

# Summary

Learned so far

- voltage
- Current
- Resistors
- Ohms law

Did:

- Battery to bulb at 2 different voltages
- Resistor in series with bulb - dims bulb
- Multimeter – measure voltage, resistance, current
- Diode lets current flow only one way
- Resistors in parallel and series



# Summary

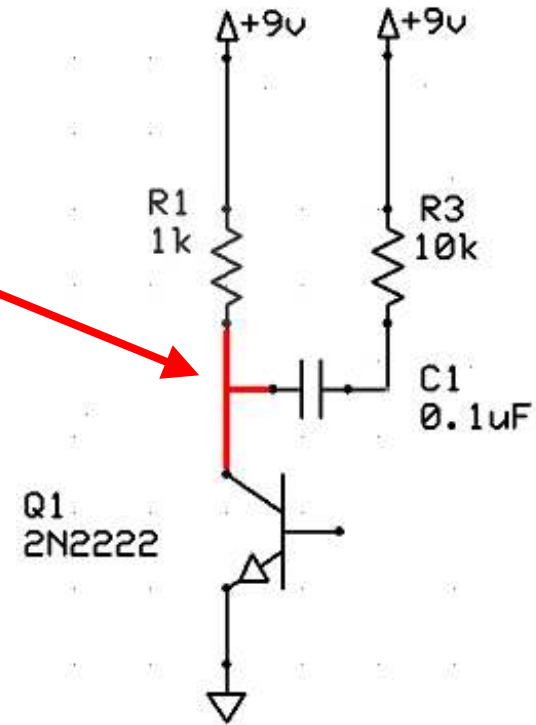
## Next

- Review voltage, current, resistance, parallel and series
- Review multimeter
- Breadboard
- Led exercise with breadboard and flex or pot
- Capacitor exercise
- Reading schematics
- Build oscillator on breadboard
- Build oscillator on perfboard



# Reading Schematic Diagrams

- Every line represents a conductor (wire) connecting together its endpoints
- A line with multiple branches connects together all branch endpoints – this called a **node**
- There are generally multiple “right” ways of connecting multiple endpoints
- Go through each **node** in a circuit and make sure all the branch endpoints are connected together
- All endpoints labeled with ground (GND) should be connected together
- All endpoints marked with a particular power label (+5, +12, V+, etc...) should be connected together

