Chapter 2: Converters in Equilibrium

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Chapter 2: Goals

- Develop techniques for easily determining output voltage of an arbitrary converter circuit
- Derive the principles of *inductor volt-second balance* and *capacitor charge (amp-second) balance*
- Introduce the key *small ripple approximation*
- Develop simple methods for selecting filter element values
- Illustrate via examples

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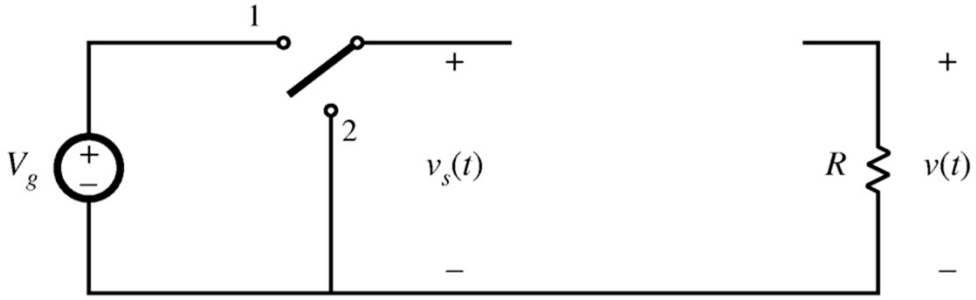
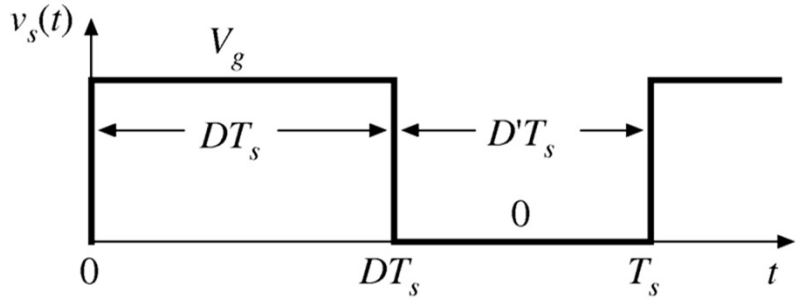
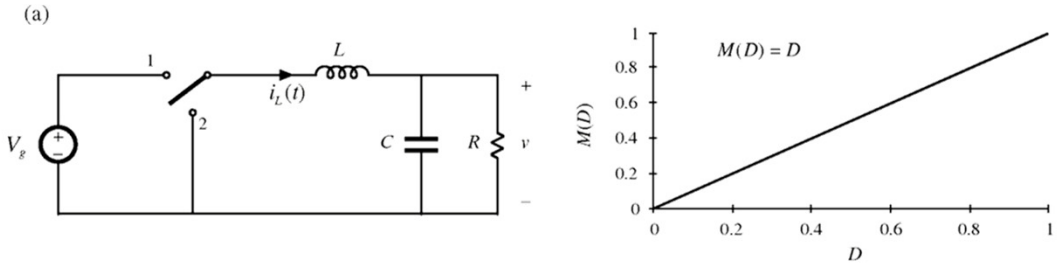
Buck Converter Review



