

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

PLECS Demo Circuit
Simulation Example



2026 May
68UG130E Rev.002

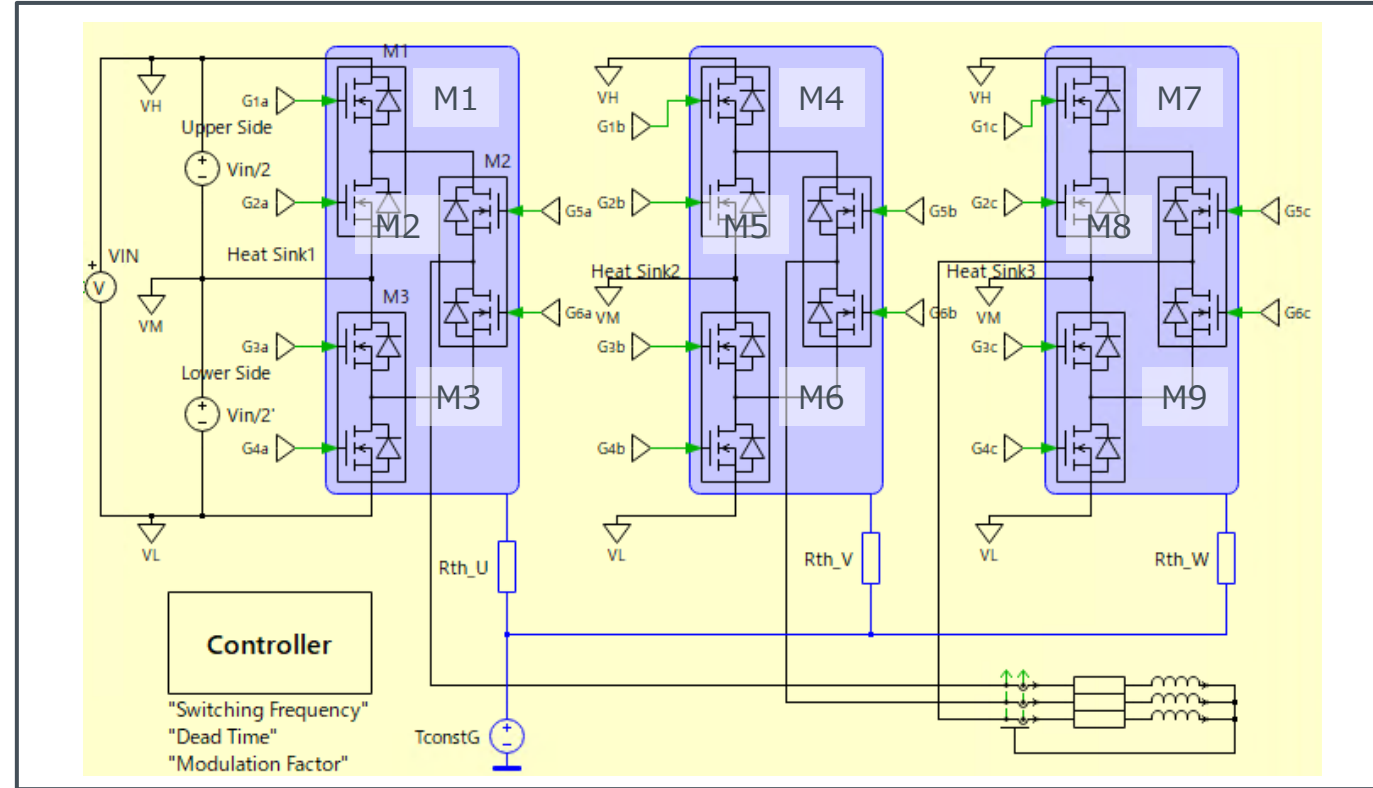
Simulation Parameters

Name	Content	unit	Default Value
fs	Switching Frequency	kHz	10
DT	Deadtime	ns	1000
M	Modulation Factor	-	0.8
Thcap	Thermal Capacitance ※	J/K	0.1
Rth	Thermal Resistance ※	K/W	0.5
TGND	Thermal GND Temperature	°C	25

