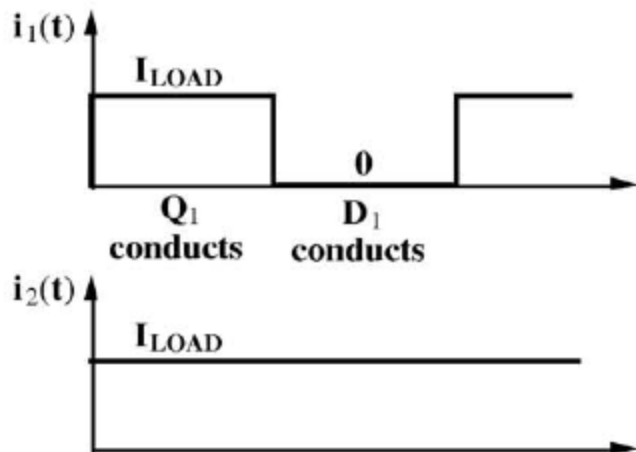
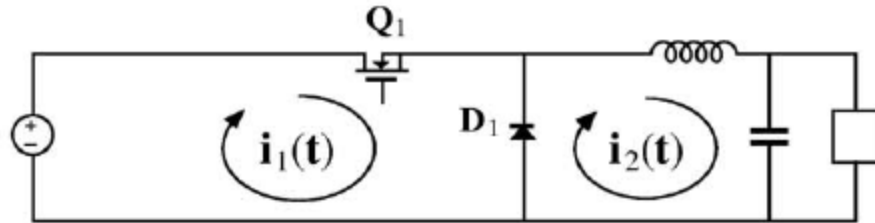


# Power Electronic Circuits

## Power Loop Layout



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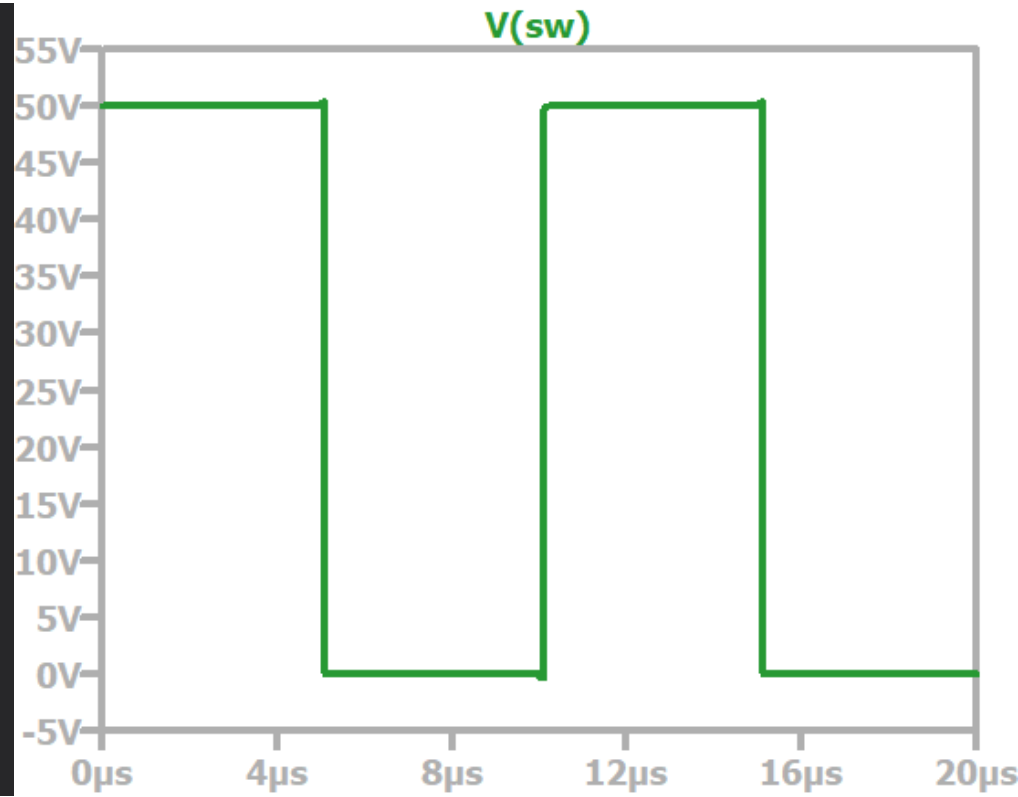
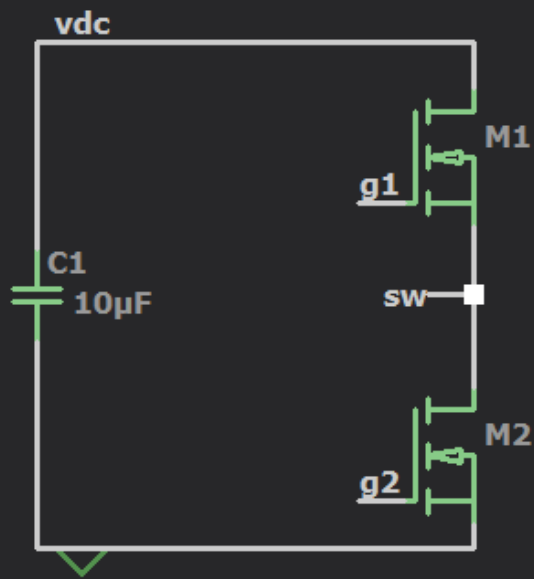


**switched input current  $i_1(t)$  contains large high frequency harmonics**

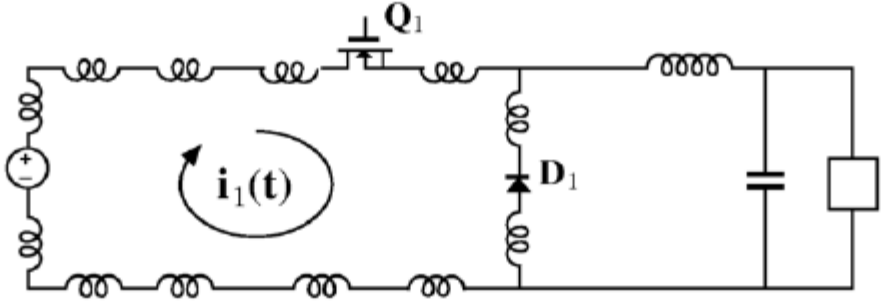
**—hence inductance of input loop is critical inductance causes ringing, voltage spikes, switching loss, generation of B- and E-fields, radiated EMI**

