World's Smallest Color Organ

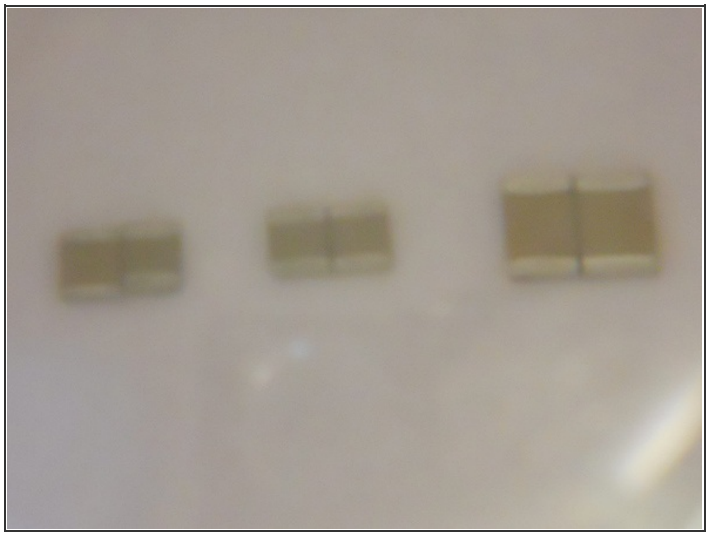
Written By: jduffy105

SUMMARY

This project details the build of a simple SMD LED color organ. A color organ takes audio input from a line source, such as an iPod, splits up the audio into frequency bands, and pulses colored lights in time with each band. For a more detailed explanation, watch Collin Cunningham's "circuit skills" video on color organs. I was inspired to build my own from his video, but since I did not have access to all the components he did I had to design my own version.

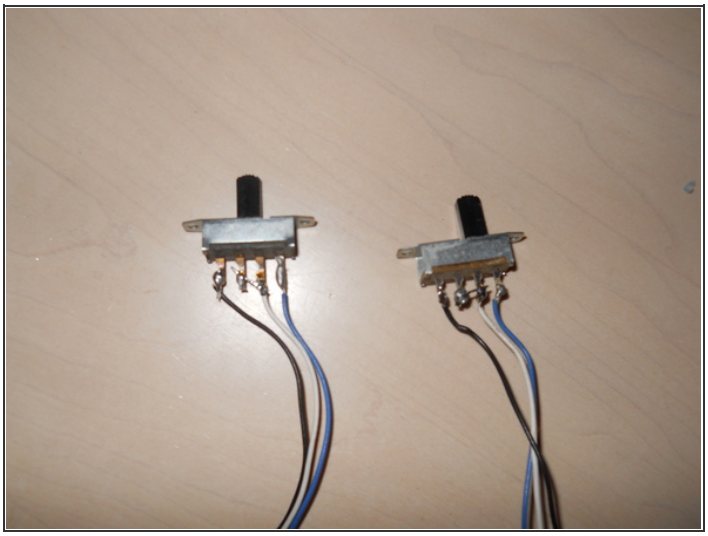
I suggest buying the components from Jameco. If you buy 100-packs, you can find the components, except the board and IC, for just 1 cent each. At that price, the whole unit only costs about $10 for the first, then just $3.50 for additional units.

Step 1 — World's Smallest Color Organ



- The first thing you will need is the materials and tools. All of both can be bought at Jameco.com
- You will need:
- an SMD LM339 (bought in packs of 5);
- SMD 1KΩ and 470Ω resistors (bought in packs of 100 each);
- SMD 0.1uF, 0.22uF, and 1uF capacitors (bought in packs of 100 each); (Note: I did not have any SMD 1uF capacitors, and I instead used a through-hole version, but it looks far better to use all SMD caps.)
- a collection of resistors or three 500K potentiometers (these cannot be SMD; they must be through-hole);
- SMD red, yellow, and blue LEDs (bought in packs of 100 each);
- SMD breakout board for 16-pin SMD ICs. Note: this is NOT a prototyping board; it is designed to be soldered to.

