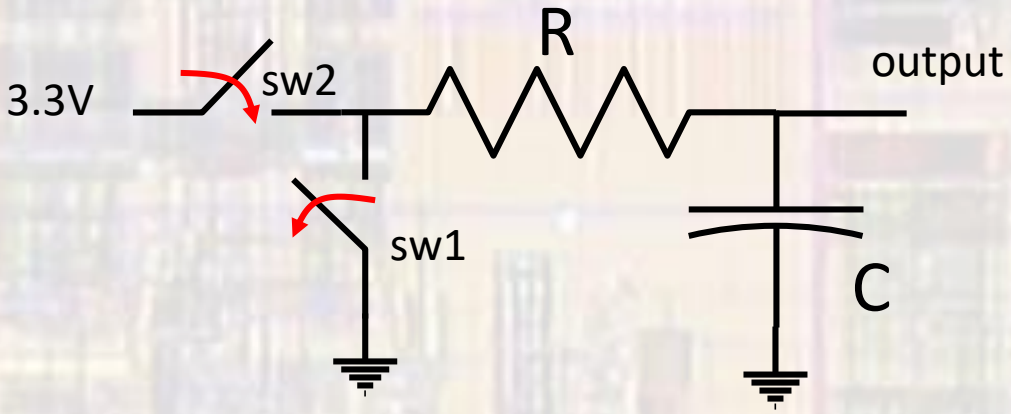
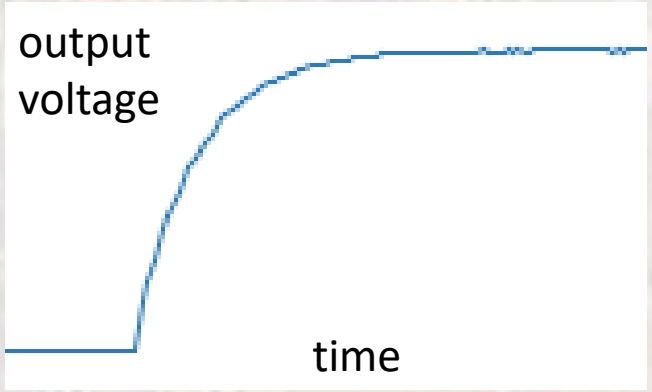
RC Notes

Last updated 10/30/18

RC Notes

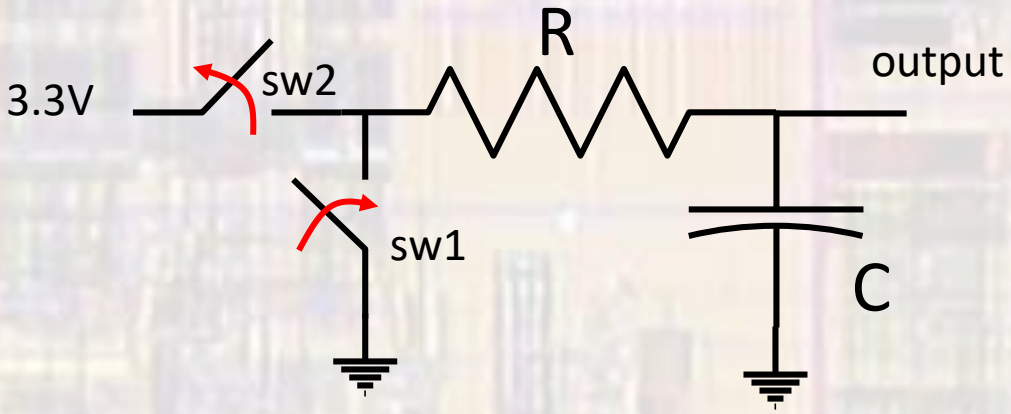
- The RC circuit
  - If we assume switch 1 has been closed for a very long time (sw2 open) – the output should be at 0v
  - When we open switch 1 and close switch 2 the resistor tries to pull the output up to 3.3V - but the capacitor limits how fast it can rise

