EECS16A Imaging 1

IMPORTANT: LAB CAPACITY

- Only students enrolled in this lab section should be present here

- If you **lie** about being enrolled in this section, you will be **REMOVED** from the course
  - Please be ready to show either CalCentral enrollment or an email confirming a switch.

Semester Outline

Imaging Module

Touchscreen Module

Locationing Module

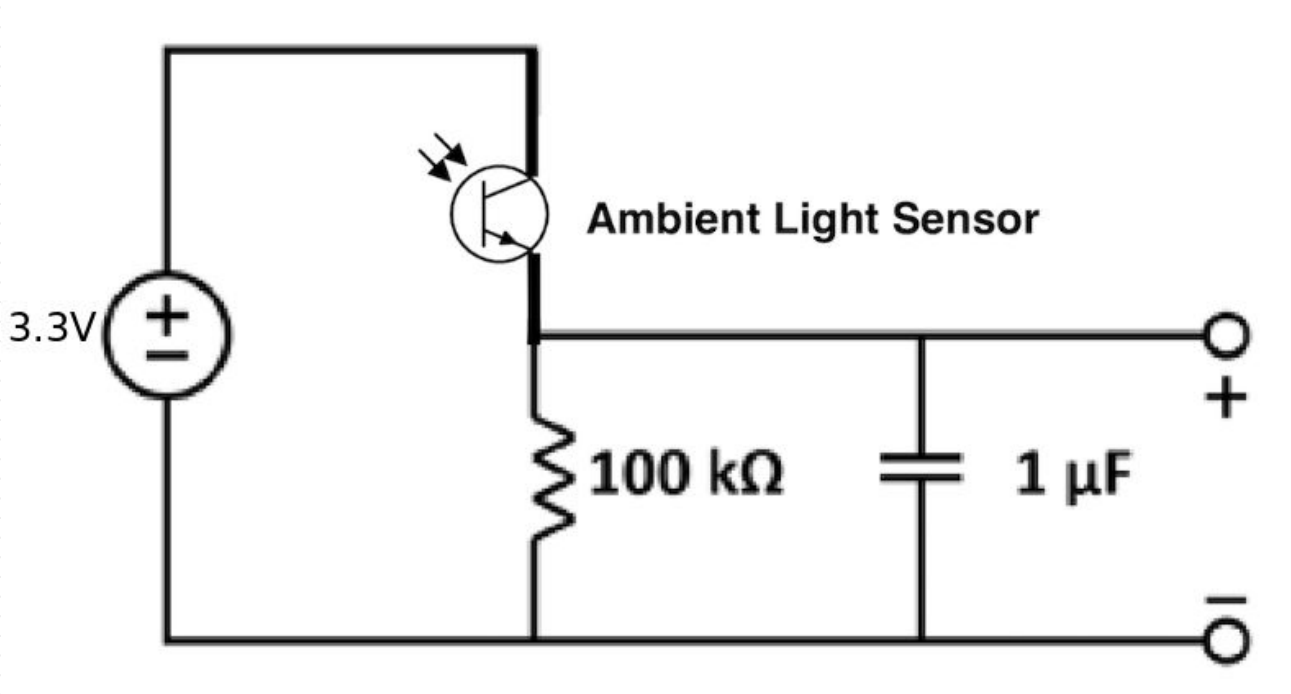
Why Imaging?

- Use linear algebra techniques to capture real world images with limited sensors
- Today:
  - Finding a link between physical quantities and voltage
  - If you can digitize it, you can do anything (IOT devices, internet, code, processing)

Today's Lab: Imaging Part 1

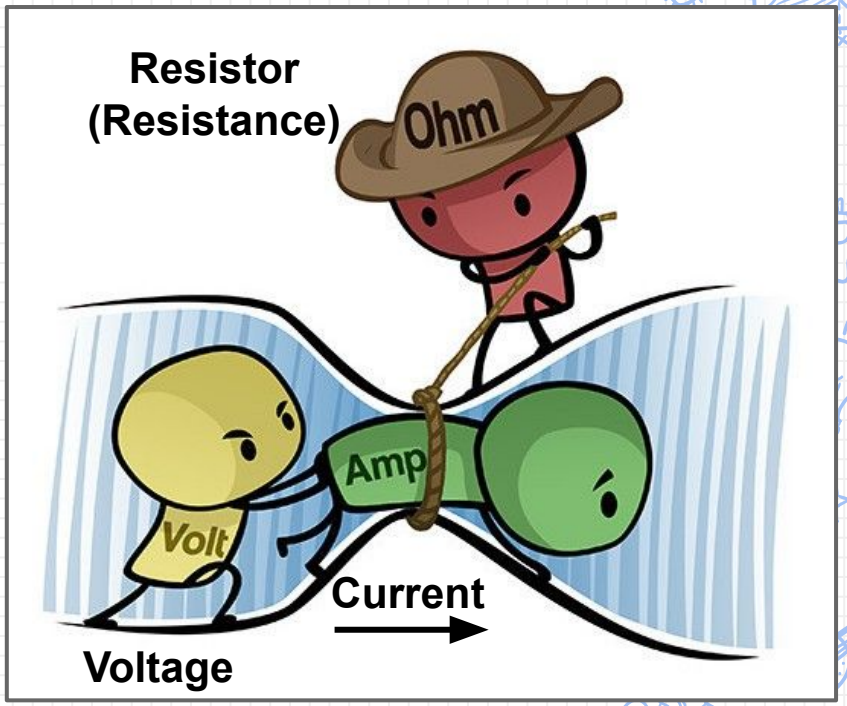
- You should have received lab materials (TI MSP430F5529 + lab kit)
- Circuits + Breadboarding 101
- Build circuit that reacts to light intensity
  - Use Launchpad to see how the circuit behaves
- Graded checkoff starts today!
- If you haven't received your lab kit yet, you may do this lab during Lab 3A (buffer lab)
  - Make sure you don't miss Img 2 or Img 3