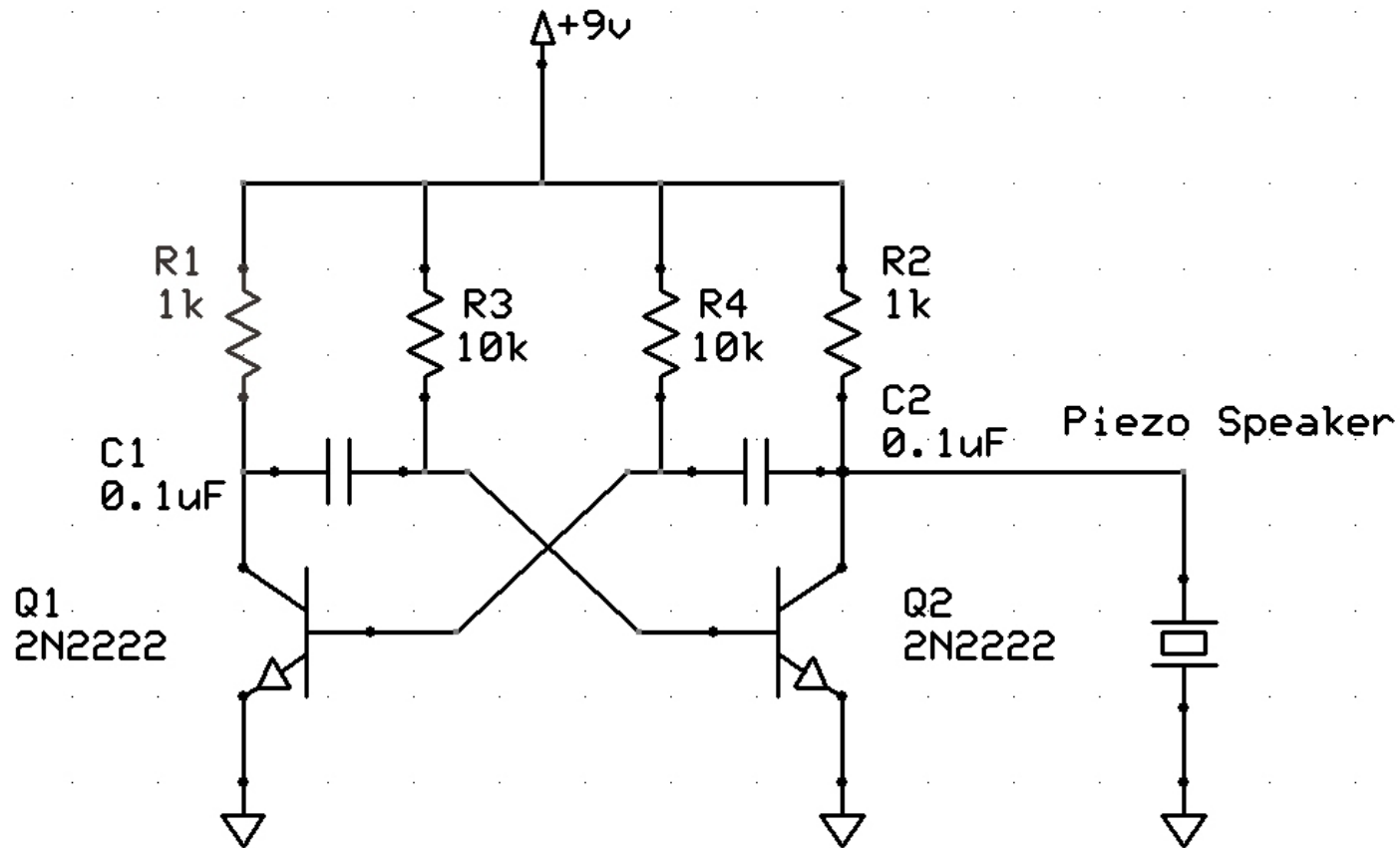




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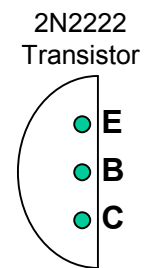
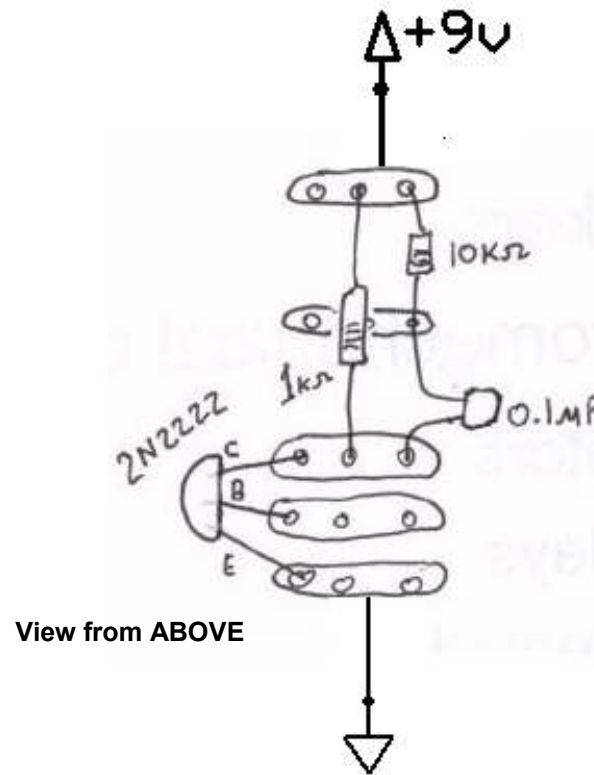
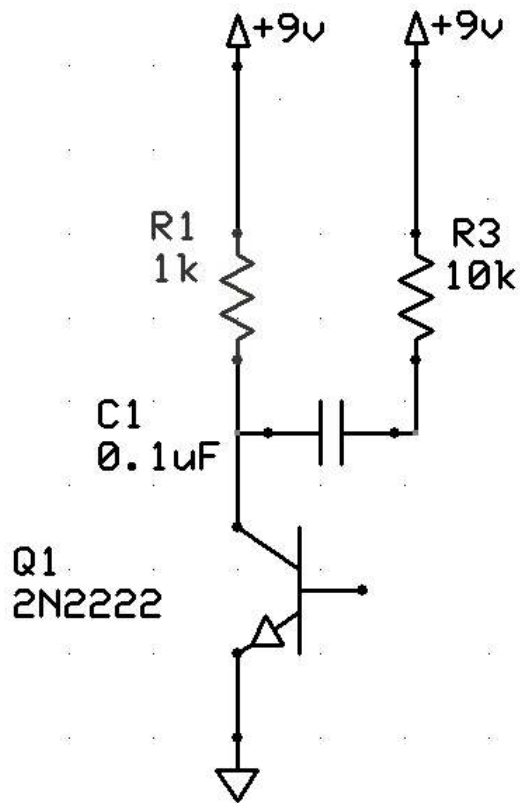
# Transistor Oscillator



Use piezospeaker as shown or put standard dynamic speaker in series with power to circuit



