

CS35L41

11 Volt Boosted Class D Audio Amplifier with DSP

Featuring Speaker Protection, Audio Enhancement
and Advanced Battery Management



Maximize loudness with 11 V output and SoundClear® Playback speaker protection

Enrich sound quality with integrated DSP and SoundClear Playback enhancement

Minimize power consumption with Class H boost and low quiescent power

Intelligently regulate battery current with predictive battery management

Save space with 5.64 mm² package footprint

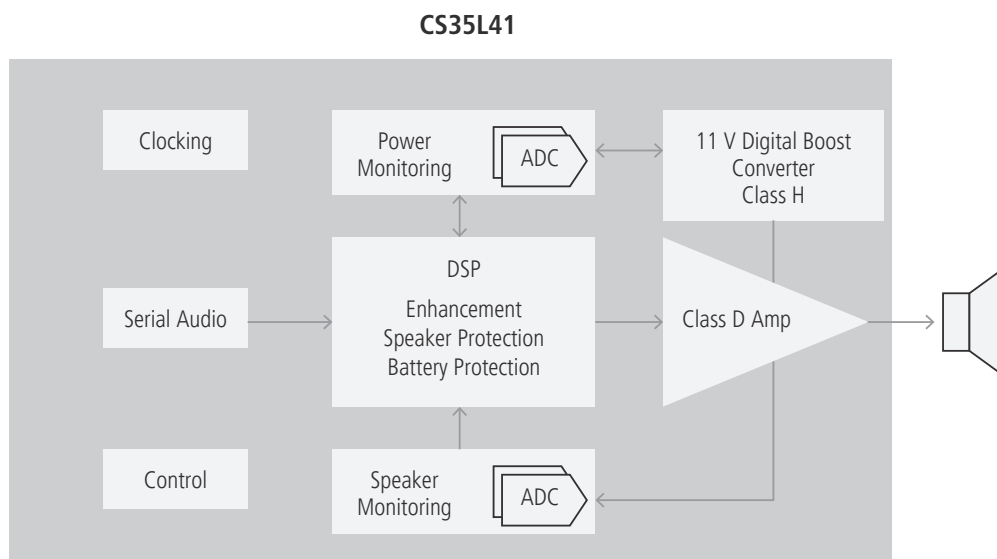
Product Overview

The CS35L41 is the industry's first 55 nm smart audio amplifier solution with integrated DSP. This device features a mono 5.3 W boosted Class D amplifier that provides very loud audio without compromising sound quality, high efficiency and the lowest noise and quiescent power consumption of any amplifier in its class. Voltage and current sensing feedback at the speaker output and battery improves the accuracy of the amplifier and integrated algorithms. Speaker protection algorithms enable maximum loudness by allowing the amplifier to safely drive high output power while ensuring that the speaker's thermal and excursion limits are not exceeded. Audio enhancement algorithms provide equalization, compression and psychoacoustic improvements to fine-tune the speaker to improve clarity, loudness and frequency response while maintaining the sound quality of the audio. A cutting-edge battery management system adapts to speaker, audio and battery conditions to intelligently regulate battery current without sacrificing loudness or audio quality. The CS35L41 provides this level of performance within a package smaller than any smart amplifier in its class, and almost half the size of other leading DSP smart amps.

