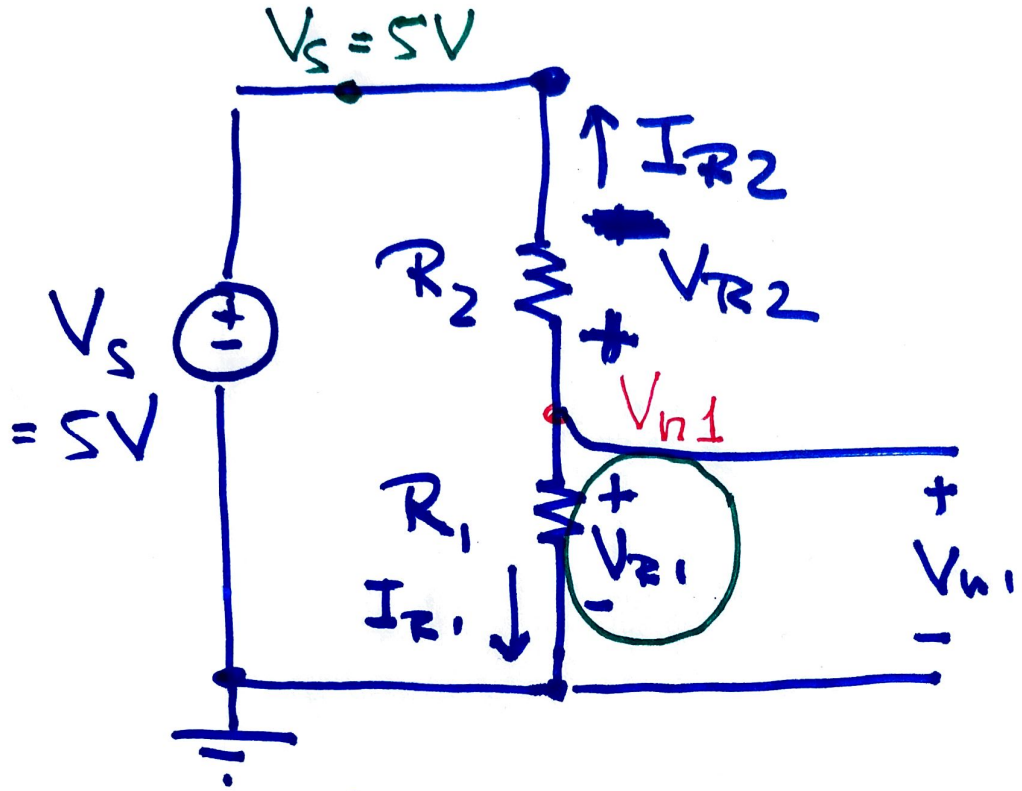
EECS 16A, Module 2, Lecture 2



Approach:

- K's equations
- Comp. equations (Ohm's Law, ...)

Technique:

Node Voltage Analysis NVA

Procedure:

STEP 1:

choose reference

STEP 2:

mark known node voltages

STEP 3:

mark unknown " "

STEP 4: mark element V_{el}, I_{el}

STEP 5:

KCL for all nodes with unknown node voltage

$$I_{R1} + I_{R2} = \emptyset$$

STEP 6:

Comp. Eqs:

$$I_{R1} = \frac{V_{R1}}{R_1} \qquad I_{R2} = \frac{V_{R2}}{R_2}$$

Replace comp voltages (V_{R1}, ...) with node voltages (V_{n1}, ...).

$$V_{R1} = V_{n1} - \cancel{0} = V_{n1}$$

$$V_{R2} = V_{n1} - V_s$$

$$I_{R1} = \frac{V_{R1}}{R_1} = \frac{V_{n1}}{R_1}$$

$$I_{R2} = \frac{V_{n1} - V_s}{R_2}$$

STEP 7:

