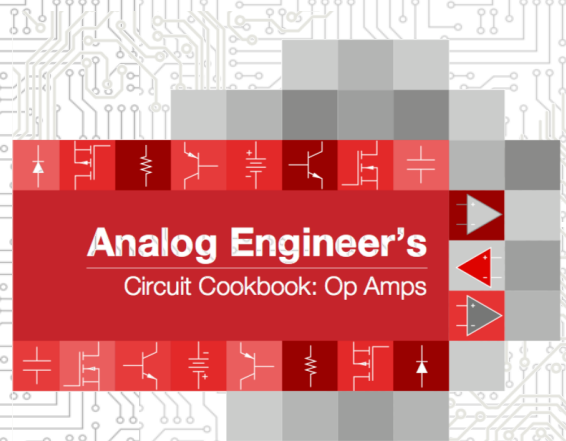


How to Design Half-wave rectifier circuit

General Purpose Amplifiers

www.ti.com/general-amps

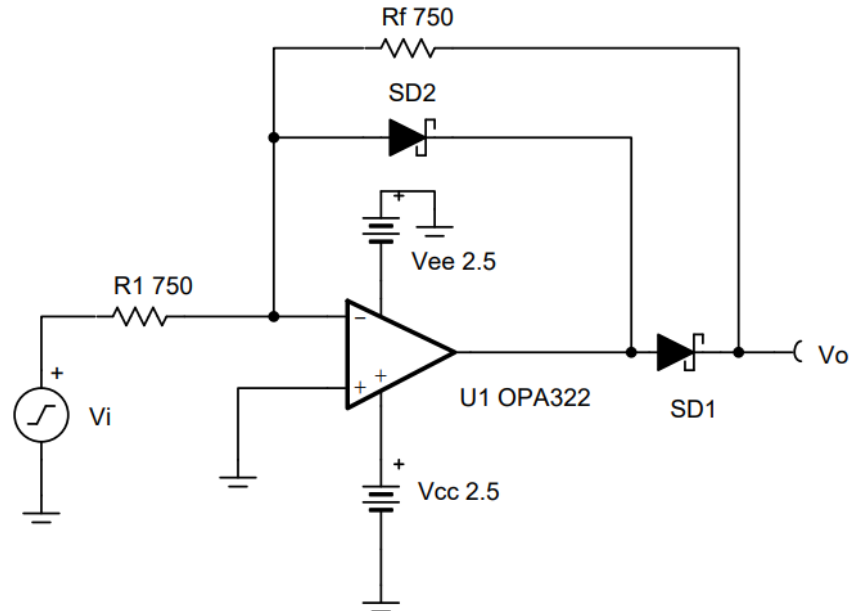
www.ti.com/circuitcookbooks



Analog Engineer's

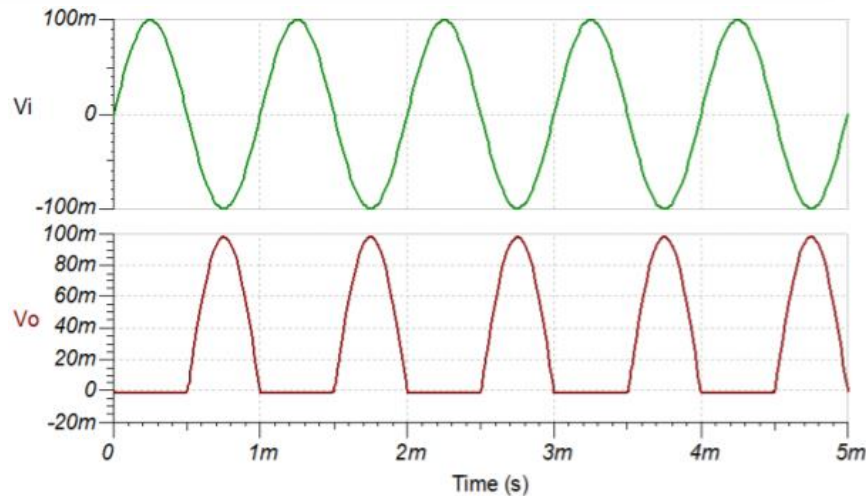
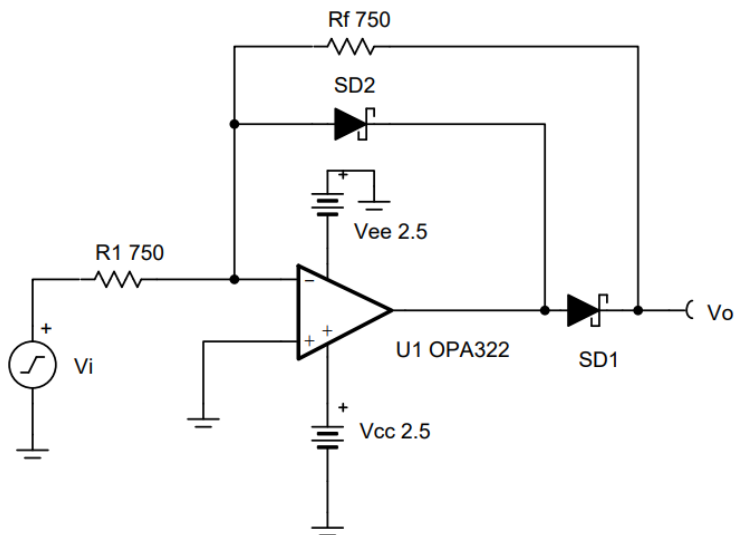
Circuit Cookbook: Op Amps

