Fundamentals of Physical Computing

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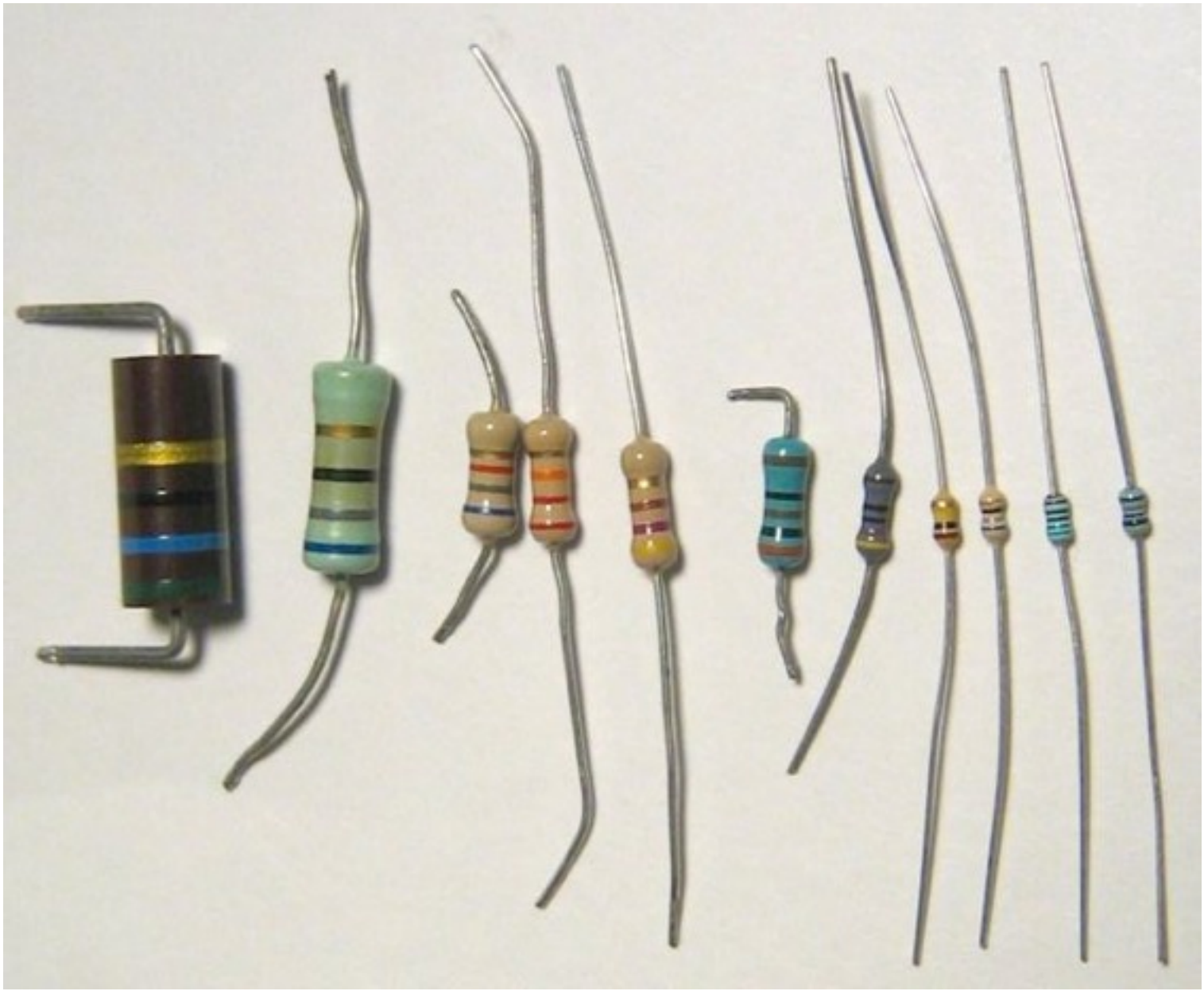
Plan for Today

- Imagined Physical Computing
- Analog Input
- Sensors
- Basic Analog Output
- Math
- Readings & Assignments