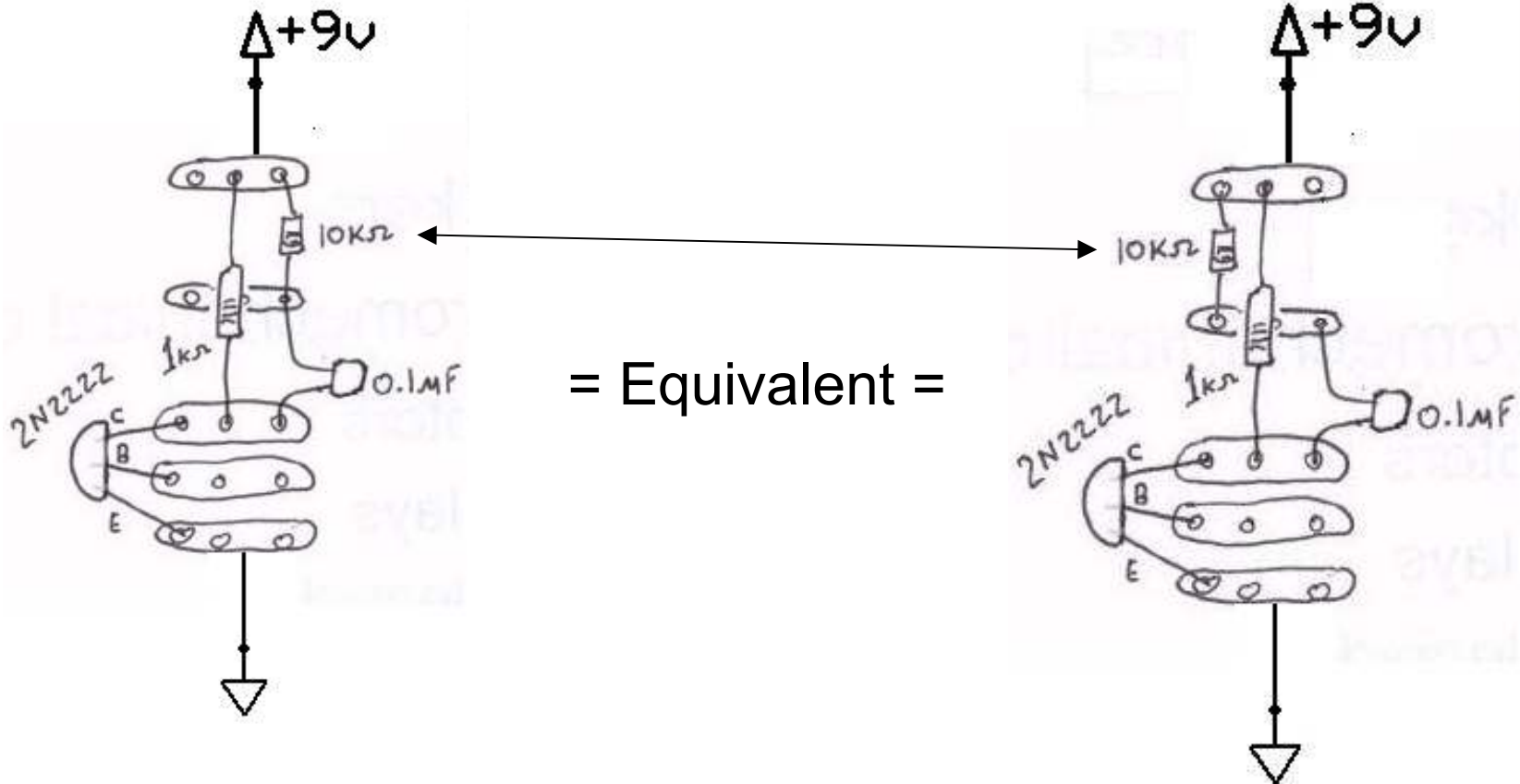
# Step One

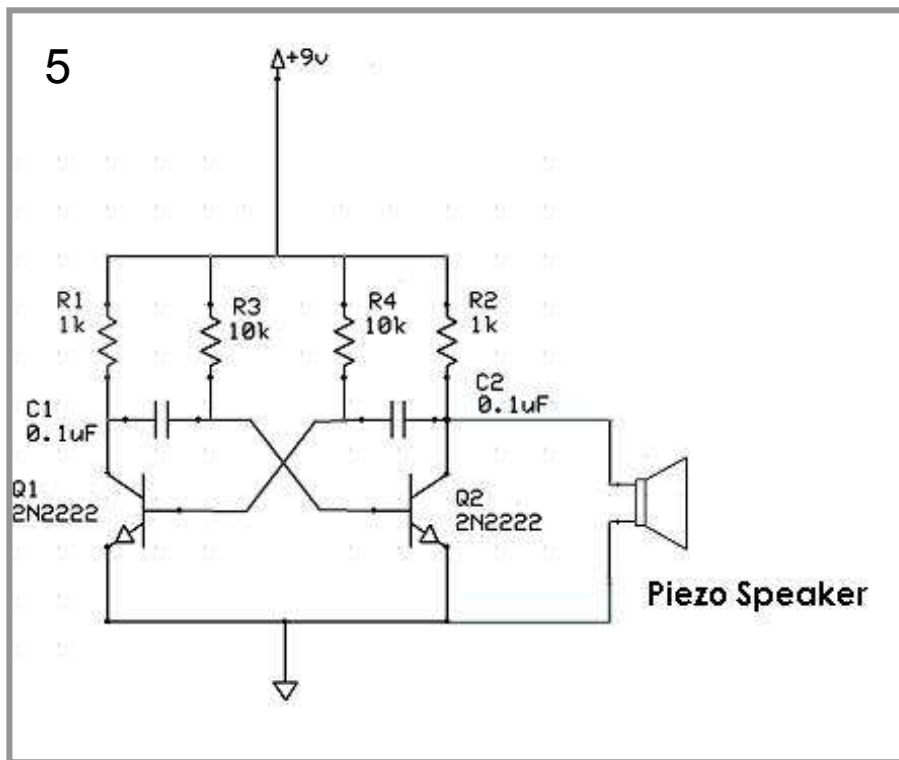
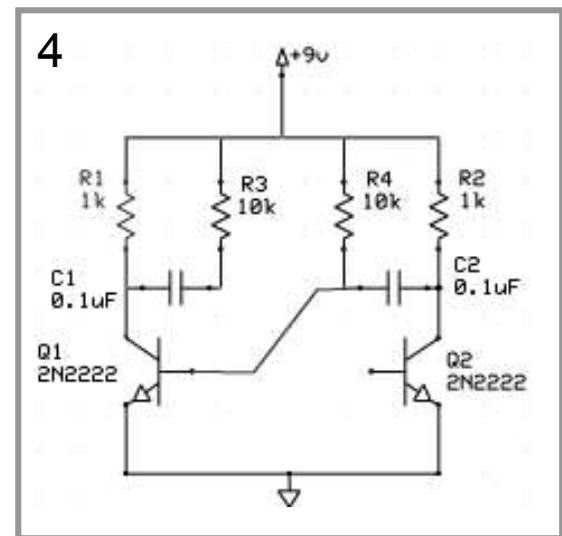
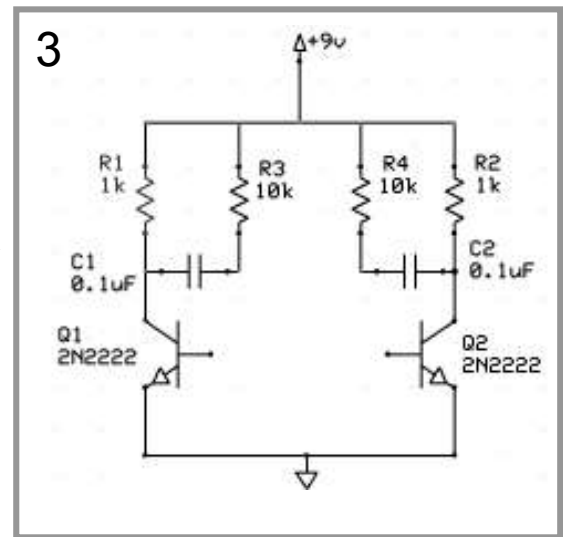
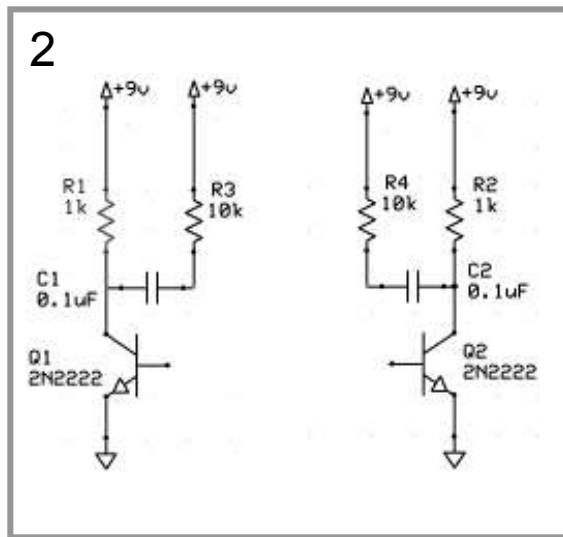
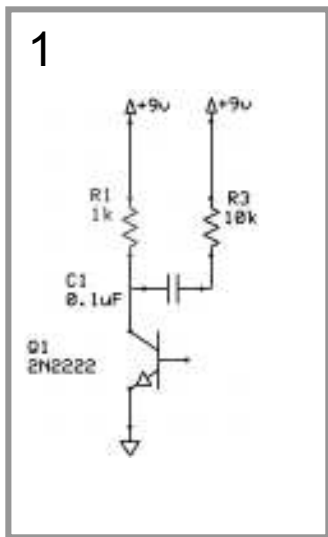


