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

ROHM PLECS Simulator
Circuit Information

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68UG118E Rev.001

Simulation Parameters (Dialog)

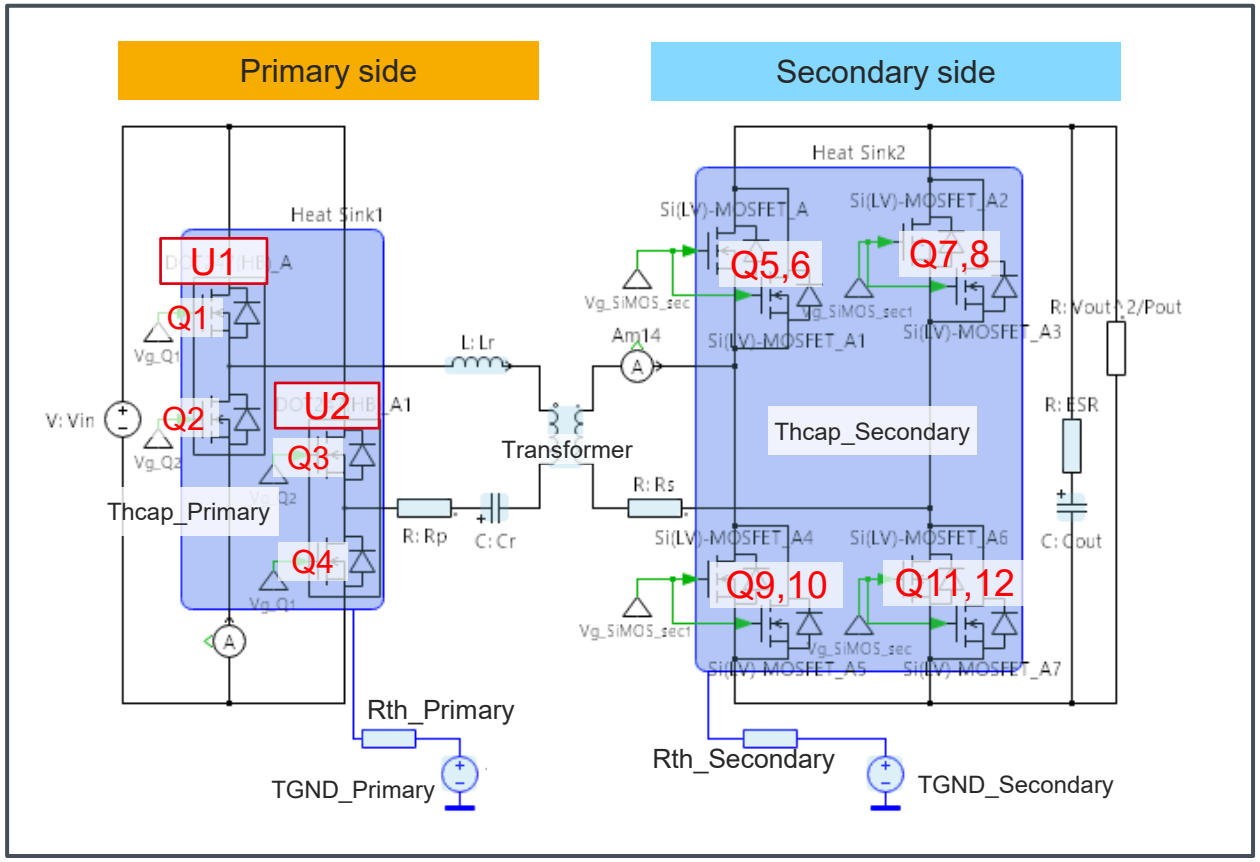
	Name	Content	unit	Default Value	Variable Range
	Transformer	Np: Primary-turns Ns: Secondary-turns Lm: Magnetizing Inductance	turns turns H	18 1 60u	1 ～ 1000 1 ～ 1000 1n～1
	Rp	Transformer Resistance	Ω	5m	1m ～ 1
	Rs	Transformer Resistance	Ω	1m	1m ～ 1
	Lr	Resonant Inductance	H	12u	1n ～ 1
	Cr	Resonant Capacitance	F	100n	1n ～ 1
	Cout	Output Capacitance Initial Voltage	F V	4.7m 50	1n ～ 1 0 ～ 80
	ESR	ESR of Cout	Ω	15m	1m ～ 1
Primary	Thcap_Primary	Thermal Capacitance	J/K	0.1	1m ～ 100
Primary	Rth_Primary	Thermal Resistance	K/W	0.1	1m ～ 100
Primary	TGND_Primary	Ambient Temperature	℃	25	-40 ～ 175
Secondary	Thcap_Secondary	Thermal Capacitance	J/K	0.1	1m ～ 100
Secondary	Rth_Secondary	Thermal Resistance	K/W	0.1	1m ～ 100
Secondary	TGND_Secondary	Ambient Temperature	℃	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	1 ～ 1200
	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
Primary	Rg_off 1*	Gate Resistance (Sink)	Ω	2.0	0.1 ～ 100
Primary	DT1	Dead Time	s	100n	0 ～1m
Secondary	Rg_on 2*	Gate Resistance (Source)	Ω	10	0.1 ～ 100
Secondary	Rg_off 2*	Gate Resistance (Sink)	Ω	10	0.1 ～ 100
Secondary	DT2	Dead Time	s	100n	0 ～1m
	T_init**	Initial Junction Temp.	℃	25	-40 ～ 175

