ROHM Solution Simulator

Automotive Zero Drift Low Offset Voltage Rail-to-Rail Input/Output CMOS Operational Amplifier

LMR1001YF-C – Non-inverting Amplifier – Frequency Response simulation

This circuit simulates the frequency response with Op-Amp as a non-inverting amplifier. You can observe the AC gain and phase of the ratio of output to input voltage when the input source voltage AC frequency is changed. You can customize the parameters of the components shown in blue, such as VSOURCE, or peripheral components, and simulate the non-inverting amplifier with the desired operating condition.

You can simulate the circuit in the published application note: Operational amplifier, Comparator (Tutorial). [JP] [EN] [CN] [KR]

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 Op-Amps 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

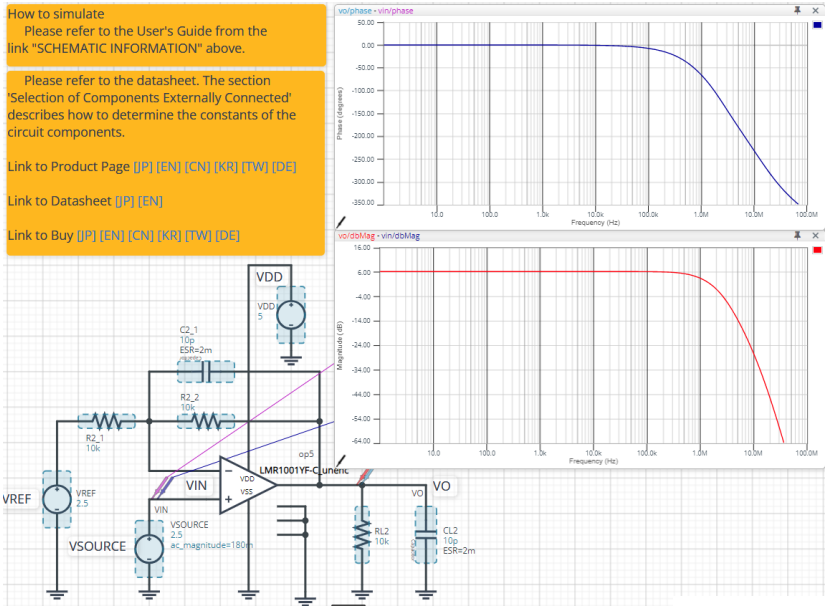


Figure 1. Simulation Schematic

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. The temperature is set to 27 °C in the default statement in 'Manual Options'. You can modify it.

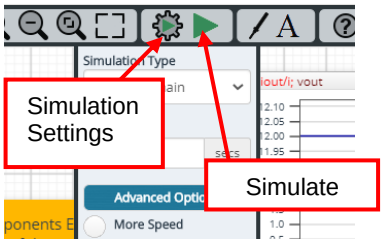


Figure 2. Simulation Settings and execution

Table 1. Simulation settings default setup

Parameters	Default	Note
Simulation Type	Frequency-Domain	Do not change Simulation Type
Start Frequency	0 Hz	Simulate the frequency response for the frequency range from 0 Hz to 100 MHz.
End Frequency	100 MHz	
Advanced options	Balanced	-
	Convergence Assist	-
Manual Options	.temp 27	-

3 Simulation Conditions

Table 2. List of the simulation condition parameters

Instance Name	Type	Parameters	Default Value	Variable Range		Units
				Min	Max	
VSOURCE	Voltage Source	Voltage_level	2.5	0	5.5	V
		AC_magnitude	180m	free		V
		AC_phase	0.0	fixed		°
VDD	Voltage Source for Op-Amp	Voltage_level	5	2.7*(Note1)*	5.5*(Note1)*	V
		AC_magnitude	0.0	fixed		V
		AC_phase	0.0	fixed		°
VREF	Voltage Source	Voltage_level	2.5	VSS	VDD	V
		AC_magnitude	0.0	fixed		V
		AC_phase	0.0	fixed		°

(Note 1) Set it to the guaranteed operating range of the Op-Amps.

4 Op-Amp model

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

Table 3. Op-Amp model pins used for the simulation

Pin Name	Description
+IN	Non-inverting input
-IN	Inverting input
VDD	Positive power supply
VSS	Negative power supply / Ground
OUT	Output
NC1	No connection inside
NC2	No connection inside
NC3	No connection inside

5 Peripheral Components

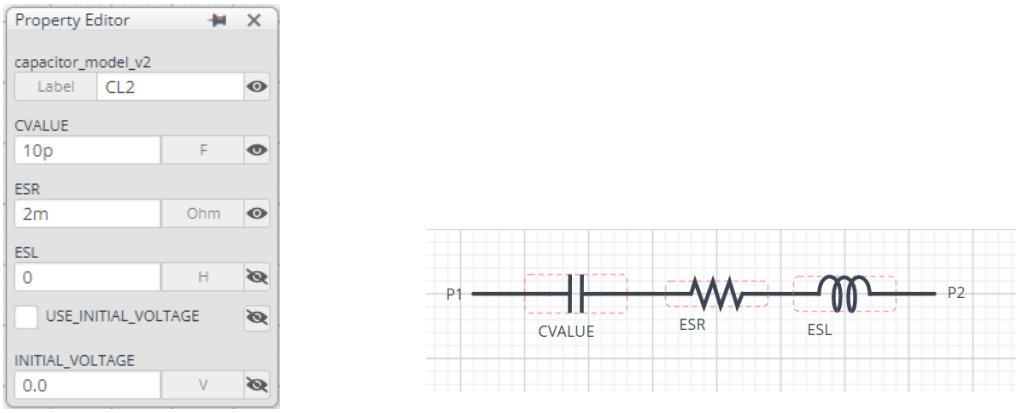
5.1 Bill of Material

Table 4 shows the list of components used in the simulation schematic. Each of the capacitors has the parameters of equivalent circuit shown below. The default values of equivalent components are set to zero except for the ESR of C. 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	R2_1	10k	1k	1M	Ω
	R2_2	10k	1k	1M	Ω
	RL2	10k	1k	1M, NC	Ω
Capacitor	C2_1	10	0.1	100	pF
	CL2	10	free, NC		pF

5.2 Capacitor Equivalent Circuits



(a) Property editor (b) Equivalent circuit

Figure 3. Capacitor property editor and equivalent circuit

The default value of ESR is 2m Ω.

(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 Op-Amp

LMR1001YF-C : Automotive Zero Drift Low Offset Voltage Rail-to-Rail I/O CMOS Op-Amp. [JP] [EN] [CN] [KR] [TW] [DE]

LMR1001YG-C : Automotive Zero Drift Low Offset Voltage Rail-to-Rail I/O CMOS Op-Amp. [JP] [EN] [CN] [KR] [TW] [DE]

LMR1002F-LB : Automotive Zero Drift Low Offset Voltage Rail-to-Rail I/O CMOS Op-Amp. [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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