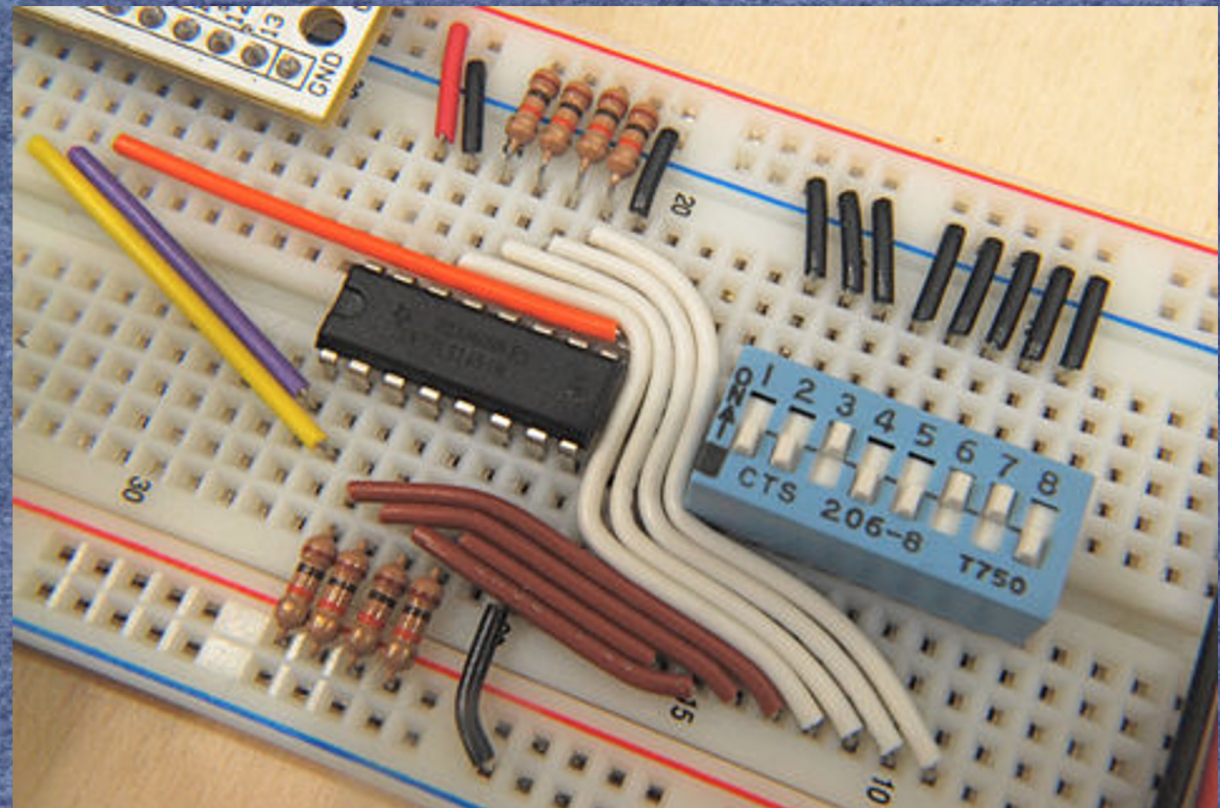
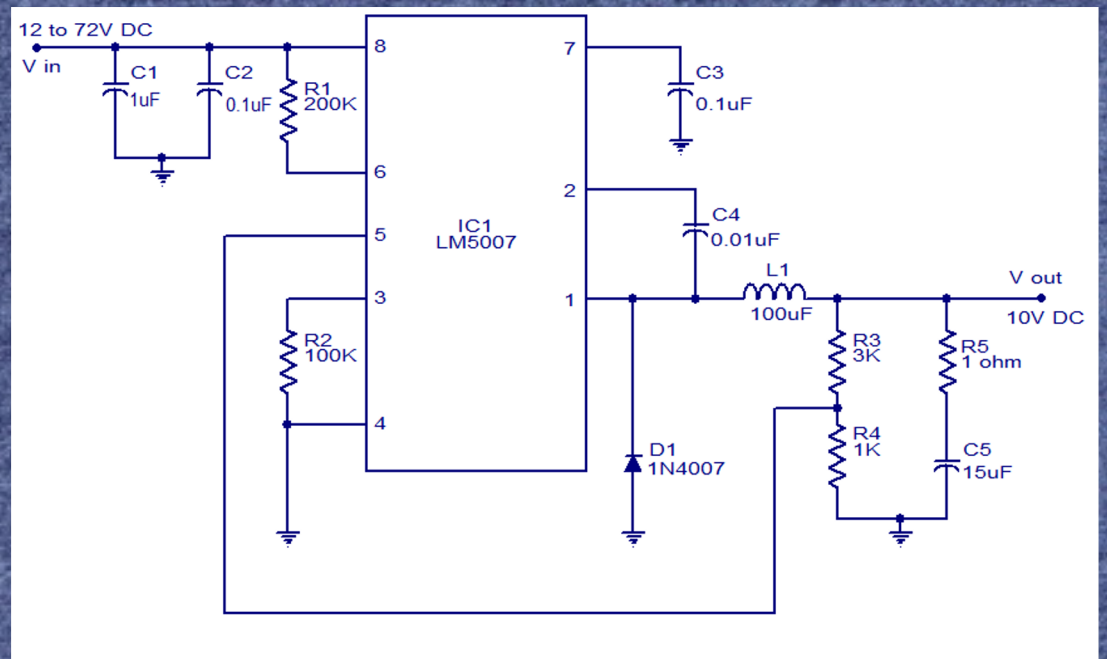


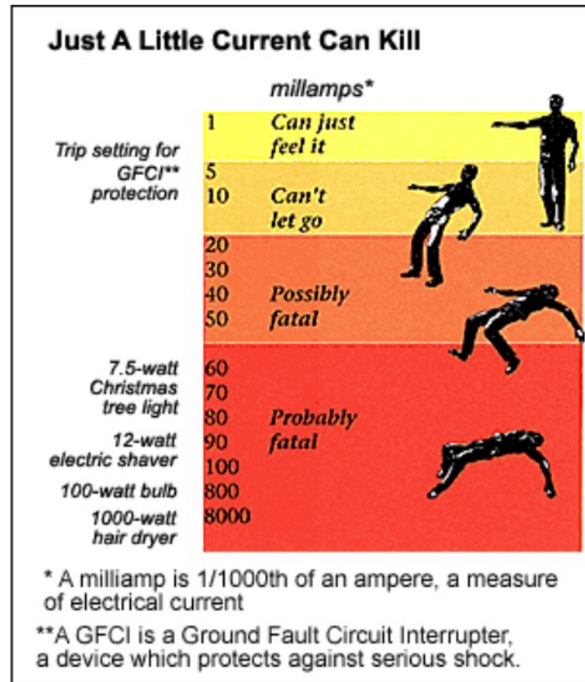
Lab Skills



Topics

- .Electrical Safety
- .ESD
- .ICs
- .Pin 1 Identification
- .Power Supplies
- .Debug Checks
- .Breadboards
- .Translating Schematic to Breadboard

Electrical Safety



R_{Pi} at boot 220 mA

$$60\text{mA} = V/R = 5V / R$$

$$R = 5V / 60\text{mA}$$

$$R = 83.33 \text{ ohms}$$

Electrical Safety

- .Keep out of the High Voltage stuff
 - power supply internals
 - wall sockets
- .Stay out of the water
- .Use one hand

- .3.3/5 Volts – you're safe

ESD

- .Electrostatic Discharge

- doesn't have to be felt to do damage

ESD

.Prevention

- ground your self before touching
- ground straps
- anti-static bags

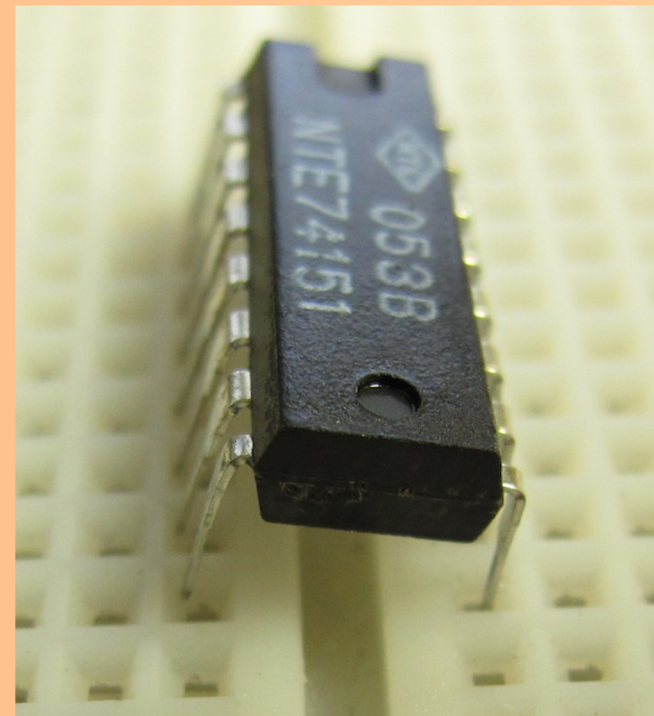
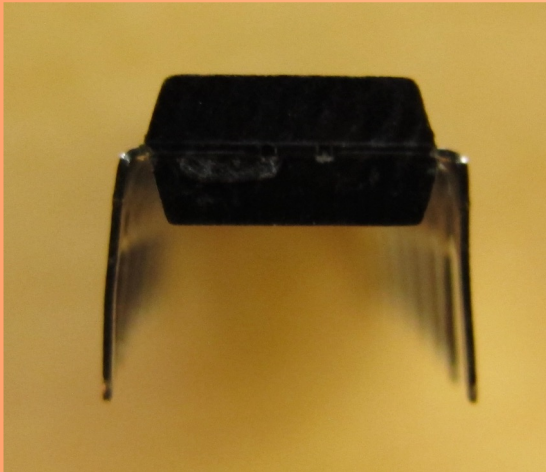
ESD

