



Reverse Engineering LED Bluetooth Speaker

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Purpose

To discover the inner workings of a speaker, including an in depth analysis of the different parts which includes functionality, materials, manufacturing, and structure and use this information to discover wear and parts that could potentially lead to product failure.



Hypothesis

When the speaker is disassembled, after an analysis of all the parts, the connection points at the ends of the wires will be the weakest points and have the highest potential to lead to a product failure.

About Our Product

- Color Blast Light Show Bluetooth Speaker
- Custom Logo
- Discount for mass orders
- 1 @ \$27.43 per unit, 100+ @ \$22.39 per unit
- Ideal for employee present



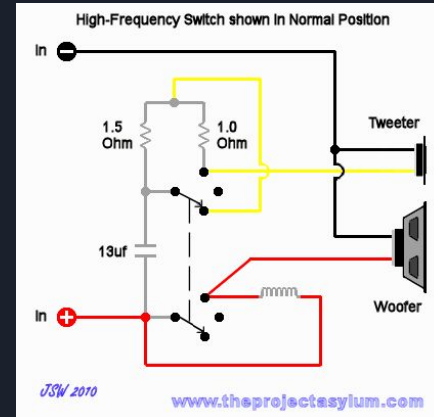
Housing

- FA: Holds together shape of the speaker; the holes in the back allow connection to the circuit for charging and other needs
- SA: Primary support held together by screws and a foam pad.
- MA: Plastic, foam, glue
- MuA: Plastic injection molding uses a mold filled with molten plastic, which is put under great pressure until hardened



Speaker

- FA: electromagnet is placed directly next to a regular magnet causing rapid vibrations as the poles are flipped, creating sound
- SA: metal frame and glue hold speaker together in place
- MA: Frame - aluminum; Permanent magnet - iron oxide, strontium, ceramic binder; Spider - treated paper; Cone - treated paper; Bobbin - plastic; Voice Coil - copper



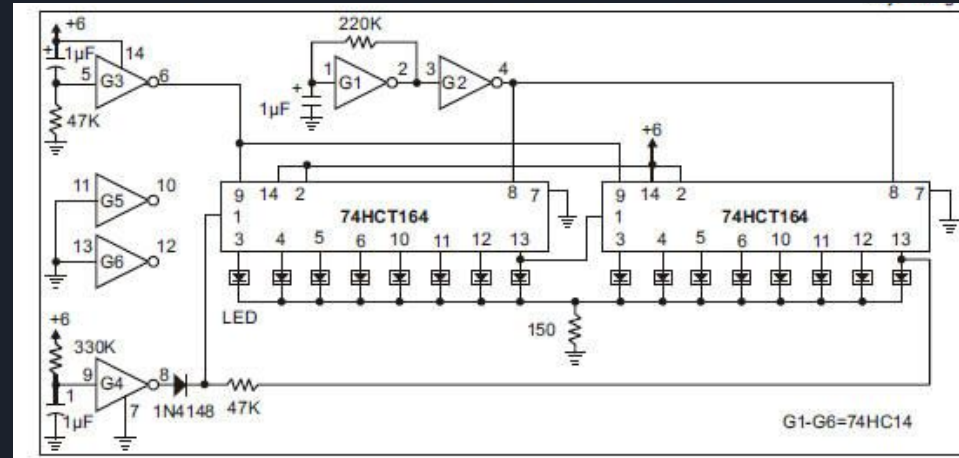
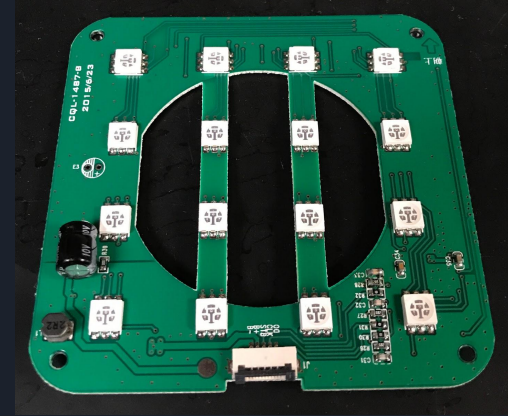
Speaker (Continued)