Our circuit



A Little Physics: Voltage, Current, and Resistors

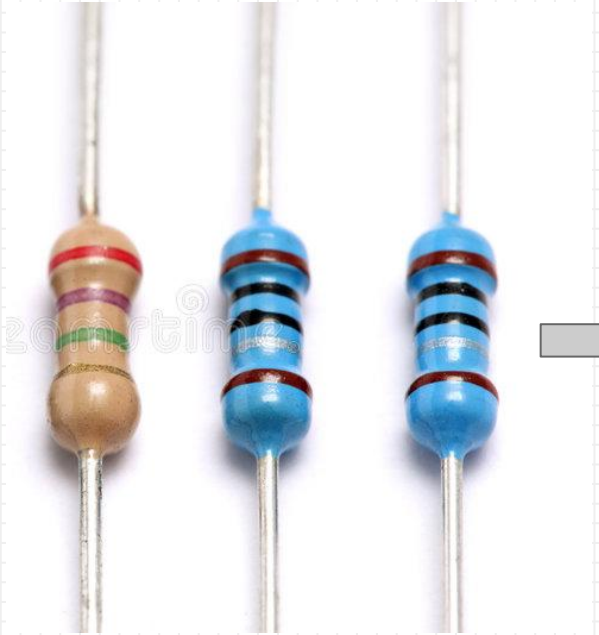
- **Voltage [Volts]** - pushes charge through circuit
- **Current [Amps]** - flow of charge through circuit
  - 1 Amp = 1 charge per second
- **Resistor [Ohms]** - circuit component that resists the flow of charge through circuit

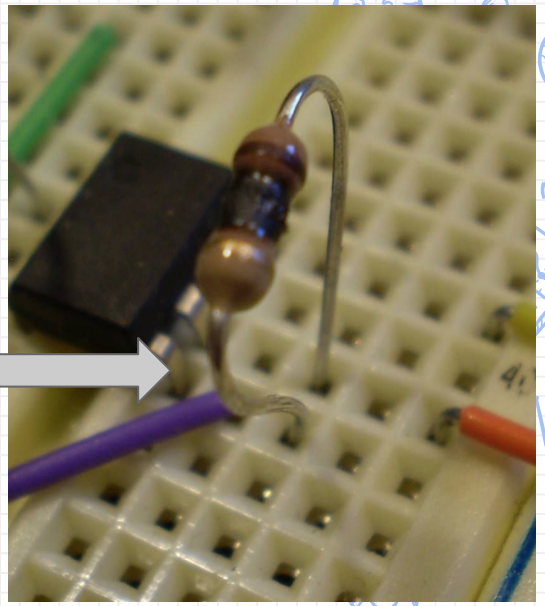


Simple Circuit: The Tools™

- Components
  - Resistors
  - Capacitors
  - Voltage Source
- Wires / Jumpers [male-to-male vs male-to-female]

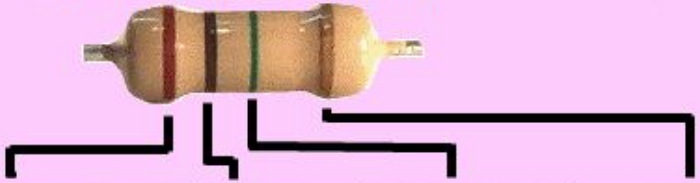
What’s in your circuit? : Resistors





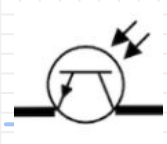
What’s on your circuit? : Resistors

4 Band Resistor Color Coding



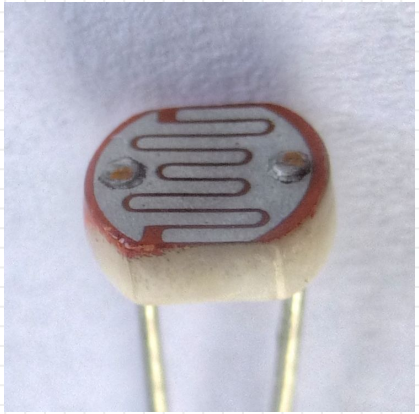
COLOR	1ST BAND	2ND BAND	MULTIPLIER	TOLERANCE
BLACK	0	0	x1Ω	
BROWN	1	1	x10Ω	±1%
RED	2	2	x100Ω	±2%
ORANGE	3	3	x1000Ω	
YELLOW	4	4	x10000Ω	
GREEN	5	5	x100000Ω	±0.5%
BLUE	6	6	x1000000Ω	±0.25
VIOLET	7	7	x10000000Ω	±0.10
GREY	8	8		±0.05
WHITE	9	9		
GOLD			0.1	±5%
SILVER			0.01	±10%

Ambient Light Sensor

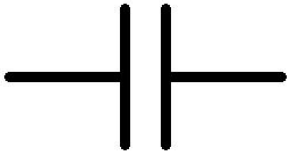


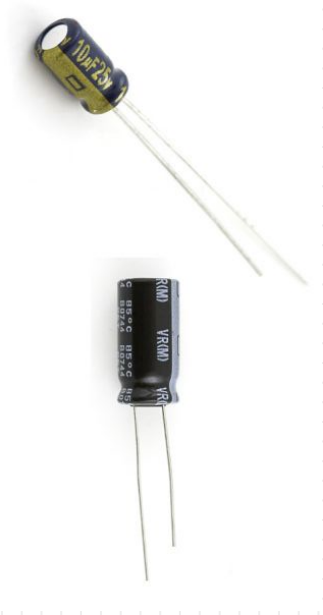
It’s a type of resistor whose value can change depending how much light there is around it!

Direction matters!



