Reverse Engineering Online Challenge 2022-2023
Disassembling an RCA 7-inch tablet

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1.0 Summary Report

The RCA Voyager 7-inch tablet is small and cheap. We chose this tablet because we wanted to explore and find out more about it and its components. We also chose this tablet because it didn't have too many parts, so we understood it better rather than not being able to finish something big. We also used this tablet because it had a few problems, and we wanted to understand why these problems were occurring. This team is very passionate about breaking things down and learning more about them. This tablet is good for small children. It is portable, and you can do a lot on the tablet, study, play games, etc.

The Intel Atom 1.2 GHz Quad-Core processor, which also serves as the tablet's battery, is the source of all power. This means this battery can do 1.2 billion calculations per second. This battery gives out electricity through wires that connect to the circuit board. When the electricity reaches the circuit board, it goes through traces, which are copper lines that you find on all circuit boards. These traces connect and give electricity to different parts of the circuit board, including the resistors, capacitors, inductors, etc. Along with these traces, there are also voltage regulators so that too much voltage doesn't flow through.

Now, we are talking about what transistors, resistors, inductors, and capacitors do. Transistors decide which way the electricity goes and control it through a semiconductor type of material. Resistors restrict the flow of current so that too much doesn't come through the trace and cause problems. Inductors are used to control the spikes of energy and store any extra energy. Inductors also keep the energy flowing even when there is no power for a short time. Finally, capacitors collect and store extra electricity. It charges with electricity before releasing another current flow into the circuit board.

Once the tablet has electricity traveling through the circuit board, it can do anything it is supposed to do. While we were taking the tablet apart, we had a few problems. First, when we tried to open the tablet, it kept breaking the plastic picks, so we improvised and tried to use my guitar picks because they were much stronger. Afterwards, we found out that our speaker had a problem. It was stuck to the other side of the tablet from the circuit board, so we had to break a part of it. Later we found out we needed to remove the battery wires since it was soldered. Finally, we tried to remove the battery wire from the circuit board so we could use metal tools to help remove other parts from the tablet.

Overall, I think it was fun working on this online project together as a team. We also learned a lot more about electronics and how they work than we knew before. We learned about each part of the tablet, how they work, and what they do. We have learned more about our team through this project.

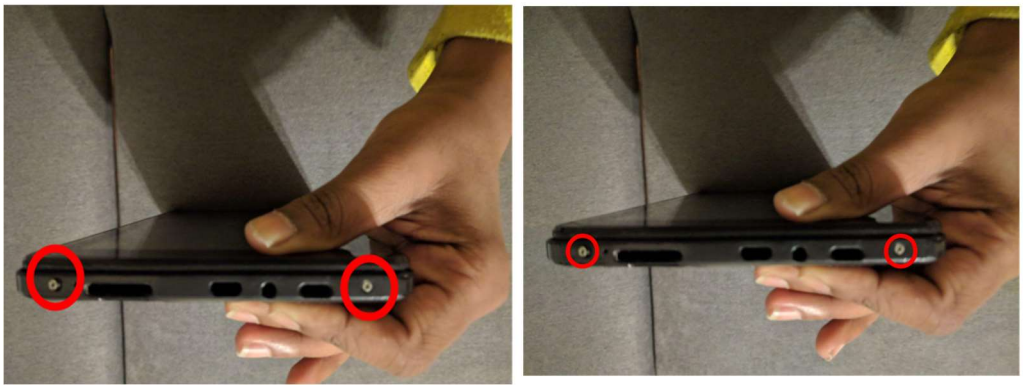
Word count: 499

2.0 Disassembly Process

Step 1: Having the materials to work prepared including safety goggles, tools and other important things needed to ensure you are safe.

