Displays & More

Press Play: Interactive Device Design | April 18, 2011

Electrolytic Capacitor Explosion

Homework Sharing

When are things due?

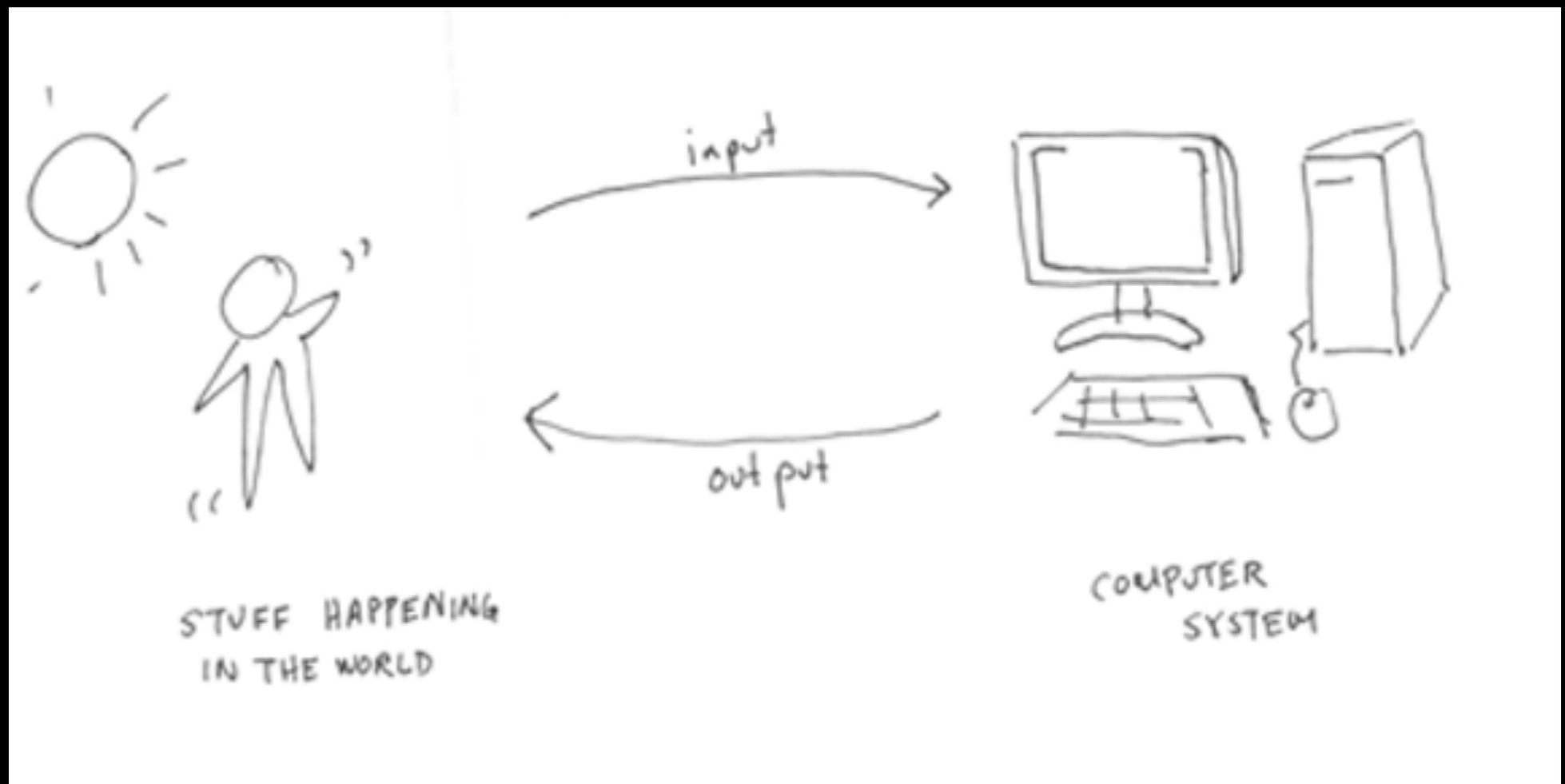
Homework - Mondays

Labs - Wednesdays

Please bring the products of Lab 2 & 3 to class next week.