Circuit Description



Design Goals

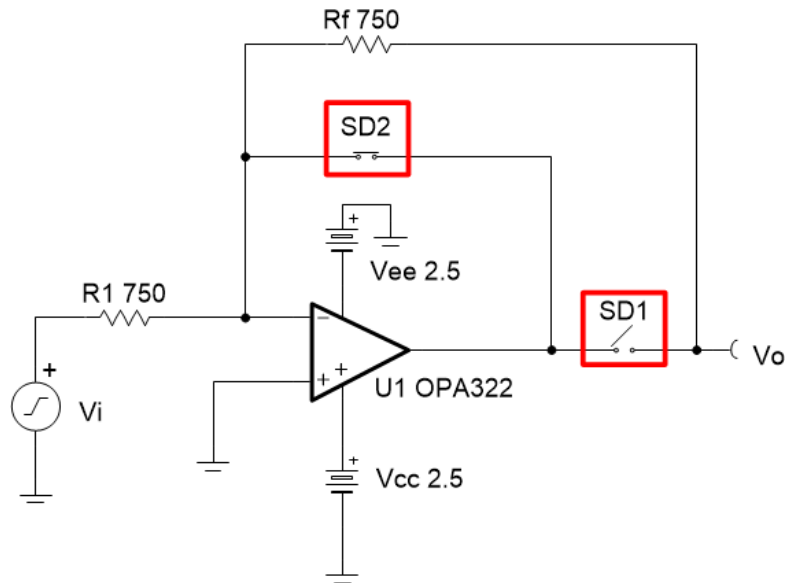
Input		Output		Supply	
V_{iMin}	V_{iMax}	V_{oMin}	V_{oMax}	V_{cc}	V_{ee}
$\pm 0.2 \text{ mV}_{pp}$	$\pm 4 \text{ V}_{pp}$	0.1 V_p	2 V_p	2.5 V	-2.5 V



$$V_o = V_i \times \left(-\frac{R_f}{R1} \right) ; \text{if } V_i < 0 \text{ V}$$

