

# Retro Tree Ornament

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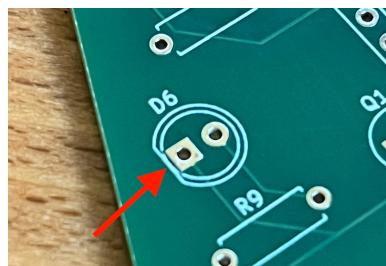
## Bill of Materials

- (5) green LED
  - (5) red LED
  - (1) yellow LED
  - (2) BC337 transistor
  - (11) 330Ω resistor (two orange stripes)
  - (1) 10KΩ resistor (one orange stripe)
  - (2) 1KΩ resistor (red stripe)
  - (1) piezo buzzer
  - (1) pushbutton
  - (1) battery holder
  - (1) CR1220 3.3V battery
  - (1) 8-pin DIP socket (optional)
  - (1) ATTiny25 microcontroller
  - (1) printed circuit board
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## Assembly instructions

1. Insert the legs of the resistors through the circuit board. **Orientation doesn't matter.** R1 is above the chip and is the 10KΩ (one orange stripe), R3 & R4 are vertical between the battery (BT1) and the transistors (Q1/Q2) and are 1KΩ (red stripe), and the remaining are near each LED and are 330Ω (two orange stripes). It's easiest to bend the leads at an angle away from perpendicular to help hold the resistors in place. Solder these & clip the leads.

2. Insert the legs of the LEDs through the circuit board & bend them so they hold the LED in place. Yellow (D1) goes at the top of the tree, green and red alternating down the sides. Though they will work the same in any position, to follow the schematic, even numbers (D2-D10) should be red and odd (D3-D11) green. Most importantly, **orientation matters.** The **shorter leg** on each LED goes in the **hole closest to the flat side** of the printed LED position, to the left of the tree. If you look closely, each actual LED has a flat side on its negative (-) pole, too. Solder the LEDs, then clip the leads.



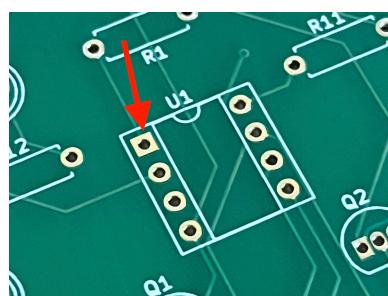
3. Insert the transistors (Q1/Q2) into their three holes according to the orientation shown on the silkscreen. The flat side should be towards the bottom of the tree. First solder the center lead, then the outsides. This is the most detailed soldering of the whole project, so be very sparing with solder and **be sure not to bridge any of the leads** to any other. Solder & clip when you are sure each of the three leads are separate.



4. Insert, solder, and trim the battery holder (BT1), piezo buzzer (BZ1), and switch (SW1). **Orientation matters on the buzzer**; check that the positive (+) side (marked faintly on top of the buzzer; both poles are also marked on the underside) is to the left of the tree when viewed from the front. It may help to use an alligator clip to hold a leg of these components in place while soldering.



5a. If you want to possibly remove & reprogram the chip at a later date, or are not as confident in your soldering, insert & solder the 8-pin socket (U1). It will work either way, but technically, the notch should be at the top center. It may help to use an alligator clip to hold a leg of the socket in place while soldering. Then, gently insert the chip into the socket. The dot on the top of the chip (marking pin 1) should be at the top left.  
**Orientation of the chip matters.**



5b. If you want to permanently attach the chip (U1), insert it directly into the PCB so that the dot on the top (marking pin 1) is at the top left. **Orientation of the chip matters.** It may help to use an alligator clip to hold a leg of the chip in place while soldering. Carefully solder the eight legs of the chip to the board. **You don't want to spend a lot of time applying heat to the chip's legs** in order to not damage it. Take a short moment between each leg to allow your iron to come up to full temperature.

6. Insert the battery, flat (+) side up, into the battery holder.

You're ready to go! Press the button and the tree should light and play a tune! Press it again to stop.



If you'd like to remove & reprogram the ATtiny25 chip, I recommend this Instructable:

<https://www.instructables.com/Program-an-ATTiny-with-Arduino/>

In addition to the chip and your computer with the Arduino IDE, you'll need an Arduino UNO, a breadboard, a 10uF capacitor, a 220Ω or 330Ω resistor, an LED, and some hookup or jumper wires. Alternatively, I recommend this Arduino shield or something similar if you think this is a process you'd like to do repeatedly in the future!

<https://www.tindie.com/products/siktec/all-attiny-arduino-programmer-shield/>

And if you'd like to restore the original firmware, you can download the source and/or the prebuilt hex, as well as the schematic and these instructions, at:

<https://github.com/incanus/ornament>

And thanks for purchasing this kit! ❤️