*Common for all MOSFETs in the same side. **Common for all devices

Simulation Circuit



Default Devices

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

Simulation Screen Overview

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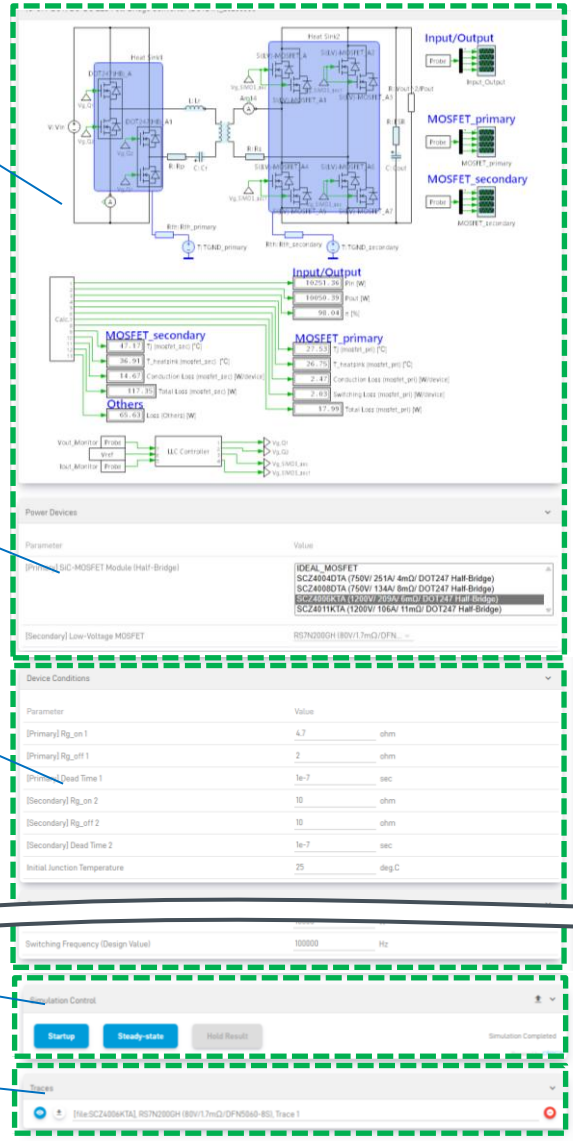
Schematic window
- Dialog parameters setting
- Results display