- Flight Hardware
 - treat with extra care

Breadboards

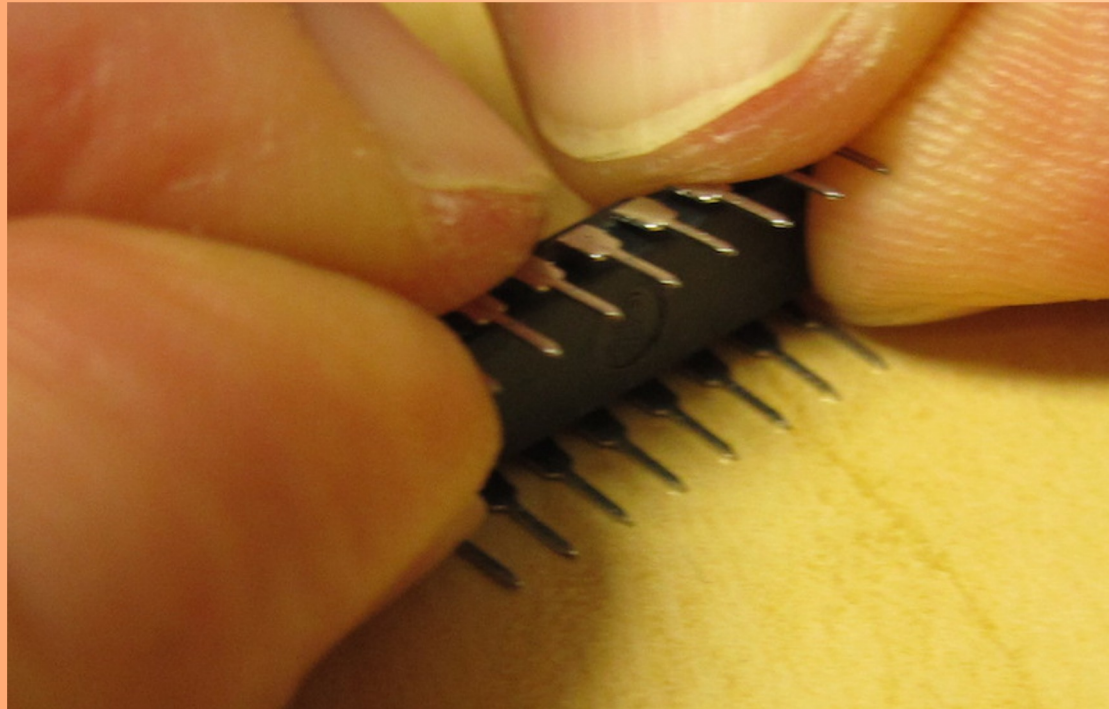
.ICs

- new ICs don't fit



ICs

.Leads need to be bent



Pin 1 Identification

.ICs

.Cables

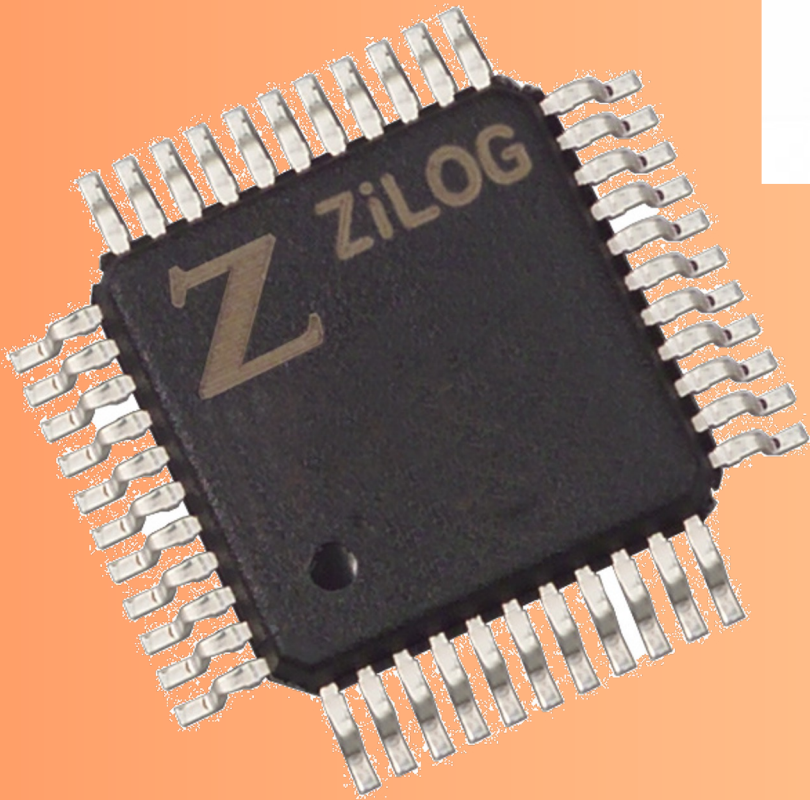
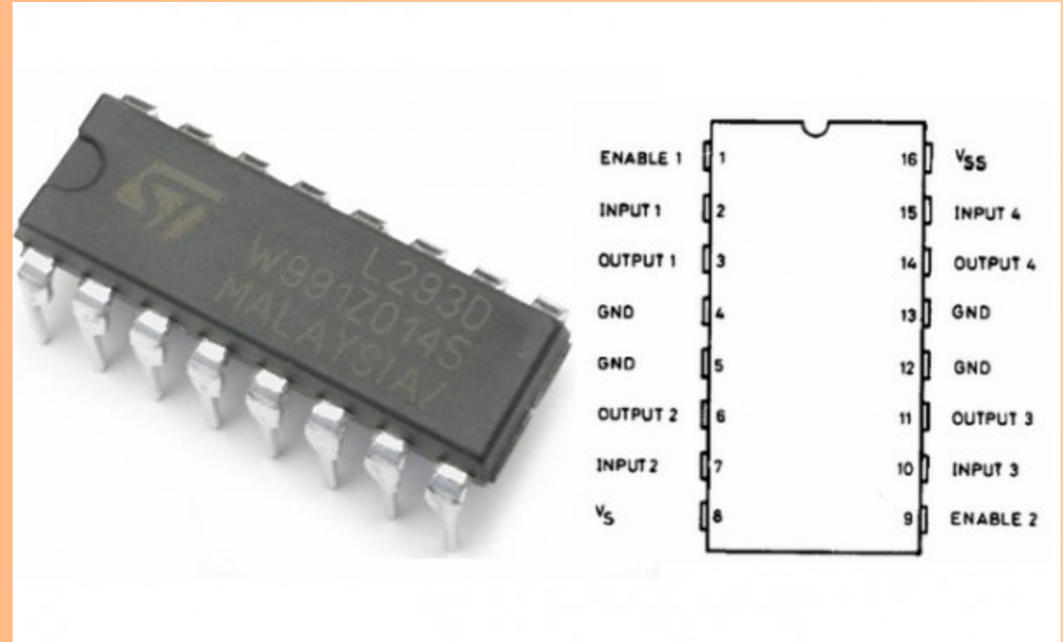
.LEDs

.Capacitors

.Resistors

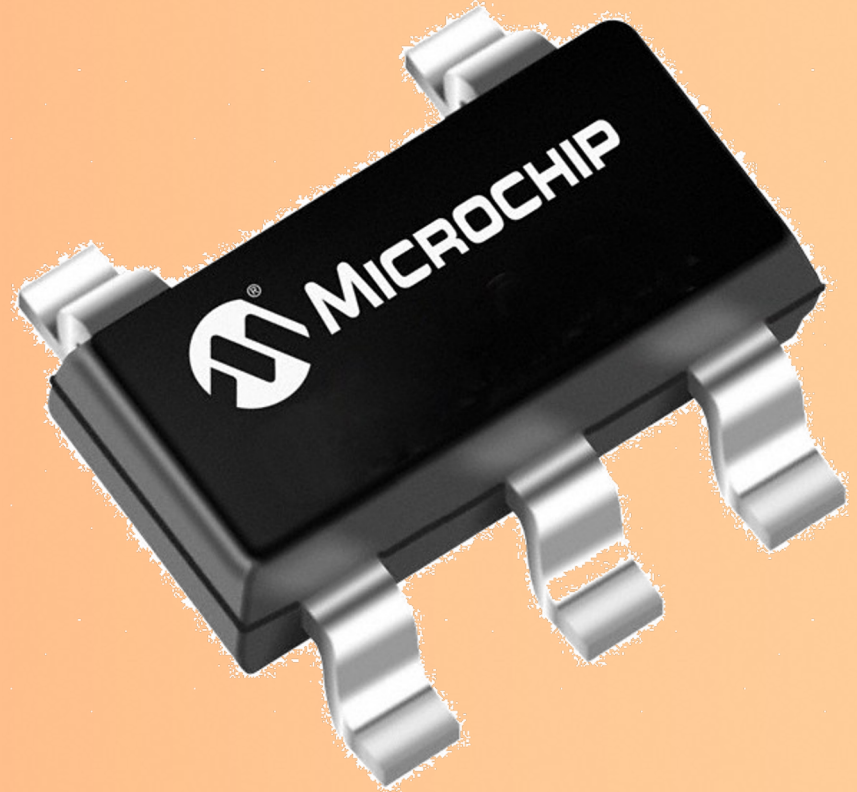
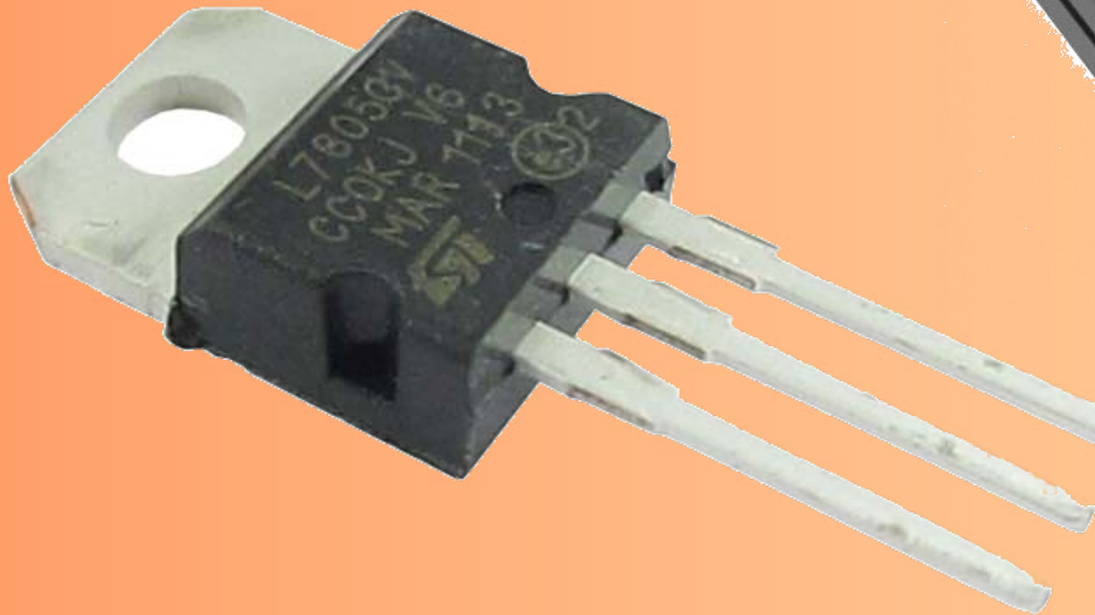
Pin 1 Identification

