

EDC 3b

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1 MOSFET Analysis

Performing small signal analysis, we get the following,

$$g_m = \frac{i_{out}}{v_{out}}$$

$$R_o = \frac{v_{out}}{i_{out}}$$

Let's do a reverse feedback analysis,

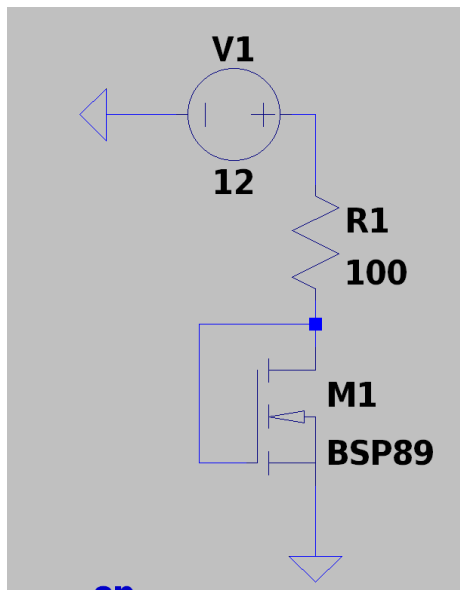


Figure 1: Reverse Feedback

The operating point we get is,

$$V_{GS} = 2.1853273V$$

Performing a DC sweep about this,

$$g_m = 246m\Omega^{-1}$$

$$r_o = 100\Omega$$

$gain \approx -24$
 Now, finding it analytically
 $g_m = 335m\Omega^{-1}$
 $r_o = 100\Omega$
 $gain \approx -33$

2 MOSFET Amplifier

2.1 Common Source

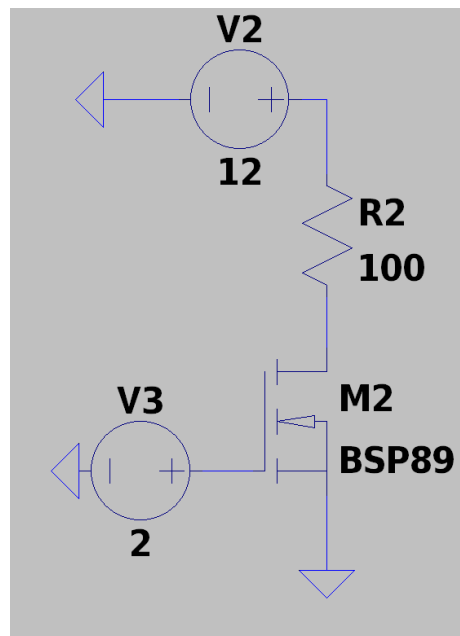


Figure 2: Common Source

In simulation,
 $g_m = 0.24\Omega^{-1}$
 $r_o = 100\Omega$
 $gain \approx 21$
 With small signal analysis,
 $g_m = 0.275\Omega^{-1}$
 $r_o = 100\Omega$
 $gain \approx 27.5$
 DC operating point about 2V

