School of Electrical, Computer and Energy Engineering

M.S. Final Oral Defense
Design and Analysis of a Dual Supply Class H Audio Amplifier

by
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Abstract
Efficiency of components is an ever increasing area of importance to portable applications, where a finite battery means finite operating time. Higher efficiency devices need to be designed that don't compromise on the performance that the consumer has come to expect. Class D amplifiers deliver on the goal of increased efficiency, but at the cost of distortion. Class AB amplifiers have low efficiency, but high linearity. By modulating the supply voltage of a Class AB amplifier to make a Class H amplifier, the efficiency can increase while still maintaining the Class AB level of linearity. A 92dB PSRR Class AB amplifier and a Class H amplifier were designed in a 0.24um process for portable audio applications. Using a multiphase buck converter increased the efficiency of the Class H amplifier while still maintaining a fast response time to respond to audio frequencies. The Class H amplifier had an efficiency above the Class AB amplifier by 5-7\% from 5-30mW of output power without affecting the THD at the design specifications. The Class H amplifier design met all design specifications and showed performance comparable to the designed Class AB amplifier across 1kHz-20kHz and 0.01mW-30mW. The Class H design was able to output 30mW into 16\ Omega without any increase in THD. This design shows that Class H amplifiers merit more research into their potential for increasing efficiency of audio amplifiers and that even simple designs can give significant increases in efficiency without compromising linearity.