

Circuit Workbook

File: Circuits-Main.kicad\_sch

©hamster

Sheet: /

File: HHC-MiniBadge-2022.kicad\_sch

**Title: SAINTCON HHC MiniBadges 2022**

Size: USLetter Date: 2022-09-26

KiCad E.D.A. kicad (6.0.7)

Rev: v1.0

Id: 1/10

### Circuit Symbols



File: Circuits – Symbols.kicad\_sch

### Reading Schematics



File: Circuits – Schematics.kicad\_sch

### Light the LED



File: Circuits – LED.kicad\_sch

### LEDs and Resistors



File: Circuits – LED Resistors.kicad\_sch

### Series and Parallel



File: Circuits – Series and Parallel.kicad\_sch

### Capacitors



File: Circuits – Capacitors.kicad\_sch

### The 555 – Astable



File: Circuits – 555 Astable.kicad\_sch

### The 555 – Monostable



File: Circuits – 555 Monostable.kicad\_sch

@hamster

**SAINTCON Hardware Hacking Community**

Sheet: /Circuit Workbook/

File: Circuits–Main.kicad\_sch

**Title: Circuits Workbook – Main**

Size: USLetter | Date: 2022–10–24

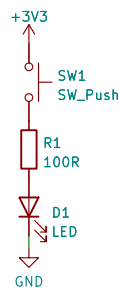
KiCad E.D.A. kicad (6.0.7)

