Experiment #3 Comments

• Focus on clean wiring, emphasizing good layout techniques
  – Keep pulsating current loops small
  – No wire is an ideal short
• Drill vector board holes first
• Avoid transients
  – Start switching, then slowly bring up input voltage
• Always have representative waveforms on oscilloscope
  – Switched node voltage, inductor current
Inductor Air Gap

\[ L \approx L_{\text{ideal}} \left( 1 + \frac{l_g}{\sqrt{A_c}} \ln \left( \frac{2W}{l_g} \right) \right) \]

Fringe Factor

https://e-magnetica.pl/flux_fringing
Heatsink

\[ R_{TP} = 1.4^\circ C/W \]

\[ R_{\theta jc} = 0.5^\circ C/W \]

\[ R_{HS,nat} = 7^\circ C/W \]

\[ R_{HS,250FPM} = 3^\circ C/W \]
Power Stage

Bootstrap supply

Bootstrap: diode recharges capacitor from V_{DD} every time low-side FET turns on

Graph:
- V_{gs1}, V_{gs2} vs. time (t)
- Gate-to-ground voltage

Circuit diagram:
- Input voltage (V_{DD})
- Output voltage (V_{gs1}, V_{gs2})
- Logic gates and level shifters

Legend:
- UVLO
- DRIVER
- NODES: HB, HO, HS, VS, HL, VDD, VSS
- Bootstrap supply diagram

Power Stage schematic with bootstrap supply and timing graph.
Some Test Circuits