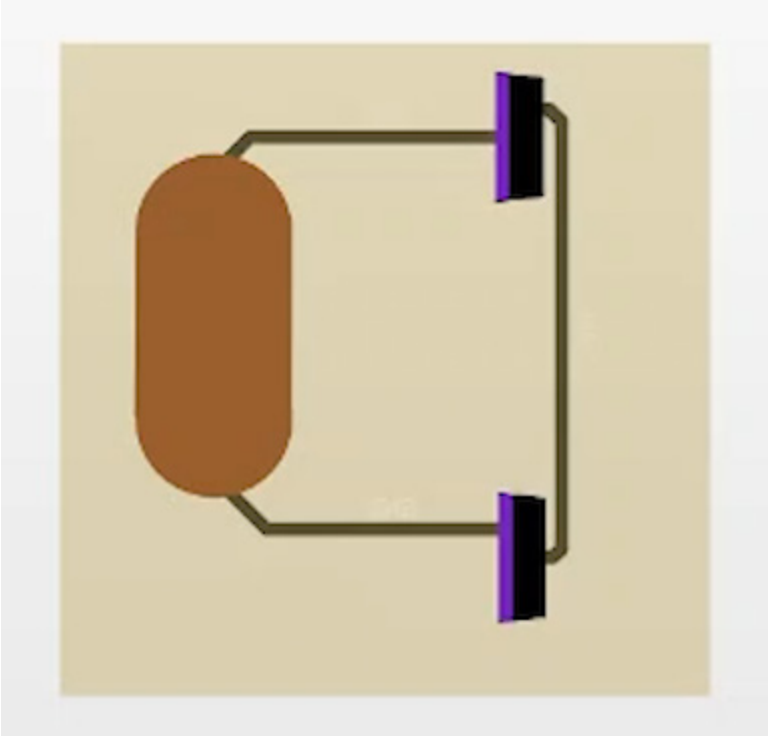
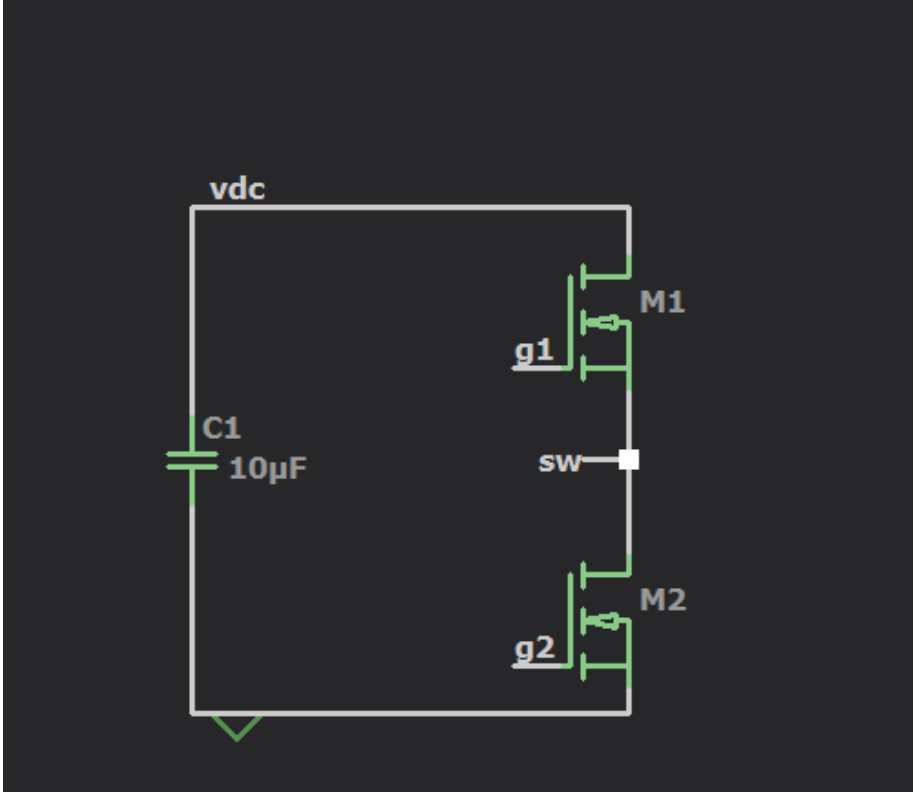
**the second loop contains a filter inductor, and hence its current  $i_2(t)$  is nearly dc**

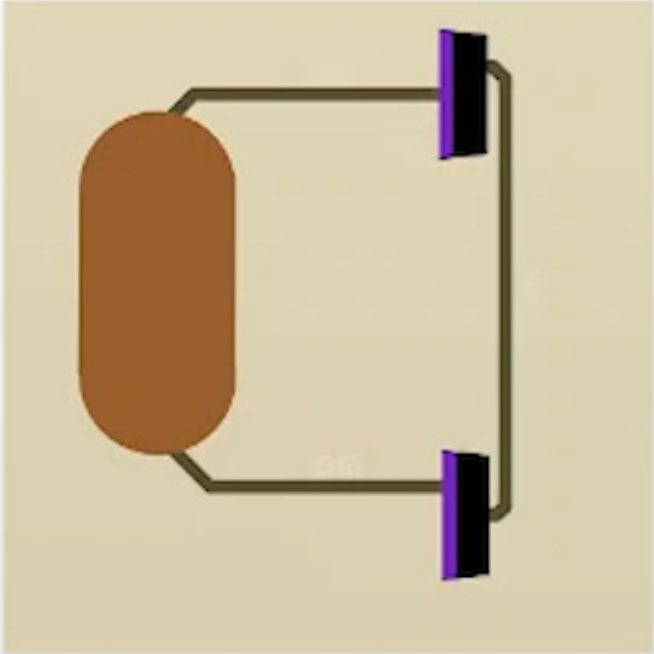
**—hence additional inductance is not a significant problem in the second loop**

