Equation Sheet

Magnetics:

- Faraday's Law: $v(t) = n\frac{d\Phi}{dt}$
- Ampere's Law: $\underbrace{\mathcal{F} = ni}_{\text{MMF "sources"}} = \underbrace{\oint_{\text{path}} \vec{H} \cdot \vec{\ell} \approx \sum H\ell}_{\text{"drops"}}$
- Flux: $\Phi = \oint_{\text{surface}} \vec{B} \cdot d\vec{A} \approx BA$
- Material Property: $B = \mu H = \mu_r \mu_\circ H$
- Reluctance: $\mathcal{R} = \frac{\ell}{\mu A_c}$
- Permeability of free space: $\mu_\circ$

Modeling in Continuous Conduction Mode:

- $0 = D(v_L$ averaged over ①$) + D'(v_L$ averaged over ②$)$.
- $0 = D(i_C$ averaged over interval ①$) + D'(i_C$ averaged over interval ②$)$.
- $v_L \approx L\frac{2\Delta i}{\Delta t}$ and evaluate in ① or ②.

Modeling in Discontinous Conduction Mode:

- $0 = D(v_L$ averaged over ①$) + D_2(v_L$ averaged over ②$) + D_3(v_L$ averaged over ③$)$.
- Diode current: $\langle i_{\text{d}} \rangle = \frac{1}{T_{\text{s}}} \underbrace{\int_0^{T_{\text{s}}} i_{\text{d}}(t)dt}_{\text{area}}.$
- Capacitor current: $\langle i_{\text{c}} \rangle = 0$.
- $v_L \approx L\frac{2\Delta i}{DT_{\text{s}}} = L\frac{i_{\text{pk}}}{DT_{\text{s}}}$ and evaluate in ①.