

(A-021-D) DC-AC 3-Phase Vienna PFC (Discrete)

Simulation Parameters

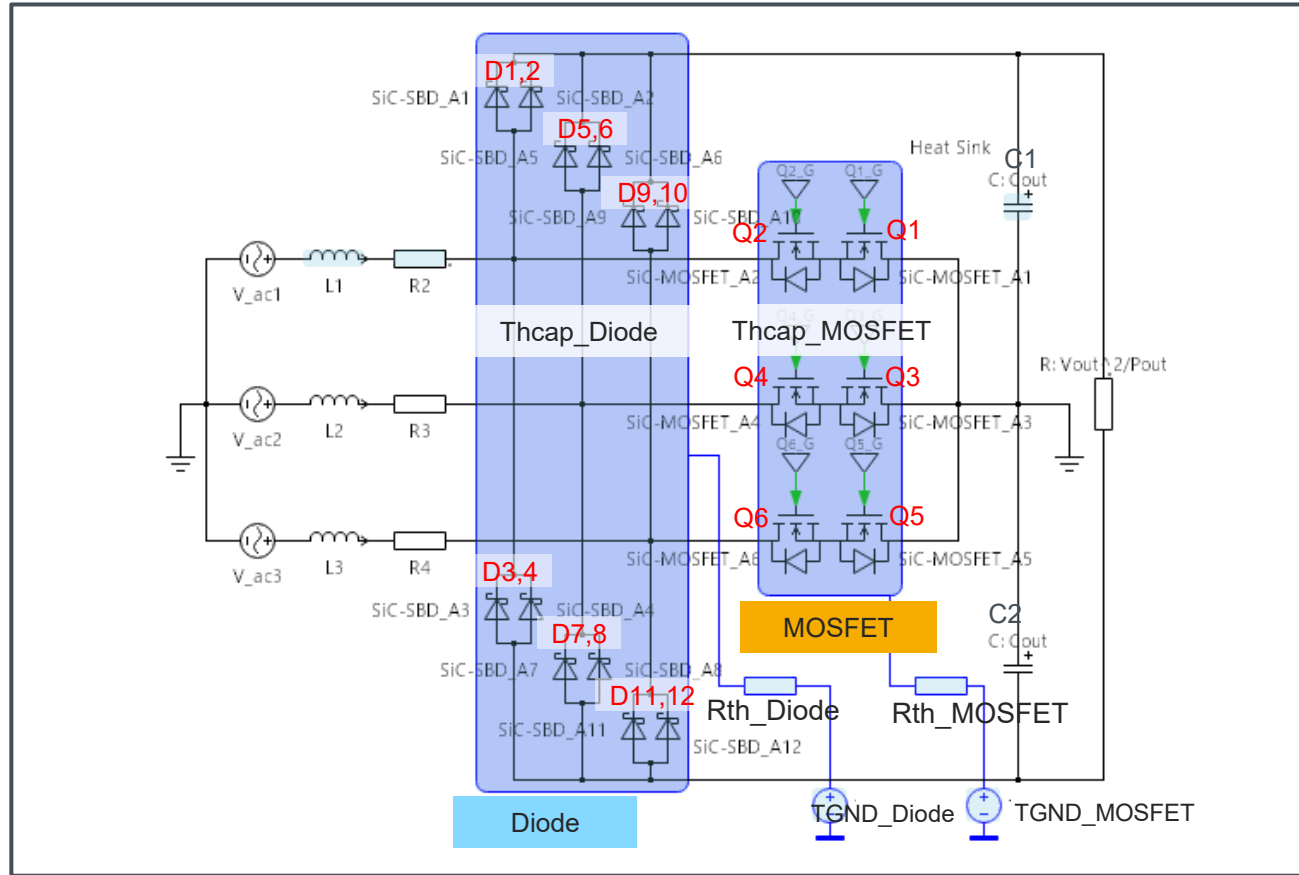
Name	Content	unit	Default Value	Variable Range
L1~3	Inductive Load	H	470u	1n ~ 1
R2~4	Choke Resistance	Ω	5m	1u ~ 100m
C1,C2	Output Capacitor Initial Voltage	F V	1m 400	1n ~ 1 0 ~ 1200
Thcap_MOSFET	Thermal Capacitance	J/K	0.1	1m ~ 100
Rth_MOSFET	Thermal Resistance	K/W	0.3	1m ~ 100
TGND_MOSFET	Thermal GND Temperature	°C	25	-40 ~ 175
Thcap_Diode	Thermal Capacitance	J/K	0.1	1m ~ 100
Rth_Diode	Thermal Resistance	K/W	0.3	1m ~ 100
TGND_Diode	Thermal GND Temperature	°C	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	20k	10k ~ 100k
Vin_ac (rms)	Input Voltage Grid Frequency	V Hz	220 50	100 ~ 400 50 or 60
Vout_dc	Output Voltage	V	800	300 ~ 1200
Pout	Output Power	W	15000	1000 ~ 30000
Rg_on*	Gate Resistance (Source)	Ω	10	0.1 ~ 100
Rg_off*	Gate Resistance (Sink)	Ω	10	0.1 ~ 100
T_init**	Initial Junction Temp.	°C	25	-40 ~ 175