Substitute (6) → (5)

$$I_{R1} + I_{R2} = 0$$

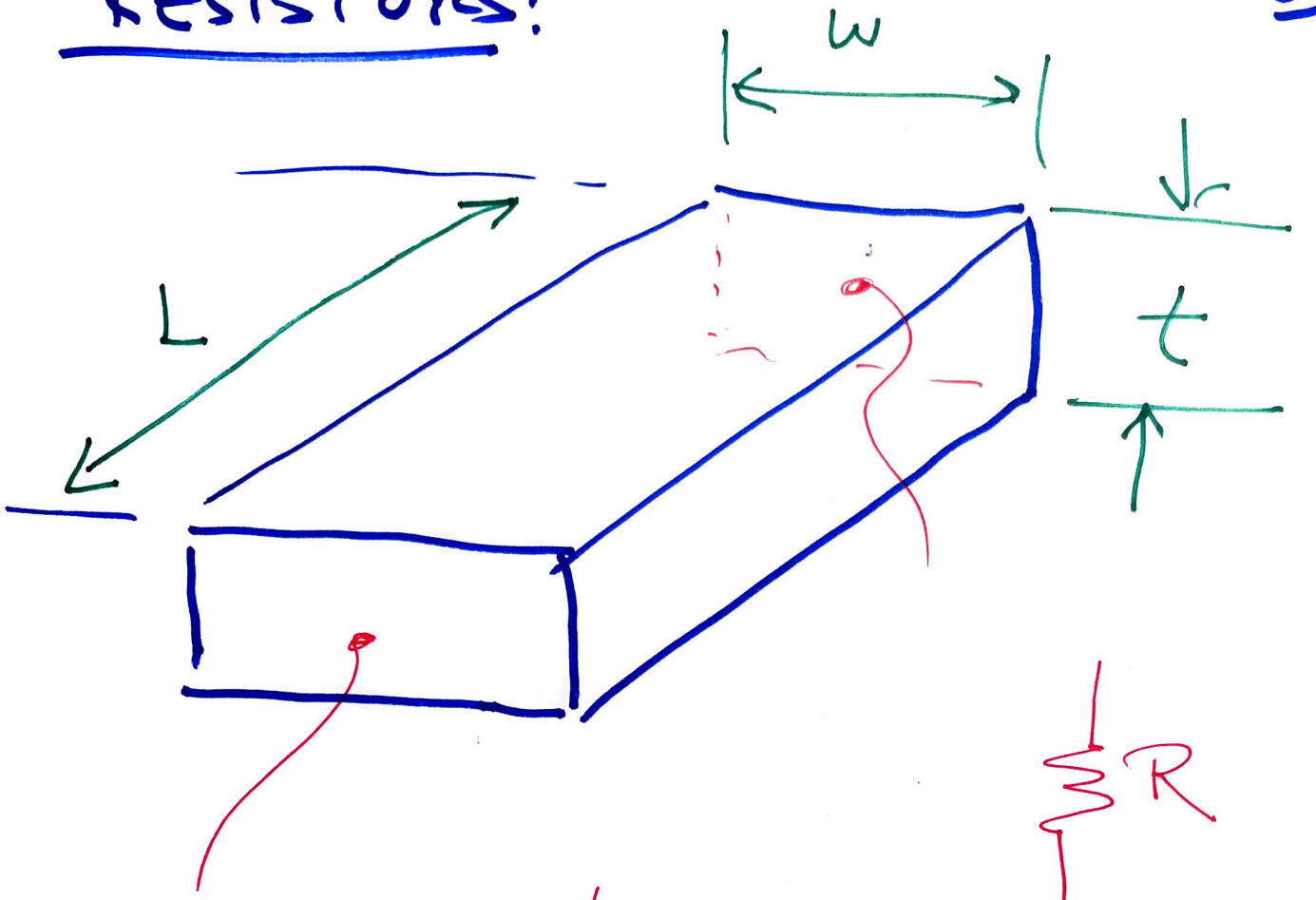
$$\frac{V_{n1}}{R_1} + \frac{V_{n1} - V_S}{R_2} = 0$$

STEP 8: SOLVE!

$$V_{n1} = V_S \cdot \frac{R_1}{R_1 + R_2}$$

Voltage Divider

RESISTORS:

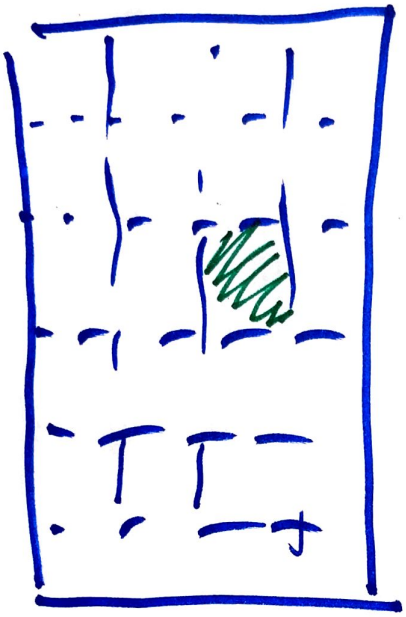


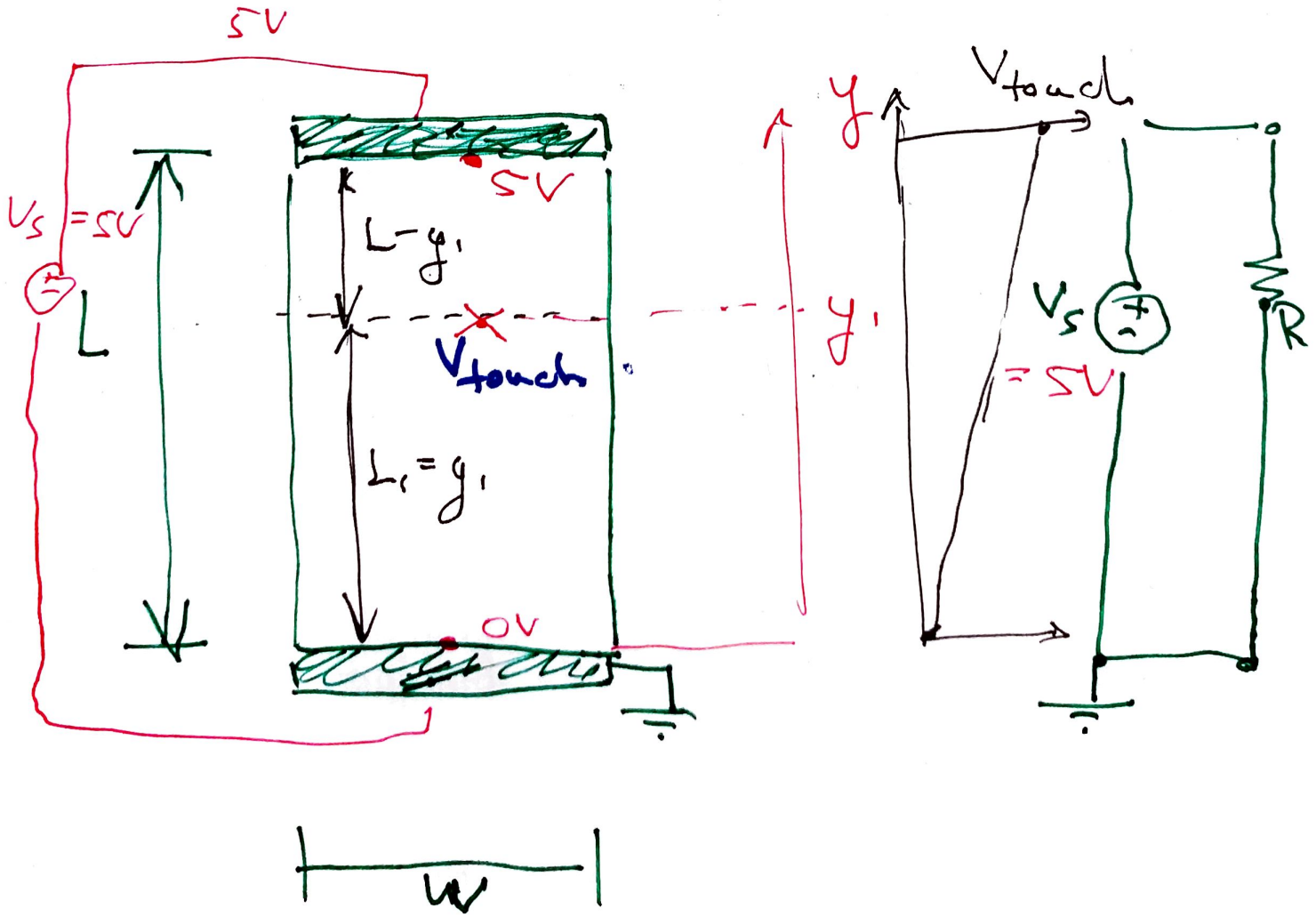
$$R = \rho \cdot \frac{L}{W \cdot t}$$

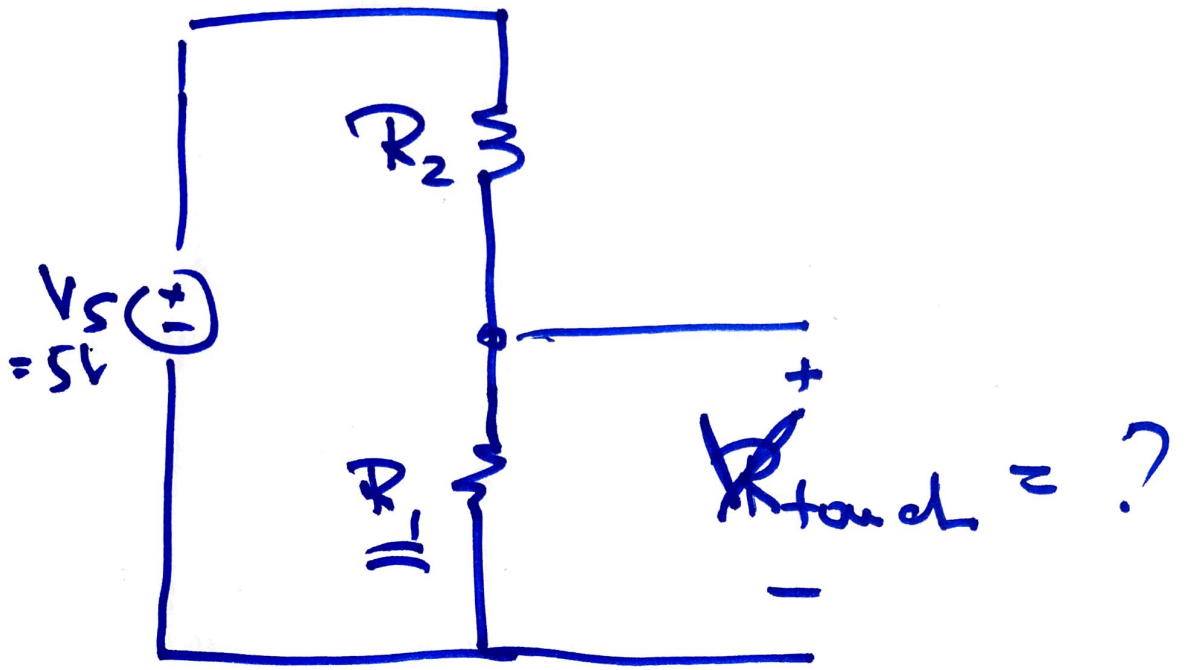
ρ: resistivity $[\Omega \cdot m]$

Material	Resistivity / Ωm
copper	1.7×10^{-8}