Imagined Physical Computing

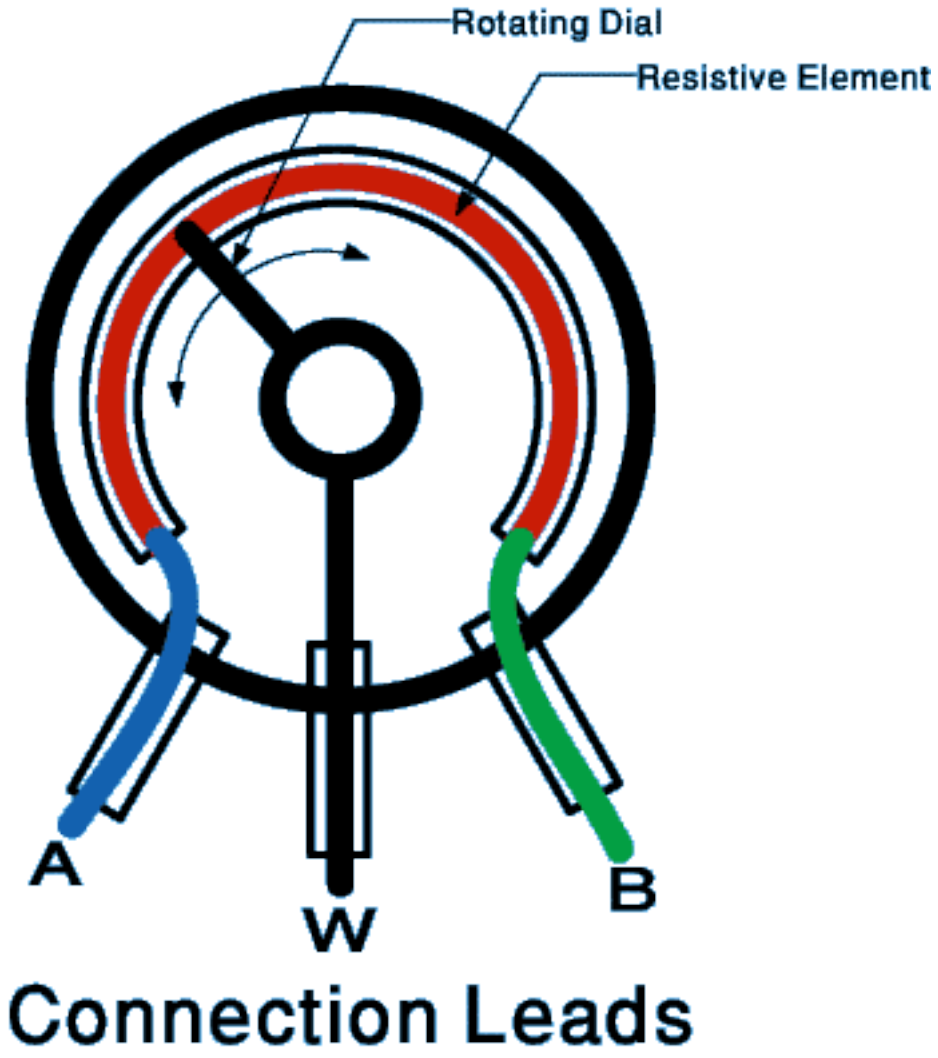
Analog Input

Resistors

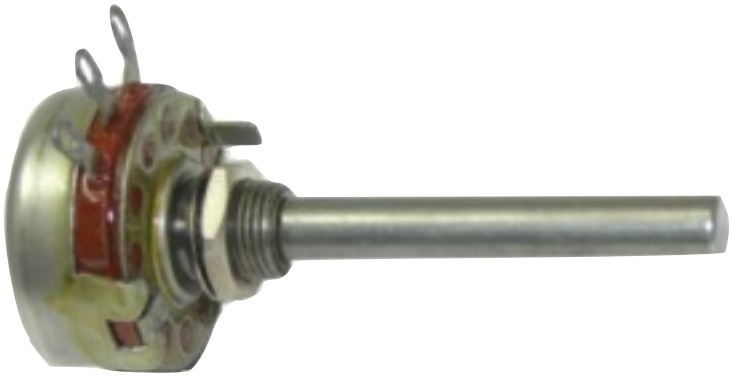


Variable Resistors

