

(C-010-D) DC-DC Flyback Converter (Discrete)

Simulation Parameters (Dialog)

Name	Content	unit	Default Value	Variable Range
Lm	Magnetizing Inductance	H	3m	1n ~ 1
Rl	Parasitic Resistance	Ω	5m	1u ~ 100m
Cout	Output Capacitor	F	500u	1n ~ 1
ESR	Equivalent Series Resistance	V	0.01	1u ~ 100m
n1	Primary coil	turns	15	1~100
n2 *	Secondary coil	turns	-2	-100~-1
Rc	Parasitic Resistance	Ω	10m	1u ~ 100m
Rth1,2	Thermal Resistance	K/W	0.3	1m ~ 100
Thcap_1,2	Thermal Capacitance	J/K	1m	1m ~ 1000
TGND	Thermal GND Temperature	$^{\circ}\text{C}$	25	-40 ~ 175

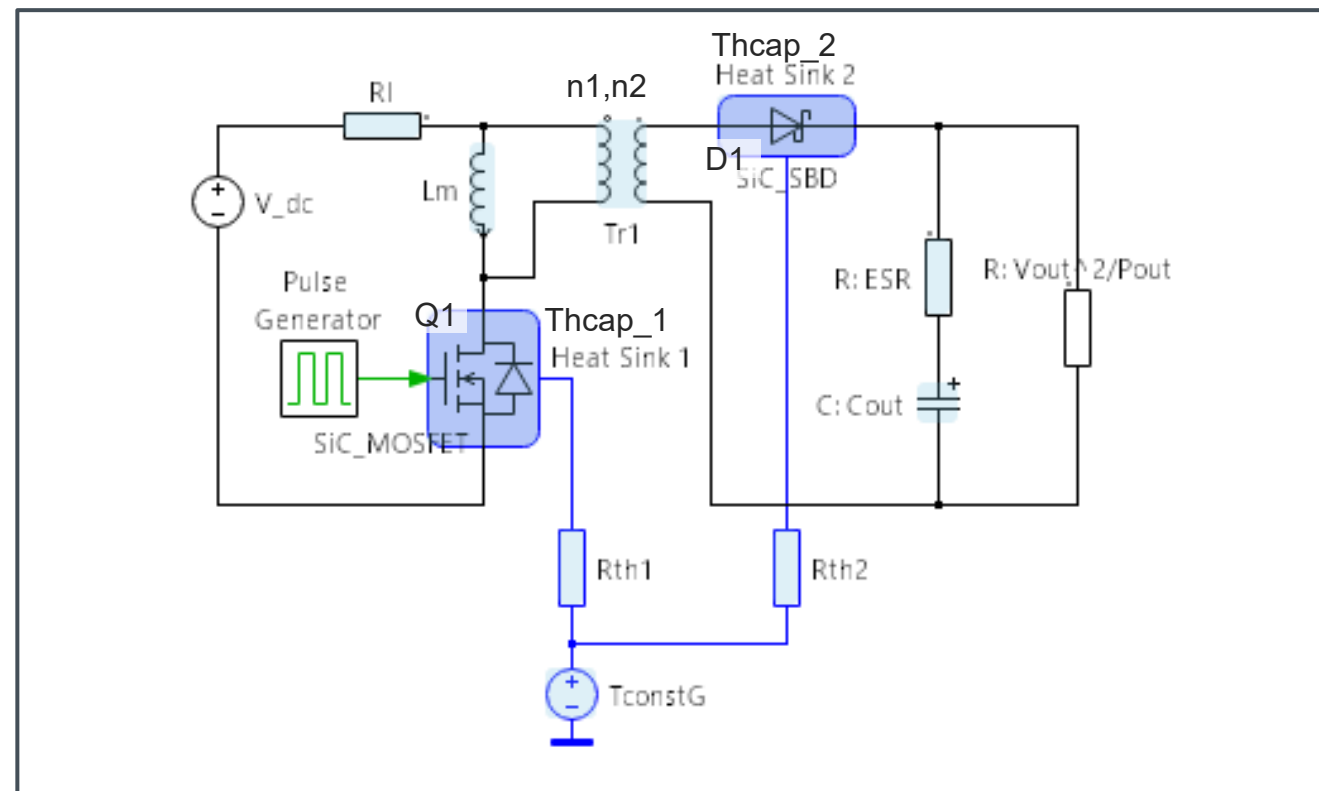
* For the secondary coil parameters, negative values must be entered.

