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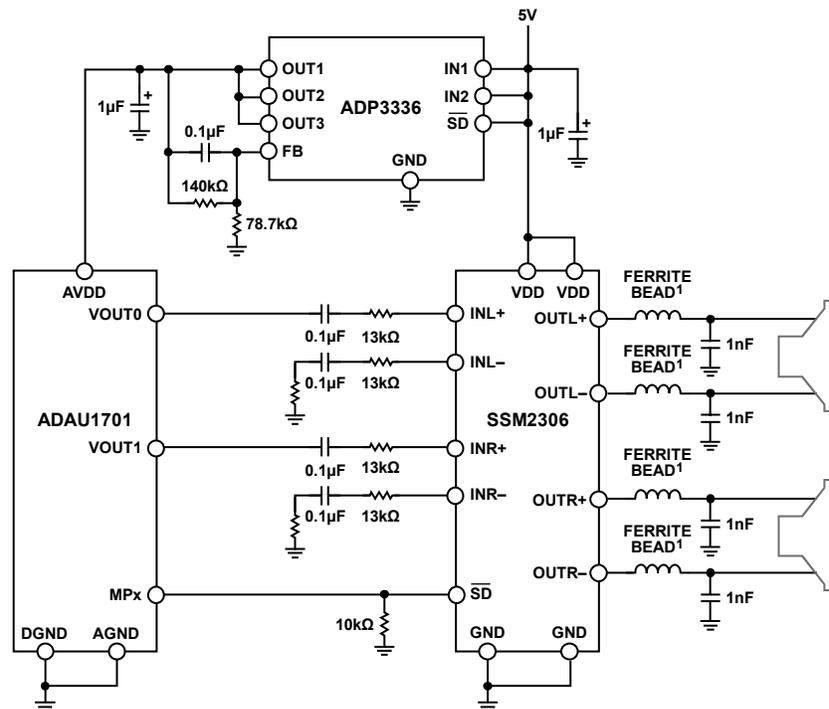
Devices Connected/Referenced	
ADAU1701	SigmaDSP® Codec
SSM2306	Class-D Amplifier
ADP3336	LDO Voltage Regulator

## Analog Audio Input, Class-D Output with the ADAU1701 SigmaDSP Codec, Low Power SSM2306 Class-D Amplifier, and ADP3336 LDO Regulator

### CIRCUIT FUNCTION AND BENEFITS

The circuit shown in Figure 1 connects an ADAU1701 codec with an integrated SigmaDSP® core to an SSM2306 2 W stereo Class-D amplifier and an ADP3336 low dropout regulator. The ADAU1701 has two ADCs and four DACs; therefore, it can process a stereo audio signal and output discretely processed signals to both a line-level output and an amplified output. This allows the line and amplified outputs to be processed in the SigmaDSP core with different signal processing, such as custom EQ, compressors tailored to the clip level of the specific output,

or spatialization effects tuned to the specific speaker configurations. The ADP3336 generates the 3.3 V supply for the ADAU1701. The SSM2306 is a stereo 2 W Class-D amplifier with ultralow idle current and high efficiency. The amplifier does not require bulky external inductors, but it does require minimal external components and has a small system footprint. The amplifier's voltage is not supplied from the regulator but rather directly from the 5 V system supply. This system can provide an audio signal processing path output to a low power efficient amplifier for systems such as radios, multimedia docks, or PC speakers.



NOTES  
 1. TDK MPZ1608S601A

09076-001

Figure 1. Class-D Amplifier Connection to Audio Codec and Voltage Regulator (Simplified Schematic: Power Supply Decoupling and All Connections Not Shown)

### Rev. 0

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## CIRCUIT DESCRIPTION

The DAC outputs of the ADAU1701 are connected to the SSM2306 with a single resistor and capacitor on each input of the amplifier. The 0.10  $\mu\text{F}$  capacitors and 13.0 k $\Omega$  resistors in series between the output of the ADAU1701 and the input of the SSM2306 implement a high-pass filter at 28 Hz. These resistors also set the gain of the amplifier to about 6 dB. The full-scale output of the ADAU1701 is 0.9 V rms; therefore, the SSM2306 amplifies this to a full-scale 1.8 V rms (5.09 V p-p). With the SSM2306's  $V_{\text{DD}} = 5\text{ V}$ , this full-scale value closely matches the clip level of the amplifier.

This circuit uses one of the ADAU1701 multipurpose (MP) pins to control the active-low shutdown pin of the SSM2306. This connection, with a 10 k $\Omega$  pull-up resistor, enables the SigmaDSP program to cleanly disable the Class-D amplifier without pops and clicks.

The Class-D amplifier outputs of the SSM2306 are stable with just a ferrite bead and a 1.0 nF capacitor on each pin before the speaker.

The SSM2306 can take its supply voltage directly from the 5 V supply, such as from a battery, but the ADAU1701 requires a regulated 3.3 V supply, which is generated by the ADP3336. The output voltage of the ADP3336 is programmed to 3.3 V with 140 k $\Omega$  and 78.7 k $\Omega$  feedback resistors. The output of the regulator is stable with a single capacitor as low as 1.0  $\mu\text{F}$  between the output pins and ground. The 1.0  $\mu\text{F}$  capacitor on the input of the regulator is used for decoupling any stray inductance between the board and the 5 V source. In this circuit, the shutdown pin of the regulator is simply tied to the input voltage so that the IC is enabled when the input voltage is present.

## COMMON VARIATIONS

This circuit can also be set up with another SigmaDSP processor with integrated DACs, such as the [ADAU1761](#), instead of the ADAU1701. The [ADAU1702](#) can also be used in place of the ADAU1701; it differs only in its SigmaDSP program and data memory sizes.

The [SSM2301](#), [SSM2302](#), and [SSM2304](#) Class-D amplifiers differ slightly from the SSM2306 used in this design. These three amplifiers do not require external resistors on the audio inputs to set the gain. The SSM2301 is a mono, rather than a stereo, amplifier.

## LEARN MORE

Eric Gaalaas, "Class D Audio Amplifiers: What, Why, and How," *Analog Dialogue*, 40-06, June 2006.

### Data Sheets and Evaluation Boards

[ADAU1701 Data Sheet.](#)

[SSM2306 Data Sheet.](#)

[SSM2306 Evaluation Board.](#)

[ADP3336 Data Sheet.](#)

[EVAL-ADAU1701MINIZ Evaluation Board.](#)

## REVISION HISTORY

6/10—Revision 0: Initial Release

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