

(A-002-D) AC-DC Boost PFC Diode Rectification (Discrete)

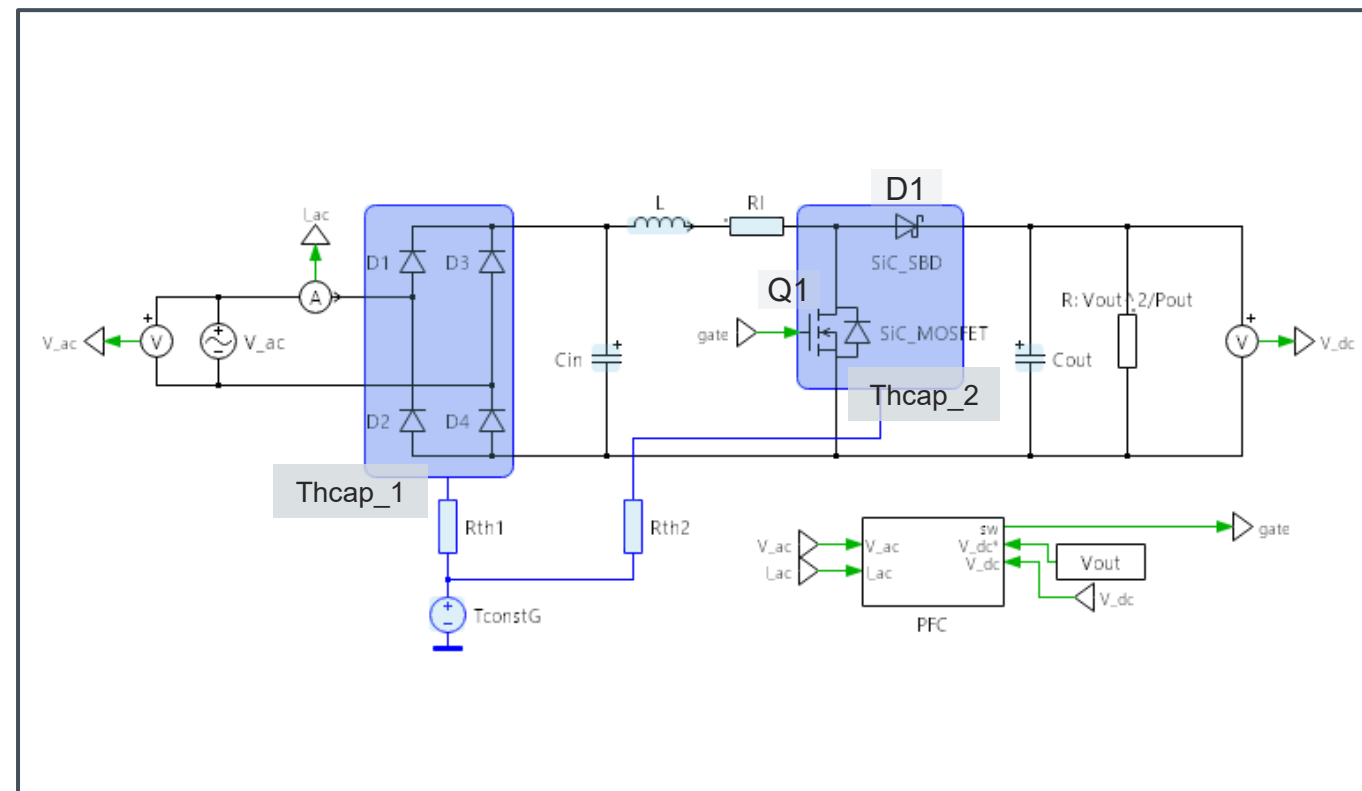
Simulation Parameters (Dialog)

Name	Content	unit	Default Value	Variable Range
L	Inductive Load	H	1m	1n ~ 1
RI	Parasitic Resistance	Ω	1m	1u ~ 100m
Cin	Input Capacitor	F	0.1u	1n ~ 1
Cout	Output Capacitor	F	1m	1n ~ 1
Vc_init	Initial Voltage of Cout	V	500	0 ~ 1200
Thcap_1	Thermal Capacitance	J/K	1m	1m ~ 100
Rth_1	Thermal Resistance	K/W	2	1m ~ 100
Thcap_2	Thermal Capacitance	J/K	1m	1m ~ 100
Rth_2	Thermal Resistance	K/W	2	1m ~ 100
TGND	Thermal GND Temperature	$^{\circ}\text{C}$	25	-40 ~ 175