Interacting with Interactive Devices

some sketches



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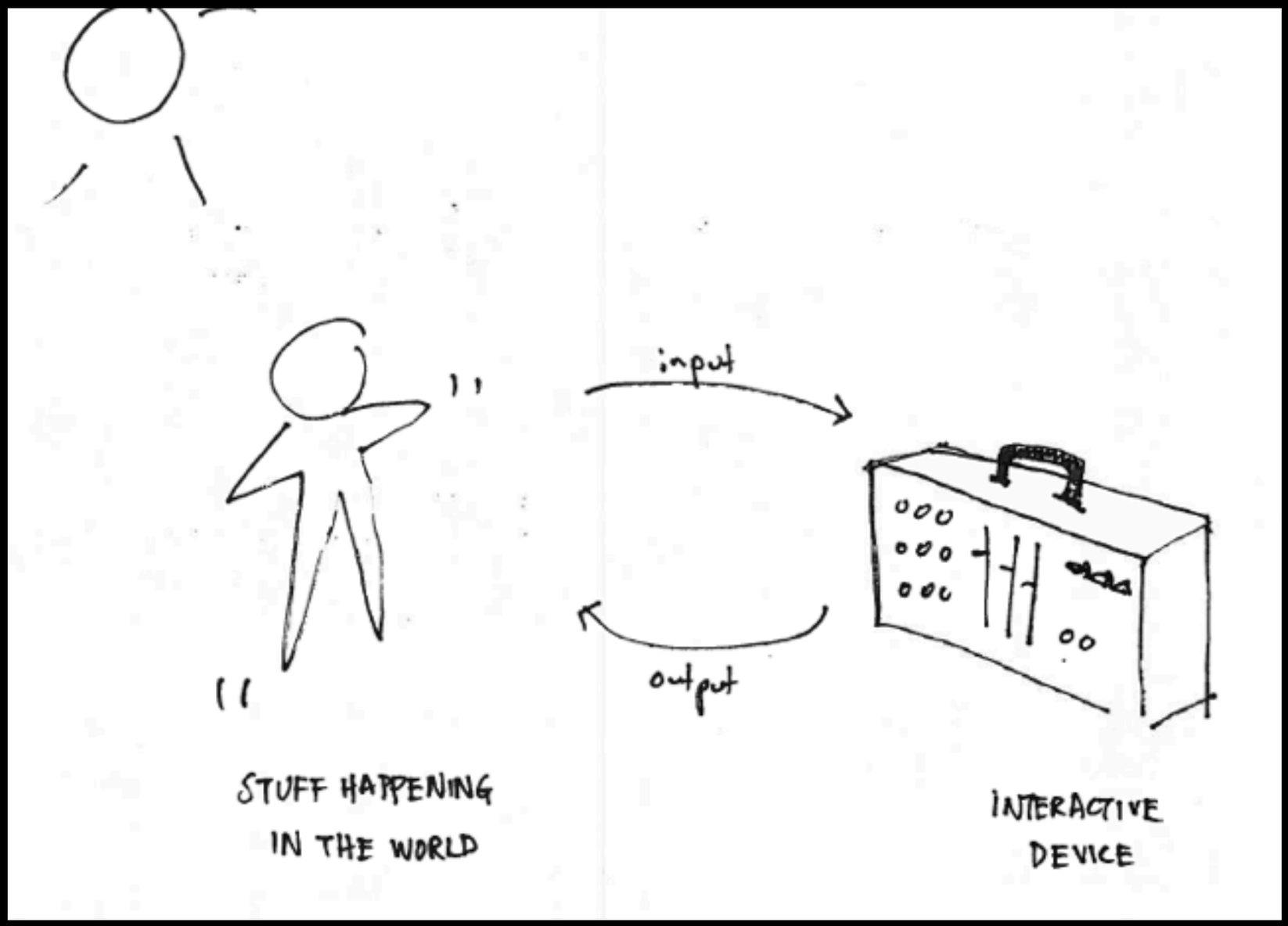

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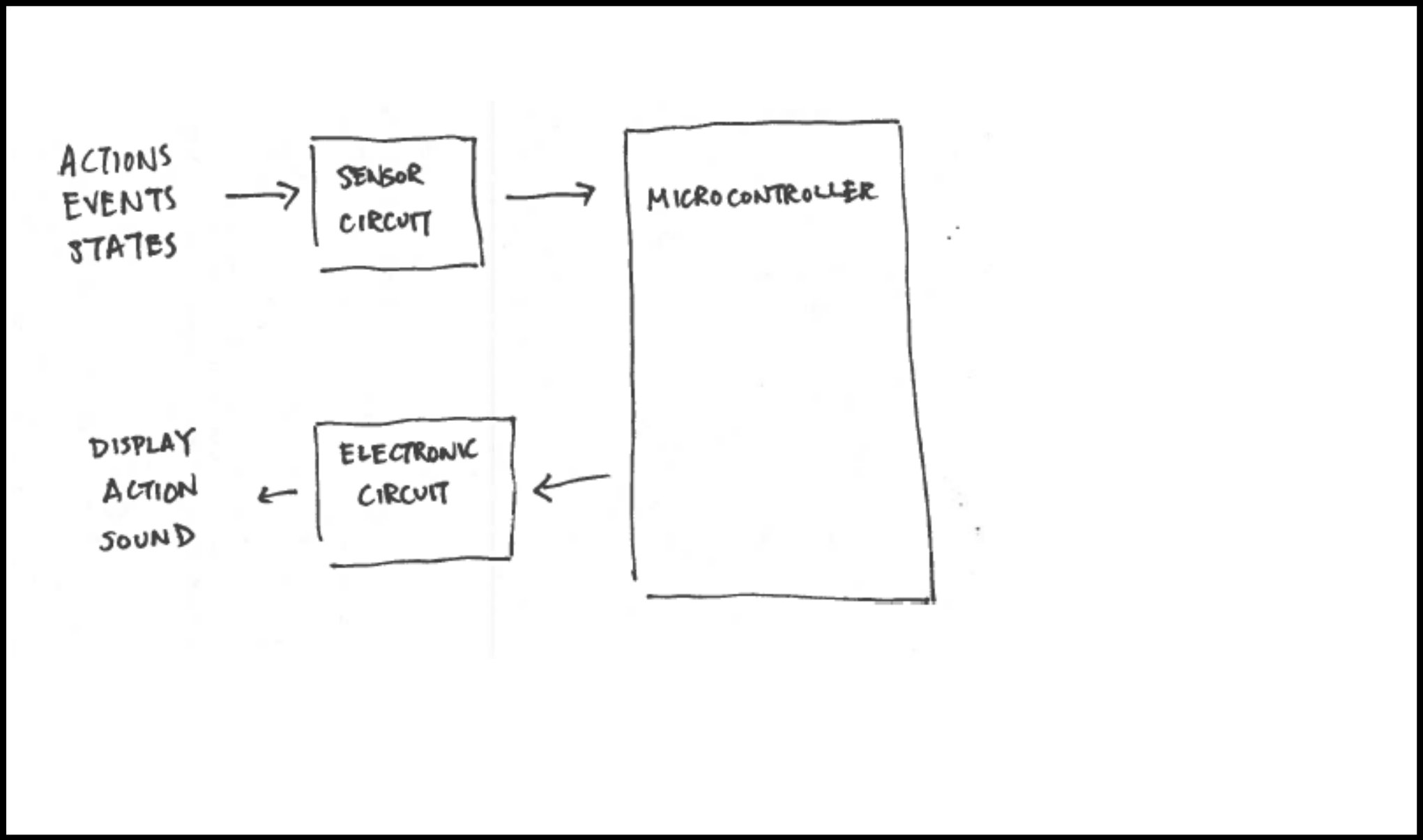