*Same value for all MOSFETs

**Same value for all devices

Simulation Circuit

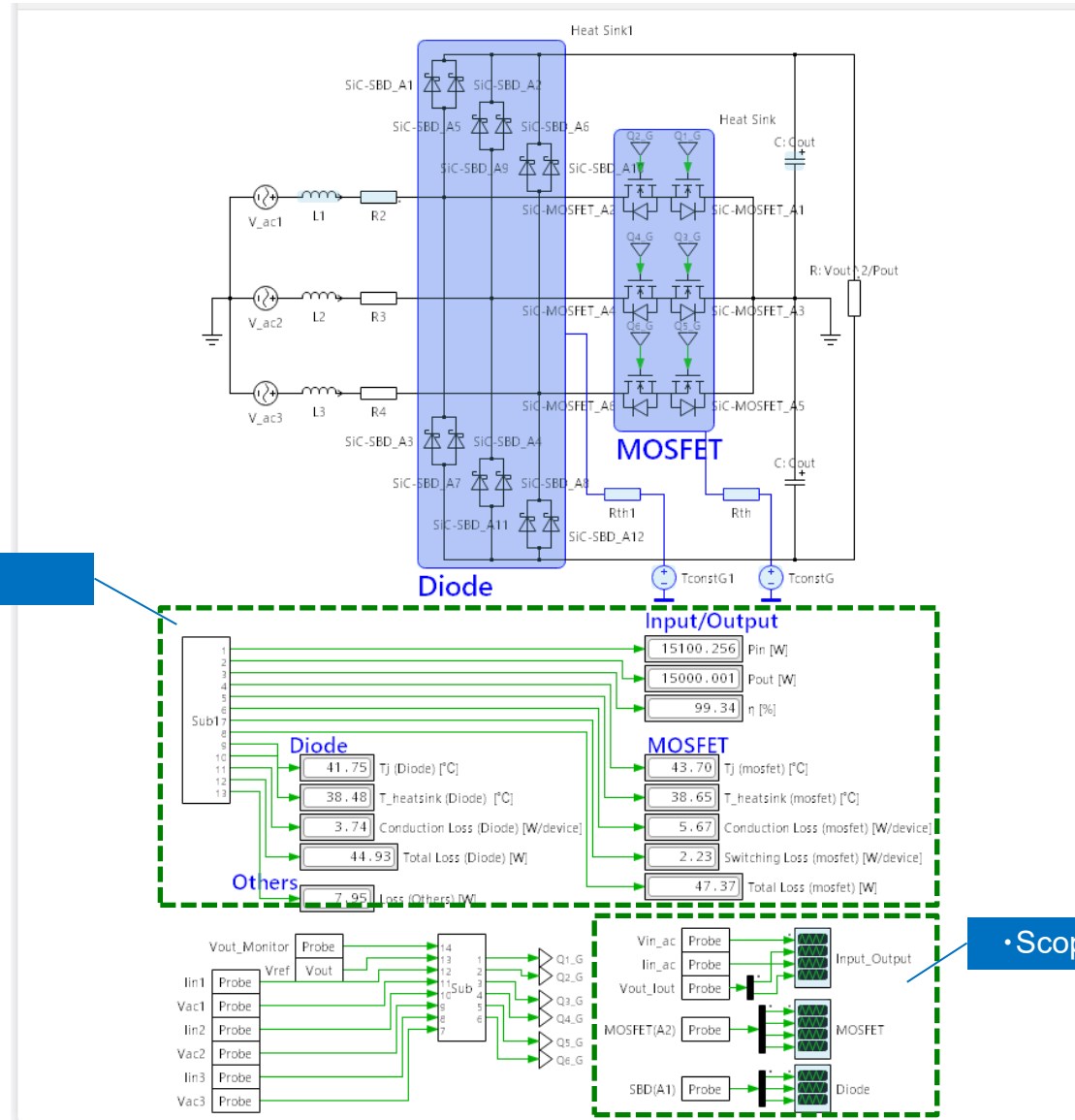


Default Devices

Name	Device Type	Part No.	Specification
Q1~6	SiC MOSFET	SCT4026DR	750V/ 56A/ 26mΩ/ TO-247-4L
D1~12	SiC SBD*	SCS320AG	650V/ 20A/ TO-220ACGE

