

Varying MOSFET Gate Drive Voltage in a Flyback

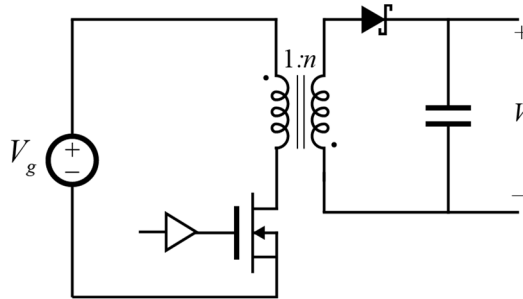


Figure 1: Flyback Converter

The Flyback converter of Fig. 1 is used to implement an auxiliary supply for the control circuits of a larger converter. The flyback is designed with the following characteristics

- Input voltage $V_g = 400$ V
- Output voltage $V = 10$ V
- Output power $P = 10$ W
- Switching frequency $f_s = 1$ MHz

The transformer magnetizing inductance and the output capacitance are large. The MOSFET exhibits an on-resistance and gate charge as shown in the plots of Fig. 2. Consider conduction and gate drive losses of the MOSFET. You may assume that the gate driver used in the flyback has very high current drive capability.

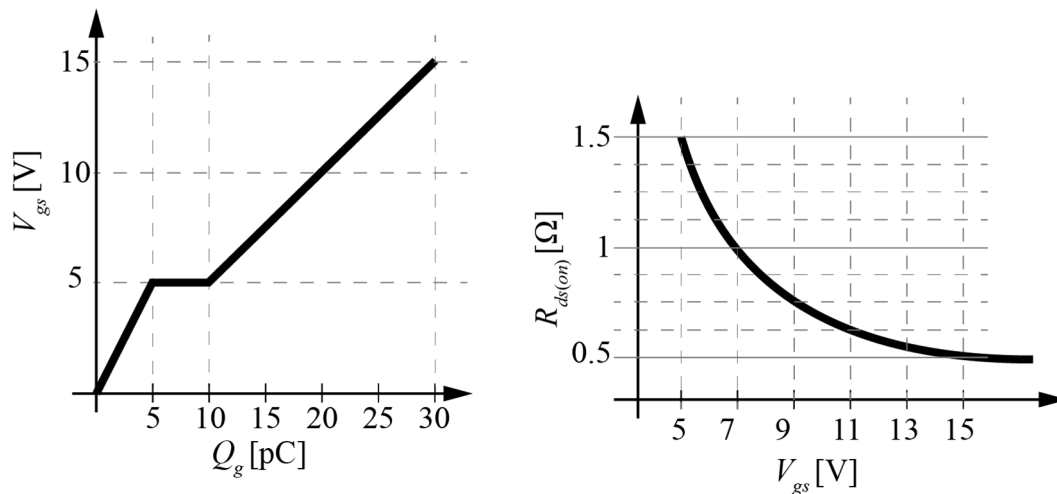


Figure 2: MOSFET parasitic parameters in the Flyback of Fig. 1

- Solve for the transformer turns ratio so that the MOSFET duty cycle D is 0.5.
- Given the parasitics of Fig. 2, select the gate drive voltage $5 \leq V_{GS} \leq 15$ V so that the efficiency of the converter is maximized.
- At what range of switching frequencies is the best V_{gs} equal to 15 V? At what range of frequencies is it optimal to use a gate drive voltage close to 5 V.