Front and back of the tablet

Step 2: Removing the two screws on the side of the device with a screwdriver



The 2 screws

Step 3: Removing the section of black casing from the rest of the tablet

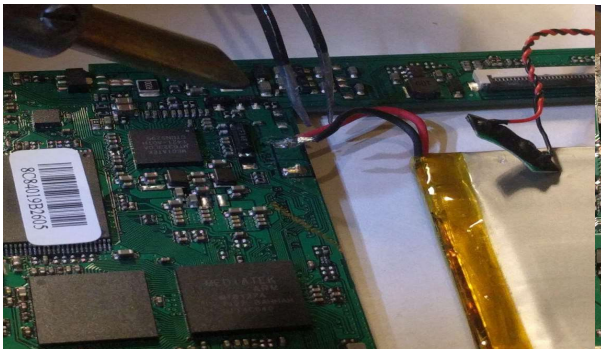
Broken plastic picks used to separate tablet

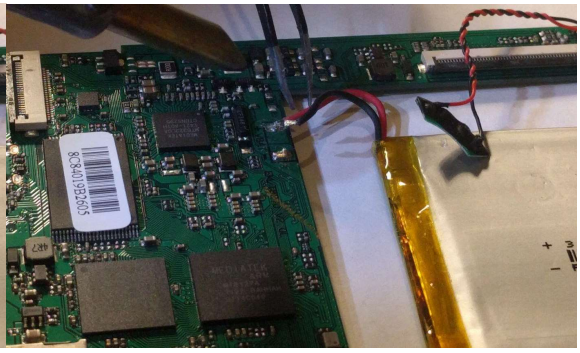
Step 4: Breaking the speaker wire from circuit board in order to open it

Speaker

Cut speaker wire

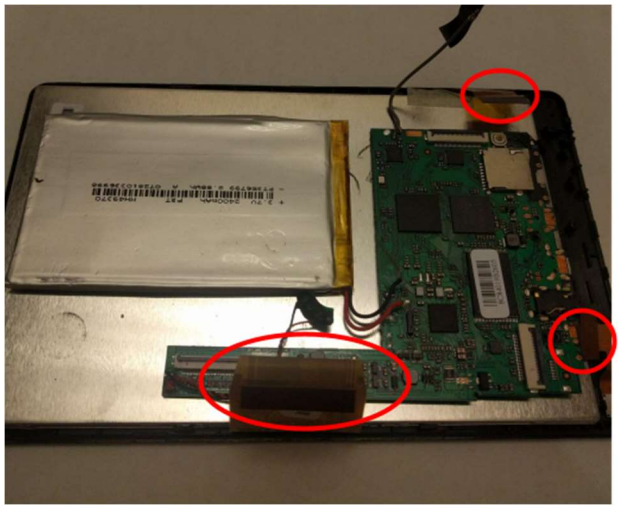
Step 5: Remove the solder of the battery connected to the circuit board with parents help





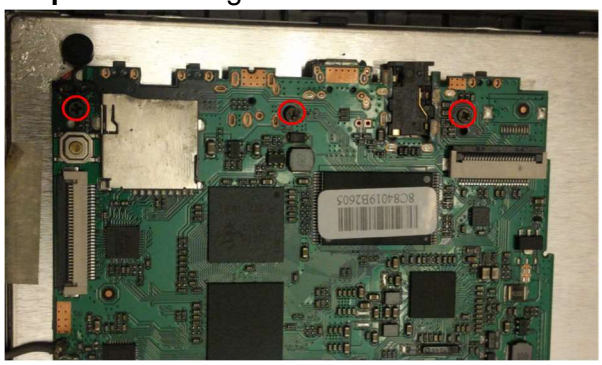
Parents helping remove the solder

Step 6: Lift the black cover so that you can remove the flex cables (very fragile)



