Chapter 2 - Circuit Elements

Lecture 4
Sections 2.8-2.9

MEMS 0031 Electrical Circuits

Mechanical Engineering and Materials Science Department
University of Pittsburgh

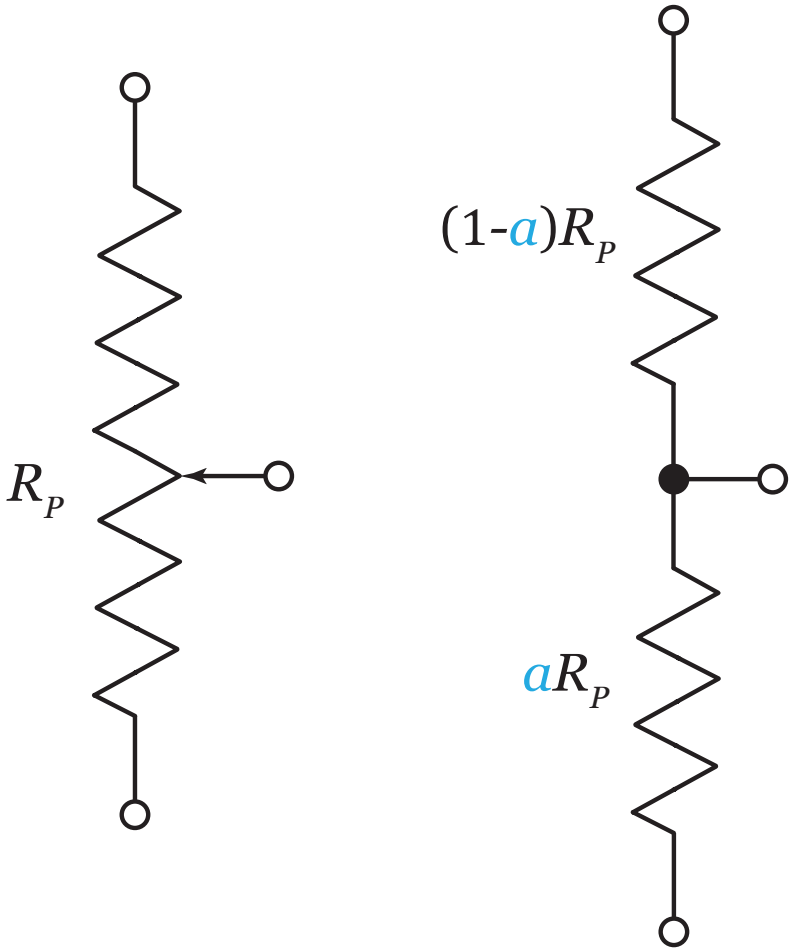
Student Learning Objectives

At the end of the lecture, students should be able to:

- Identify and understand the behavior of a potentiometer, a subset of transducers
- Understand the behavior of switches, both single pole single throw and single pull double throw

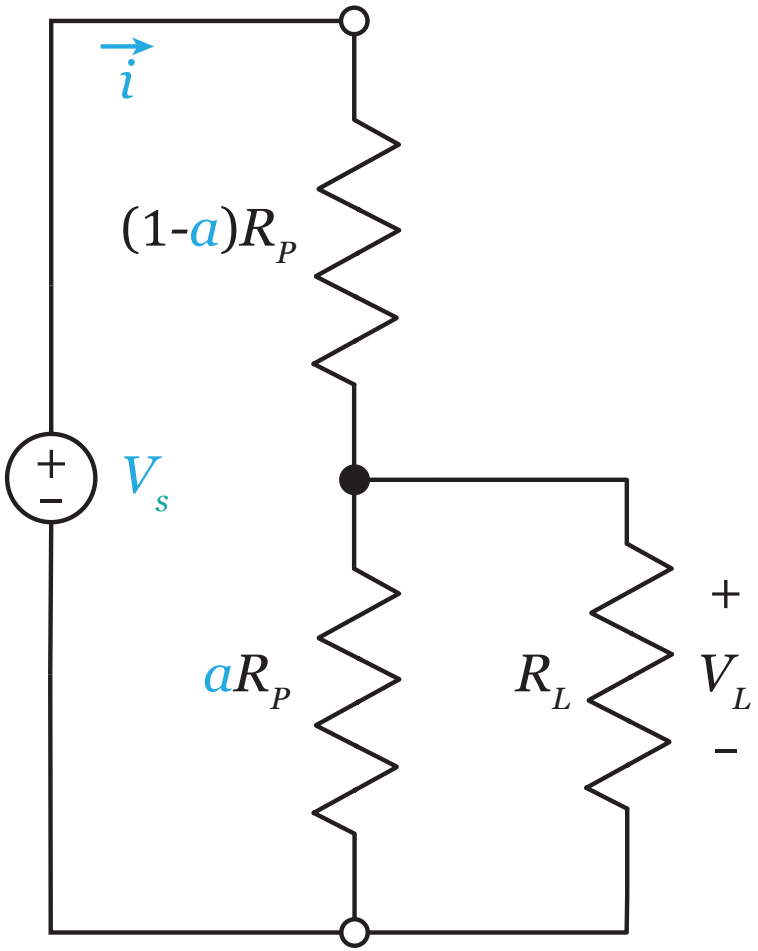
Potentiometers

- Potentiometeres are a subset of transducers, where the resistance is variable based upon the location of the wiper.
- The variable a represents the wiper location $(0 \leq a \leq 1)$



