Intro to Touch Sensors

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Why Touch Sensors?

- Some can provide a non-contact interaction point:
useful in a time when people don't want to touch things

- There are lots of different types, and they don't all work the way
you might expect

- Not going to cover: **touchscreens**. Far too many variants, would
take too long

Basic Types

1. **RESISTIVE**
   - Your body's electrical resistance becomes part of the circuit
   - Needs two points of contact
   - Can't measure proximity
2. **CAPACITIVE**
   - Your body's capacitance affects the frequency of an electronic oscillator
   - Can be truly non-contact
   - Can interfere with one another, or become unresponsive with long cables

Downsides of Touch Sensors

- **No haptic feedback**: no audible or tactile 'click'
    - add LED or buzzer chirp;
    - accessibility: would a non-sighted person know your input was there?
- **No hardware latching**: state doesn't survive power cycle
    - don't use them for safety-critical input
- **Always drawing some power**
    - allow for parasitic loads on battery power
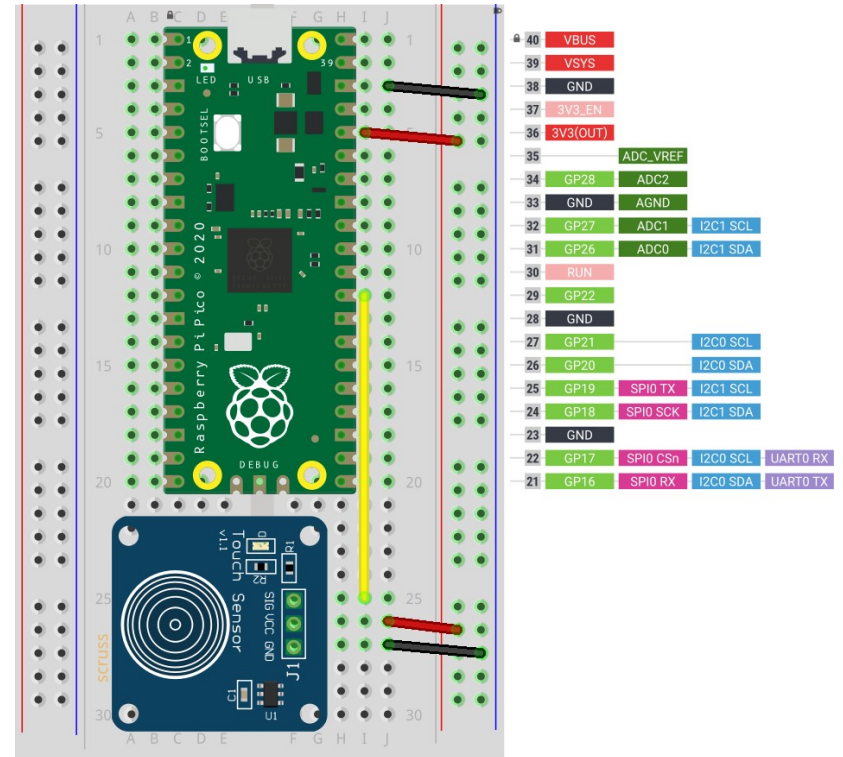
Resistive: Makey Makey®

- Hardwired as either USB 12-key keyboard or game controller

- Needs solid contact to work

- No longer open source; quite expensive

- Popular in education and rehab because it "just works"