.ICs



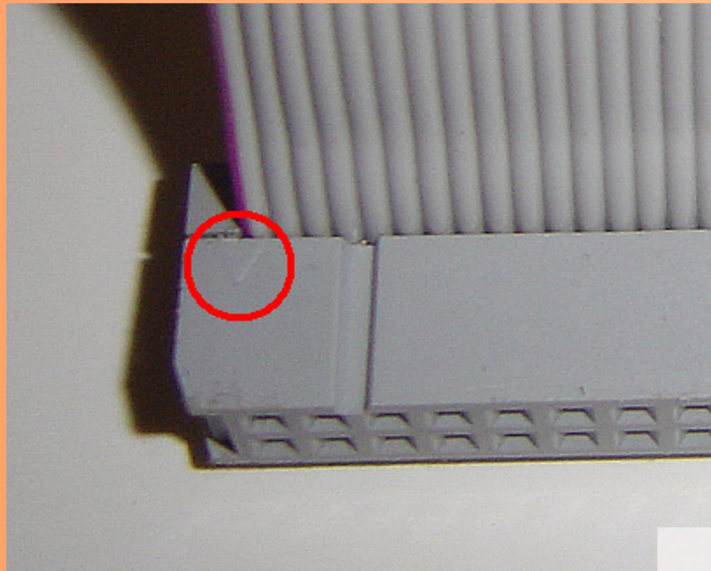
Pin 1 Identification

.ICs



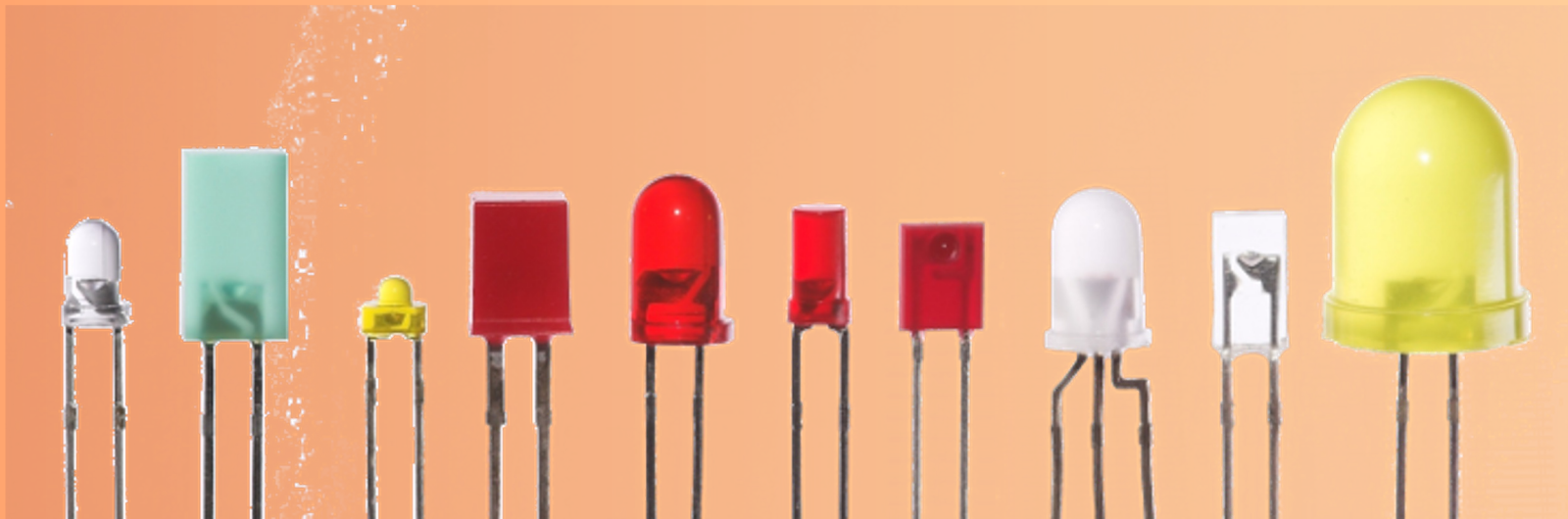
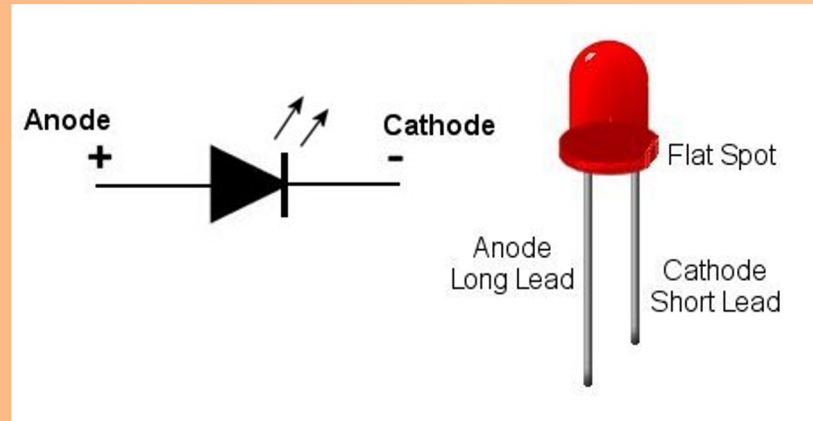
Pin 1 Identification