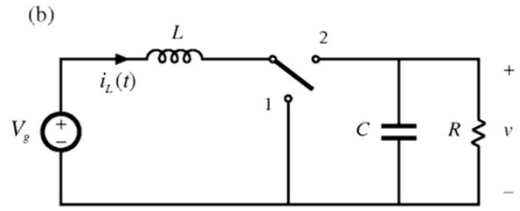


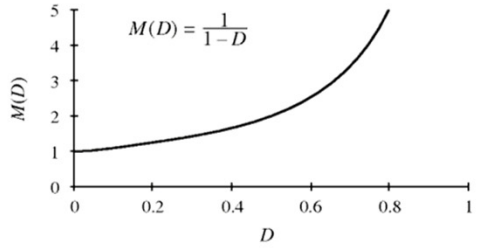
Three Basic DC-DC PWM Converters

Buck

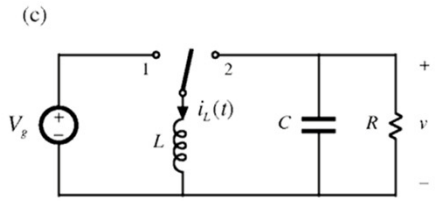


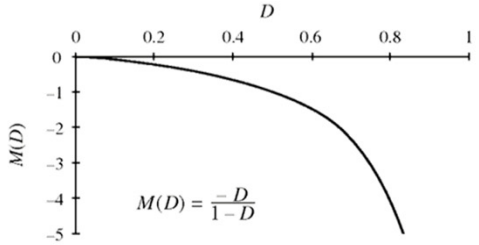
Boost



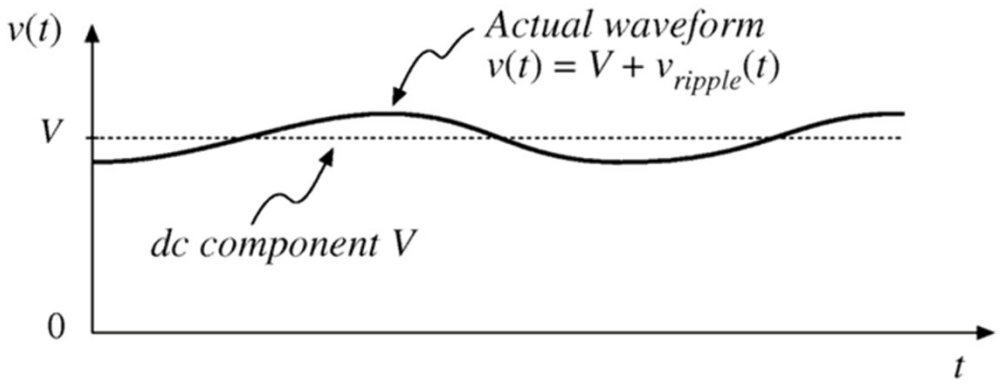


Buck-boost