pinout viewed from BELOW



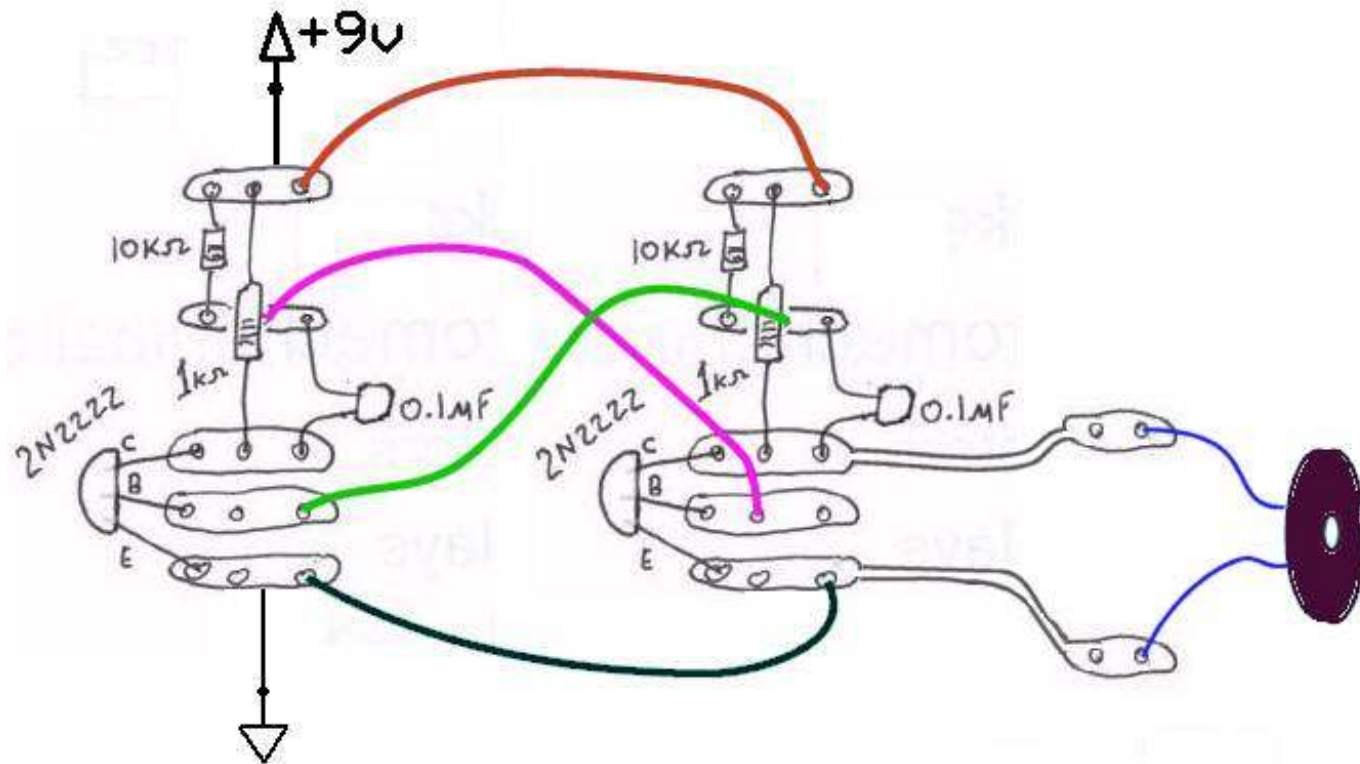
There can be multiple correct ways of connecting things.