.Cables



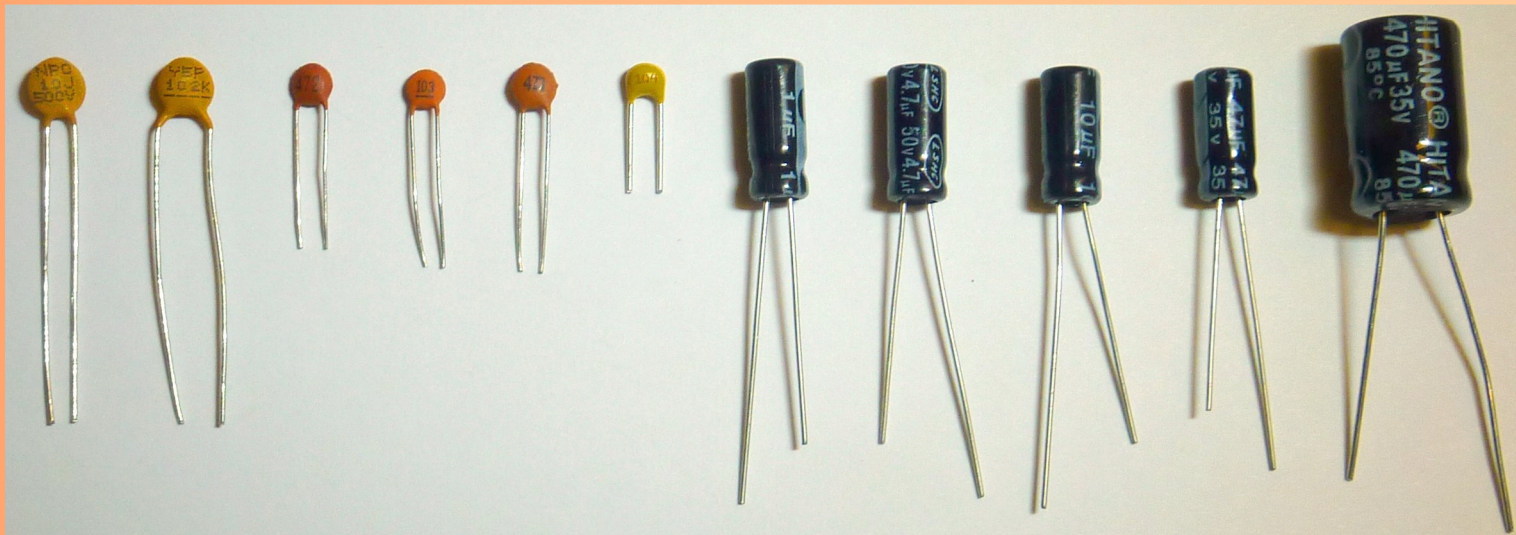
Pin 1 Identification

.LEDs



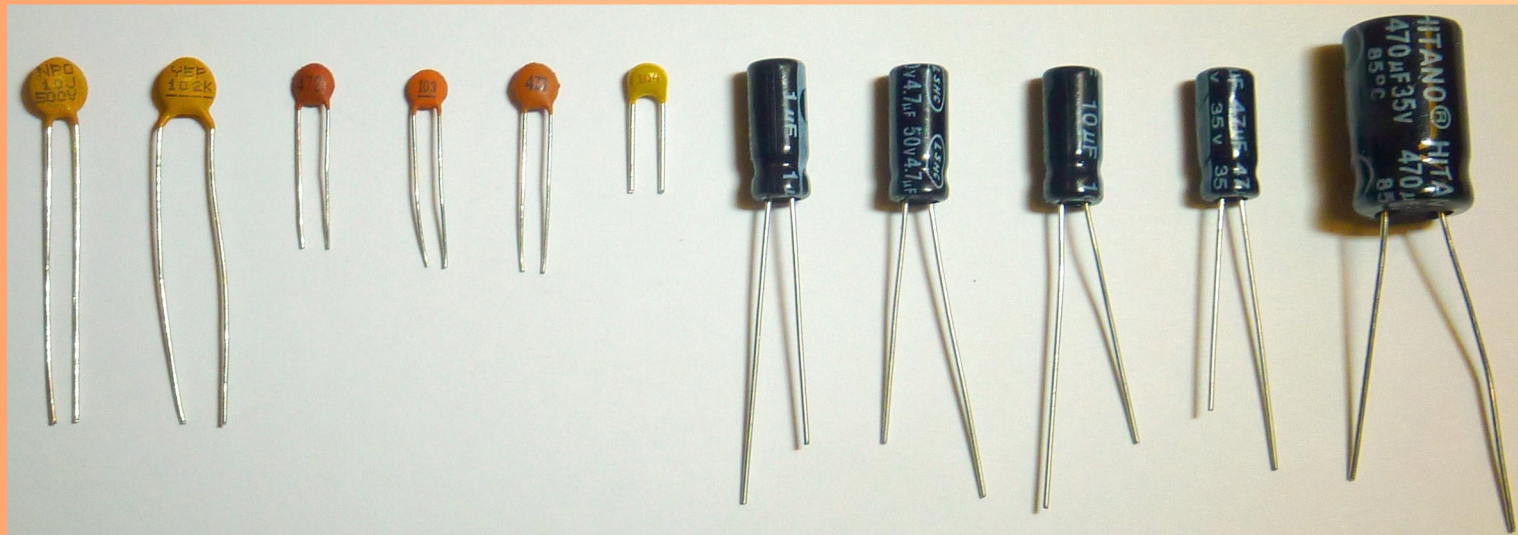
Pin 1 Identification

.Capacitors



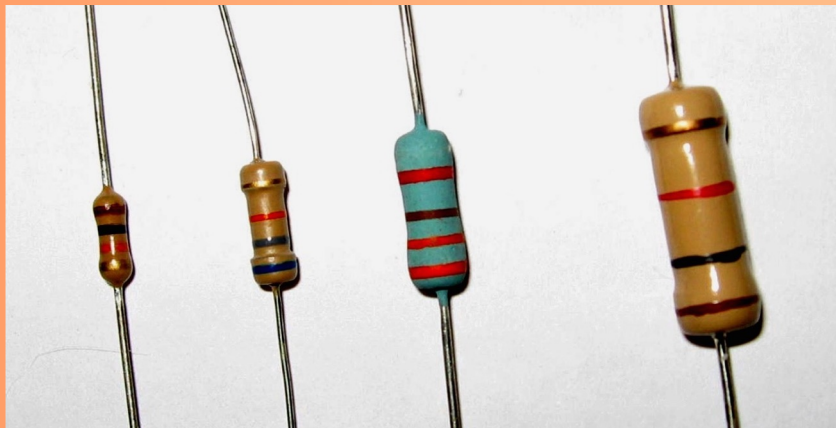
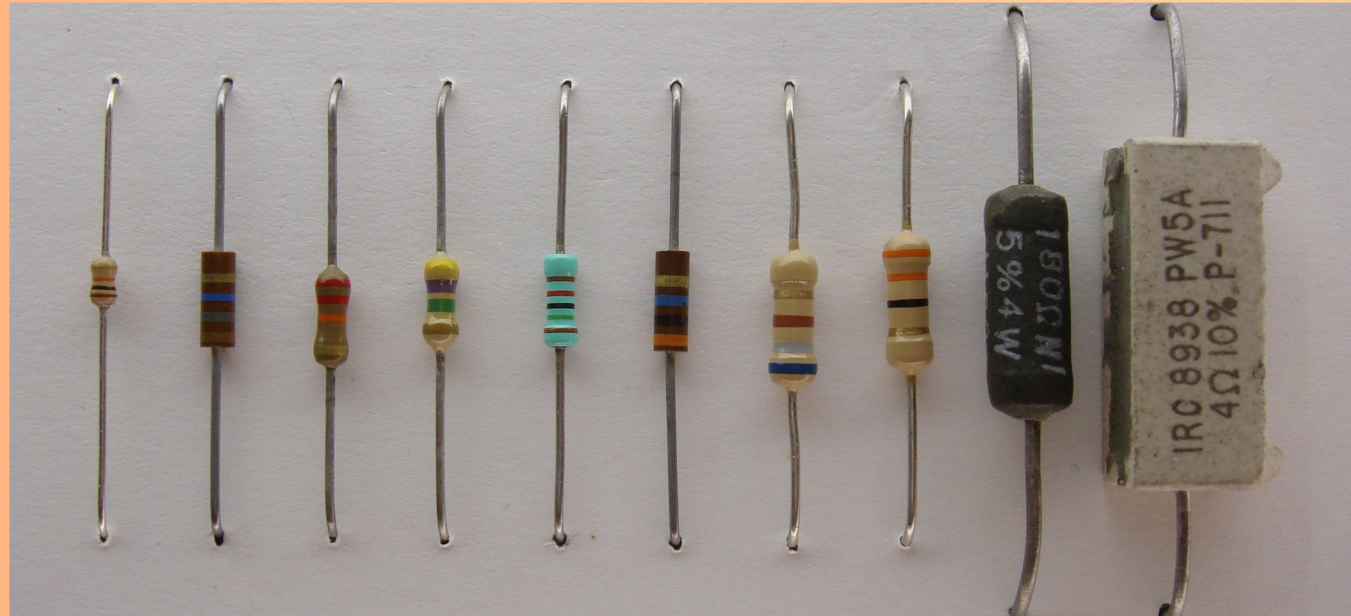
Pin 1 Identification

.Capacitors



Pin 1 Identification

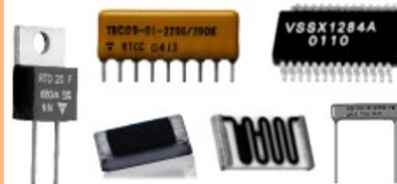
.Resistors



Carbon & Metal Film



Thick Film



Thin Film



Wire-Wound



Special-Purpose



Adjustable



Compilation by
www.RFCafe.com

Examples provided by Radio Shack (radioshack.com) and Vishay (vishay.com) websites

Power Supplies



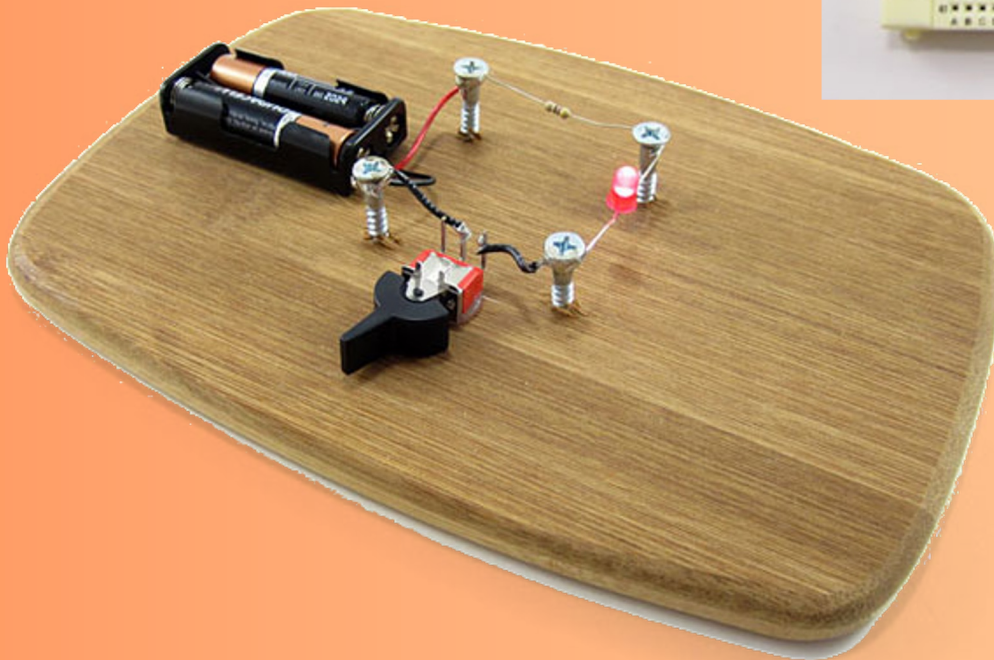
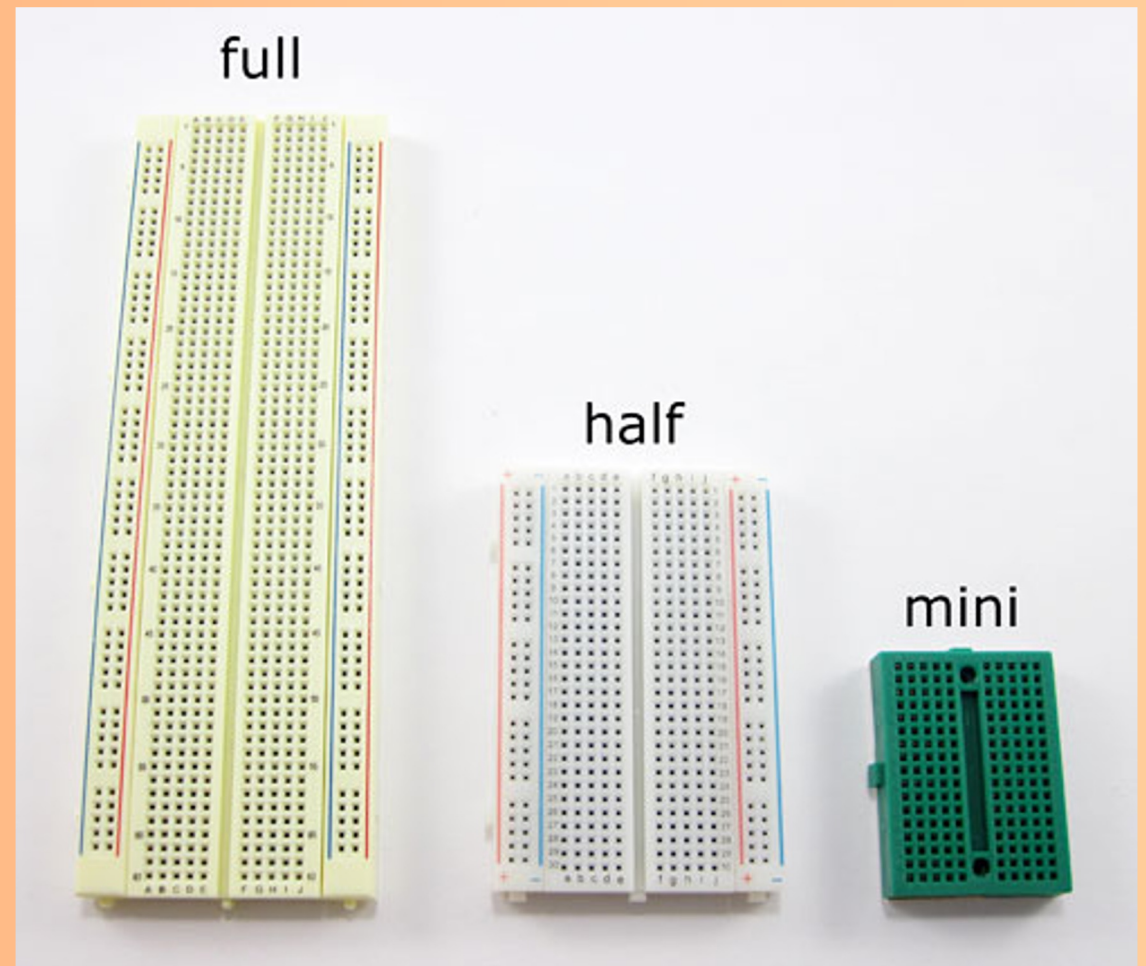
Power Supplies