Step 2

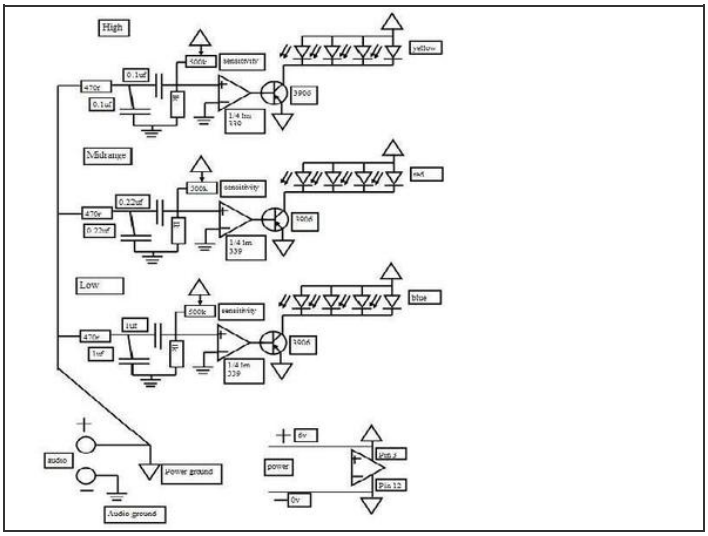


- Offboard components:
- 3.5mm jack, or other line-level audio input
- 2 x 3v coin cell battery holder, 4 AAs, or any other power source over 5V
- Resistor, capacitor or other through-hole leads if you want to pin it on a shirt or lapel
- Non-momentary switch (any kind, basic power switch)
- Optional: power indicator LED

Step 3

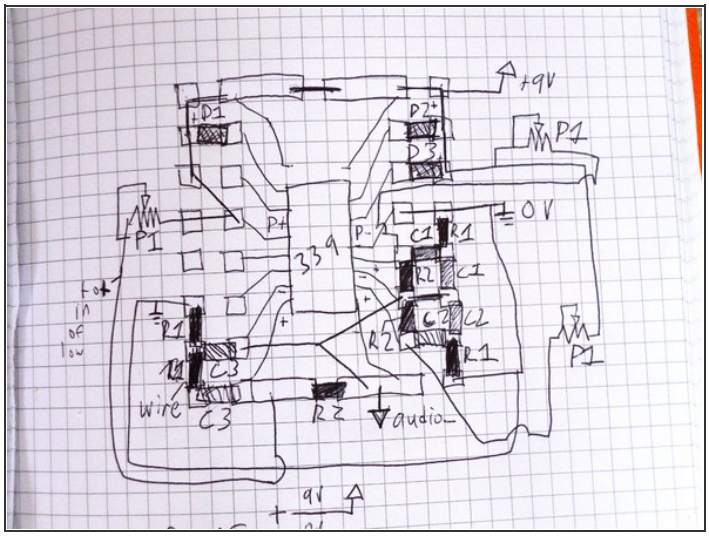
- Recommended and needed tools: (Note: the file and screwdriver in the picture are not useful for this project; they are for another.)
- Soldering iron (needed)
- Wire cutters (usually needed)
- Wire strippers (usually needed)
- Tweezers (recommended)
- "Fun tack" or "blue tack" used for hanging posters. It also helps hold down the components, as in Colin Cunningham's SMD video (recommended)
- Solder (needed)
- Magnifier loupe, glass, or other magnifying device (recommended)

Step 4



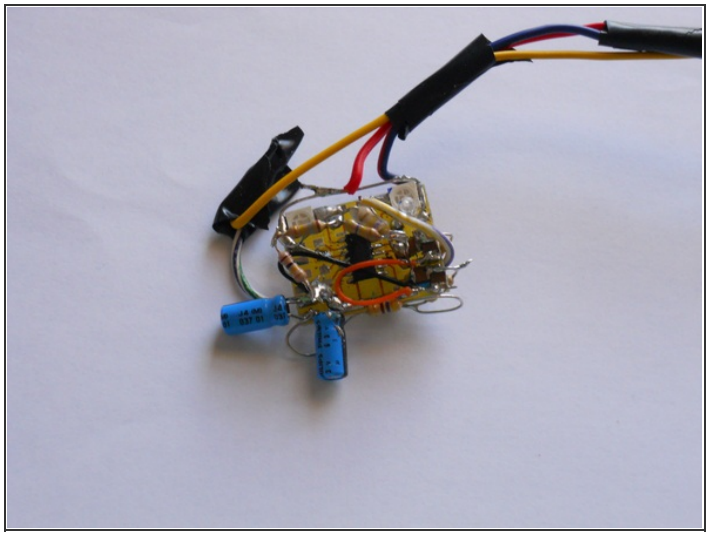
- Now, solder everything according to the schematic in picture 2. You only need one LED per channel, however, not four. Also, if you are using fixed resistors to control the frequency response, replace the 500K pots with your choice of resistors. Ignore the 3906 transistors. Connect the LEDs directly between positive and the comparator outputs. This will put about 6V across the LEDs, but the chip cannot deliver enough current to damage them, and the voltage is only applied for a tiny fraction of a second.
- If you notice that the chip is too hot to touch, stop soldering and let it cool down. Too much heat will damage the chip.
- The recommended component layout is shown in the next step.

