

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

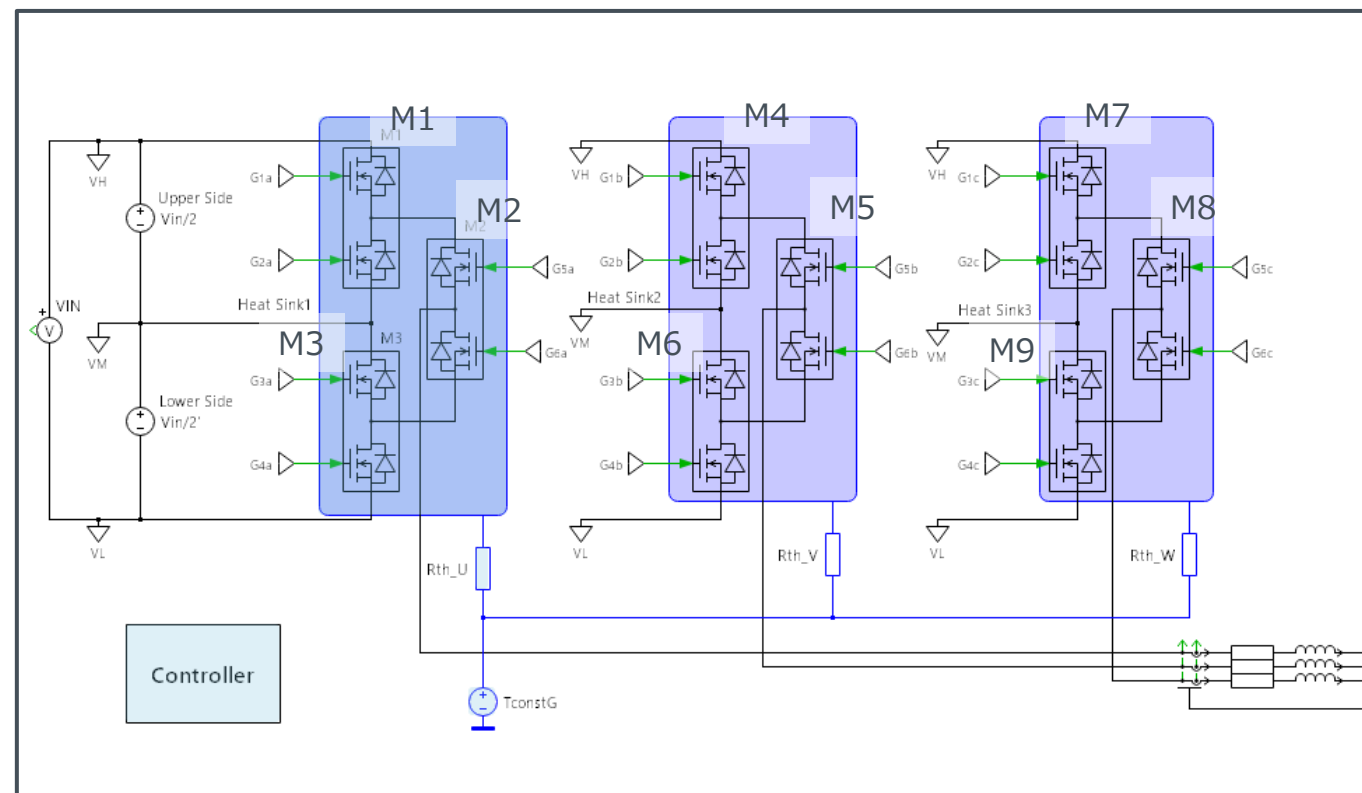
Simulation Parameters

Name	Content	unit	Default Value	Variable Range
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	°C	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	°C	25	-40 ~ 175