Simulation Parameters (Table)

Name	Content	unit	Default Value	Variable Range
Test_time	Test time in simulation	s	0.3	100u ~ 0.5
fs	Switching Frequency	kHz	100	1k ~ 200k
Vin	Input Voltage	V	400	10 ~ 1000
Vout	Output Voltage	V	12	10 ~ 650
Pout	Output Power	W	100	1m ~ 1k
Rg_on	Gate Resistance (Source)	Ω	6.8	0.1 ~ 100
Rg_off	Gate Resistance (Sink)	Ω	6.8	0.1 ~ 100
T_init	Initial Junction Temperature	$^{\circ}\text{C}$	25	-40 ~ 175

Simulation Circuit

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Power Deices

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

Simulation Screen Overview

Schematic window

- Dialog parameters setting
- Results display

Clicking blue-colored symbols will allow you to change the parameters.

Input / Output

Electrical

Thermal

Input / Output Loss

92.82	Pin [W]	0.02	Conduction Loss (SIC MOSFET) [W]
82.02	Pout [W]	2.29	Switching Loss (SIC MOSFET) [W]
88.37	η [%]	2.31	Total Loss (SIC MOSFET) [W]
		8.37	Conduction Loss (SIC SBD) [W]
		0.12	Others [W]

Thermal

28.73	T _J (SIC MOSFET) [°C]
34.82	T _J (SIC SBD) [°C]
25.69	T _J Heatsink 1 [°C]
27.51	T _J Heatsink 2 [°C]

Simulation Control

Start-Up Steady-state Hold Result Simulation Completed

Traces

[file: SCT4065DR], SCS320AG (650V/20A/TO-220ACGE), Trace 1

Waveforms

Table parameters setting

Parameter	Value	Unit
Rg_on	6.8	ohm
Rg_off	6.8	ohm
Initial Junction Temperature	25	deg.C

