

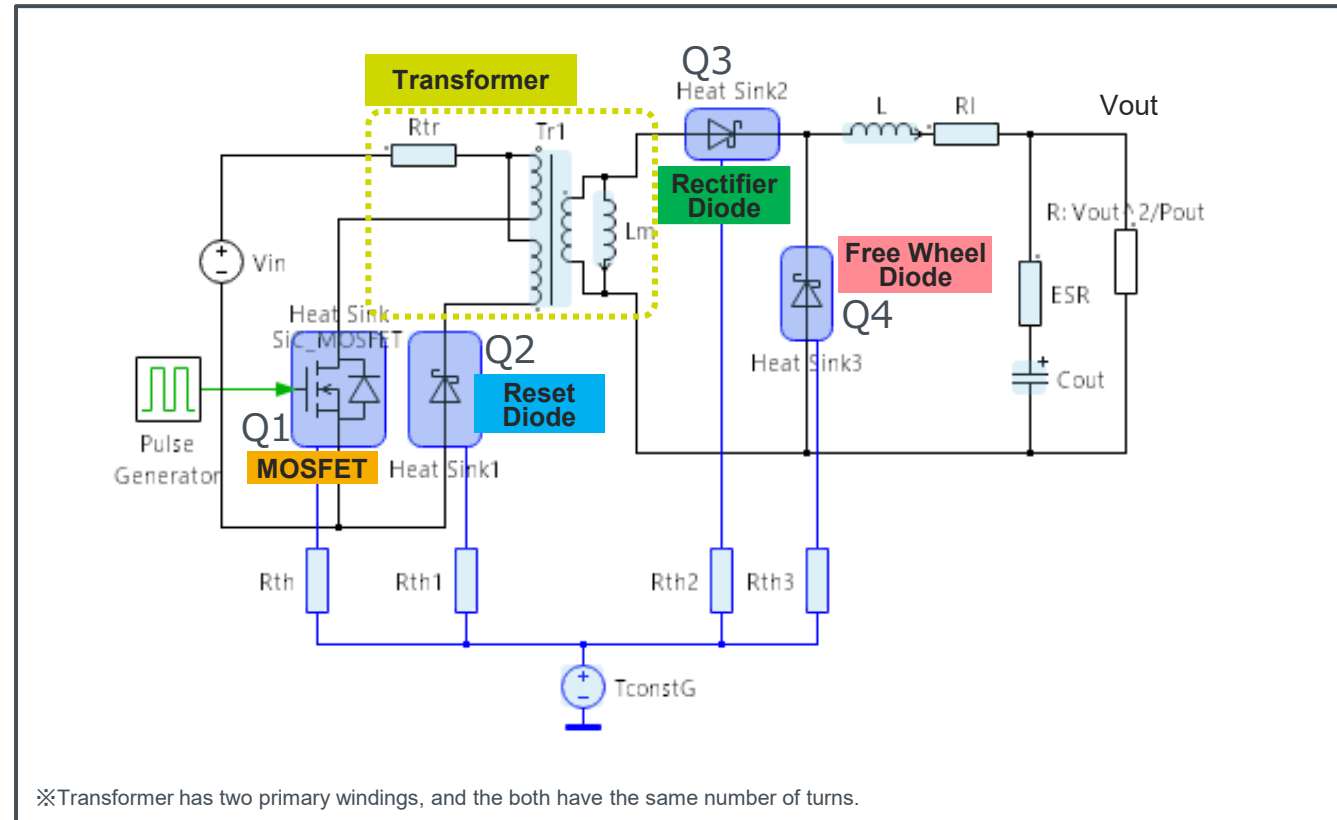
(C-011-D) DC-DC Forward Converter (Discrete)

Simulation Parameters

Name	Content	unit	Default Value	Variable Range
Cout	Output Capacitor	F	500u	1u ~ 10m
ESR	ESR of Cout	Ω	3m	1u ~ 100
L	Inductive Load	H	300u	1u ~ 10m
RI	Choke Resistance	Ω	100m	1m ~ 100
Lm	Magnetizing Inductance	H	2m	1u ~ 10m
Np	Number of Primary windings	turns	3	1~100
Ns	Number of Secondary windings	turns	1	1~100
Rtr	Parasitic Resistance	Ω	100m	1m ~ 10
Thcap_mos	Thermal Capacitance	J/K	0.1	1m ~ 100
Rth_mos	Thermal Resistance	K/W	0.5	1m ~ 100
Thcap_rst	Thermal Capacitance	J/K	0.1	1m ~ 100
Rth_rst	Thermal Resistance	K/W	0.5	1m ~ 100
Thcap_rec	Thermal Capacitance	J/K	0.1	1m ~ 100
Rth_rec	Thermal Resistance	K/W	0.5	1m ~ 100
Thcap_fw	Thermal Capacitance	J/K	0.1	1m ~ 100
Rth_fw	Thermal Resistance	K/W	0.5	1m ~ 100
TGND	Thermal GND Temperature	$^{\circ}\text{C}$	25	-40 ~ 175

