Analysis and experiments for high-efficiency class-F and inverse class-F power amplifiers
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Summary: This paper presents analytic and experimental comparisons for high-efficiency class-F and inverse class-F amplifiers. The analytic formula of the efficiencies, output powers, dc power dissipations, and fundamental load impedances of both amplifiers are derived from the ideal current and voltage waveforms. Based on the formula, the performances are compared with a reasonable condition: fundamental output power levels of class-F and inverse class-F amplifiers are conditioned to be identical. The results show that the inverse class-F amplifier has better efficiency than that of class-F amplifiers as the on-resistance of the transistor increases. For experimental comparison, we have designed and implemented the class-F and inverse class-F amplifiers at 1-GHz band using a GaAs MESFET and analyzed the measured performances. Experimental results show 10% higher power-added efficiency of the inverse class-F amplifier than that of the class-F amplifier, which verifies the waveform analysis.

Maximum efficiency and output of class-F power amplifiers
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Summary: A class-F power amplifier (PA) improves efficiency and power-output capability (over that of class A) by using selected harmonics to shape its drain-voltage and drain-current waveforms. Typically, one waveform (e.g., voltage) approximates a square wave, while the other (e.g., current) approximates a half sine wave. The output power and efficiency of an ideal class-F PA can be related to the Fourier coefficients of the waveforms, and Fourier coefficients for maximally flat waveforms have been determined. This paper extends that theory by determining the coefficients for the maximum power and efficiency possible in a class-F PA with a given set of controlled harmonics.
A high-efficiency inverse class-F power amplifier using GaN HEMT
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inverse class-F • high efficiency • power amplifier • GaN HEMT

ABSTRACT
The design and fabrication of a high-efficiency inverse class-F power amplifier using a 10-W gallium nitride (GaN) high-electron mobility transistor at 1 GHz is presented. The output load network has been used to control harmonic components for high-efficiency operation. The measurement results show that power-added efficiency of 74.2%, drain efficiency of 77.5%, and gain of 13.7 dB at an output power of 39.8 dBm for a continuous wave signal. © 2008 Wiley Periodicals, Inc. Microwave Opt Technol Lett 50: 2420-2422, 2008; Published online in Wiley InterScience (www.interscience.wiley.com). DOI 10.1002/mop.23678