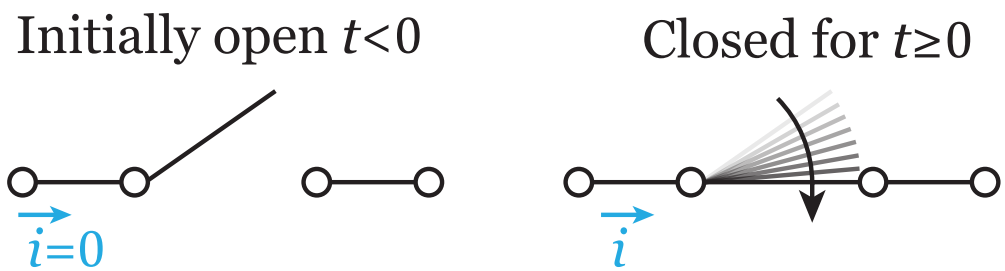
Potentiometers

- Connecting the wiper to a ckt, this creates a division of voltage and current



Switches

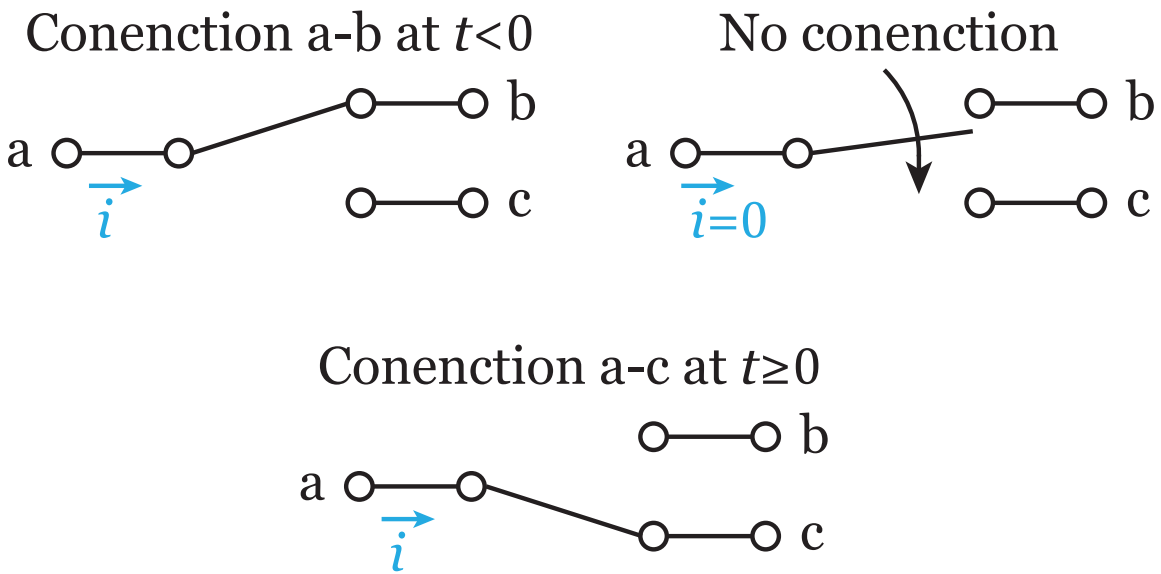
- There exist a variety of switches that serve many purposed
- a Single Pole Single Throw (**SPST**) is just like the light switch in this room