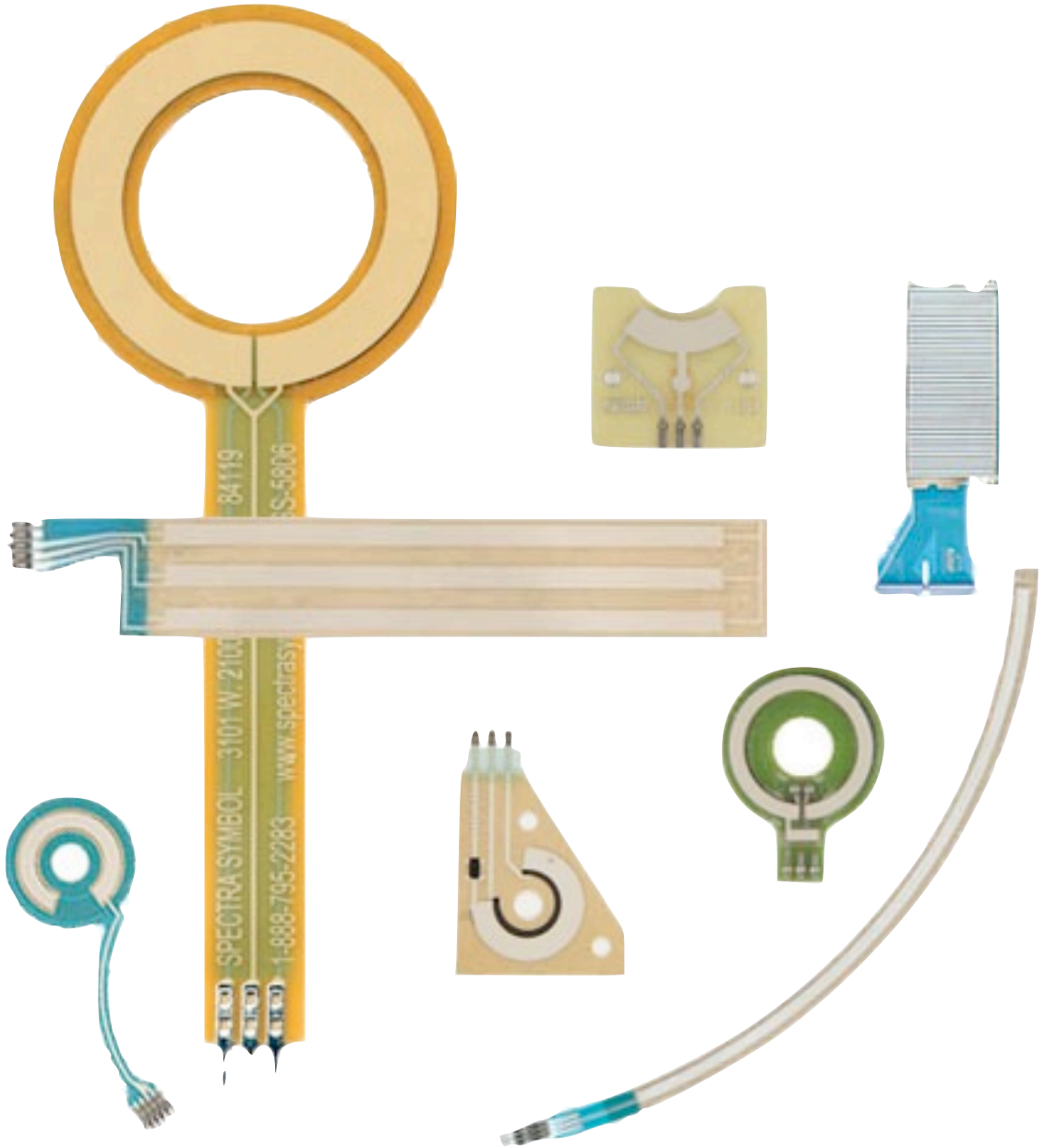
Potentiometer



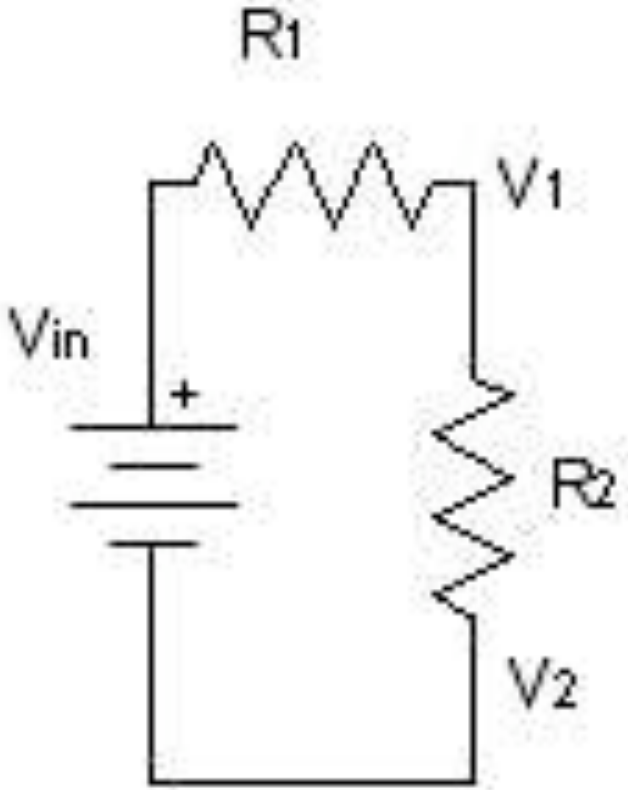
Potentiometers



Soft Potentiometers



