Announcements

• Presentation from General Motors (electrification and controls)
  — Thursday (tomorrow) at 3:40 in MK 524
CCM Flyback: Ringing Due to $L_I$

MOSFET turn off
Leakage Voltage Stress

\[ V_{PH} = \frac{V_{b} + \frac{V_f}{n}}{1 + \frac{L_m}{L}} \]

\[ V_{PH} = V_{b} + \frac{V_f}{n} + R_o \frac{I_{m}}{1 + \frac{L_m}{L}} \]

\[ V_{PH} = V_{b} + \frac{V_f}{n} \]

\[ V_{b} = 400 \text{V} \]
\[ V_f = 10 \text{V} \]
\[ n = 100 \]
\[ L_m = 1.8 \text{mH} \]
\[ I_p = 2.5 \text{mA} \]

Risk of destruction or higher rating necessary

Leakage Switching Loss

\[ E_{shunt} = \frac{1}{2} C_o \left( \frac{V_f}{n} \right)^2 + \frac{1}{2} L \frac{I_{mp}}{n}^2 \]

\[ E_{loss} = \frac{1}{2} L \frac{I_{mp}}{n}^2 \]

\[ E_{loss} = \frac{1}{2} \left( 35 \text{mA} \right)^2 \]

\[ E_{loss} = 5.29 \text{mJ} \]
\[ I_{mp} = 1 \text{mA} \]
\[ f_s = 5 \text{kHz} \]
\[ P_{loss} = 5.29 \text{W} \]

* Assuming ringing dies out before the end of the switching period.
CCM Flyback: Clamping Circuit

Clamped State Plane