Keywords: class D audio amplifiers, switchmode boost converters, AA alkaline cells

APPLICATION NOTE 4526

Two AA Cells Produce Huge Audio Volume

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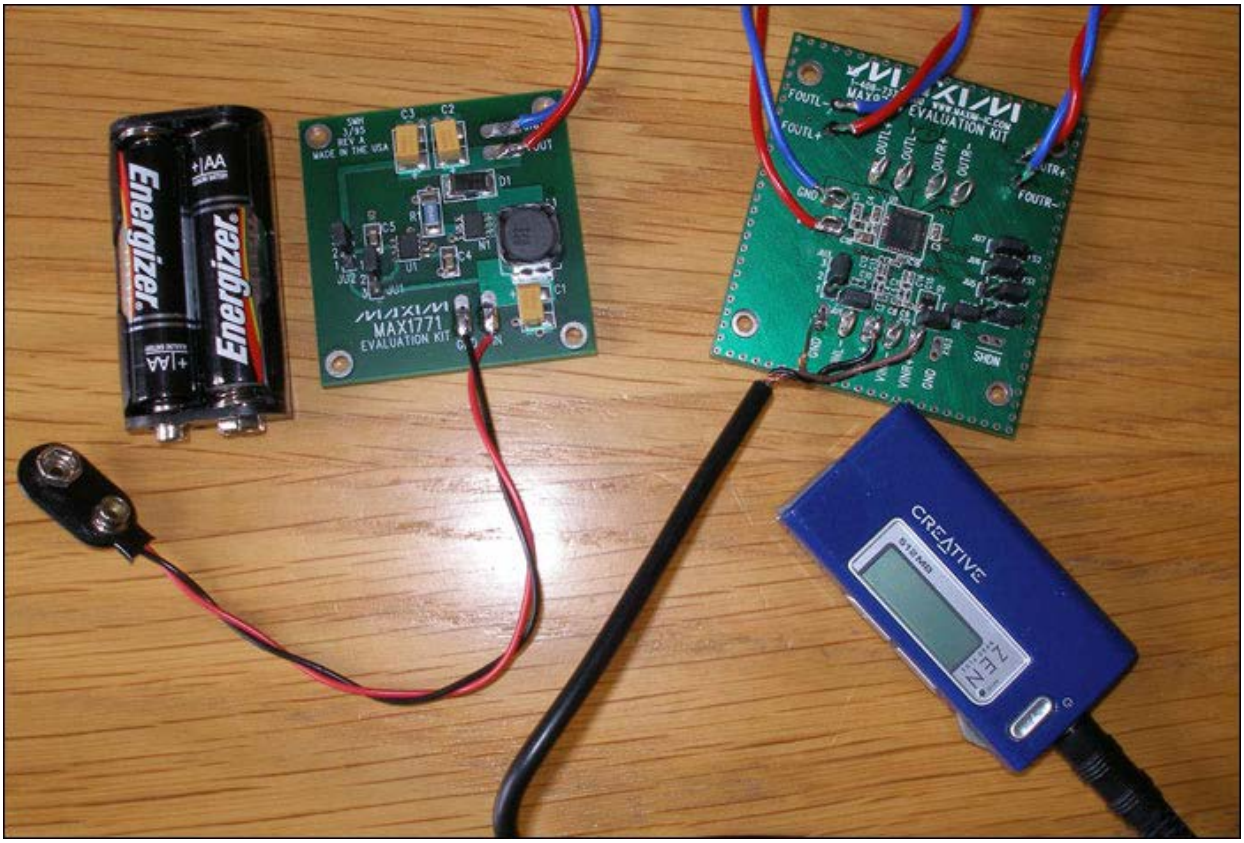
Abstract: Class D audio amplifiers like the MAX9704 offer almost 90% efficiency, but they need 10V to operate. By incorporating a switched-mode boost converter (MAX1771), which generates 12V from inputs down to 2V and delivers output currents up to two amperes, this class D amplifier can operate from a pair of AA cells.

A similar version of this article appeared in the March 11, 2008 issue of *Electronic Design* magazine.

Class D audio amplifiers from Maxim offer almost 90% efficiency, but they need 10V to operate, and (for battery-operated systems) 10V requires a large number of batteries wired in series. You can avoid bulky battery packs by incorporating a switched-mode boost converter (MAX1771), which generates 12V from inputs down to 2V, and delivers output currents up to two amperes. The battery-operated class D amplifier can then operate from a pair of AA cells.

Maxim provides evaluation boards (EV kits) for both the Class D amplifier (MAX9704) and the boost converter. You simply wire them together and connect two AA alkaline cells, an MP3 player for the audio source, and a pair (in this case) of Celestion Ditton 44 loudspeakers (**Figure 1**).



More detailed image (PDF, 39MB)

Figure 1. Powered by a switching converter operating from two AA cells, this Class D amplifier (right-hand board) delivers 6W of speaker power for as long as four hours.

The results are stunning. Power output is limited by the MAX1771EVKIT, but the total available power, estimated at 6 watts, is utilized with high efficiency by the class D amplifier. The volume from this simple circuit is amazing, and allows the estimated battery life of two AA cells (over 4 hours) to provide a full evening of loud entertainment.

The technique can also provide uninterrupted audio in an automobile, allowing entertainment to continue at full volume while the engine is being cranked. That capability will be of increasing interest when a proposed law requires car engines to stop at traffic lights, and then re-start when the throttle is depressed. The voltage from a 12V battery dips as low as 6V when the car is cranked during cold conditions, and that drop in supply voltage can have a substantial effect on the audio amplifier. Rear-seat applications can also benefit from this circuit, because DVD players initiate a relatively long reset period when their power supply is interrupted. DVD-based navigation systems, too, need protection from supply dropouts.

Again, the main limitation on power output is the MAX1771EVKIT, whose maximum output current at 6V is 0.5A. The kit can be modified to deliver as much as 2A, which boosts the power output (at 6V) to 24W. Two AA batteries can support this power output as before, but perhaps not for four hours!

Related Parts		
MAX1771	12V or Adjustable, High-Efficiency, Low I_Q, Step-Up DC-DC Controller	Free Samples
MAX1771EVKIT	Evaluation Kit for the MAX1771	
MAX9704	10W Stereo/15W Mono, Filterless, Spread-Spectrum, Class D Amplifiers	Free Samples

More Information
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