System Features

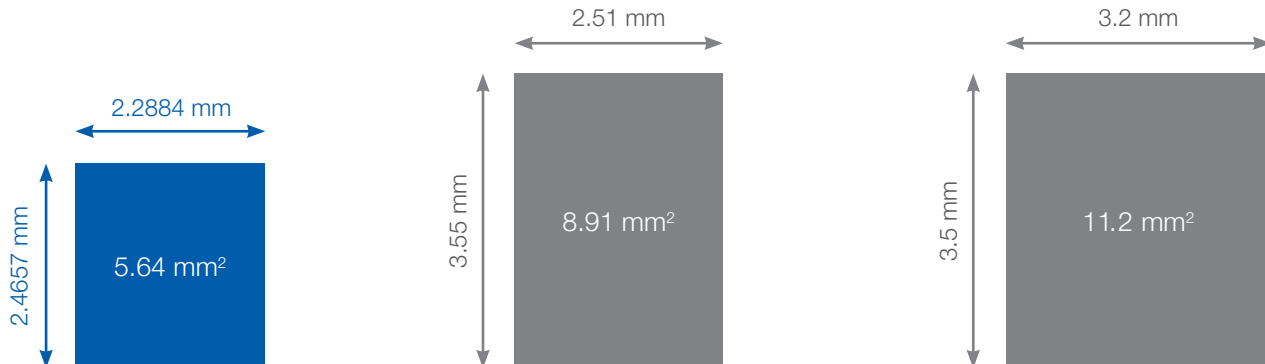
- Boosted output – 11 V
- High output power – 5.3 W
- Idle channel noise – 9 μ V
- Low quiescent power – 6.7 mW
- Integrated DSP
- SoundClear® Playback enhancement and speaker protection
- Advanced battery management system
- I²S, I²C, PDM inputs
- Supply voltage – 2.5 V to 5.5 V
- Stereo configuration using two CS35L41 devices
- Space Saving 30-ball WLCSP package – 5.64 mm² footprint, 0.4 mm pitch

Product Block Diagram



Space Saving Package

CS35L41 Package Size and Footprint



Enhanced Audio and Battery Performance

Audio Enhancement

Cirrus Logic's SoundClear Playback provides the ability to fine tune the CS35L41 to the specific micro speaker being used in the mobile system. Equalization, compression and psychoacoustic enhancement algorithms improve sound clarity and increase loudness. Playback filtering compensates for the unique frequency response of the speaker while eliminating pre-ringing found in conventional linear phase filters as shown in Figure 1. These algorithms are integrated into the on-chip DSP and prevent additional workloads from being placed on the application processor.

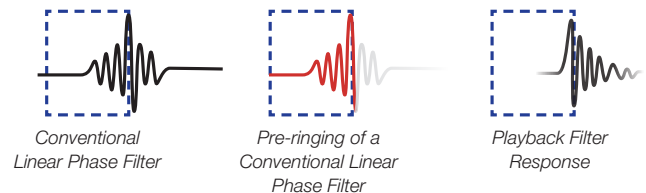


Figure 1 – Playback Filtering

Battery Management

The CS35L41 preserves battery life using an advanced battery management system in addition to its Class H boost and extremely low quiescent current. As illustrated in Figure 2, the Class H DC-DC converter boosts the supply while maintaining higher efficiency than the Class G boost regulators commonly used in other smart amplifiers. The battery management system predictively adapts to changing audio, speaker and battery conditions by intelligently regulating battery current to protect the amplifier from drawing high currents that can cause a system brownout if managed incorrectly. Figure 3 shows that by predictively managing the demand on the battery, the amplifier is able to maximize loudness and audio quality while minimizing the power impact to the mobile device.

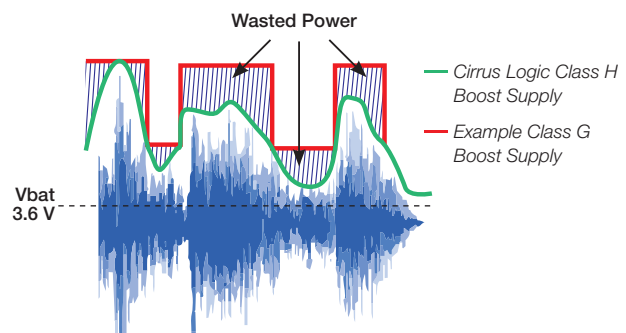


Figure 2 – Class G and Class H Supply Rail Voltage vs. Time

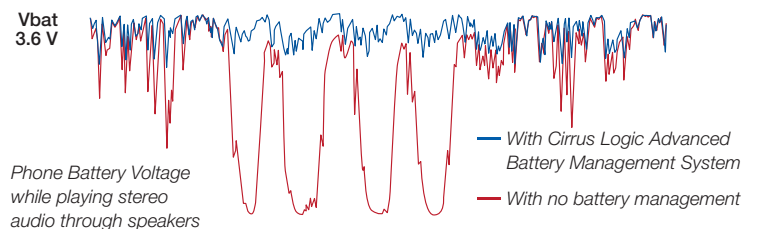


Figure 3 – Predictive Battery Management Performance



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