Name	Content	unit	Default Value
Test_time	Test time in simulation	s	0.5
Vin	Input Voltage	V	600
Iout(peak)	Output Current (peak)	A	30
fr	Output Frequency	Hz	50
PF	Power Factor	-	0.9
Rg_on_HB	Gate Resistance (Source) ※	Ω	15
Rg_off_HB	Gate Resistance (Sink) ※	Ω	15
T_init	Initial Junction Temperature	°C	25

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

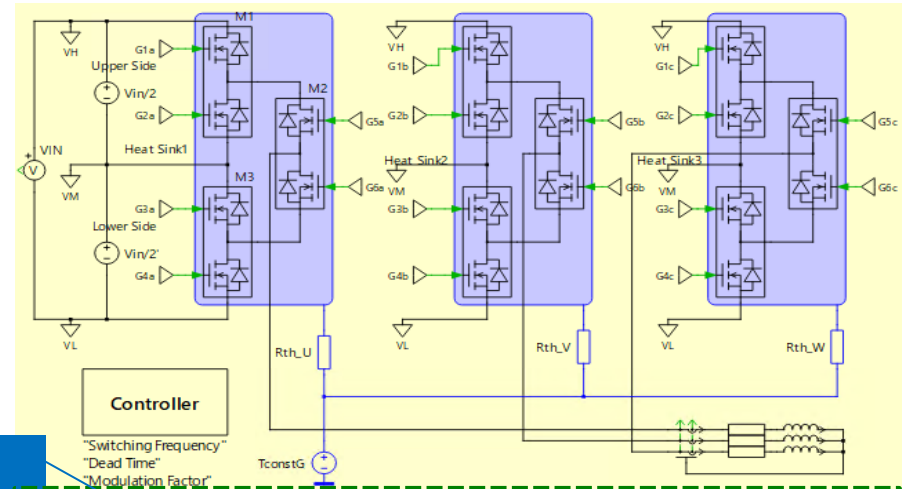
Simulation Circuit



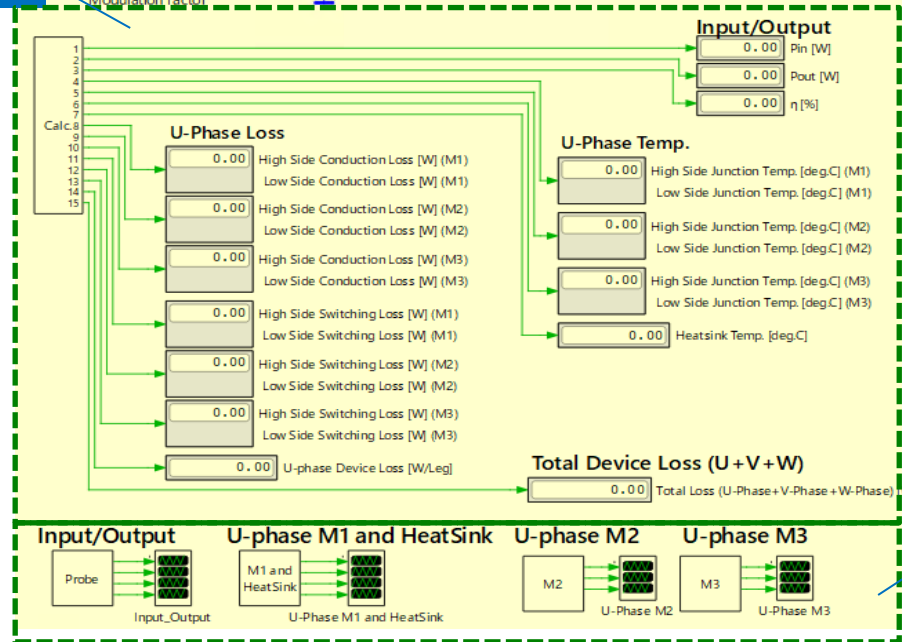
Power Device

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