Simulation Circuit

2026 March
68UG134E Rev.001



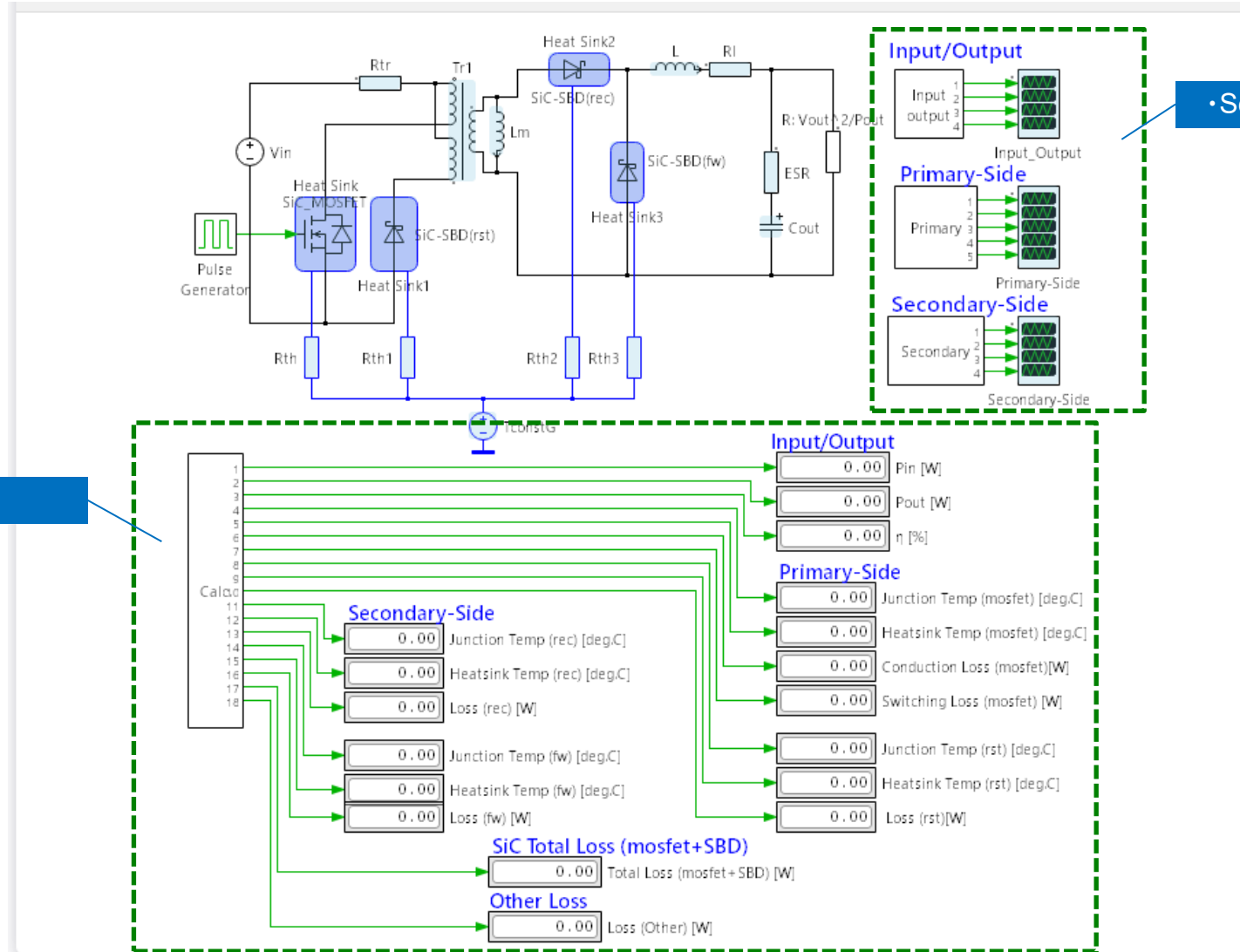
※Transformer has two primary windings, and the both have the same number of turns.