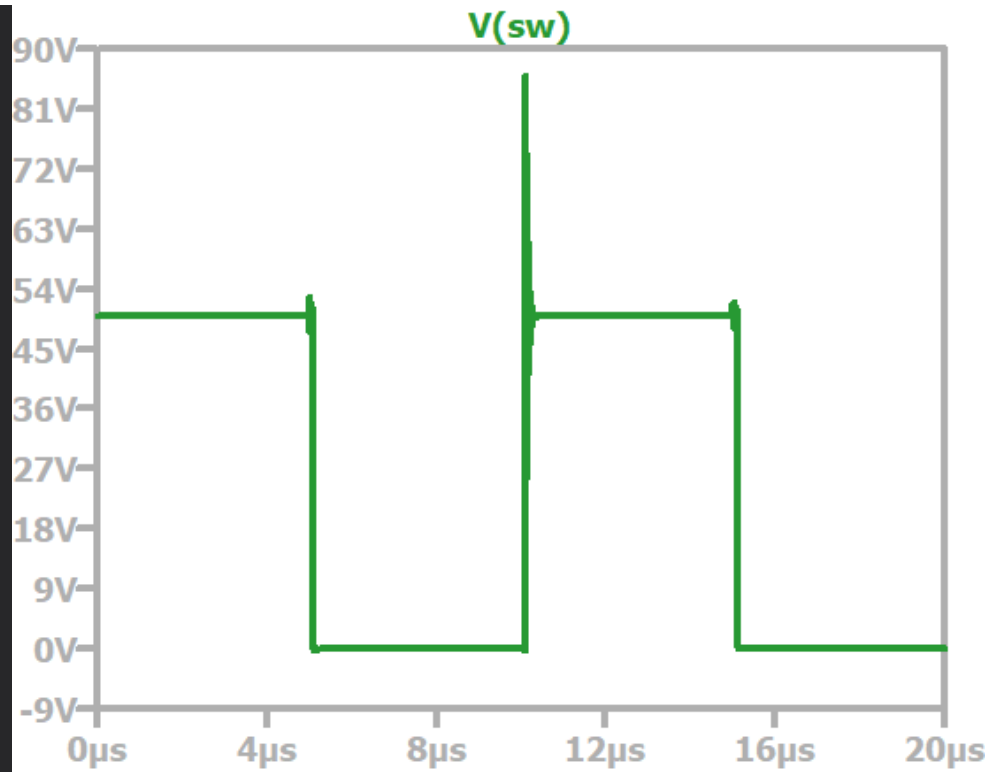
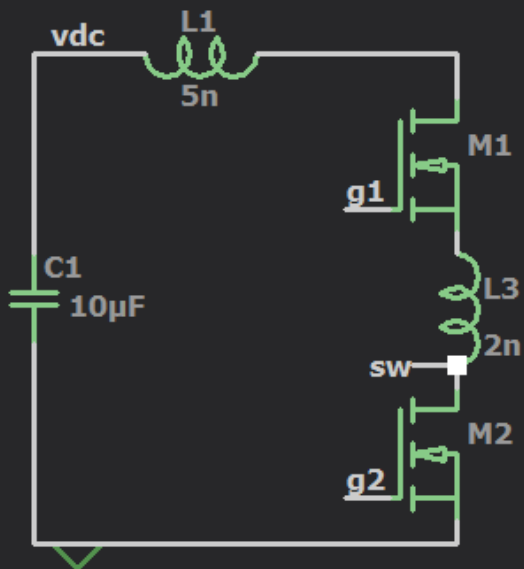


**Parasitic inductances of input loop explicitly shown:**

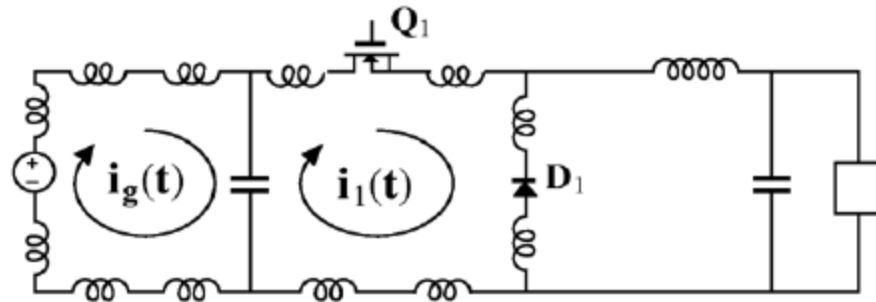






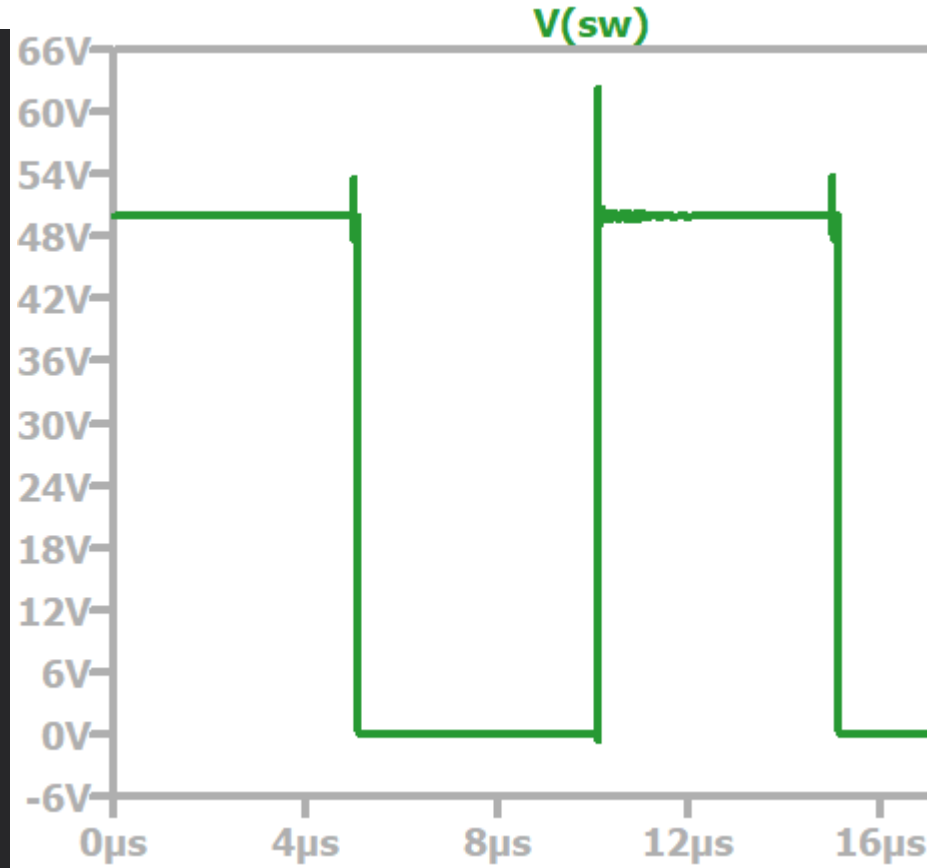
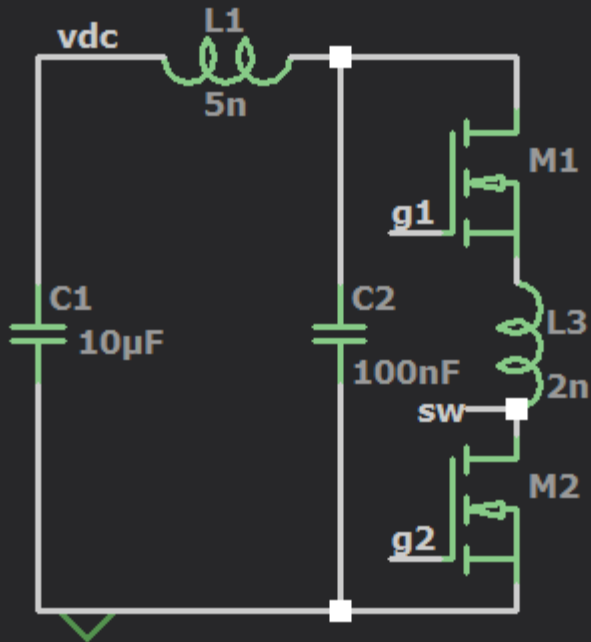