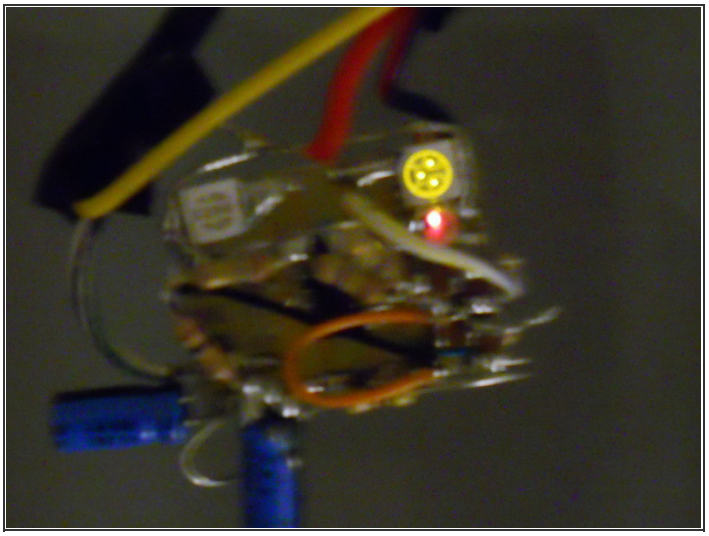
Step 5



- Recommended component layout.

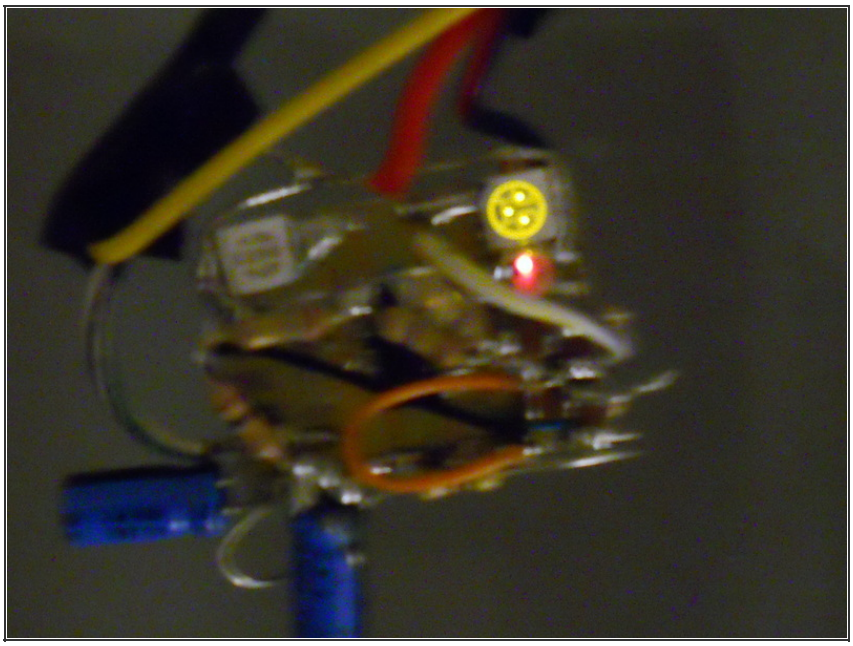
Step 6





- After soldering the circuit, just add a 6-12V source (I used a 9V battery for its compact size), and an audio input. Since the audio positive is connected to power ground, you will only need three input wires.
- I suggest covering the circuit in epoxy or hot glue to protect it.

Step 7



- Troubleshooting tips:
- If the LEDs stay on steadily, check the audio connection to the circuit itself. Also, make sure the pots or large resistors are connected between the "+" comparator input on the 339 and power "+".
- If nothing happens, put an LED with a resistor across the power pins on the LM339 to ensure that power is reaching it. Also, turn up the input volume, or increase the value of the resistors between the LM339 inputs and power "+".
- If nothing happens, test your batteries first. Even a perfect circuit will not work without at least 3-4V, and it needs current. A 9V battery producing 4V will not power this, but a 3.6V battery producing 3.6V will.

This project is rated "Difficult" only because it requires circuit-building and SMD soldering. It is easy with a little practice in both.

This document was last generated on 2012-10-31 08:35:19 PM.