Headphones typically have an impedance of 40Ω to 300Ω. By using the dual OPA2604 and four resistors one can economically drive a 2.8V peak signal into the 40Ω headphones.

Figure 1 illustrates a circuit that can be used to drive loads that exceed the output current capabilities of an operational amplifier, but not enough to require the use of a power operational amplifier. The OPA2604 used in this application is a dual, FET-input operational amplifier that can typically sink or source 35mA on the output. By taking advantage of the fact that the OPA2604 is a dual, this circuit will sink or source 70mA. In addition, each operational amplifier has its own short circuit protection of ±40mA (typ), which makes the overall typical short circuit current of this application ±80mA.

One side of the dual OPA2604, A₂, is in the feedback loop of the other side of the dual, A₁. The current, I₁, which is supplied by A₁ is matched by the current I₂, the output current of A₂. The load will receive a total current of I₁ + I₂. The ratio between the output currents, I₁ and I₂, is equal to:

$$I_2 = I_1 \left(\frac{R_3}{R_4}\right)$$

Resistors R₃ and R₄ are set equal for equal output currents. Resistors R₁ and R₂ set the overall gain of the circuit. The transfer function is:

$$V_{OUT} = V_{IN} \left(1 + \frac{R_2}{R_1}\right)$$

The OPA2604 is a dual, FET-input operational amplifier designed for enhanced AC performance. Very low distortion, low noise and wide bandwidth provide superior performance in high quality audio applications. The OPA2604 is available is plastic 8-pin DIP and plastic 8-pin SOIC.

FIGURE 1. Using the Dual OPA2604 Op Amp to Double the Output Current to a Load.
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