Power Supplies



Breadboards



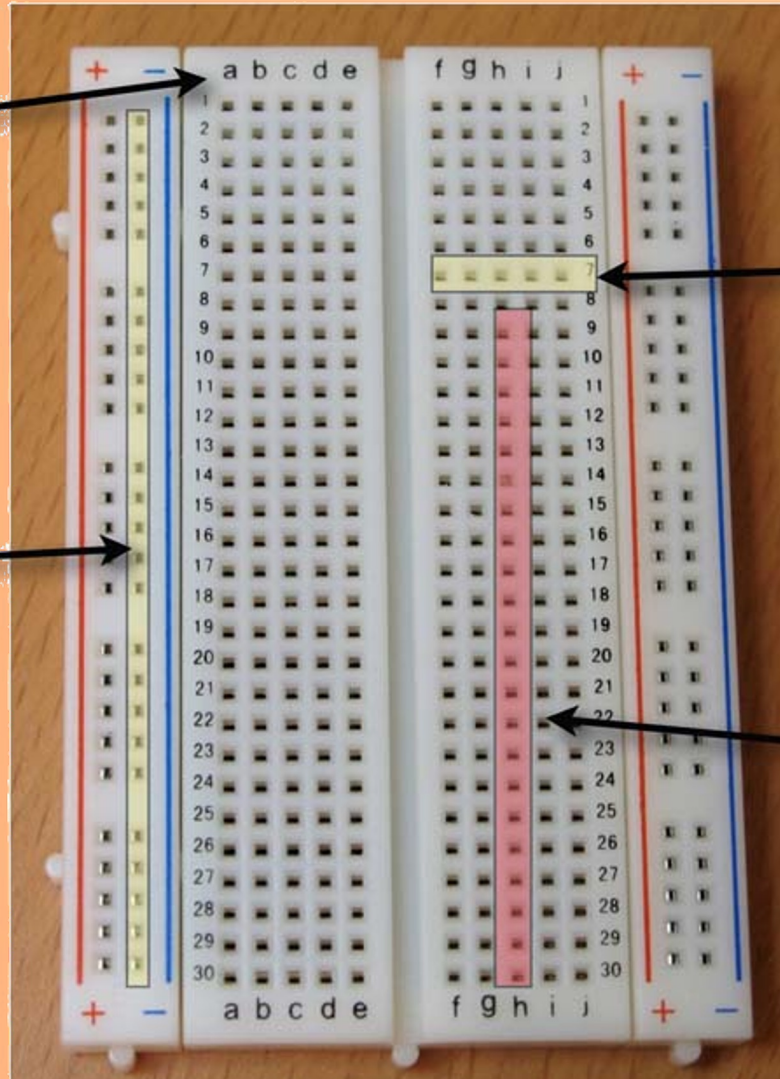
Solderless Breadboards

numbers & letter labels just for reference

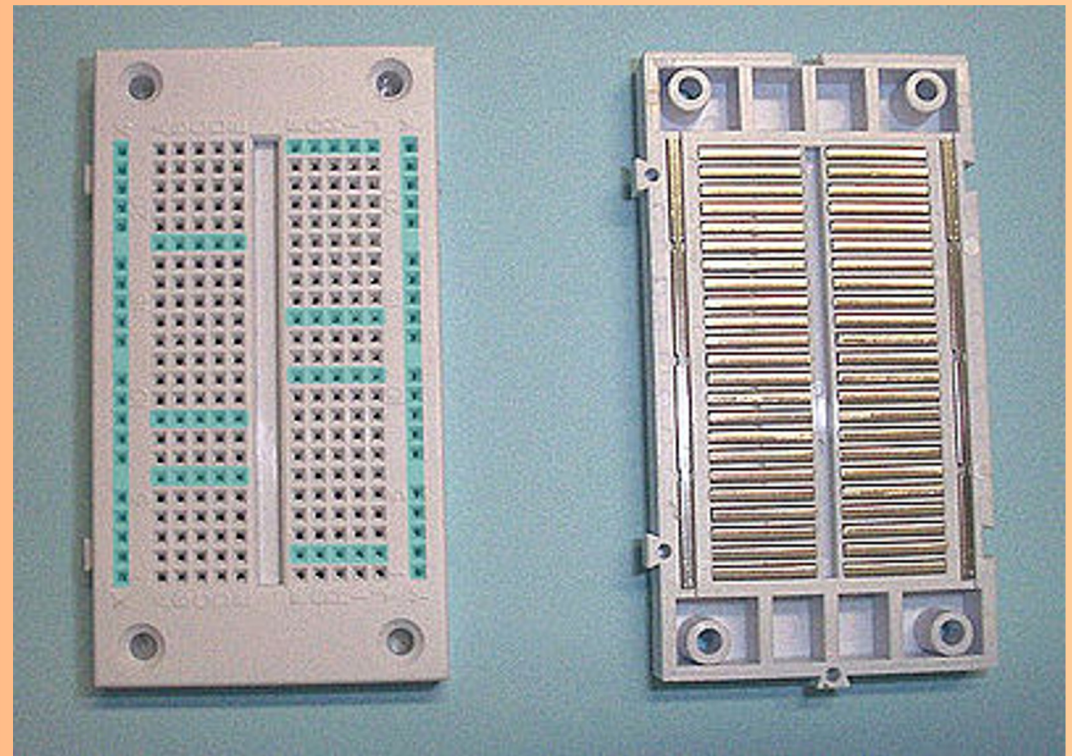
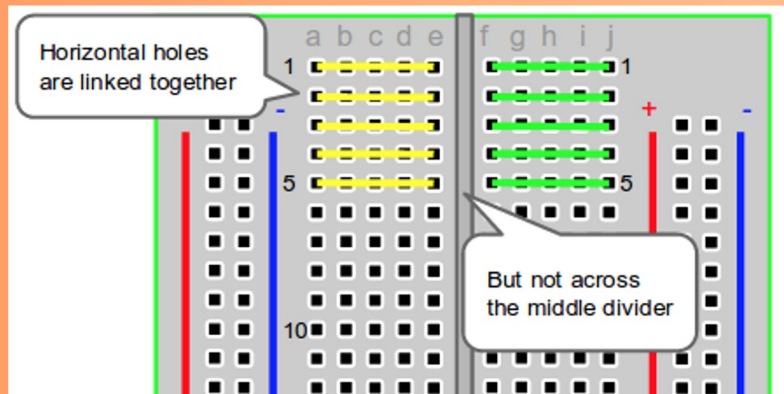
All connected, a "bus"