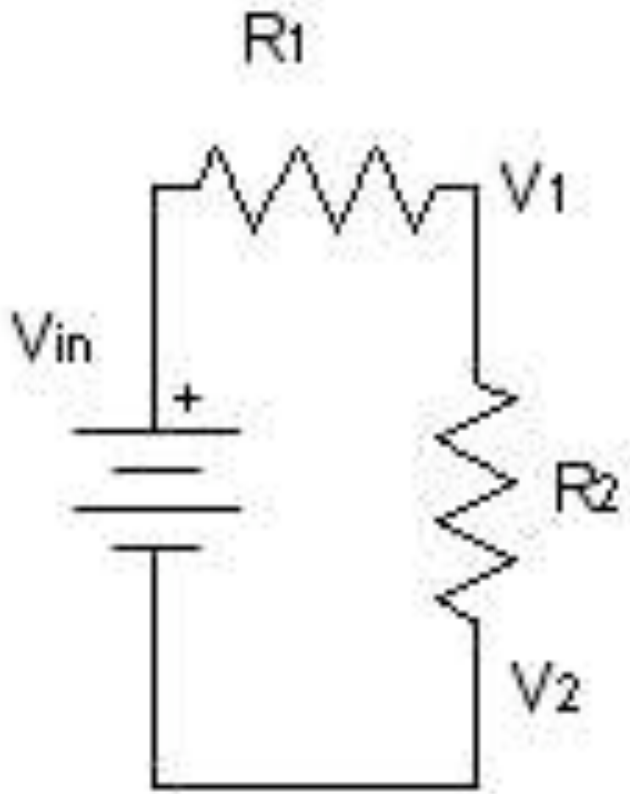
Series



Voltage Dividers

- Rt is the total of all the resistors

- Voltage at V1 = Vin * R1/Rt



Photoresistors (LDRs)