*SBD:Schottky Barrier Diode

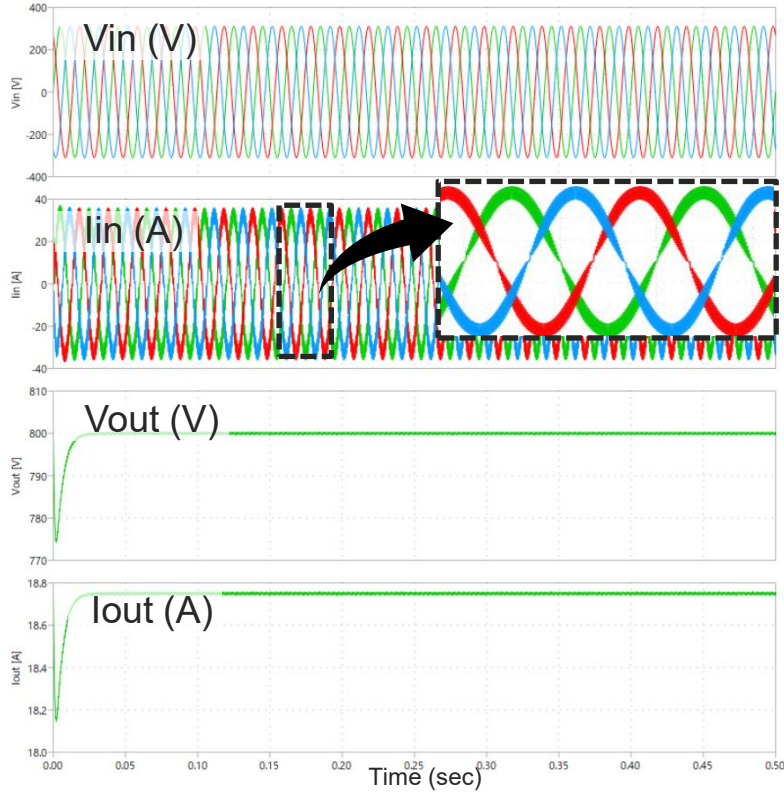
Schematic window



• Results display

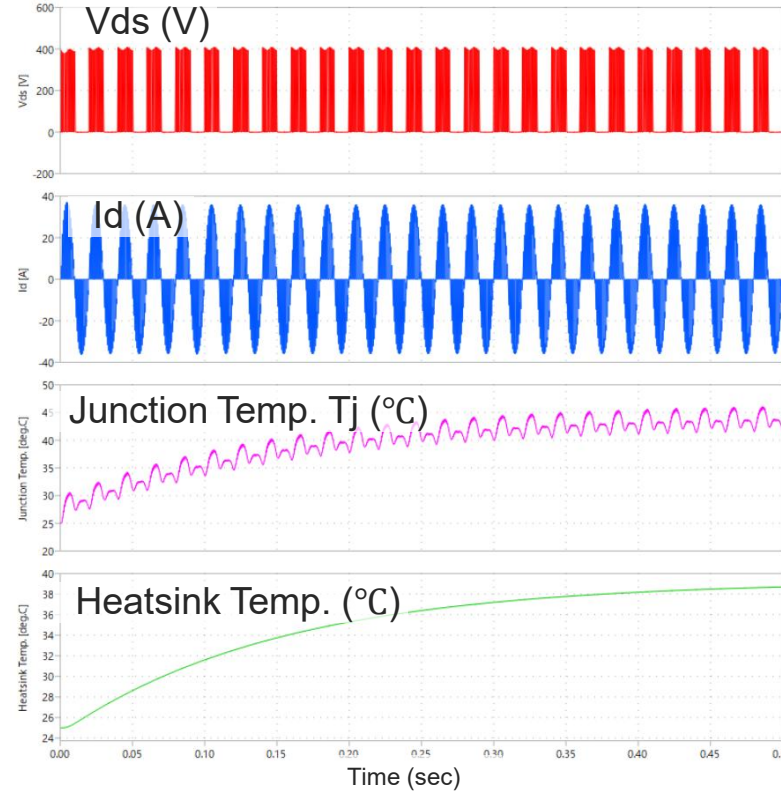
• Scope the waveform

Input and Output



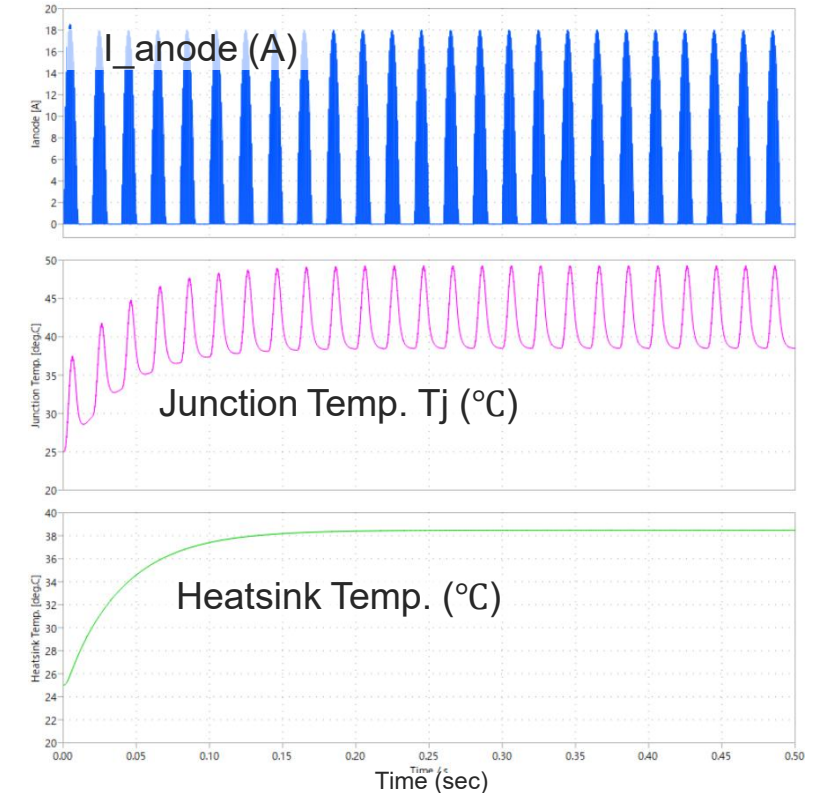
Contents	Results
Input Power : P_{in}	15.100 (kW)
Output Power: P_{out}	15.000 (kW)
Efficiency: η	99.34 (%)

MOSFET



Contents	Results
Junction Temp. T_j (mosfet)	43.70 (°C)
Heatsink Temp. T_{hs} (mosfet)	38.65 (°C)
Conduction Loss: P_{cond} (mosfet)	5.67 (W/device)
Switching Loss: P_{sw} (mosfet)	2.23 (W/device)
Total Loss: P_{tot} (mosfet)	47.37 (W)

Diode



Contents	Results
Junction Temp. T_j (diode)	41.75 (°C)
Heatsink Temp. T_{hs} (diode)	38.48 (°C)
Conduction Loss: P_{cond} (diode)	3.74 (W/device)
Total Loss: P_{tot} (diode)	44.93 (W)

