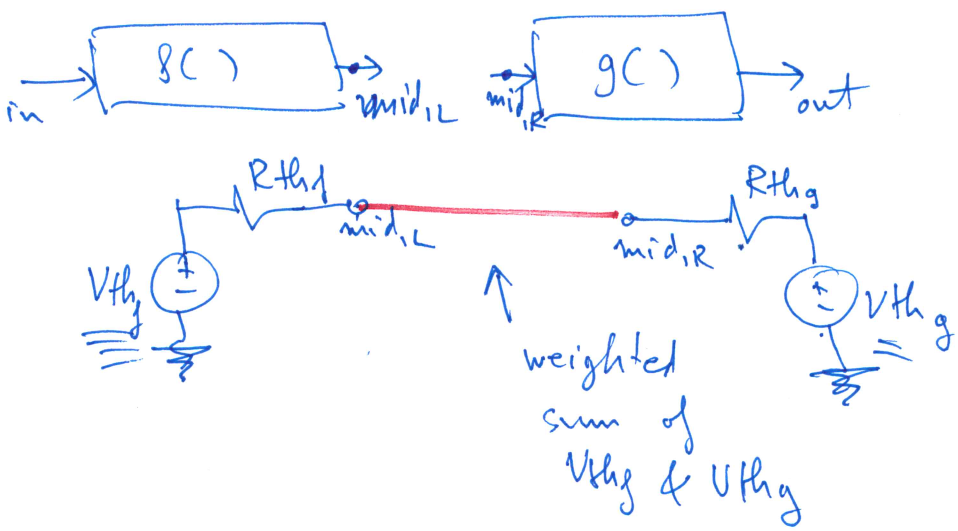
EE16A - Module 2 - Lecture 10

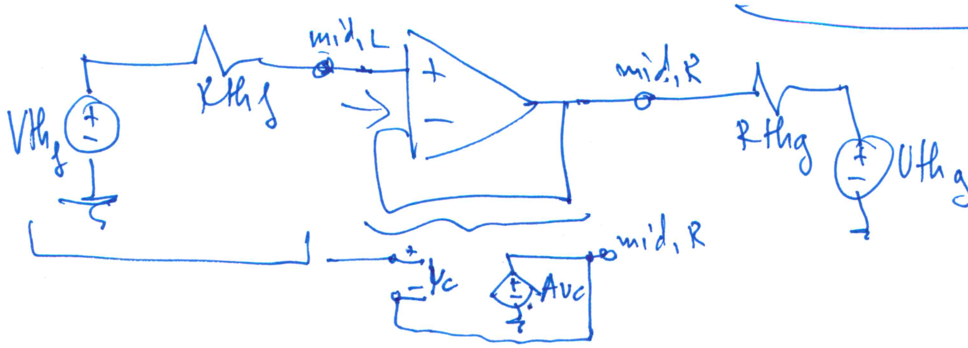
* Cascading ckt blocks continued
* Design procedure
* Design examples



Ideal isolation scenario:

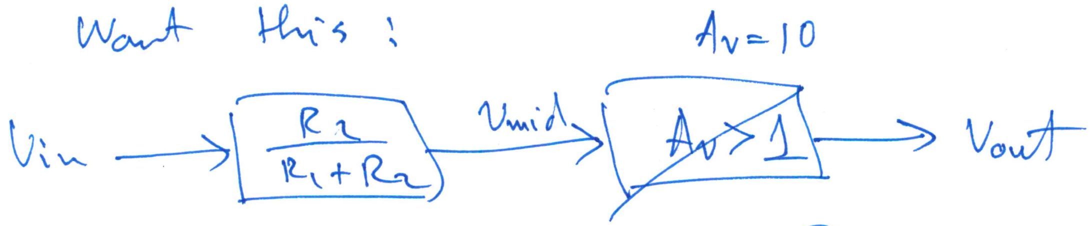
From perspective of block f ⇒ see an open-circuit.