Default Devices

Name	Device Type	Part No.	Specification
Q1	SiC MOSFET	SCT4065DR	750V/25A/65m Ω /TO-247-4L
Q2~4	SiC Schottky Barrier Diode	SCS320AG	650V/20A/TO-220ACGE

Name	Content	unit	Default Value	Variable Range
Test_time	Test time in simulation	s	0.4	100u ~ 0.5
fs	Switching Frequency	kHz	100	10 ~ 1000
Vin	Input Voltage	V	300	100~ 1000
Vout	Output Voltage	V	48	5 ~ 1000
Pout	Output Power	W	500	10~100k
Rg_on	Gate Resistance (Source)	Ω	4.7	0.1 ~ 100
Rg_off	Gate Resistance (Sink)	Ω	4.7	0.1 ~ 100
T_init	Initial Junction Temperature	$^{\circ}\text{C}$	25	-40 ~ 175

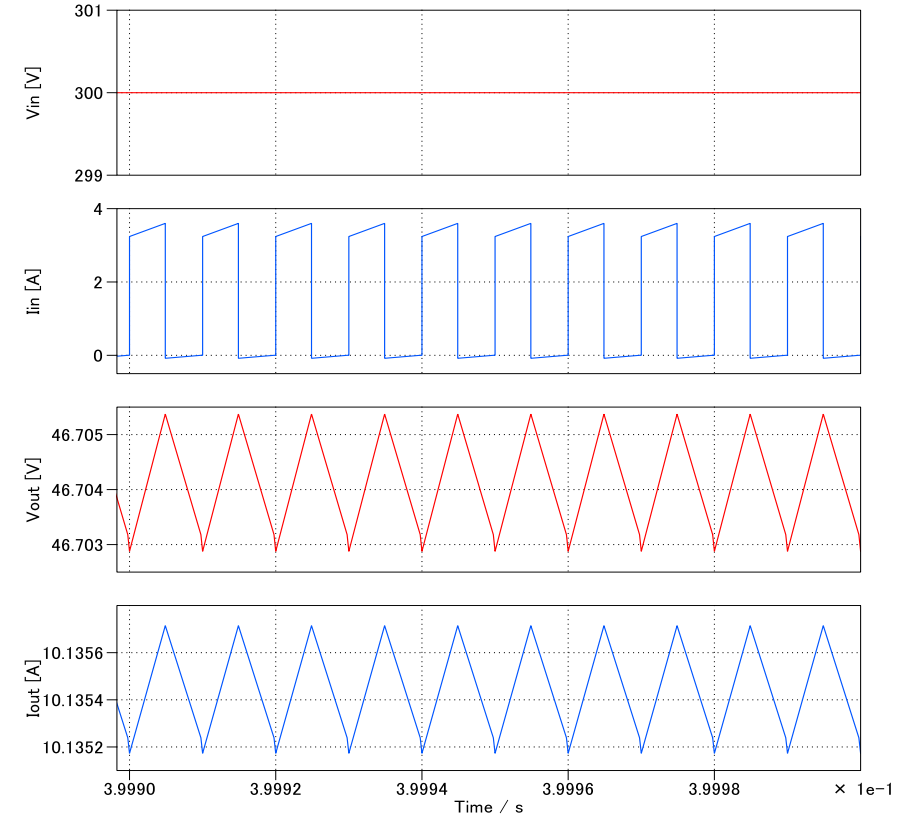
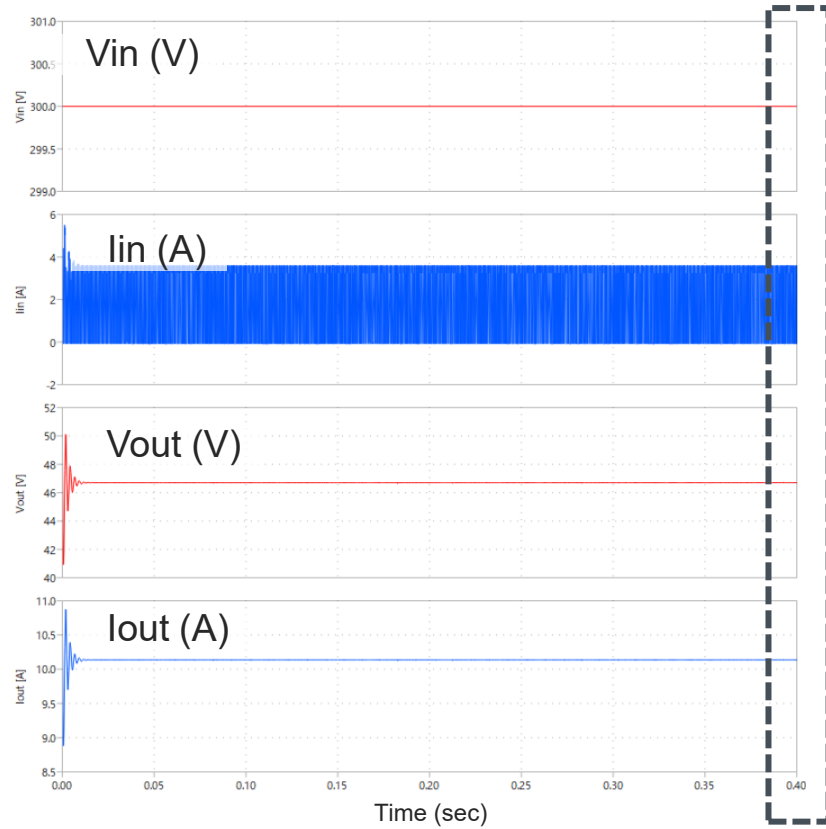
Schematic window



