Ultralow Distortion Audio Panpot Amplifier

By Chau Tran

An audio "panpot" circuit, shown in Figure 1, continuously varies the position of a monophonic audio signal between left and right stereo channels in response to a potentiometer setting. Low cost and low distortion are important considerations for audio circuits. The AD8273[1] dual low-distortion difference amplifier uses internal gain setting resistors to ensure excellent matching between the two channels. With no external components, each channel is configured as two high-performance amplifiers with a gain of 3. In the audio frequency range, the total harmonic distortion is less than 0.0007%.

Although this circuit can be built discretely, integrating the amplifiers and resistors on a single chip offers advantages to board designers, including improved specifications, less PCB area, and lower production cost.

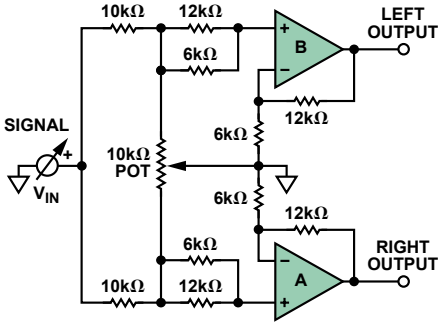

Figure 1. Audio panpot amplifier.

In this circuit, the signal is split between the two amplifiers, using series 10-kΩ resistors. A potentiometer, with a grounded wiper, is inserted between the two noninverting inputs. The combination of the potentiometer and the 10 kΩ resistors presents a light load that can be easily driven by most sources. The amplifiers are configured for a gain of 3. When the potentiometer wiper is at either end, one input is grounded, so no signal gets through to the corresponding output. The other input sees $V_{IN}/2$, so its output is $1.5 \times V_{IN}$. With the wiper in the middle, the input to both amplifiers is $V_{IN}/3$, so the output of each amplifier is V_{IN}. Thus, by moving the wiper (either mechanically or electronically), the signal level varies continuously from 0 to $1.5 \times V_{IN}$ on one channel and from $1.5 \times V_{IN}$ to 0 on the other channel, so that, to a listener, the source appears to move across the sound stage from one channel to the other. This allows the image, or the apparent source of the sound, to be placed at any location between the left and right speakers.

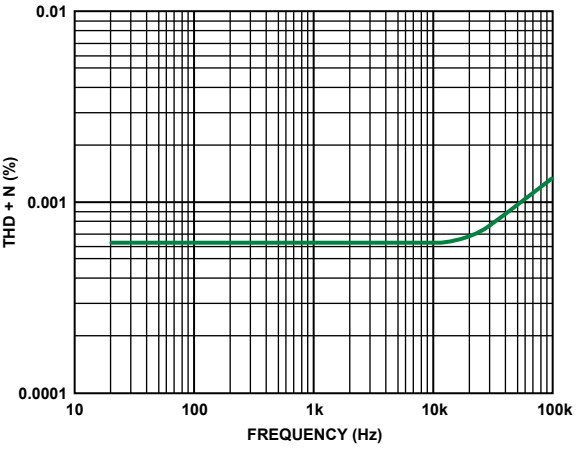

Figure 2. Total harmonic distortion and noise vs. frequency.

Figure 2 shows the total harmonic distortion and noise over the audio frequency range. The error increases with frequency, but the total error is still less than 0.0007% at 20 kHz. Figure 3 shows the connections to the IC.

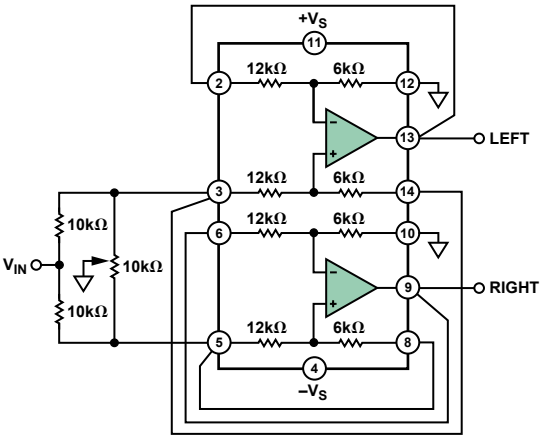

Figure 3. Connection diagram.

References

[1] www.analog.com/en/audiovideo-products/audio-amplifiers/ad8273/products/product.html.

Author

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