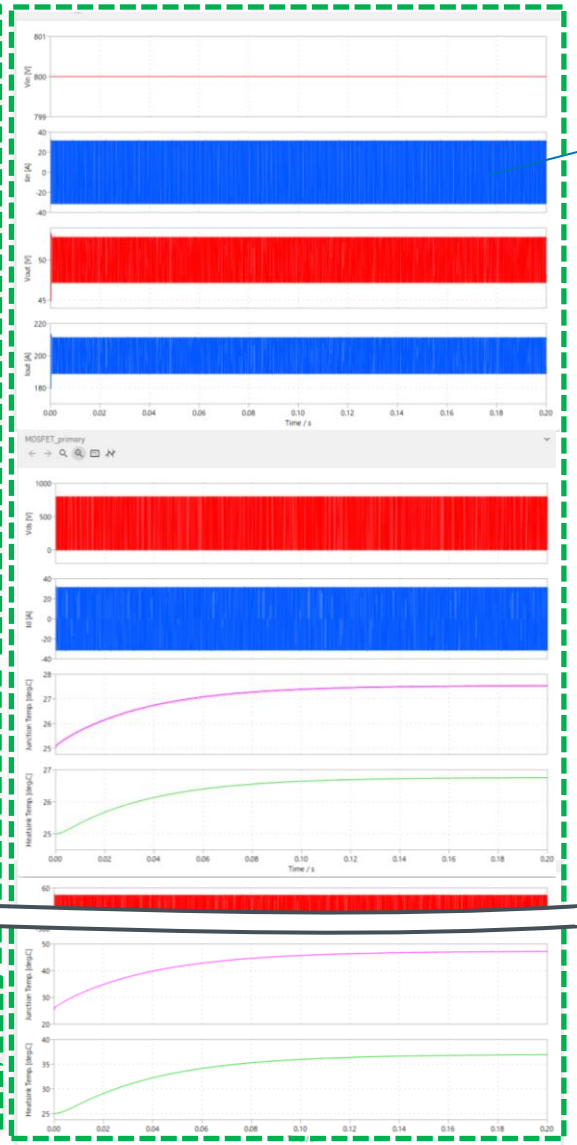
Device selection

Table parameters setting

Simulation control

Trace selection





Waveforms

Simulation Results 1

