Optimum phase shift in the self-oscillating loop for piezoelectric transformer-based power converters - DTU Orbit (25/12/2018)

Optimum phase shift in the self-oscillating loop for piezoelectric transformer-based power converters

A new method is implemented in designing of self-oscillating loop for driving piezoelectric transformers. The implemented method is based on combining both analog and digital control systems. Digitally controlled time delay through the self-oscillating loop results in very precise frequency control and ensures optimum operation of the piezoelectric transformer in terms of gain and efficiency. Time delay is implemented digitally for the first time through a 16 bit digital-to-analog converter in the self-oscillating loop. The new design of the delay circuit provides 45 ps time resolution, enabling fine-grained control of phase in the self-oscillating loop. This allows the control loop to dynamically follow frequency changes of the transformer in each resonant cycle. Ultimately, by selecting the optimum phase shift, maximum efficiency under the load and temperature condition is achievable.

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