

## ABSTRACT

### A UNIFIED MODEL FOR DC-DC CONVERTERS IN BOTH CONTINUOUS AND DISCONTINUOUS CONDUCTION MODES

DC-DC converters gained recognition in industry due to their high efficiency over the traditional linear DC voltage regulators. The contribution of this thesis is in developing accurate and detailed mathematical models for all popular DC-DC converters. These models proved effective for both modes of converter operation, namely Continuous Conduction Mode (CCM) and Discontinuous Conduction Mode (DCM). A complete study of the modeling techniques is conducted to determine their limitations and to provide a comparison that helps future researchers in utilizing these models. Unlike many previous works, the focus in this thesis is on utilizing the duty cycle as the main voltage regulating input due to its practical value. The nonlinear characteristic of the converters became prevalent when operating over a wide range of voltage and loading conditions. To demonstrate their effectiveness, the performance of the mathematical models is compared to that of detailed physical components computer simulations as a benchmark.

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