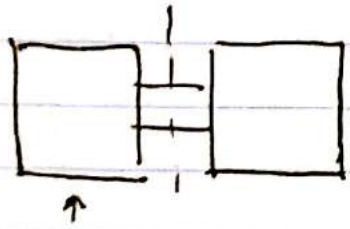
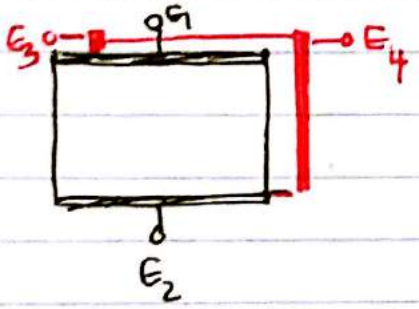
03/01

Thevenin

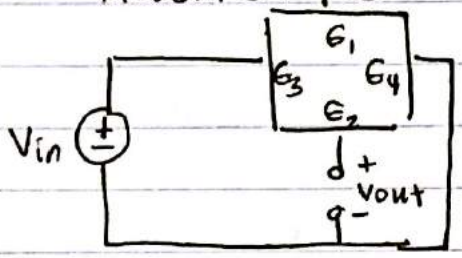


can transform to find equivalent

2D-Resistive Touchscreen

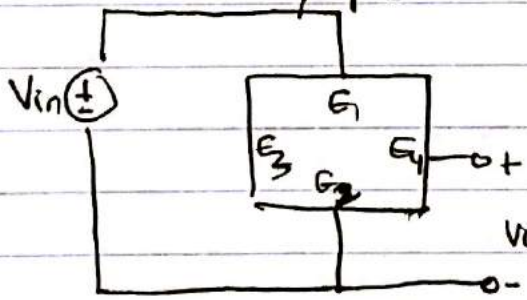


Measure x-pos:

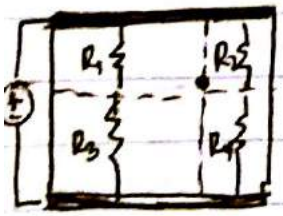


$\frac{V_{out}}{V_{in}} = \frac{x_t}{x_{total}}$

Measure y-pos:



$\frac{V_{out}}{V_{in}} = \frac{y_t}{y_{total}}$



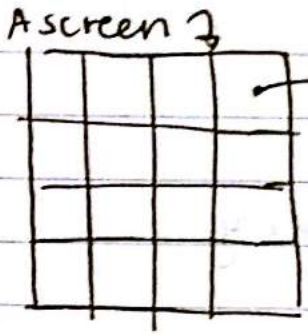
$\frac{R_1}{R_3} = \frac{R_2}{R_4}$

(BUT)

$R_1 \neq R_2$ b/c cross-sectional area

Multitouch

R-screen: analog voltage $\Leftrightarrow$ touch coordinates

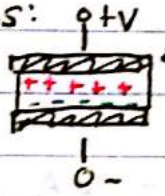


→ is their finger above me or not?

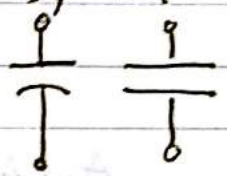
The Capacitor

- Capacitance can change w/ presence of paper.

→ Basics:



symbol:



"parallel plate capacitor"

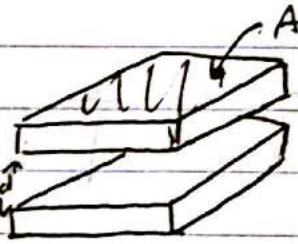
* Capacitance: $\frac{\text{Charge stored}}{\text{V across}}$

→ $\boxed{Q = C \cdot V}$ ← capacitance.

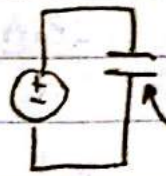
$C \equiv Q/V$ Farads (F) "buckets of charge"

* Calculating capacitance:
  - → dimensions
  - → material parameters

$C = \frac{\varepsilon A}{d}$ ← cross-sectional area; d ← dist. between plates; ε ← permittivity

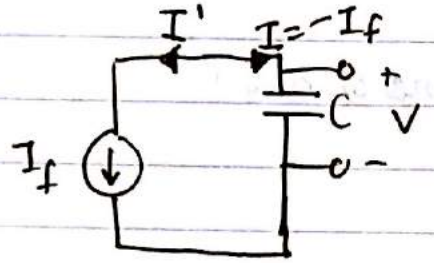


air: $\varepsilon = 8.85\ e^{-12}$ F/m.

* 

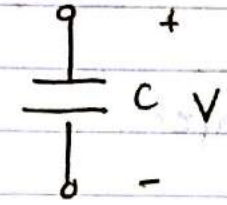
eventually, current approaches 0.

$$I = C \cdot \frac{dV}{dt}$$



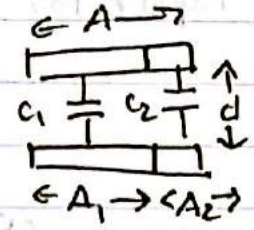
$$I = C \frac{dV}{dt}$$

→ voltage decreasing



There is energy stored in the capacitor

$$\epsilon = \frac{1}{2} CV^2 \qquad (\epsilon = CV)$$

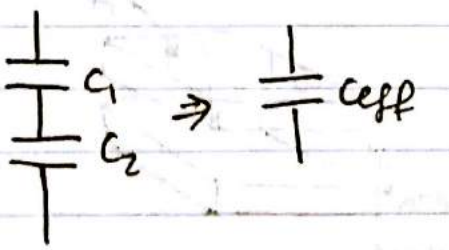


$A_1 + A_2 = A$ $\qquad C_{orig} = \varepsilon A/d$

$C_1 = \frac{\varepsilon A_1}{d}$ $\qquad C_2 = \frac{\varepsilon A_2}{d}$

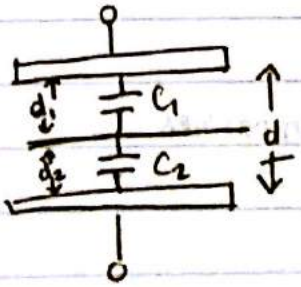
$C_{orig} = C_1 + C_2$. in parallel.

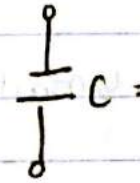
$C_{eff} = C_1 + C_2 + \dots$ for parallel capacitors



$$C_{eff}^{-1} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$= \frac{C_1 C_2}{C_1 + C_2} = C_1 \| C_2$$





$$C = \frac{\varepsilon A}{d} \qquad C_1 = \frac{\varepsilon_0 A}{d_1}$$

$$= \frac{\varepsilon A}{d_1 + d_2} \qquad C_2 = \frac{\varepsilon A}{d_2}$$

$$C^{-1} = \frac{d_1 + d_2}{\varepsilon A} = \frac{1}{C_1} + \frac{1}{C_2}$$ H!
O!