groups of 5 connected

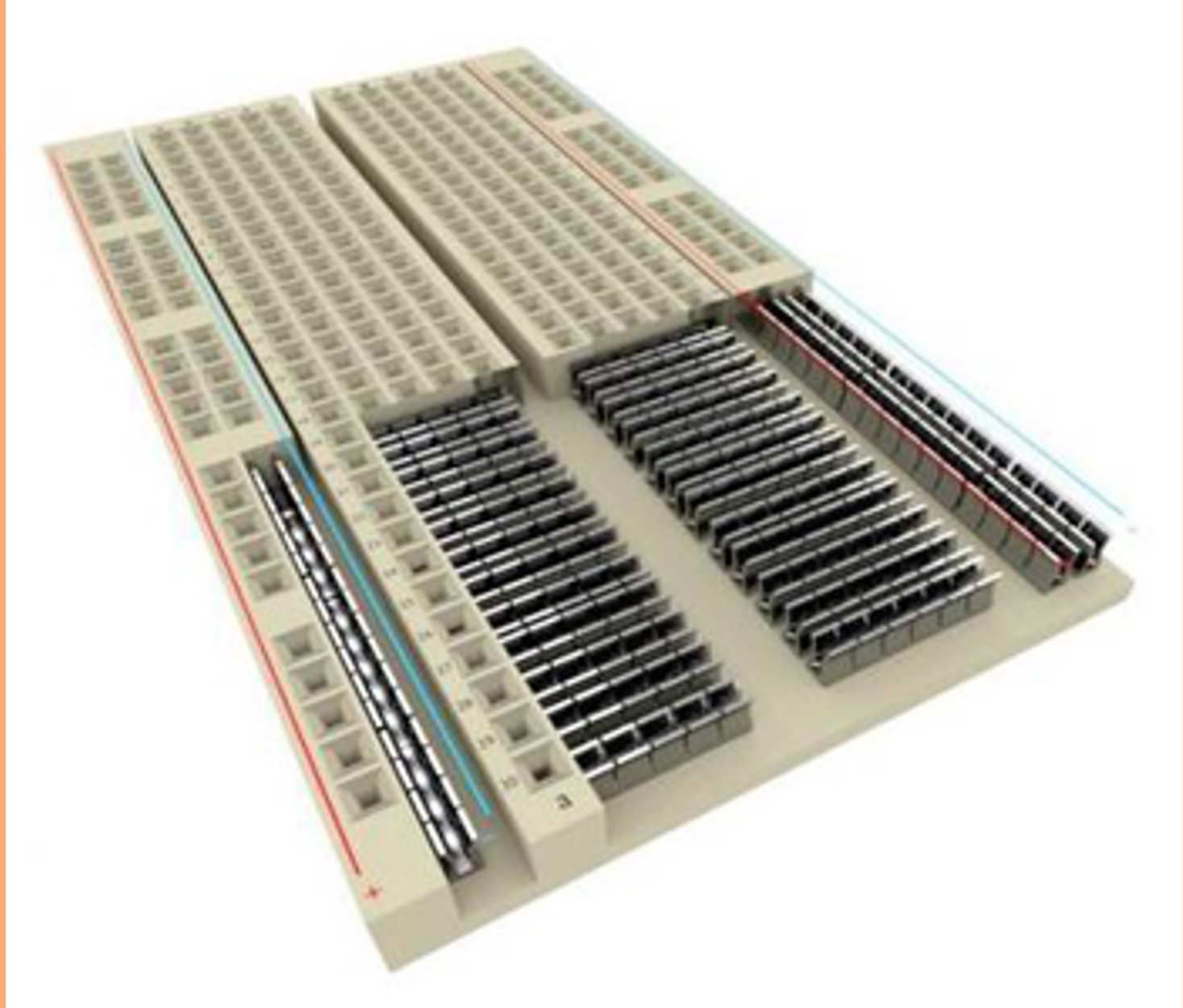
not connected



Breadboards



Breadboards



Debug Checks

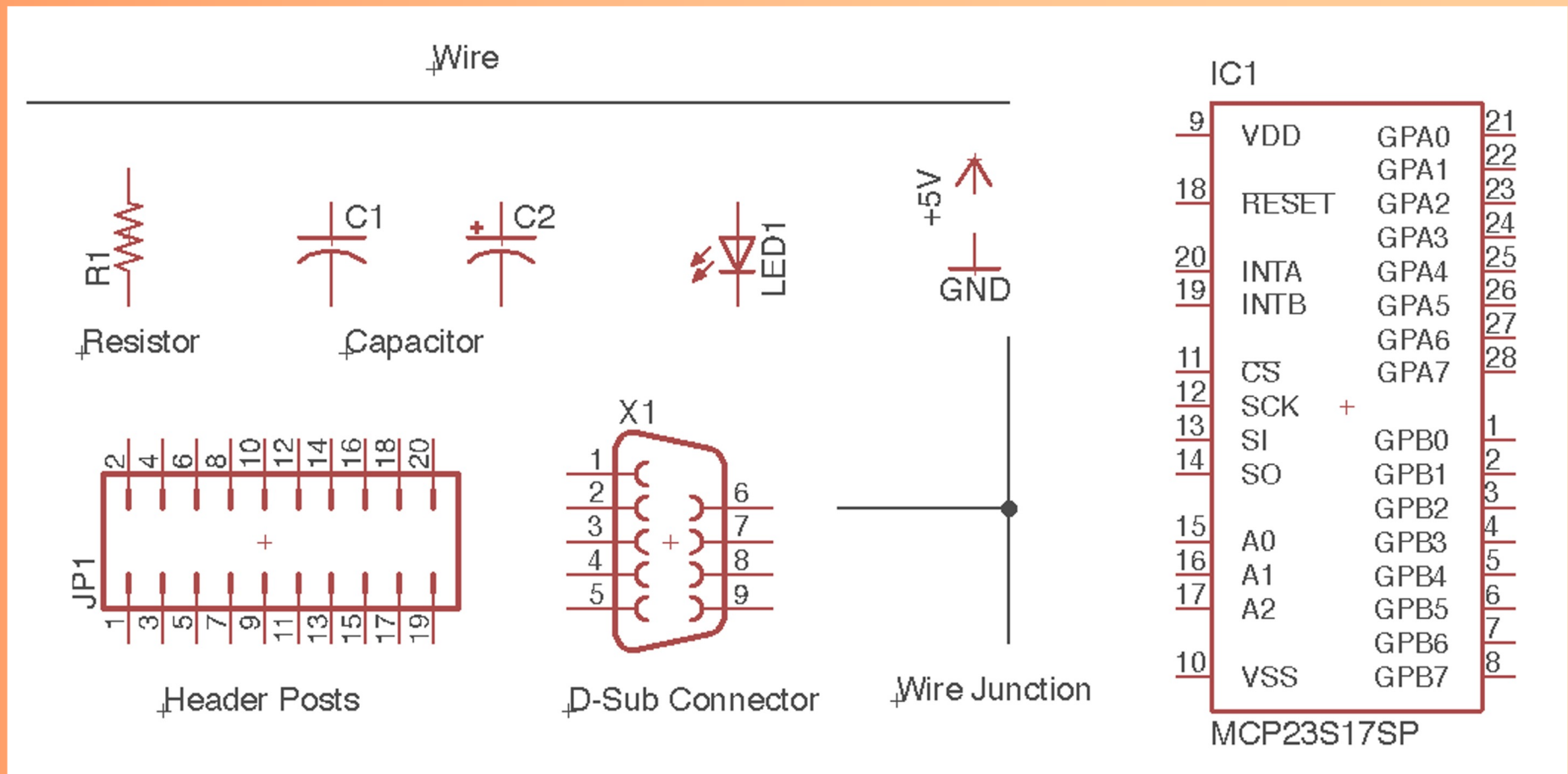
- .Is there power?
- .Is your circuit wired correctly?
- .Simplify
 - hardware or software?

Translating Schematics to Breadboards

- .Reading Schematics
- .Translating to Breadboard

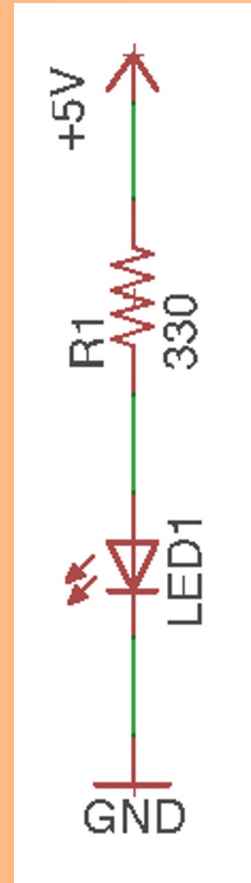
Reading Schematics

.Symbols



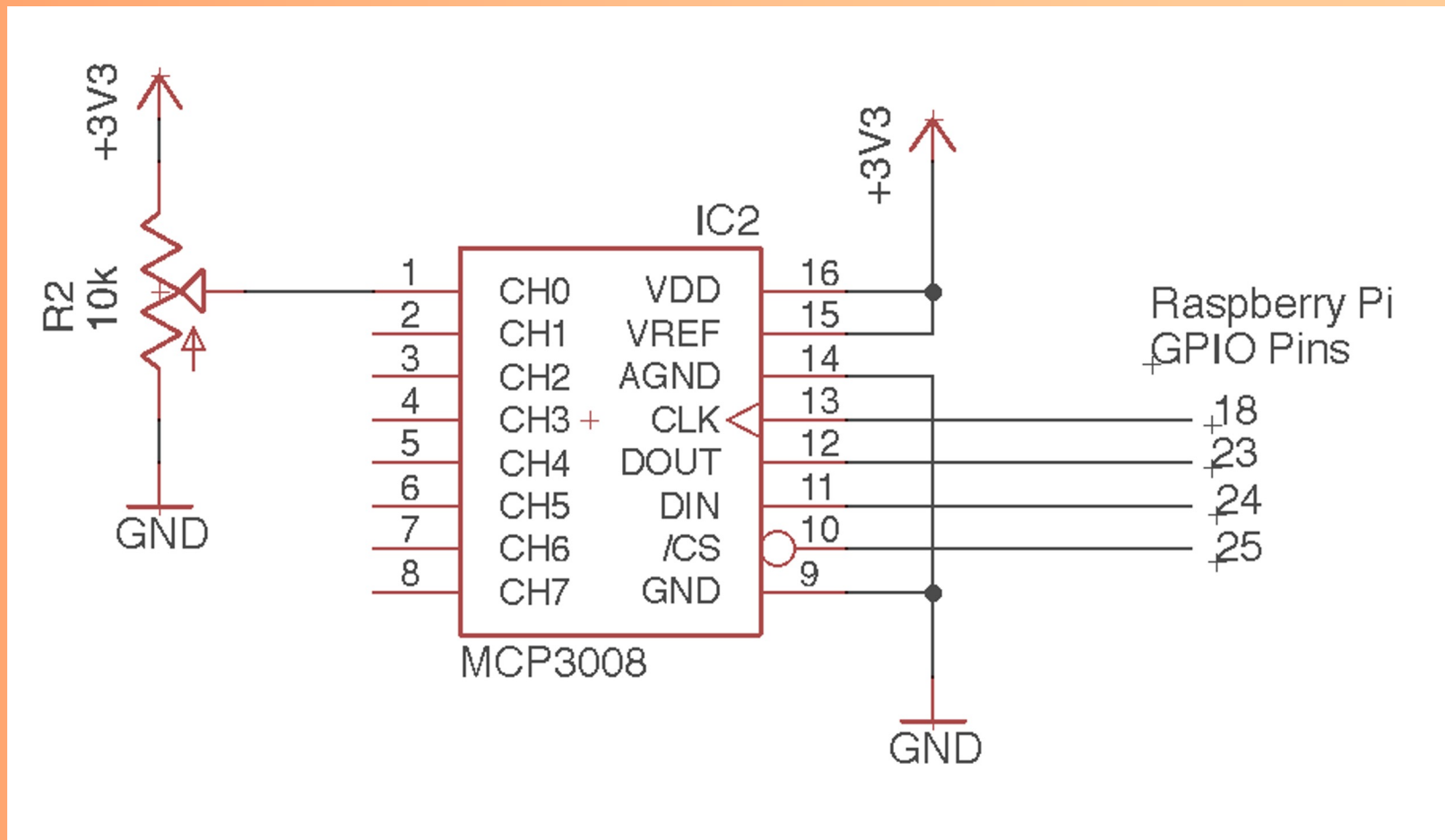
Reading Schematics

.Connections

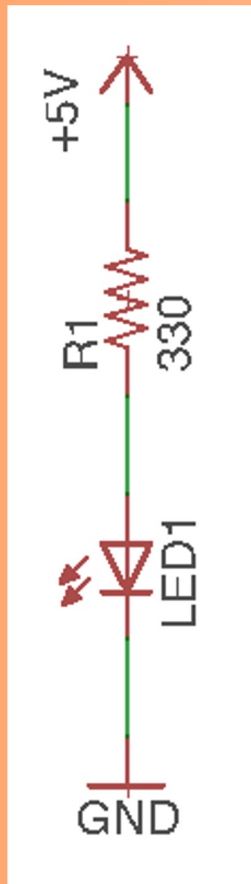


Reading Schematics

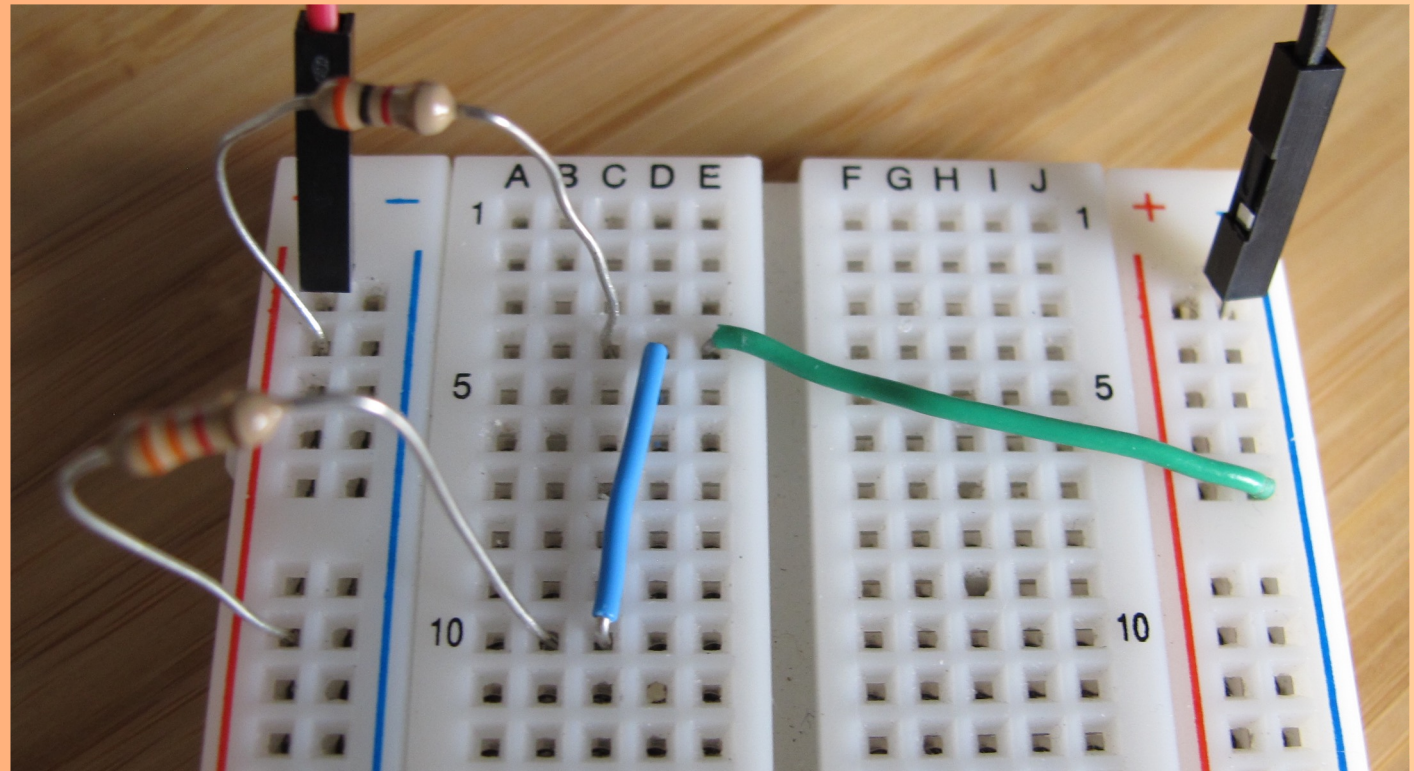
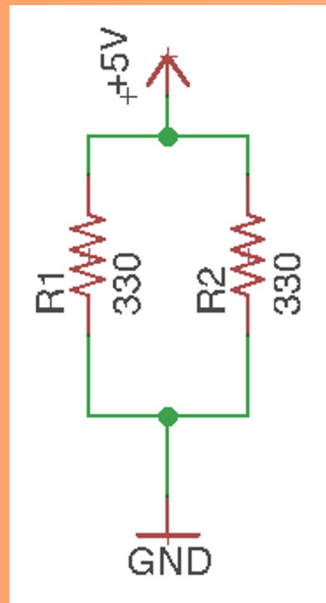
.Connections