Design Steps

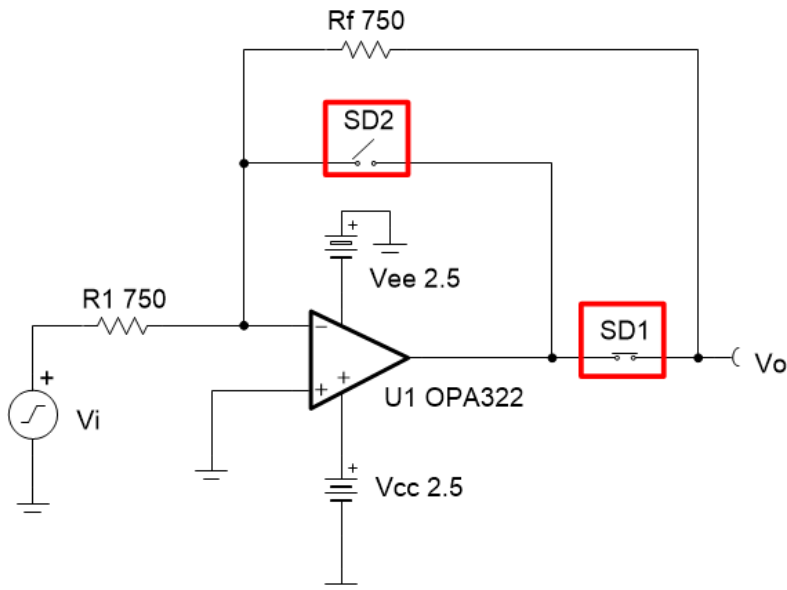
Input		Output		Supply	
V_{iMin}	V_{iMax}	V_{oMin}	V_{oMax}	V_{cc}	V_{ee}
$\pm 0.2 \text{ mV}_{pp}$	$\pm 4 \text{ V}_{pp}$	0.1 V_p	2 V_p	2.5 V	-2.5 V



$$V_o = 0V$$

Design Steps

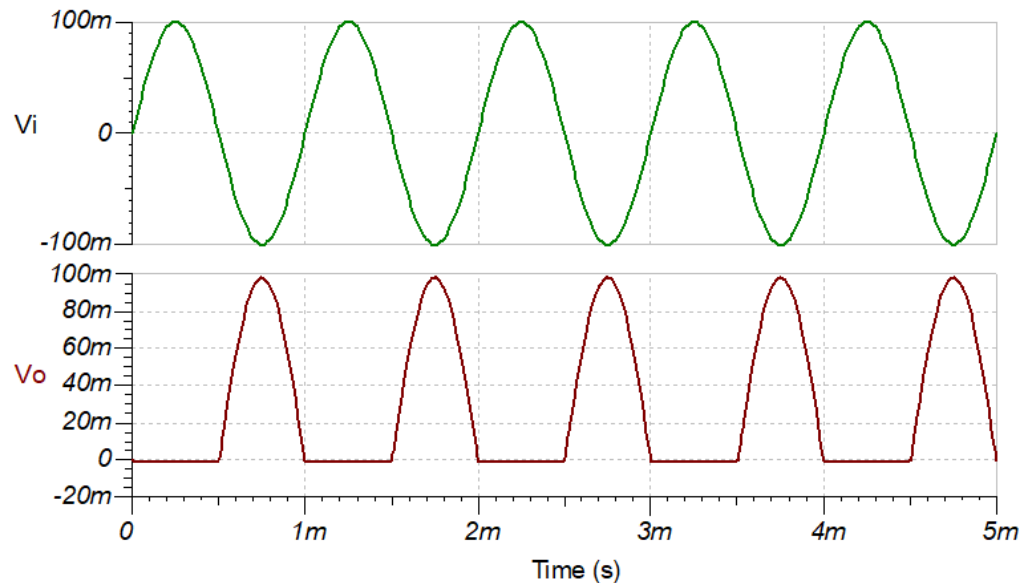
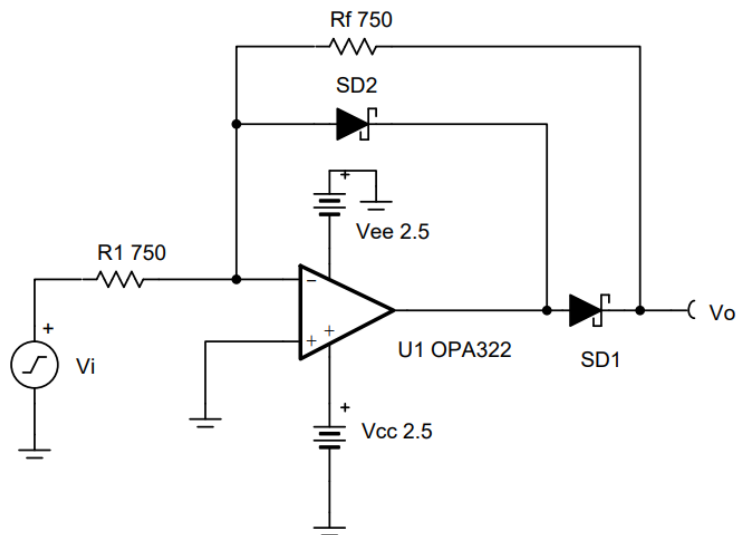
Input		Output		Supply	
V_{iMin}	V_{iMax}	V_{oMin}	V_{oMax}	V_{cc}	V_{ee}
$\pm 0.2 \text{ mV}_{pp}$	$\pm 4 \text{ V}_{pp}$	0.1 V_p	2 V_p	2.5 V	-2.5 V



