

(C-014-DOT) DC-DC LLC Full-Bridge Converter (DOT247)

Simulation Parameters (Dialog)

Name	Content	unit	Default Value	Variable Range	
Transformer	Np: Primary-turns	turns	18	1 ~ 1000	
	Ns: Secondary-turns	turns	1	1 ~ 1000	
	Lm: Magnetizing Inductance	H	60u	1n~1	
Rp	Transformer Resistance	Ω	5m	1m ~ 1	
Rs	Transformer Resistance	Ω	1m	1m ~ 1	
Lr	Resonant Inductance	H	12u	1n ~ 1	
Cr	Resonant Capacitance	F	100n	1n ~ 1	
Cout	Output Capacitance	F	4.7m	1n ~ 1	
	Initial Voltage	V	50	0 ~ 80	
ESR	ESR of Cout	Ω	15m	1m ~ 1	
Primary	Thcap_Primary	Thermal Capacitance	J/K	0.1	1m ~ 100
	Rth_Primary	Thermal Resistance	K/W	0.1	1m ~ 100
	TGND_Primary	Ambient Temperature	$^{\circ}\text{C}$	25	-40 ~ 175
Secondary	Thcap_Secondary	Thermal Capacitance	J/K	0.1	1m ~ 100
	Rth_Secondary	Thermal Resistance	K/W	0.1	1m ~ 100
	TGND_Secondary	Ambient Temperature	$^{\circ}\text{C}$	25	-40 ~ 175

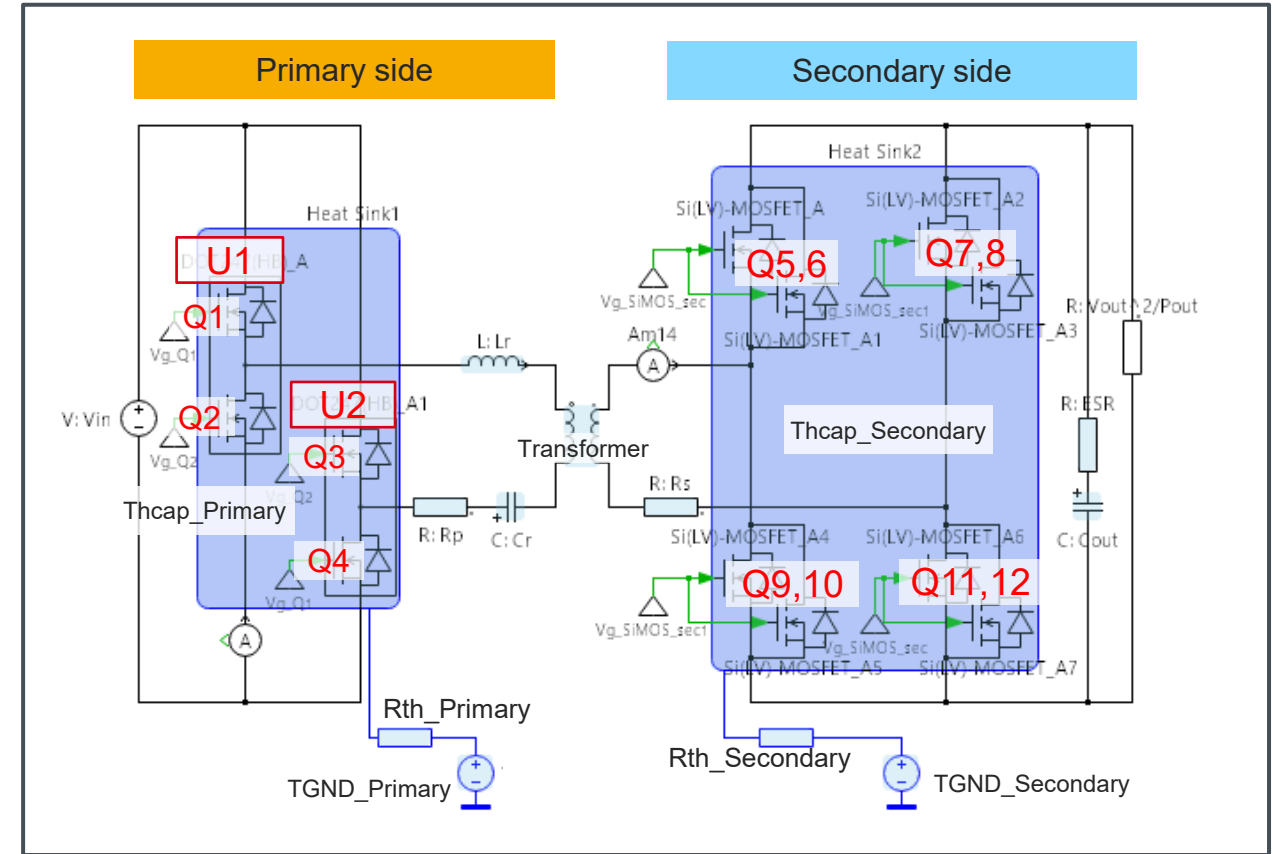
Simulation Parameters (Table)