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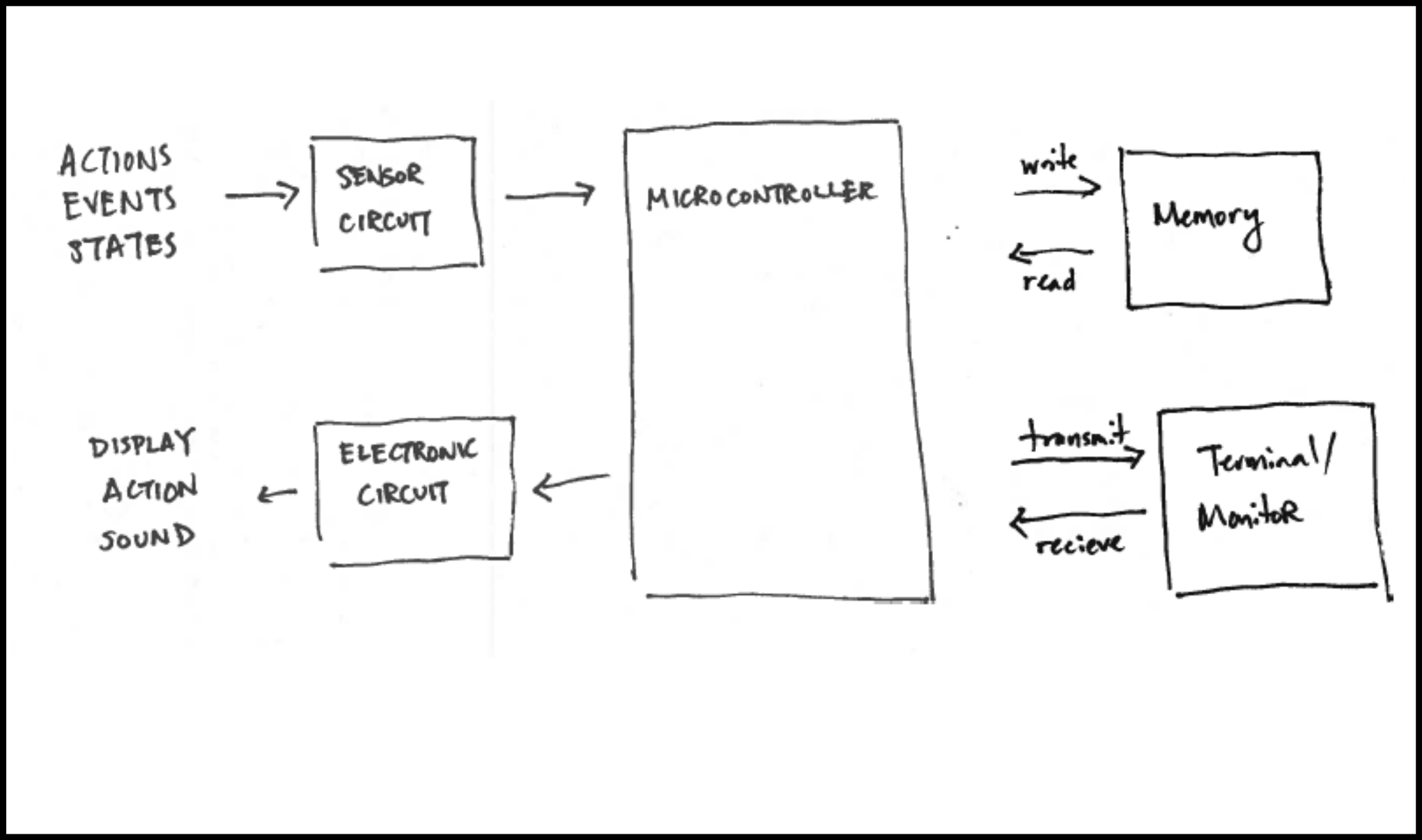
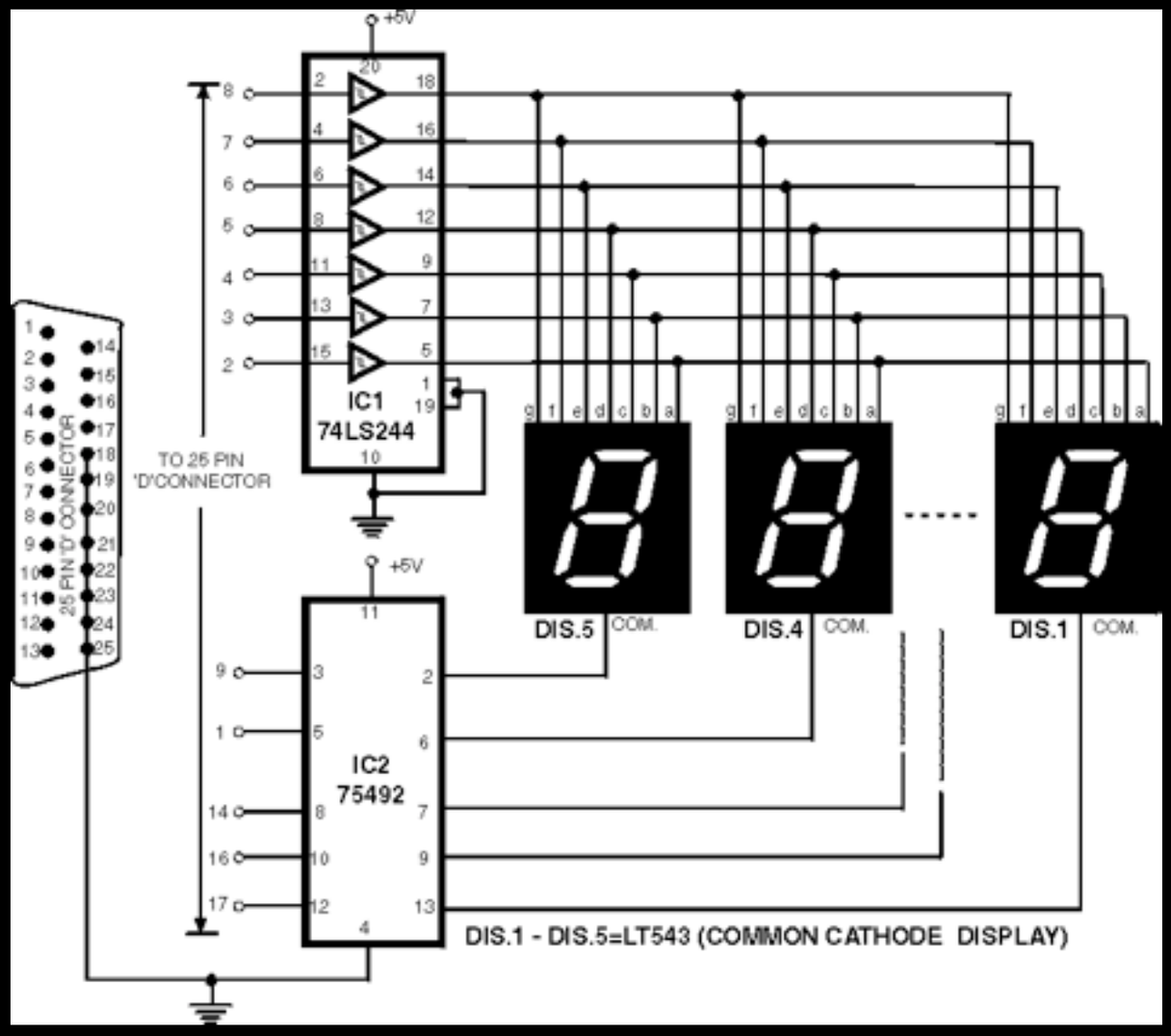


