



## Simon

Kit Information & Instructions



Red then green...no, blue?...wait!...BUZZ! Remember the classic game of Simon? Well, we have a build-your-own Simon kit that will sharpen your reaction time while teaching you basic soldering (a useful skill in its own right).

After you have successfully built a working Simon game, you will have a greater knowledge of through-hole soldering and the tools, techniques, and terminology required to populate your own PCB prototype. Additionally, the source code and design files are available, making this project a great entryway into microcontrollers and embedded programming. Game on!

### Kit includes:

- ATmega168
- Buzzer
- 0.1 $\mu$ F Cap (*quantity: 2*)
- 10K Resistor
- LEDs (*quantity: 4*)
- Slide Switch (*quantity: 2*)
- Battery Clips (*quantity: 4*)
- AA Batteries (*quantity: 2*)
- Button pad
- Bezel
- Standoffs and screws (*quantity: 4 of each*)

## STEP BY STEP INSTRUCTIONS

These instructions are meant to be followed in chronological order. Some components get soldered to the

### WORKING ON THE BOTTOM OF THE BOARD:

1

**ATmega168** (microcontroller): Looking at the bottom of the board, insert the microcontroller. Make sure the notch on the chip aligns with the white silk screen on the board. You will need to gently bend the legs in a bit. Flip the board over, then begin to solder.

2

**0.1 $\mu$ F Cap** (decoupling cap): Insert the capacitors, flip the board over, bend the legs outward to secure, then solder into place. Hold metal leg while clipping off excess.

3

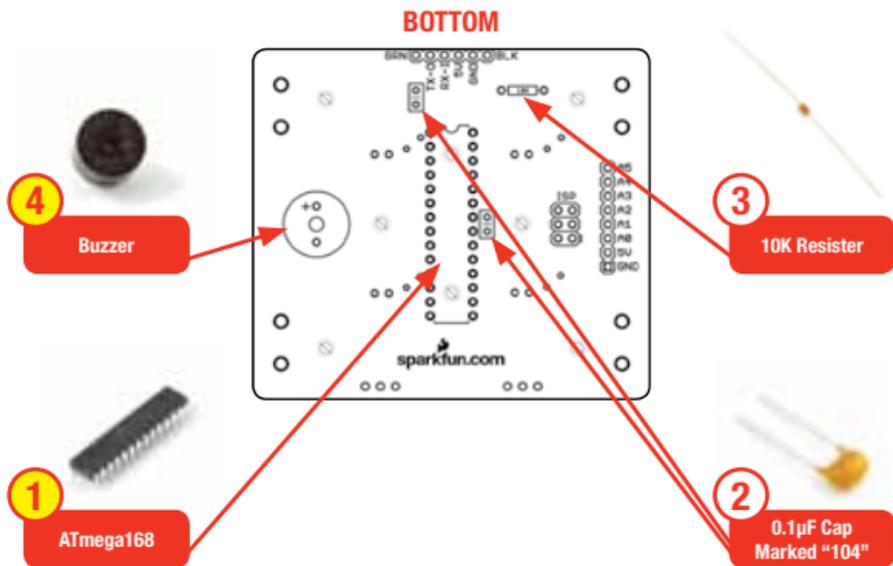
**10K Resistor** (reset pull-up): Insert the resistor, flip the board over, bend the legs outward to secure, then solder into place. Hold metal leg while clipping off excess.

4

**Buzzer** (alarm): Insert the buzzer. The “+” on the buzzer should align with the white “+” on the board. Flip the board over then solder into place. Hold metal leg while clipping off excess.

**Steps highlighted in yellow involve a polarized component. Pay special attention to the component's markings indicating how to place it on the board.**

top of the board, some get soldered to the bottom. For steps 1-4 you will be looking at the bottom of the board while soldering components on the top of the board.



## STEP BY STEP INSTRUCTIONS

These instructions are meant to be followed in chronological order. Some components get soldered to the top

### WORKING ON THE TOP OF BOARD:

5

**Slide Switch** (sound and power): Looking at the top of the board, insert switches. Keep the iron tip away! Plastic melts easily. Flip the board over, then begin to solder. The switch can go in any way you want.

6

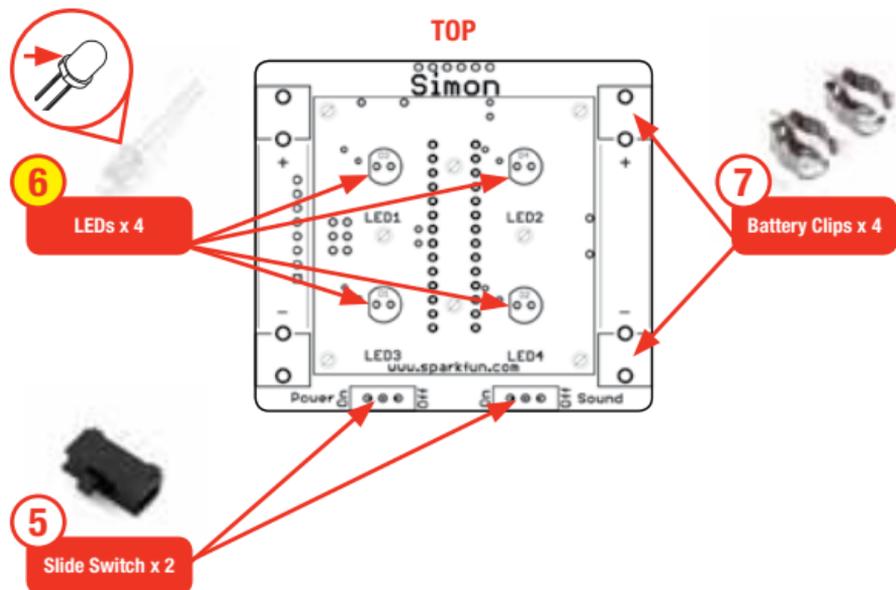
**LEDs** (indicator lights): Insert the four LEDs into the front of the board. Each LED has one side that is flat. Make sure this flat side aligns with the flat white marking on the PCB. Then solder from the bottom of board. Hold metal leg while clipping off excess.