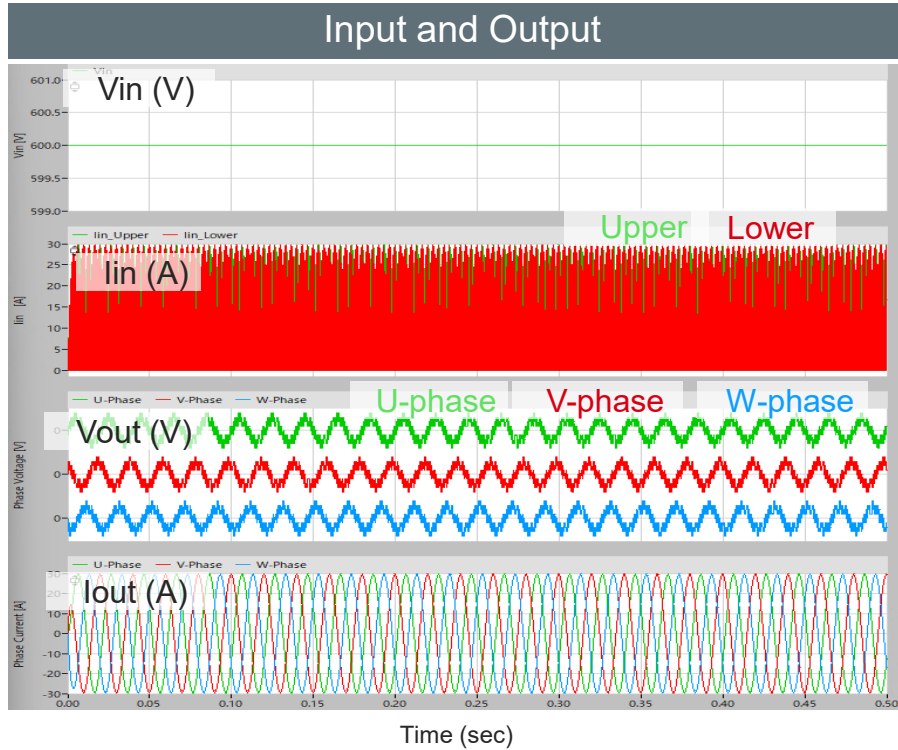
Simulation Screen Overview



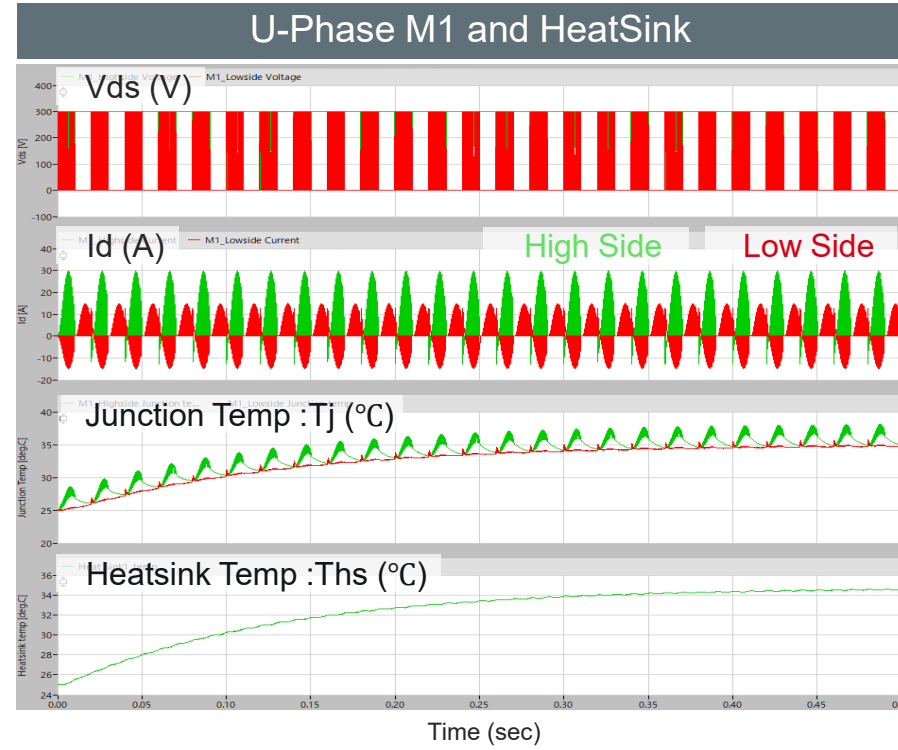
Results display



Scope the waveform

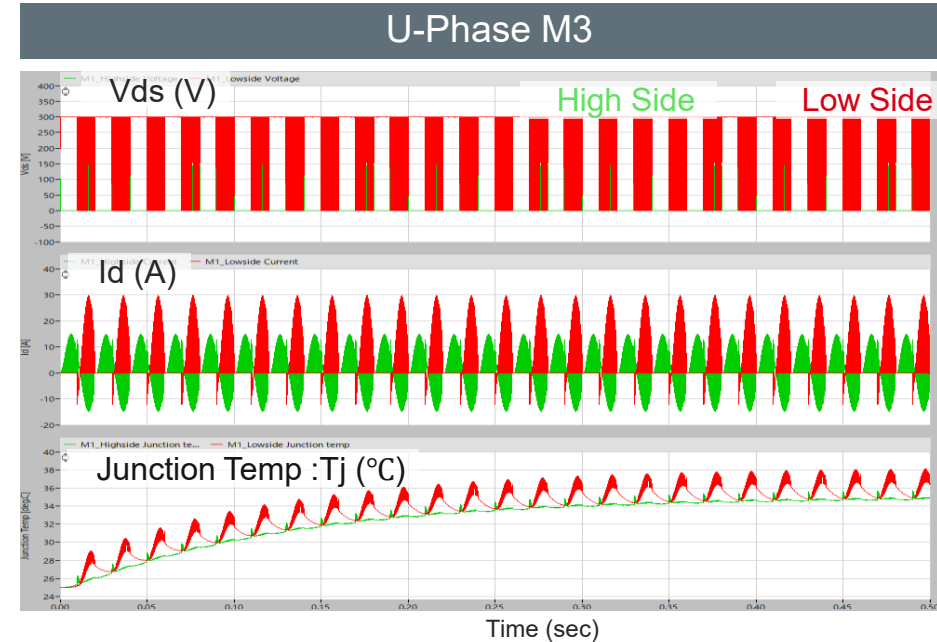
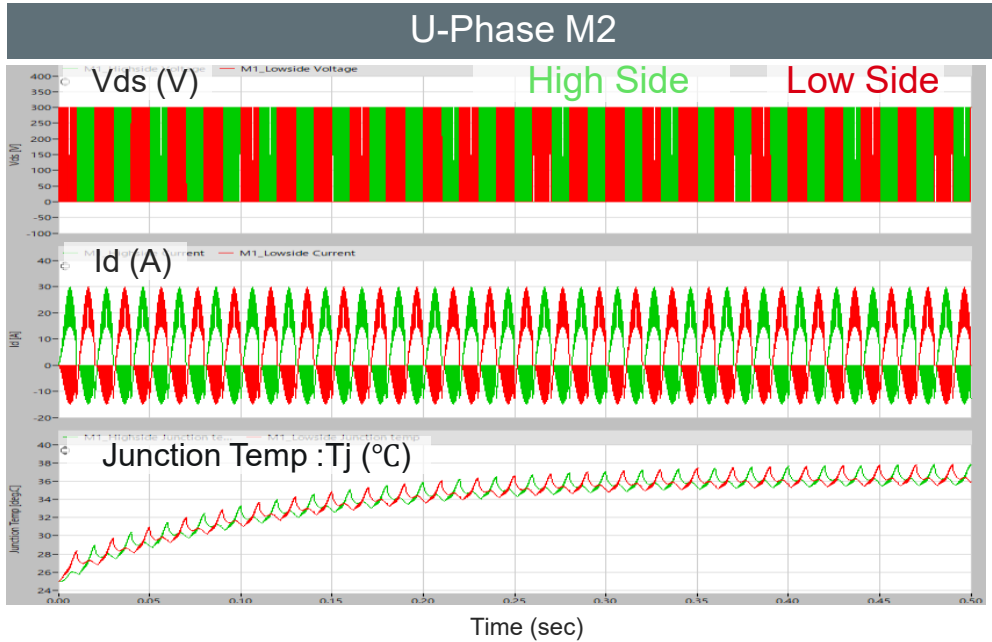