Equipment for Today: Capacitors

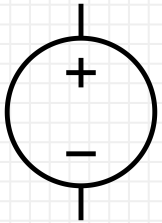


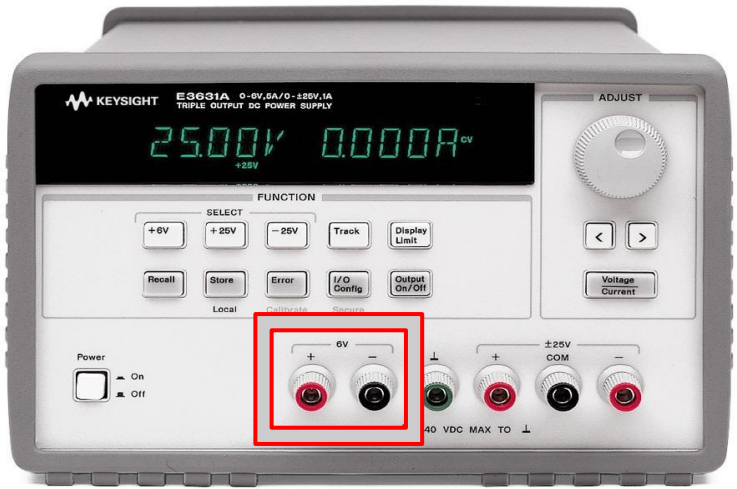


They store your charge!
Called capacitors because they have a set capacity (in Farads)

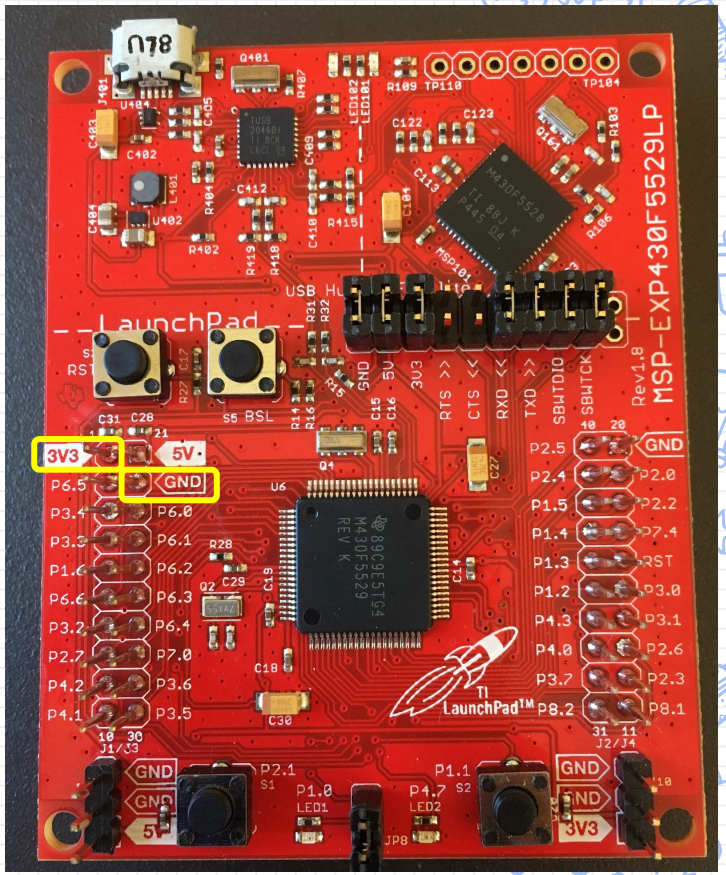
Equipment for Today: Wires/Jumpers

Equipment for Today: Voltage Source





Power Supply Unit (PSU)



We will be using the LaunchPad instead of the PSU as our voltage source. The 3V3 and GND pins on the LaunchPad are the + and - terminals of the voltage source respectively

Simple Circuit: The Theory

- Components
- Nodes
  - Point in circuit where circuit elements meet
  - Wire between components are considered part of one node
- We know you don’t know much about circuits yet; we’ve given you very detailed instructions on how to build the circuit in the lab

Simple Circuit: The Theory™

- Components (Resistors, LEDs, Capacitors)
- Nodes
  - Point in circuit where circuit elements meet
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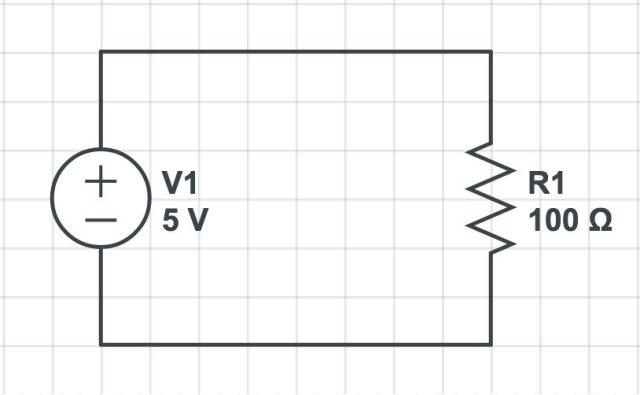

What components?

How many nodes?

Where are these nodes?

Simple Circuit: The Theory™

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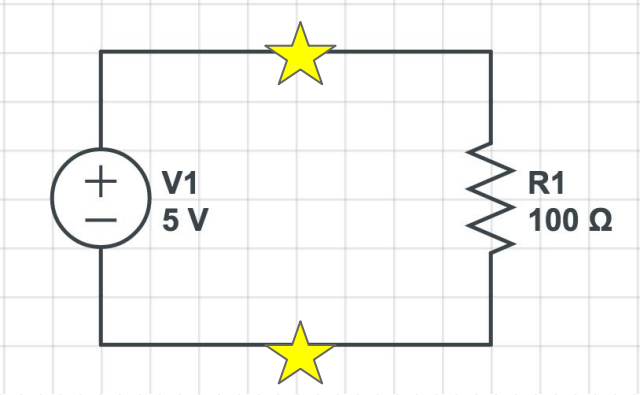

What components?

Voltage source, resistor

How many nodes? **2**

Where are these nodes?