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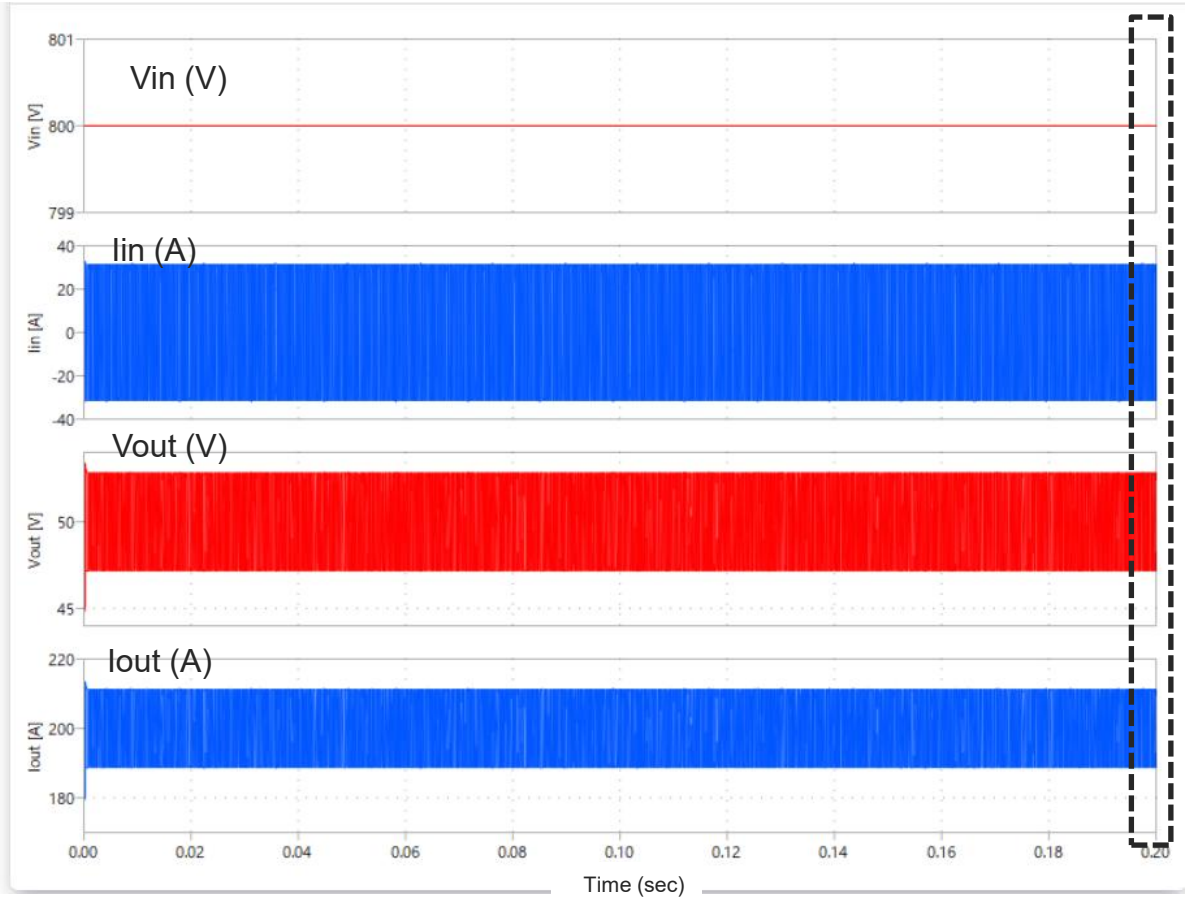
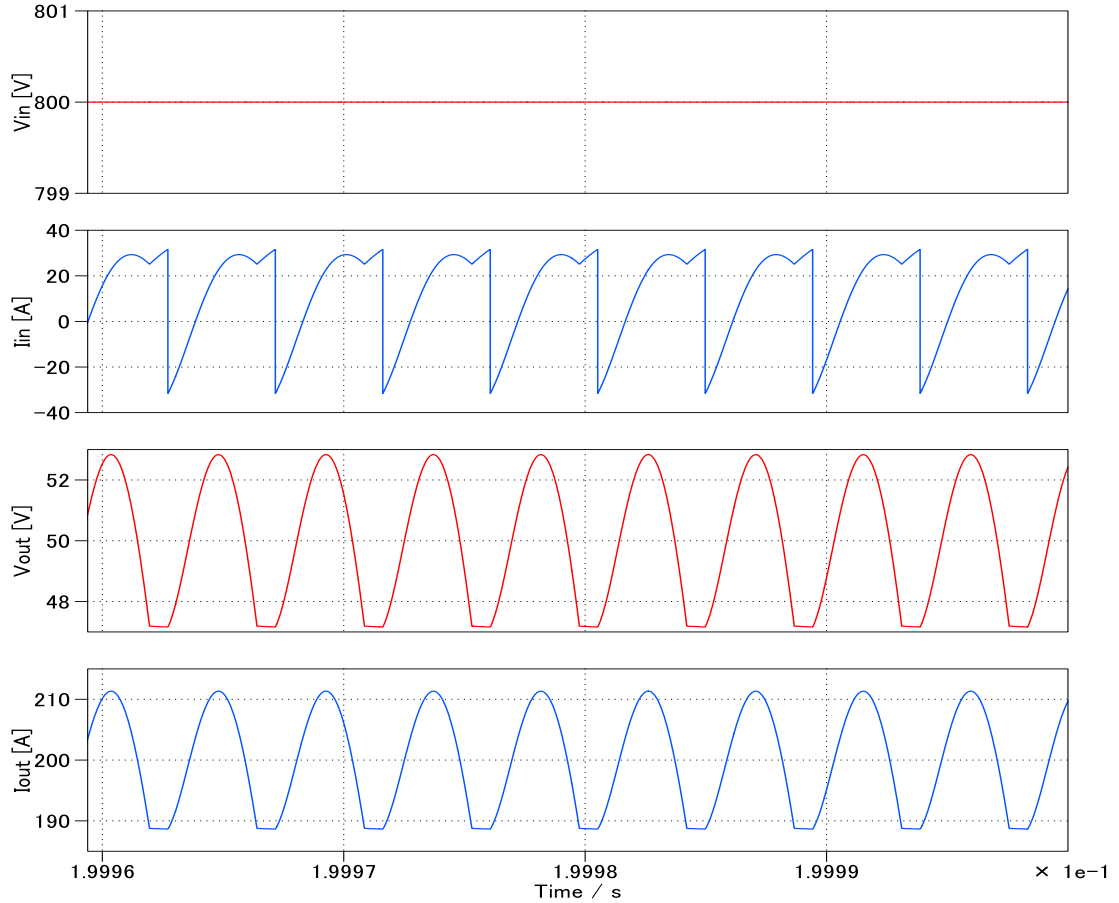
Input and Output