Name	Content	unit	Default Value	Variable Range	
Test_time	Test time in simulation	s	0.2	10u ~ 0.5	
Vin_dc	Input Voltage	V	800	400 ~ 1,200	
Vout_dc	Output Voltage	V	50	10 ~ 80	
Pout	Output Power	W	10k	100~30k	
fs_ref	Target Carrier Frequency	Hz	100k	10k~500k	
Primary	Rg_on 1*	Gate Resistance (Source)	Ω	4.7	0.1 ~ 100
	Rg_off 1*	Gate Resistance (Sink)	Ω	2.0	0.1 ~ 100
	DT1	Dead Time	s	100n	0 ~ 1m
Secondary	Rg_on 2*	Gate Resistance (Source)	Ω	10	0.1 ~ 100
	Rg_off 2*	Gate Resistance (Sink)	Ω	10	0.1 ~ 100
	DT2	Dead Time	s	100n	0 ~ 1m
T_init**	Initial Junction Temp.	$^{\circ}\text{C}$	25	-40 ~ 175	

*Common for all MOSFETs in the same side.

**Common for all devices

Simulation Circuit

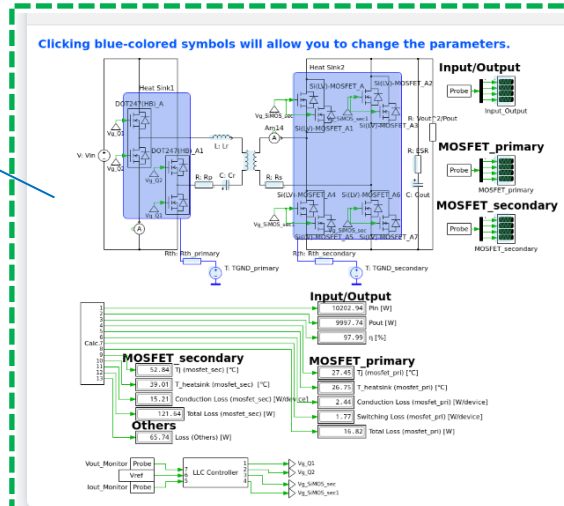


Power Devices

Name	Device Type	Part No.	Specification
U1,2	SiC MOSFET Module	SCZ4006KTA	1200V/ 209A/ 6m Ω / DOT247
Q5~12	Si MOSFET	RS7N200BH	80V/ 200A/ 1.7m Ω / DFN5060-8S