$$V_o = -\frac{R_f}{R_1} \times V_i$$

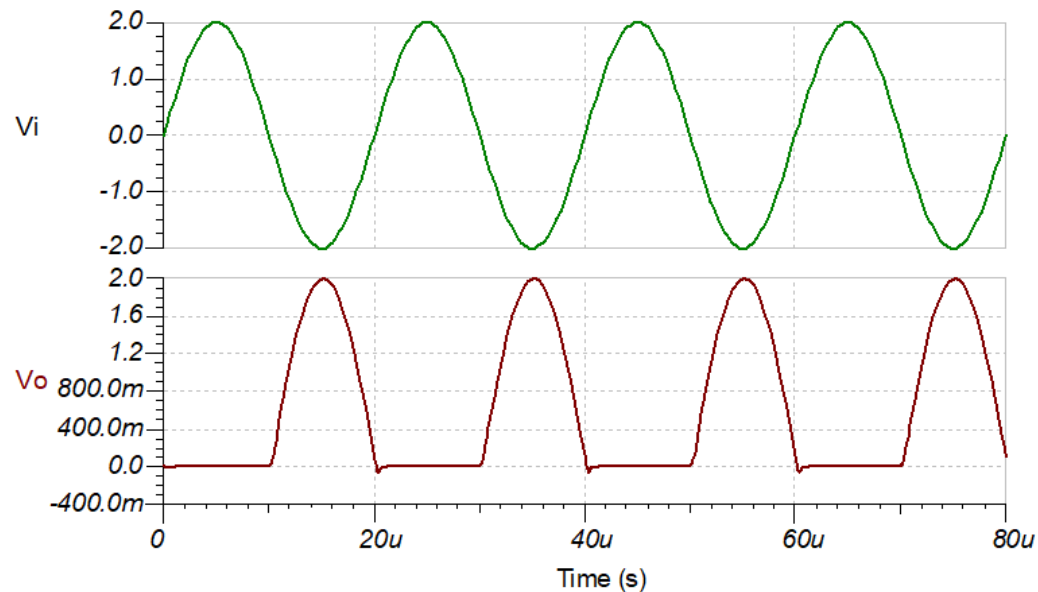
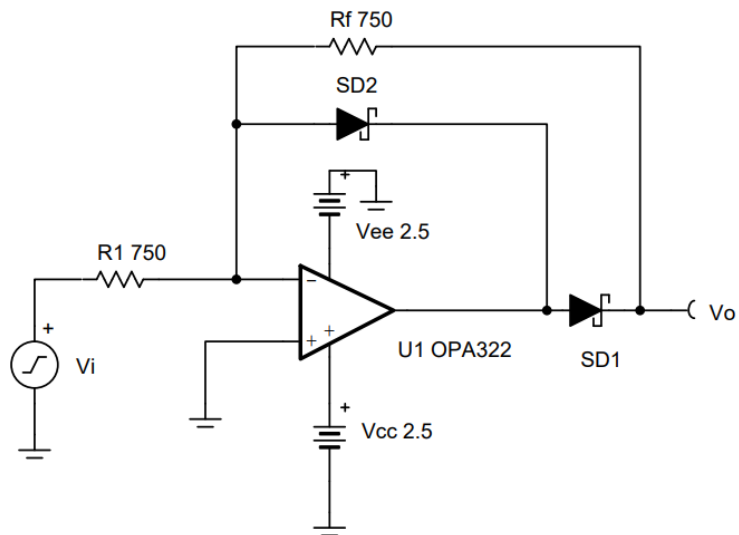
Transient Results