Simple Circuit: The Theory™

- Components (Resistors, LEDs, Capacitors)
- Nodes
  - Point in circuit where circuit elements meet
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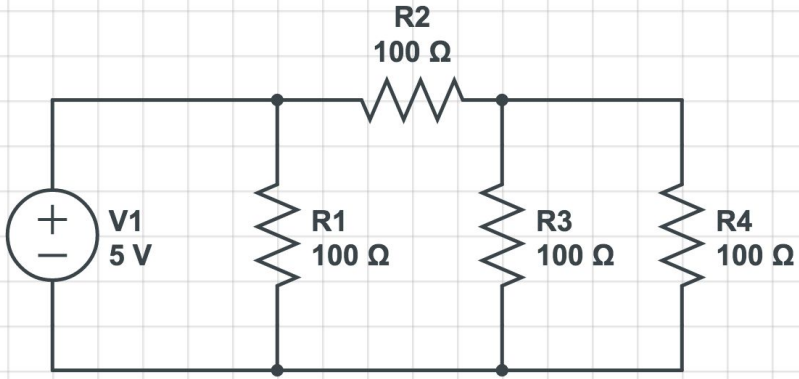


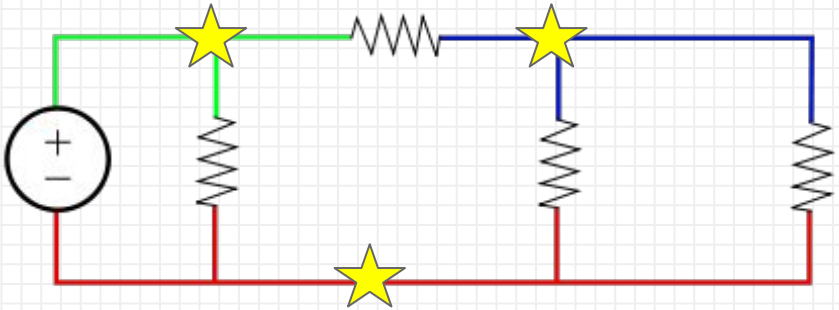
What components?

How many nodes?

Where are these nodes?

Simple Circuit: The Theory™

- Components (Resistors, LEDs, Capacitors)
- Nodes
  - Point in circuit where circuit elements meet
  - Wire between components are considered part of one node

