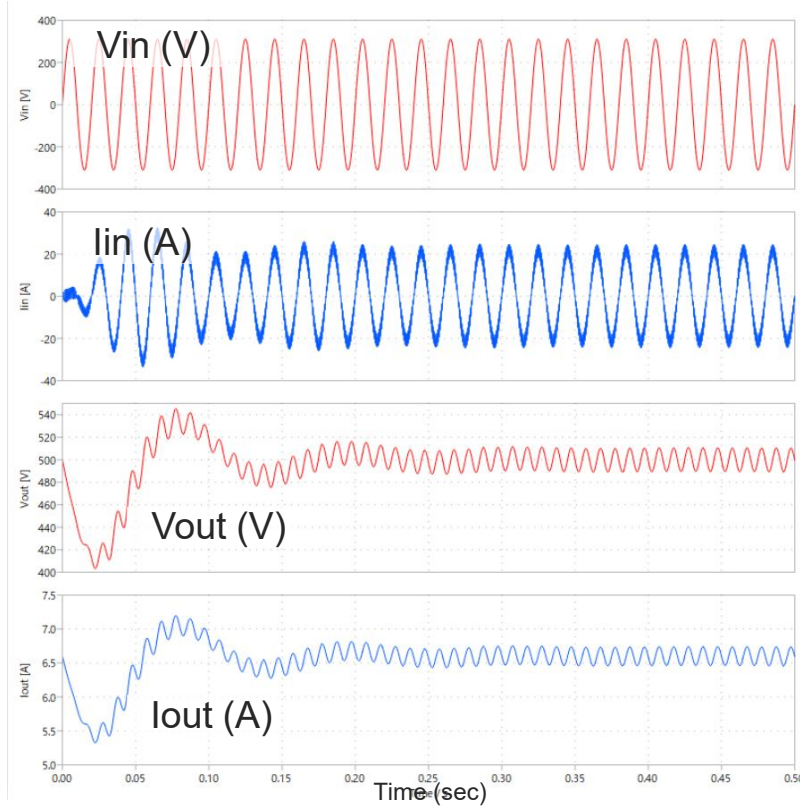
Schematic window



• Results display

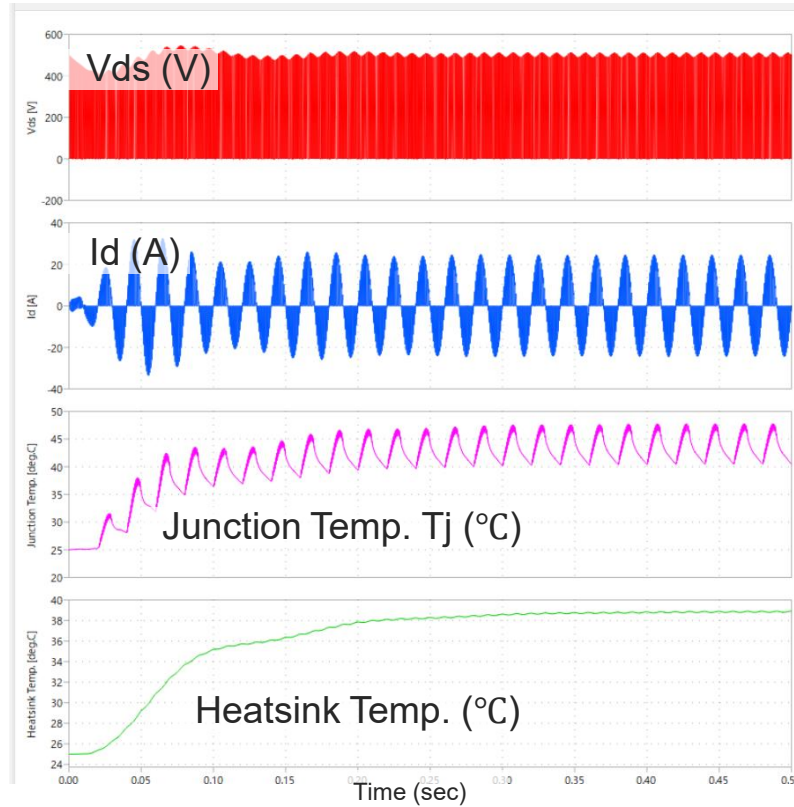
• Scope the waveform

Input and Output



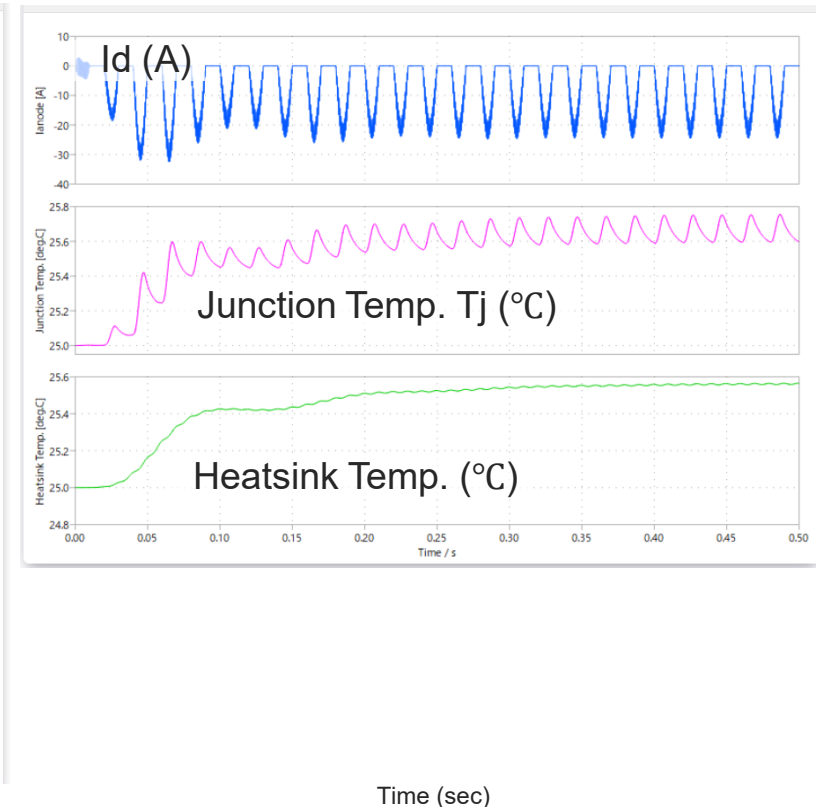
Contents	Results
Input Power : Pin	3330.04 (kW)
Output Power: Pout	3299.88 (kW)
Efficiency: η	99.09 (%)

High-Frequency (HF) Leg



Contents	Results
Junction Temp. Tj (HF)	43.41 (°C)
Heatsink Temp. T_hs (HF)	38.85 (°C)
Conduction Loss: Pcond (HF)	1.43 (W/Leg)
Switching Loss: Psw (HF)	12.51 (W/Leg)
Total Loss: Ptot (HF: Leg1+Leg2)	27.88 (W)

Low-Frequency (LF) Leg



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.

