Sampled-data modeling of a single-ended primary inductor converter in discontinuous conduction mode

Yossawee Weerakamhaeng, author

Abstrak

ABSTRACT
This paper presents the small-signal modeling of a Single-Ended Primary Inductor Converter power stage operating in discontinuous conduction mode using the sampled-data modeling technique. In addition, two algebraic manipulating features are revealed; the simpler periodic solution determination by the concept of Volt-Second and Capacitor-Charge balance, and the replacement of the expression involving the singular matrix by the equivalent function with the s-domain matrix. Four pulse transfer functions are derived from the model: the smallsignal input-to-output voltage pulse transfer function, the small-signal duty duration-to-output voltage pulse transfer function, the input-to-output voltage pulse transfer function, and the duty duration-to-output voltage pulse transfer function. The model verification is analyzed by the simulation results. The response sequences from the pulse transfer functions oscillate by the same phase and frequency to the one from the simulation with slightly peak amplitude differences, confirming the validity of the acquired pulse transfer functions.