Input		Output		Supply	
V_{iMin}	V_{iMax}	V_{oMin}	V_{oMax}	V_{cc}	V_{ee}
$\pm 0.2 \text{ mV}_{pp}$	$\pm 4 \text{ V}_{pp}$	0.1 V_p	2 V_p	2.5 V	-2.5 V



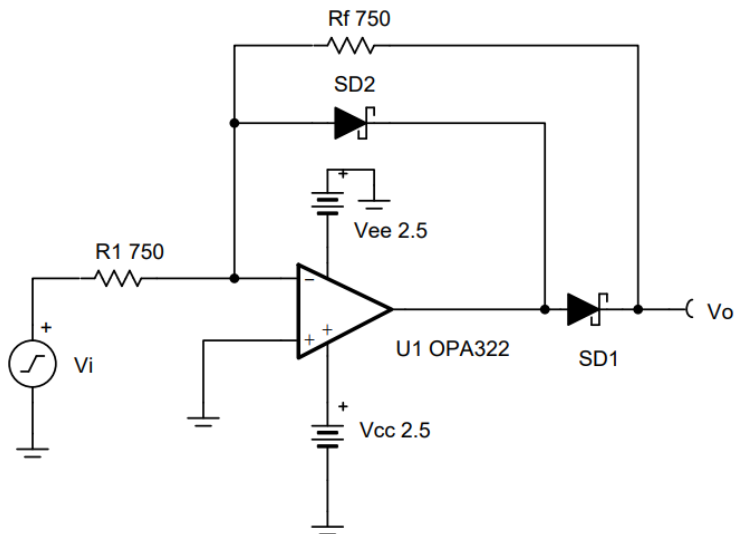
Transient Results

Input		Output		Supply	
V_{iMin}	V_{iMax}	V_{oMin}	V_{oMax}	V_{cc}	V_{ee}
$\pm 0.2 \text{ mV}_{pp}$	$\pm 4 \text{ V}_{pp}$	0.1 V_p	2 V_p	2.5 V	-2.5 V



Design Notes

Input		Output		Supply	
V_{iMin}	V_{iMax}	V_{oMin}	V_{oMax}	V_{cc}	V_{ee}
$\pm 0.2 \text{ mV}_{pp}$	$\pm 4 \text{ V}_{pp}$	0.1 V_p	2 V_p	2.5 V	-2.5 V



Design Notes:

1. For half wave rectifier circuits, be sure to use an op amp with a high slew rate. When the input signal changes polarities, the amplifier output must slew two diode drops.
2. Use fast switching diodes. Schottky diodes might be a preferable choice, since these have faster transitions than pn-junction diodes at the expense of higher reverse leakage.
3. Minimize noise by selecting low-value resistors.

Design Resources

EE Cookbook: Op Amp

www.ti.com/circuitcookbooks

Step-by-step circuit design of common op amp building block circuits.

TI Designs

www.TI.com/tidesigns

Ready-to-use reference designs with theory, calculations, simulations schematics, PCB files, bench test results

Analog Engineer's Pocket Reference

www.TI.com/analogrefguide

PDF, iTunes app and hardcopy available
PCB, analog, mixed signal design formulae
Conversions, tables, equations

TI Precision Labs

www.TI.com/precisionlabs

Quiz questions, problems, solutions
Labs and evaluation module (EVM) available

TINA-TI™ simulation software

www.TI.com/tool/tina-ti

Complete SPICE simulator DC, AC, transient, noise analysis
Schematic entry and post-processor for waveform math

DIYAMP-EVM

www.TI.com/DIYAMP-EVM

Evaluation module providing engineers with SC70, SOT23, SOIC packaging and 12 popular amplifier configurations

The Signal

www.TI.com/signalbook

PDF, iTunes app and hardcopy available
A compendium of blog posts on op amp design topics including offset voltage, input bias current, stability, noise and more

Analog Wire Blog

www.TI.com/analogwire

Technical blogs written by analog experts
Tips, tricks, and design techniques

TI E2E™ Community

www.TI.com/e2e

Support forums for all TI products

Op Amp Parametric Quick Search

www.TI.com/amplifiers

Search for precision, high-speed, general-purpose, ultra-low-power, audio and power op amps

Op Amp Parametric Cross-Reference

www.TI.com/opampcrossreference

Find similar TI op amps using competitive part numbers

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