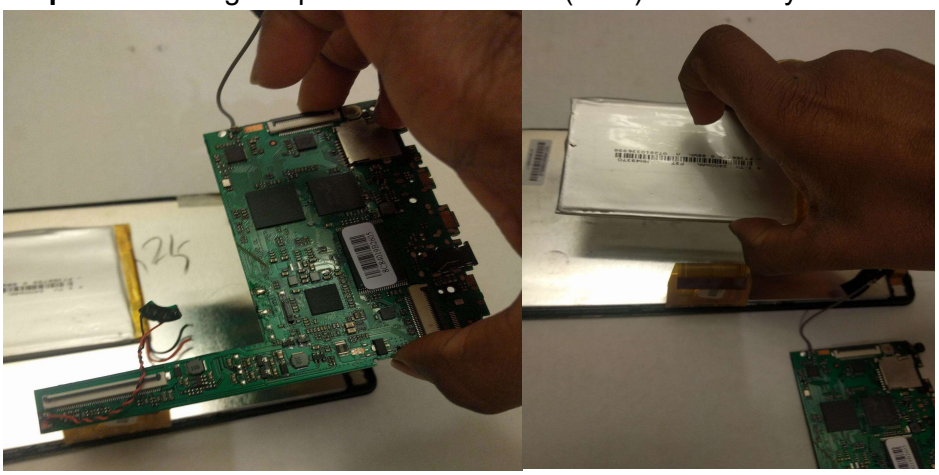
Removing the 3 flex wires

Step 7: Removing the three screws on the circuit board



The 3 screws which we removed

Step 8: Removing the printed circuit board (PCB) and battery from the tablet



Taking the printed circuit board and battery off the tablet

Step 9: Remove the LCD which stands for Liquid-crystal display from the digitizer frame

