

## 数字电源PFC部分PI控制参数计算

PFC输入量

$$V_{inmin} := 218 \quad V_{inmax} := 450 \quad I_{inmax} := 50$$

$$V_{omax} := 450$$

$$V_o := 400$$

功率级参数

$$C_{\text{vv}} := 2010 \cdot 10^{-6} \quad L_{\text{vv}} := 710 \cdot 10^{-6}$$

计算系数

$$K_s := \frac{1}{I_{inmax}} \quad K_f := \frac{1}{V_{inmax}} \quad K_{vd} := \frac{1}{V_{omax}} \quad K_m := \frac{V_{inmax}}{V_{inmin}} \quad K_{ff} := \frac{\pi}{2} \cdot \frac{V_{inmax}}{V_{inmin}}$$

1、电压环计算

$$G_{vopen}(z) = K_{vd} G_{vea}(z) G_{vh}(z)$$

$$K_{\text{vv}} := \frac{\pi^2}{8} \frac{K_m}{K_s \cdot K_f \cdot K_{ff}^2}$$

$$\text{电压环截止频率} \quad f_c := 20 \quad \text{电压环相角裕度} \quad \theta := 45$$

$$\text{电压环采样频率} \quad f_s := 20 \cdot 10^3$$

$$\omega_c := 2 \cdot \pi \cdot f_c \quad T_s := \frac{1}{f_s} \quad z := e^{j \cdot \omega_c \cdot T_s}$$

$$K_{pv} := 1$$

$$K_{iv} := 1$$

已知

$$\left| \frac{K \cdot T_s}{C \cdot V_o \cdot (z - 1)} \cdot \left( K_{pv} + \frac{K_{iv} \cdot z}{z - 1} \right) \cdot K_{vd} \right| = 1$$

$$\arg \left[ \frac{K \cdot T_s}{C \cdot V_o \cdot (z - 1)} \cdot \left( K_{pv} + \frac{K_{iv} \cdot z}{z - 1} \right) \cdot K_{vd} \right] = \frac{\pi}{180} \cdot \theta - \pi$$

$$\text{Find}(K_{pv}, K_{iv}) = \begin{pmatrix} 5.89886 \\ 0.03695 \end{pmatrix}$$

2、电流环计算

$$G_{iopen}(z) = K_s G_{iea}(z) F_m G_{ih}(z)$$

$$F_m := 1$$

电流环截止频率  $f_c := 5000$  电流环相角裕度  $\theta := 45$

电流环采样频率  $f_s := 45 \cdot 10^3$

$$\omega_c := 2 \cdot \pi \cdot f_c \quad T_s := \frac{1}{f_s} \quad z := e^{j \cdot \omega_c \cdot T_s}$$

$$K_{pi} := 1 \quad K_{ii} := 1$$

已知

$$\left| \frac{V_o \cdot T_s}{L \cdot (z - 1)} \cdot \left( K_{pi} + \frac{K_{ii} \cdot z}{z - 1} \right) \cdot K_s \right| = 1$$

$$\arg \left[ \frac{V_o \cdot T_s}{L \cdot (z - 1)} \cdot \left( K_{pi} + \frac{K_{ii} \cdot z}{z - 1} \right) \cdot K_s \right] = \frac{\pi}{180} \cdot \theta - \pi$$

$$\text{Find}(K_{pi}, K_{ii}) = \begin{pmatrix} 2.05571 \\ 0.84044 \end{pmatrix}$$