

# Models of Basic Converters, Current Loaded

## 1 DC model

	$V_{OUT}, V_C$	$I_{IN}$	$I_L$
buck	$D_0 V_{IN}$	$D_0 I_{OUT}$	$I_{OUT}$
boost	$\frac{V_{IN}}{D'_0}$	$\frac{I_{OUT}}{D'_0}$	$\frac{I_{OUT}}{D'_0}$
buck-boost	$-\frac{D_0}{D'_0} V_{IN}$	$-\frac{D_0}{D'_0} I_{OUT}$	$-\frac{1}{D'_0} I_{OUT}$

## 2 Pulse Width Modulation Control

	$\frac{\hat{v}_{OUT}(s)}{\hat{v}_{IN}(s)}$	$\frac{\hat{v}_{OUT}(s)}{\hat{i}_{OUT}(s)}$	$\frac{\hat{v}_{OUT}(s)}{\hat{d}(s)}$
buck	$\frac{D_0}{1 + s^2 LC}$	$-\frac{sL}{1 + s^2 LC}$	$\frac{V_{IN}}{1 + s^2 LC}$
boost	$\frac{1}{D'_0} \frac{1}{1 + s^2 \frac{LC}{D_0'^2}}$	$\frac{-s \frac{L}{D_0'^2}}{1 + s^2 \frac{LC}{D_0'^2}}$	$\frac{V_{IN}}{D_0'^2} \frac{1 - s \frac{LI_{OUT}}{D'_0 V_{IN}}}{1 + s^2 \frac{LC}{D_0'^2}}$
buck-boost	$-\frac{D_0}{D'_0} \frac{1}{1 + s^2 \frac{LC}{D_0'^2}}$	$\frac{-s \frac{L}{D_0'^2}}{1 + s^2 \frac{LC}{D_0'^2}}$	$-\frac{V_{IN}}{D_0'^2} \frac{1 + s \frac{LI_{OUT}}{D'_0 V_{IN}}}{1 + s^2 \frac{LC}{D_0'^2}}$

## 3 Current Mode Control

	$\frac{\hat{v}_{OUT}(s)}{\hat{v}_{IN}(s)}$	$\frac{\hat{v}_{OUT}(s)}{\hat{i}_{OUT}(s)}$	$\frac{\hat{v}_{OUT}(s)}{\hat{i}_L(s)}$
buck	0	$-\frac{1}{sC}$	$\frac{1}{sC}$
boost	$\frac{1}{D'_0} \frac{1}{1 + s \frac{CV_{IN}}{D'_0 I_{OUT}}}$	$-\frac{V_{IN}}{D'_0 I_{OUT}} \frac{1}{1 + s \frac{CV_{IN}}{D'_0 I_{OUT}}}$	$\frac{V_{IN}}{I_{OUT}} \frac{1 - s \frac{LI_{OUT}}{D'_0 V_{IN}}}{1 + s \frac{CV_{IN}}{D'_0 I_{OUT}}}$
buck-boost	$-\frac{D_0}{D'_0} \frac{1}{1 - s \frac{CV_{IN}}{D'_0 I_{OUT}}}$	$\frac{V_{IN}}{D'_0 I_{OUT}} \frac{1}{1 - s \frac{CV_{IN}}{D'_0 I_{OUT}}}$	$\frac{V_{IN}}{I_{OUT}} \frac{1 + s \frac{LI_{OUT}}{D'_0 V_{IN}}}{1 - s \frac{CV_{IN}}{D'_0 I_{OUT}}}$