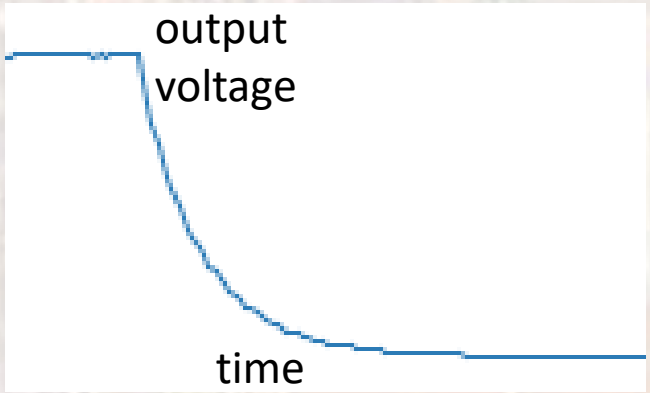




RC Notes

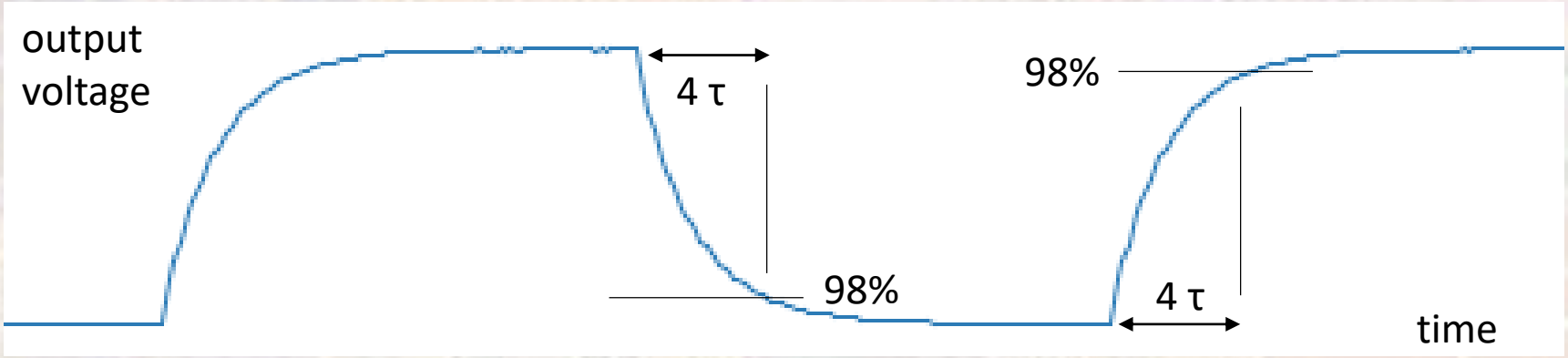
- The RC circuit
  - If we assume switch 2 has been closed for a very long time (sw1 open) – the output should be at 3.3v
  - When we open switch 2 and close switch 1 the resistor tries to pull the output down to gnd - but the capacitor limits how fast it can fall