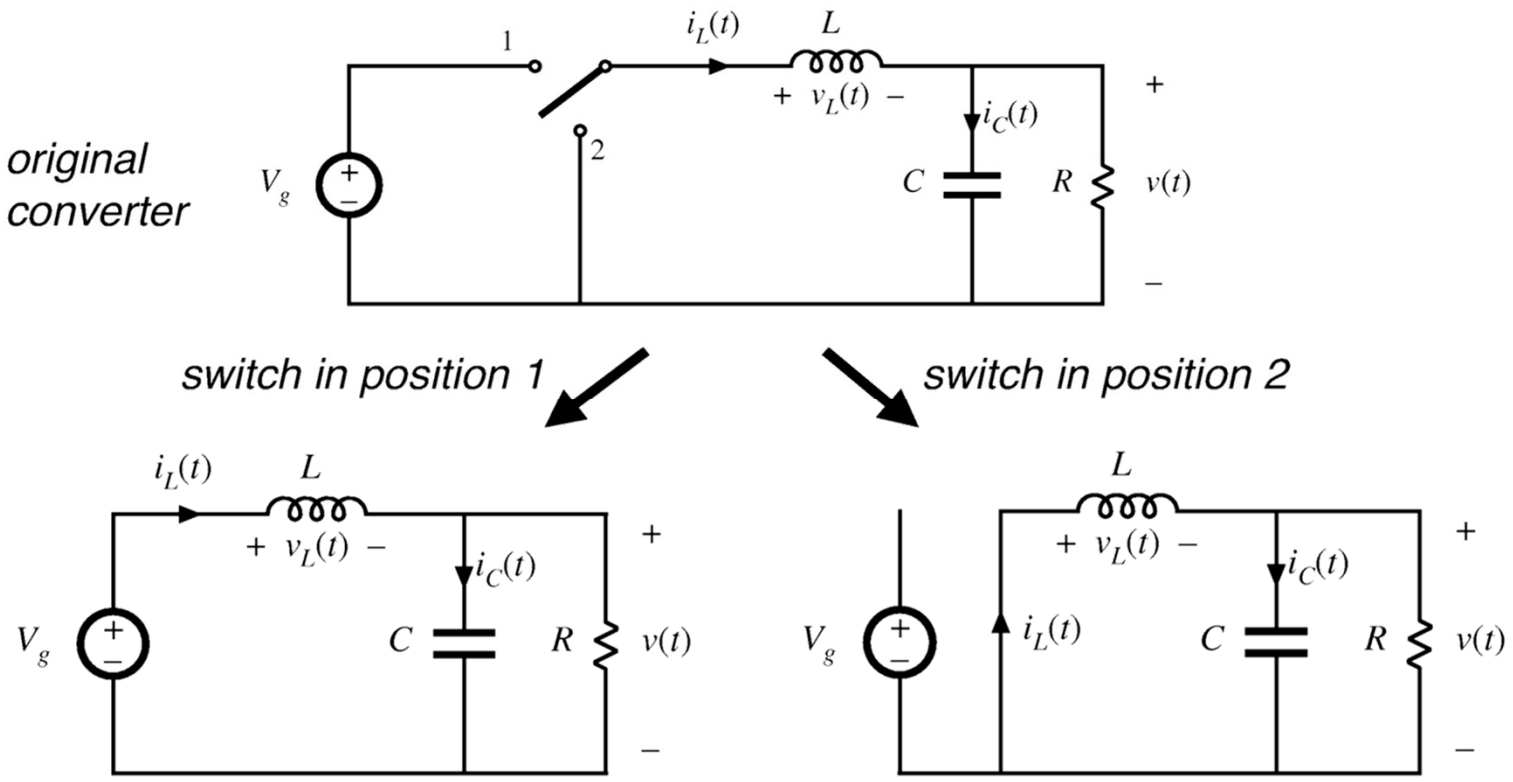




The Small Ripple Approximation



Buck Switching Intervals: Inductor Current



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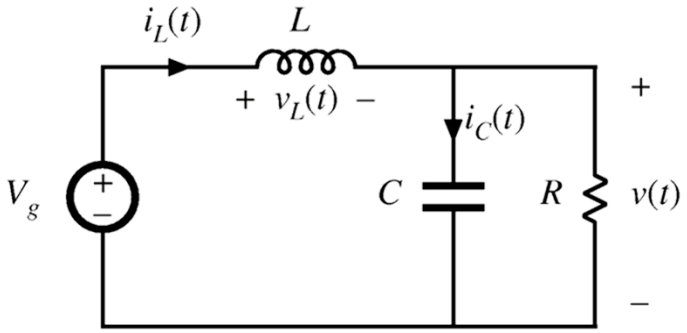
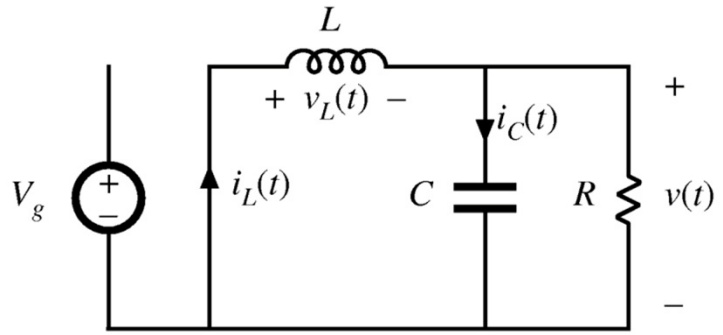
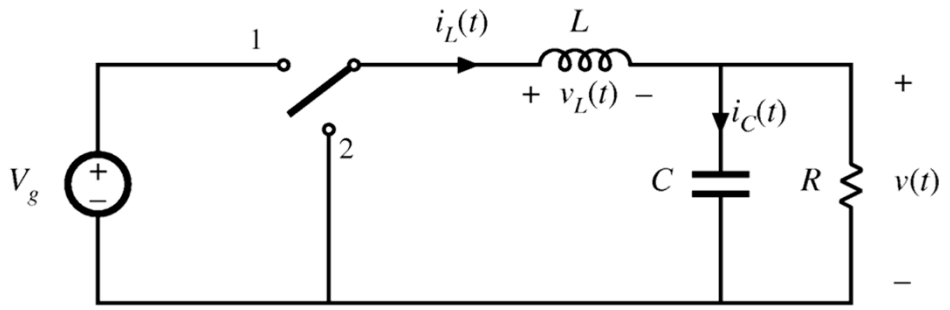
Subinterval 1

