Buck Converter Transfer Functıon Derivation

Average Model & Small Signal Circuits

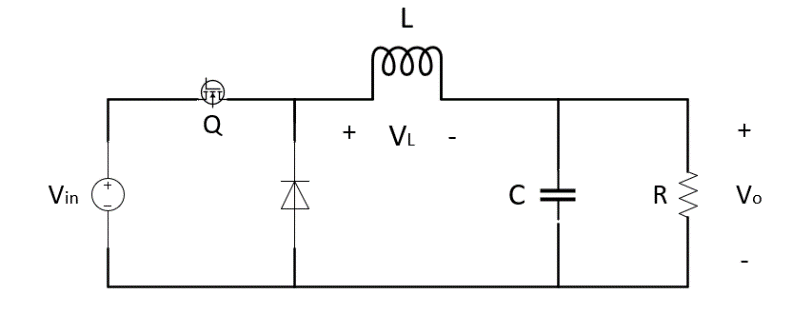
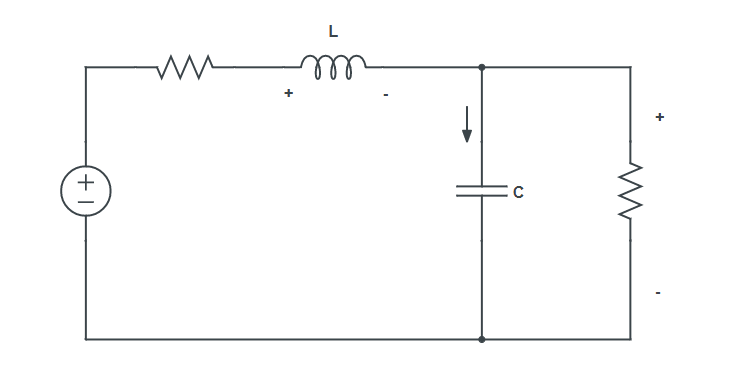
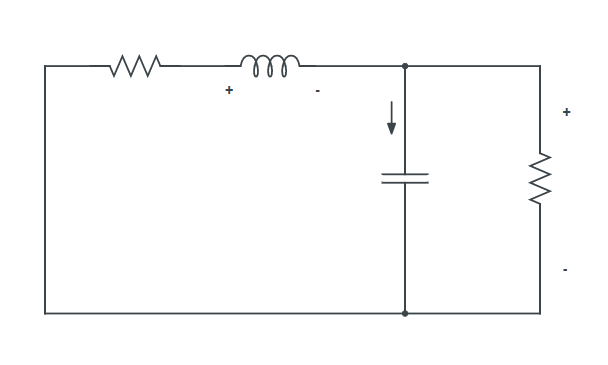


Figure 1. Buck Converter

*Interval I:* *Interval II*:

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1. **Averaged, Small Signal Circuit Description**

1. **Capacitor Charge & Volt. Second Balance Equations**
2. **Small Signal ‘’hat’’ Terms ( x(t) = X + )**

*Inductor:*

Single hat terms:

**Averaged Small Signal**

DC Terms:

**Averaged steady-state DC eqn.**

*Capacitor:*

Single hat terms:

**Averaged Small Signal**

DC Terms:

**Averaged Steady-State DC eqn**

*Input Current:*

**Very small compared to DC values, ignored.**

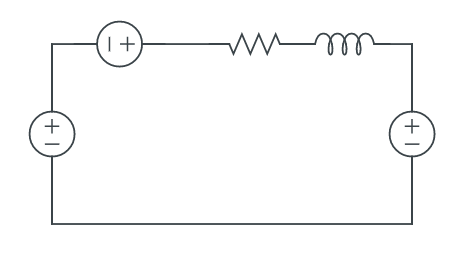
→ Averaged small signal

→ Steady-state DC signal

Small signal and steady-state DC signal analysis has been implemented. Now, they should be merged in one circuit to get the transfer function of the system.

*Inductor:*

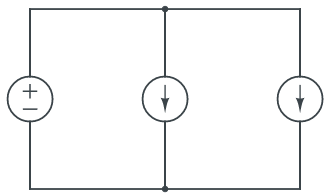
Small Signal Eqn:



*Input Current:*

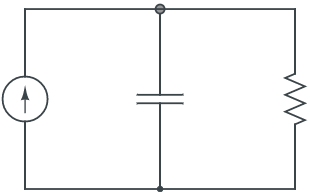
Small Signal Eqn:

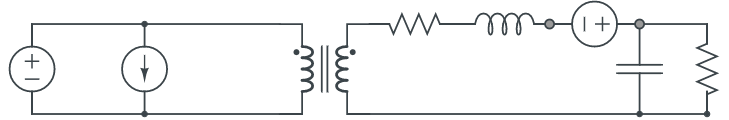
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*Capacitor:*

Small Signal Eqn:





1. **Control-to-Output Transfer Function**

If there is no resistance of the inductor, use this formula:

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