Schematic window

- Dialog parameters setting
- Results display



Simulation control

Simulation Control

Startup Steady-state Hold Result Simulation Completed

Powered by pleggs

Trace selection

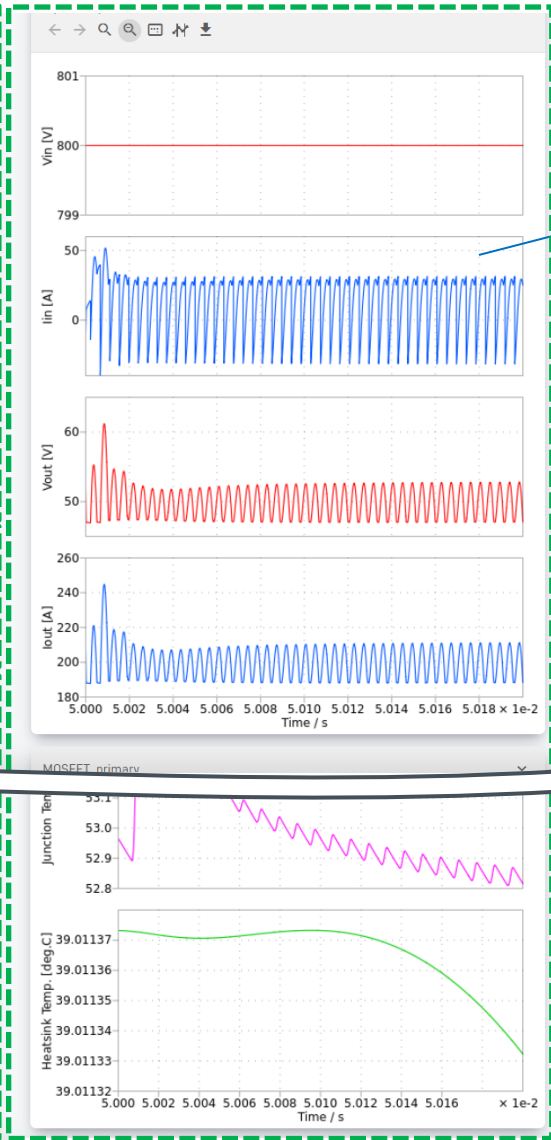
Traces

[file:SCZ4006KTA], RS7N200BH (80V/1.7mΩ/DFN5060-8S), Trace 1

Table parameters setting

Parameter	Value	Unit
Test_time	0.2	sec
Vin_dc	800	V
Vout_dc	50	V
Pout	10000	W
Switching Frequency (Design Value)	100000	Hz