aluminium	2.7×10^{-8}
graphite	8.0×10^{-6}
silicon	2.3×10^{3}
quartz	5.0×10^{16}

TOUCH SCREEN







$$R_1 = \rho \cdot \frac{y_1}{w \cdot t}$$

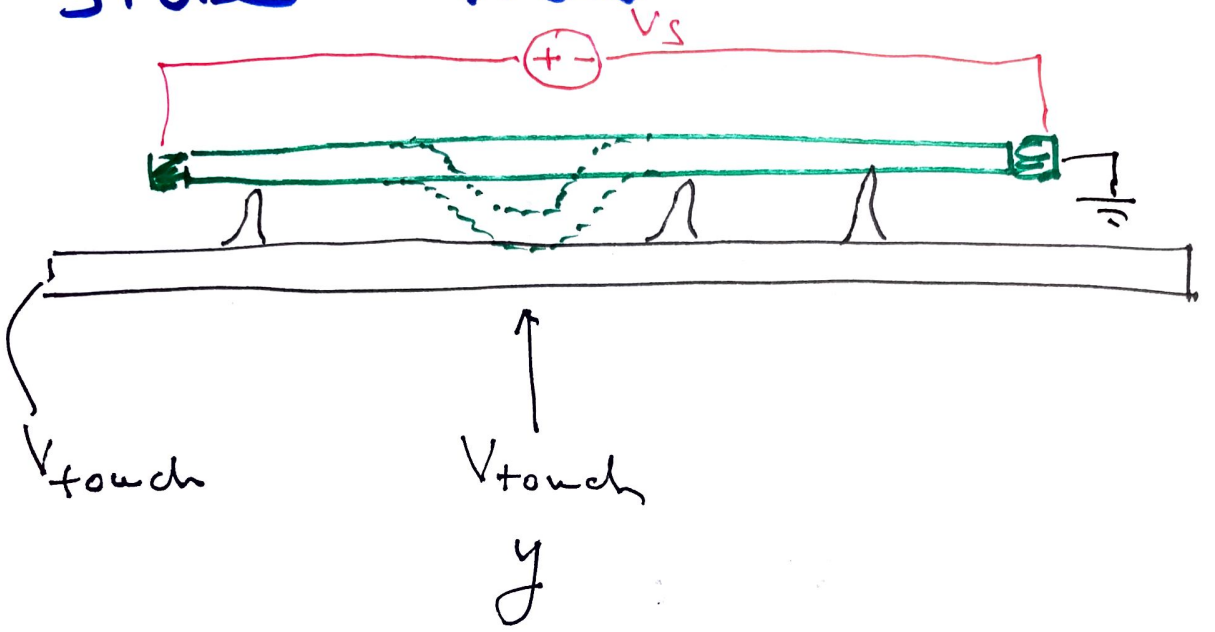
$$R_2 = \rho \cdot \frac{L - y_1}{w \cdot t}$$