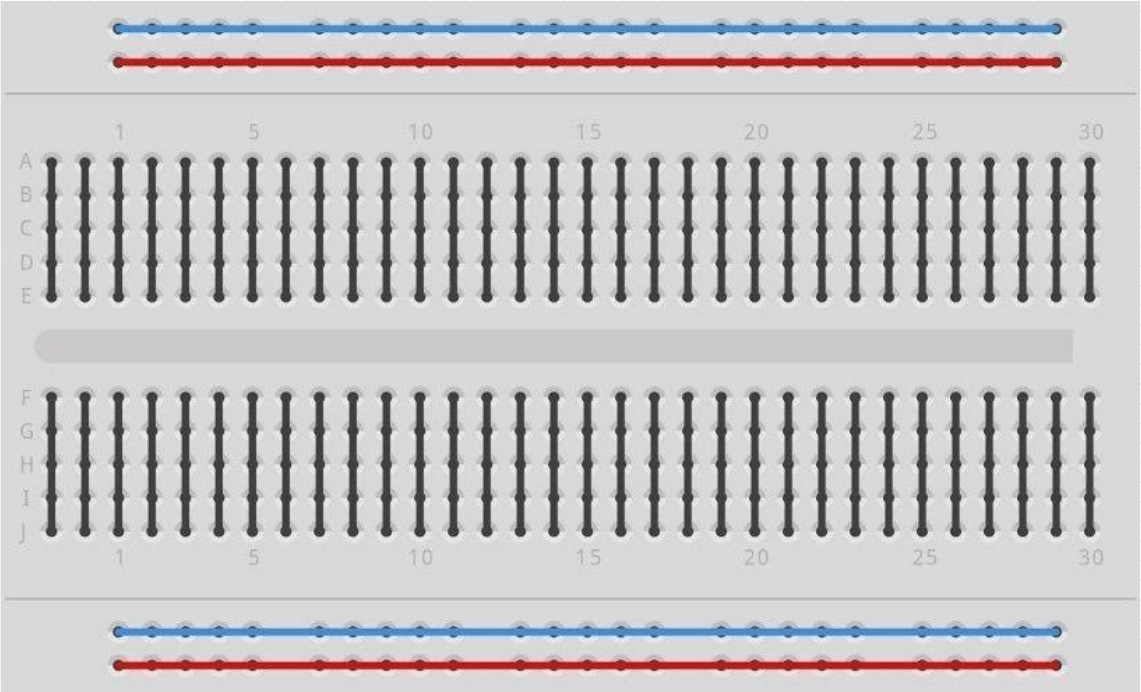


What components? **Same**

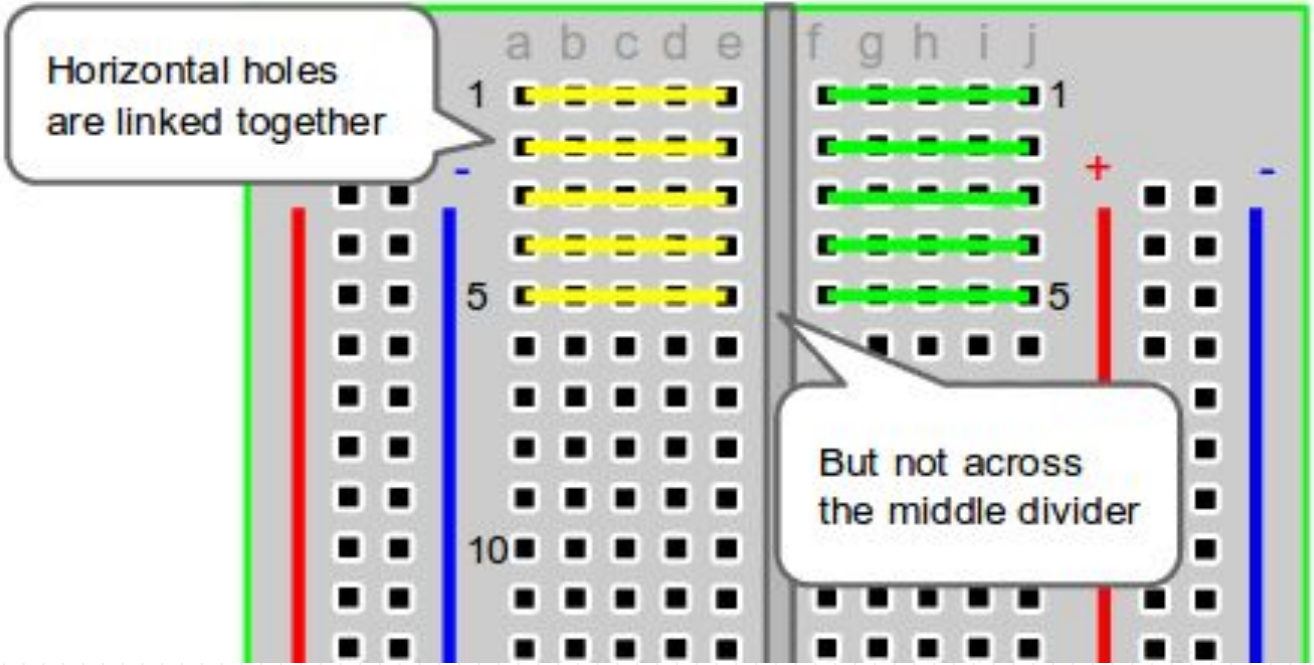
How many nodes? **3**

Where are these nodes?

Breadboard

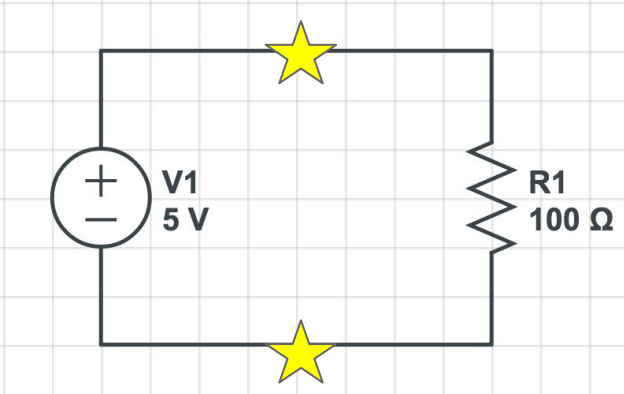


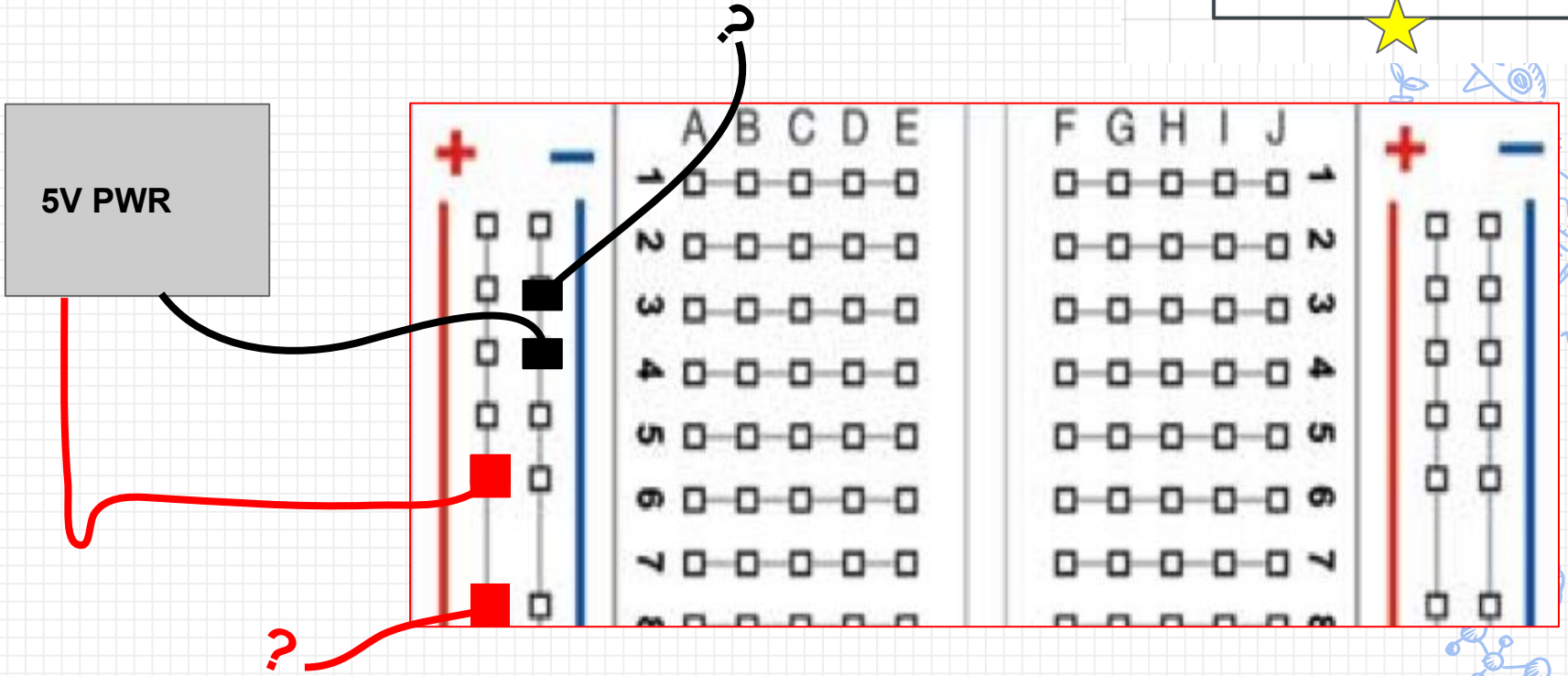
Breadboard


Horizontal holes are linked together
a b c d e
f g h i j
1
5
10
1
5
-
+
-
But not across the middle divider