Thermal Temperature Waveforms

Simulation control

Trace selection

Table parameters setting

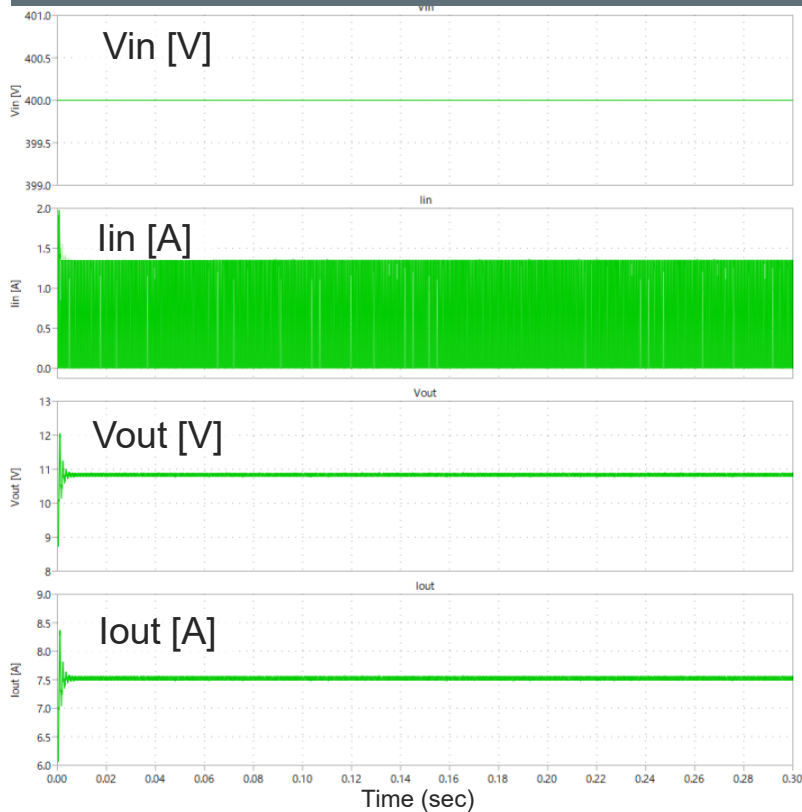
Waveforms

Simulation Results

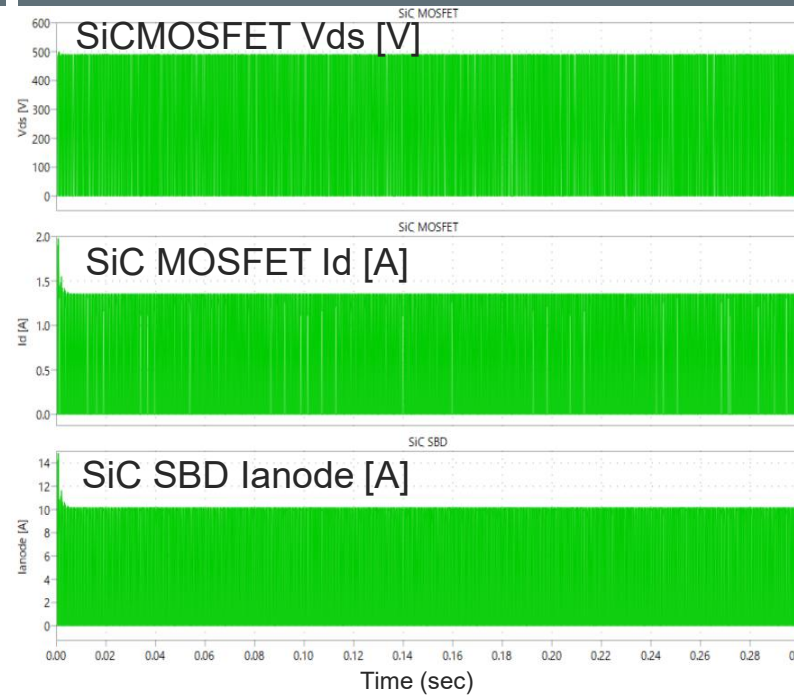
Simulation Mode: Start-UP

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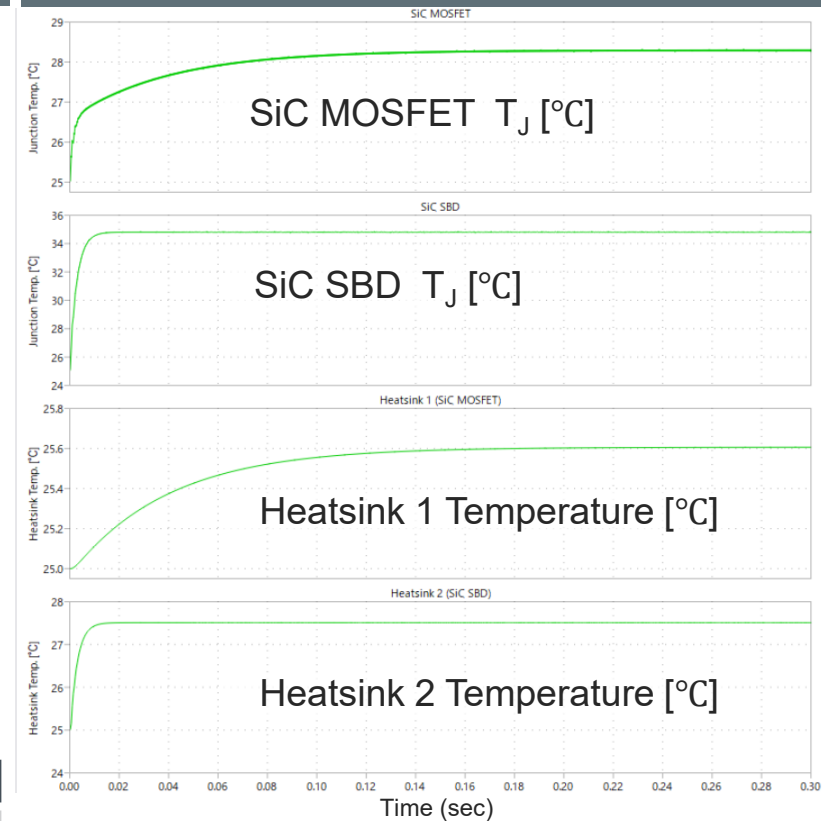
Input and Output



