DUCK 3 mm Construction Kit

Contents:

- 1 PCB "DUCK 3 mm Rev. 2.0"
- 1 Controller ATtiny84 (programmed)
- 1 14-pin IC socket
- 8 NPN transistors BC337-40
- 2 PNP transistors BC327-40
- 35 LEDs yellow, 3 mm diameter (1 spare)

- 1 Ceramic capacitor, 100 nF
- 1 Electrolytic capacitor, 220 µF
- 1 Mini loudspeaker, electromagnetic, 16 Ω
- 1 Tactile push-button switch, 6x6 mm
- 1 2x3 Pin header
- 1 Battery holder for 3x AAA

General Soldering Advice

Insert the components one at a time and bend the leads outward slightly to prevent the component from falling out. Heat up the solder joint for a second before feeding some solder wire between the soldering iron's tip, the board and the component's lead. Wait for a few more seconds before removing the tip from the solder joint. Don't move the board before the solder has solidified. After soldering, trim the leads with a wire cutter to about 1-2 mm length.

See https://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf (or scan QR code) for more detailed soldering advice.
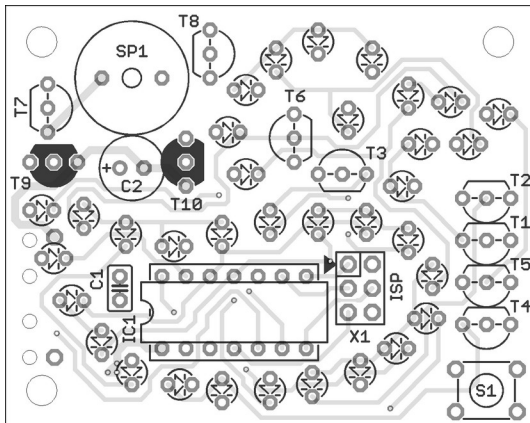
I recommended soldering the components in the order listed below.

1. IC Socket (IC1): Insert the IC socket into the board, making sure the orientation of the small notch matches the printed outline on the board. You can bend two diagonally opposite pins of the socket to prevent the socket from falling out, but setting the board with the socket inserted upside-down on a flat surface usually works just as well.
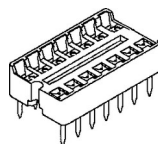
2. Push-button switch (S1): Insert the switch to the intended location on the board. It will fit in two orientations, you can use either of them.

3. LEDs (LED1~LED34): The orientation is important for the LEDs. Make sure the flat side of the LED (cathode) matches the silkscreen outline. The flat side of the LED also corresponds to the shorter lead. Start with 3 or 4 LEDs, one in each corner, then add the other LEDs one at a time. Try to avoid bending the leads outward, as this will make it harder to remove the LED again. Don't solder too long on the LEDs, they will have reduced brightness if they become too hot during soldering. You can insert the LEDs flat to the board, or have them stick out (e.g. if you want to make a cover with LED holes).

4. Transistors (T1~T10): There are two types of transistors in the kit with very similar part numbers, make sure you insert them to the correct locations. Orientation is important, the flat side of the transistor must match the outline on the board.
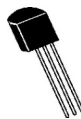
| Designator	Type	Part number / marking
T1~T8	NPN	BC3**37**-40 *or* BC3**38**-40
T9, T10	PNP	BC3**27**-40 *or* BC3**28**-40

5. Pin Header (X1) *(optional)***:** Insert the short end into the board. Orientation is not important. You can connect an Atmel ISP programmer to this header to reprogram the microcontroller. The header uses the standard Atmel pinout.

6. Loudspeaker (SP1): Orientation is not important. If there is a label on top of the speaker, remove it after soldering.

7. Capacitors (C1, C2): C1 is a ceramic capacitor which doesn't have a specific orientation. It is marked "104" (for $10 \cdot 10^4$ pF = 100 nF). For the electrolytic capacitor C2 (marked "220 µF"), the orientation is important. The *negative* side is indicated with a printed bar containing (–) signs on the side of the capacitor. On the PCB, the *positive* side is marked with a small (+) sign next to the pad.
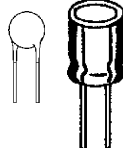
8. Microcontroller (IC1): Insert the controller into the socket. You may have to bend the pins inward slightly before it will fit. Make sure the controller's notch faces that of the socket and the silkscreen outline. Sometimes, the notch is replaced by a tiny dot near pin one, which should also face toward the socket's notch.
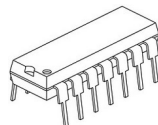
9. TEST THE DUCK!   **Do this before soldering the battery holder!**

Put batteries into the battery holder, then insert its two pins into the board from the bottom and angle it to make good contact. Hold down the button until the LEDs start flashing. Push it again to make the duck quack. Hold the button down again until the LEDs turn off.

- If a single LED lights up at the wrong time, it's likely installed the wrong way around. You can remove it by heating both pins at the same time with a large soldering iron tip while gently pulling on the LED (with your fingers or needle-nose pliers).
- If a group of LEDs (adjacent or equally spaced) doesn't work, check the soldering on IC pins 2, 7~9 & 11~13. For a group of adjacent LEDs, also check T1~T6.
- If nothing works, check IC power pins 1 & 14.

10. Battery Holder (BAT1): Remove the batteries before soldering the battery holder. If you want to make it a bit sturdier, apply a piece of double-sided tape on the back of it as shown to the right. Trim the leads to just stick out a tiny amount on the LED side before soldering. **Use a large, sturdy side cutter to cut the leads, small snips will be ruined by the hard metal!**
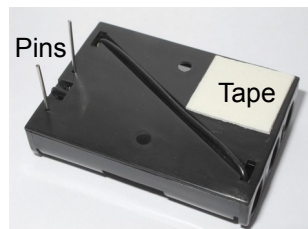
Always-on mode: hold down the button while installing the batteries. The duck will start flashing immediately and can't be turned off with the button. Remove the batteries to exit always-on mode.

Questions? Problems? Comments? Ideas?
Please contact me!   E-Mail: arne@blinkenarea.org

Project webpage: https://wiki.blinkenarea.org/index.php/DuckEnglish