

Stacking Power MOSFETs

PMOS Configuration

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Test 2 – IFR9640

- PMOS Configuration; 5 Stack PMOS
- MOSFET:
 - IFR9640, $V_{DS} = -200\text{ V}$, $R_{DS(on)} = 0.5\text{ Ohms}$
- Capacitance Values:
 - 150 pF
- Max Voltage:
 - 400 V
- Changes:
 - Switched to a stack of 2 MOSFETs to get better results

Test 2 – Calculations

$$C_{sg} = 1200 \text{ pF}$$

$$C_{dg} = 81 \text{ pF}$$

$$V_d = 500 \text{ V}$$

$$V_{sg} = 20 \text{ V}$$

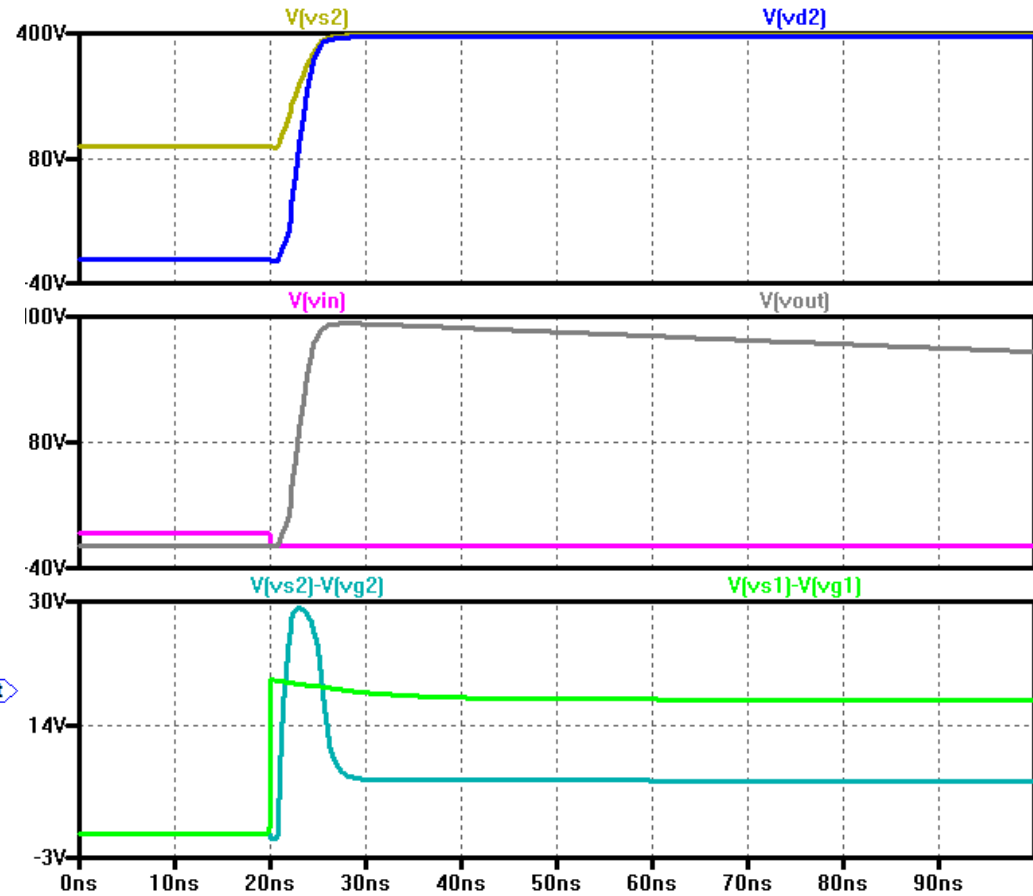
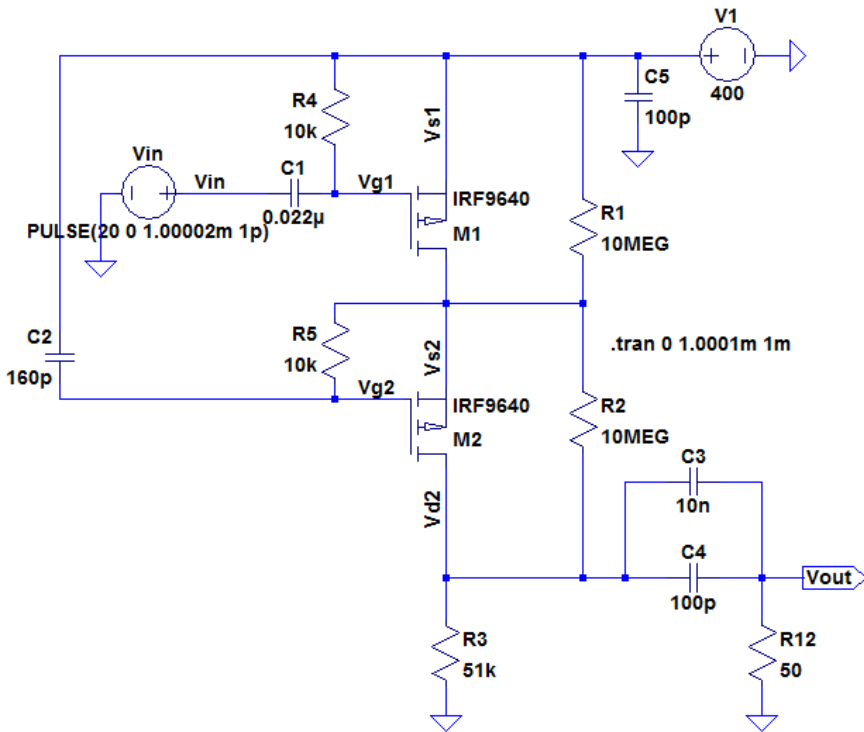
$$A_v = 25$$