From perspective of block g ⇒ see an voltage-source

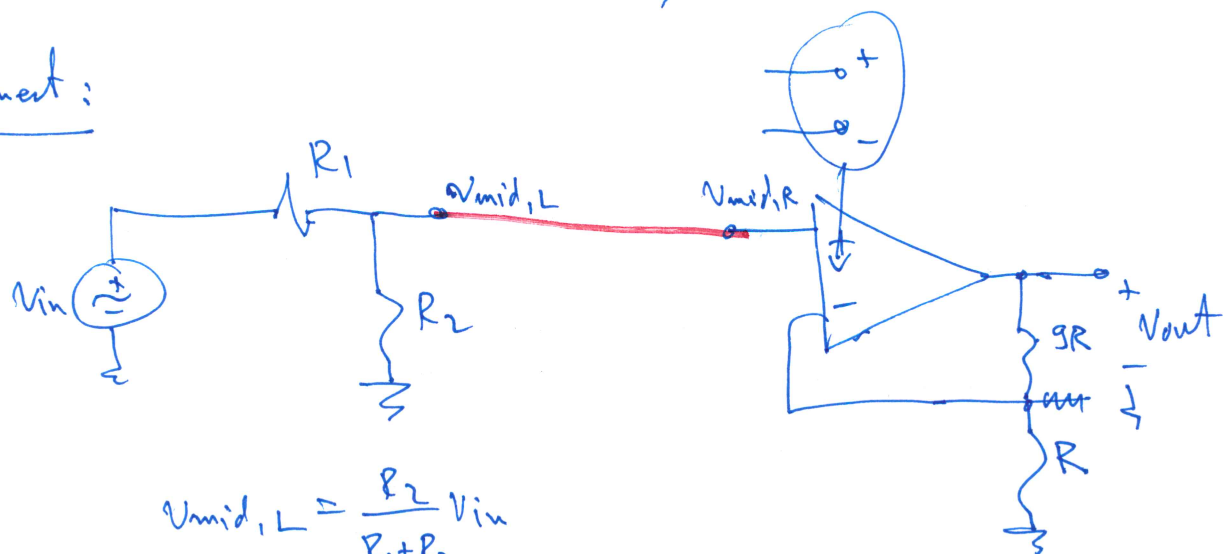


Example 1:

Want this:



Implement:

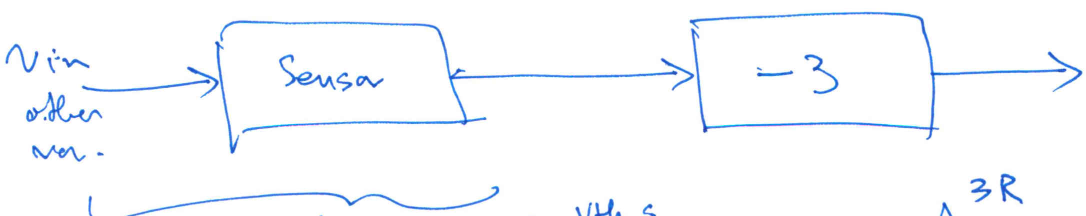


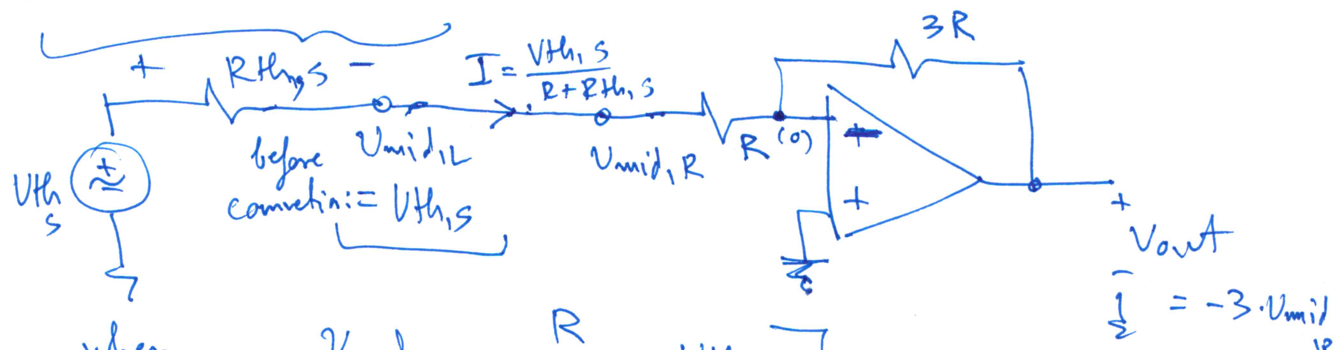
$$V_{mid,L} = \frac{R_2}{R_1+R_2} V_{in}$$

$$A_V = \left(1 + \frac{9}{1}\right) = 10$$

$$V_{mid,L} = V_{mid,R} = \frac{R_2}{R_1+R_2} V_{in}$$

Example 2:





when connected: $V_{mid} = \frac{R}{R+R_{th,s}} \cdot V_{th,s}$

$$V_{Rth} = R_{th,s} \cdot \frac{V_{th,s}}{R+R_{th,s}}$$

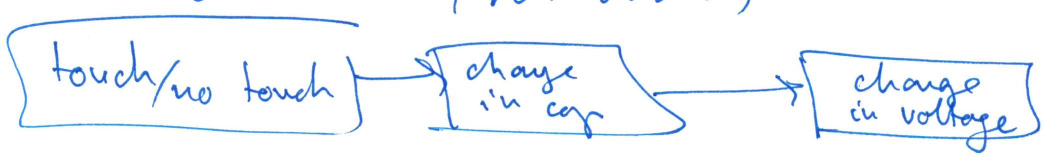
Design procedure:

step 1: (Specification) Concretely (re)state your goal for the design. (most often from a word specification)

step 2: (Strategy) Describe (often as a block diagram) the strategy to achieve the goal.