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

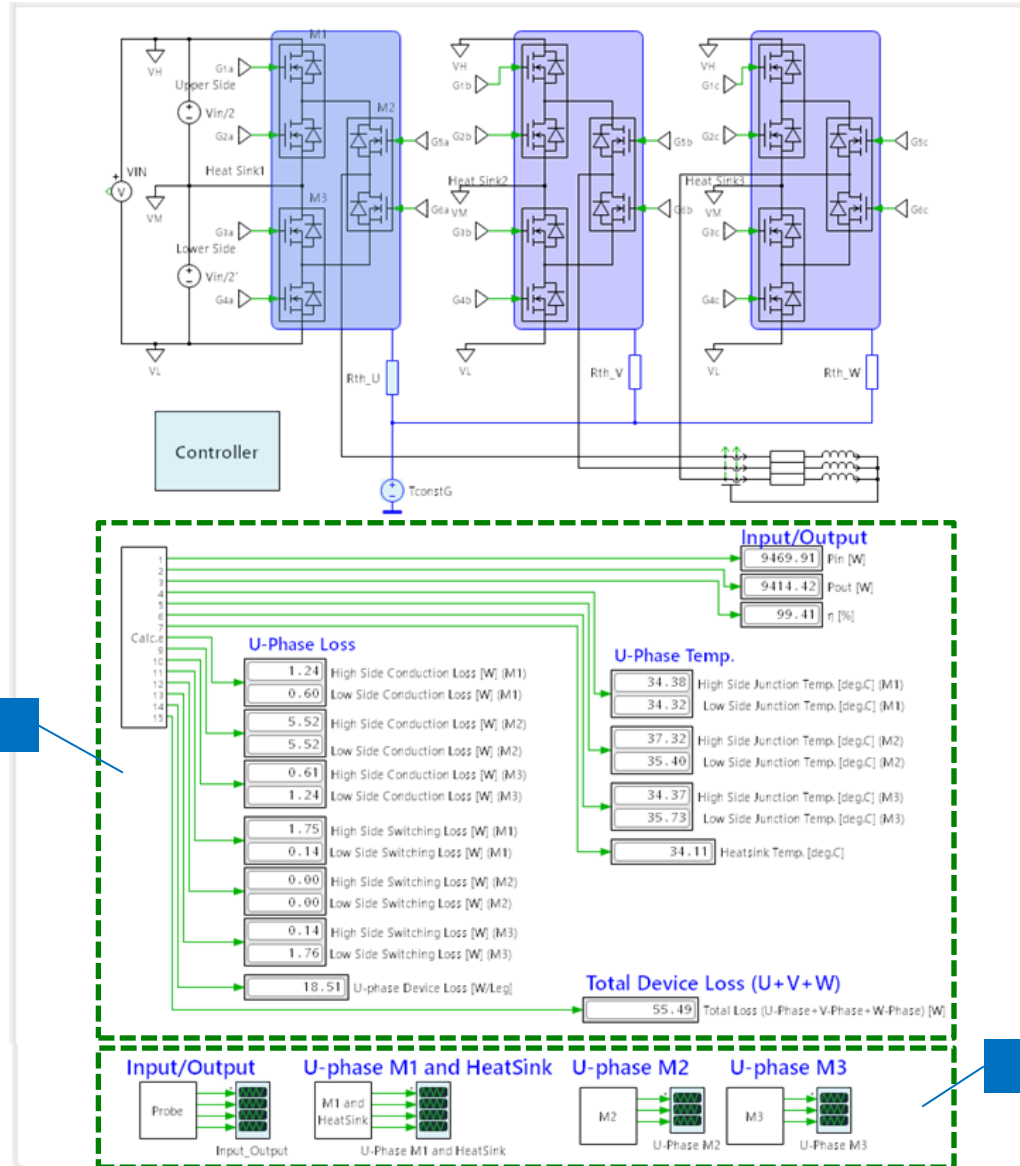
Simulation Circuit



Default Devices

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

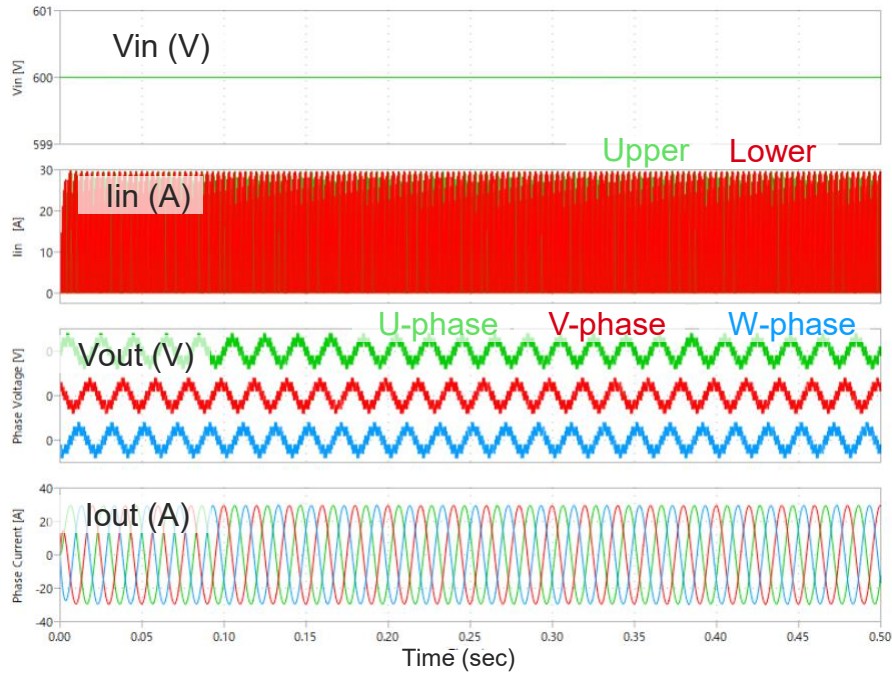
Schematic window



•Results display

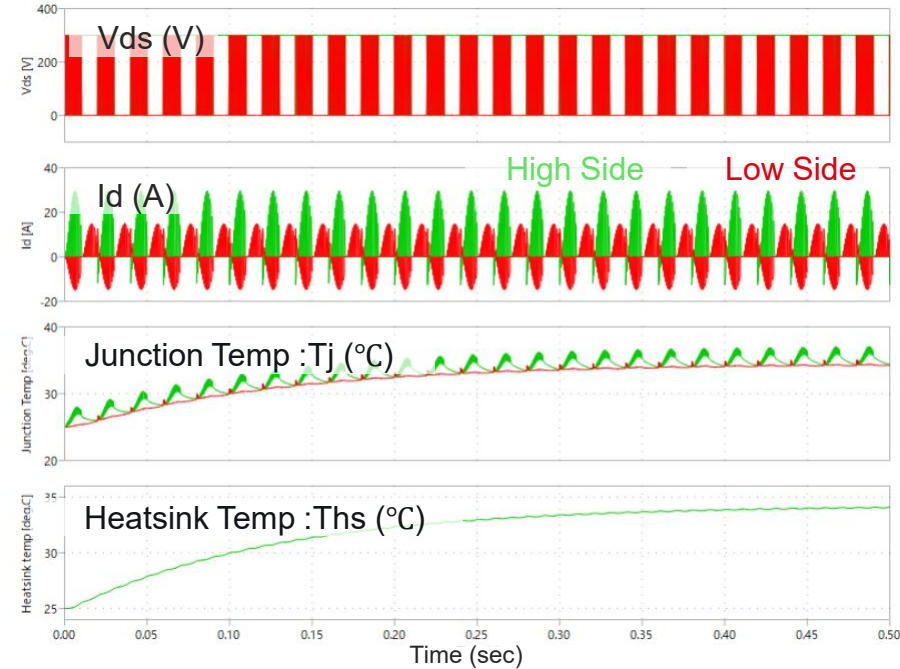