Contents	Results
Input Power : Pin	10.251 (kW)
Output Power: Pout	10.050 (kW)
Efficiency: η	98.04 (%)

Simulation Results 2

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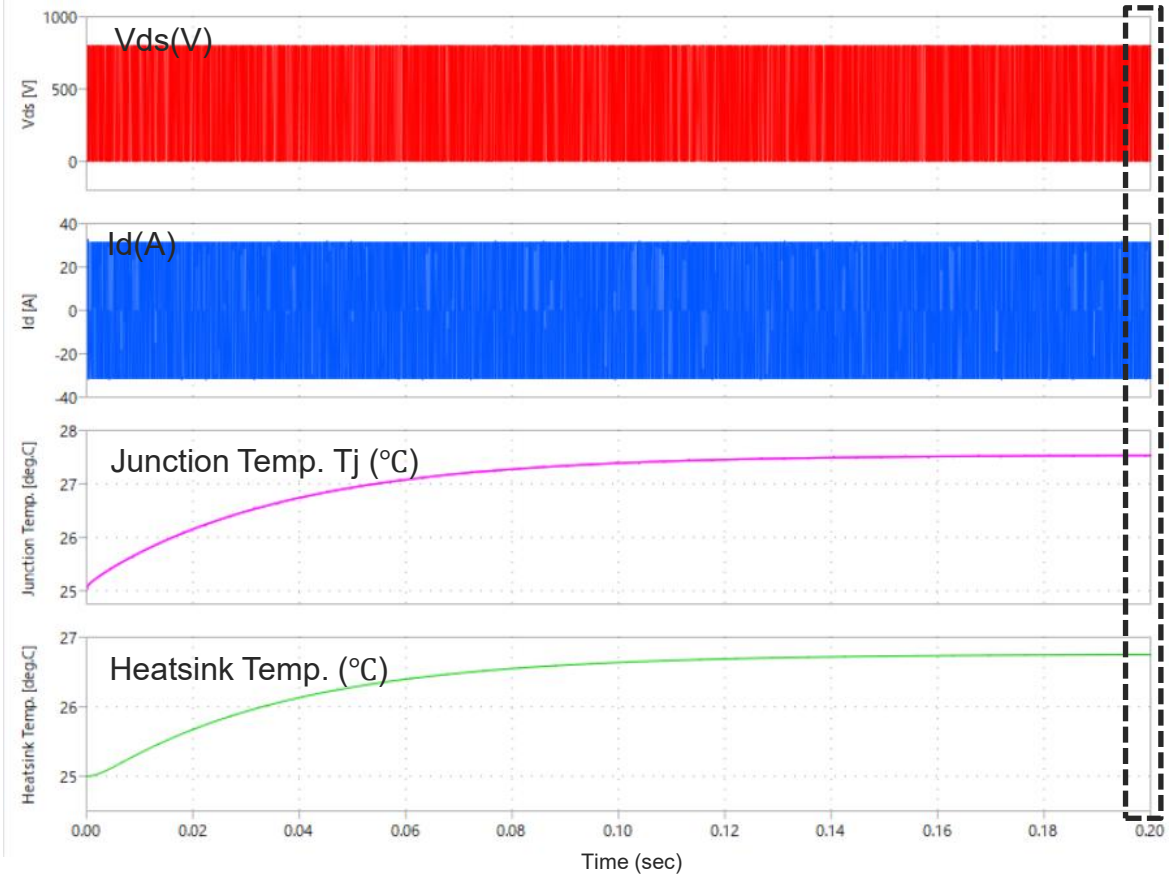
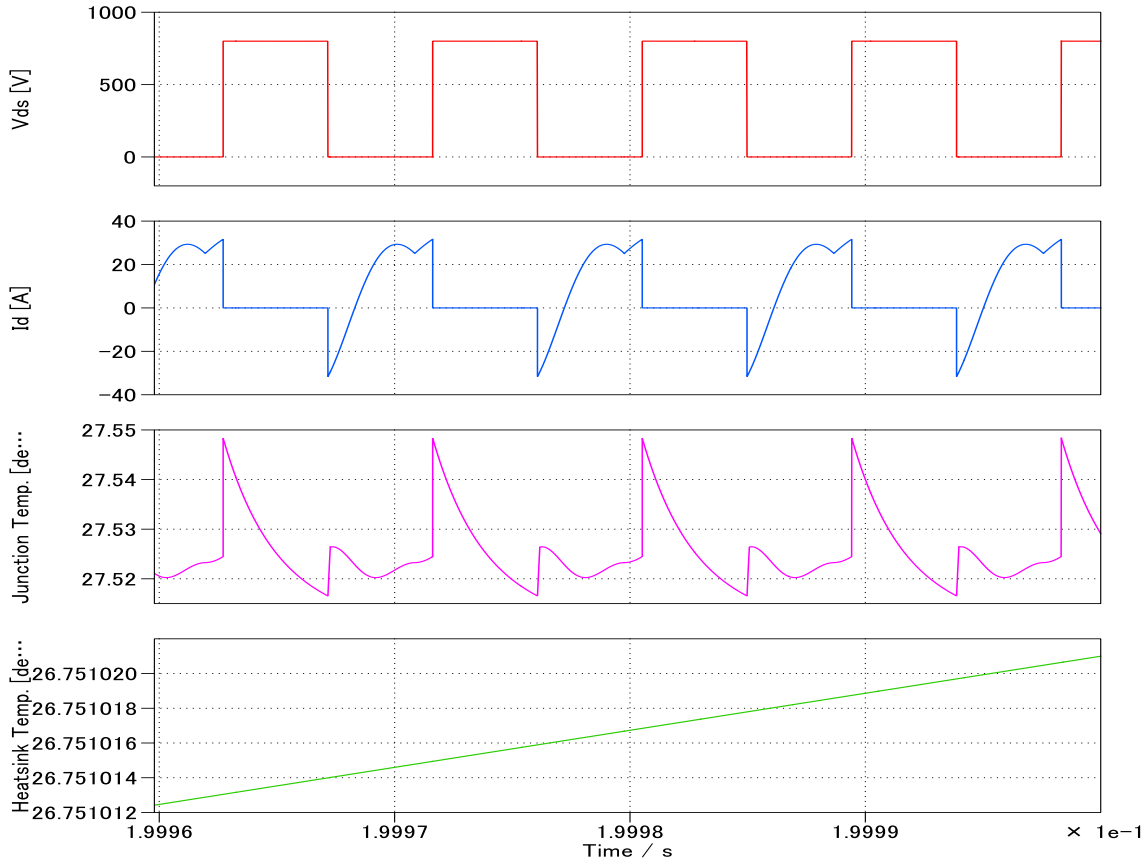
Primary side





