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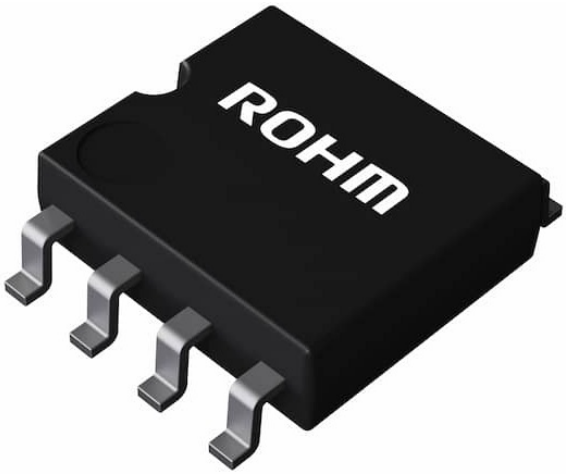
ROHM LMR1001YF-C Semiconductor Integrated Circuits



Specifications

- **Product Name:** ROHM Solution Simulator
- **Type:** Automotive Zero Drift Low Offset Voltage Rail-to-Rail Input/Output CMOS

Operational Amplifier

- **Simulation Type: Time-Domain**
- **End Time**: 100 us
- **Default VSOURCE Voltage Range:** 0V to 5.5V
- **Op-Amp Model Pins:** +IN, -IN, VDD, VSS, OUT, NC1, NC2, NC3

Product Usage Instructions

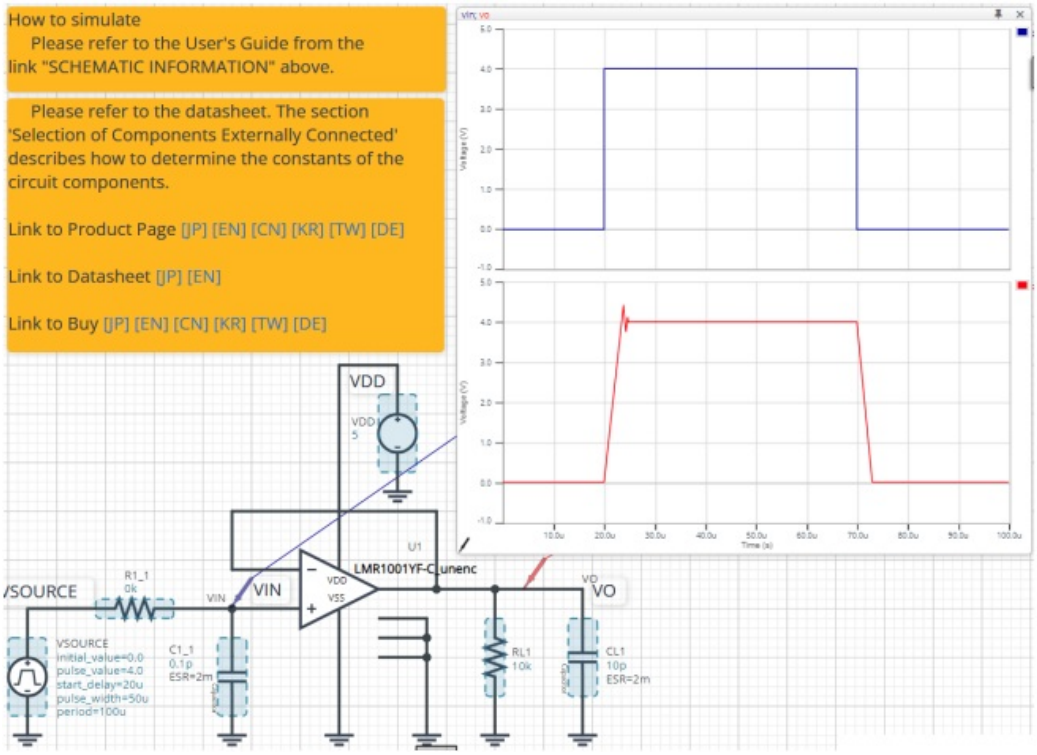
Input) – Transient Response simulation

This circuit simulates the transient response to a pulse input with voltage follower configured Op-Amps. You can observe the fluctuation of the output voltage when the input voltage is abruptly changed. You can customise the parameters of the components shown in blue, such as VSOURCE or peripheral components, and simulate the voltage follower 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 the 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.