Displays

Variations on LEDs



Displays

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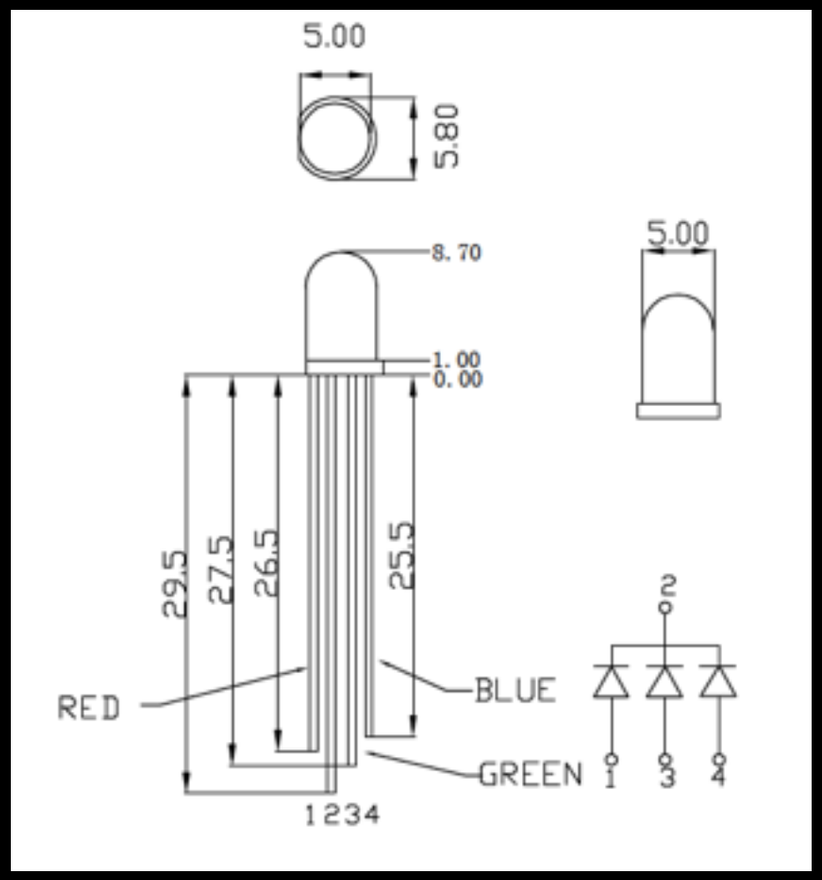

Displays

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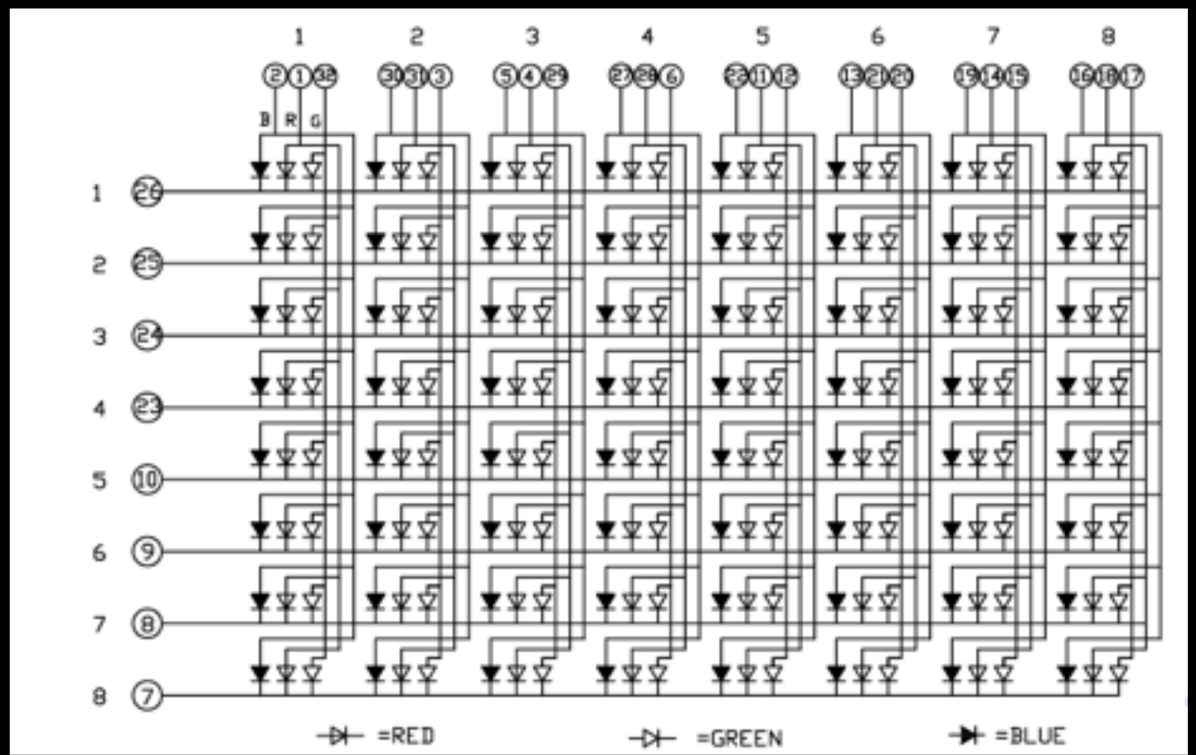