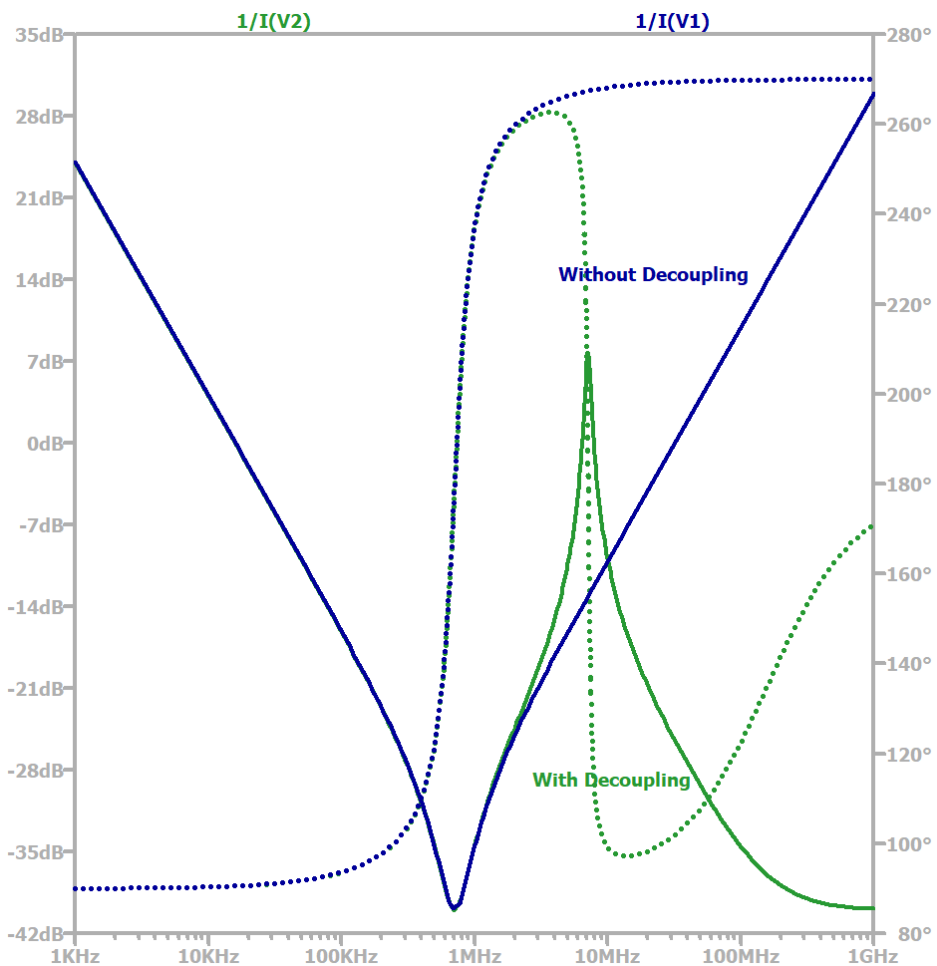
**Addition of bypass capacitor confines the pulsating current to a smaller loop:**



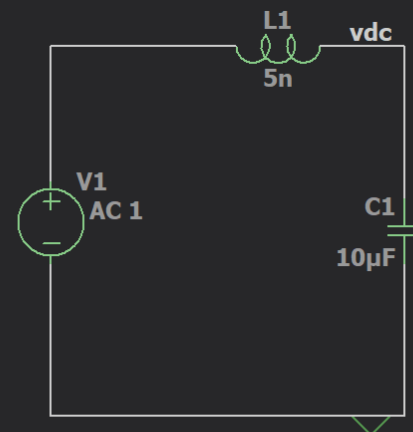
**high frequency currents are shunted through capacitor instead of input source**



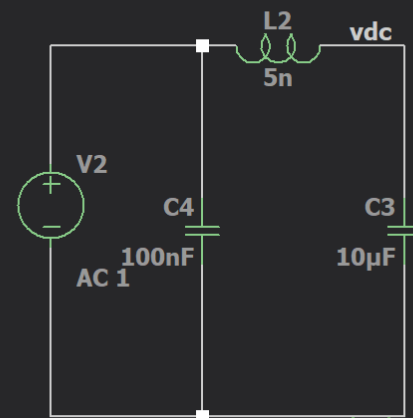




Without Decoupling

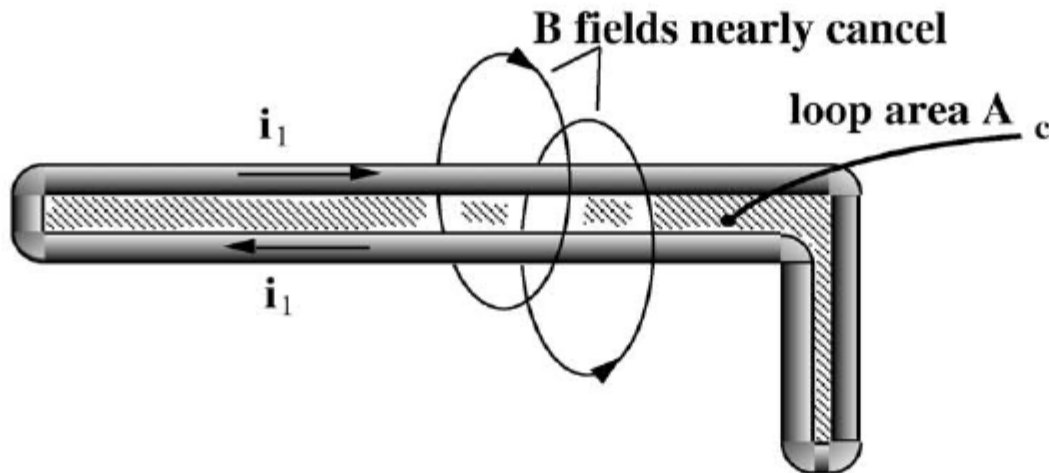
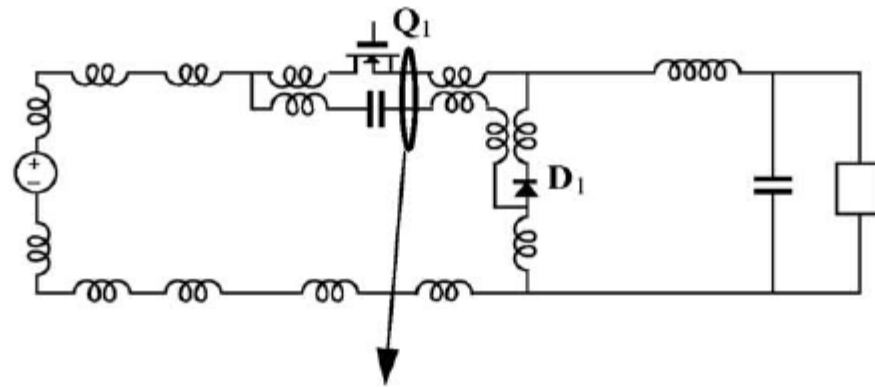


