ROHM Solution Simulator

Ultra Small Package & High Precision Rail-to-Rail Input/Output CMOS Operational Amplifier

TLR377GYZ – Non-inverting Amplifier (Sine Wave Input) – Transient Response simulation

This circuit simulates the transient response to sine wave input with non-inverting amplifier configured Op-Amps. You can observe the output voltage and how faithfully the sine wave input voltage is reproduced. 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

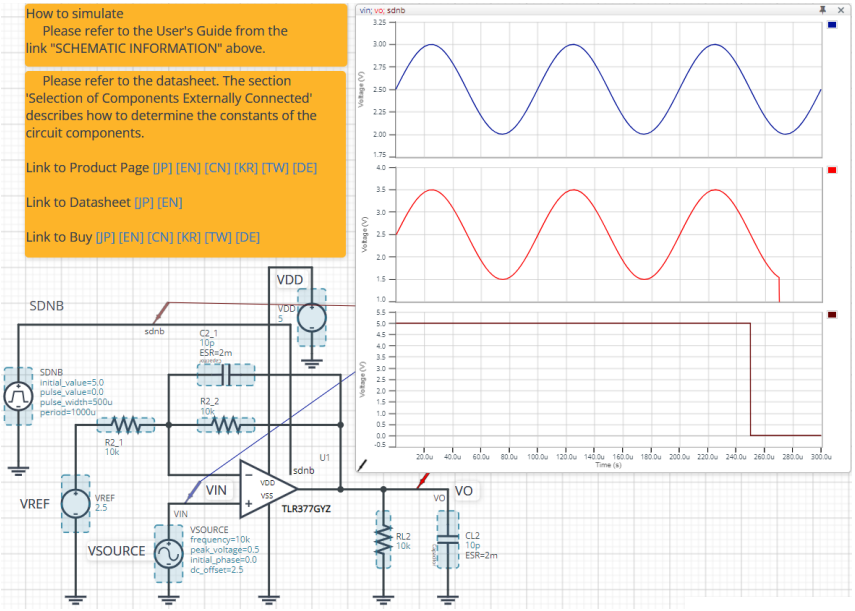


Figure 1. Simulation Schematic

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.

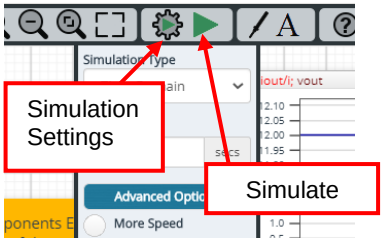


Figure 2. Simulation Settings and execution

Table 1. Simulation settings default setup

Parameters	Default	Note
Simulation Type	Time-Domain	Do not change Simulation Type
End Time	300 µs	-
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	Frequency	10k	10	10M	Hz
		Peak_voltage	0.5	0	5.5	V
		Initial_phase	0	free		°
		DC_offset	2.5	0	5.5	V
		DF	0.0	fixed		1/s
		AC_magnitude	0.0	fixed		V
		AC_phase	0.0	fixed		°
VDD	Voltage Source For Op-Amp	Voltage_level	5	1.8(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		°
SDNB	Voltage Source For Shutdown Setting	Initial_value	5	VSS	VDD	V
		Pulse_value	0	VSS	VDD	V
		ramptime_initial_to_pulse	100	free		ns
		ramptime_pulse_to_initial	100	free		ns
		Start_delay	250	free		µs
		Pulse_width	500	free		µs
		Period	1	1	-	ms

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

3.1 VSOURCE parameter setup

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

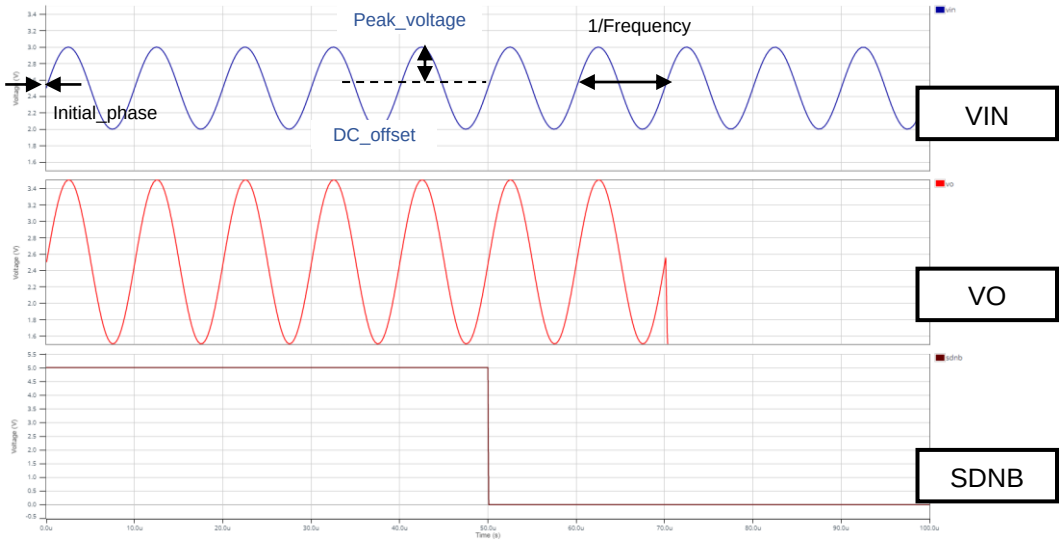


Figure 3. VSOURCE parameters and its waveform

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
SDNB	Shutdown setting

Peripheral Components

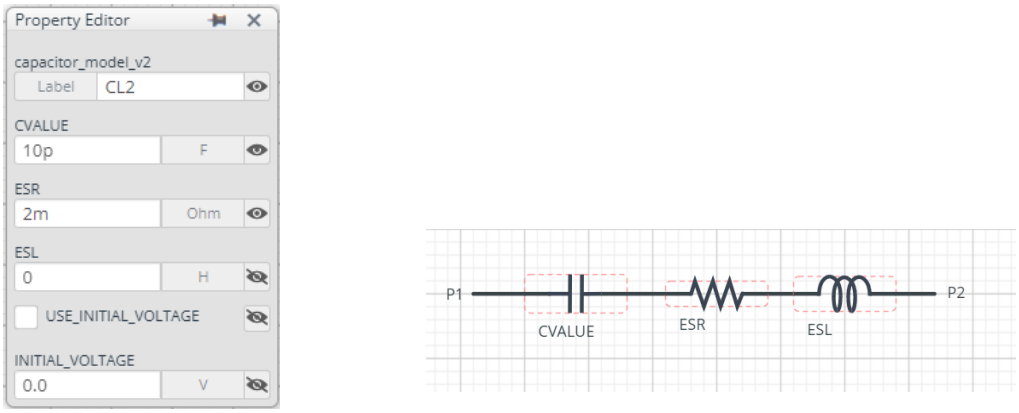
4.1 Bill of Material

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	10	100	pF
	CL2	10	free, NC		pF

5.2 Capacitor Equivalent Circuits



(a) Property editor (b) Equivalent circuit

Figure 4. 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.

5 Recommended Products

5.1 Op-Amp

TLR377GYZ : Ultra Small Package & High Precision Rail-to-Rail Input/Output CMOS Operational Amplifier. [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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