Contents	Results
Conduction Loss: Pcond (primary)	2.47 (W/device)
Switching Loss: Psw (primary)	2.03 (W/device)
Junction Temp. : Tj (primary)	27.53 (℃)
Heatsink Temp.: T_hs (primary)	25.75 (℃)
Total Loss: Ptot (primary)	17.99 (W)

Simulation Results 3

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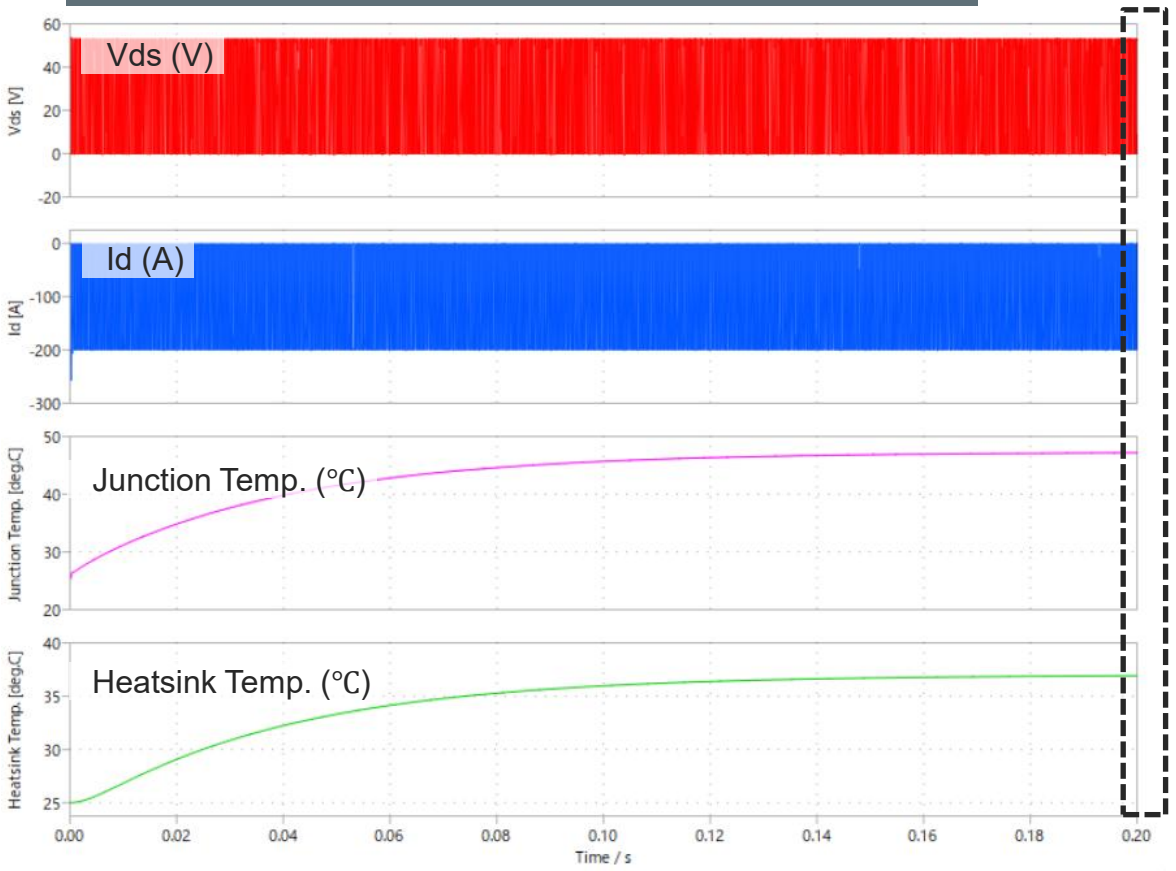
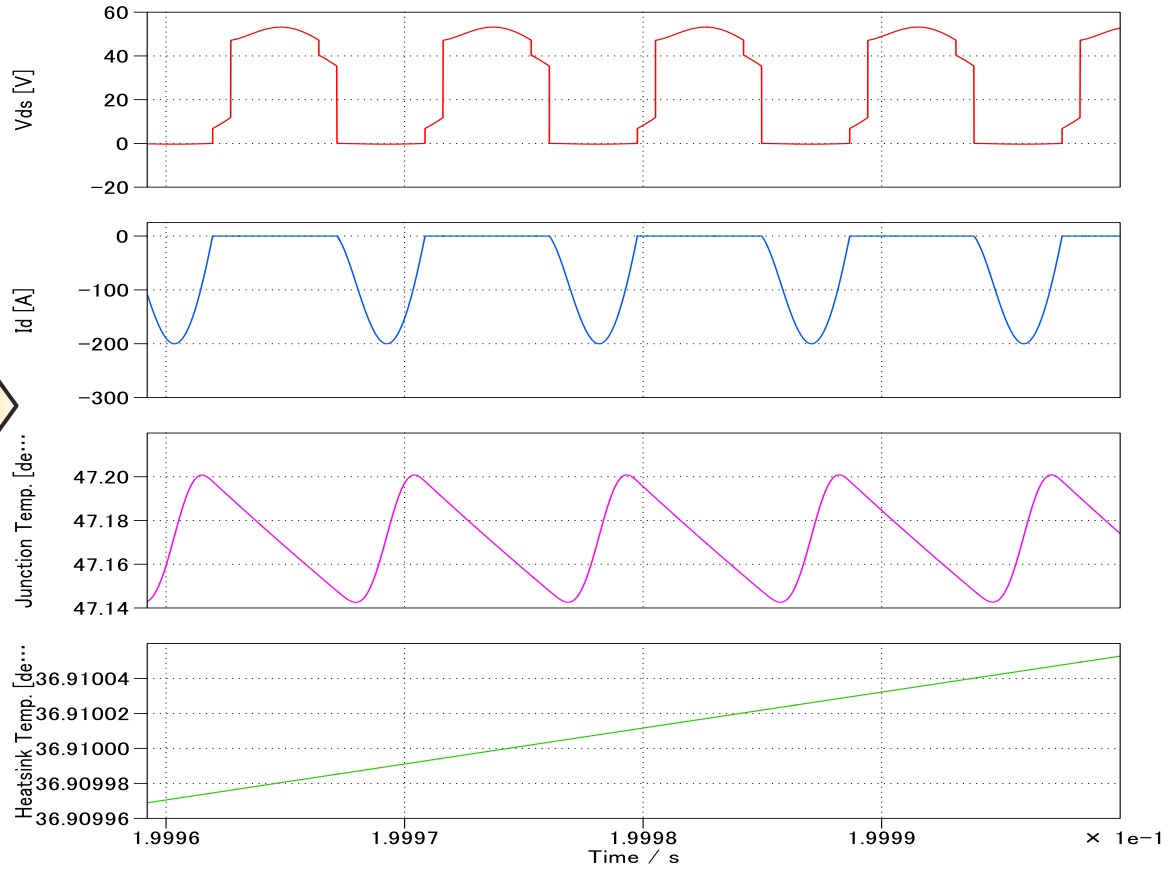
Secondary side





Contents	Results
Conduction Loss: Pcond (secondary)	14.67 (W/device)
Junction Temp. : Tj (secondary)	47.17 (℃)
Heatsink Temp.: T_hs (secondary)	36.91 (℃)
Total Loss: Ptot (secondary)	117.35 (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.