Displays

Character displays

- Variations:
  - dimensions
  - # columns and rows
  - Colors
  - Voltages
  - Backlight
  - HD44780 compatibility
  - Control interfaces (parallel v. serial)

Displays

Graphical displays

- Variations:
  - dimensions
  - pixel width & height
  - LCD v. OLED
  - Voltages
  - Backlight
  - Color
  - Control interfaces

Voltage Regulation

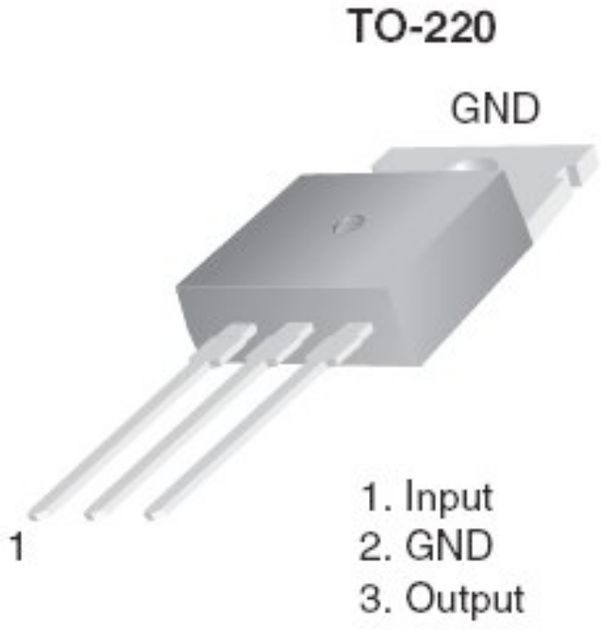
Why would we want to regulate voltage?

- The 3-Axis Accelerometer sensor will operate between 2.2 and 6 volts. Because the MMA7361 chip only will deal with 3.6 volts maximum, the sensor is equipped with a low-dropout regulator so the sensor will work, out of the box, with an Arduino or other 5 volt microcontroller. At 5 volts the sensor draws around 50 uA with the shunt off and 100 uA with the shunt on. The current draw at 3.3 V is 150 / 200 uA respectively.

Voltage Regulation

How to get the voltage you want

- Check:
  - Input/Output voltages (LDO)
  - Current rating
  - Package
- Here, classic 7805 +5V linear regulator
  - The regulating device is made to act like a variable resistor, continuously adjusting a voltage divider network to maintain a constant output



Voltage Regulation

How to get the voltage you want

KIA7805AP/API

ELECTRICAL CHARACTERISTICS (V_{IN}=10V, I_{OUT}=500mA, 0℃≦T_j≦125℃)

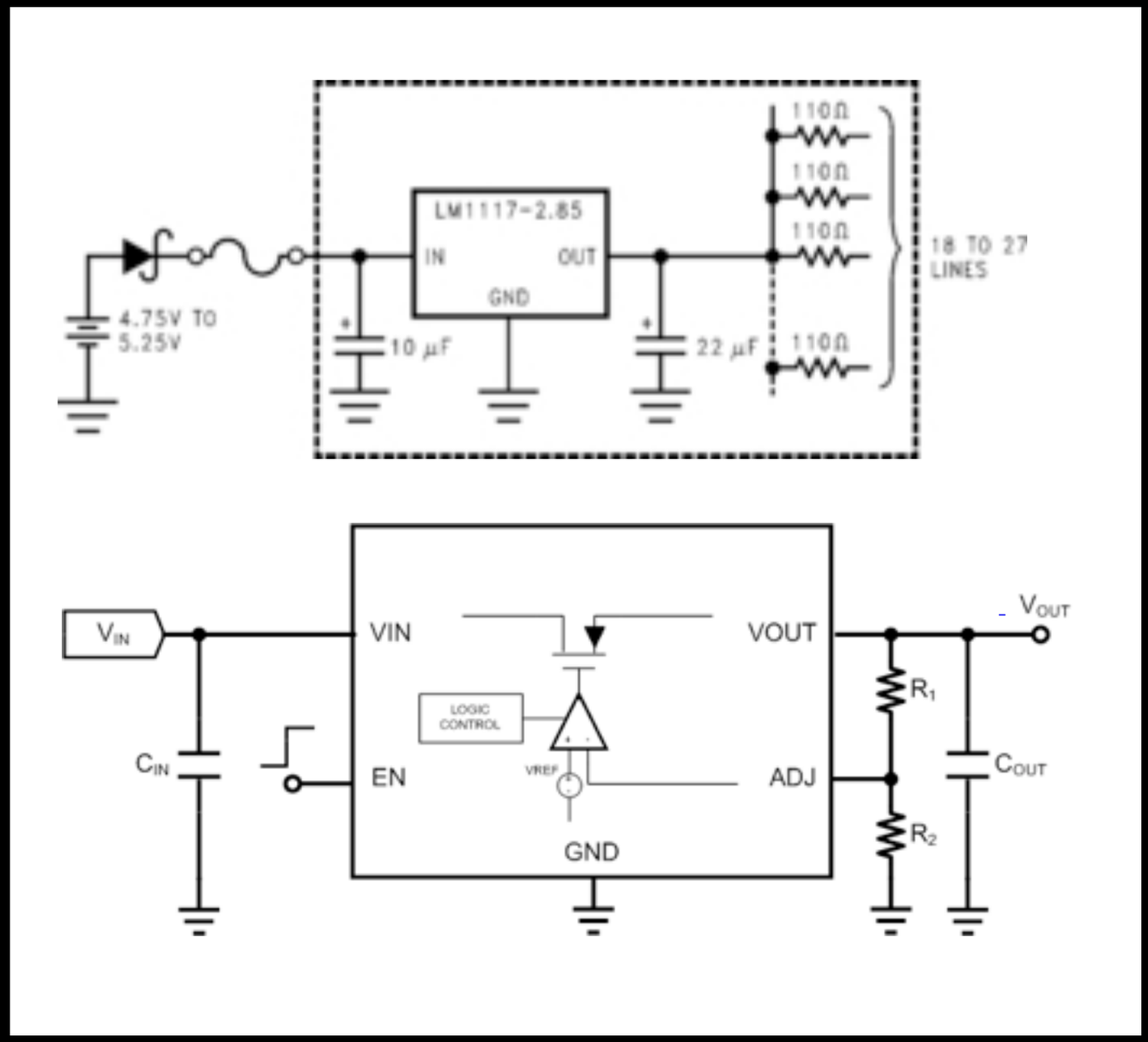
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃, I_{OUT}=100mA		4.8	5.0	5.2	V
Input Regulation	Reg line	1	T_j=25℃	7.0V≦V_{IN}≦25V	-	3	100	mV
				8.0V≦V_{IN}≦12V	-	1	50	
Load Regulation	Reg load	1	T_j=25℃	5mA≦I_{OUT}≦1.4A	-	15	100	mV
				250mA≦I_{OUT}≦750mA	-	5	50	
Output Voltage	V_{OUT}	1	7.0V≦V_{IN}≦20V 5.0mA≦I_{OUT}≦1.0A, Po≦15W		4.75	-	5.25	V
Quiescent Current	I_B	1	T_j=25℃, I_{OUT}=5mA		-	4.2	8.0	mA
Quiescent Current Change	ΔI_B	1	7.0V≦V_{IN}≦25V		-	-	1.3	mA
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz≦f≦100kHz I_{OUT}=50mA		-	50	-	μV_{rms}