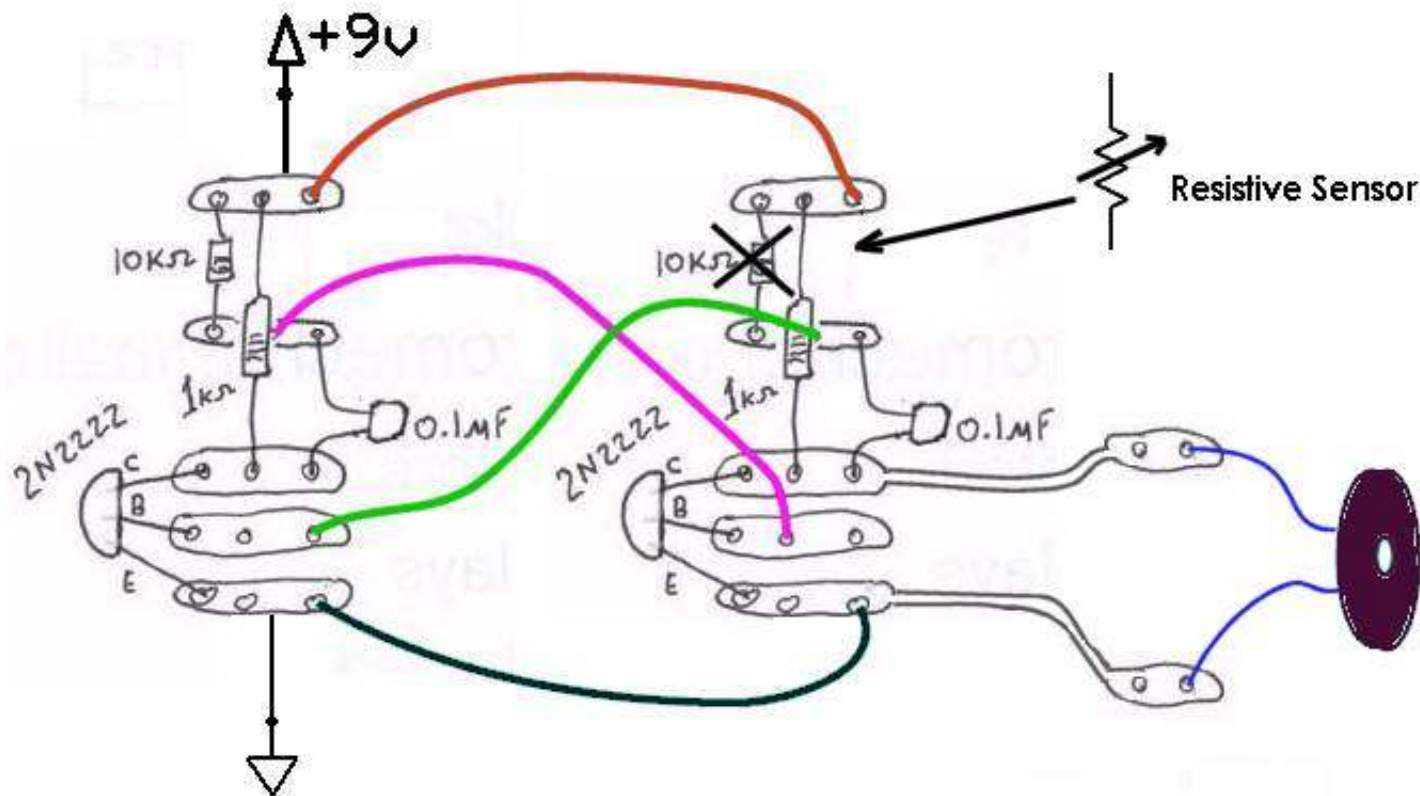




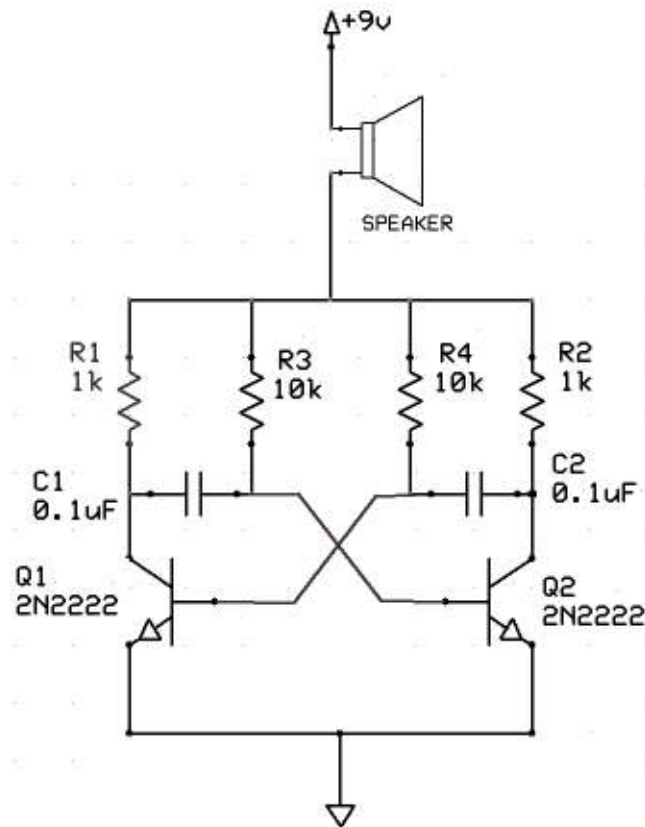
# Complete



# Add a Sensor



# Variation for a Common Speaker



# Soldering

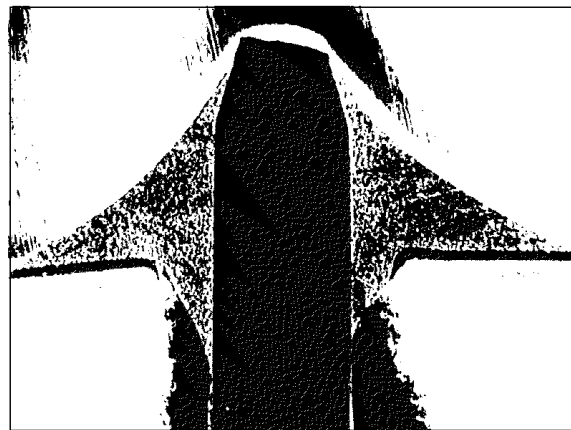
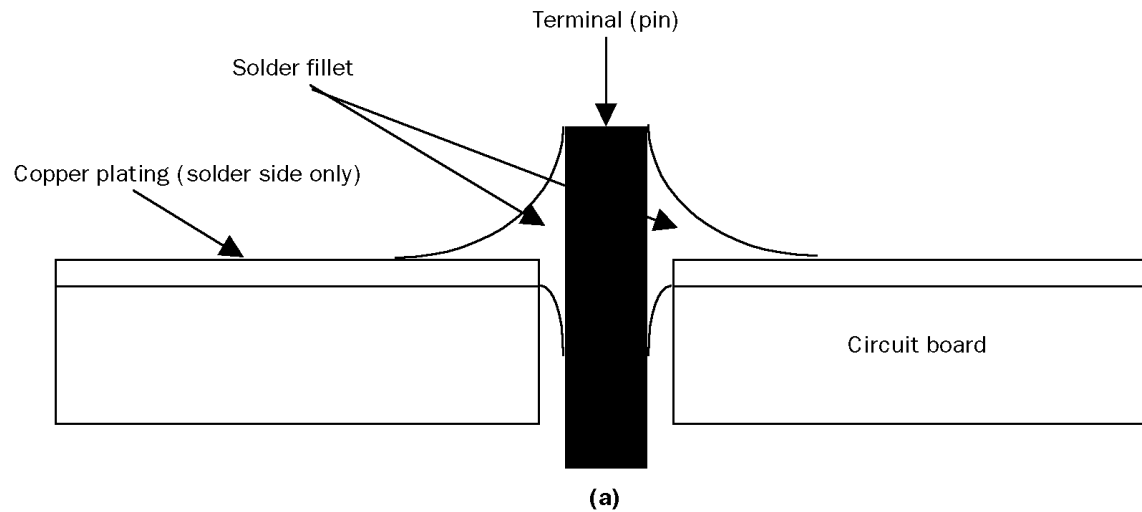
- Keep tip clean and “tinned” (coated with solder)
- Make sure all wires and copper pads are clean and bright
- Put a very small drop of solder on the tip
- Heat all parts of the joint
- Apply solder to joint
- If joint is hot enough it will wick-up the solder like a sponge