MuA: Permanent magnet - bonding iron oxide and strontium together under heat. Frame - a hydraulic press is used to cut holes and form the metal into the desired shape. Cone, Surround, Spider - formed out of composite paper, then glued together as an assembly. Voice Coil - Winding many turns of very fine insulated copper wire on a plastic bobbin, then glued to the cone dust cap. The frame, soft iron core, and permanent magnet are bolted together as an assembly. The rest of the speaker components are glued together.



LEDs

- FA: LEDs convert electrical energy into light. A voltage is applied to the semiconductor affecting electrons which start vibrating rapidly to produce a light
- SA: keeps speaker in place attached via a set of screws.
- MA: Semiconductors, plastic



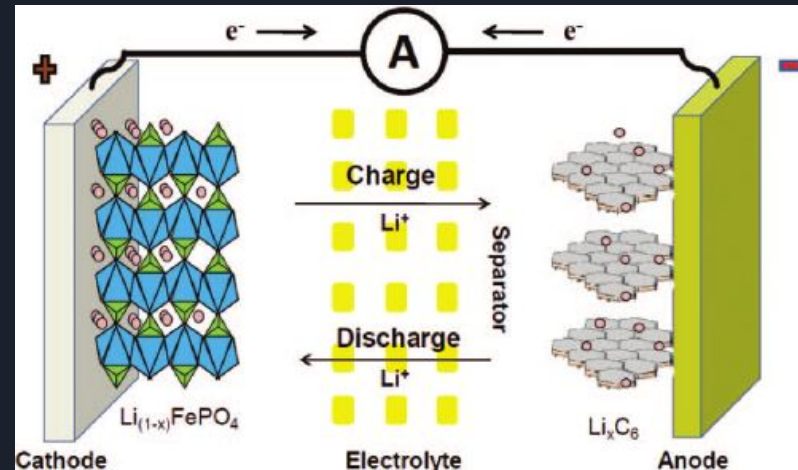
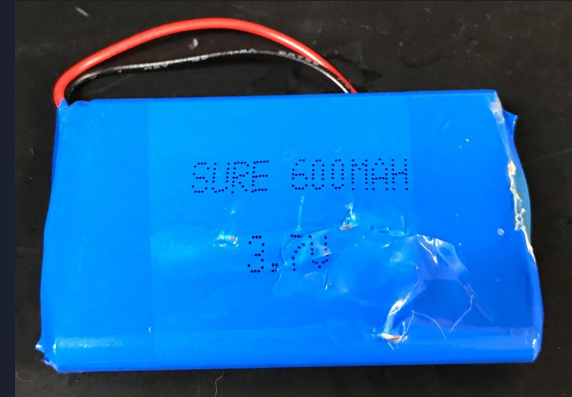
LEDs (Continued)

MuA: First, the semiconductor material is made and cut into thin wafers, sanded down, and rigorously cleaned. More layers of semiconductor material are added to the wafer. Metal contacts are then defined on the semiconductor. Lastly, diodes are mounted onto the appropriate package, wires are attached and then everything is encased in plastic.