Voltage Regulation

How to get the voltage you want

LM1117-3.3V 800mA Low-Drop Out (LDO) Linear Regulator

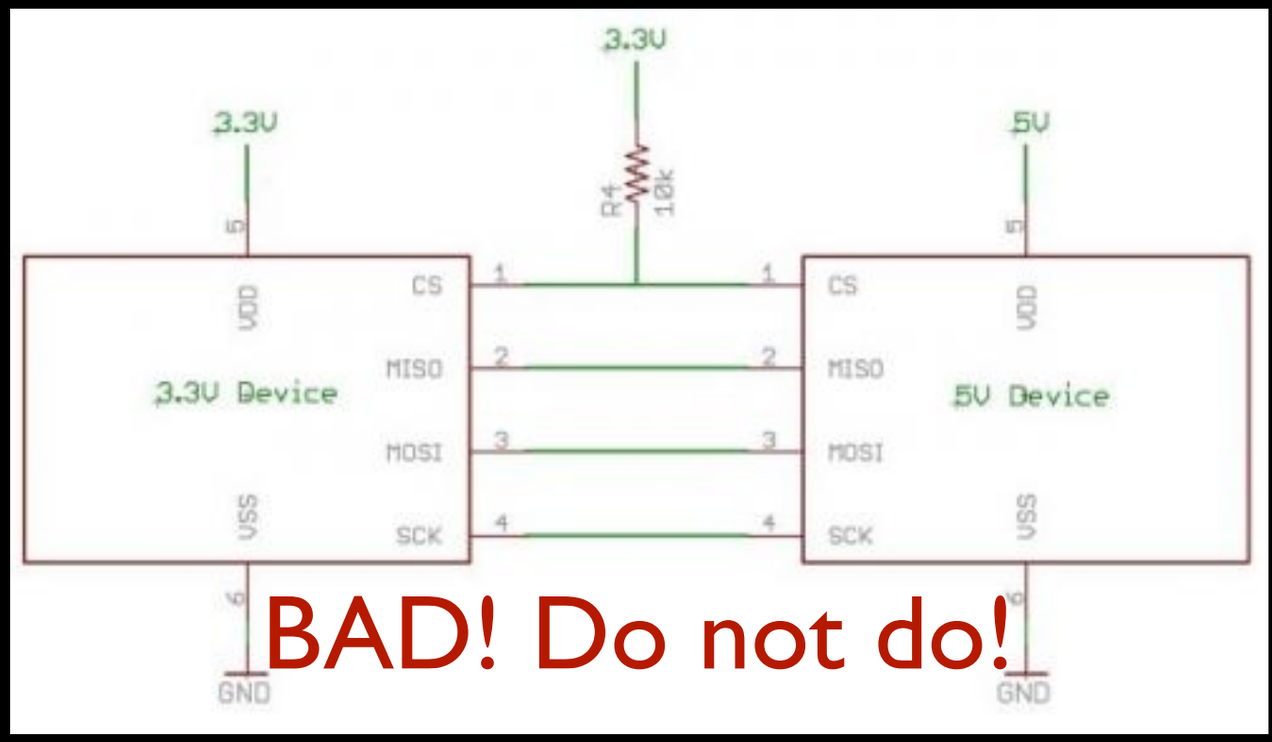
Also available in 1.8V, 2.5V, 2.85V, 3.3V, 5V and Adjustable versions



Voltage Level Shifting

Why would you want to shift the voltage?