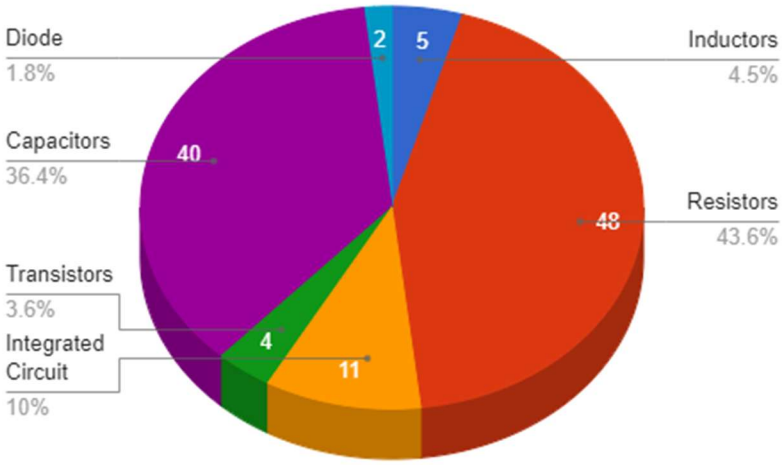
3.0 Device Components Analysis

3.1. Printed Circuit Board

Table of Components and Quantity

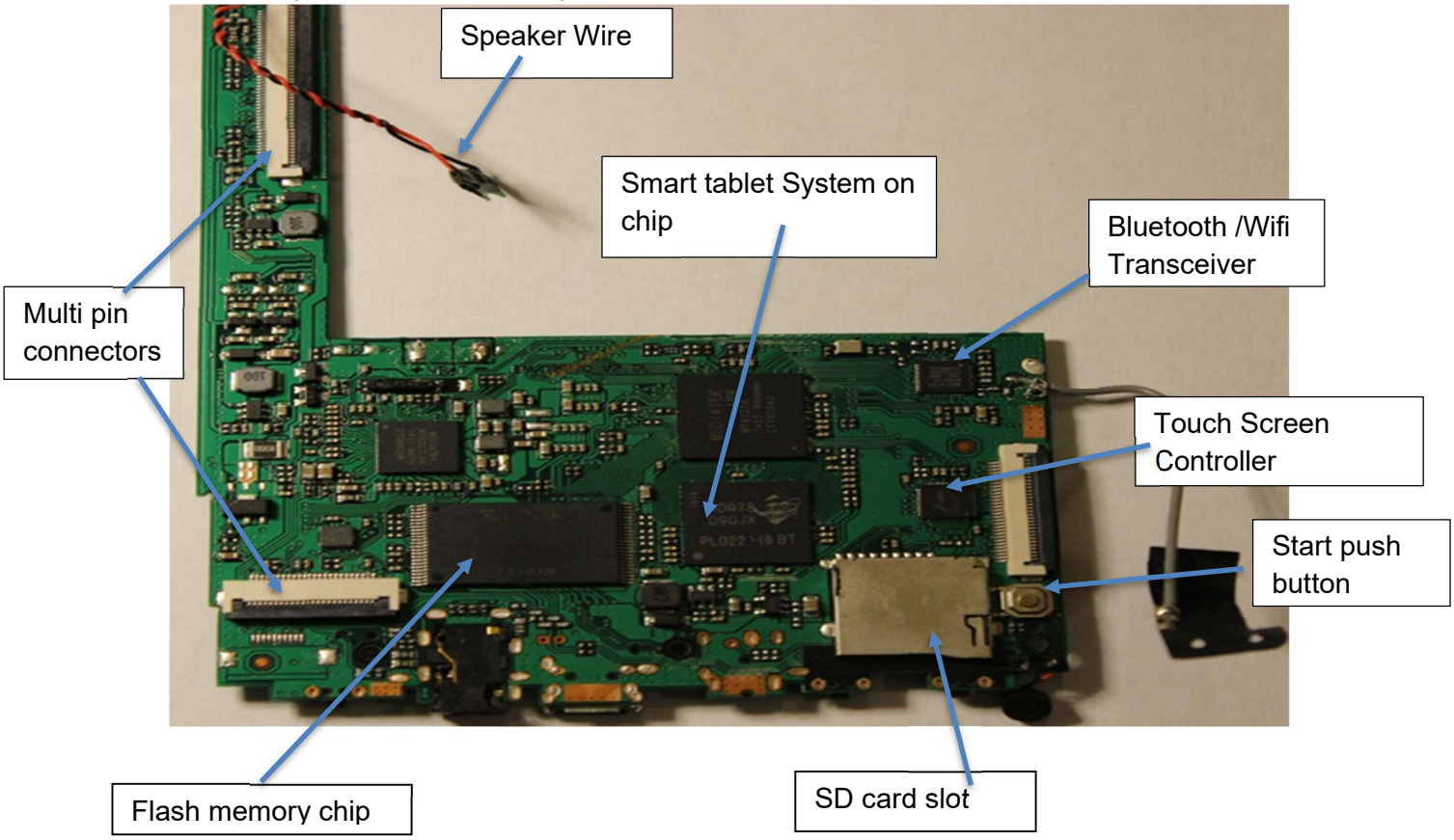
Components	Quantity	Percent
Inductors	5	4.55%
Resistors	48	43.63%
Integrated Circuits	11	10%
Transistors	4	3.64%
Capacitors	40	36.36%
Diodes	2	1.82%