Simulation Schematic



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 a simulation convergence issue, you can change the advanced options to solve it. The temperature is set to 27 °C in the default statement in ‘Manual Options’. You can modify it.

Simulation Settings and execution

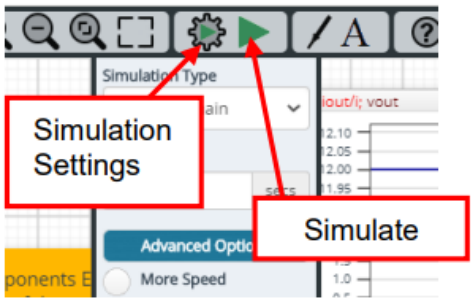


Table 1. Simulation settings: default setup

Parameters	Default	Note
Simulation Type	Time-Domain	Do not change Simulation Type
End Time	100 us	–

Advanced options	Balanced	–
	Convergence Assist	–
Manual Options	.temp 27	–

Simulation Conditions

- Table 2. List of the simulation condition parameters

Instance Name	Type	Parameters	Default Value	Variable Range		Units
				Min	Max	
VSOURCE	Voltage Source	Initial_value	0	0	5.5	V
		Pulse_value	4	0	5.5	V
		ramptime_initial_to_pulse	1	free		ns
		ramptime_pulse_to_initial	1	free		ns
		Start_delay	20	free		µs
		Pulse_width	50	free		µs
		Period	100	free		µs
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		°

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

VSOURCE parameter setup

Figure 3 shows how the VSOURCE parameters correspond to the VIN stimulus waveform.

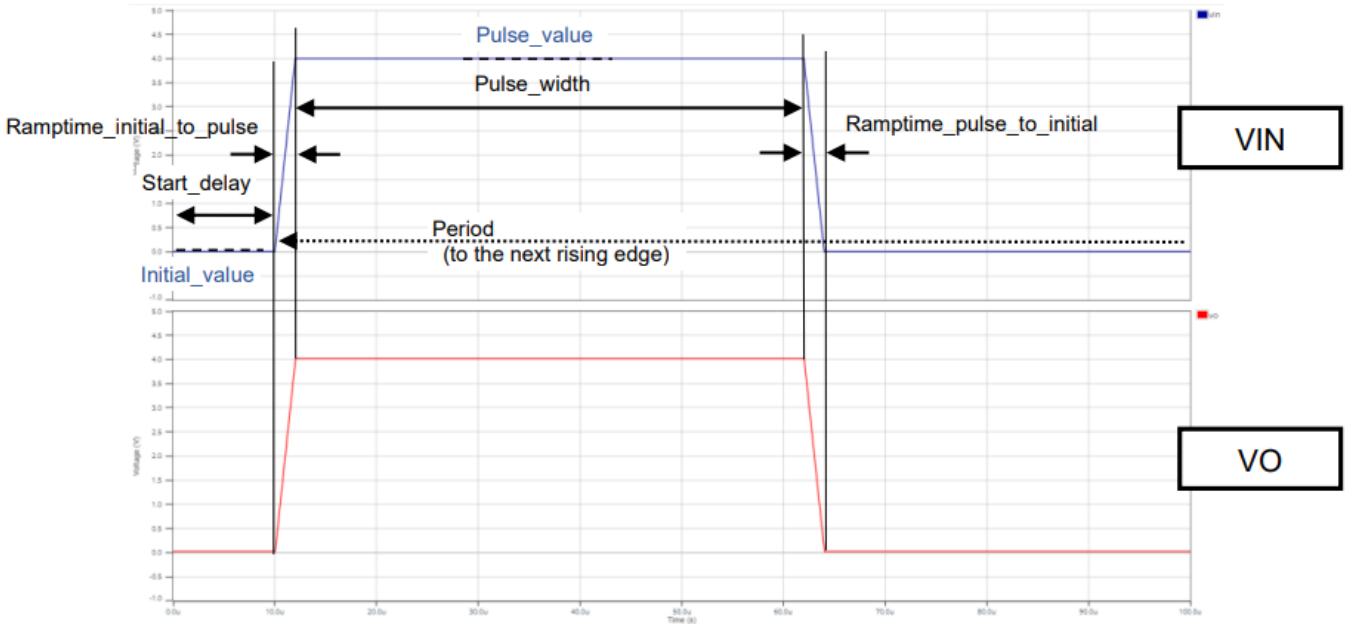


Figure 3. VSOURCE parameters and its waveform

Op-Amp model

Table 3 shows the model pin function implemented. Note that the Op-Amp model is a behavioural 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