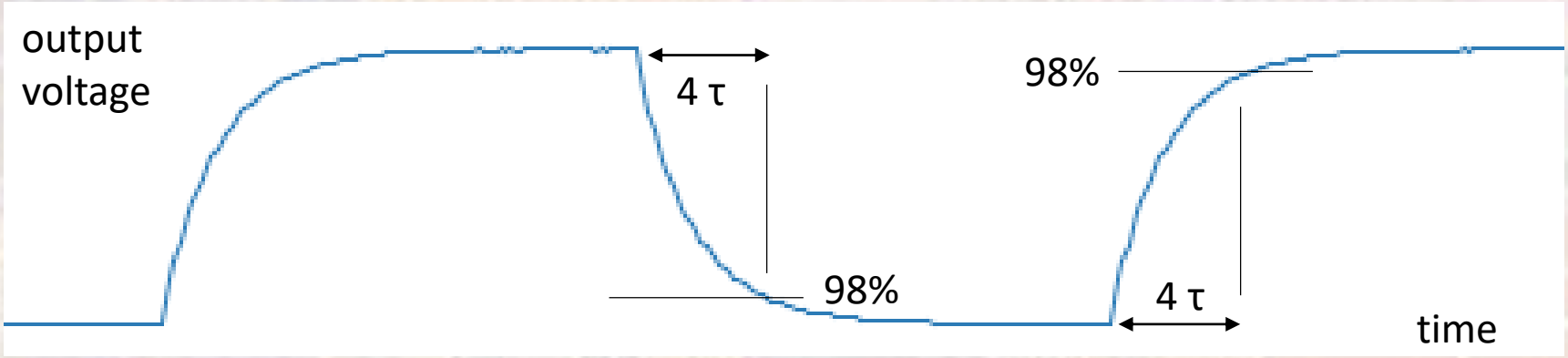
RC Notes

- The RC circuit
  - The rise (charge) and fall (discharge) times are a function of the RC product, which is called the RC Time Constant and uses the symbol τ (tau)
  - $\tau = R \times C$
  - It takes approximately 4 time constants for the output to reach 98% of its final change in value



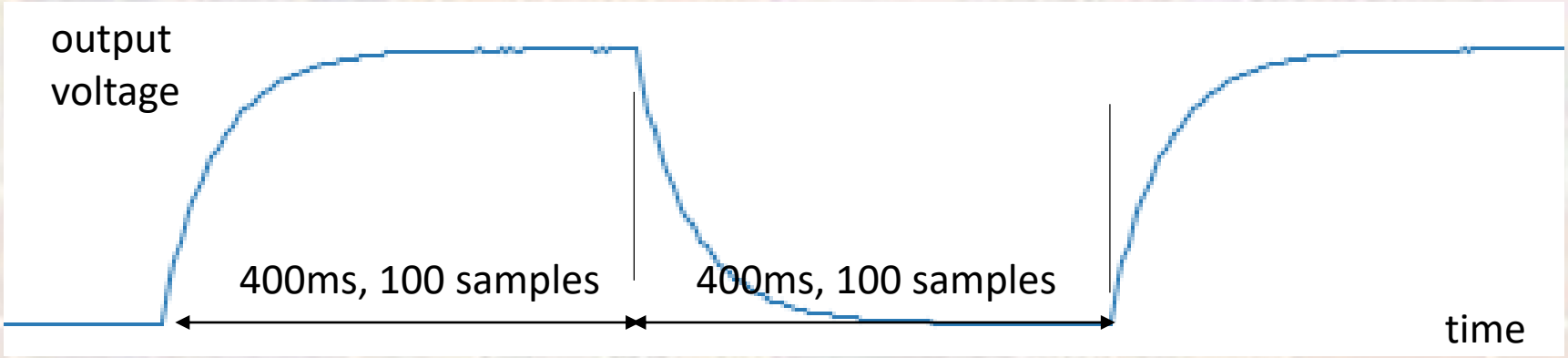
RC Notes

- The RC circuit
  - For our circuit we will use a 10KΩ resistor and a 4.7uF capacitor
  - $\tau = 10K\Omega \times 4.7uF = 47x10^{-3}\Omega\text{-}F = 47ms$
  - $4\tau = 188ms$



RC Notes

- The RC circuit
  - In order to ensure we can see the whole waveform we will use a total time of 400ms
  - With 100 samples → 4ms delay between each sample



RC Notes

- The RC circuit
  - We cannot control the timing of switches well enough to do this by hand
  - Use our controller to force the input high and low
    - 1 pin as a digital output alternating between high and low
    - 1 pin as an analog input, doing an analog read every 4ms