$$\begin{aligned} C'_{sg} &= C_{sg} + A_v * C_{dg} \\ &= 1200 \text{ pF} + 25 * 81 \text{ pF} \\ &= 3225 \text{ pF} \end{aligned}$$

$$\begin{aligned} V_{sg} &= V_d * C_2 / (C_2 + C'_{sg}) \quad \text{Solve for } C_2 \\ C_2 &= [(V_{sg} / V_d) * C'_{sg}] / [1 - (V_{sg} / V_d)] \\ &= [(20 / 500) * 3225\text{p}] / [1 - (20 / 500)] \\ &= 135 \text{ pF} \end{aligned}$$

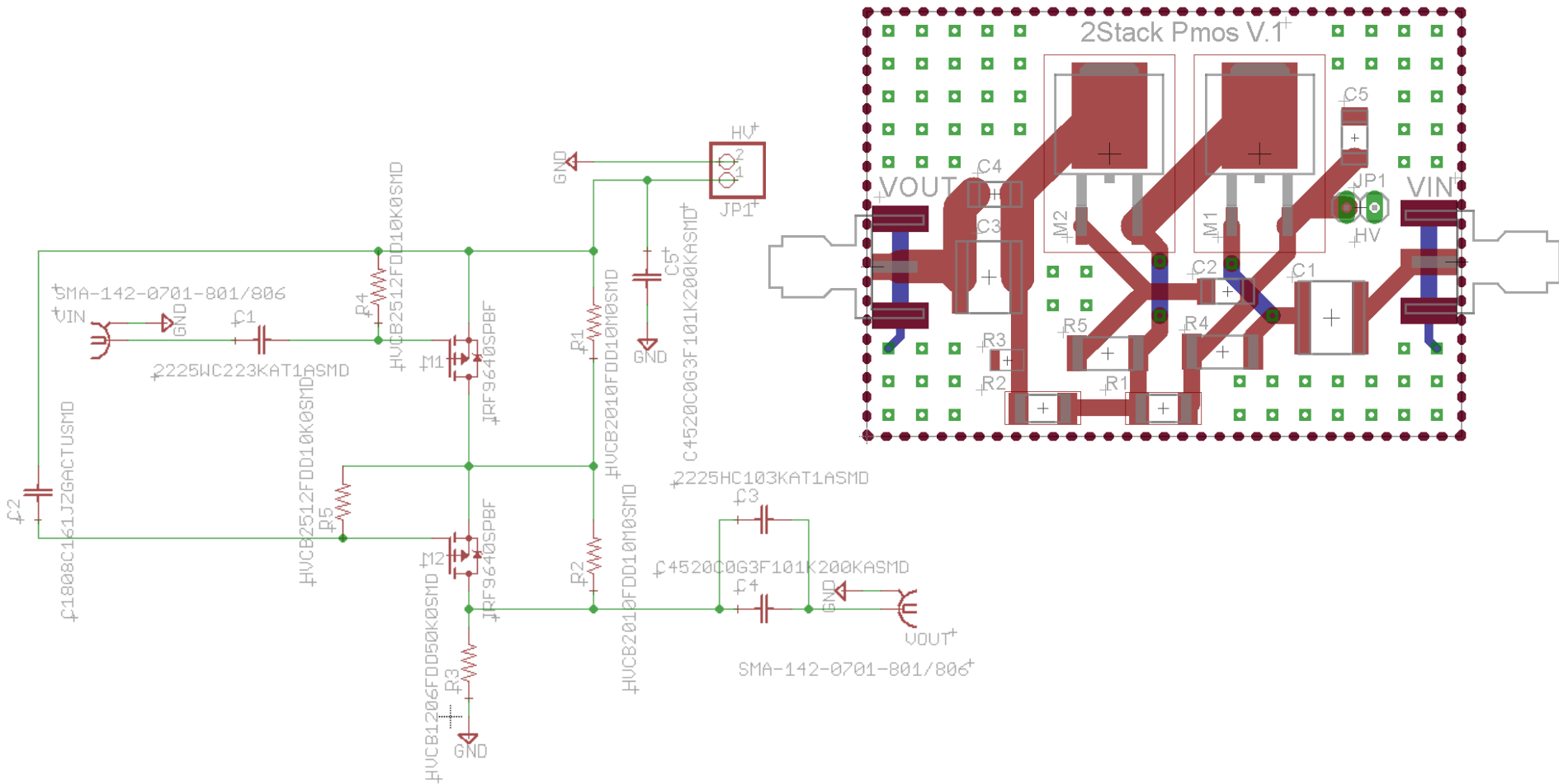
*To ensure the MOSFETs turn on, increase C_2 to **150 pF**