Simulation Parameters (Table)

Name	Content	unit	Default Value	Variable Range
Test_time	Test time in simulation	s	0.5	100u ~ 0.5
fs	Switching Frequency	Hz	50k	10k ~ 100k
Vin_ac (rms)	Input Voltage	V	100	1 ~ 1000
	Grid Frequency	Hz	50	50 or 60
Vout_dc	Output Voltage	V	500	10 ~ 1200
Pout	Output Power	W	500	10 ~ 5000
Rg_on	Gate Resistance (Source)	Ω	4.7	0.1 ~ 100
Rg_off	Gate Resistance (Sink)	Ω	3.3	0.1 ~ 100
T_init	Initial Junction Temperature	$^{\circ}\text{C}$	25	-40 ~ 175

Simulation Circuit

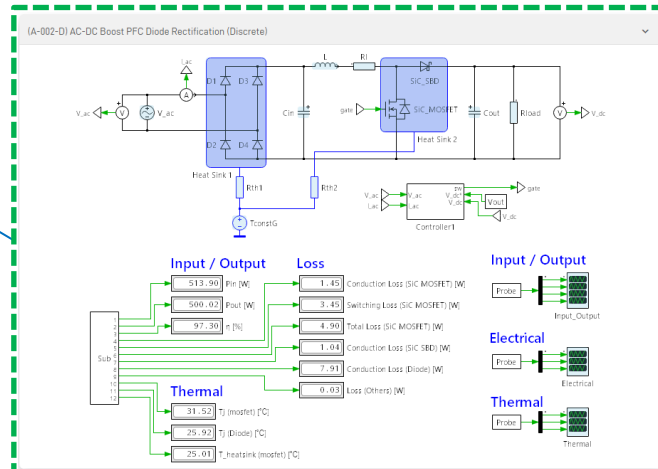


Default Devices

Name	Device Type	Part No.	Specification
Q1	SiC MOSFET	SCT4065DR	750V/ 25A/ 65m Ω / TO-247-4L
D1	SiC Schottky Barrier Diode	SCS320AG	650V/ 20A/ TO-220ACGE

Schematic window

- Dialog parameters setting
- Results display



Device selection

Parameter	Value
Part No. (SIC-MOSFET)	SCT4065DR (750V/65mΩ/TO-247)
Part No. (SIC-Schottky Barrier Diode)	SCS320AG (650V/20A/TO-220)

General Conditions

Parameter	Value
Test_time	0.5 sec
Switching Frequency	50 kHz
V _{in} (ac rms)	100 V
Grid Frequency	<input checked="" type="radio"/> 50Hz <input type="radio"/> 60Hz
V _{out} (dc)	500 V
P _{out}	500 W

Device Conditions

Parameter	Value
R _g (on)	4.7 ohm
R _g (off)	3.3 ohm
Initial Junction Temperature	25 deg C