- Why are there different voltages anyway?
- What can go wrong when connecting 3.3 V and 5V devices?



http://www.sparkfun.com/commerce/tutorial_info.php?tutorials_id=65

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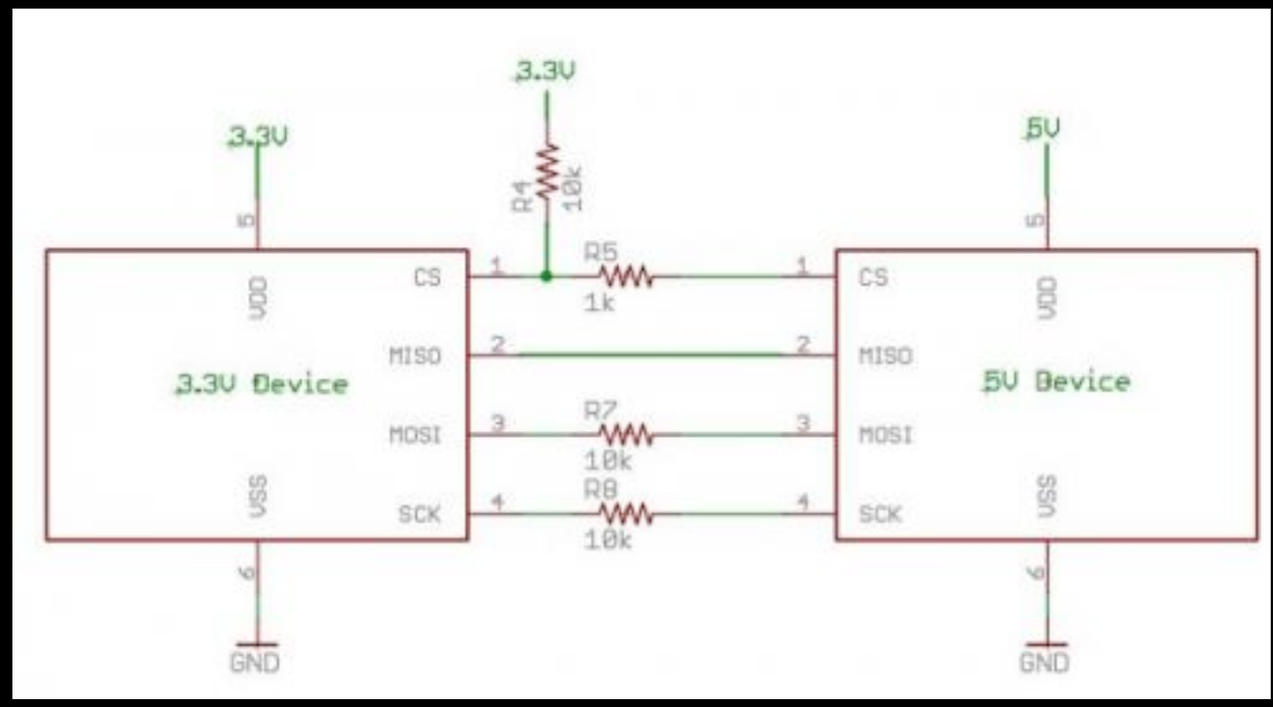

Inline resistor method

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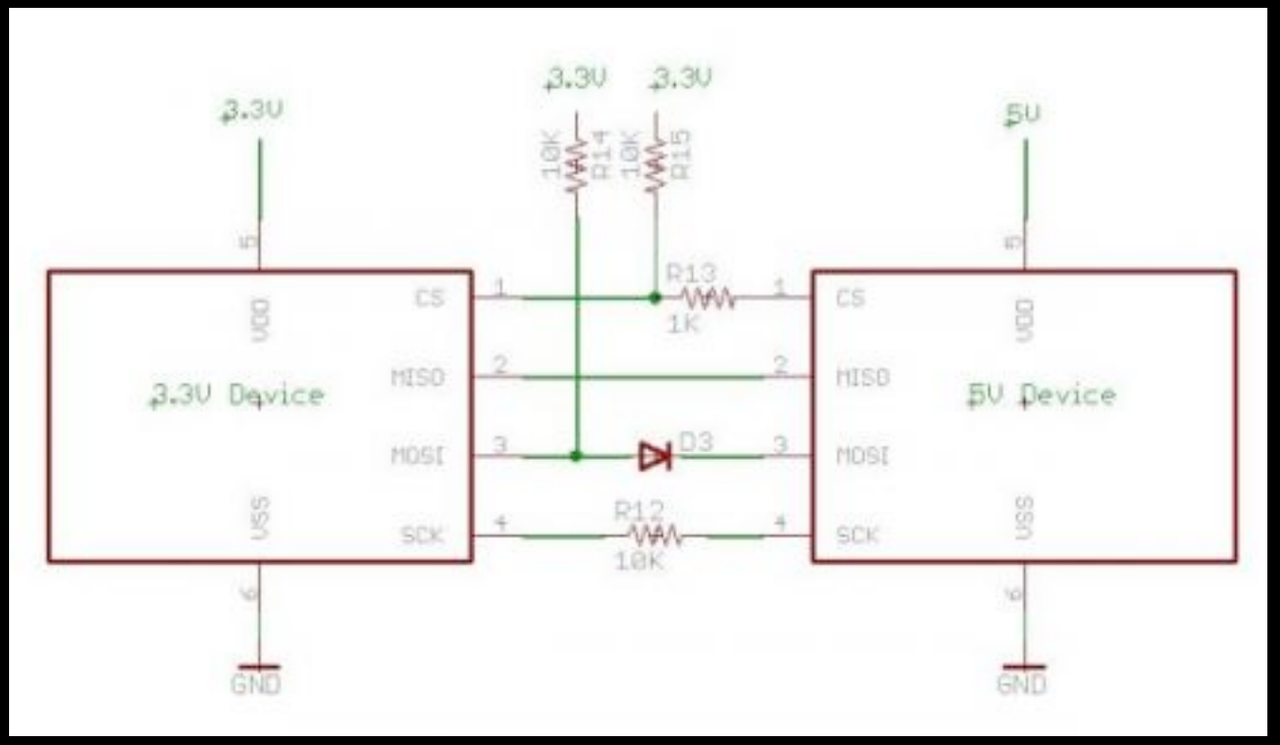

