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HIGH EFFICIENCY SWITCHING CLASSES RF POWER AMPLIFIERS IN WIRELESS COMMUNICATION

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Abstract:
Energy and power consumption have always been the most important issues for any communication system. Efficient energy and power management requires a deep insight knowledge of where and how the energy is consumed. In this paper, a detailed analysis of power consumption in wireless communication especially in cellular systems is presented with a brief overview of global system for mobile (GSM) communication architecture. Unfortunately, the cellular system dissipates huge amount of power and energy due to poor power-added-efficiency (PAE) of power amplifiers (not more than 20%). For high PAE, a fully integrated 1.8 GHz differential Class-E power amplifier, implemented in 0.13 µm (0.43 µft) complementary metal-oxide-semiconductor (CMOS), is presented. With great emphasis on power and energy issues, the novel use of lattice LC (L and C represents inductor and capacitor, respectively) balun is proposed which results in a differential amplifier with less number of inductors and capacitors, and subsequently decreases power dissipation. The replacement of traditional parallel inductor and series resonant circuit by a series capacitor and parallel resonant circuit respectively improves the performance and decreases the chip area. The amplifier delivers 19.3 dBm power to a load of 50W from a dc supply of 2.5V at 1.8GHz. An overall PAE is 44% including input driving and output balun stage. To minimize energy and power crisis in future technologies, a novel design is also proposed in this paper that eradicates the trade-off between linearity and PAE in a communication system. In this design, PAs are based on digital controlled oscillator (DCO). The proposed design can deliver high output power with minimum input power (oscillator control power) due to high amplification ratio.

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