



A 60W Compact Highly Efficient Wideband Class-E Power Amplifier

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By

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ABSTRACT

With the rapid growth of wireless communication systems, there is more and more demand for radio frequency power amplifiers (RFPAs) in base stations to be power-efficient so as to reduce the cooling and electrical power cost. Besides the efficient requirement, wide-band working frequency and compact PCB size are also attractive for cutting more cost. This thesis deals with a switch-mode Class E power amplifier which provides wide-band, highly efficient and compact size performance, with a 60W GaN HEMT device. A mathematical model for Class E amplifier is presented and analyzed. Based on the model, a novel design procedure for wide-band power amplifier design is proposed. The input/output matching networks in the amplifier are built by bondwires and pre-matching capacitors so as to give an extremely compact size. The 60W compact wide-band power amplifier is then implemented with PCB to verify the concept. A wide-band measured output power performance is observed over 1.7GHz - 2.3GHz in the range of 40-65W and the measured drain efficiency is between 66% and 74%; measured PAE is between 61% and 70%. Transducer power gain is $12\text{dB} \pm 1\text{dB}$ over the frequency range. Besides the amplifier, additional work is about large signal device modeling with PolyHarmonic Distortion model which is based on acquiring X-parameters of a device.

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