ROHM Solution Simulator

Current Sense Amplifier

BD14210G-LA – Low-Side Current Sensing Circuit – DC Sweep simulation

This circuit simulates the DC sweep response of a low-side current sensing circuit using the BD14210G-LA current sense amplifier. You can observe the output voltage and the difference between the output and reference pin voltage as load current is changed. You can customize the parameters of the components shown in blue, such as VSOURCE1, or peripheral components, and simulate the low-side current sensing circuit with the desired operating condition.

General Cautions

Caution 1: The values from the simulation results are not guaranteed. Please 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 Application note of Current Sense Amplifiers 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

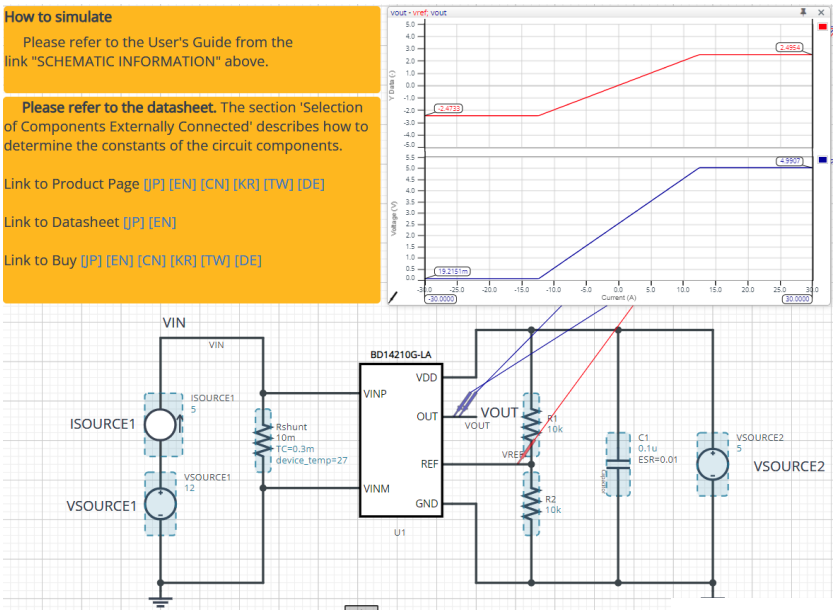

Figure 1. Simulation Schematic

2 How to simulate

The simulation settings, such as parameter sweep 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. Nothing is stated in the default statement in 'Manual Options'. You can modify it.

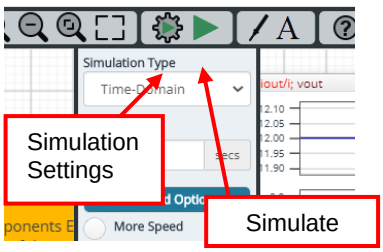

Figure 2. Simulation Settings and execution

Table 1. Simulation settings default setup

Parameters	Default	Note
Simulation Type	DC	Do not change Simulation Type
Parameter Sweep	ISOURCE1	CURRENT_LEVEL from -30A to 30A by 0.3A
Advanced options	Simulation Resolution	1e-7
	Convergence Assist	-
Manual Options	-	-

3 Simulation Conditions

Table 2. List of the simulation condition parameters

Instance Name	Type	Parameters	Default Value	Variable Range		Units
				Min	Max	
VSOURCE1	Voltage Source	Voltage_level	12	-0.2	26	V
		AC_magnitude	0.0	fixed		V
		AC_phase	0.0	fixed		°
VSOURCE2	Voltage Source For Current Sense Amplifier	Voltage_level	5	2.7 *(Note1)*	5.5*(Note1)*	V
		AC_magnitude	0.0	fixed		V
		AC_phase	0.0	fixed		°
ISOURCE1	Current Source	Current_level	5	-30	30	A
		AC_magnitude	0.0	fixed		A
		AC_phase	0.0	fixed		°

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

4 Amplifier model

Table 3 shows the model pin function implemented. Note that the Amplifier model is the behavioral model for its input/output characteristics, and neither protection circuits nor functions unrelated to the purpose are implemented.

Table 3. Amplifier model pins used for the simulation

Pin Name	Description
VINP	Input of supply side of shunt resistor.
VINM	Input of load side of shunt resistor.
VDD	Power supply.
OUT	Current detection output.
REF	Reference input.
GND	Ground.

5 Peripheral Components

5.1 Bill of Material

Table 4 shows the list of components used in the simulation schematic. The default values of equivalent components are set to zero except for the ESR of C1. The model parameters of Rshunt are shown below. You can modify the values of each component.

Table 4. List of capacitors used in the simulation circuit

Type	Instance Name	Default Value	Variable Range		Units
			Min	Max	
Resistor	Rshunt	10m	free		Ω
	R1	10k	free		Ω
	R2	10k	free		Ω
Capacitor	C1	0.1	free		µF

5.2 Rshunt Model Parameters

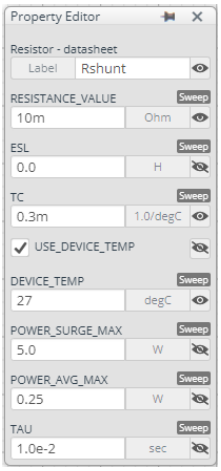

Figure 3. Rshunt property editor

Figure 3 shows the model parameters of Rshunt. The default values of Rshunt and TC are 10m Ω and 0.3m Ω/°C respectively.

(Note 2) 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 Recommended Products

6.1 Current Sense Amplifier

BD14210G-LA : Current Sense Amplifier. [JP] [EN] [CN] [KR] [TW] [DE]

6.2 Shunt Resistor

LTR50UZPFU : High Power Low Ohmic Chip Resistor. [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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