Contents	Results
Input Power : P_{in}	9.473 (kW)
Output Power: P_{out}	9.414 (kW)
Efficiency: η	99.38 (%)



Contents	Results
Junction Temp: T_j (M1_HS)	34.92 (°C)
Junction Temp: T_j (M1_LS)	34.84 (°C)
Heatsink Temp: T_{hs}	34.60 (°C)

Contents	Results
Conduction Loss: P_{cond} (M1_HS)	1.24 (W)
Switching Loss: P_{sw} (M1_HS)	2.22 (W)
Conduction Loss: P_{cond} (M1_LS)	0.61 (W)
Switching Loss: P_{sw} (M1_LS)	0.16 (W)



Contentsa	Results
Junction Temp: Tj (M2_HS)	37.80 (°C)
Junction Temp: Tj (M2_LS)	35.92 (°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)

Contents	Results
Junction Temp: Tj (M3_HS)	34.85 (°C)
Junction Temp: Tj (M3_LS)	36.49 (°C)
Conduction Loss: Pcond (M3_HS)	0.61 (W)
Switching Loss: Psw (M3_HS)	0.15 (W)

Contents	Results
Conduction Loss: Pcond (M3_LS)	1.24 (W)
Switching Loss: Psw (M3_LS)	2.23 (W)
U-phase Device Loss (U+V+W)	19.49 (W/Leg)
Total Device Loss (U+V+W)	58.43(W)