Waveforms



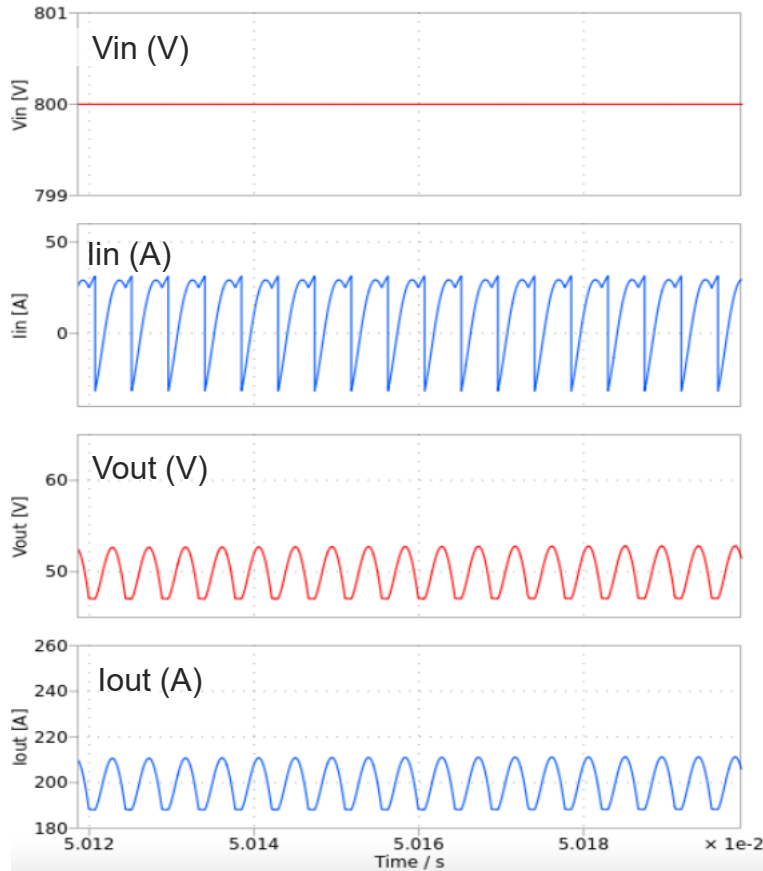
Simulation Results



Simulation Mode: Steady State

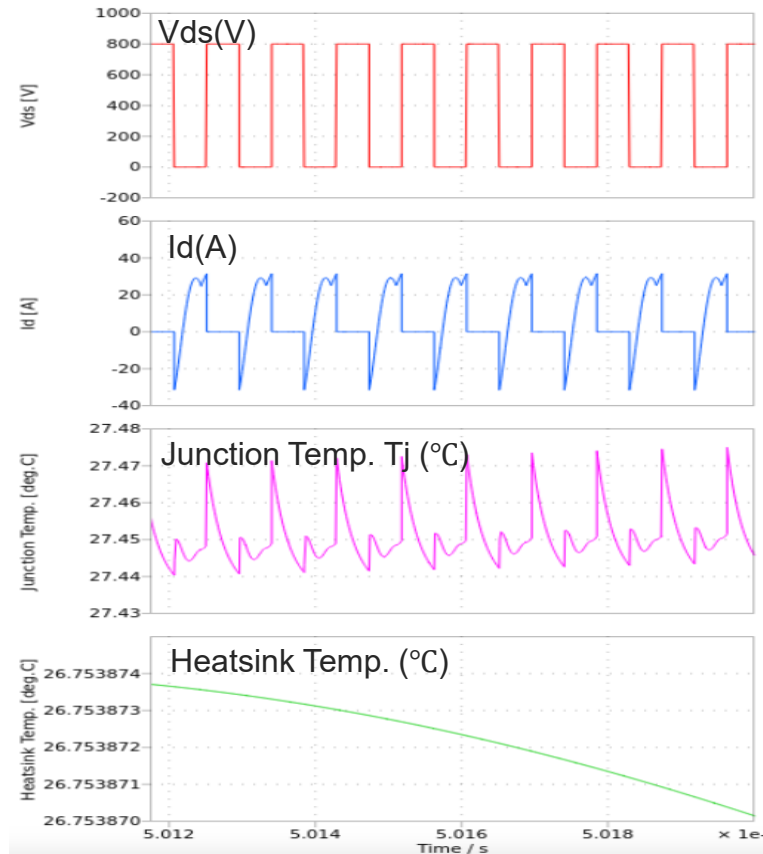
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Input / Output



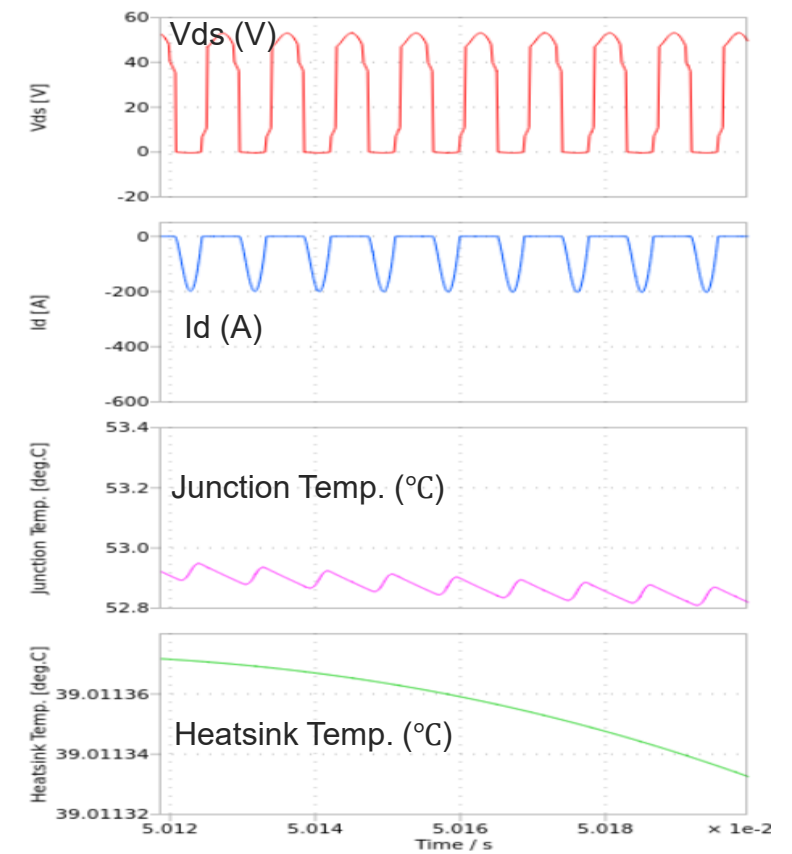
Contents	Results
Input Power : P_{in}	10.203 (kW)
Output Power: P_{out}	9.998 (kW)
Efficiency: η	97.99 (%)