Peripheral Components

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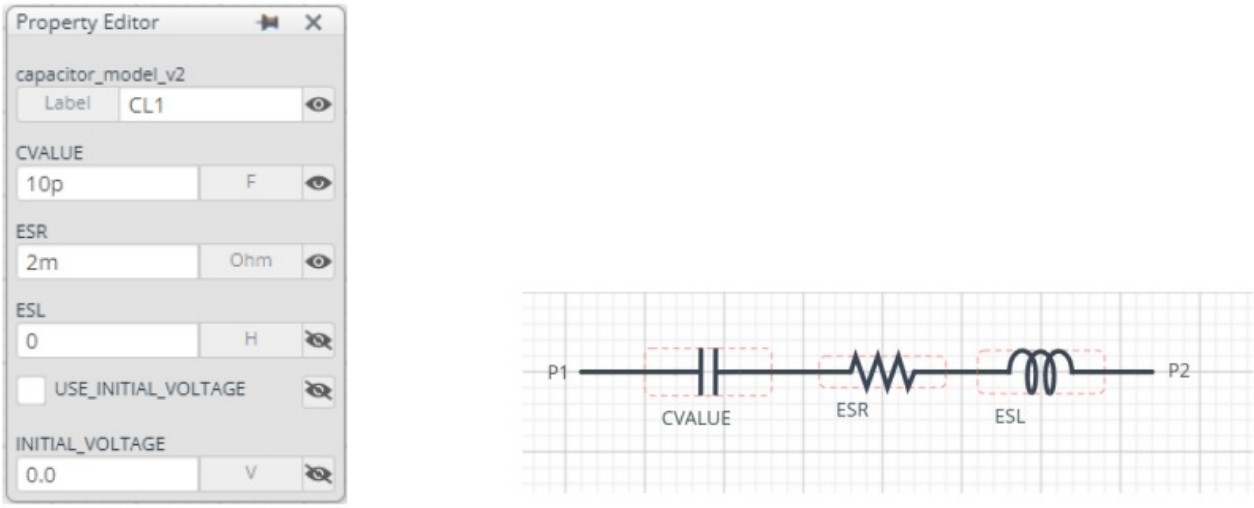
Table 4 shows the list of components used in the simulation schematic. Each of the capacitors has the parameters of the equivalent circuit shown below. The default values of equivalent components are set to zero, except for the ESR of

- 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	R1_1	0	0	10	kΩ
	RL1	10k	1k	1M, NC	Ω
Capacitor	C1_1	0.1	0.1	22	pF
	CL1	10	free, NC		pF

Capacitor Equivalent Circuits



- Property editor
- Equivalent circuit

Figure 4. Capacitor property editor and equivalent circuit
The default value of ESR is mωΩ.

- **(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 the adequate value of parameters.

Recommended Products

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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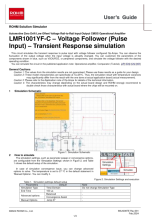
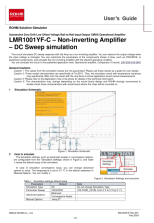
FAQs

Q: Can I change the default simulation settings?
A: Yes, you can customise the simulation settings, but avoid changing the Simulation Type.

Q: What is the purpose of the Op-Amp model pins NC1, NC2, and NC3?
A: These pins signify no internal connections and are not utilised for simulation purposes.

Documents / Resources

	ROHM LMR1001YF-C Semiconductor Integrated Circuits [pdf] User Guide LMR1001YF-C, LMR1001YF-C Semiconductor Integrated Circuits, LMR1001YF-C, Semiconductor Integrated Circuits, Integrated Circuits, Circuits
	ROHM LMR1001YF-C Semiconductor Integrated Circuits [pdf] User Guide LMR1001YF-C, LMR1001YF-C Semiconductor Integrated Circuits, LMR1001YF-C, Semiconductor Integrated Circuits, Integrated Circuits, Circuits

References

- User Manual

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