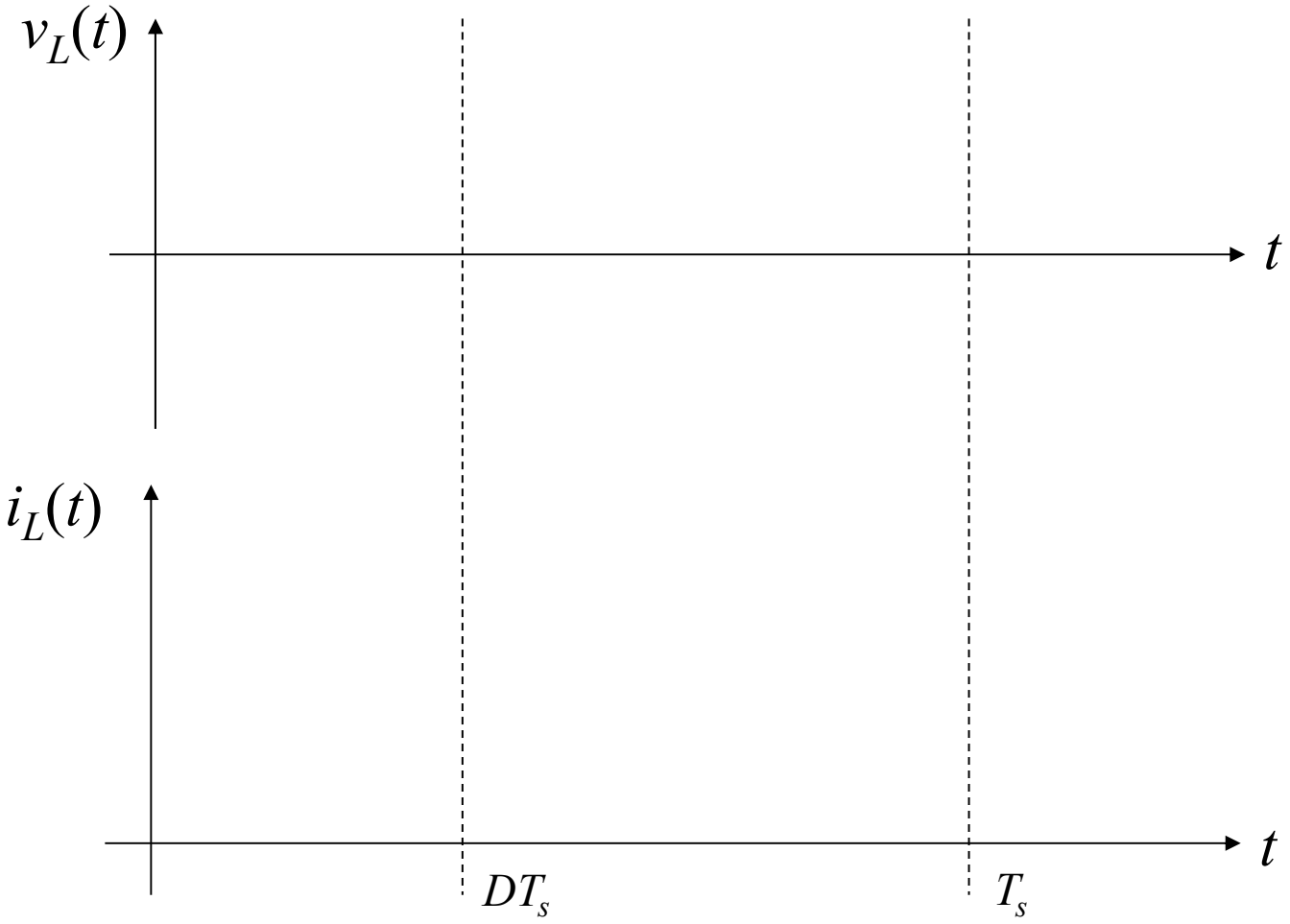


Subinterval 2

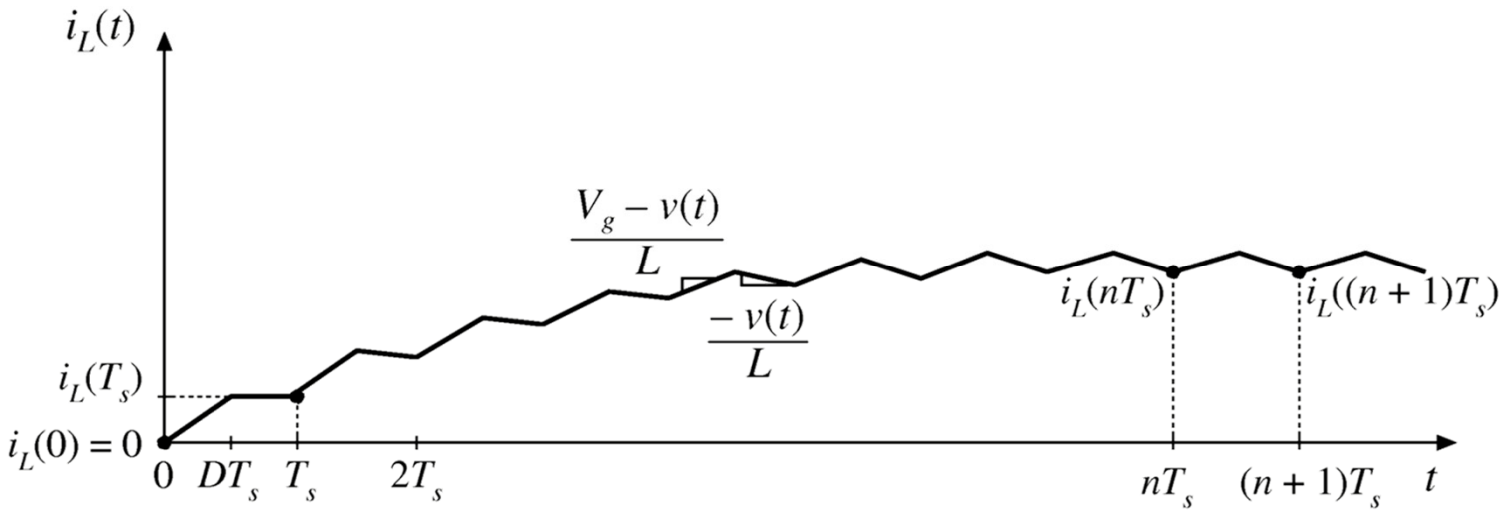


Current Waveform