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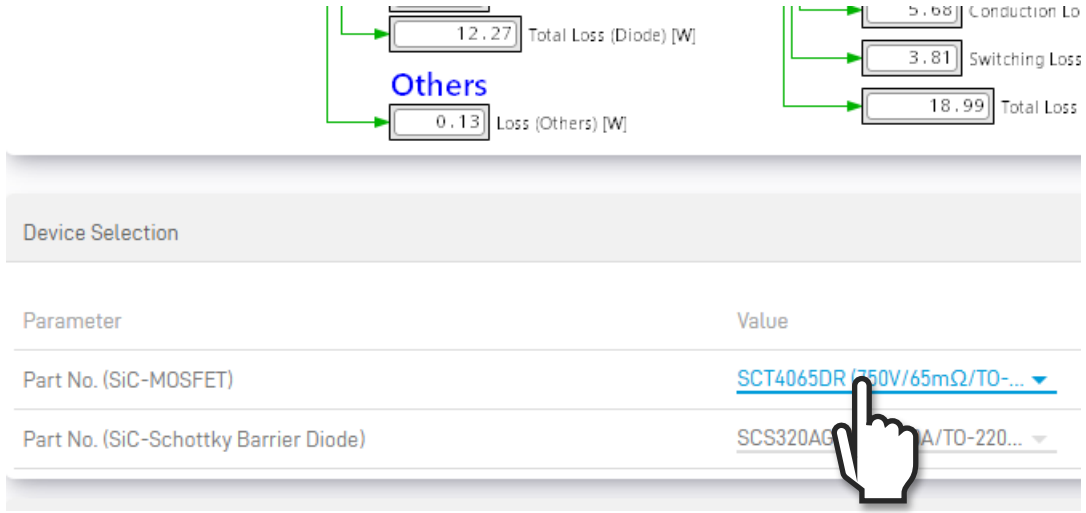
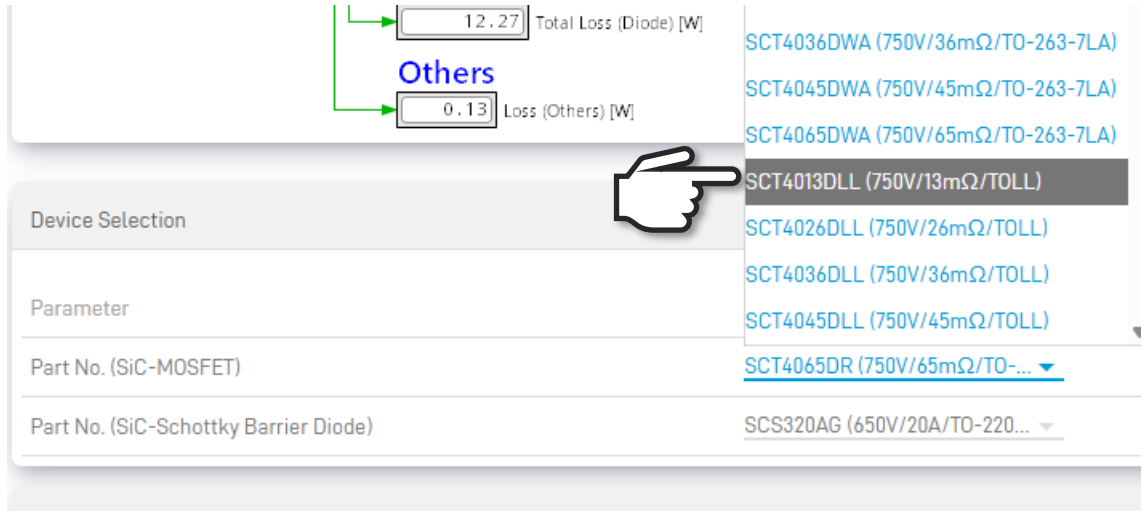
Device Selection



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



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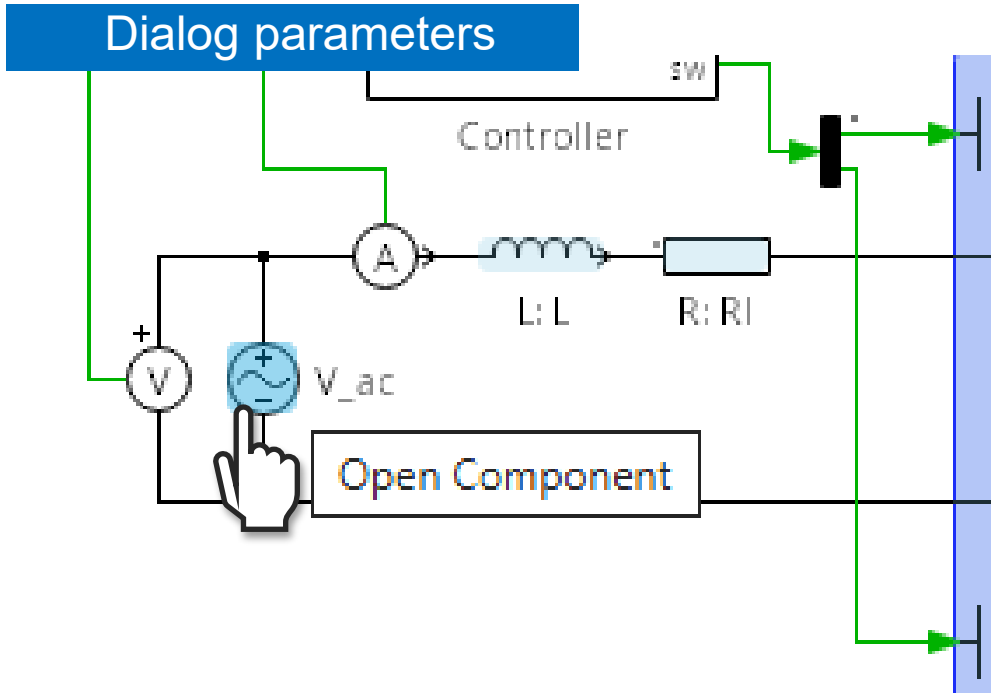
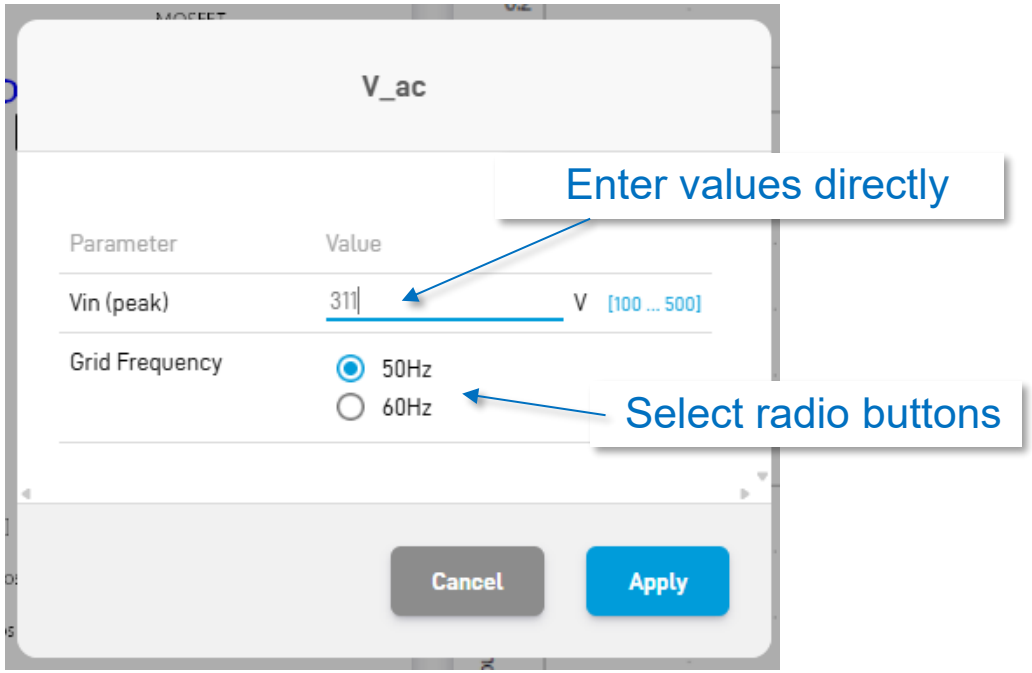
- Symbols whose parameters can be changed are colored light-blue in the circuit diagram.
- Over your mouse cursor to the symbol that you want to change the parameter and the symbol color is turned to blue (e.g. “V_ac” symbol in the below).
- Click the mouse’s left button.