$$V_{touch} = V_S \cdot \frac{R_1}{R_1 + R_2}$$

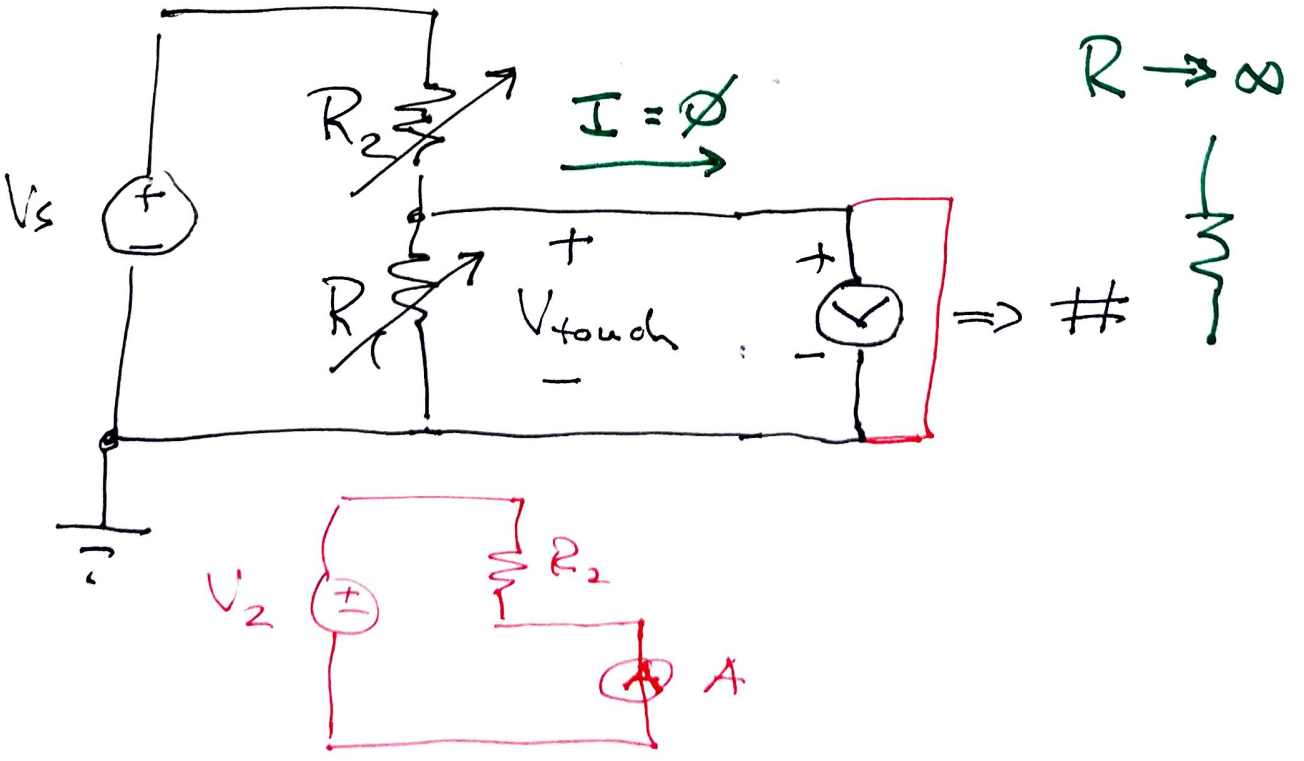
$$= V_S \cdot \frac{y_1}{L}$$

1D Touch

Side view



Volt / Am - meter



Am-meter