Breadboard Do’s and Don’t’s

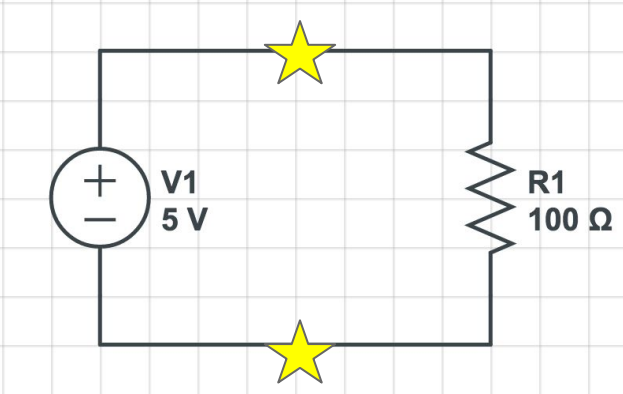
How do we make this circuit? →

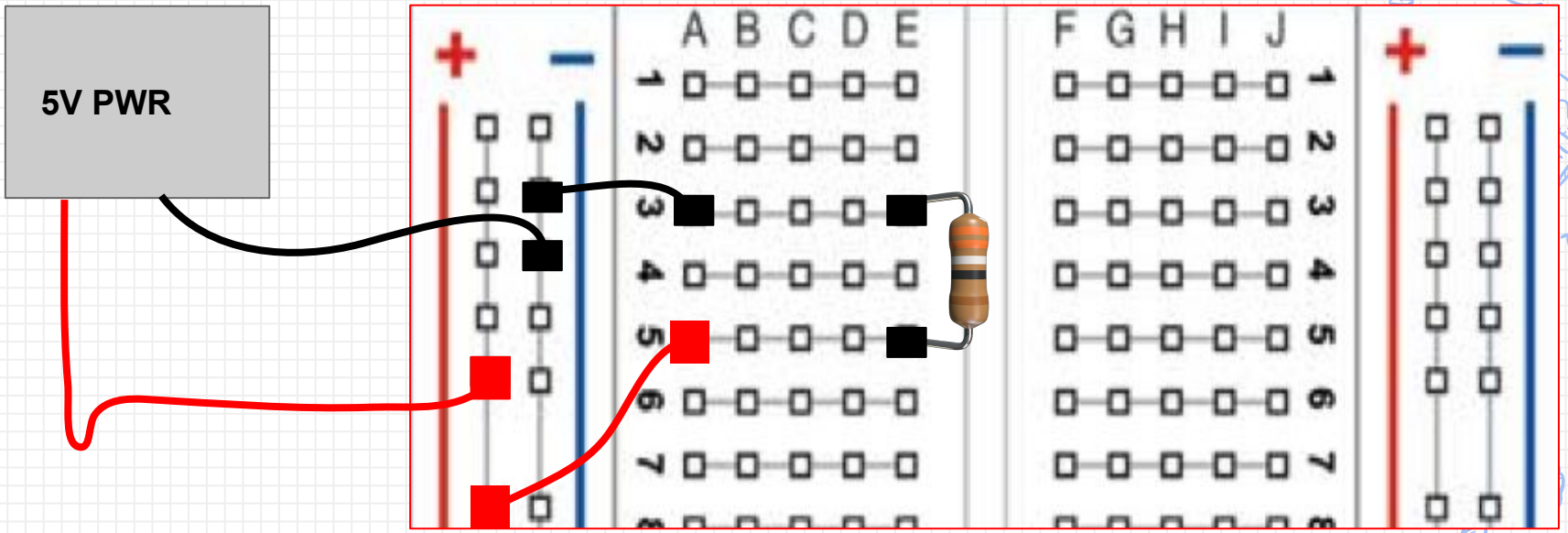




Breadboard Do’s and Don’t’s

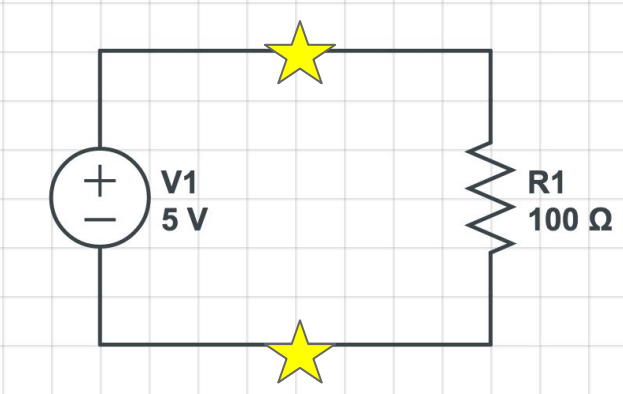
✓ **Do** plug component’s ends into two different rows - separate nodes