With Decoupling

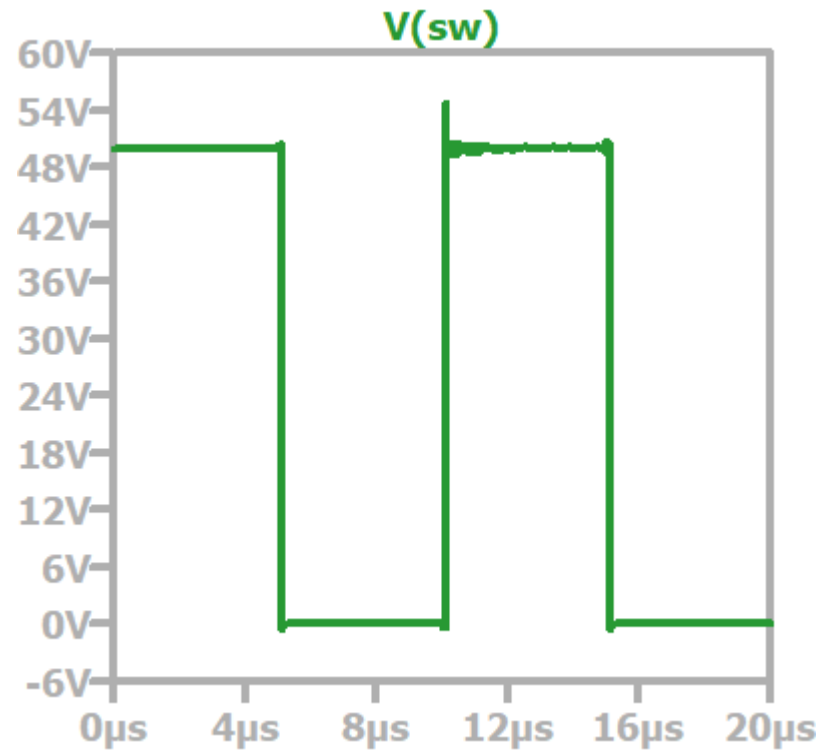
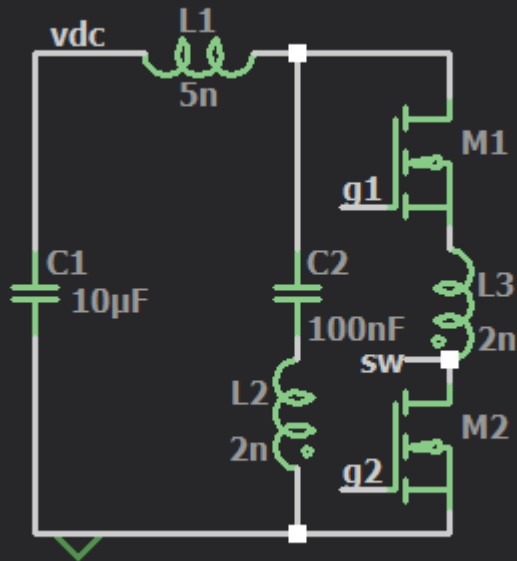


.ac dec 1000 1k 1G

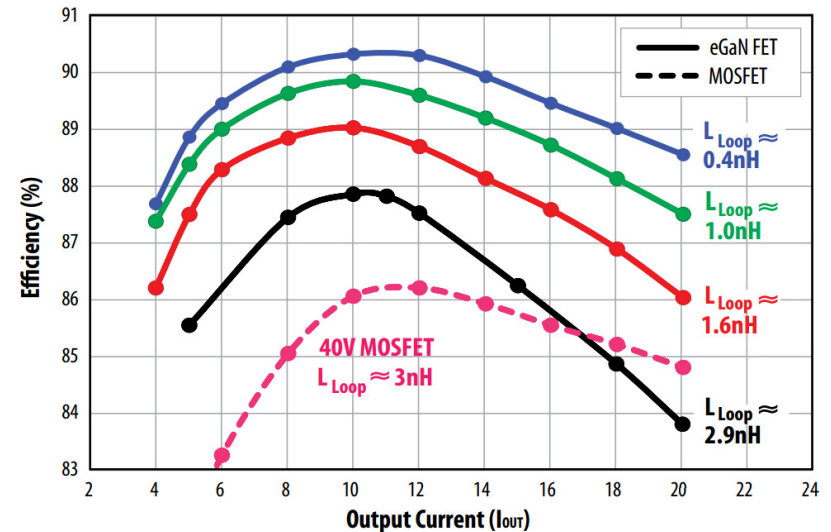
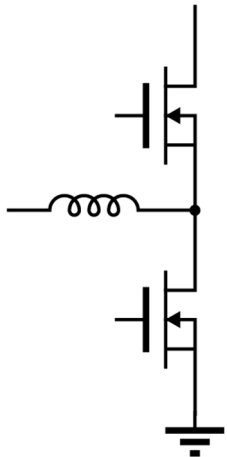
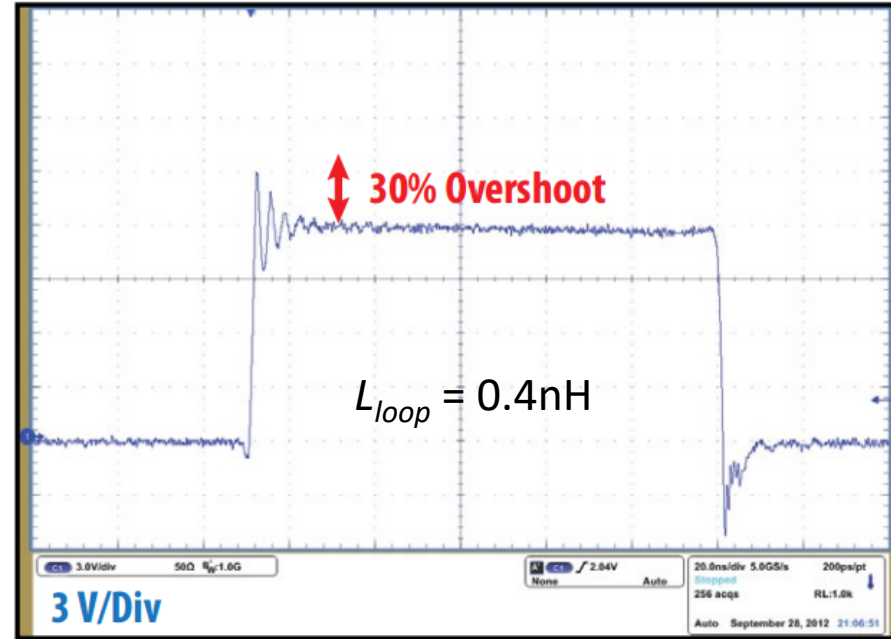
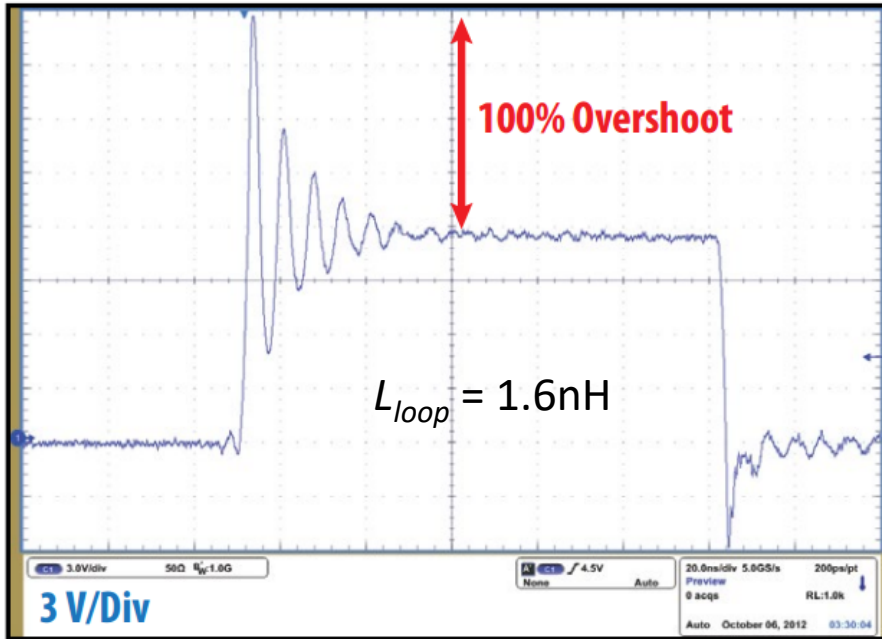
Even better: minimize area of the high frequency loop, thereby minimizing its inductance