Image credit: Makey Makey LLC / makeymakey.com

Capacitive: TTP223

- Each sensor acts as a momentary switch

- Incredibly cheap: ~$3 for 2

- Easy to use

- Quite sensitive

- No debouncing needed

- Has sense invert (NH/NL) and (soft) latching option

- Some have built-in LED trigger indicator

- Usually sold as an 8 or 16 key touchpad

- TTP229-<u>B</u>SF uses an I²C-*ish* protocol: TTP229-<u>L</u>SF is I²C

- Needs to be polled frequently to catch all touch status changes

- Single/multi key modes selected in hardware
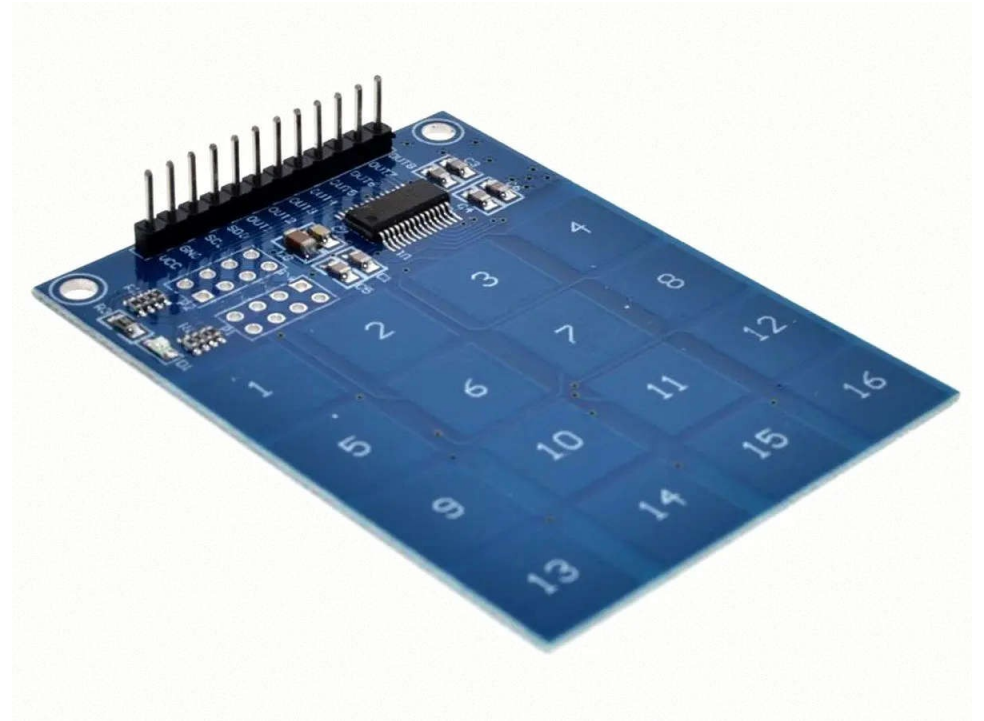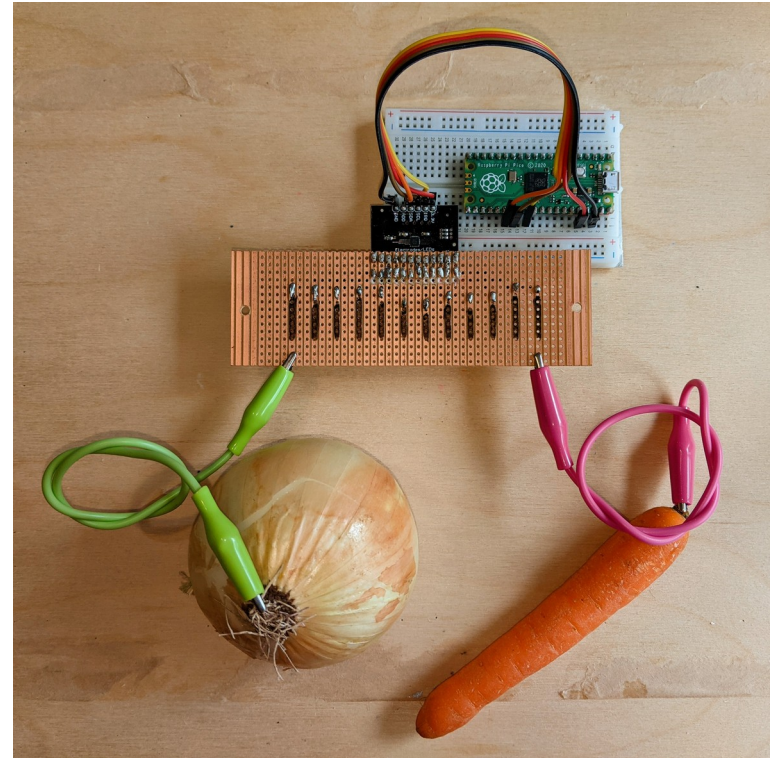
- Cheap: ~$4

Image credit: Universal Solder

Capacitive: MPR121

- 12 inputs, I²C

- Cheap(ish): $4.50 for small breakout

- NXP may have discontinued this sensor, but still available

- Has IRQ line that goes low on state change

- Works well with stripboard and alligator clips

Colourful Clips by Lee — http://leecyb.org/?p=373

- **Microchip SAMD μc as USB HID device**
  - Such as Adafruit Circuit Playground Express
- **Roll your own**
  - Time how long it takes to raise a pin charged from another
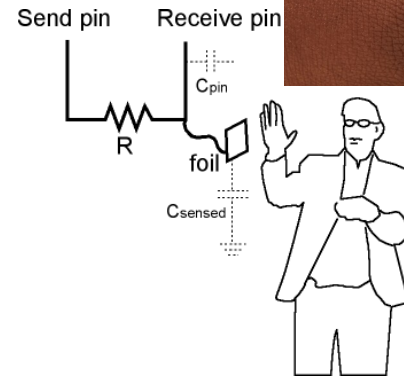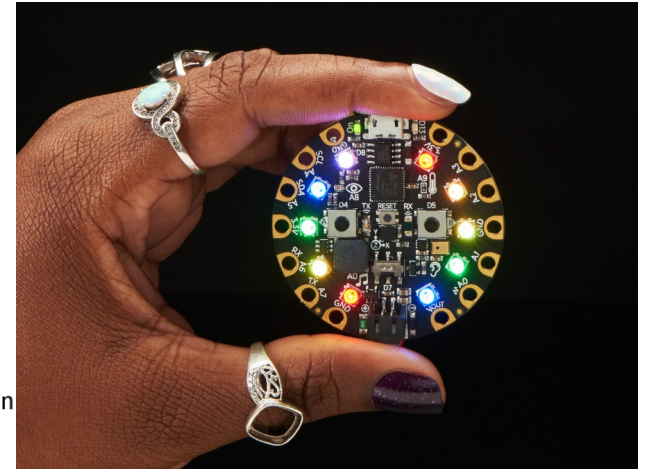 - Needs accurate timing
  - … and lots of signal cleanup to allow for humidity, static, …

Image credits: 1) Adafruit 2) Arduino.cc