

Design of a one-watt level RF power amplifier for smartphones

Abstract

Smartphones, embodying wireless data and voice communication means, are increasingly the wireless communications transceiver (phone) of choice. Nevertheless, the primary complaint of smartphone users is the short battery lifespan between charges, and this complaint is exacerbated with the increasing speed and amount of data communications, particularly with the existing 4G Long Term Evolution (LTE) data and impending 5G data communication protocols.

The radio frequency power amplifier (RF PA) is one of the most critical blocks in the smartphone, in part because it is the most power-dissipative block therein. To address the said short battery lifespan, it is imperative that the power dissipation of the RF PA be low and its power-efficiency high.

The objective of this MEng program is to design a fully integrated one-watt RF power amplifier using 65nm CMOS process. To achieve one-watt output power, the power-combining technique is applied to combine two power cells. The linearity and efficiency issues related to the chip, package, printed circuit board are discussed. Further objectives include LTE applications and linearity and efficiency improvement for LEES-SMART InGaAs-on-CMOS process.