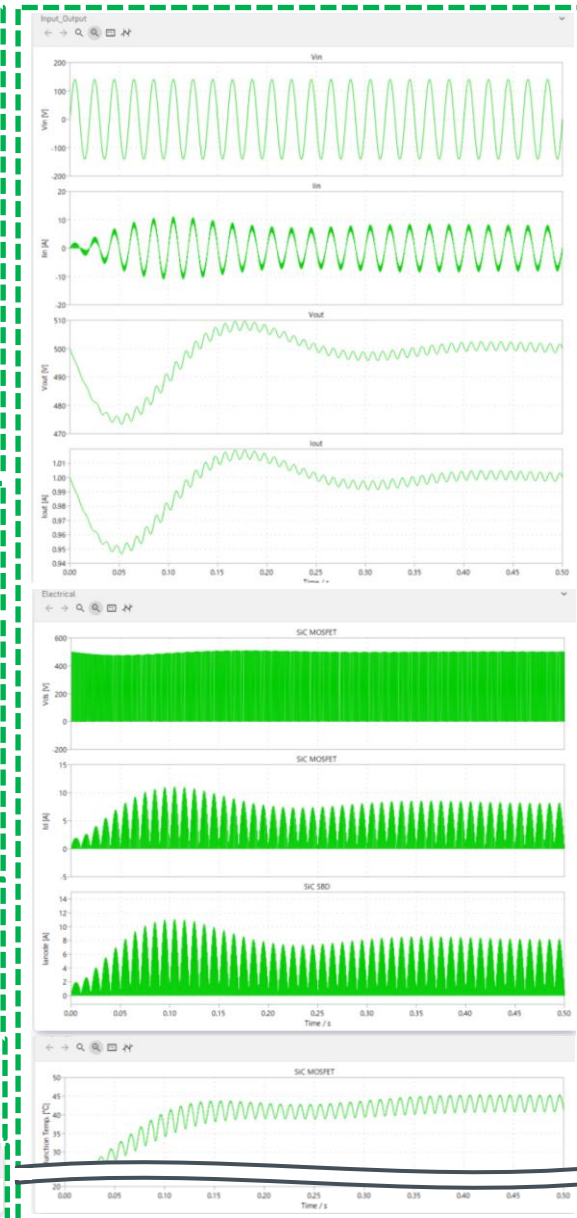
Simulation control

Simulation Control

Trace selection

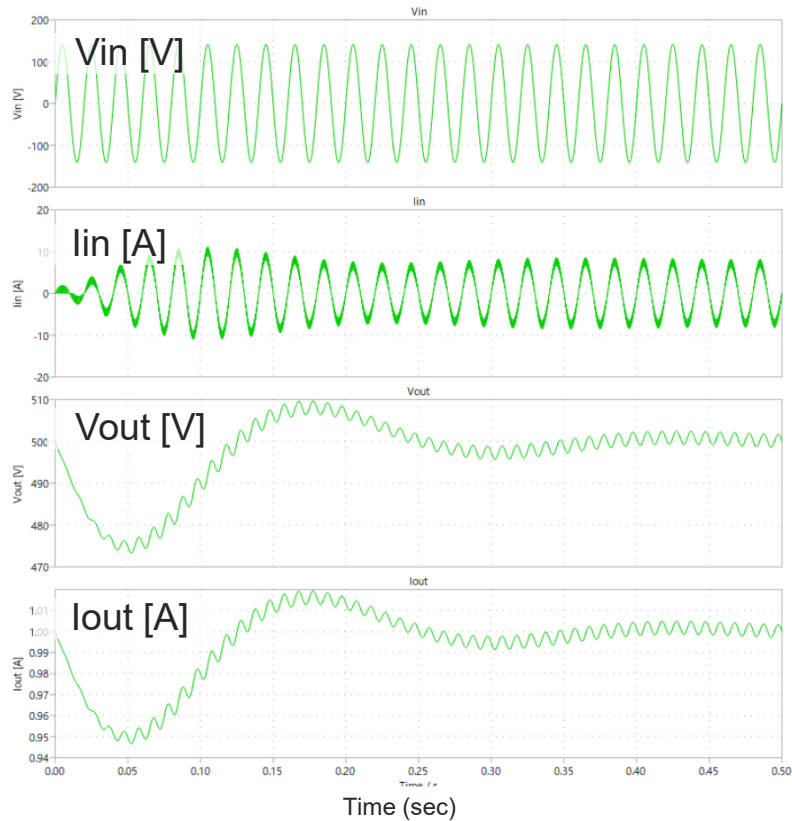
Traces

Trace 1



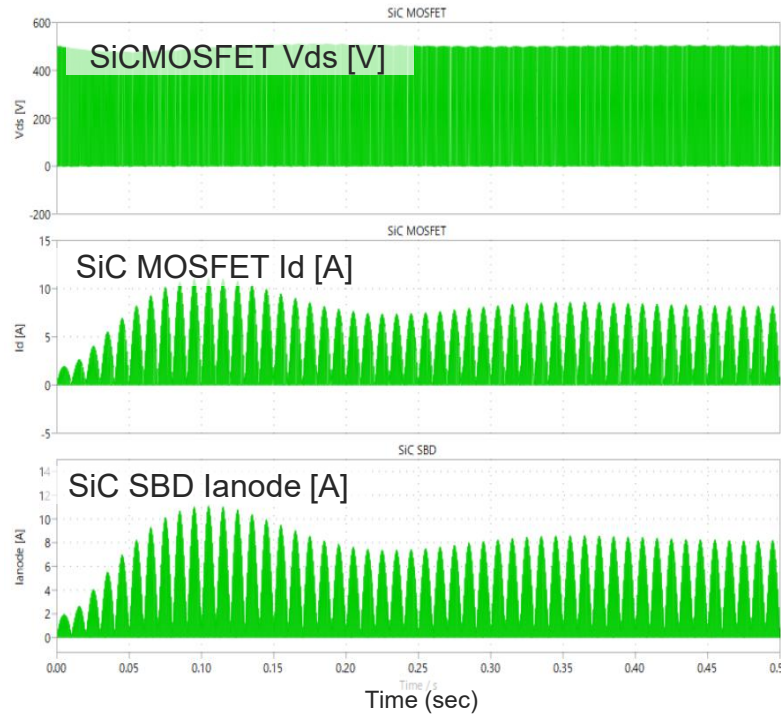
Waveforms

Input and Output



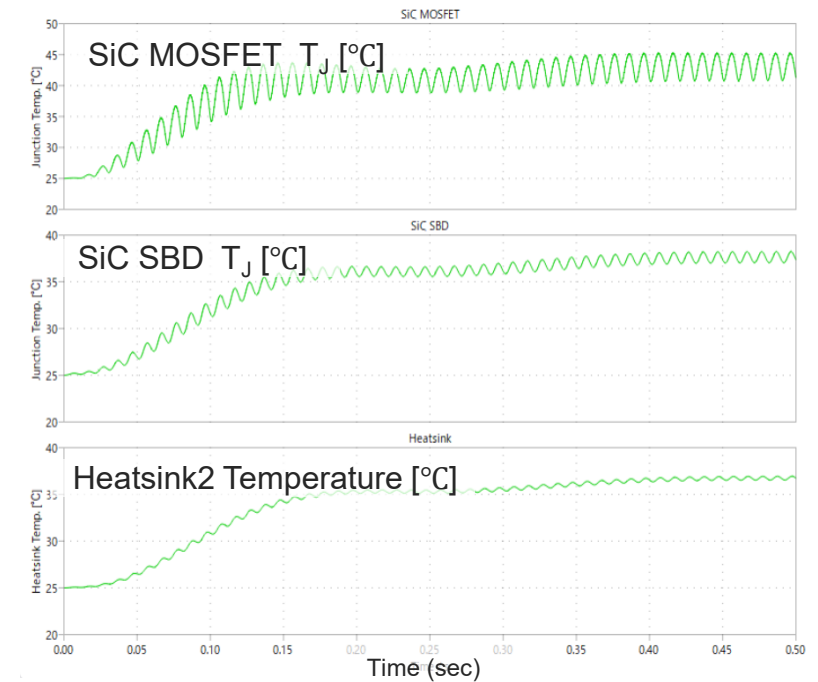
Contents	Results
Input Power : Pin	512.89 W
Output Power: Pout	500.41 W
Efficiency: η	97.57 %

Electrical



Contents	Results
Conduction Loss (SiC MOSFET)	1.47 W
Switching Loss (SiC MOSFET)	3.41 W
Total Loss (SiC MOSFET)	4.88 W
Conduction Loss (SiC SBD)	1.02 W
Conduction Loss (Diode)	6.55 W
Loss (Others)	0.03 W

Thermal



Contents	Results
T _j (SiC MOSFET)	43.20 °C
T _j (SiC SBD)	37.62 °C
T_Heatsink2	36.74 °C

How to change the devices

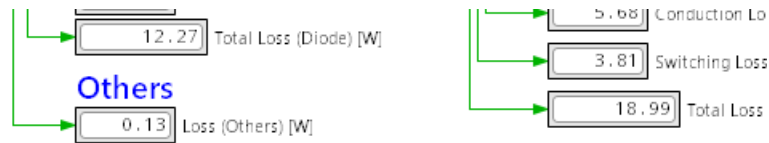
The figure of "(A-011-D) DC-AC Totem-Pole PFC Diode Rectification (Discrete)" is used as an example in this page.

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Circuit Information



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Device Selection



Device Selection	
Parameter	Value
Part No. (SiC-MOSFET)	SCT4065DR (750V/65mΩ/TO-...
Part No. (SiC-Schottky Barrier Diode)	SCS320AG (650V/20A/TO-220...

Over your mouse cursor to the device name that you want to change and click the left button of the mouse.



Device Selection	
Parameter	Value
Part No. (SiC-MOSFET)	SCT4065DR (750V/65mΩ/TO-...
Part No. (SiC-Schottky Barrier Diode)	SCS320AG (650V/20A/TO-220...

