

$$\omega_{z2} = \frac{RD'^2}{L} \quad (\text{RHPZ})$$

$$\omega_{p1} = \frac{\frac{2}{R} + \frac{T_{sw}}{LM^3} \left(1 + \frac{S_e}{S_n}\right)}{C}$$

Current-mode, DCM:

Reference 2, 3, 4, and 5 equations:

$$\frac{V_{out}(s)}{V_{err}(s)} = F_m H_d \frac{\left(1 + \frac{s}{\omega_{z1}}\right) \left(1 - \frac{s}{\omega_{z2}}\right)}{\left(1 + \frac{s}{\omega_{p1}}\right) \left(1 + \frac{s}{\omega_{p2}}\right)} \quad (2A-17)$$

$$\omega_{z1} = \frac{1}{r_{Cf}C}$$

$$\omega_{z2} = \frac{R}{M^2 L} \quad (\text{high-frequency RHPZ}) \quad \text{In relation to } \omega_{p2}: \quad \omega_{z2} = \frac{\omega_{p2}}{1 - \frac{1}{M}} > 2F_{sw}$$

$$\omega_{p1} = \frac{1}{RC} \frac{2M-1}{M-1}$$

$$\omega_{p2} = 2F_{sw} \left( \frac{1 - \frac{1}{M}}{D} \right)^2 \geq 2F_{sw}$$

$$H_d = \frac{2V_{out}}{D} \frac{M-1}{2M-1}$$

$$F_m = \frac{1}{S_n m_c T_{sw}}$$

$$M = \frac{1 + \sqrt{1 + \frac{2D^2}{\tau_L}}}{2} \quad \text{with } \tau_L = \frac{L}{RT_{sw}}$$

### 2A.3 Buck-Boost

Voltage-mode, CCM

Reference 1 equations:

$$\frac{V_{out}(s)}{V_{err}(s)} = -\frac{V_{in}}{(1-D)^2 V_{peak}} \frac{\left(1 + \frac{s}{\omega_{z1}}\right) \left(1 - \frac{s}{\omega_{z2}}\right)}{1 + \frac{s}{Q\omega_0} + \left(\frac{s}{\omega_0}\right)^2} \quad (2A-18)$$