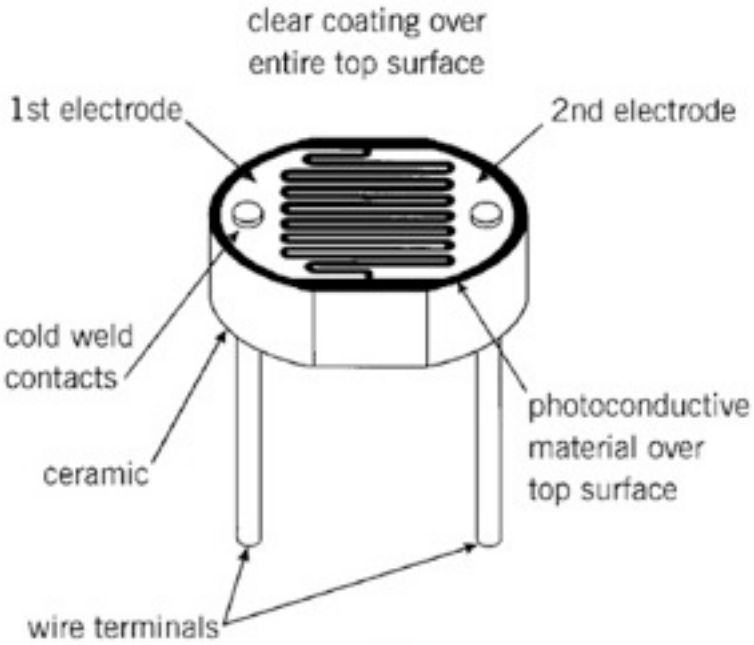
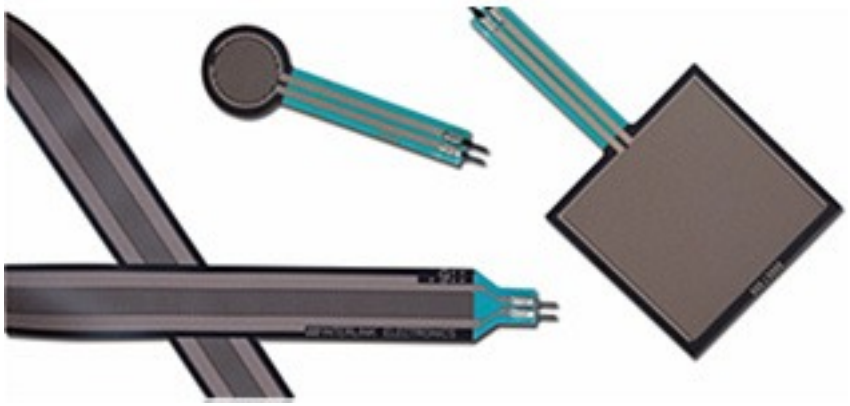
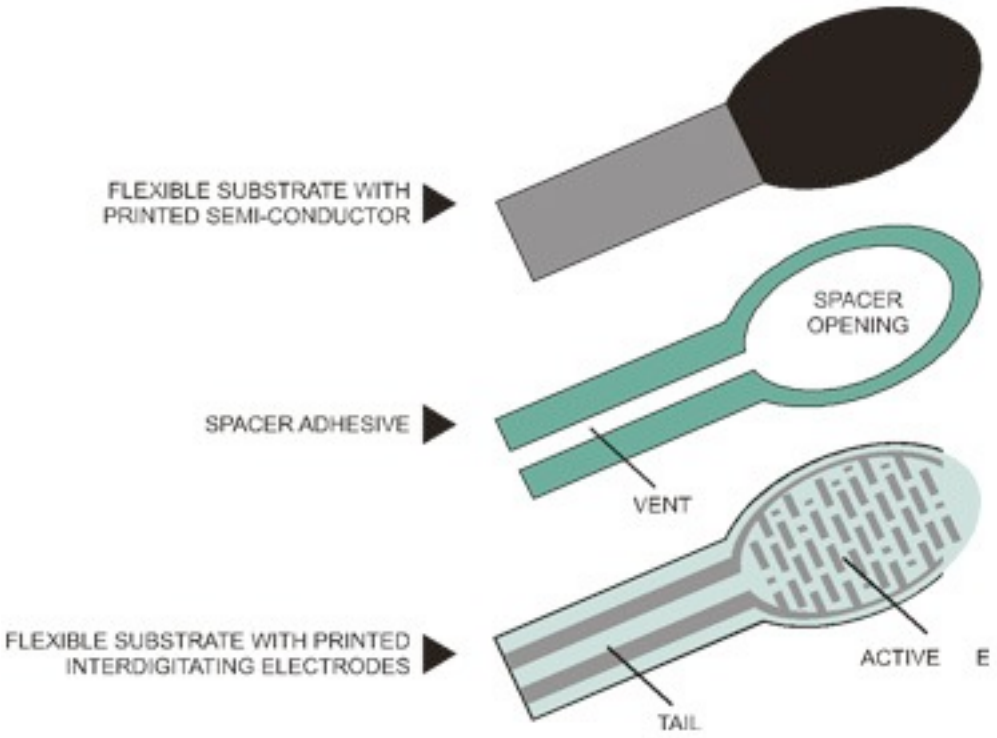


Figure 3
Typical Construction of a Plastic Coated Photocell

Force Sensing Resistors (FSRs)