• Scope the waveform

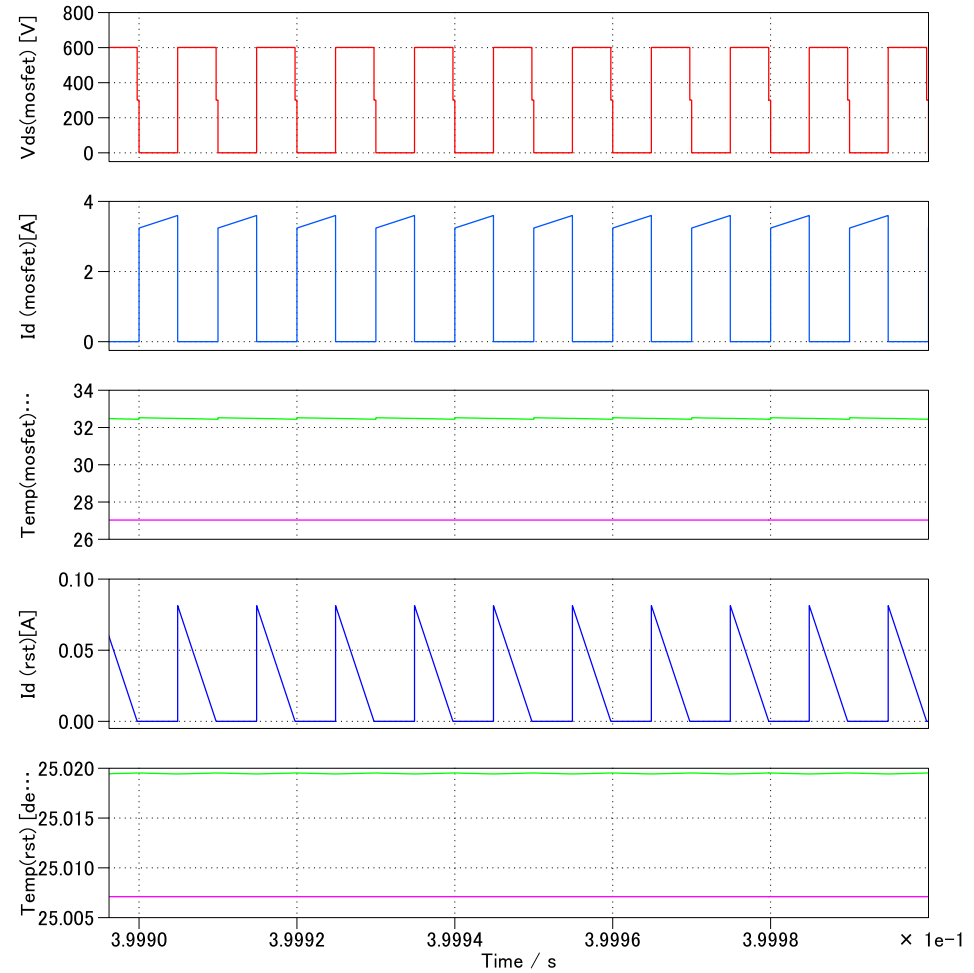
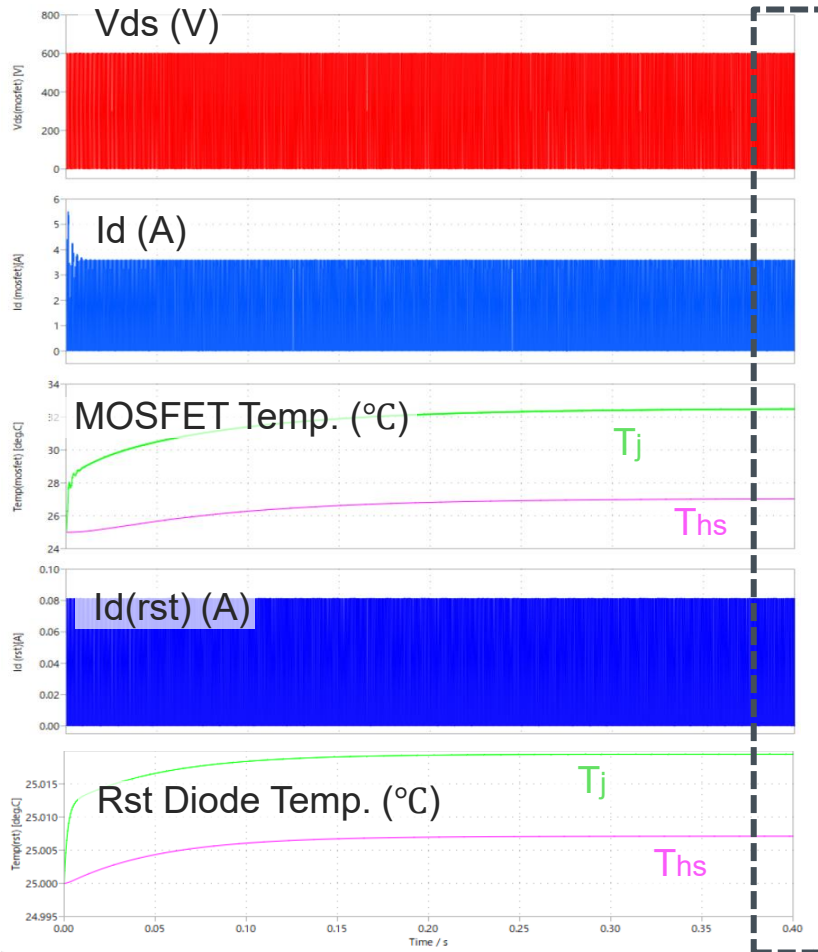
• Results display