K L2 L3 .95

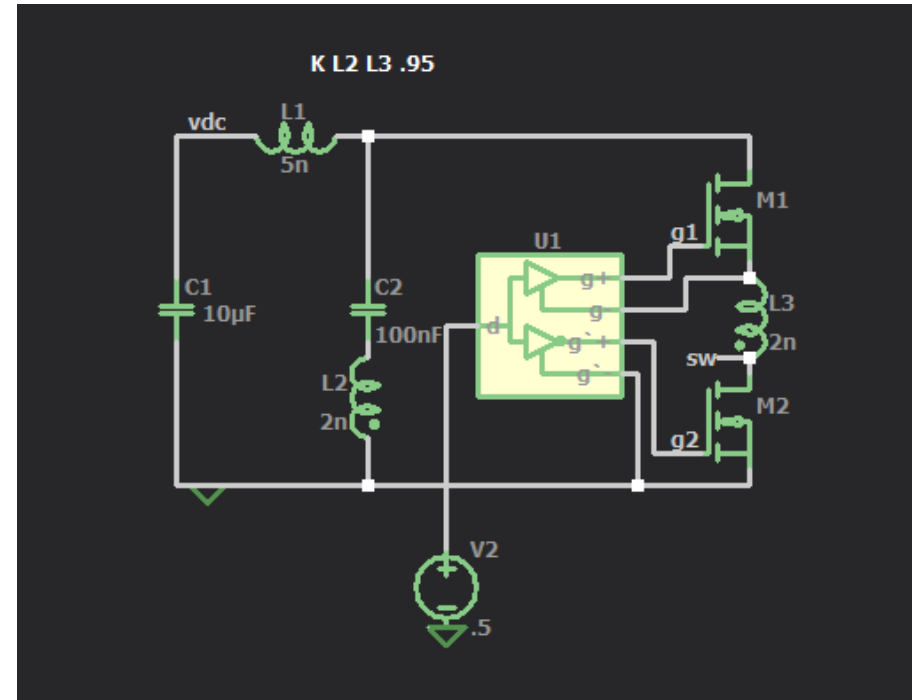
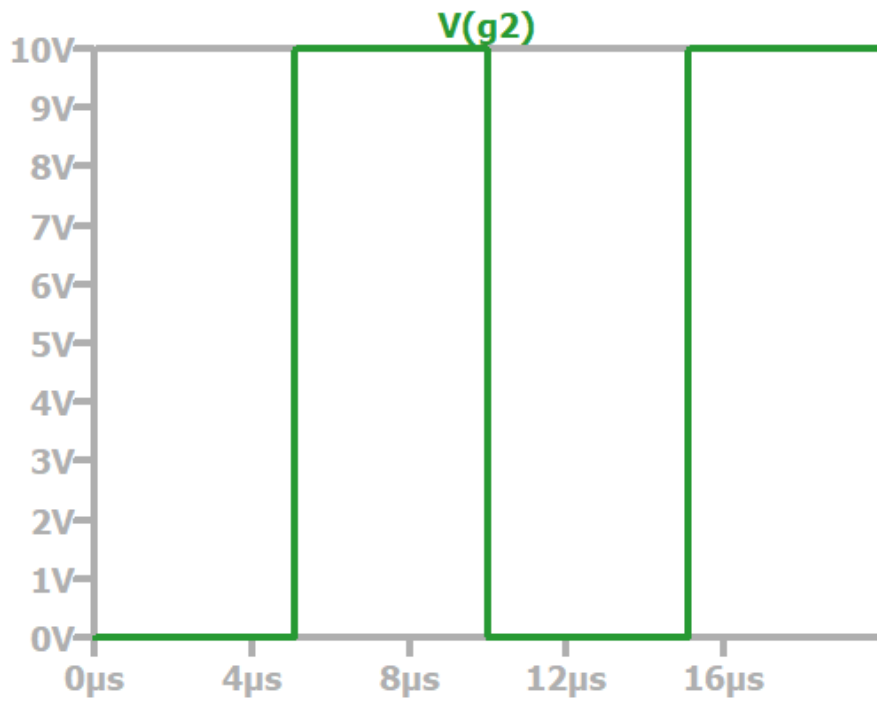


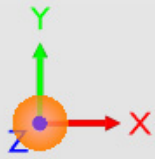
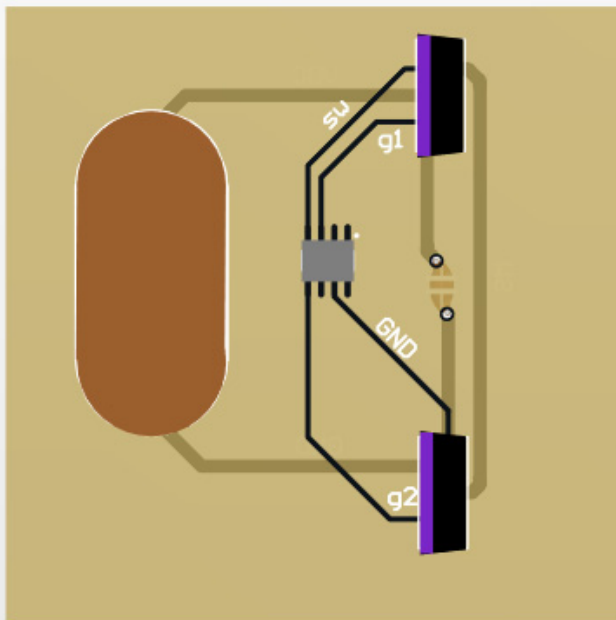
# Effect of Loop Inductance