Primary side



Contents	Results
Conduction Loss: P_{cond} (primary)	2.44 (W/device)
Switching Loss: P_{sw} (primary)	1.77 (W/device)
Junction Temp. : T_j (primary)	27.45 (°C)
Heatsink Temp.: T_{hs} (primary)	26.75 (°C)
Total Loss: P_{tot} (primary)	16.82 (W)

Secondary side



Contents	Results
Conduction Loss: P_{cond} (secondary)	15.21 (W/device)
Junction Temp. : T_j (secondary)	52.84 (°C)
Heatsink Temp.: T_{hs} (secondary)	39.01 (°C)
Total Loss: P_{tot} (secondary)	121.64 (W)

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

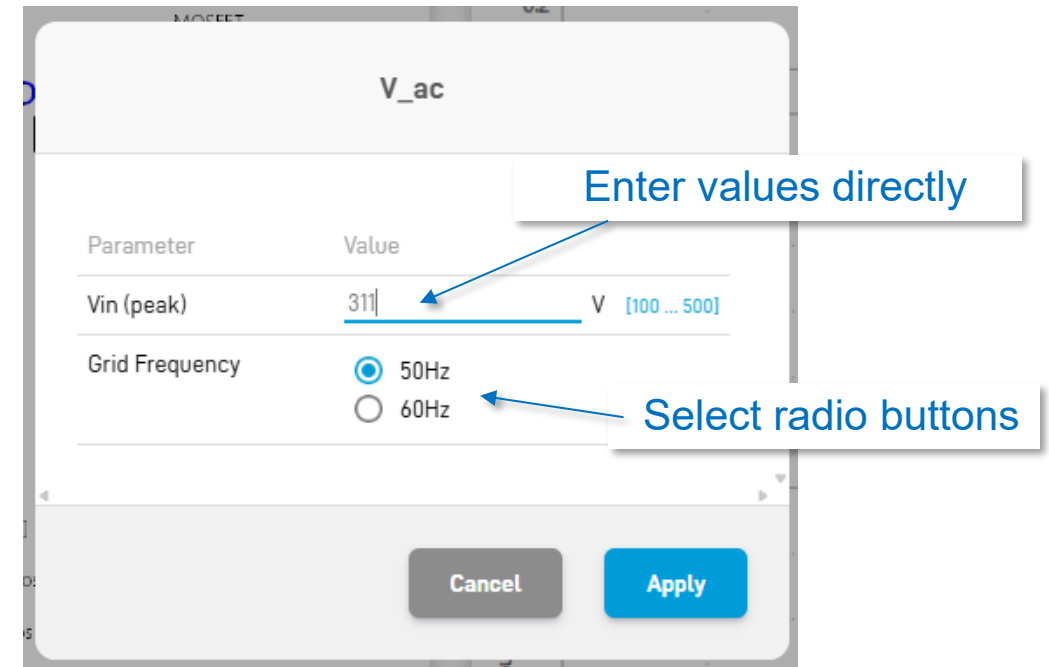


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- Symbols whose parameters can be changed are colored light-blue in the circuit diagram.
- Over your mouse cursor to the symbol that you want to change the parameter and the symbol color is turned to blue (e.g. "V_ac" symbol in the below).
- Click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

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.

ROHM PLECS Simulator
Simulation Example



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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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