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

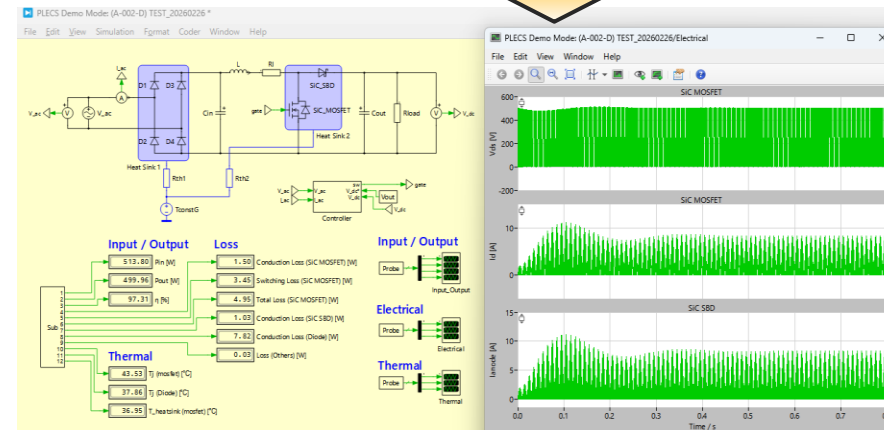
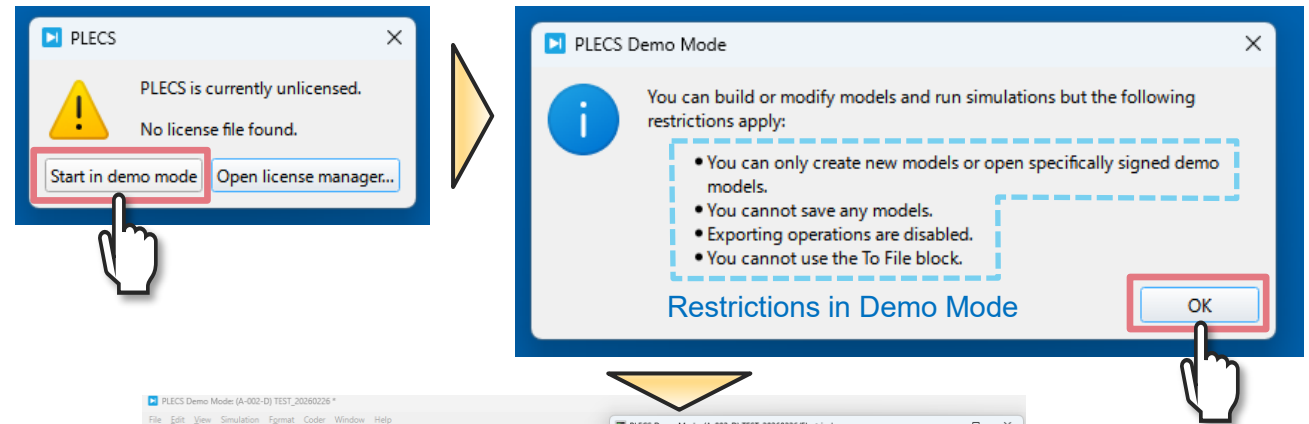
1. Obtaining the Software