Translating Schematics to Breadboards

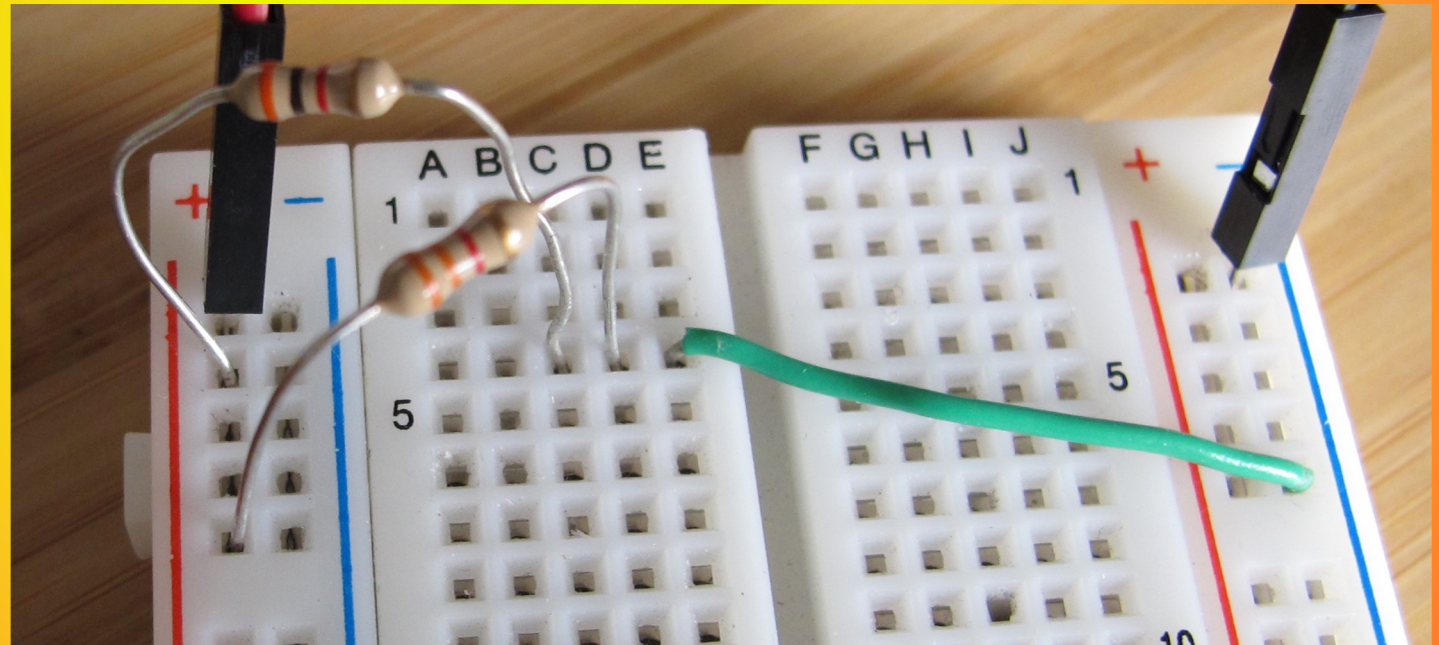


Translating Schematics to Breadboards

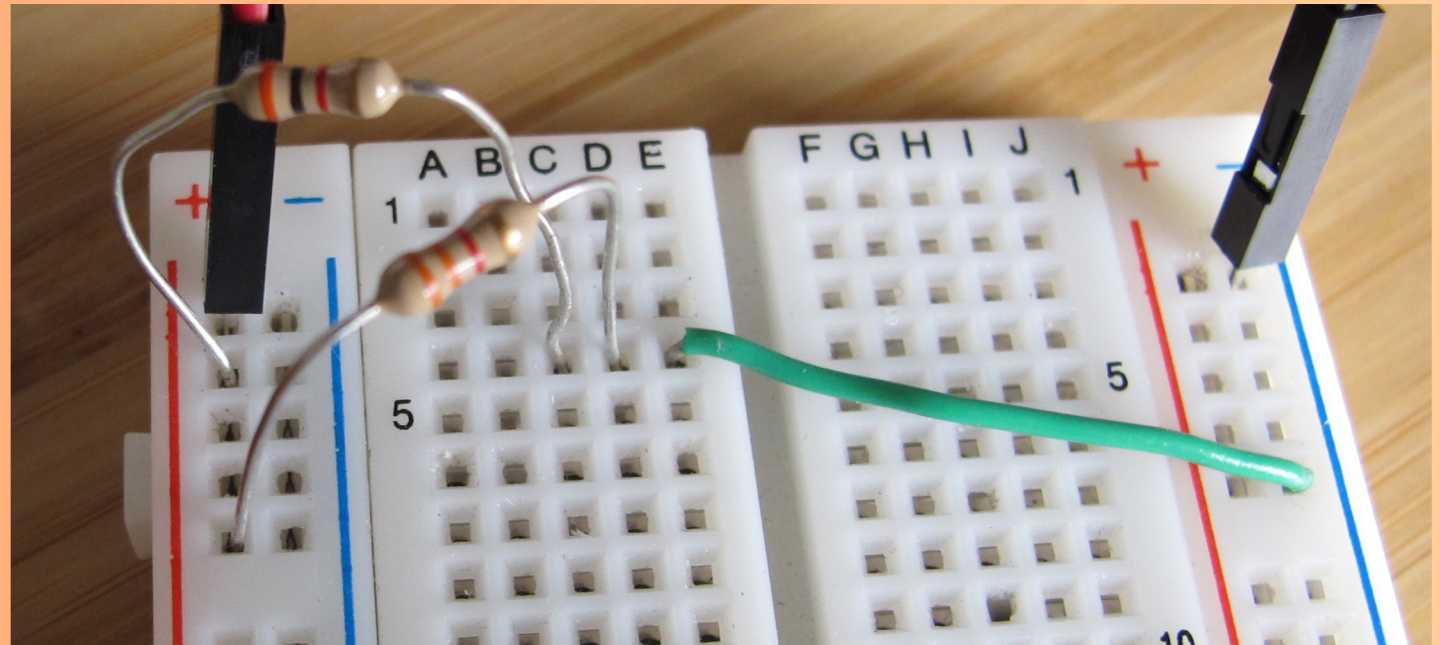
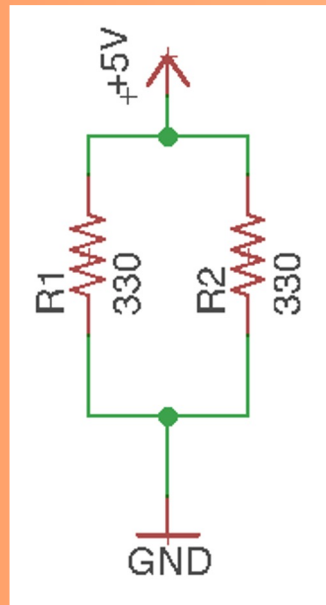