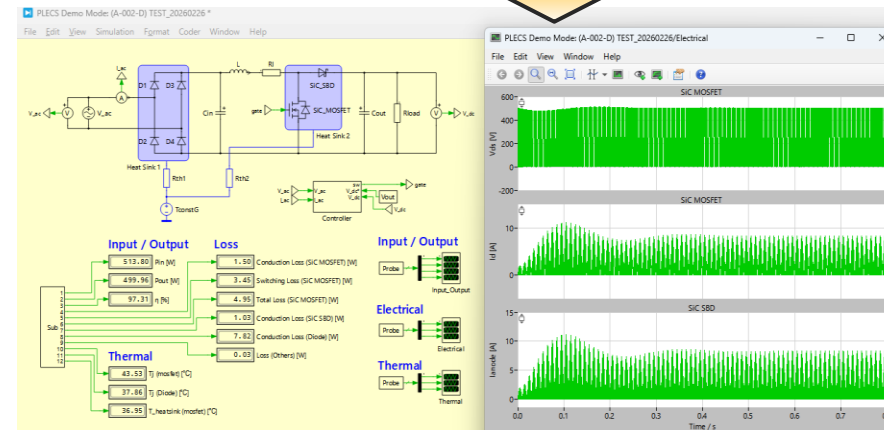
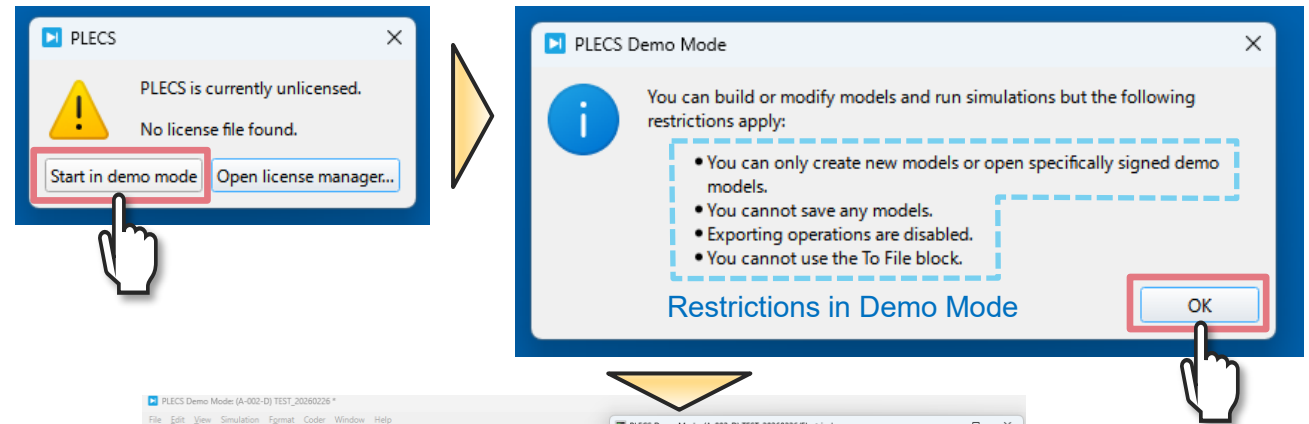
1. Obtaining the Software