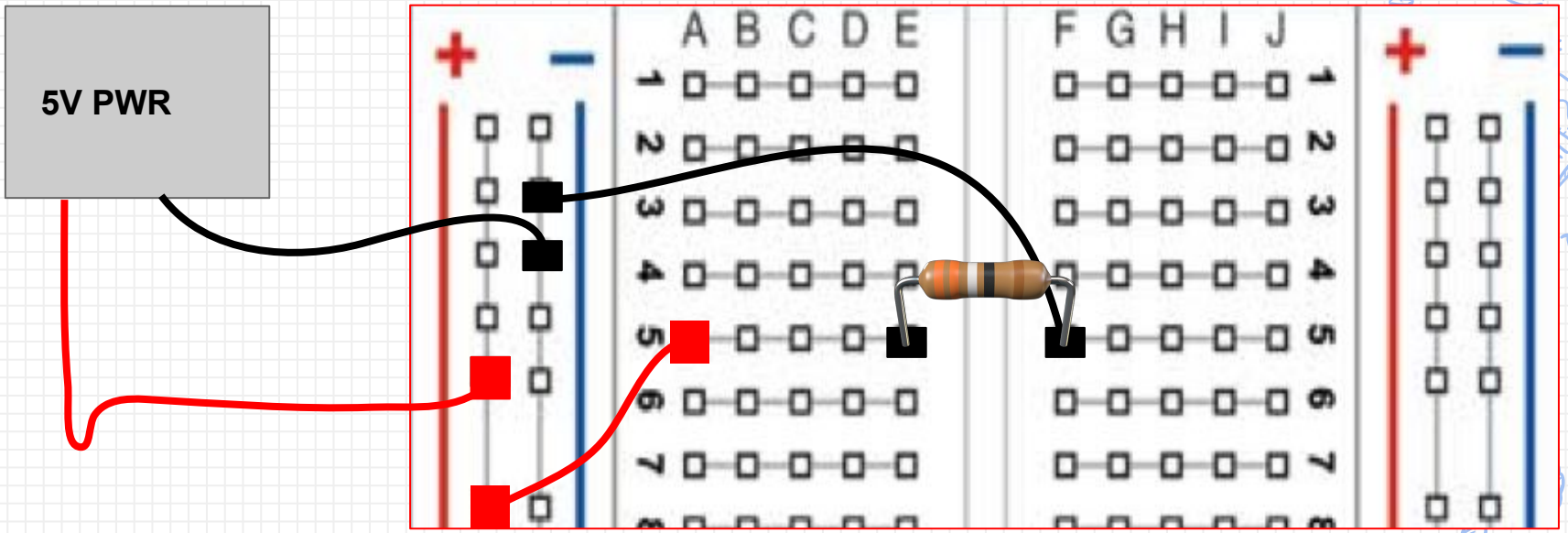




Breadboard Do’s and Don’t’s

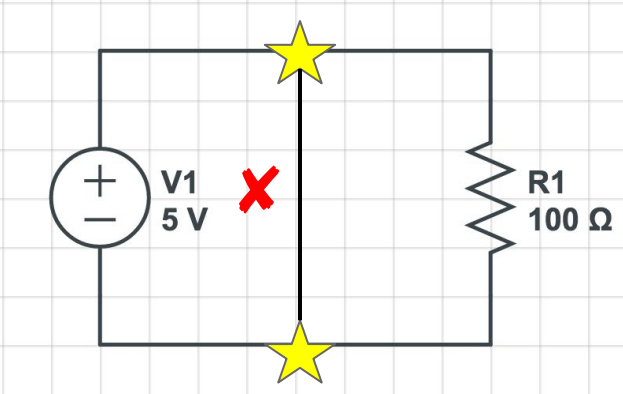
✓ **Do** plug components across the gap in your breadboard - A-E and F-J are separate