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

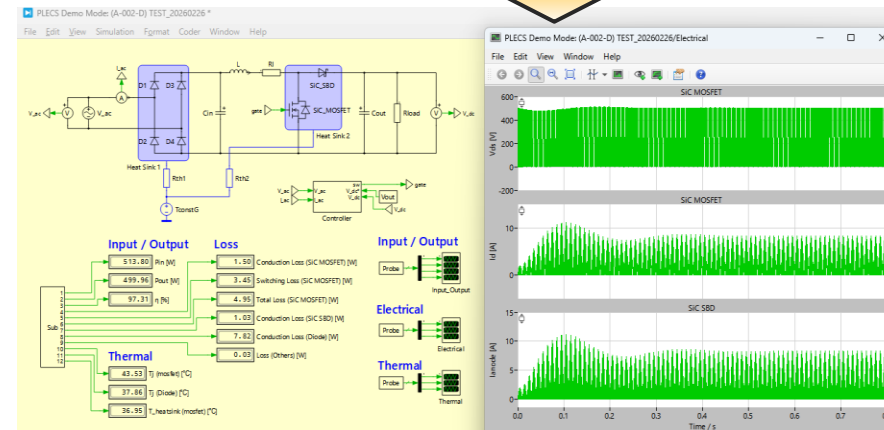
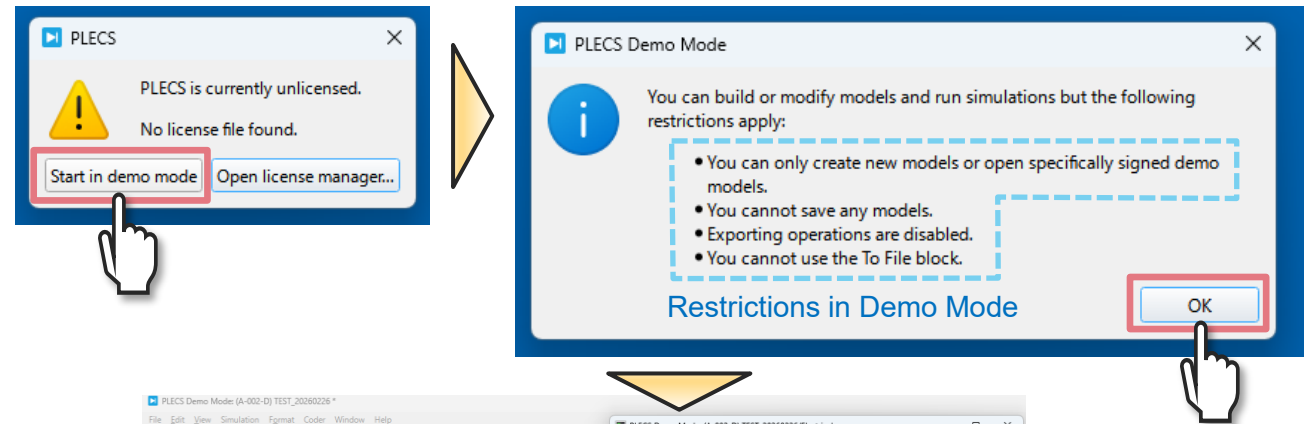
1. Obtaining the Software

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

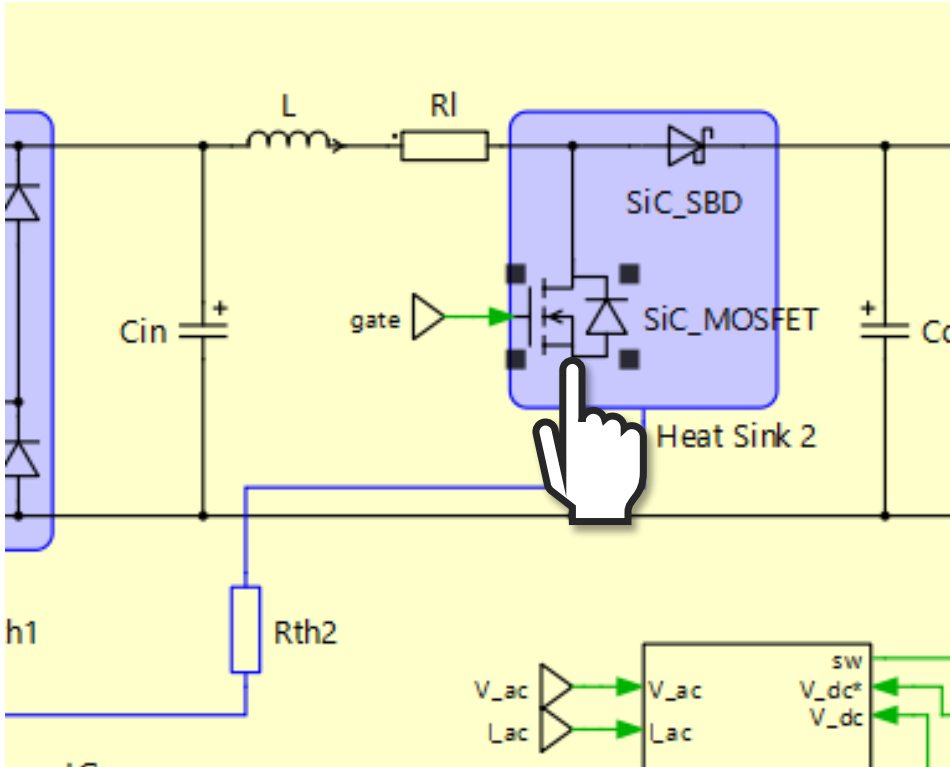
<https://www.plexim.com/download>

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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Commercial Use or Resale Restricted