•Scope the waveform

Input and Output



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

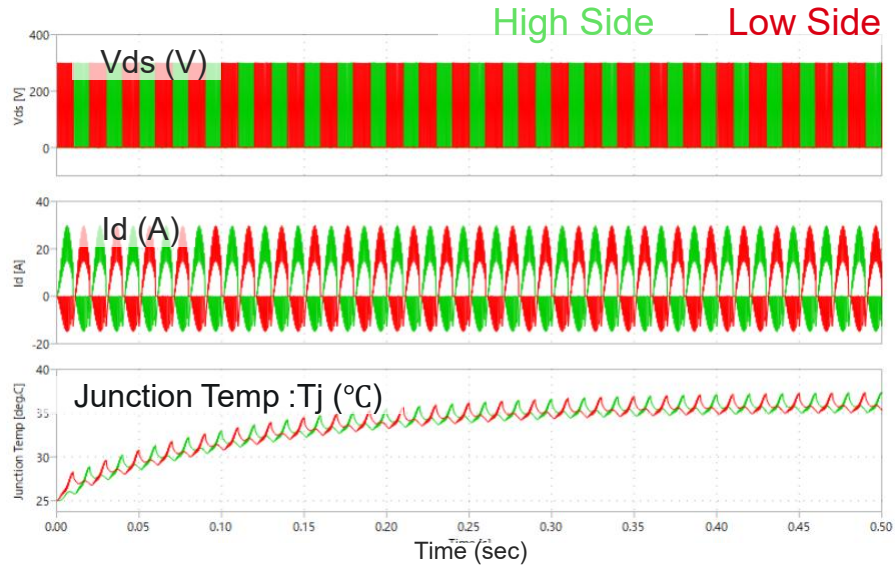
U-Phase M1 and HeatSink



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

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)