**Rev: 1**

Id: 2/10

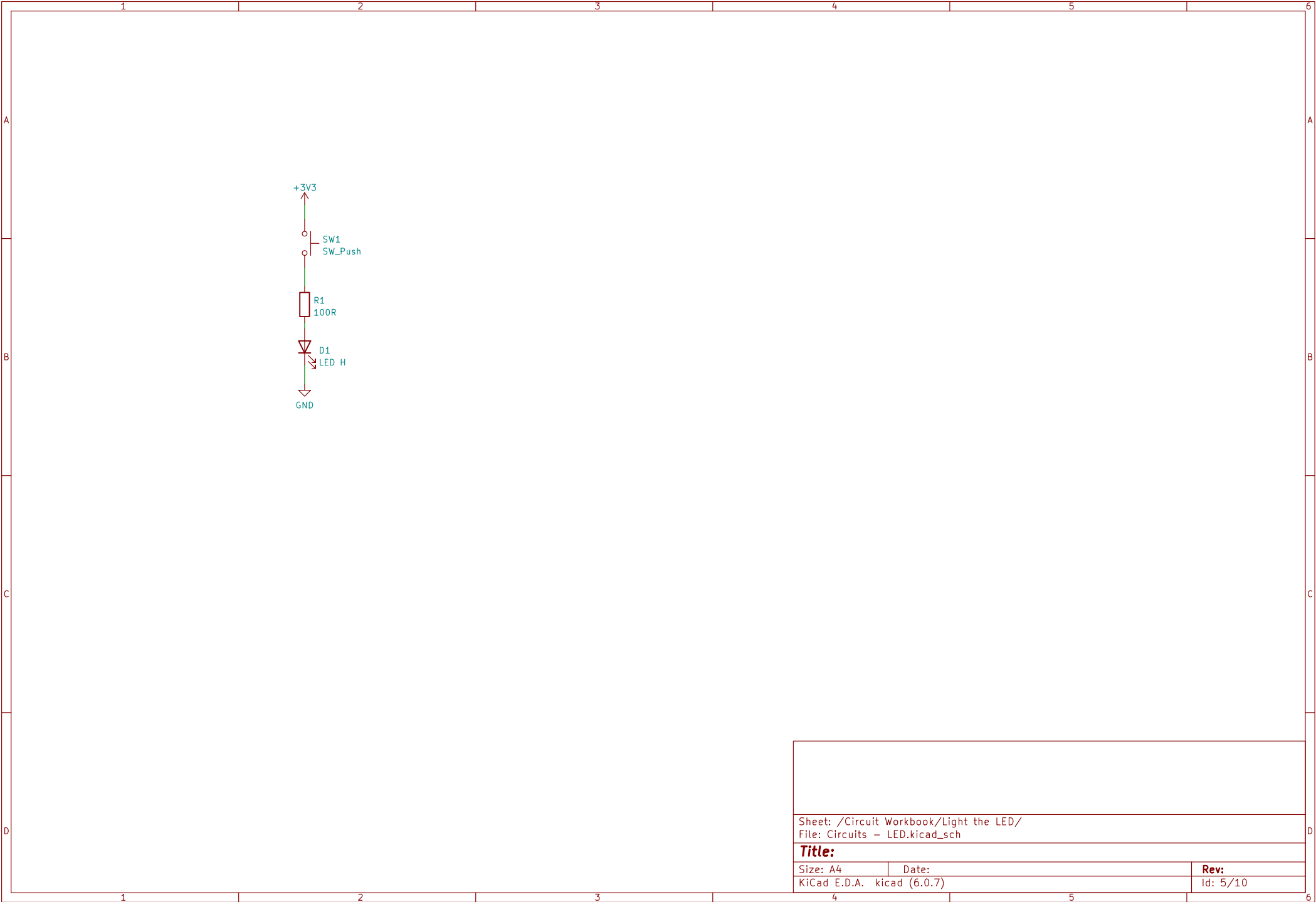
	1	2	3	4	5	6
A		<p>These are power symbols. 3.3v is plus, or positive. GND is ground, or negative.</p>				
		<p>Note that the symbols have a letter and a number. The letter is the type of component. This is a Resistor. The number is uniquely identify the part on the schematic. Together, this is called the 'Reference Designator' or 'RefDes'. Sometimes a component value is present as well.</p>				A
		<p>This is a resistor. A resistor impedes the flow of electricity They are measured in 'ohms'. Values less than 1000 usually have an R at the end to help denote less than 1000.</p>				
B		<p>This is a special resistor that is variable. You twist a knob to change the value. Terminals 1 and 3 measure 50k ohms on this one, and are constant. Terminal 2 is a wiper that moves along the fixed part. As you twist the knob, resistance at 1-2 goes in one direction, and resistance at 2-3 goes to the other direction.</p>				
		<p>This special resistor is also variable. However, the resistance across it varies as the amount of light it 'sees' changes. Shine more light, and the resistance goes down.</p>				B
		<p>These are capacitors. A capacitor stores energy and smooths changes in voltage. Some capacitors have a polarity. They are 'polarized'. Connecting a polarized capacitor backwards can damage them.</p>				
		<p>This is a LED, or Light Emitting Diode. It converts electricity into light. Note that has a polarity and will only light in one direction.</p>				
		<p>This is a transistor. It allows a very small current to 'switch' a much larger current. The transistor is the cornerstone of our modern electronics. These bi-polar transistors are two different kinds, NPN and PNP The 2N3904 is a NPN. An easy way to remember this is 'Not Pointing In' The 2N3906 is a PNP. The P and N refer to the layers inside the transistor. An N is negatively doped. A P is positively doped. The 3 terminals of a transistor are the Base, Collector and Emitter.</p>				
C						C
		<p>These are switches. A switch interrupts the flow of current. The one on the left is a 'push button', it will open when you let go. This is called 'Normally Open' or 'NO'. The other switch latches closed or open. It has a single 'pole'. It is a 'Single Pole, Single Throw', SPST.</p>				
		<p>This is a transformer. It transforms the magnitude of the signal from the 'primary' to the 'secondary' winding. The voltages at the two sides are magnetically coupled. They are not directly coupled. This is called 'galvanic isolation'.</p>				
D		<p>This is a speaker. It converts an alternating voltage into sound. A thin membrane is wrapped with a magnetic coil, and the magnetic field moves the coil. The moving membrane pushes air to make sound.</p>				D
	1	2	3	4	5	6