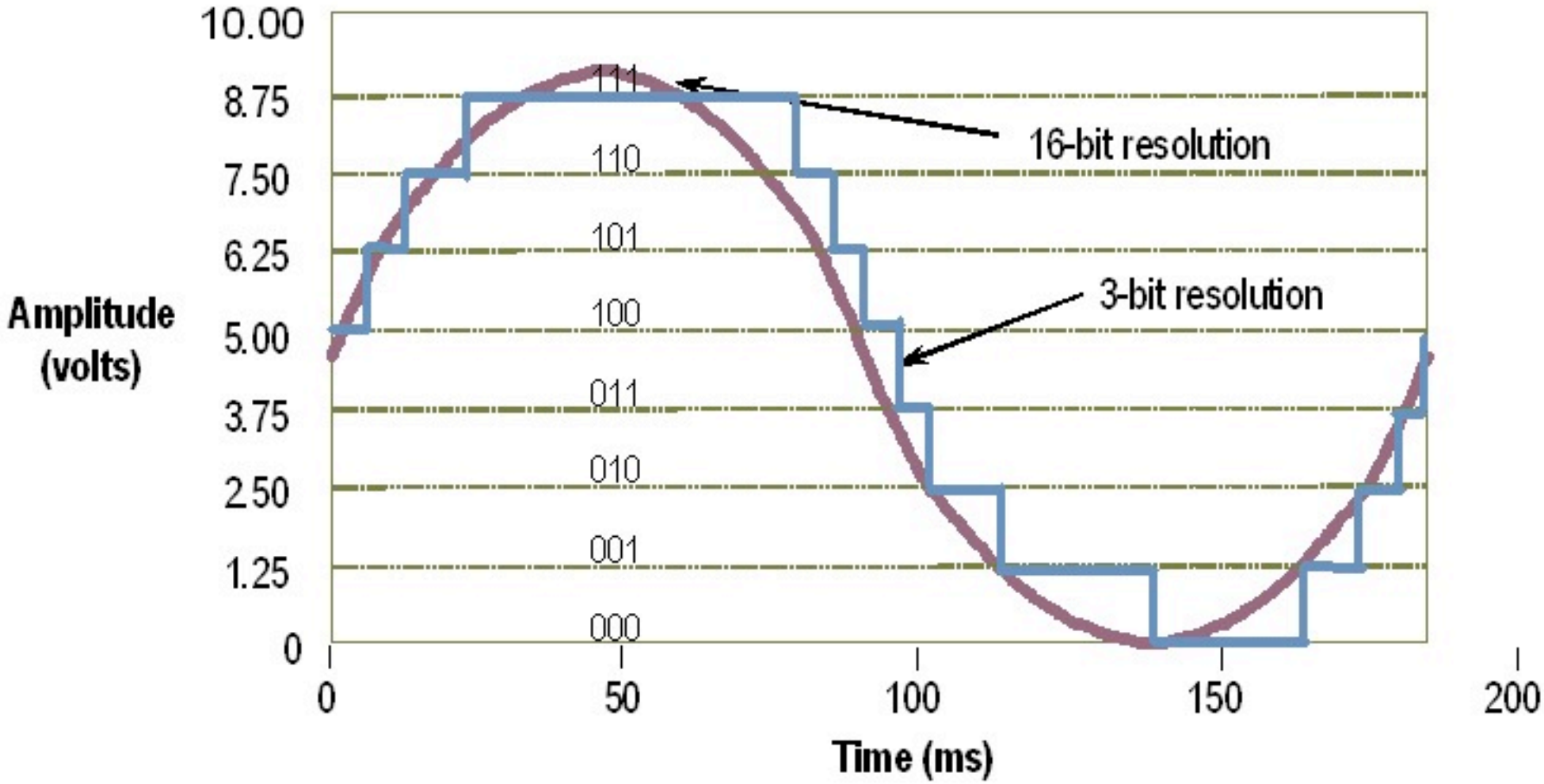


Thermistors

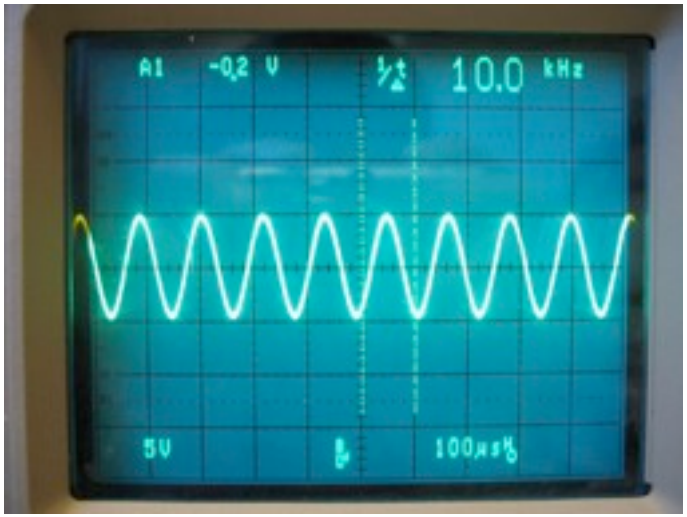
Flex Sensors

Stretch Sensors

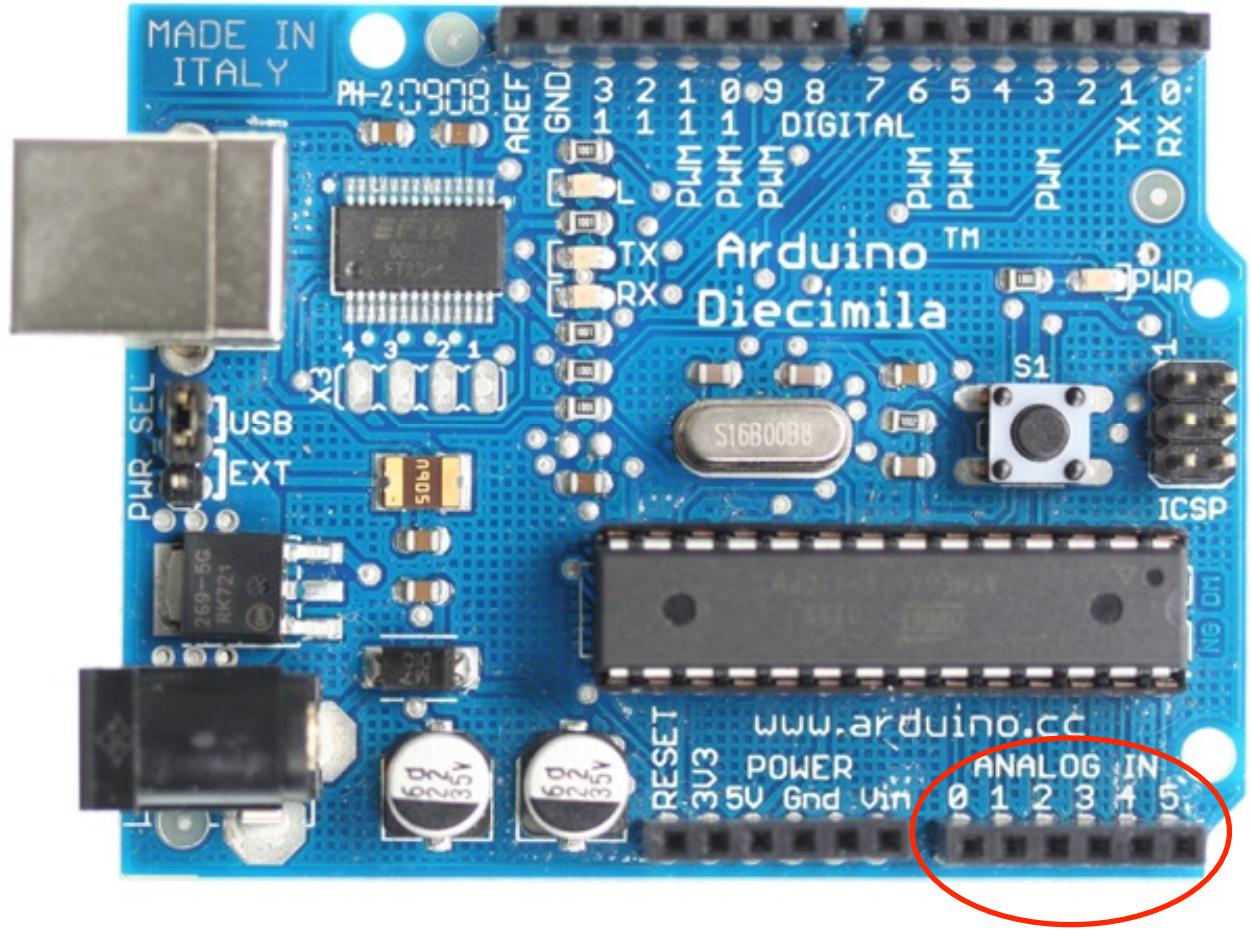
Analog Digital Conversion (ADC)



Analog Digital Conversion (ADC)



10000100
10000110
10000110
10000101
10000011
10000001
10000100
10000110
10000110
10000101
10000011
10000001


MADE IN ITALY
PH-20908
AREF
GND
DIGITAL
TX
RX
Arduino TM
Diecimila
PWR
S1
ICSP
PWR_SEL
USB
EXT
www.arduino.cc
POWER
ANALOG IN
RESET
3V3
5V Gnd Vin
0 1 2 3 4 5

