Formula Sheet

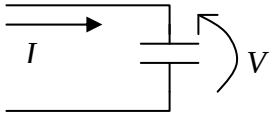
Ohm's Law: $V = I \cdot R$ and power: $P = I \cdot V$

Charge, current, voltage and energy in a capacitor:

$$Q = C \cdot V \text{ and } U = \tfrac{1}{2} C V^2$$

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

where current and voltage are defined as:



For a parallel plate capacitor of area *A*, and dielectric thickness *t*, $C = \frac{\varepsilon_R \varepsilon_0 A}{t}$ where the dielectric constant of free space $\varepsilon_0 = 8.85 \cdot 10^{-14}$ fd/cm. The charge on an electron is $q = 1.6 \cdot 10^{-19}$ coulombs.

Current in an N-Channel MOSFET:

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

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:

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