ROHM Solution Simulator

4.5V～26V Input, 2.0A Integrated MOSFET Single Synchronous Buck DC/DC Converter

BD9E200FP4-Z / Load Response

This circuit simulates the load response of BD9E200FP4-Z. You can observe the fluctuation of the output voltage when the load current is abruptly changed. You can customize the simulation conditions by changing the parameters of components highlighted in blue, such as VIN, IOUT, or peripheral components, and simulate the load response with desired operating condition.

General Cautions

Caution 1: The values from the simulation results are not guaranteed. Use these results as a guide for your design.
Caution 2: These model characteristics are specifically at Ta = 25 °C. Thus, the simulation result with temperature variances may significantly differ from the result with the one done at actual application board (actual measurement).
Caution 3: Please refer to the datasheet for details of the technical information.
Caution 4: The characteristics may change depending on the actual board design and ROHM strongly recommend to double check those characteristics with actual board where the chips will be mounted on.

1 Simulation Schematic

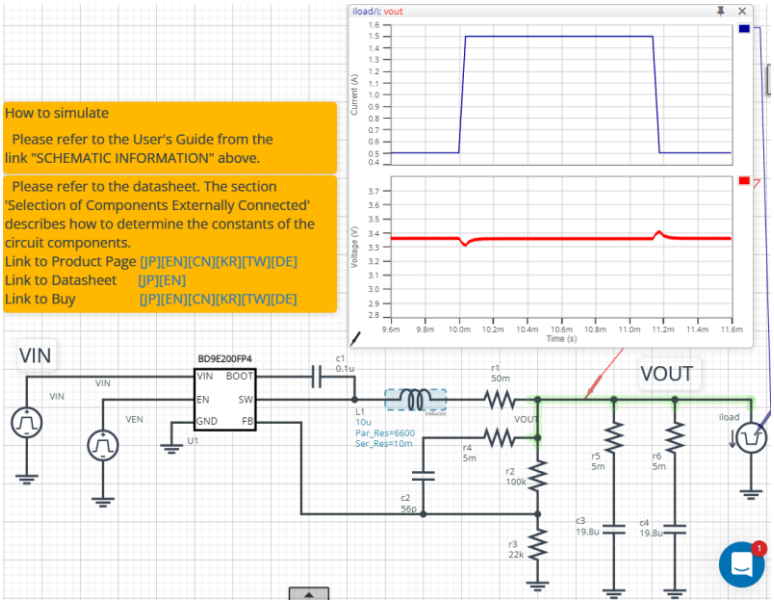


Figure 1. Simulation Schematic

2 How to simulate

The simulation settings, such as time domain or convergence options, are configurable from the 'Simulation Settings' shown in Figure 2, and Table 1 shows the default setup of the simulation.

In case of simulation convergence issue, you can change advanced options to solve. The temperature is set to 25 °C in the default statement in 'Manual Options'.

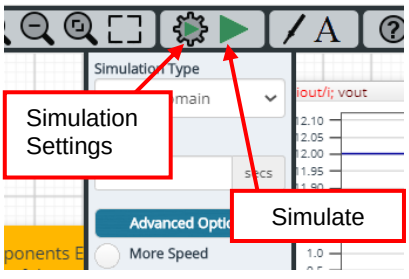


Figure 2. Simulation Settings and execution

Table 1. Simulation settings default setup

Parameters	Default	Note
Simulation Type	Time-Domain	Do not change Simulation Type
End Time	12 ms	-
Advanced options	Balanced	-
	Time Resolution Enhancement Convergence Assist	-
Manual Options	.temp 25	-

3 Simulation Conditions

3.1 Parameter/Variables

No variables were used in the design. Table 2 shows the settings of the supplies used.

Table 2. List of the simulation condition parameters

Instance Name	Type	Parameters	Default Value	Units
VIN	Voltage Source	Initial_value	0	V
		Pulse_value	12	V
		ramptime_initial_to_pulse	1	µs
		ramptime_pulse_to_initial	1	µs
		Start_delay	0.1	ms
		Pulse_width	10	s
		Period	11	s
VEN	Voltage Source	Initial_value	0	V
		Pulse_value	3	V
		ramptime_initial_to_pulse	1	µs
		ramptime_pulse_to_initial	1	µs
		Start_delay	0.1	ms
		Pulse_width	10	s
		Period	11	s
iload	Current Source	Initial_value	0.5	A
		Pulse_value	1.5	A
		ramptime_initial_to_pulse	40	µs
		ramptime_pulse_to_initial	40	µs
		Start_delay	10	ms
		Pulse_width	1.1	ms
		Period	10	s

(Note 1) Set it to the guaranteed operating range of the DCDC Converter.

4 BD9E200FP4 model

The simulation model in this circuit is designed for load response, and the functions not related to load response are not implemented.