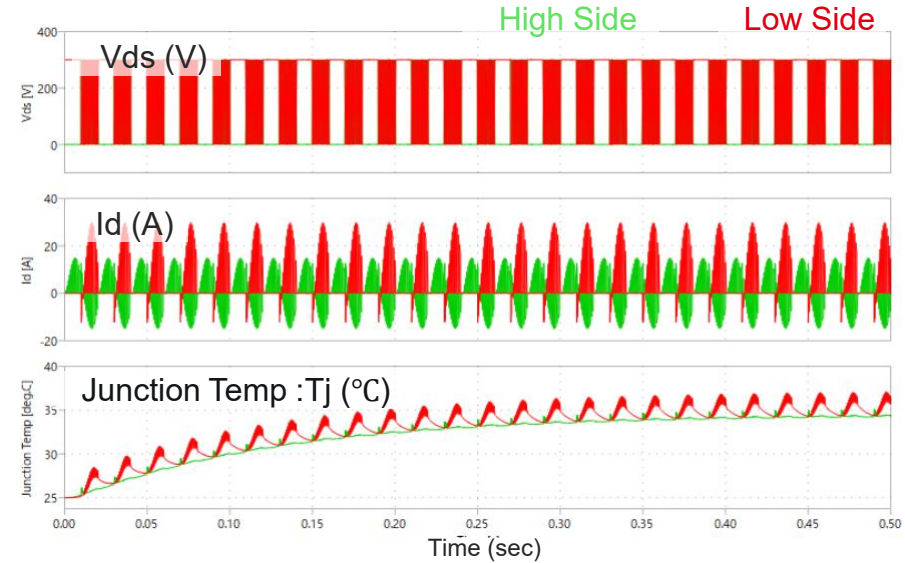
U-Phase M2



Contents ^a	Results
Junction Temp: Tj (M2_HS)	37.32 (°C)
Junction Temp: Tj (M2_LS)	35.40 (°C)

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 (°C)
Junction Temp: Tj (M3_LS)	35.73 (°C)
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)