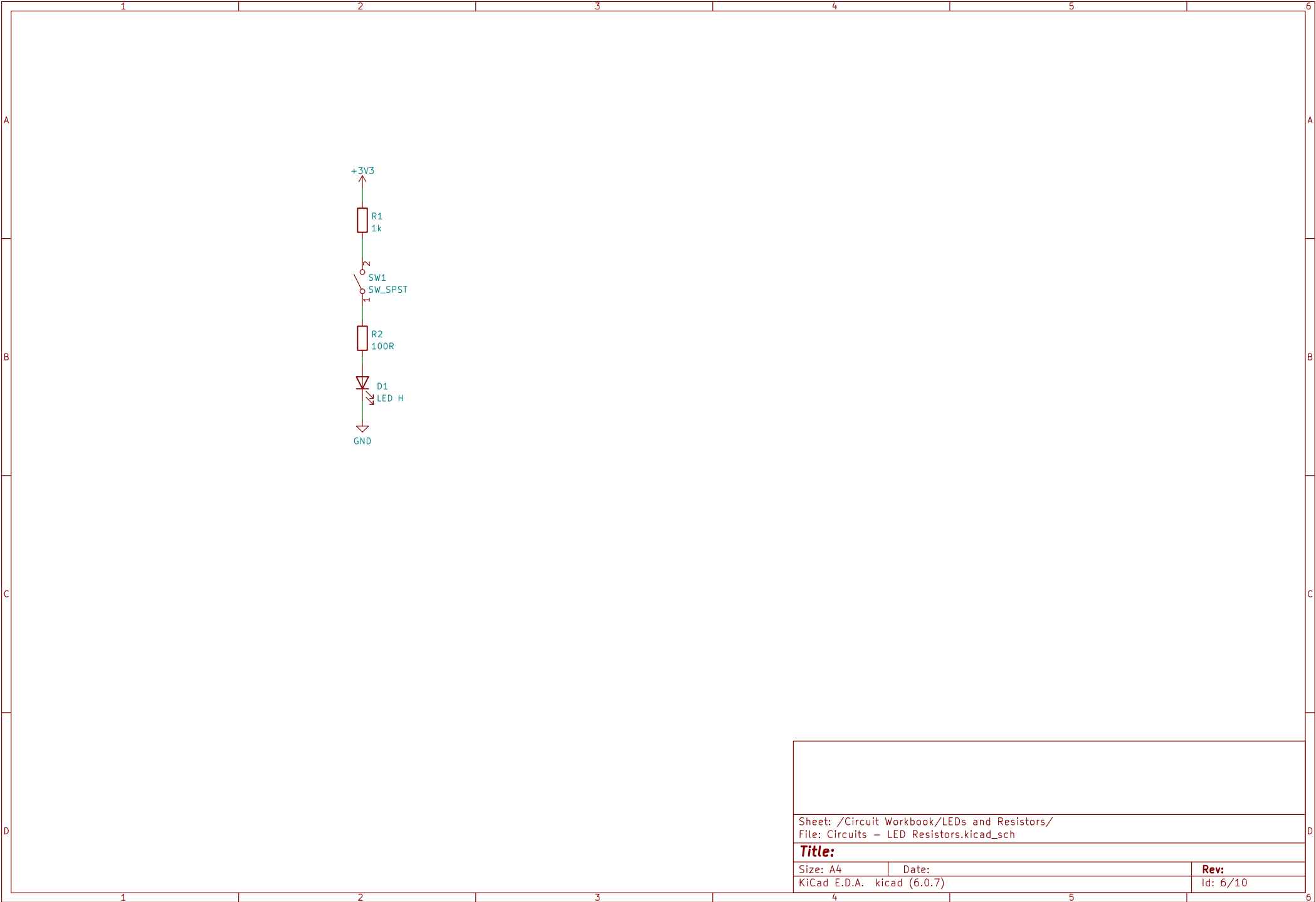
Sheet: /Circuit Workbook/Circuit Symbols/ File: Circuits - Symbols.kicad_sch		
<b>Title:</b>		
Size: A4	Date:	Rev:
KiCad E.D.A. kicad (6.0.7)	Id: 3/10	



