

In response to requests for an advance copy of the formula sheet that I will include on the intra-semester exam, here is one from a prior year. I reserve the right to make additions, corrections, and deletions.

Formula Sheet

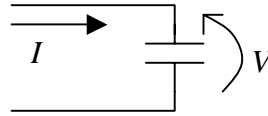
Ohm's Law: $V = I \cdot R$ and power: $P = I \cdot V$

Charge, current, and voltage in a capacitor:

$$Q = C \cdot V$$

$$I = C \frac{dV}{dt} \quad \text{or} \quad \frac{dV}{dt} = \frac{I}{C}$$

where current and voltage are defined as:



For a parallel plate capacitor of area A , and dielectric thickness t , $C = \frac{\epsilon_R \epsilon_0 A}{t}$ where the dielectric constant of free space $\epsilon_0 = 8.85 \cdot 10^{-14}$ fd/cm. The charge on an electron is $1.6 \cdot 10^{-19}$ coulombs.

Current in an N-Channel MOSFET:

$$I_{DS} = \frac{W}{L} \cdot K_N \cdot \begin{cases} 0 & \text{if } V_{GS} \leq V_{TH} \\ \left(V_{GS} - V_{TH} - \frac{(1+a)}{2} V_{DS} \right) V_{DS} & \text{if } V_{DS} \leq \frac{(V_{GS} - V_{TH})}{(1+a)} \\ \frac{(V_{GS} - V_{TH})^2}{2(1+a)} & \text{if } V_{DS} \geq \frac{(V_{GS} - V_{TH})}{(1+a)} \end{cases}$$

For P-Channel MOSFETs, one can use all absolute voltages and get the magnitude of the drain current with the same formula as for N-Channels.

CMOS Power: $P_D = f_C \cdot C_{DISP} \cdot V_{DD}^2$

DeMorgan's Theorems:

$$\overline{A \cdot B} = \overline{A} + \overline{B} \quad \text{and} \quad \overline{A + B} = \overline{A} \cdot \overline{B}$$