Technical Article

Avoid Noise Pollution in Hi-Fi Systems with Low-noise Power Supply

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High-fidelity (Hi-Fi) audio is a combination pure and harmonic sounds, so captivating that the listener is transported to a higher level of bliss and happiness. Thanks to technological advances the Hi-Fi experience is becoming widely available in portable devices like smart phones, tablets, media players and many more.

Figure 1 shows the main components that contribute to Hi-Fi audio; at the center of the diagram is the power management (PM) system. The PM directly affects every component in the audio signal chain. It's essential to design a low-noise and low-ripple power supply to avoid unwanted signals that can affect the noise-sensitive components in the systems.

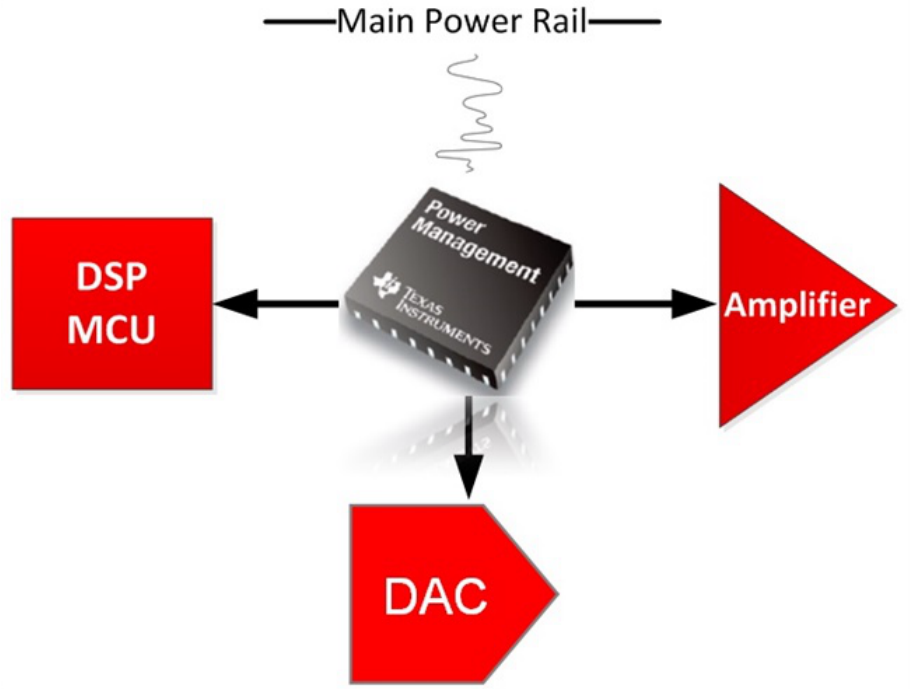

Figure 1. Main components for Hi-Fi audio systems

High efficiency switch-type regulators could be used to power the system; however, the switching and ripple noise common to switch-type regulators may harm the signal integrity and create an audible pop or hum noise in the audio system. External filters can reduce the noise but increase complexity, cost and total solution size. Luckily, noise reduction and ripple rejection can be obtained with an easy-to-implement, small size and low cost linear regulator (LDO). LDOs keep the output voltage regulated with line and load variations even under very small input/output voltage differences (also known as dropout voltage).

Detailed information and test data of a low-noise power supply for Hi-Fi applications can be obtained by looking at one example in a reference design for audio applications, TIDA-00571. Figure 2 from the TIDA-00571 design compares the noise density of the TPS62203 buck regulator with the LP5907 LDO; the buck converter has a notorious spike and subsequent harmonics within the audio bandwidth of 20 Hz and 20 kHz.

Figure 3 compares the LP5907 (LDO) and TPS65130 EVM (buck-boost).It is notorious that the white noise is higher in the buck-boost device, adding an LDO after the buck-boost will greatly improve the noise over a wide range of frequencies.

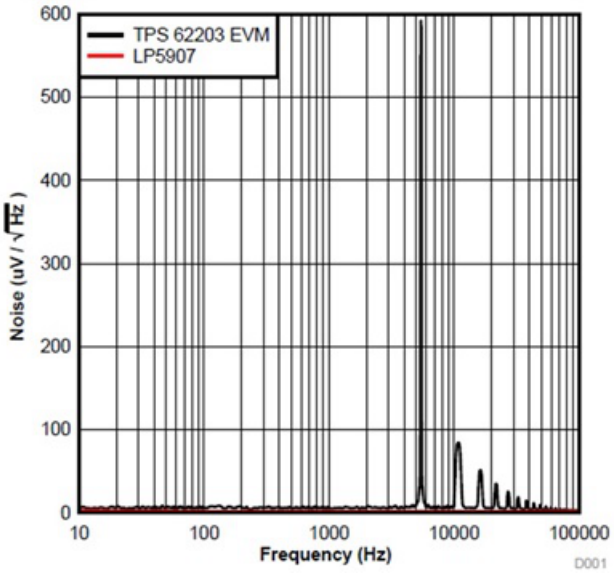

Figure 2. Comparison between TPS62203 EVM and LP5907

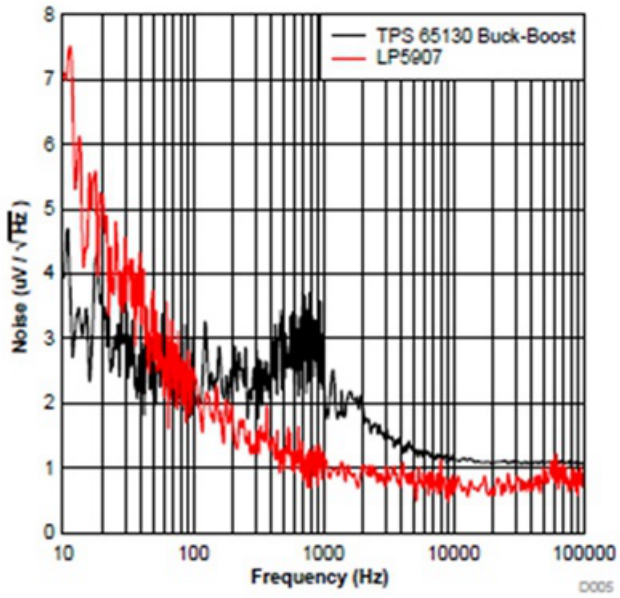

Figure 3. Noise comparison between TPS65130 Buck-Boost and LP5907

Figure 4 compares the output ripple of the boost converter with the quiet output voltage of the LP5907. The notorious 45mV in the blue trace is nonexistent at the LDO output.

As we have seen LDOs offer considerable benefits over switching topologies for noise-sensitive applications, especially in the low frequencies range like Hi-Fi audio systems.

For other design advice related to LDOs, check out other blog posts.

Additional Resources:

- Find help designing a quiet power supply with this TI Designs reference design.
- Consider the low noise and small footprint LP5907 for your next design.
- Learn more about our LDO portfolio at http://www.ti.com/ldo.

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