Reverse diode method

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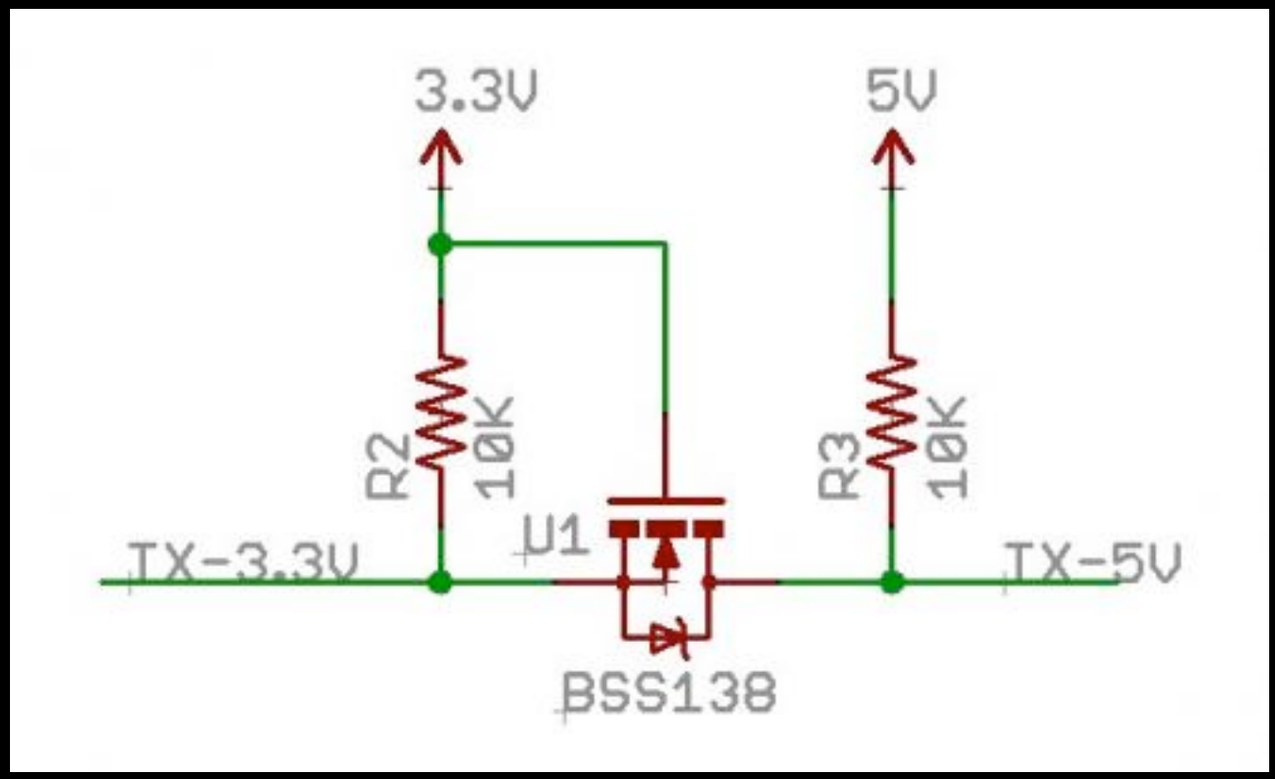

MOSFET (metal oxide semiconductor field effect transistor) method

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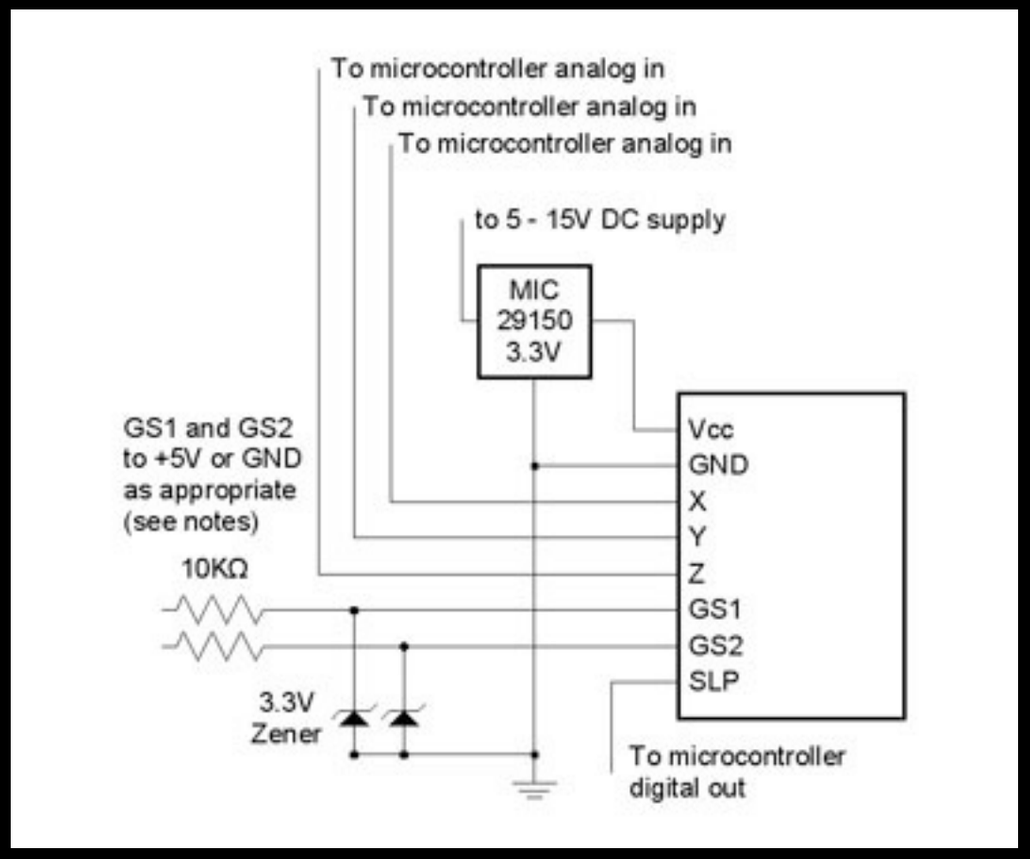

Zener diode method

http://itp.nyu.edu/physcomp/sensors/Reports/MMA7260Q

Where do we get cool sensors, displays and actuators?

Fry's (Palo Alto)

Radio Shack (everywhere)

HSC /Halted (electronic surplus)

Jameco Electronics (San Carlos)

?Arrow Electronics (Santa Clara)

Digikey (online)

McMaster Carr (online, for mechanical)

Sparkfun (online, hobbyist)

Acroname (online, robotics)

Lab 4 Preview: Data Logger

Sound! Lights! Acceleration! Gesture!

Using the serial monitor

Writing to the EEPROM