7

**Battery Clips** (hold batteries): Insert battery clips, make sure clips point toward each other so the battery fits. Ensure clips are flat against the board. Then solder from the bottom of board.

**Steps highlighted in yellow involve a polarized component. Pay special attention to the component's markings indicating how to place it on the board.**

of the board, some get soldered to the bottom. For steps 5-7 you will be looking at the top of the board while soldering components on the bottom of the board.



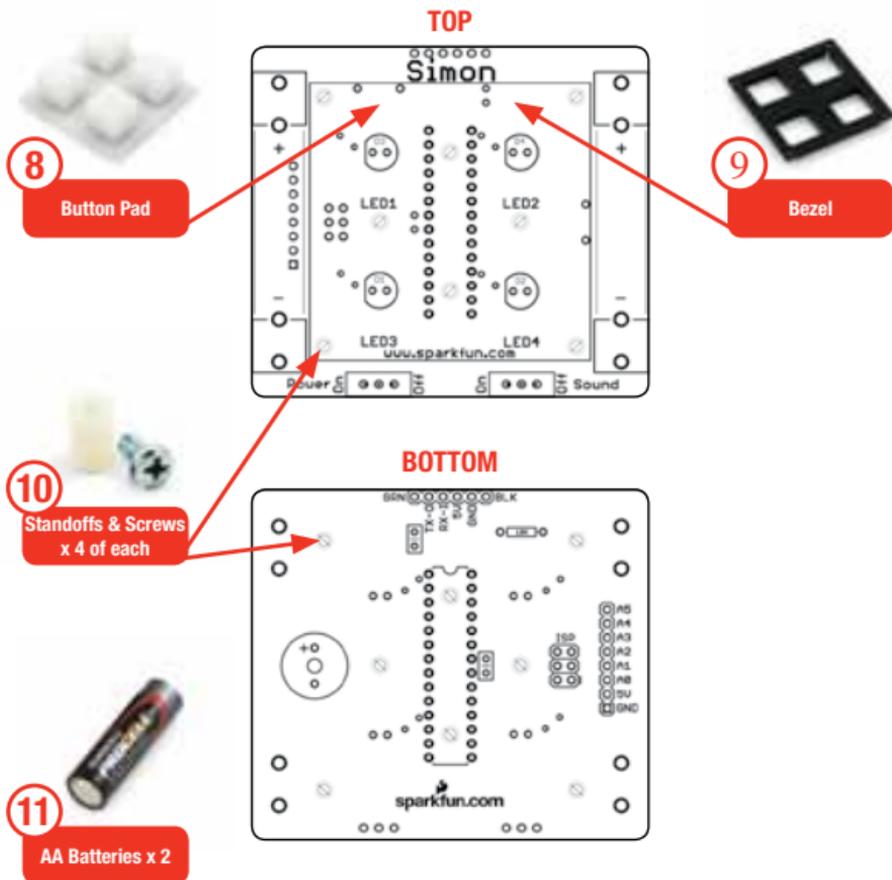
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### FINAL ASSEMBLY:

- 8 Button Pad** (game control): Attach to top. Lay rubber button pad over LEDs.
- 9 Bezel** (holds button pad): Attach to top. Lay bezel over button pad, with notches for the screws pointing up. You may need to remove batteries to get bezel to fit.
- 10 Standoffs and screws** (mechanical): Insert the screws through the bezel and button pad, then twist standoffs onto the protruding screw.
- 11 AA Batteries** (power source): Insert the batteries, following “+” and “-” indicators on the board. Turn on the board and verify the LEDs are flashing.
- 12 Clean up!** Collect and throw away extra bits. It’s okay to throw away with general trash.

top of the board, some get soldered to the bottom. For steps 8-12 you will be looking at the top of the board while assembling the final parts of the board.



# Tips and Hints

## Microcontroller and PCB

The microcontroller is the brain of the game. It's programmed to light up the buttons and create the game sequence. Bending the legs won't hurt the chip – it is designed to withstand the heat of the soldering iron as well as gentle bending.

Try to be gentle with the board, but a few scratches are not a big deal.

## Soldering

The tip of the iron is normally 700 °F, hot enough to melt metal. It is normal for the handle of the soldering iron to heat up a bit. Hold it like a pencil and move your hand further away from the tip if the heat is uncomfortable. The solder smokes because the rosin inside the solder is burning off - it's not harmful.

## Buzzer and Other Components

The buzzer makes the noise for the game – pretty simple! The capacitors help “clean up” the power on the board. The resistor tells the microcontroller not to reset once the power is turned on, so your game can continue uninterrupted. The slide switches turn on and off the power and sound.

## LEDs

Light-emitting diodes (LEDs) are like light bulbs, but much smaller and more efficient.

## Buttons, Bezels, and Standoffs

Squishy buttons are fun! The bezel helps hold the buttons in place. The standoffs hold the board up off a surface, helping to protect the electronics. They also hold the pad and bezel onto the board.