- After cooling, trim wires
- Use a desoldering braid or a solder sucker to remove excess solder or extract components



# Soldering

**Figure 1**

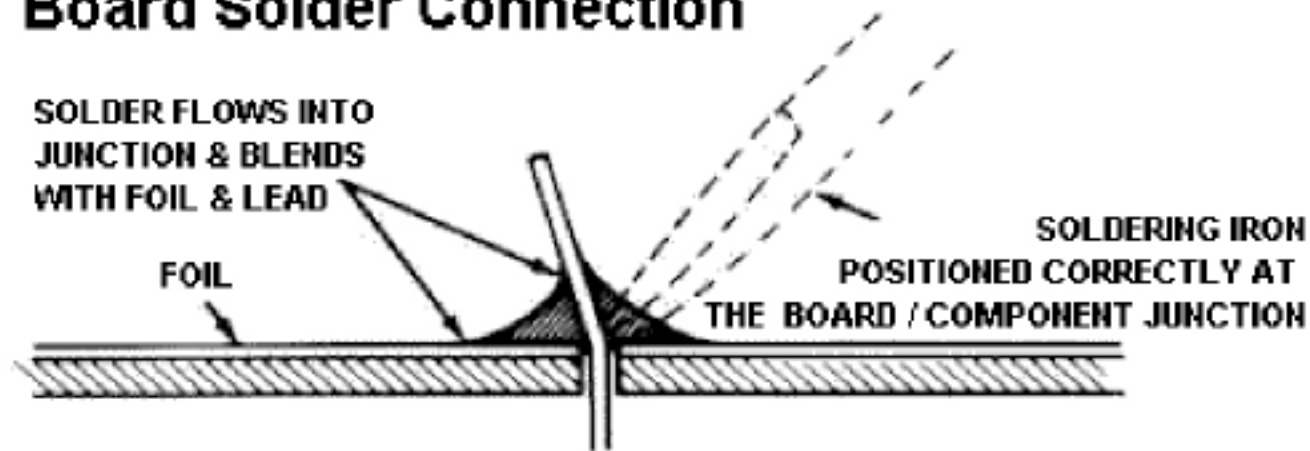
(a) Schematic of a single-sided insertion-mount solder joint. (b) An optical micrograph (28x) of the cross-section of a terminal with the characteristics of a good solder joint. These include good fillet formation, centering of the pin (dark), and good wetting at the solder/pin and solder/copper pad interfaces