- The change of state is instantaneous

Switches

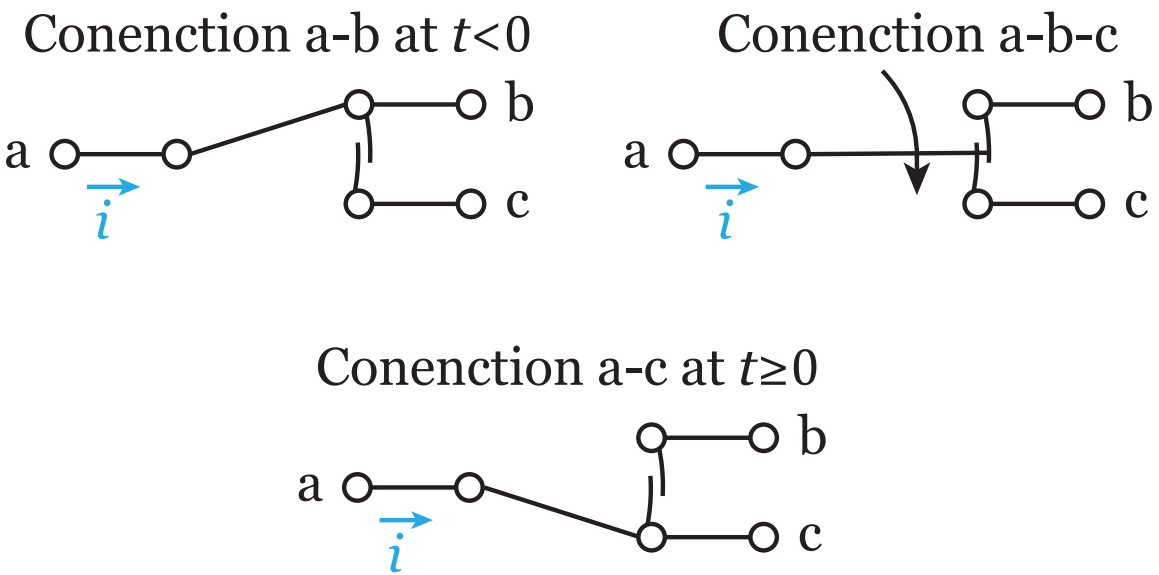
- a Single Pole Single Throw (**SPST**) can be configured in a break-before-make switch
- It prevents momentary connection of the old and new signal paths



- The change of state is instantaneous

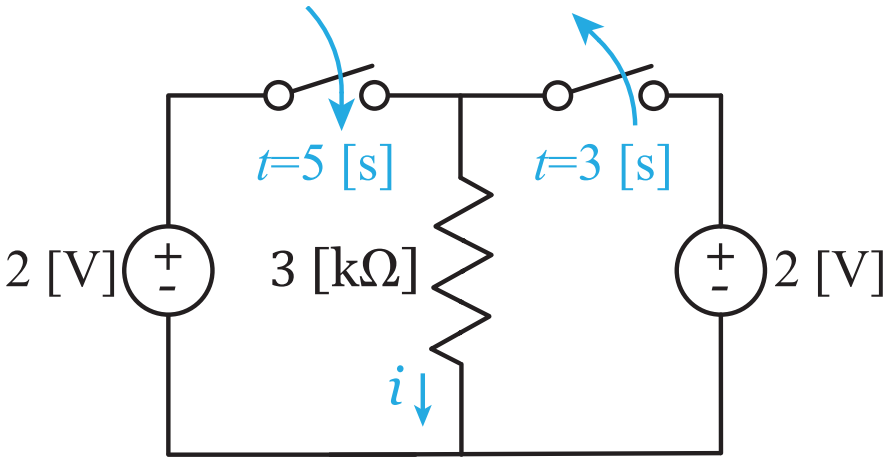
Switches

- a Single Pole Double Throw (**SPDT**) prevents the path of the current from ever seeing an open-circuit - make-before-break
- Basically 2 SPST with the switching action between 2 terminals



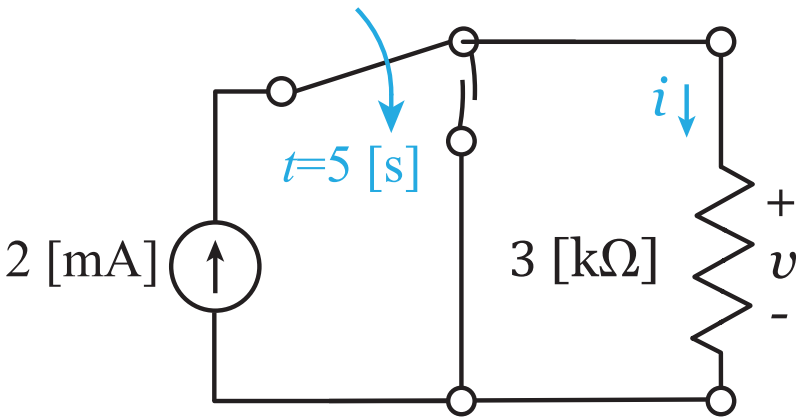
Example #1

- Find i for 0, 4 and 6 [s].



Example #2

- Find v for 0, 5 and 6 [s].



Student Learning Objectives

At the end of the lecture, students should be able to:

- Identify and understand the behavior of a potentiometer, a subset of transducers
  - Potentiometers are variable-resistance devices, where the resistance typically scales between a minimum and maximum value, often times linearly.
- Understand the behavior of switches, both single pole single throw and single pull double throw
  - A single-pole single-throw switch is the most common type of switch. The flow of current is interrupted as the switch is activated. A single-pole double-throw switch does not interrupt the flow of current, and is referred to as a make-before-break switch.

Suggested Problems

- 2.9-1, 2.9-2, 2.9-3