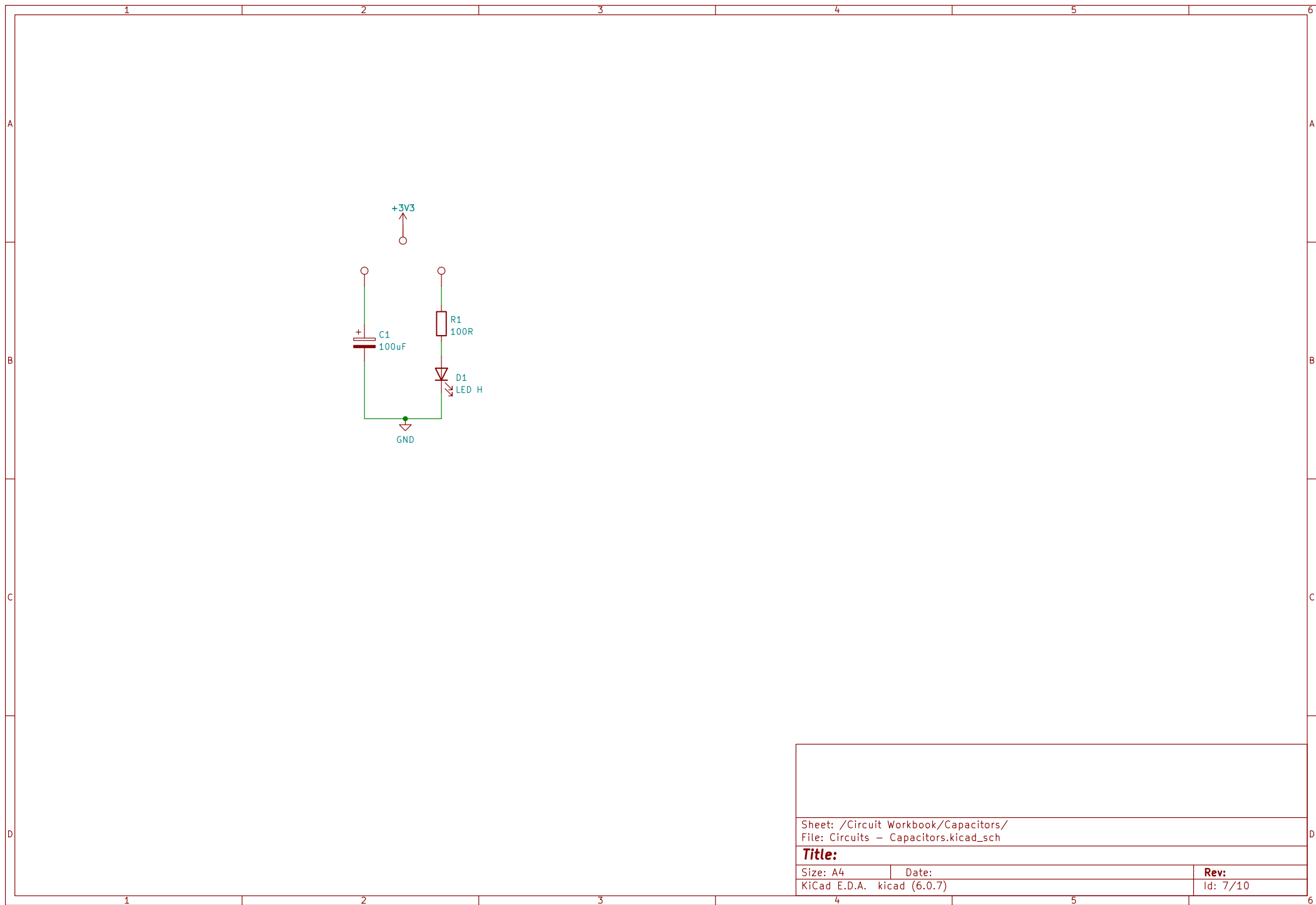
Let's look at a schematic. It is a visual diagram that shows how a circuit is wired. To wire this circuit up, you simply use wires to replicate the lines.

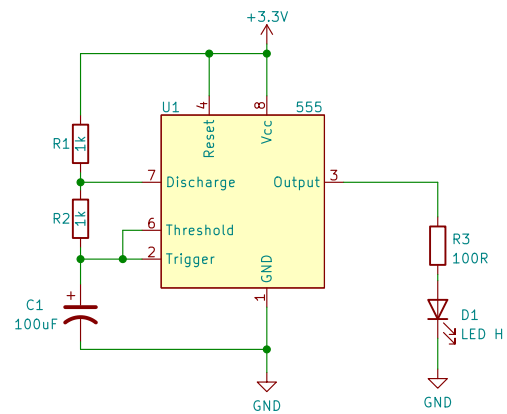






Sheet: /Circuit Workbook/LEDs and Resistors/ File: Circuits - LED Resistors.kicad_sch		
<b>Title:</b>		
Size: A4	Date:	Rev:
KiCad E.D.A. kicad (6.0.7)		Id: 6/10





Sheet: /Circuit Workbook/The 555 - Astable/  
File: Circuits - 555 Astable.kicad\_sch

**Title:**

Size: A4

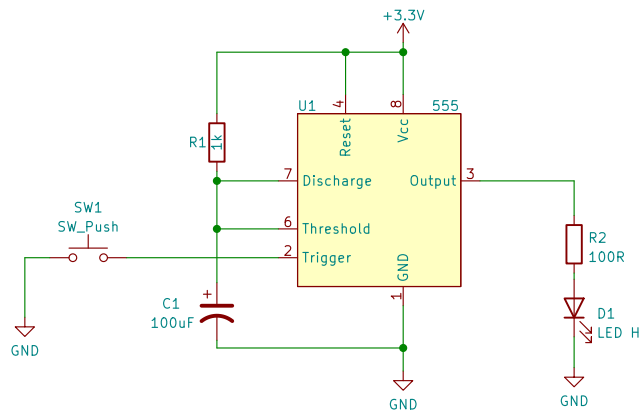
Date:

KiCad E.D.A. kicad (6.0.7)

Rev:

Id: 8/10





Sheet: /Circuit Workbook/The 555 - Monostable/  
File: Circuits - 555 Monostable.kicad\_sch

**Title:**

Size: A4

Date:

KiCad E.D.A. kicad (6.0.7)

**Rev:**

Id: 9/10