Input and Output



Contents	Results
Input Power : P_{in}	499.8(W)
Output Power: P_{out}	473.4 (W)
Efficiency: η	94.72 (%)

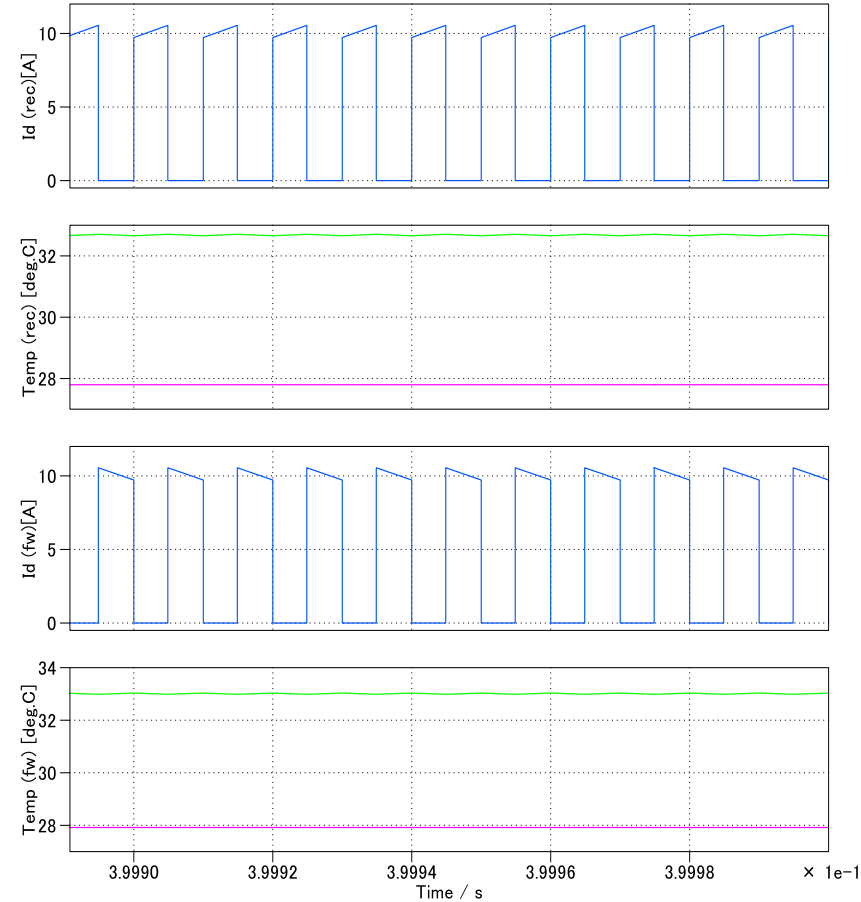
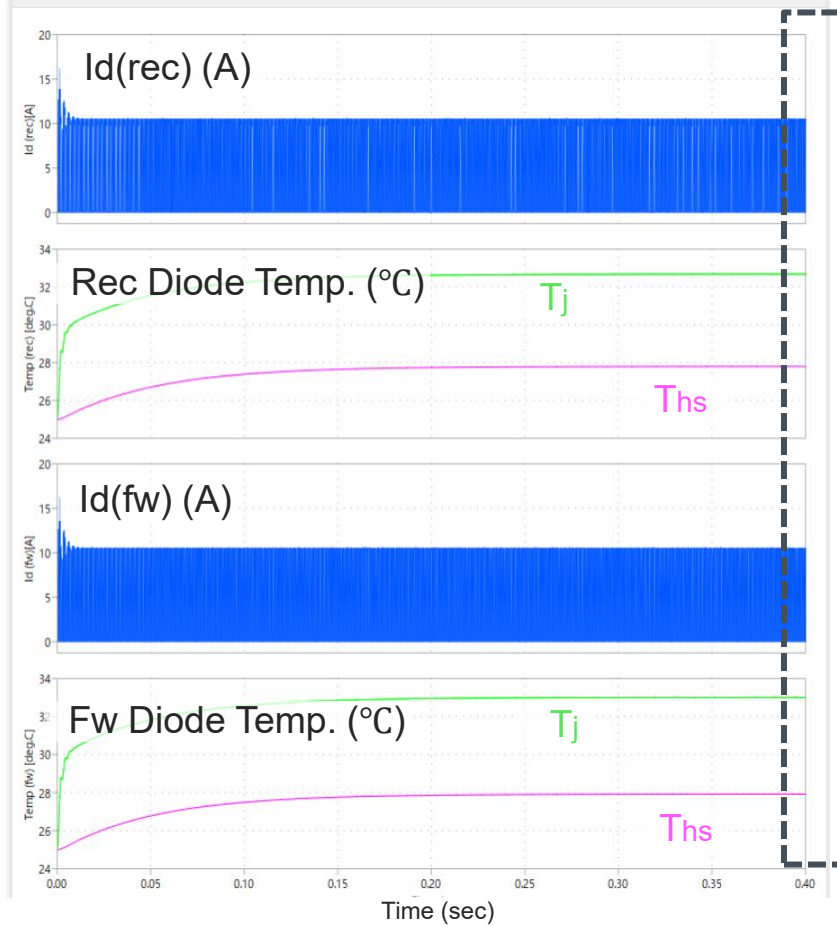
Primary Side



Contents	Results
Junction Temp: Tj (mosfet)	32.48 (°C)
Heatsink Temp: Ths (mosfet)	27.03 (°C)
Conduction Loss: Pcond (mosfet)	0.42 (W)
Switching Loss: Psw (mosfet)	3.70(W)

Contents	Results
Junction Temp : Tj (rst)	25.02(°C)
Heatsink Temp: Ths (rst)	25.01(°C)
RST Diode Loss: Pcond(rst)	0.01(W)

Secondary Side



Contents	Results
Junction Temp : $T(\text{rec})$	32.68 (°C)
Heatsink Temp : $T_{hs}(\text{rec})$	27.80 (°C)
REC Diode Loss: $P_{\text{cond}}(\text{rec})$	5.60 (W)

Contents	Results
Junction Temp : $T(\text{fw})$	33.01(°C)
Heatsink Temp : $T_{hs}(\text{fw})$	27.92(°C)
FW Diode Loss: $P_{\text{cond}}(\text{fw})$	5.84 (W)
Total Loss: $P_{\text{total}}(\text{mosfet+SBD})$	15.56 (W)