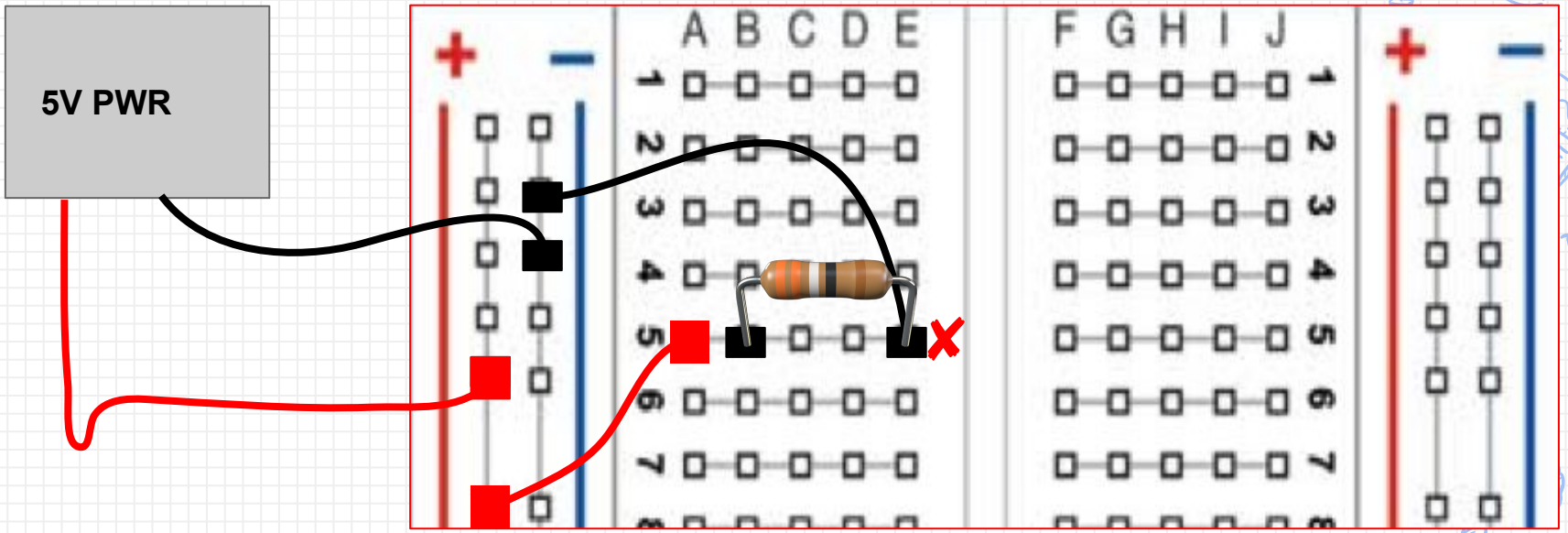




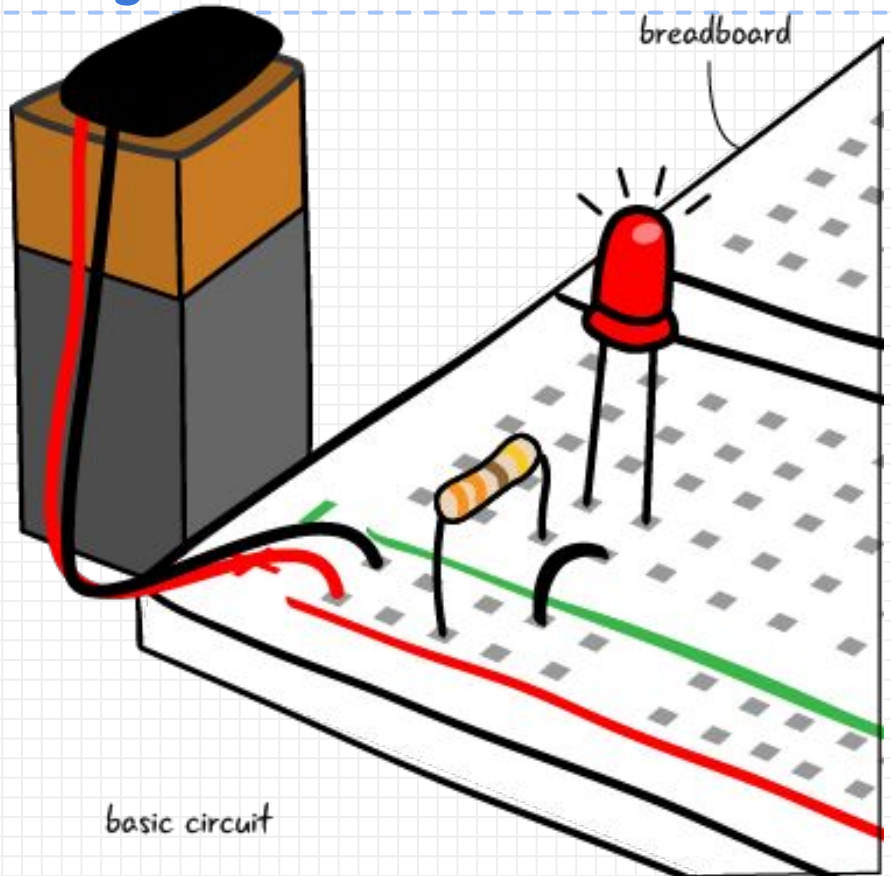
Breadboard Do’s and Don’t’s

✘ **Do not** plug both ends of component into the same row! This creates a short

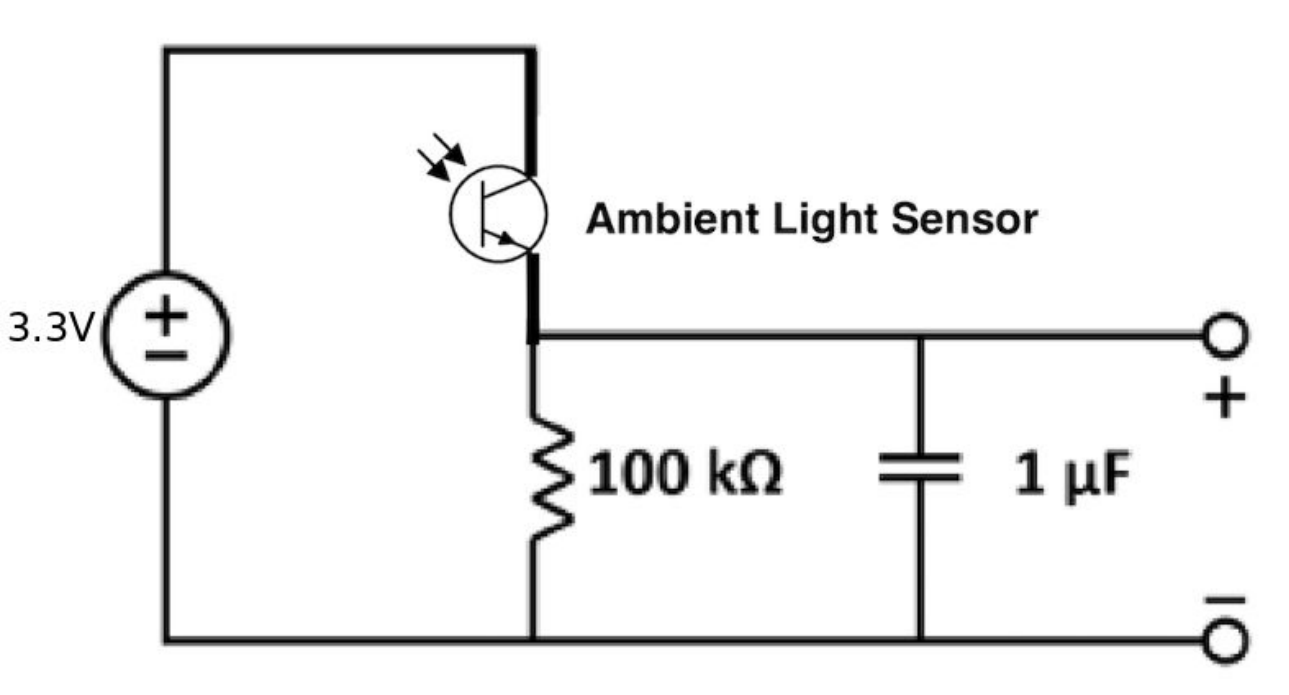




Breadboarding Color Convention



Light-detecting Circuit



FAQ

- Lab notebook link is on course website
- Keep voltage source leads from LaunchPad to breadboard disconnected whilst building your circuit
  - Female ends can stay connected to the LaunchPad
- **Make sure you are using the correct resistors (Brown Black Yellow Gold for light sensor)**
- **Make sure your ambient light sensor is in the right direction**
- Complete the lab in **GROUPS OF 4** in your assigned breakout room
  - You must each build your own setup and answer all questions in your own notebook
- DON’T LEAVE/PACK UP YOUR CIRCUIT WITHOUT BEING CHECKED OFF FIRST