Test 2 – Simulation & Values



*Values reflect parts available

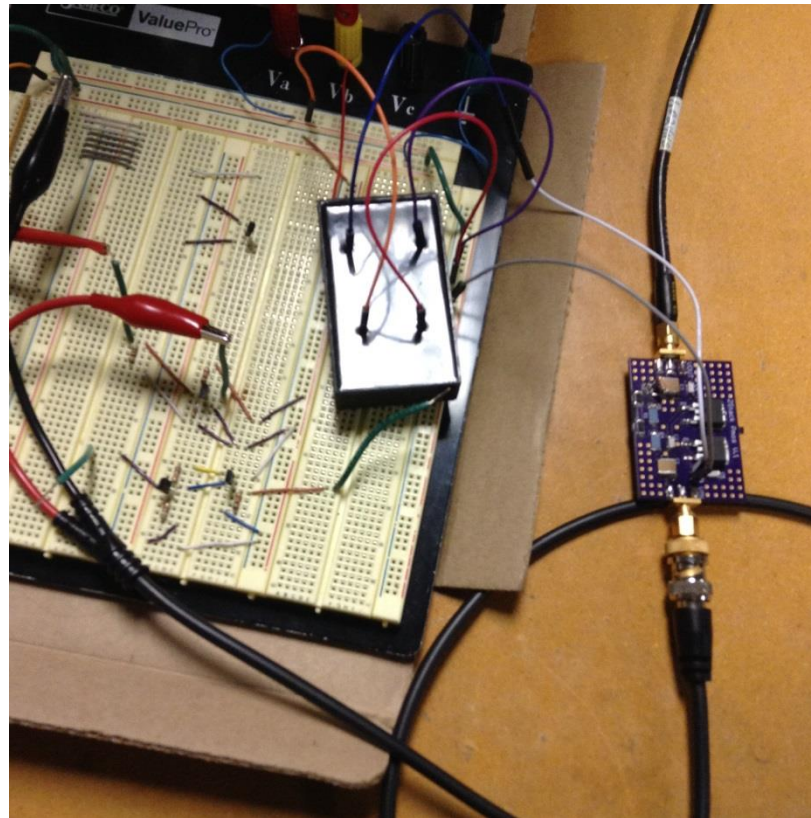
Test 2 – PCB Layout



Test 2 – FQD4P40

- PMOS Configuration; 5 Stack PMOS
- MOSFET:
 - FQD4P40, $V_{DS} = -400\text{ V}$, $R_{DS(on)} = 3.1\text{ Ohms}$
- Calculated Capacitance Values:
 - 50 pF
- Max Voltage:
 - 800 V

Test 2 – Set up



Test 2 – Chip