- [SCT4036DWA \(750V/36mΩ/TO-263-7LA\)](#)
- [SCT4045DWA \(750V/45mΩ/TO-263-7LA\)](#)
- [SCT4065DWA \(750V/65mΩ/TO-263-7LA\)](#)
- [SCT4013DLL \(750V/13mΩ/TOLL\)](#)**
- [SCT4026DLL \(750V/26mΩ/TOLL\)](#)
- [SCT4036DLL \(750V/36mΩ/TOLL\)](#)
- [SCT4045DLL \(750V/45mΩ/TOLL\)](#)

Available device lists are appeared like the above, and you can select a favorite device from these.

How to change Dialog parameters

The figure of "(A-011-D) DC-AC Totem-Pole PFC Diode Rectification (Discrete)" is used as an example in this page.

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Circuit Information

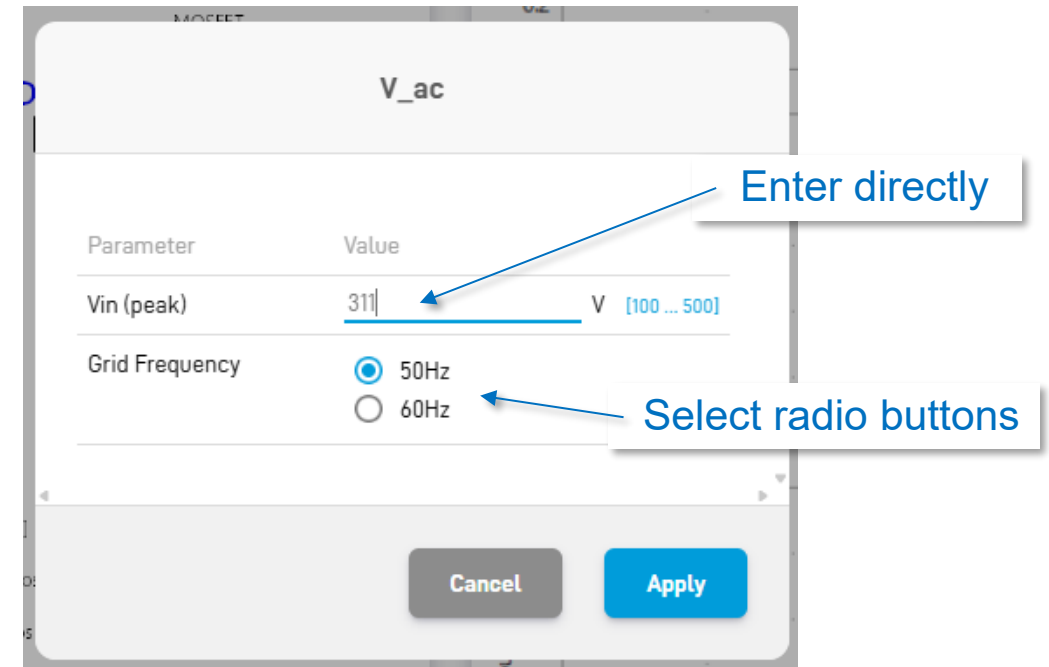


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- Symbols whose parameters can be changed are colored light-blue in the circuit diagram.
- Over your mouse cursor to the symbol that you want to change the parameter and the symbol color is turned to blue (e.g. "V_ac" symbol in the below).
- Click the mouse's left button.



- A new window like the below is opened.
- You can change the parameters by entering the value directly* or selecting radio buttons.
- Push "Apply" button after changing all parameters.



*Note: Parameters can be entered directly are limited by Min. and Max. values to avoid unexpected system errors.
(e.g. "Vin(peak)" is limited between 100 and 500V in the above.)

How to change Table parameters

The figure of "(A-011-D) DC-AC Totem-Pole PFC Diode Rectification (Discrete)" is used as an example in this page.

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Table parameters

General Conditions

Parameter	Value
Test_time	1 sec
Switching Frequency	60000 Hz

Device Conditions

General Conditions

Parameter	Value
Test_time	1 sec
Switching Frequency	<u>20000</u> Hz [10000 ... 100000]

Device Conditions

Choose the parameter that you want change on the parameter tables (e.g. "60kHz" of Switching Frequency in the left figure.)

- A blue under-line and variable range of the parameter are appeared.
- Then, you can change the parameters by entering the value directly " (e.g. "60kHz" was changed to "20kHz").

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