

## Abstract

As the speed and power demands on buck converters continue to increase, the linearly-controlled buck converters become inadequate for fast speed applications. In this work, three traditional control schemes—voltage mode control, current mode control, and hysteretic control—are studied and implemented. In addition, a new hybrid voltage mode control scheme is proposed to improve the transients of the buck converter. The hybrid scheme utilizes a sub-circuit to maintain charge balance on the output capacitor, thus reducing voltage spikes during transients. All the control schemes are simulated and evaluated based on the magnitude of the voltage spikes and the settling time. In the hybrid scheme, the output voltage overshoot and undershoot are reduced by roughly three times comparing to the conventional ones. The settling time is improved by approximately ten-folds.