Battery

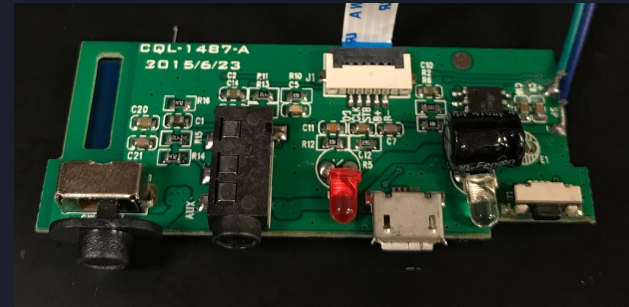
- FA: powers the speaker and LED; allows electricity to be transferred to all components
- SA: Attached to the outer casing by glue wedged between the central circuit board and the casing
- MA: Plastic, Lithium metal oxides-cathode, Lithium-anode, Foam, Electrolyte
- MuA: Electrolyte mixed from paste, spread on cathode & anode, separator soaked in electrolyte, layers stacked, inserted into case, conducting tabs added, other safety devices added like seals



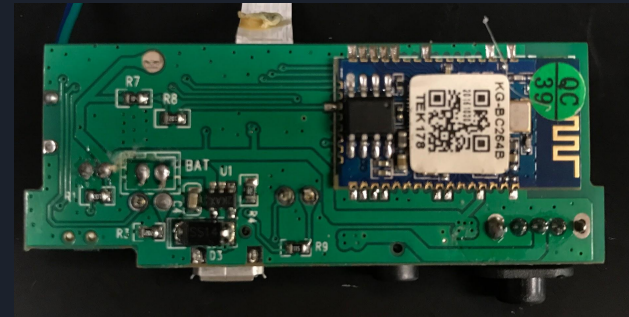
Circuit Board

- FA: carries electricity to every component in the speaker through the battery and wires. Copper etchings into the board transfer electricity to each part in the circuit board
- SA: attached to frame via two fitted pylons.
- MA: Reinforced phenolic resin, Copper, Tin-Lead alloy

Top Side

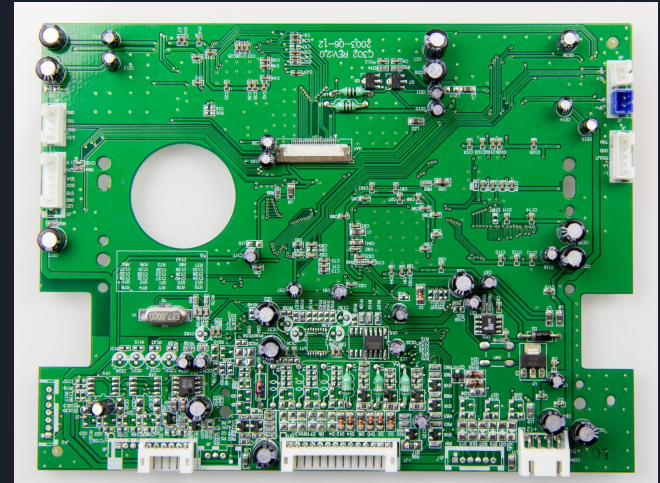
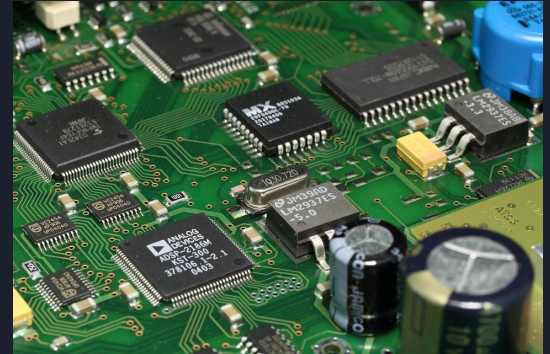


Bottom Side



Circuit Board (Continued)

MuA: Woven glass fiber is cured, cut and stacked in layers. The substrate material is also bonded to copper foil. Holes are then drilled in designated locations. The panel is electroplated with copper. The copper foil is then stripped away using an acid spray. Contact fingers are added and the panel goes through another round of plating. Plating is done with three metals: first tin-lead, next nickel, then gold. Finally, all the necessary components are mounted and soldered to the boards.





Analysis/Conclusion

The wire connections were the weakest part

Not an issue because internal

Not much physical wear

Maybe some electrical wear but don't have the knowledge to tell