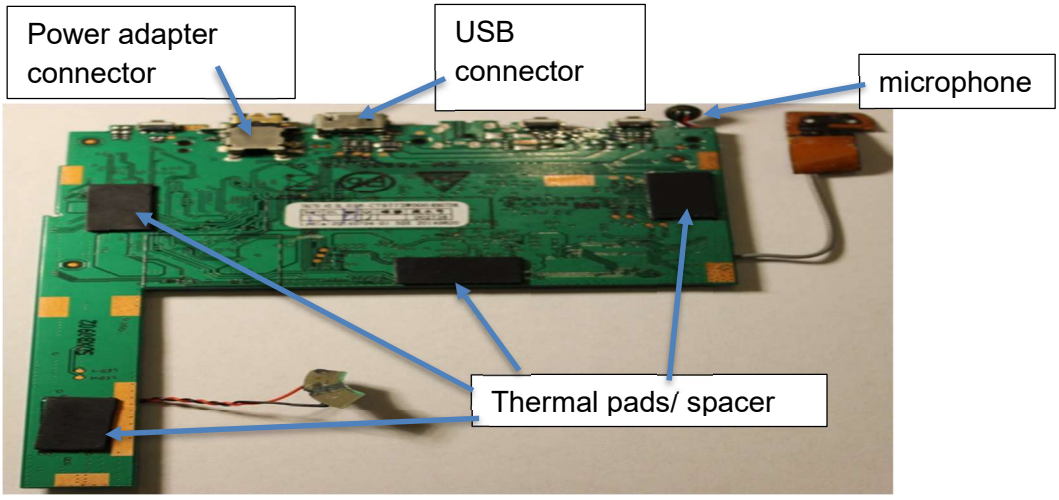
Note: These numbers are approximations



3.1.1 Labeled Images of Circuit Board

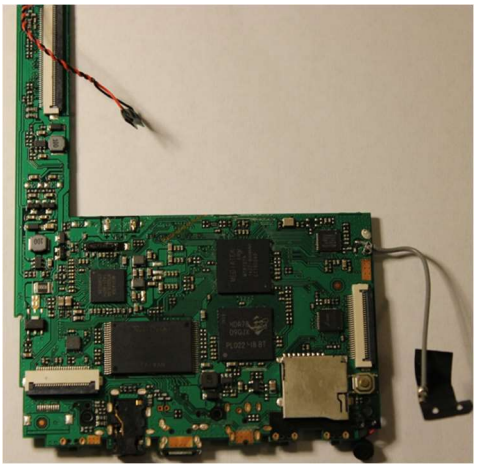
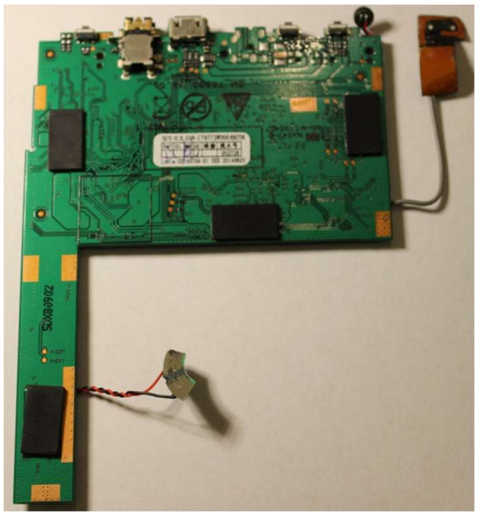
Full PCB (Printed Circuit Board) Top Side

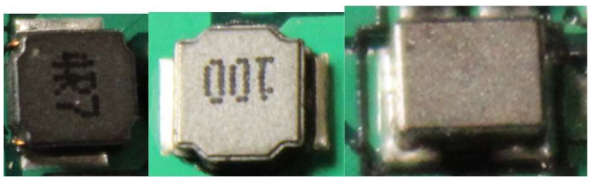
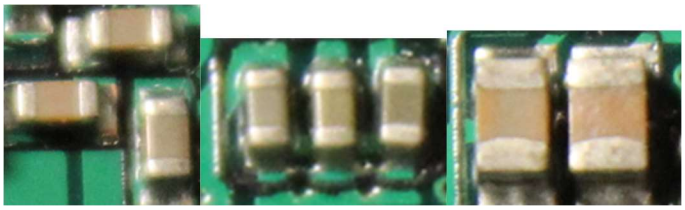
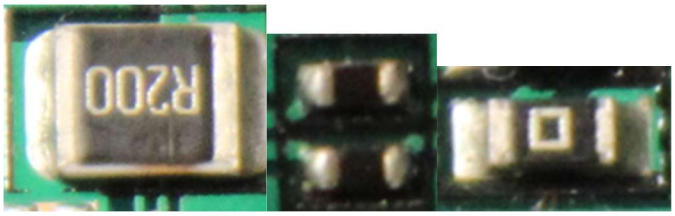