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

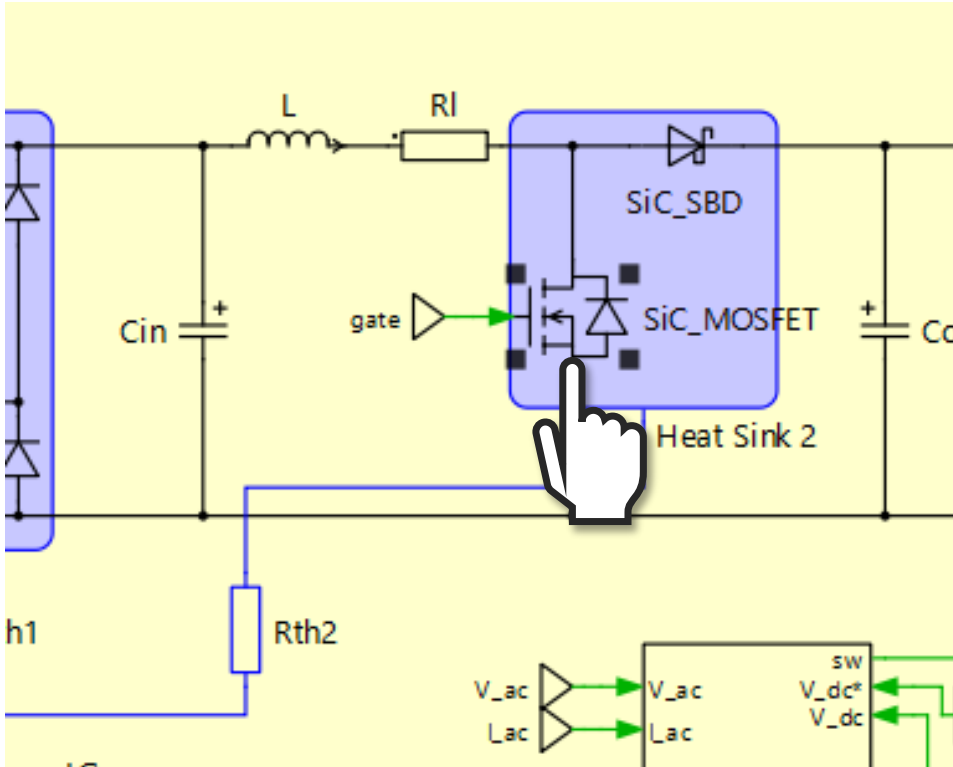
<https://www.plexim.com/download>

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)

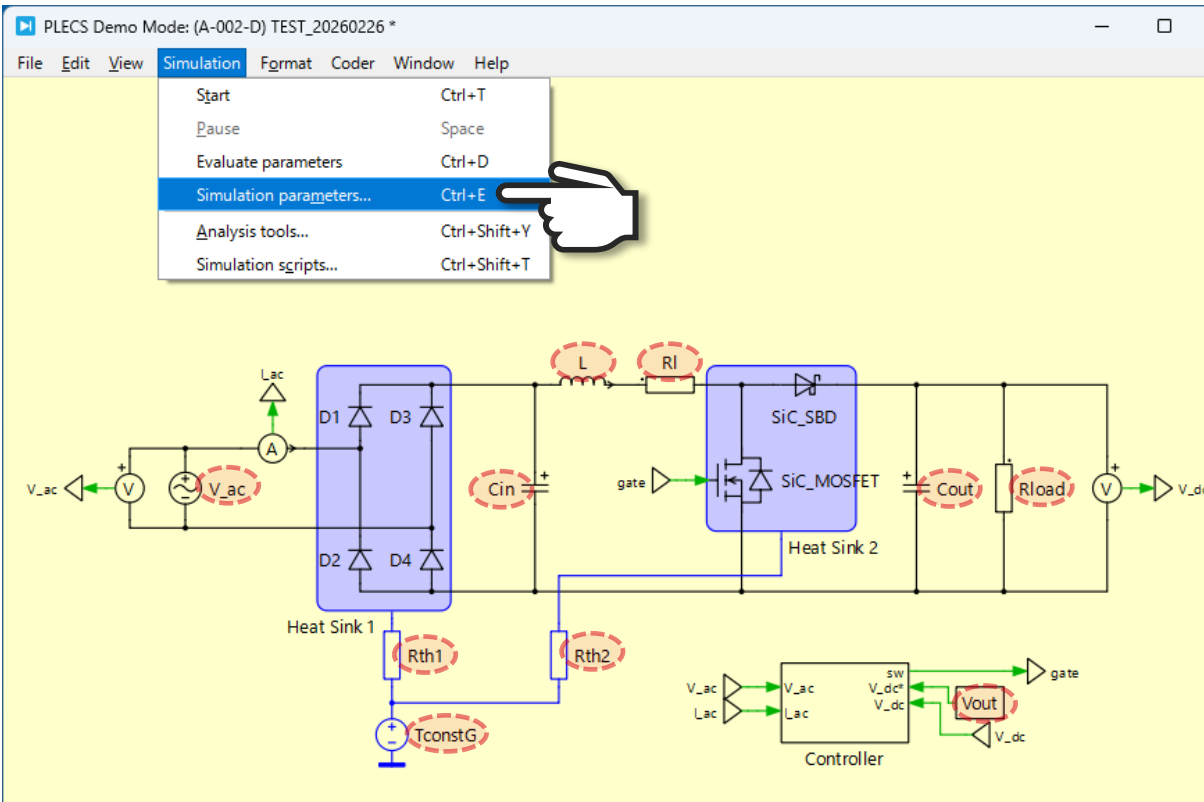
Hover your mouse cursor over the device symbol that you want to change and double-click the left button of the mouse.

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



```
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 T_GND = 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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