- 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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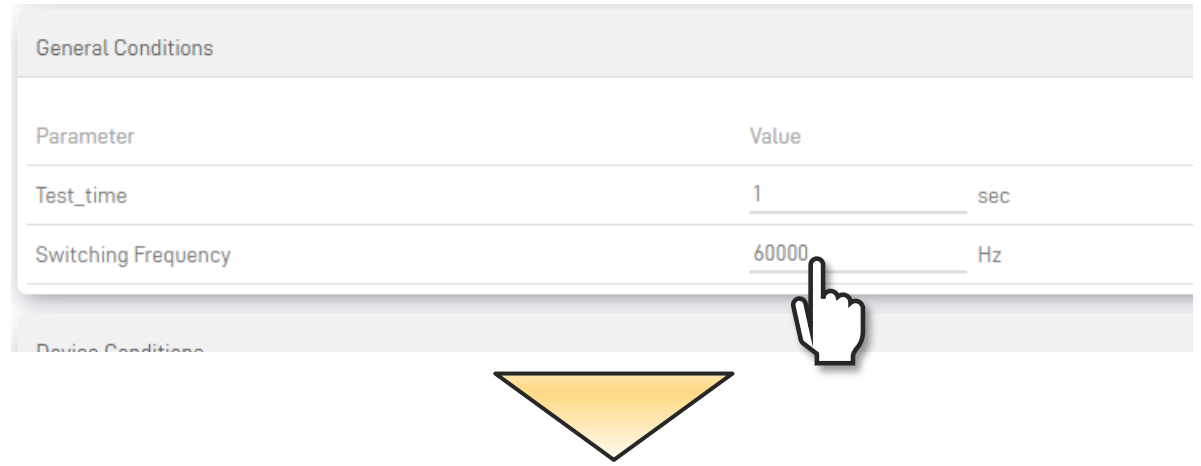
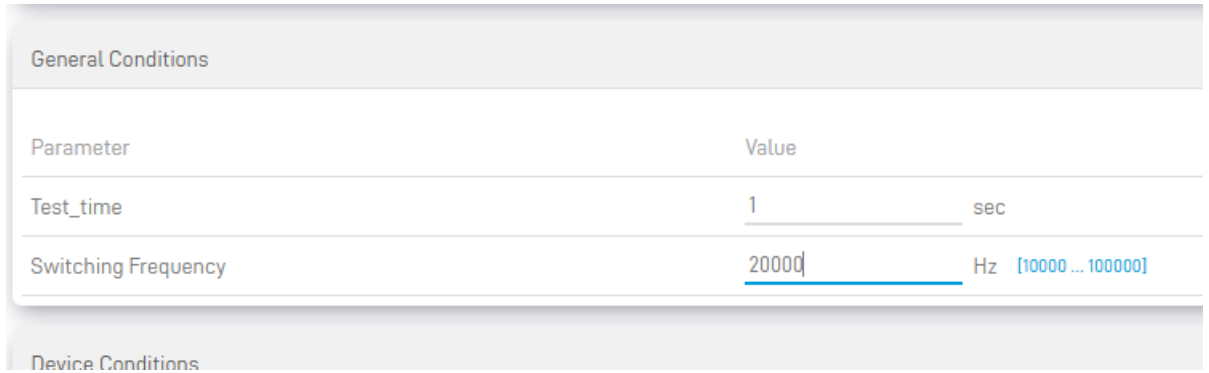
Table parameters





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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