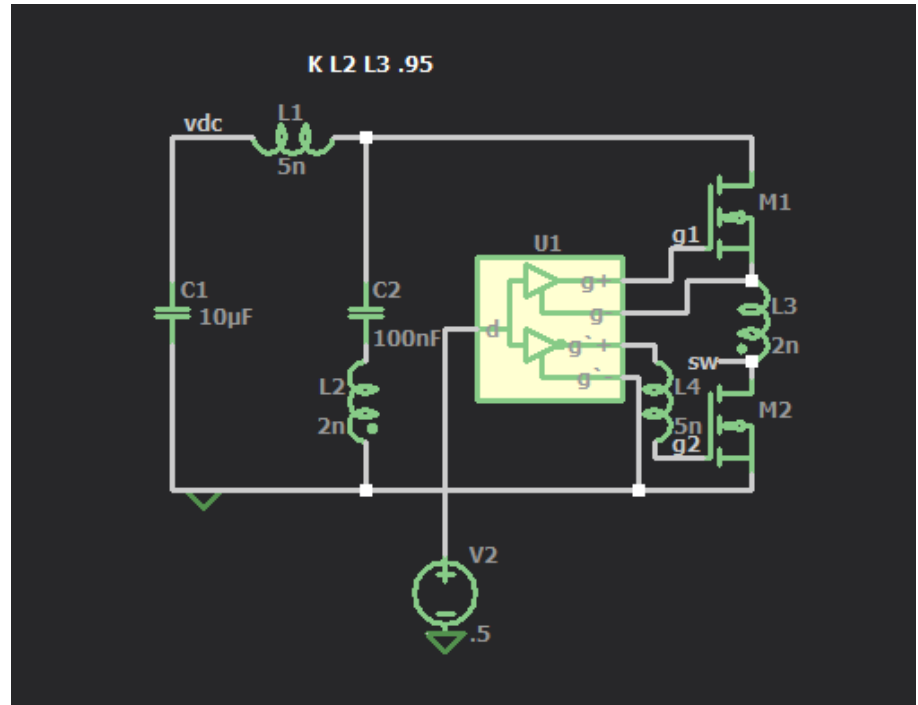
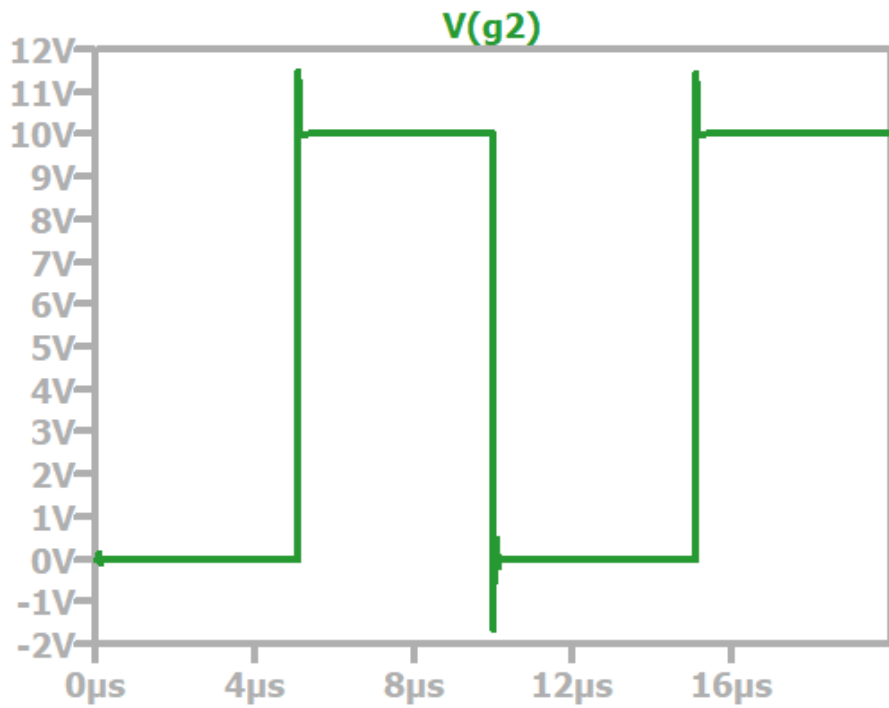
# Power Loop Inductance

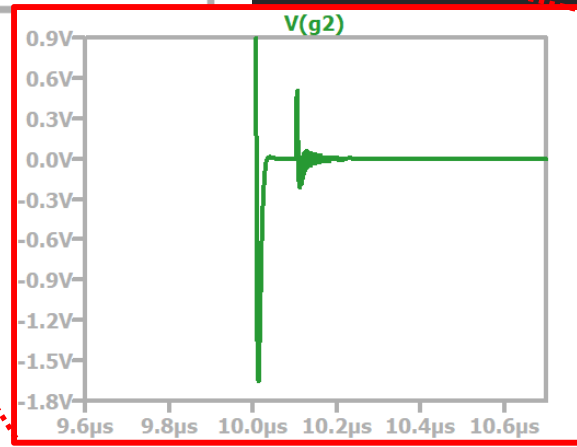
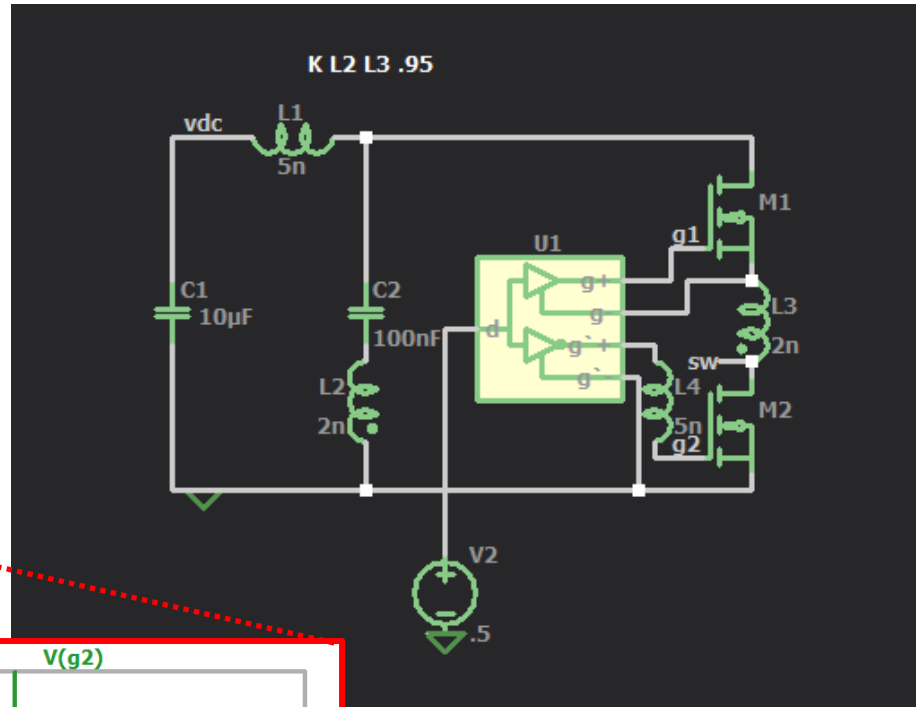
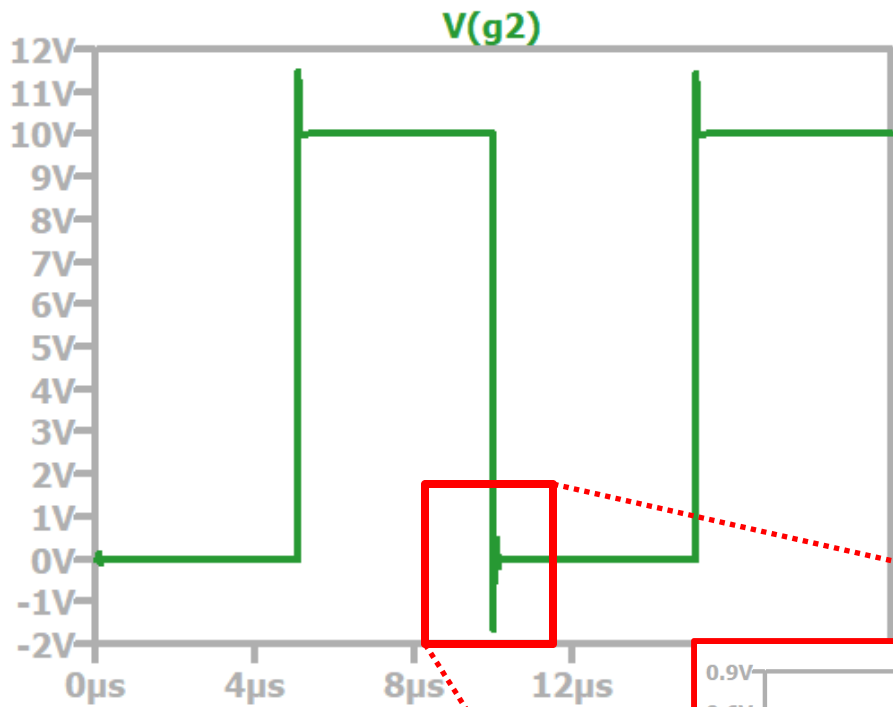
- When wiring (or doing PCB layout) for a switching converter
  - Most important consideration is power loop inductance
  - Use minimum-loop decoupling capacitors in addition to bulk capacitance
- The same principles will apply to
  - Gate drive loops
  - DC supplies for other components and ICs