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

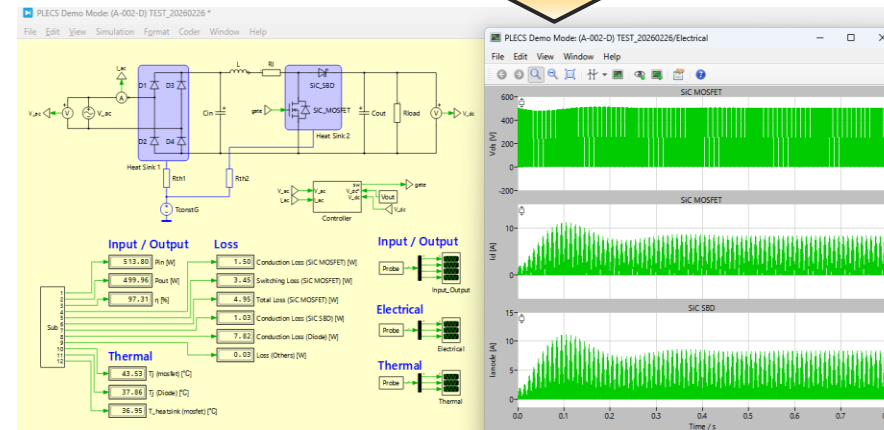
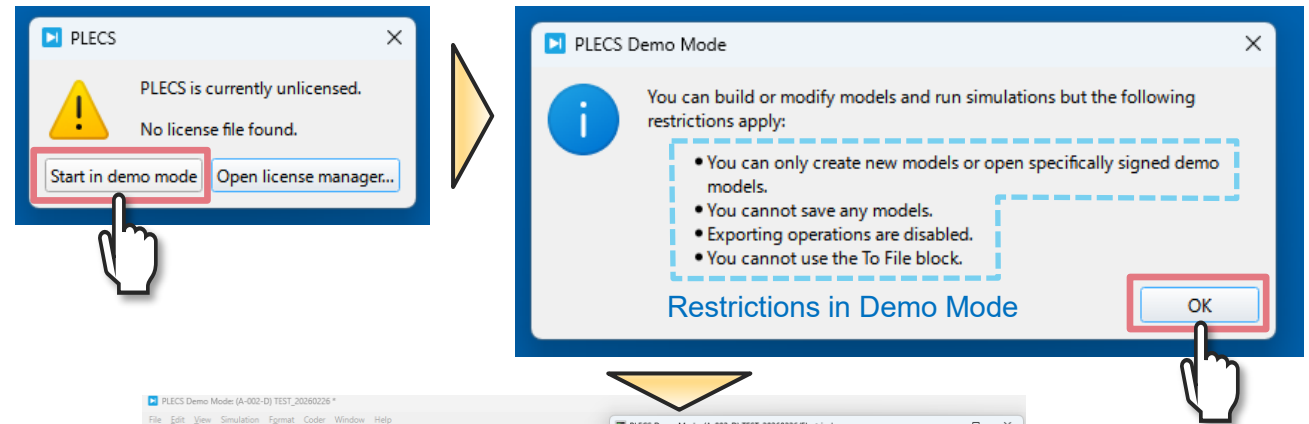
1. Obtaining the Software

