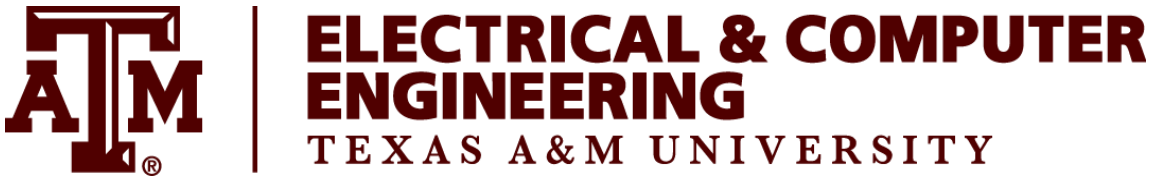

Lab 11: Mosfet Amplifier Configuration

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ECEN 325 -501

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Date: 11/14/2020

Calculations:

Common Source:

$V_{DD} = 5\ V$

$|A_V| = 25$

from Lab 10:

$V_T = 2.23\ V$

$K'\frac{W}{L} = \frac{0.0895\ A}{v^2}$

$V_{RS} = 1\ V$ & *choose* $\widehat{V_o} = 1.3\ V,\ R_i = 11\ k\ \Omega$

$$V_{RD} = \frac{V_{DD} - \widehat{V_o} - V_{RS}}{1 + \frac{2}{|A_v|}} = \frac{5 - 1.3 - 1}{1 + \frac{2}{25}} = 2.5\ V$$

$$V_{ov} = \frac{2 \cdot V_{RD}}{|A_V|} = \frac{2 \cdot 2.5}{25} = 0.2\ V$$

$$I_D = \frac{k'}{2}\left(\frac{W}{L}\right)V_{ov}{}^2 = \frac{0.0895'}{2}(0.2)^2 = 1.79\ mA$$

$$R_D = \frac{V_{RD}}{I_D} = \frac{2.5}{1.79m} = 1.4\ k\Omega\ ;\ R_S = \frac{V_{RS}}{I_D} = \frac{1}{1.79m} = 559$$

$V_{RG2} = V_{RS} + |V_T| + V_{ov} = 1 + 2.23 + 0.2 = 3.43\ V$

$$R_{G1} = \frac{(R_i)V_{DD}}{V_{RS} + |V_T| + V_{ov}} = \frac{11k \cdot 5}{3.43} = 16035\ \Omega$$

$$R_{G2} = \frac{16035 \cdot 11000}{16035 + 11000} = 35032\ \Omega$$

Common Drain:

$$V_{DD} = 5V$$

$$R_{G1} = 16035\ \Omega$$

$$R_{G2} = 35032\ \Omega$$

$$R_S = 559\ \Omega$$

$$V_{ov} = 0.2\ V$$

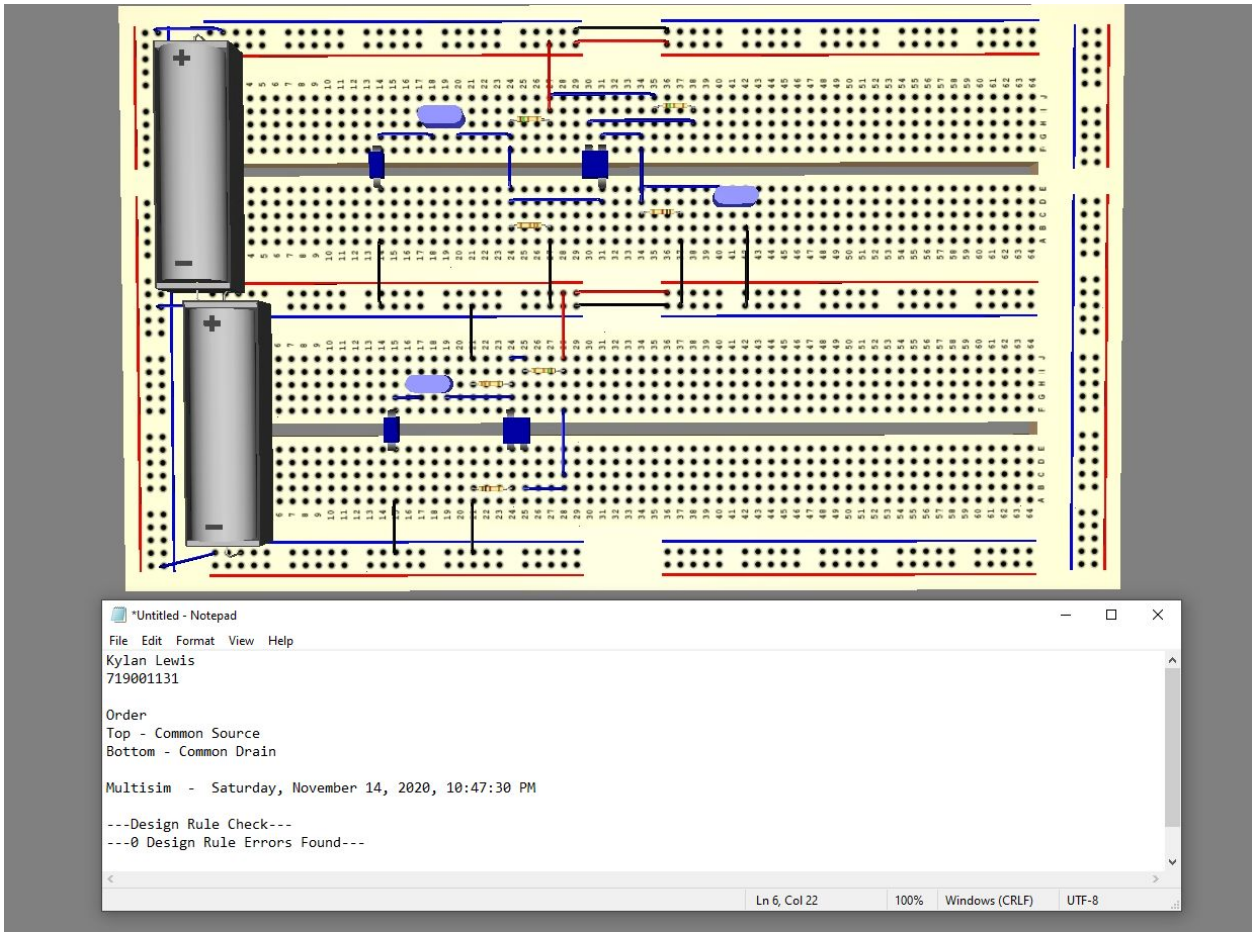
$$g_m = k'\left(\frac{W}{L}\right) V_{ov} = 0.0895 \cdot 0.2 = 0.0179\ {}^{A}\!/_{V}$$

$$A_V = \frac{R_s}{\frac{1}{g_m} + R_S} = \frac{559}{\frac{1}{0.0179} + 559} = 0.909$$

$$R_i = R_{G1} \,||\, R_{G2} = 11\ k\Omega$$

$$R_o = R_S \,||\, \frac{1}{g_m} = \frac{559 \cdot \frac{1}{0.0179}}{559 + \frac{1}{0.0179}} = 50.79\ \Omega$$

Breadboard:


*Untitled - Notepad
File Edit Format View Help
Kylan Lewis
719001131
Order
Top - Common Source
Bottom - Common Drain
Multisim - Saturday, November 14, 2020, 10:47:30 PM
---Design Rule Check---
---0 Design Rule Errors Found---
Ln 6, Col 22
100%
Windows (CRLF)
UTF-8