Table 3. BD9E200FP4 model pins used for load response

Pin Name	Description
VIN	Power supply input.
EN	Enable input.
BOOT	Pin for bootstrap.
SW	Switching node.
FB	Output voltage feedback pin.
GND	Ground.

Peripheral Components

To set parameters of components, open 'property' by double click or right click on a component. You can input a value to a property text box if available. Please refer to the hands-on manual for more details.

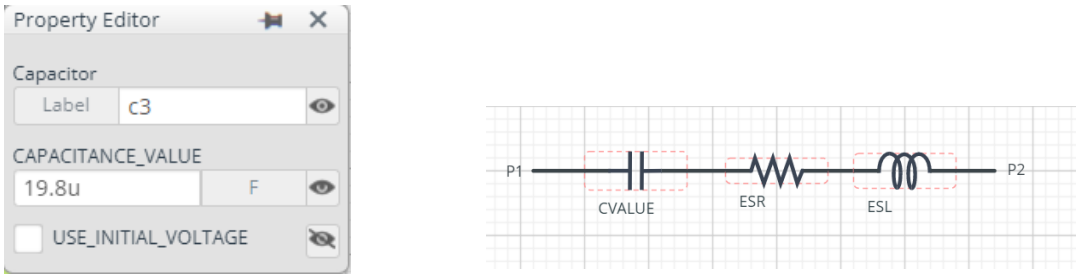
4.1 Bill of Material

Table 4 shows the list of components used in the simulation schematic. Each of the capacitor and inductor has the parameters of equivalent circuit shown below. The default value of equivalent components are set to zero except for the parallel resistance of L and series resistance of capacitors. You can modify the values of each component.

Table 4. List of components used in the simulation circuit

Type	Instance Name	Default Value	Units
Resistor	r1	50m	Ω
	r2	100k	Ω
	r3	22k	Ω
	r4	5m	Ω
	r5	5m	Ω
	r6	5m	Ω
Capacitor	c1	0.1	µF
	c2	56	pF
	c3	19.8	µF
	c4	19.8	µF
Inductor	L1	10	µH

5.2 Capacitor Equivalent Circuits

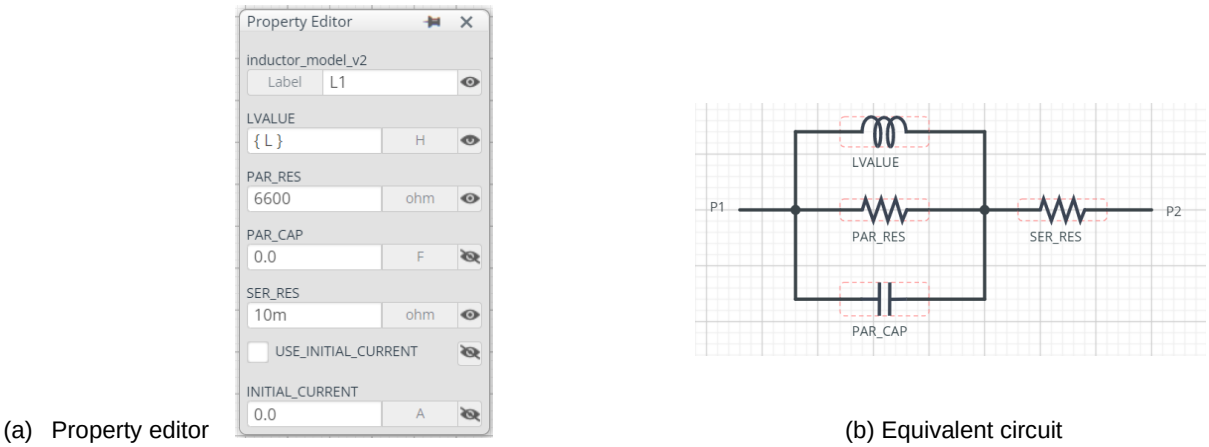


(a) Property editor (b) Equivalent circuit

Figure 1. Capacitor property editor and equivalent circuit

The default value of ESR is 0 mΩ.

5.3 Inductor Equivalent Circuits



(a) Property editor (b) Equivalent circuit

Figure 2. Inductor property editor and equivalent circuit

The default value of PAR_RES is 6.6 kΩ.

(Note 1) These parameters can take any positive value or zero in simulation but it does not guarantee the operation of the IC in any condition. Refer to the datasheet to determine adequate value of parameters.

6 Link to the product information and tools

5.1 DC/DC Converter
BD9E200FP4-Z : Integrated MOSFET Single Synchronous Buck DC/DC Converter. [JP] [EN] [CN] [KR] [TW] [DE]

5.2 General Purpose Chip Resistors
MCR01MZPF : Thick Film Chip Resistors. [JP] [EN] [CN] [KR] [TW] [DE]

Technical Articles and Tools can be found in the Design Resources on the product web page.

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