Electrical



Thermal



Contents	Results
Input Power : Pin	92.82 W
Output Power: Pout	82.02 W
Efficiency: η	88.37 %

Contents	Results
Conduction Loss (SiC MOSFET)	0.02 W
Switching Loss (SiC MOSFET)	2.29 W
Total Loss (SiC MOSFET)	2.31 W
Conduction Loss (SiC SBD)	8.37 W
Loss (Others)	0.12 W

Contents	Results
T _j (SiC MOSFET)	28.73 °C
T _j (SiC SBD)	34.82 °C
T_Heatsink 1	25.69 °C
T_Heatsink 2	27.51 °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.

You can select the simulation devices at "Step-2: Device Selection"

Step 2: Device Selection

Please check the checkboxes of the devices you want to simulate (Square checkboxes allow you to select up to three devices simultaneously.)

You can also select IDEAL devices (no-loss).

In addition, clicking PDF icon will allow you to view the datasheet of the certain device.

Parameter	Value
V_{DSS}	750V
$R_{DS(on)}$ (Typ.)	65mΩ
I_D^{-1}	25A
P_D	88W

Features

- 1) Low on-resistance
- 2) Fast switching speed
- 3) Fast reverse recovery
- 4) Easy to parallel
- 5) Simple to drive
- 6) Pb-free lead plating ; RoHS compliant

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.

ROHM PLECS Simulator
Simulation Example

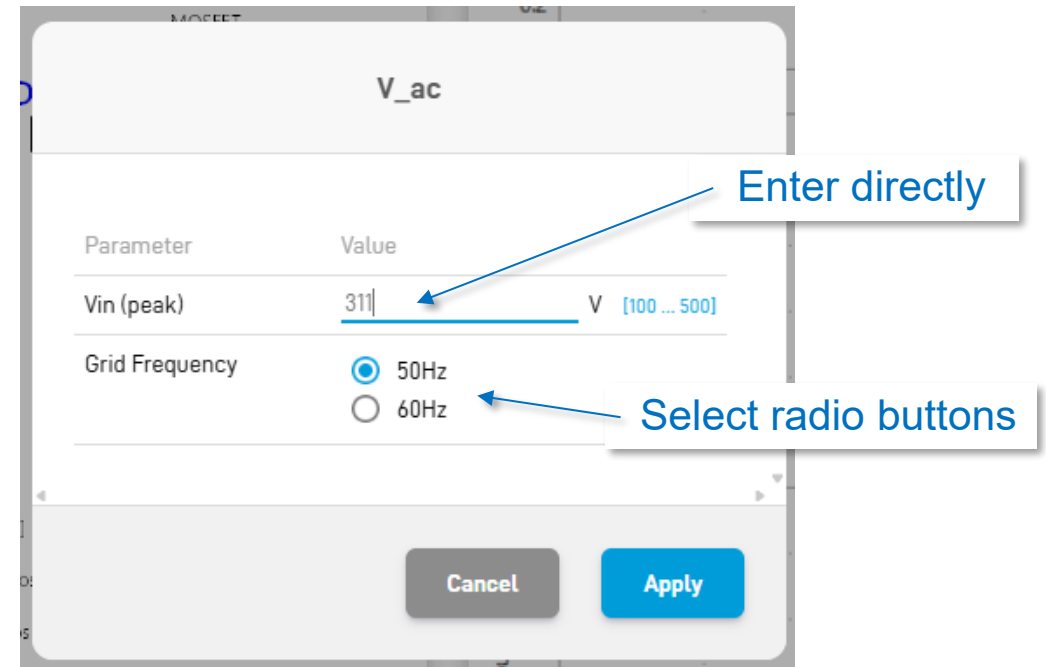


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- Symbols whose parameters can be changed are colored light-blue in the circuit diagram.
- Over your mouse cursor to the symbol that you want to change the parameter and the symbol color is turned to blue (e.g. "V_ac" symbol in the below).
- Click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

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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