

Chapter 2 - Circuit Elements

Lecture 4

Sections 2.8-2.9

Learning Objectives

2.8 Transducers

2.9 Switches

Summary

MEMS 0031 Electrical Circuits

Mechanical Engineering and Materials Science Department
University of Pittsburgh



Student Learning Objectives

Chapter 2 - Circuit
Elements

MEMS 0031

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

[Learning Objectives](#)

[2.8 Transducers](#)

[2.9 Switches](#)

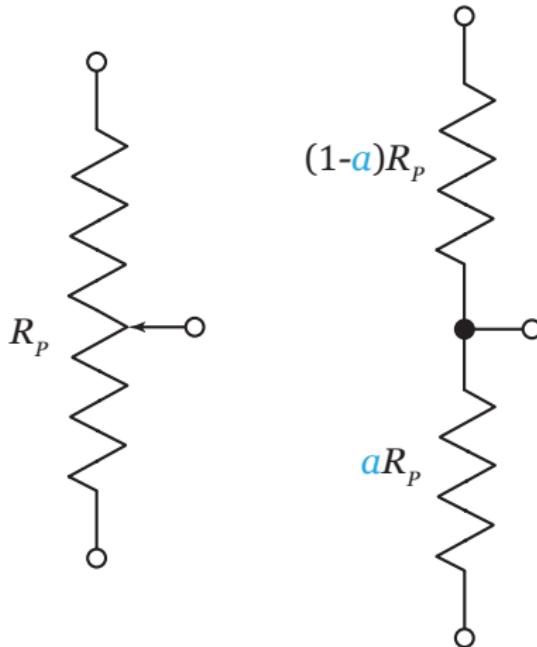
[Summary](#)



Potentiometers

- ▶ Potentiometers are a subset of transducers, where the resistance is variable based upon the location of the wiper.

- ▶ The variable a represents the wiper location ($0 \leq a \leq 1$)



Learning Objectives

2.8 Transducers

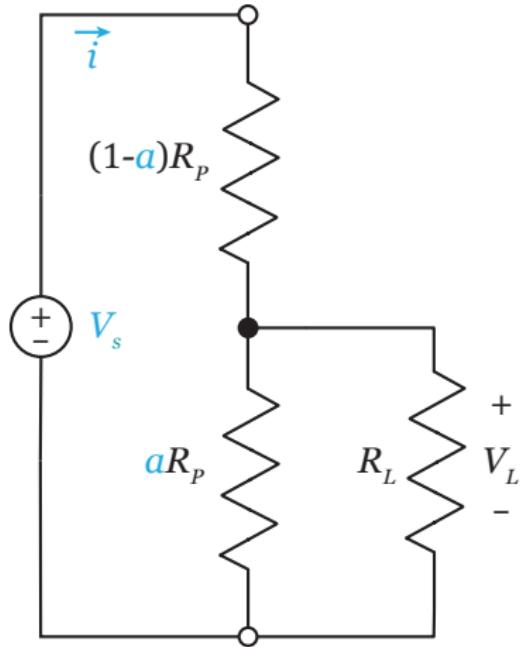
2.9 Switches

Summary



Potentiometers

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



Learning Objectives

2.8 Transducers

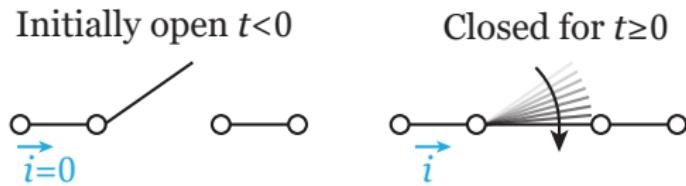
2.9 Switches

Summary



Switches

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

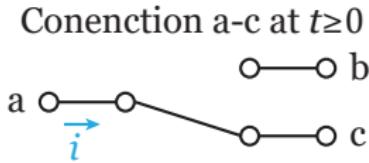
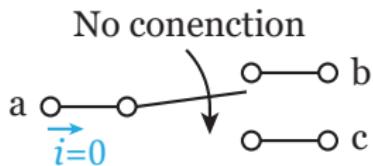
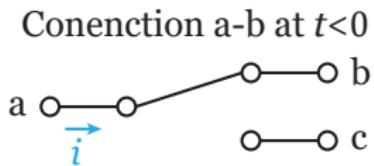


- ▶ The change of state is instantaneous



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

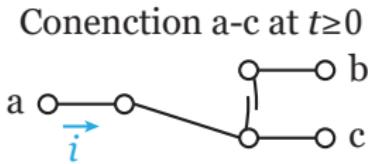
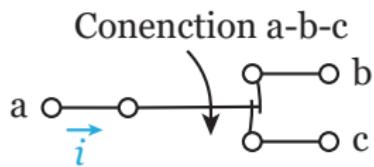
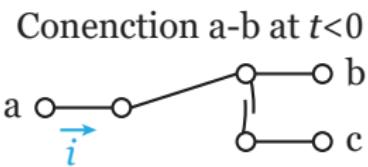


- ▶ The change of state is instantaneous



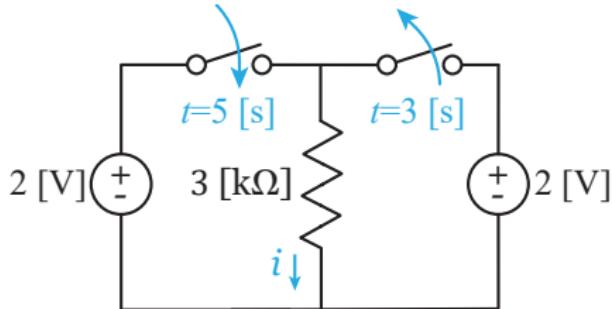
Switches

- ▶ 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].



Learning Objectives

2.8 Transducers

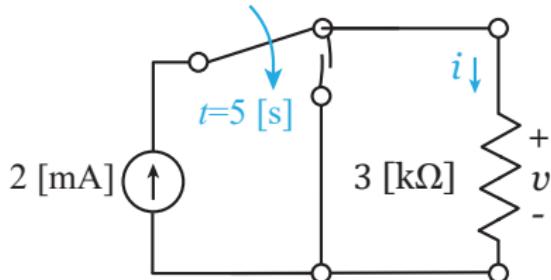
2.9 Switches

Summary



Example #2

- ▶ Find v for 0, 5 and 6 [s].



Learning Objectives

2.8 Transducers

2.9 Switches

Summary



Student Learning Objectives

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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.

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Suggested Problems

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Elements

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- ▶ 2.9-1, 2.9-2, 2.9-3

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