You Try It

Translate Breadboard to Schematic



Translating Schematics to Breadboards



You Try It

Translate Schematic to Breadboard



Translating Schematics to Breadboards

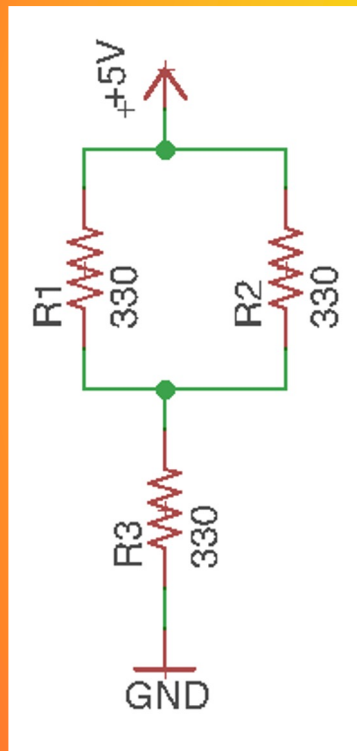


Translating Schematics to Breadboards

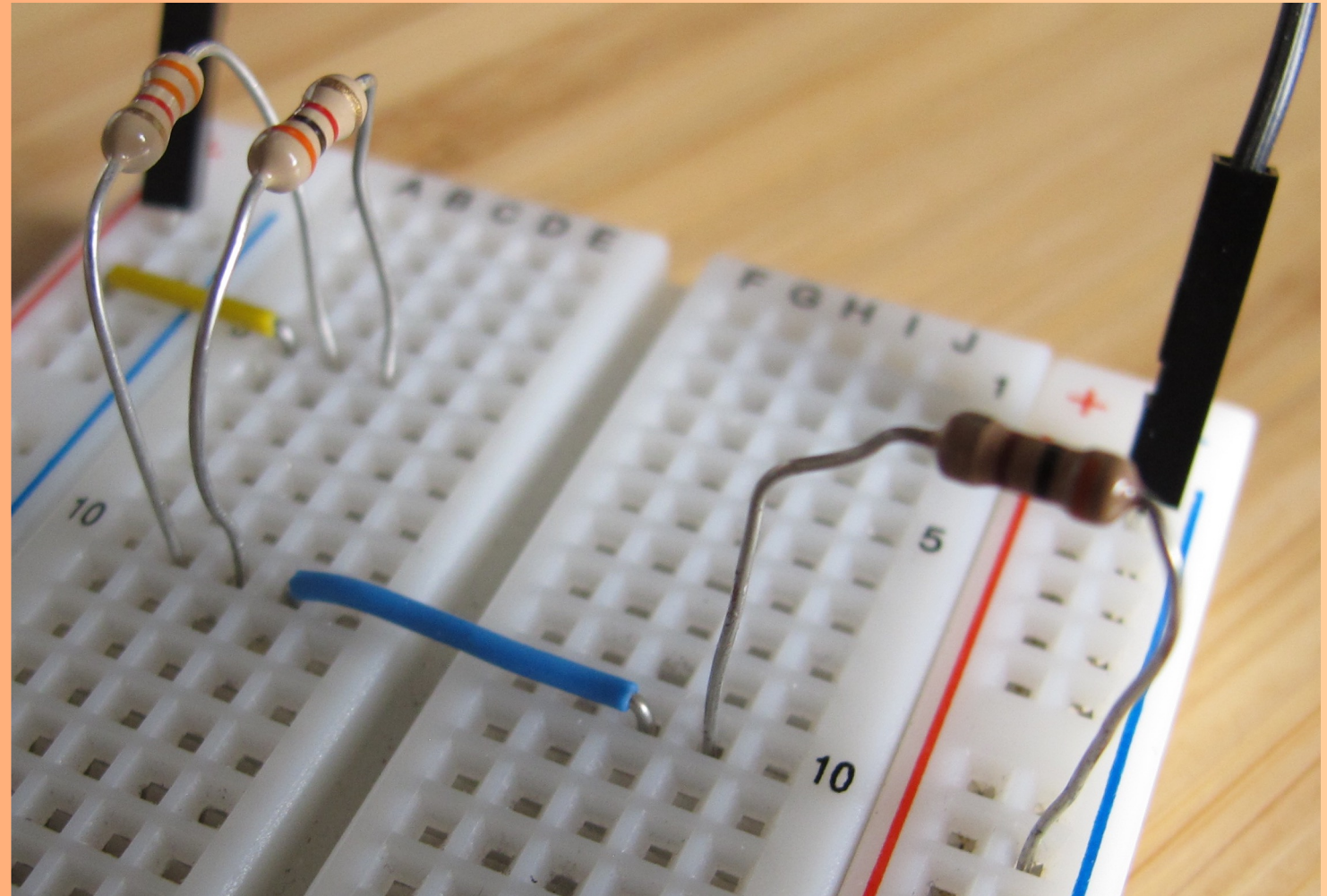
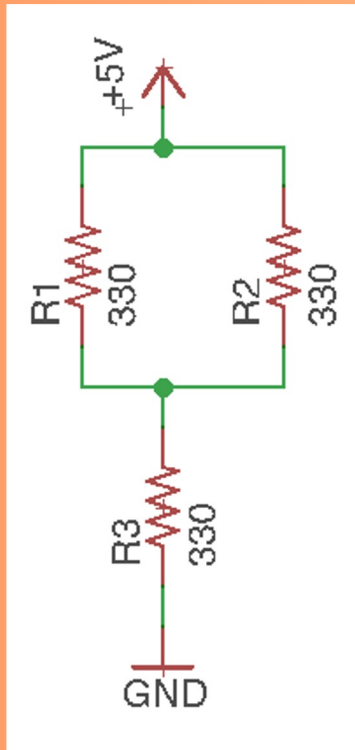


You Try It

Translate Schematic to Breadboard

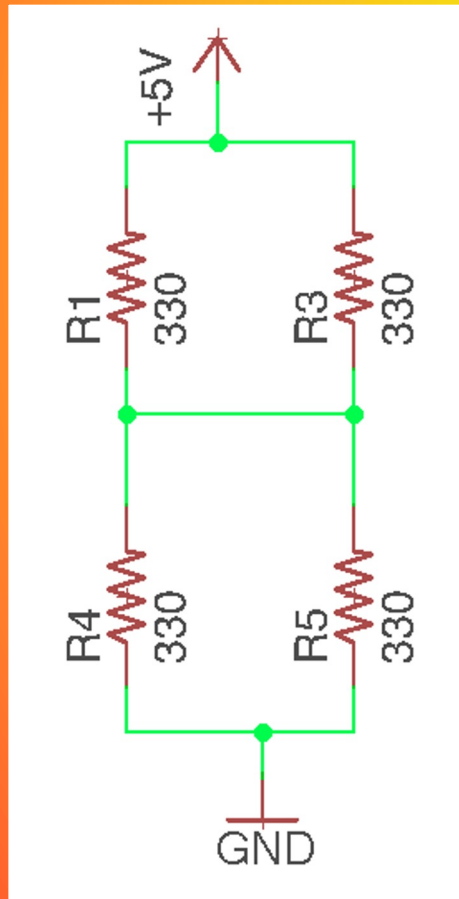


Translating Schematics to Breadboards

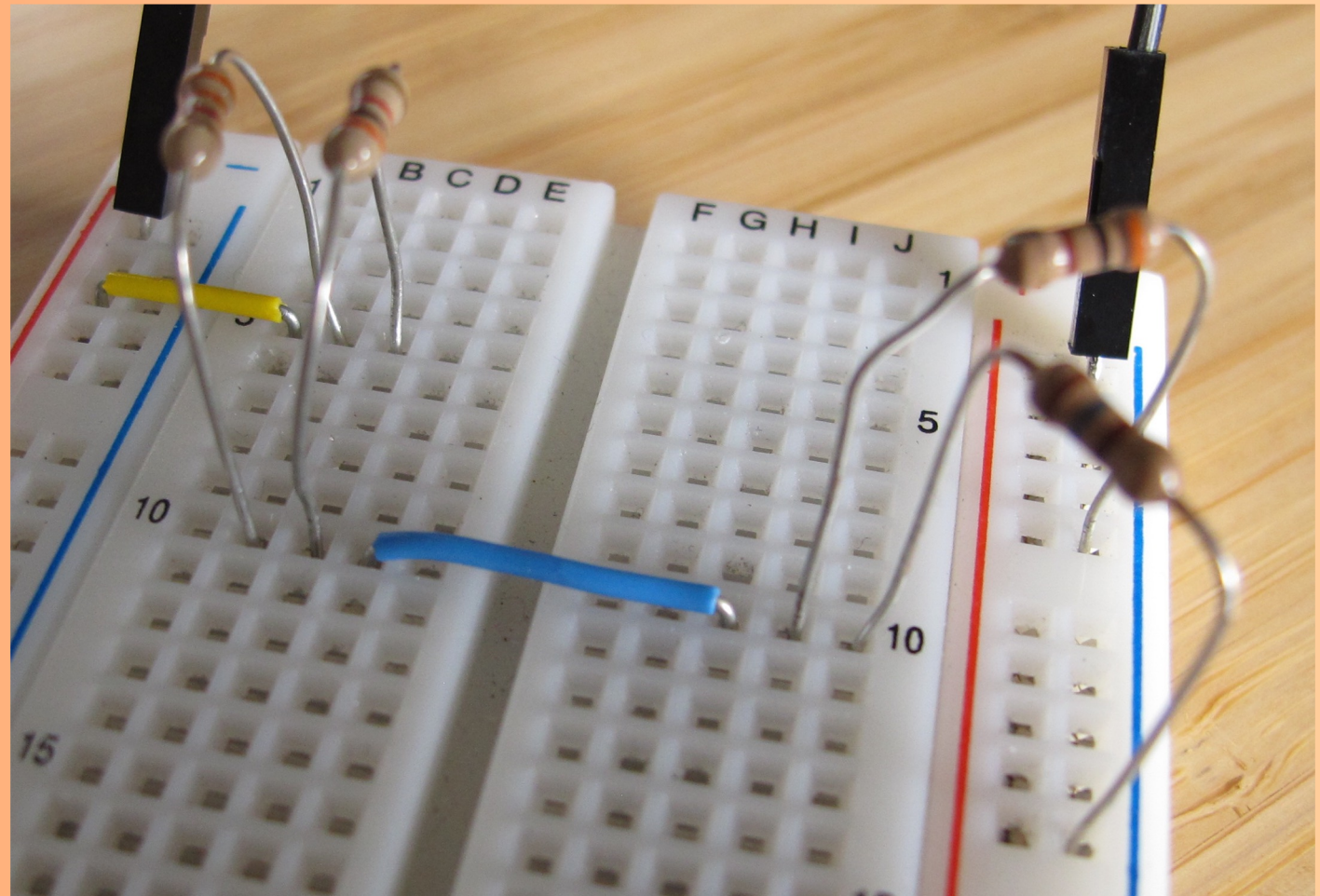
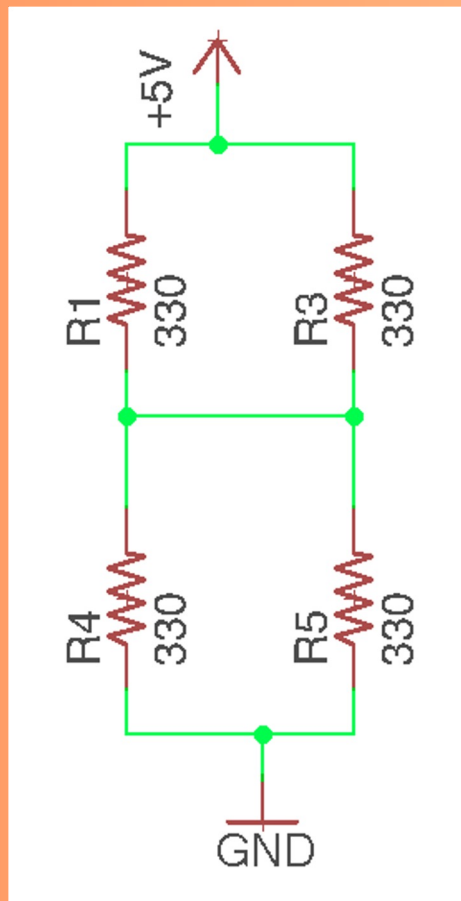


You Try It

Translate Schematic to Breadboard



Translating Schematics to Breadboards



Review

- .Electrical Safety
- .ESD
- .ICs
- .Pin 1 Identification
- .Power Supplies
- .Debug Checks
- .Breadboards
- .Translating Schematic to Breadboard