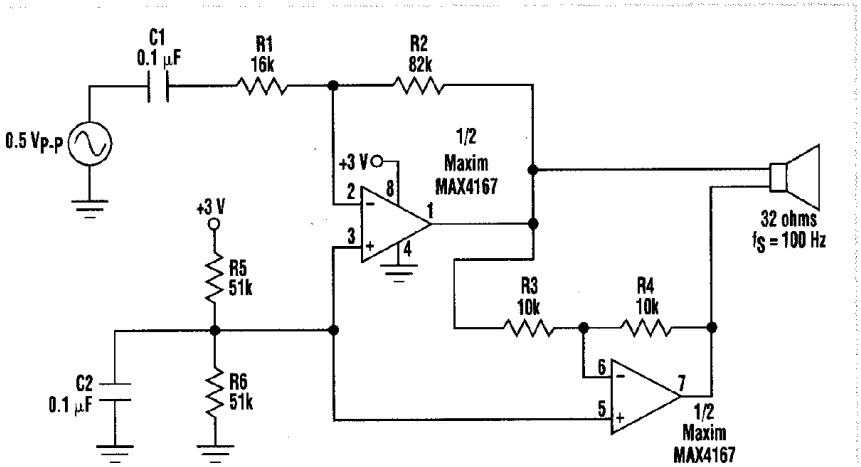
Noncascaded Arrangement Optimizes Bridged Amplifiers

John Guy and Joe Neubauer

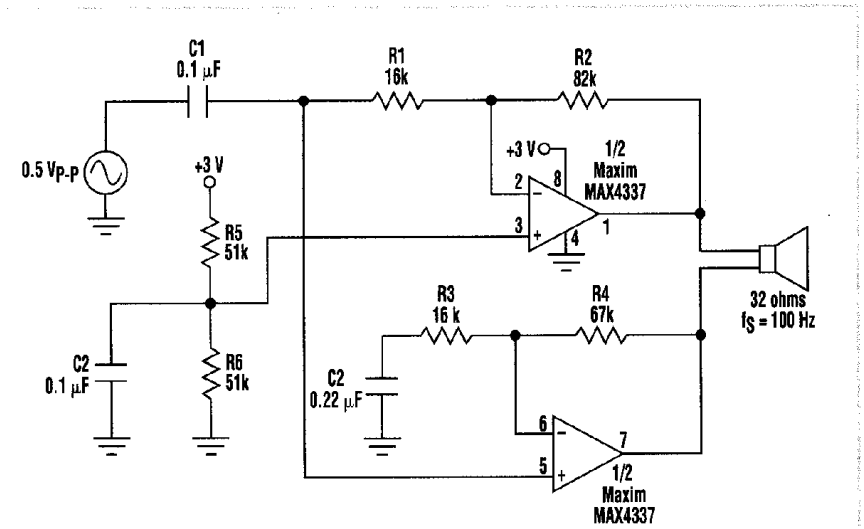
Maxim Integrated Products, 120 San Gabriel Dr., Sunnyvale, CA 94086

Low-voltage systems that drive loudspeakers often employ a bridged-amplifier configuration that effectively doubles the voltage swing at the transducer (speaker).

In a typical bridge-amplifier circuit, an ac-coupled inverting stage with gain is used to drive one side of the speaker *(Fig. 1)*. This stage also drives a second unity-gain inverting amplifier. This amplifier, in turn, is used to drive the other side of the speaker.



1. This conventional bridged amplifier features two matched amplifiers in tandem.



2. This circuit optimizes the configuration in Fig. 1 by distributing gain between the two amplifiers. The elimination of dc gain in the noninverting amplifier also improves the design.

Usually, bridged amplifiers incorporate a matched pair of amplifiers. Yet in this configuration, the first amplifier dominates the overall performance since its output noise and distortion are replicated in the second amplifier.

This drawback can be eliminated by placing the two amplifiers in a noncascaded configuration. While one is inverting, the other is noninverting *(Fig. 2)*. Since both amplify the same input signal, neither amplifier reproduces the noise, distortion, or clipping introduced by the other amplifier.

An additional improvement to the design in Figure 1 is the bias arrangement in the Figure 2 circuit. In this circuit, the dc bias for the noninverting circuit is derived from the inverting amplifier's source resistor (bias is required because the input is ac-coupled). Using the inverting amplifier's source resistor as a bias source lowers the component count and eliminates signal injection into the high-impedance bias source ($V_{CC}/2$ applied to the top amplifier's noninverting input).

Another advantage of the circuit in Figure 2 is the elimination of dc gain in the noninverting amplifier. For the circuit shown, C2 sets the -3dB point at half the input cutoff frequency. R1/C1 sets the input high-pass cutoff frequency at 100 Hz.