Date: 21-Jan.-2026

Parameters Assertions

SiC-MOSFET:
SiCMOS

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

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 (SCT4026DWW)
[SiC-MOSFET] TOLL_750V_120A_13mΩ (SCT4013DLL)
[SiC-MOSFET] TOLL_750V_26A_65mΩ (SCT4065DLL)
[SiC-MOSFET] TOLL_750V_37A_45mΩ (SCT4045D11)

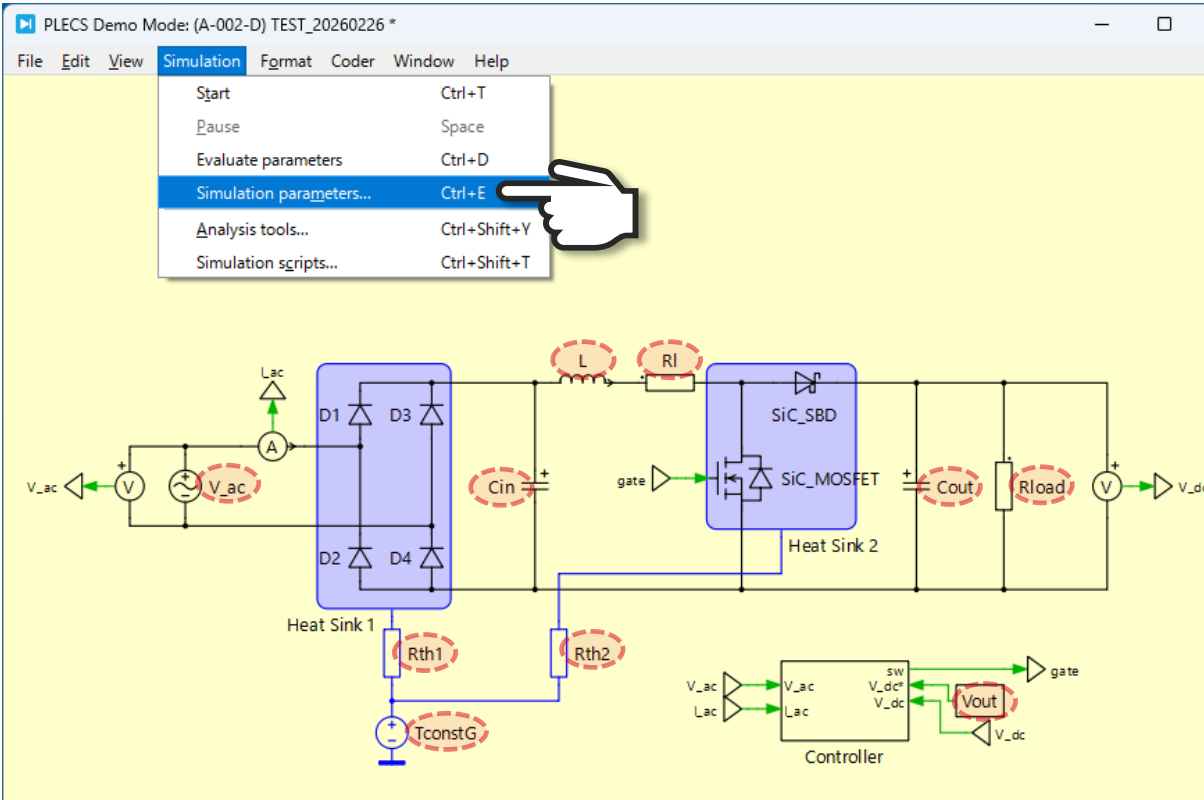
Hover your mouse cursor over the device symbol that you want to change and double-click the left button of the mouse.

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 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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