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

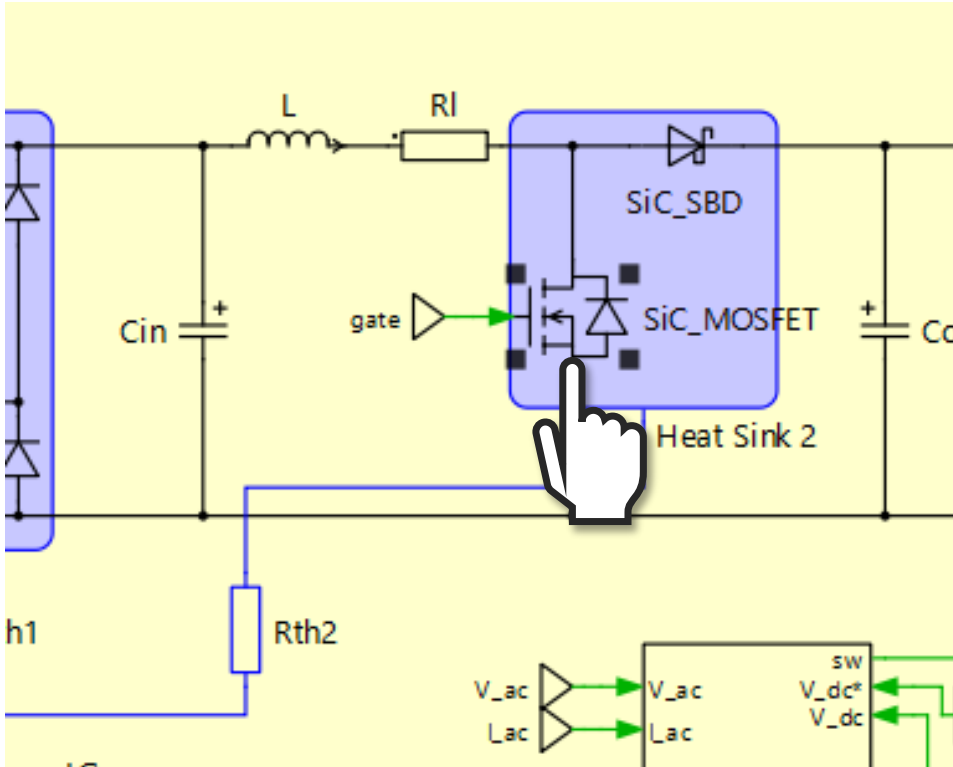
<https://www.plexim.com/download>

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
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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)

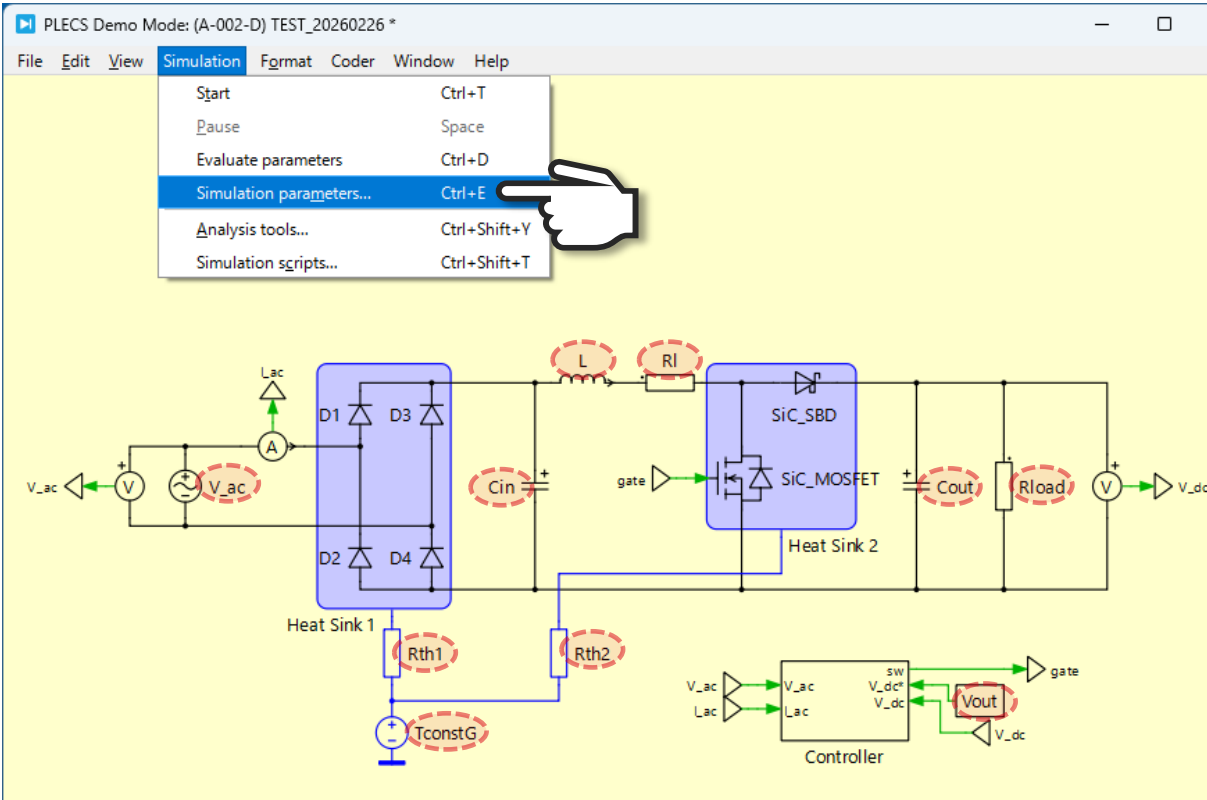
Hover your mouse cursor over the device symbol that you want to change and double-click the left button of the mouse.

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 parameterized 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 V_F_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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