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

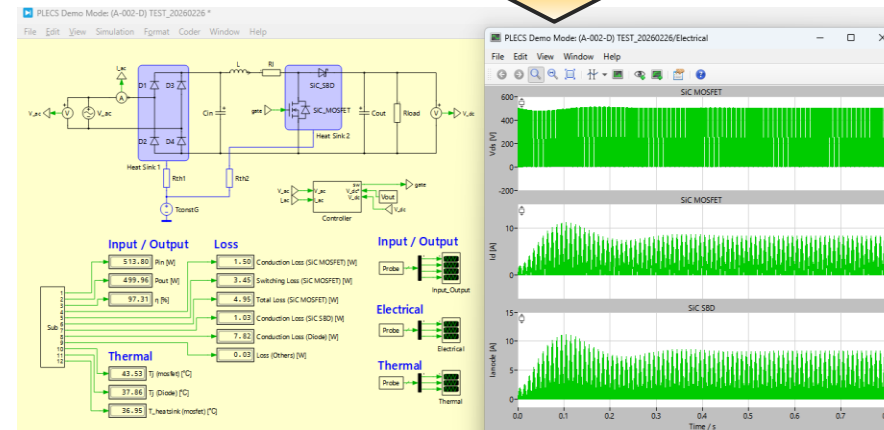
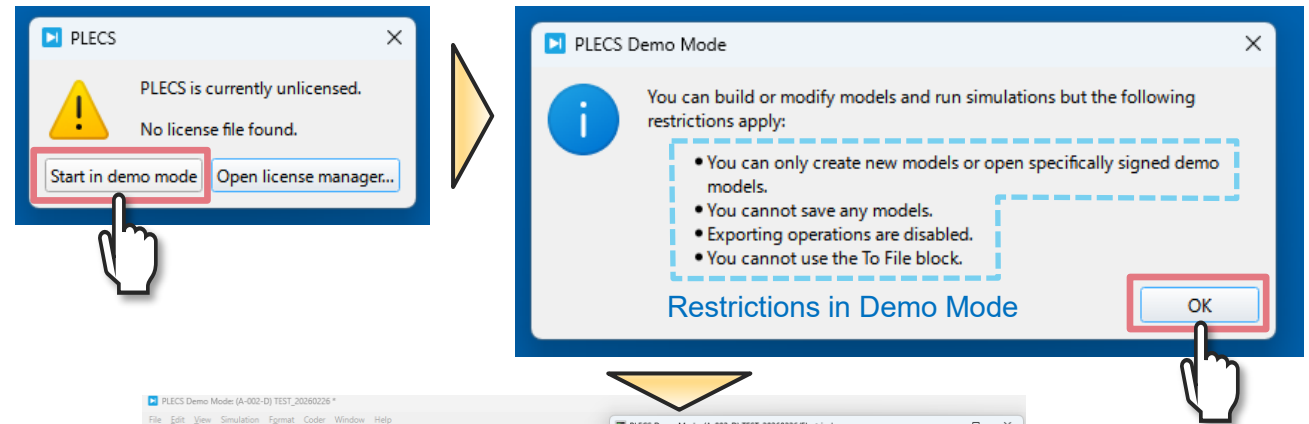
1. Obtaining the Software