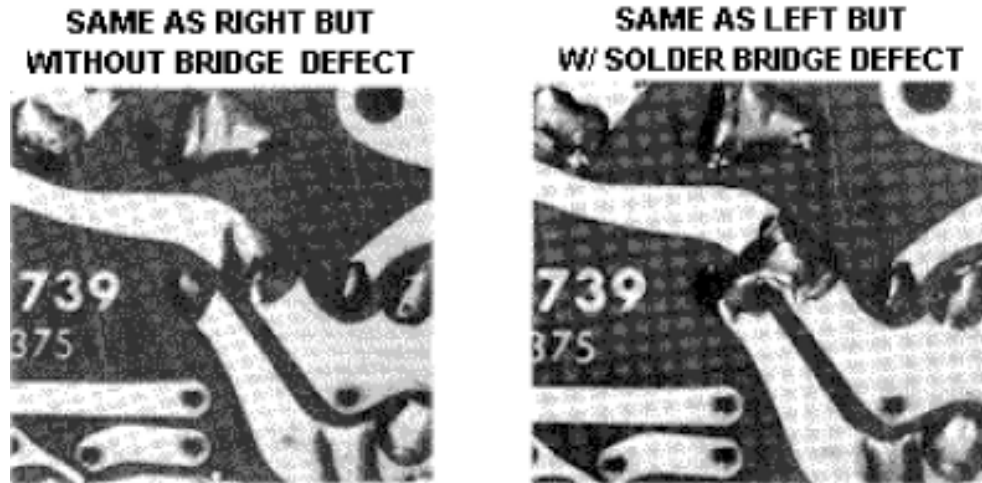
# Common Soldering Mistakes

- Wiring mistakes
- Solder bridges
- Incomplete or cold solder joints
- Poorly tinned/unclean soldering iron tip