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

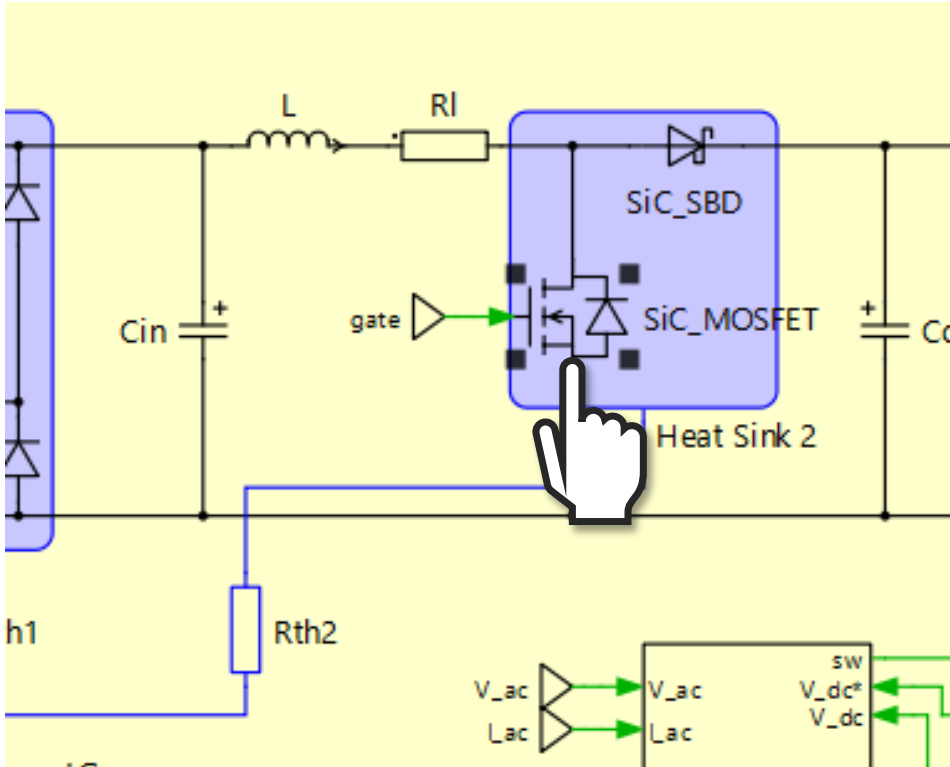
<https://www.plexim.com/download>

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)

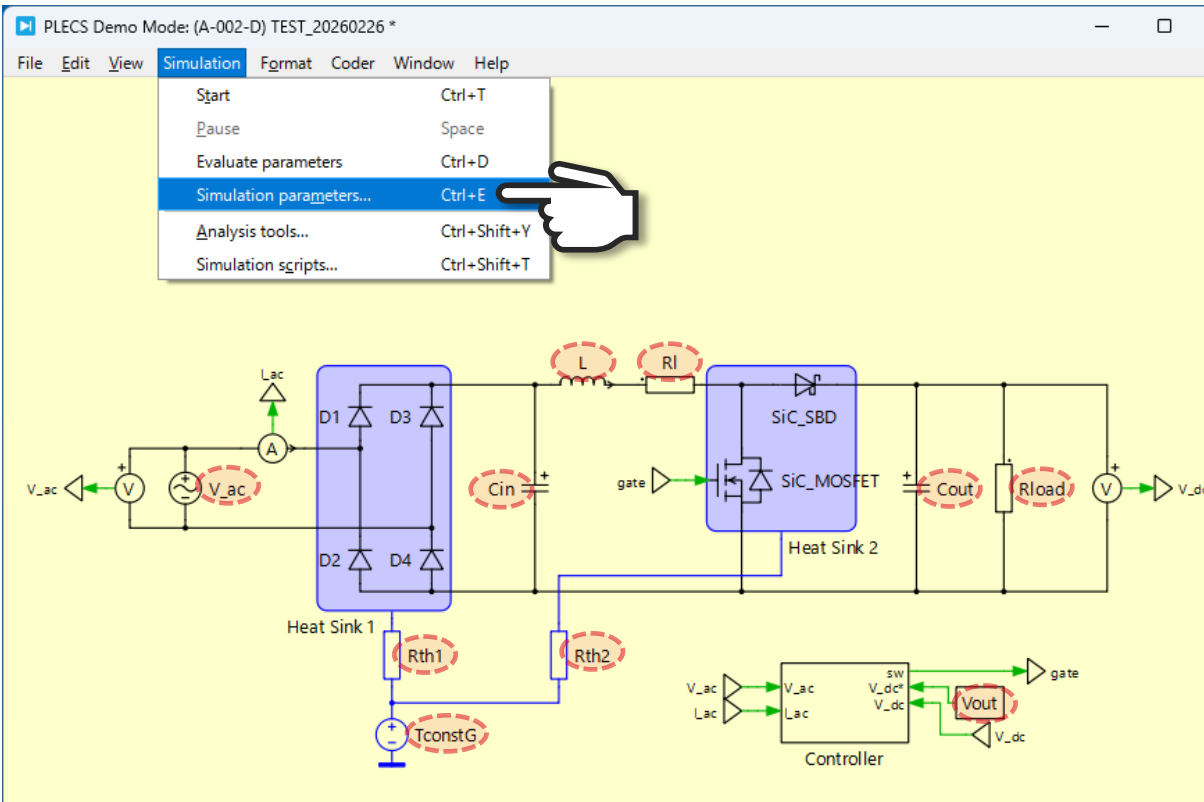
Hover your mouse cursor over the device symbol that you want to change and double-click the left button of the mouse.

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



Simulation Parameters: (A-002-D) TEST_20260226

Solver Options Diagnostics Initialization

System state

Initialize from: Block parameters
 Stored system state

Store current state...

Model initialization commands

```
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
```

OK Cancel Apply Help

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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