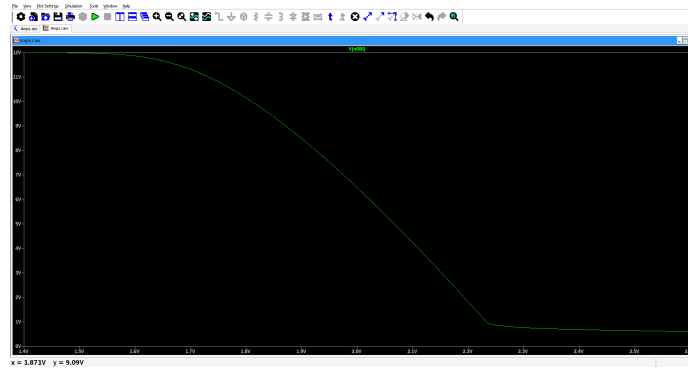


Figure 3: Common Source DC plot

2.2 Common Drain

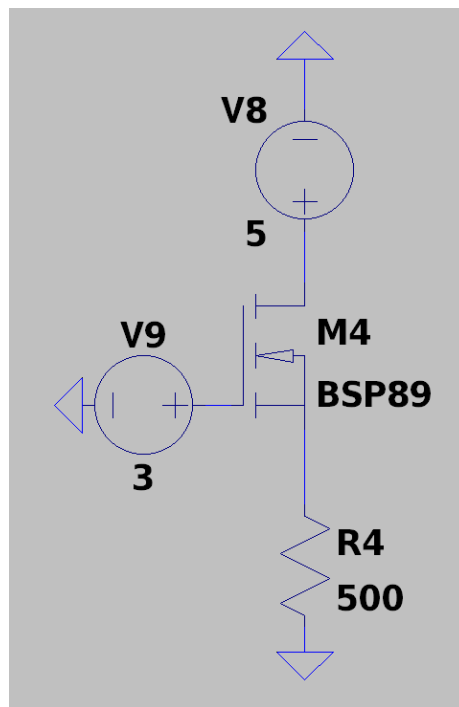


Figure 4: Common Drain

In simulation,
 $g_m = 45.11 m\Omega^{-1}$
 $gain \approx 0.95$

With small signal analysis,
 $g_m = 110m\Omega^{-1}$
 $gain = 0.98$
 DC operating point about 3V

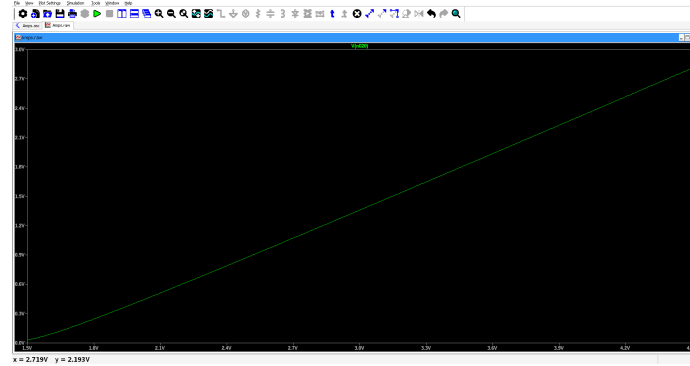


Figure 5: Common Drain DC Plot

2.3 Common Gate

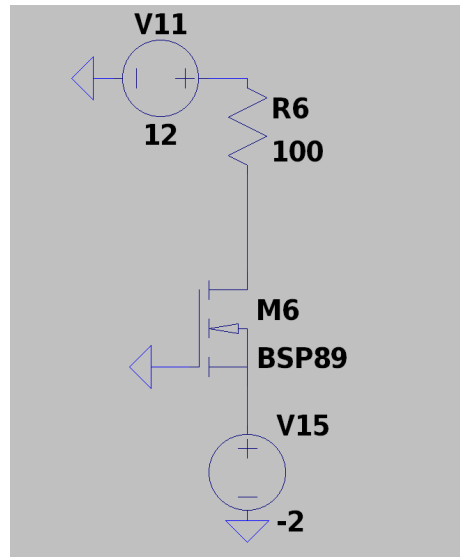


Figure 6: Common Gate

In simulation,
 $g_m = 217m\Omega^{-1}$

$gain = 21$
 With small signal analysis,
 $g_m = 276m\Omega^{-1}$
 $gain = 27.6$
 DC operating point about -2V

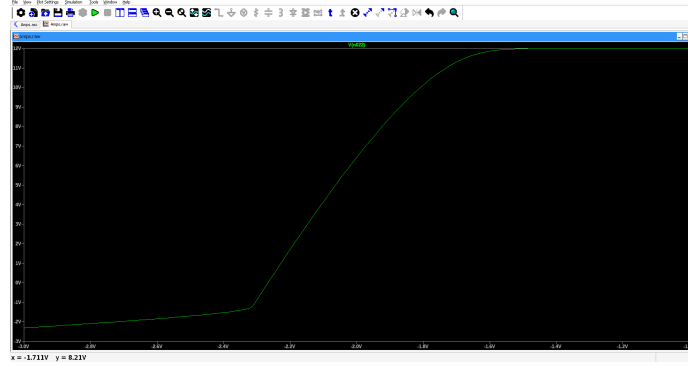


Figure 7: Common Gate DC Plot