↳ often review what you can measure vs. what you wanted to know

↳ what is the relationship between the two (e.g. touch/no-touch)



step 3: (Implementation) Implement the components within the strategy

↳ Remind yourself of blocks you know that can provide the desired block function.

↳ Think about how to extend/modify the blocks you know (attempt #1000)

Step 4: Analysis/Verification

Does the implementation in step 3 do what the spec in step 1 says.

↳ Check for block-to-block connections

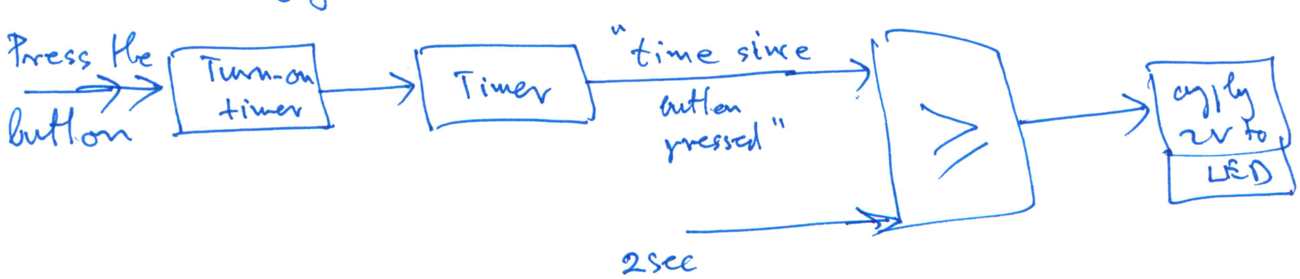
↳ especially if different people work on different blocks.

Example #1 design: ("Countdown timer")

step 1: Build a ckt that after a button is pressed measures 2s and will then apply 2V across the LED.

(I assume you can only push the button once)