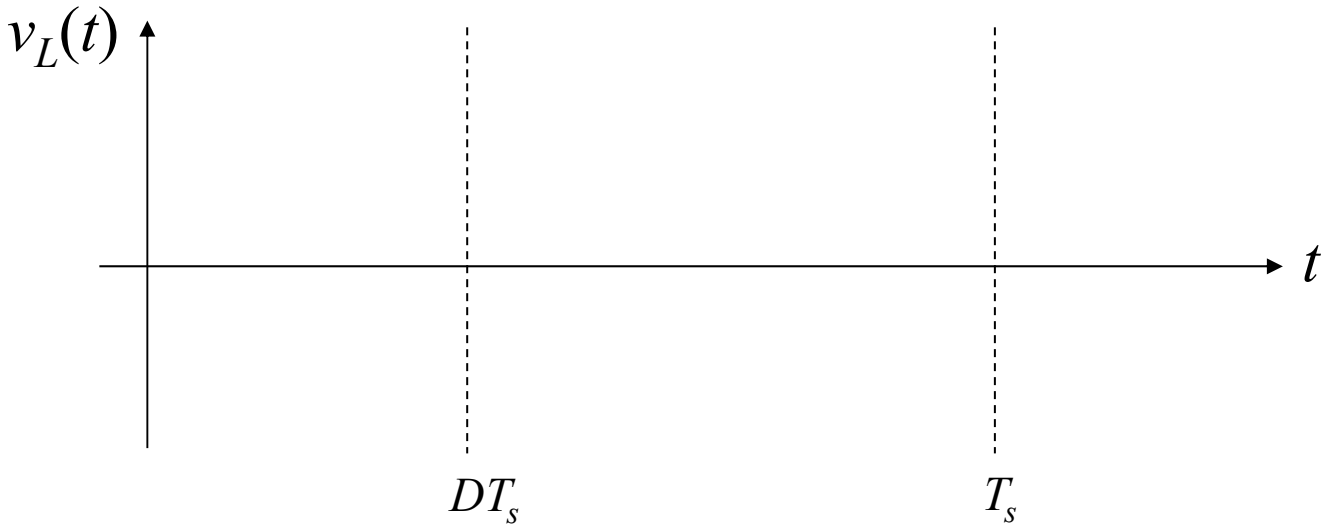


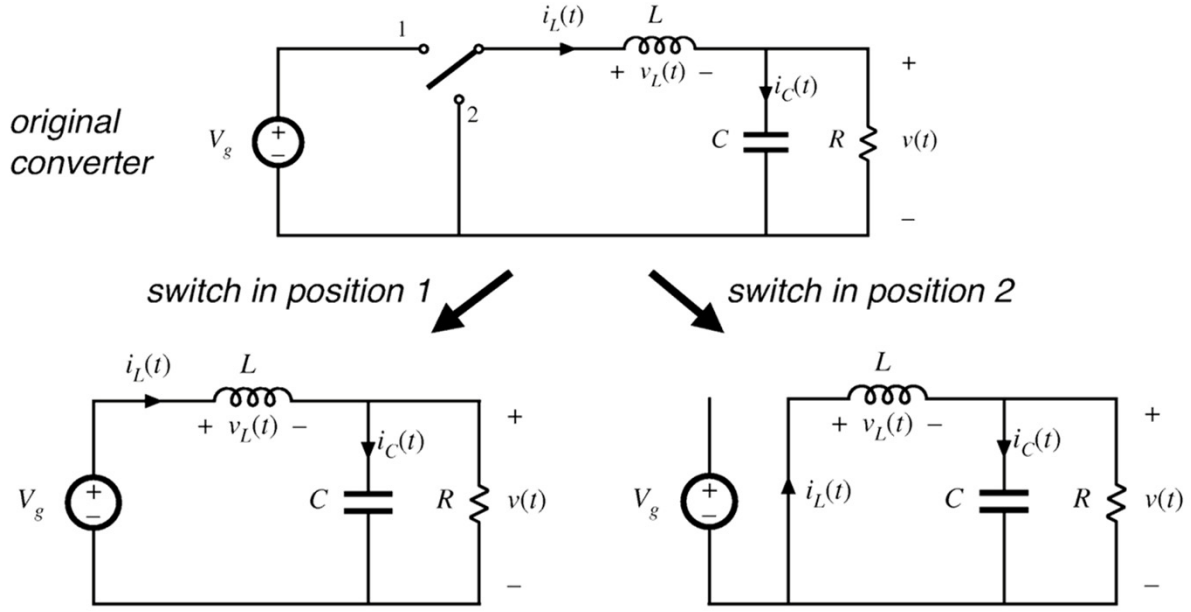


Transient vs. Steady-State Operation



Volt-Second Balance



Derivation of Volt-second Balance

Volt-Second Balance: Direct Application