Part III

Energy Efficient Amplifiers and Drivers

The third part of this book is dedicated to recent developments in the field of Energy Efficient Amplifiers and Drivers. Some papers deal with theoretical limitations and circuit solutions, while others address problems at the system level.

The first paper from Klaas Bult (Delft University) presents a comprehensive method of estimating the power dissipation of residue amplifiers. This method is then used to analyze the power efficiency of some recently published residue amplifiers. The most power efficient topologies share the same core circuits and mainly differ in how these are driven by the input signal. Finally, an overview is given of these topologies, ranked according to their power efficiency.

The second paper from Youngcheol Chae (Yonsei University) discusses the design and biasing of energy-efficient inverter-based amplifiers. The paper discusses recent developments and presents some examples of state-of-the-art designs.

The next two papers deal with class-D amplifiers, typically adopted for their energy efficiency.

In the third paper, Marco Berkhout (NXP Semiconductors) gives an overview of innovative class-D architectures and how they balance efficiency, EMI, and application cost.

In the fourth paper, Mark McCloy-Stevens (Cirrus Logic) presents a digital Class D amplifier architecture that combines open-loop and closed-loop configurations to provide high performance over the full signal range. At low signal levels, low noise and power is achieved with open-loop digital operation. At larger signal levels, a closed-loop digital Class D mode is used to deliver low THD and high PSRR with minimal analog circuitry.

In the fifth paper, Lorenzo Crespi (Synaptics) analyzes system and circuit solutions for improving efficiency in microphone audio interfaces. The main specifications of typical microphone interfaces are illustrated to exhibit the advances in their development toward the maximization of their efficiency in each block (preamplifiers and ADCs).

In the sixth paper, Khaled Khalaf (Imec) deals with efficiency improvement in digital transmitter implementations for millimeter wave wireless communication systems. Despite having a higher bandwidth baseband and more complex digital...
processing, high efficiency front-ends in digital polar architectures are closer to show a power consumption advantage in phased arrays, where the front-end contribution dominates.