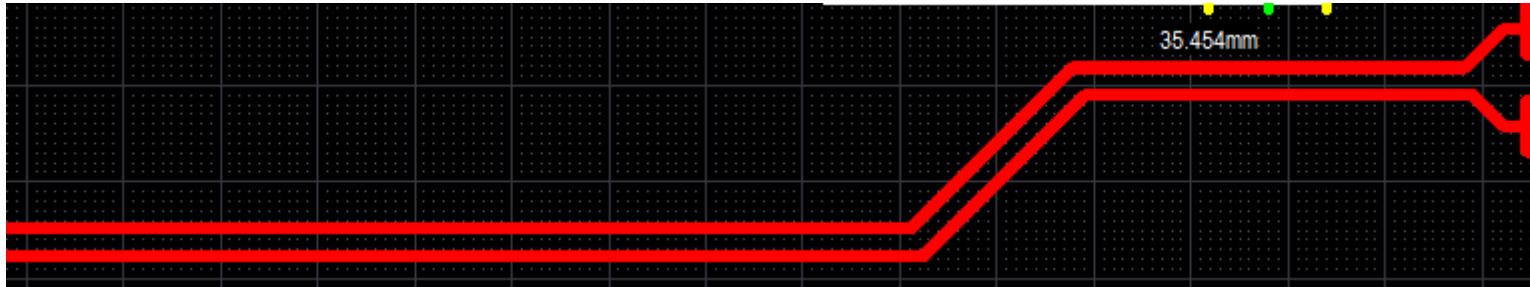




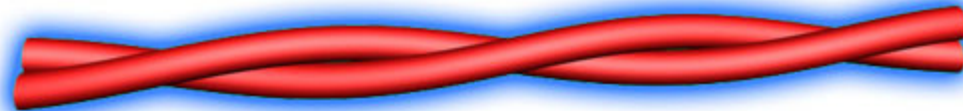


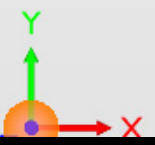
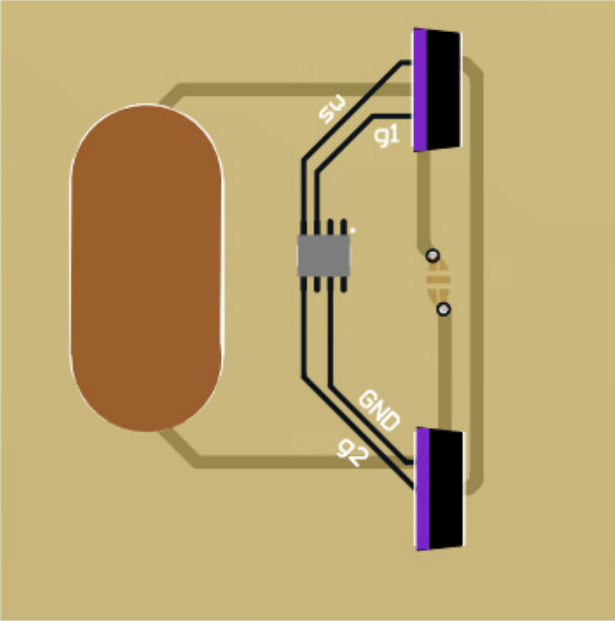


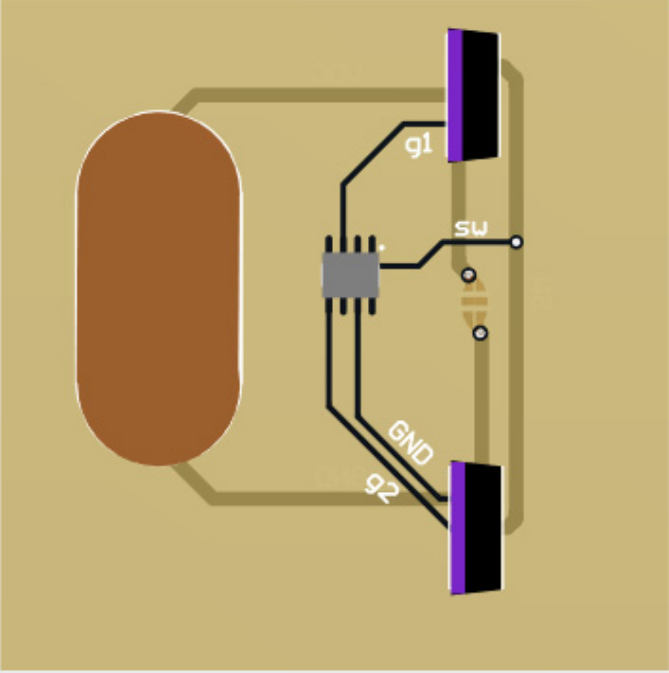
## PCB Layout



## Vectorboard Wiring







Y  
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