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

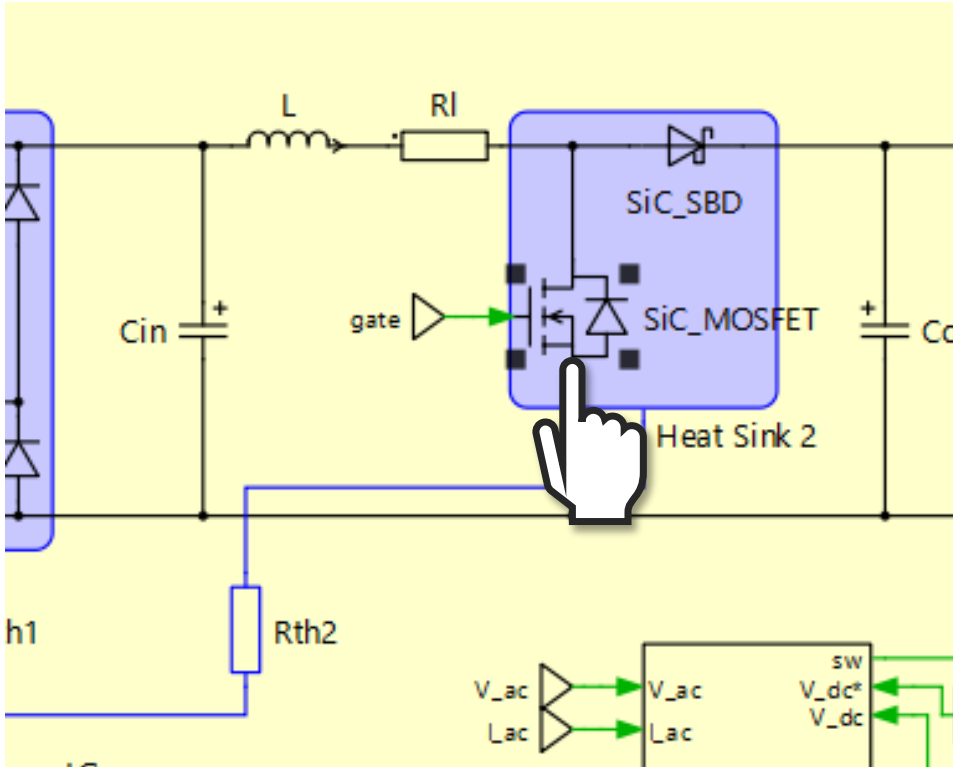
<https://www.plexim.com/download>

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)

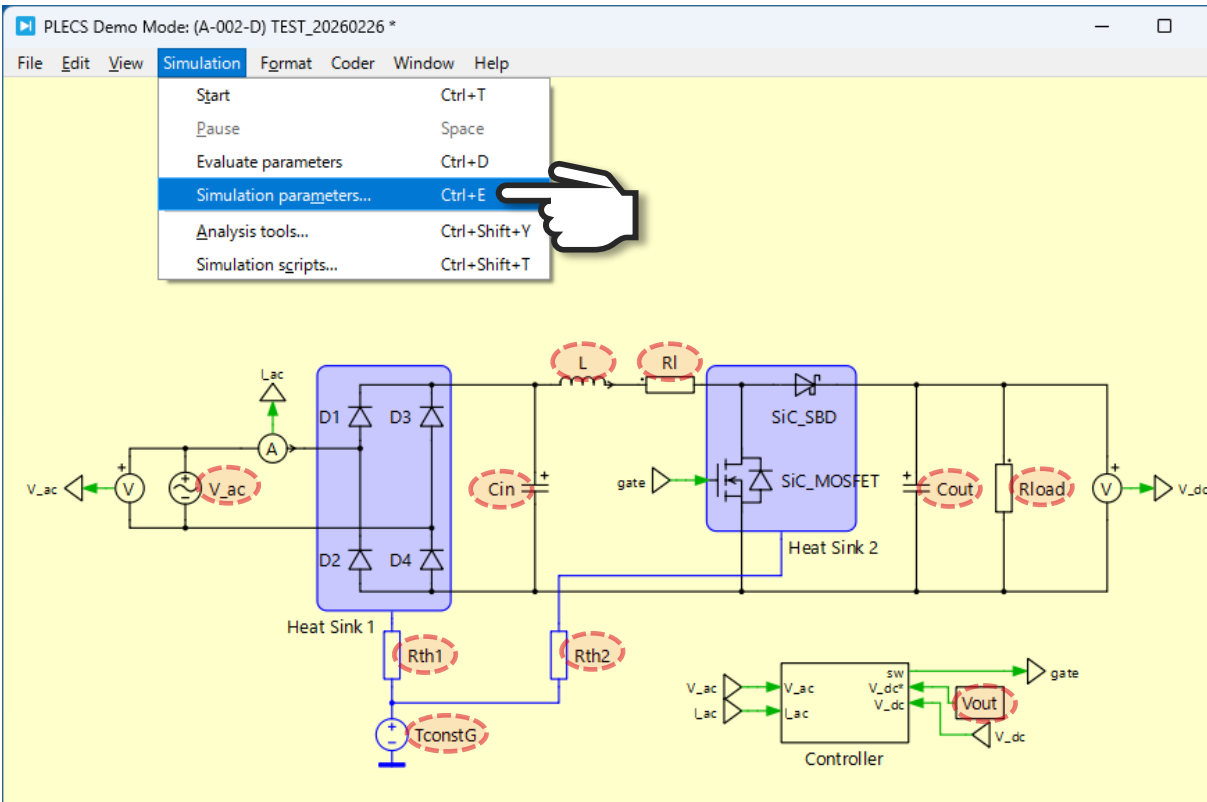
Hover your mouse cursor over the device symbol that you want to change and double-click the left button of the mouse.

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:
  [x] 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
```

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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