step 2: Strategy

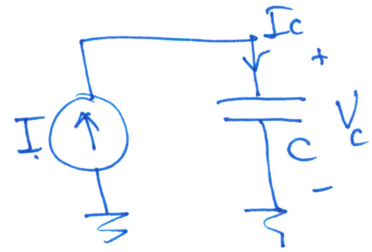


(25) Step 3: Implement

"Turn-on" ckt

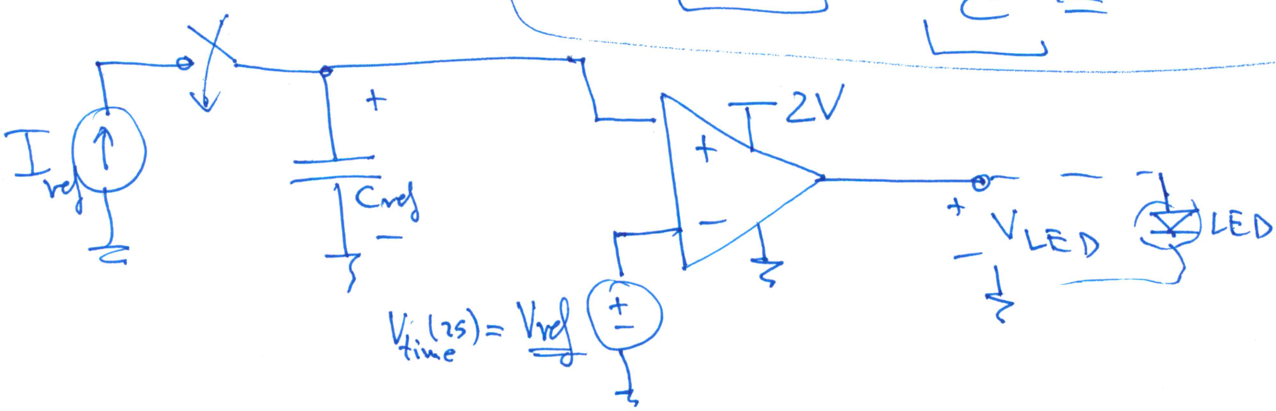
$Q = C \cdot V$

$I \cdot t = C \cdot V_c$



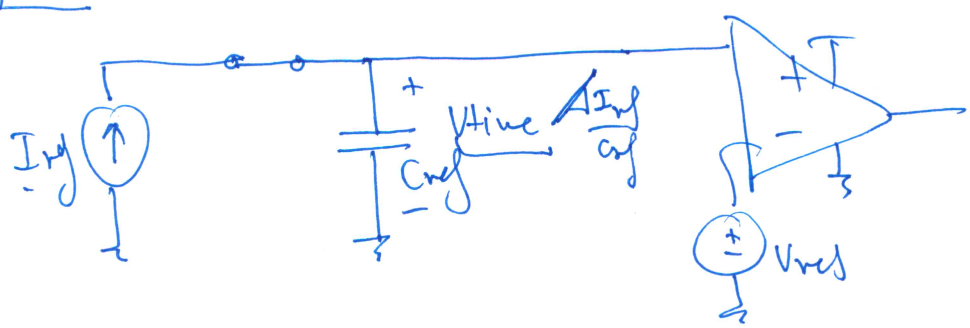
$$I_c = C \cdot \frac{dV_c}{dt}$$

$$V_{time} = V_c(t) = \frac{I_c \to I}{C} \cdot t + V_c(0)$$

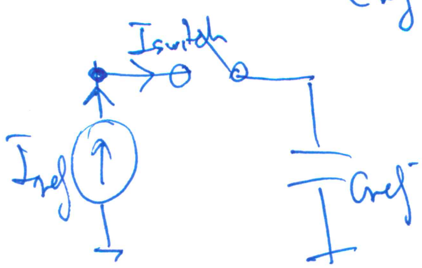


$$V_{time} = \frac{I_{ref}}{C_{ref}} \cdot t \qquad V_{ref} = \frac{I_{ref}}{C_{ref}} \cdot 2sec + \bigcirc$$

Step 4:



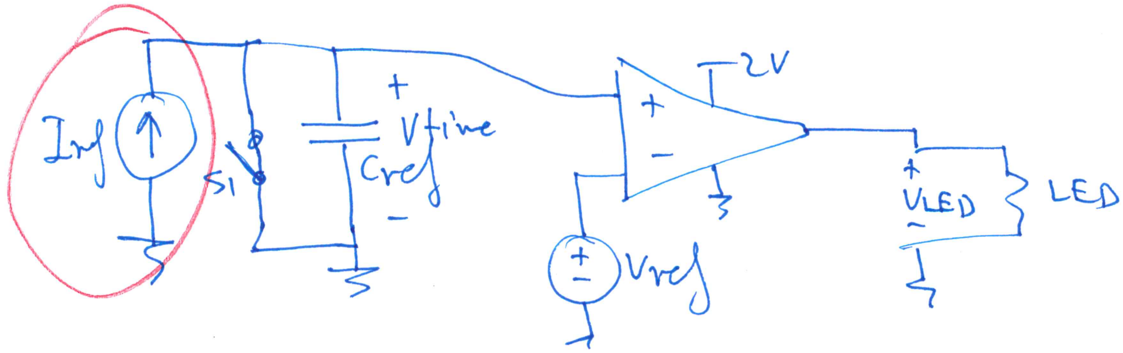
$$V_{time}(t) = \frac{I_{ref}}{C_{ref}} \cdot t + V_{time}(0)$$



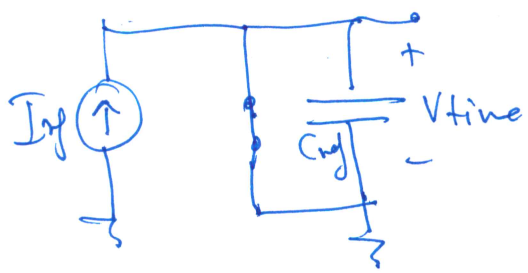
$I_{ref} \neq I_{switch} \neq 0$

1mA

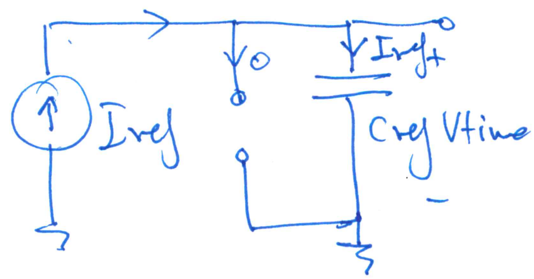
violating KCL



Before the button is pushed: S1 is on



When you push the button: S1 is off



In the lab, no current source.

Next, figure-out how to build a current source out of Vs, R, op-amp, etc.