## An Example of a Quality PC Board Solder Connection

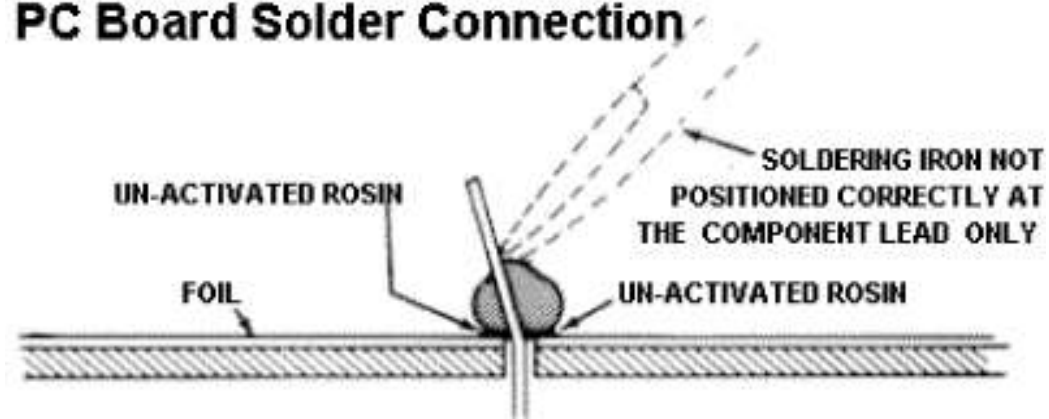


# Solder Bridge



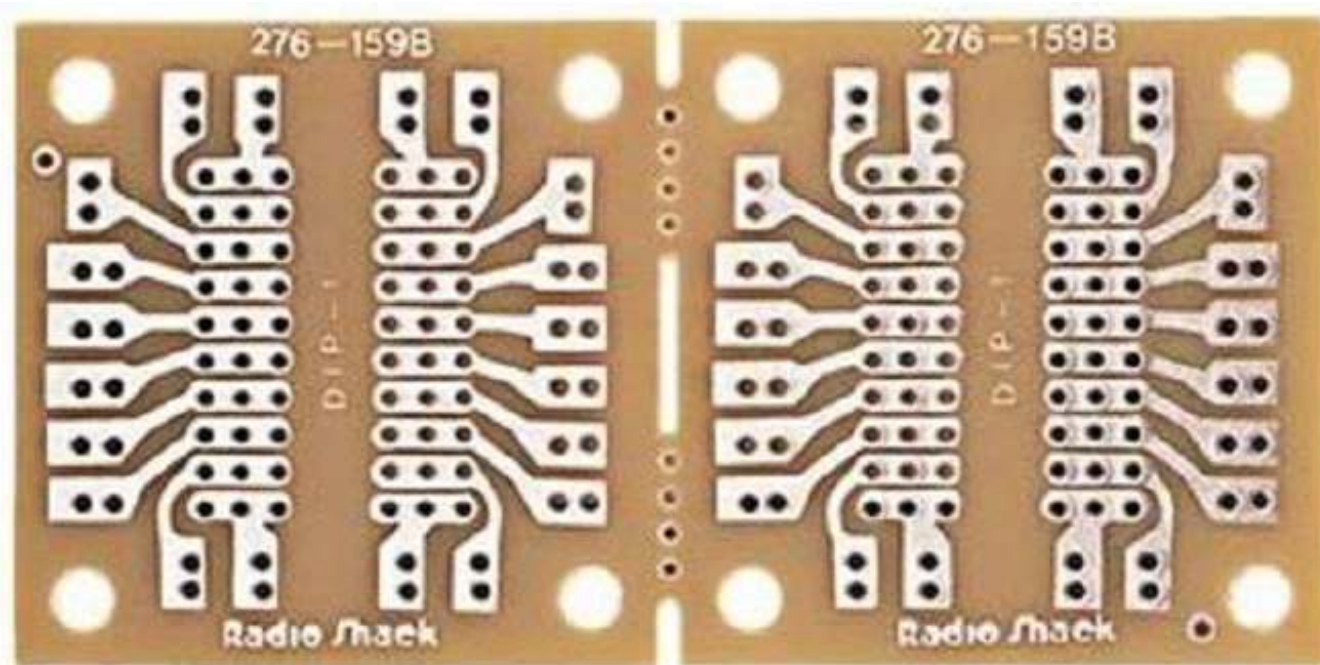
# Cold Solder Joint

**An Example of a Defective  
PC Board Solder Connection**



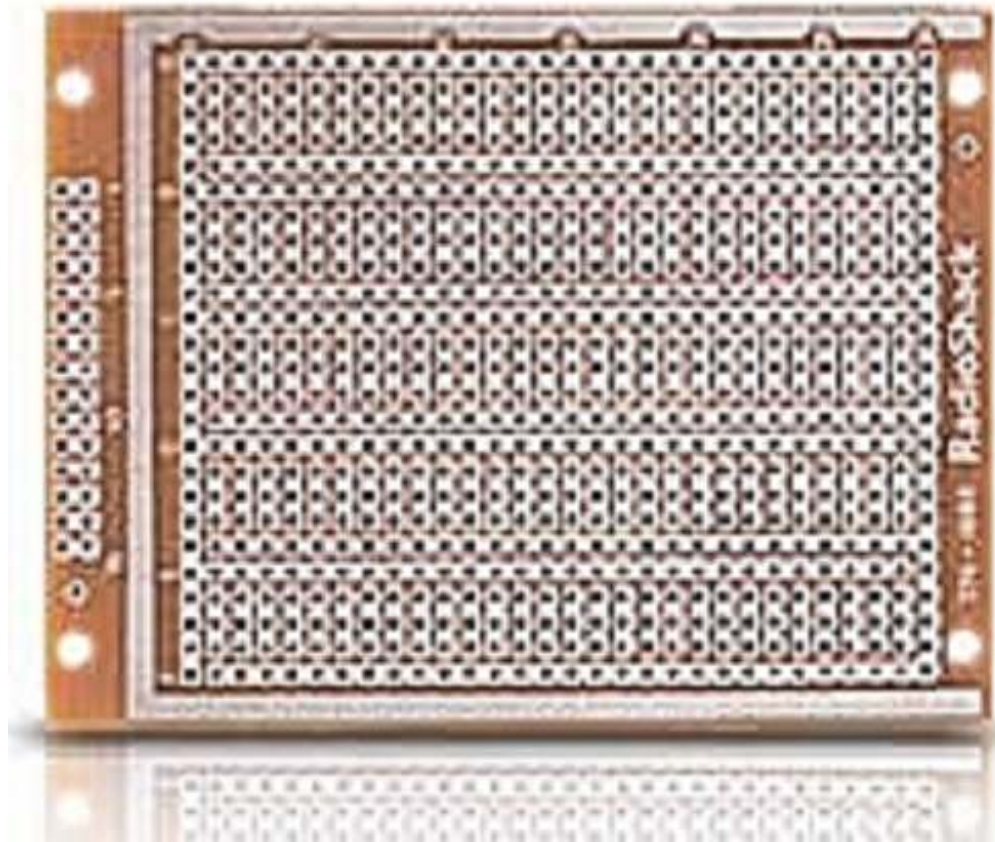


# Solderable breadboards





# Solderable breadboards





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# Sensors & Transducers

- A **sensor** is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument.
- A **transducer** is a device that converts one type of energy to another. Key aspect – *a transducer produces or generates a physical effect.*



# Assignment

- Buy a small electronic toy of some kind for use in our upcoming (week 4 or 5) circuit bending class
- Download and install the Arduino software on your home computer:  
<http://www.arduino.cc/en/Main/Software>
- Read the first 51 pages of *Getting Started with Arduino*.

## Written Assignment Due Thursday Feb 4th:

List all the sensors and transducers you come across in a typical day or go on a “sensor safari”... around your apartment, block, a department store...

Choose one sensor and one transducer and write a paragraph proposing a connection between them that could initiate new mode(s) of interaction, generate an element of surprise, sensitize people to the ways that technology influences their environment, comments on the social implications of technology, or could add a new level of functionality to a human-technology interface .