Other Analog Sensors

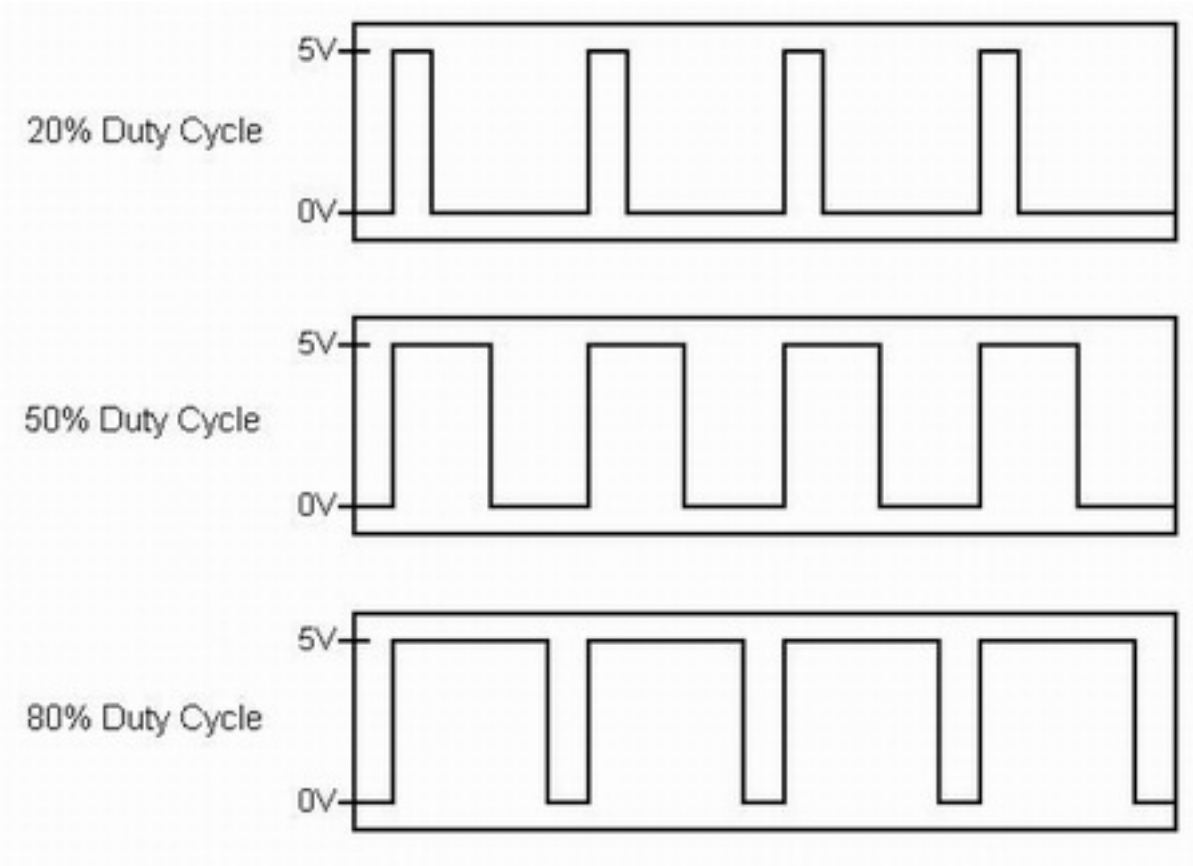
- accelerometers
- proximity sensors
- capacitive sensors
- current transformers
- infrared
- magneto
- (motion)

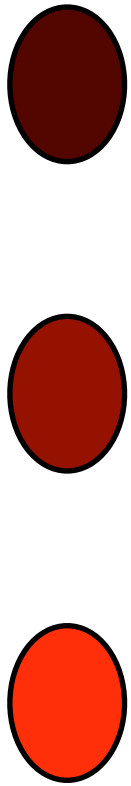
Analog Output

Getting Analog from Digital

vroom....vroom...vroom

Pulse Width Modulation (PWM)





Programming Analog in Arduino

- myvariable = analogRead(pin);

- analogWrite(pin, value);

Variables for ADC

- 10 bit input
    - 0 to 1023 (which variable type?)
- 8 bit output
    - 0 to 255 (which variable type?)

Math

Computer Math

- Binary, Decimal, Octal, Hexadecimal
  - Why?
    - Understanding computers
    - Programming helper, communications essential
  - What?
    - It’s all notation

Decimal

- Place system
- Powers
- Adding and carries
- Finger counting, but is that base 10?

Binary

- Place system
- Notation: %010 010b 0b10
- Powers
- Adding and carries
- Finger counting!

Readings and Assignments

- Readings
  - Physical Computing, chapters 6 & 11
  - Arduino, chapter 5
- Assignment
  - Analog Input Lab