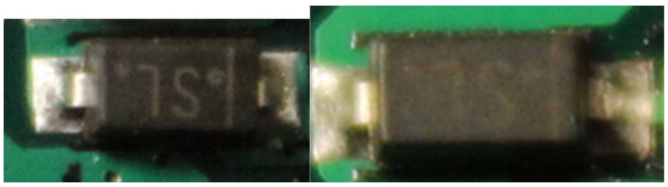
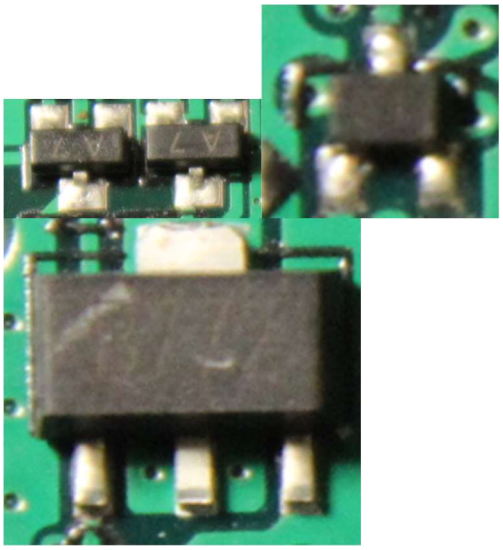


Full PCB (Printed Circuit Board) Bottom Side

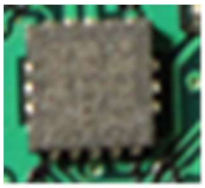
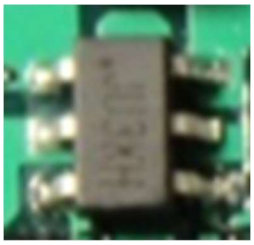
3.1.2 PCB Components Description

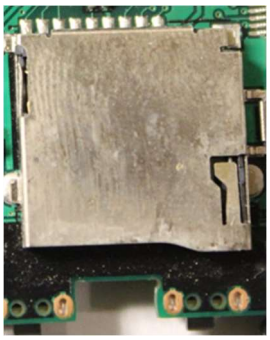
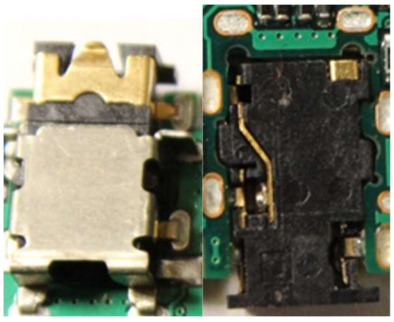
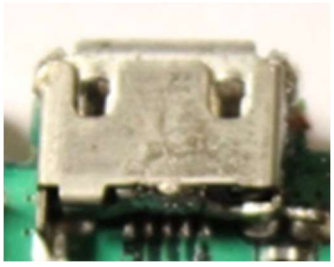
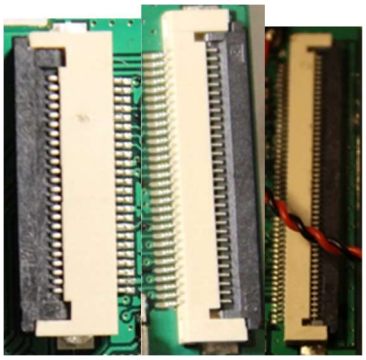
Serial #	Image	Description
1		Full PCB (Printed Circuit Board) Top Side
2		Full PCB (Printed Circuit Board) Bottom Side
3		Rechargeable Lithium Battery

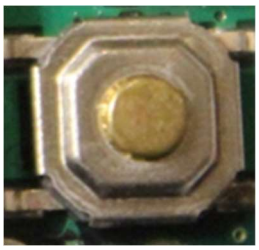
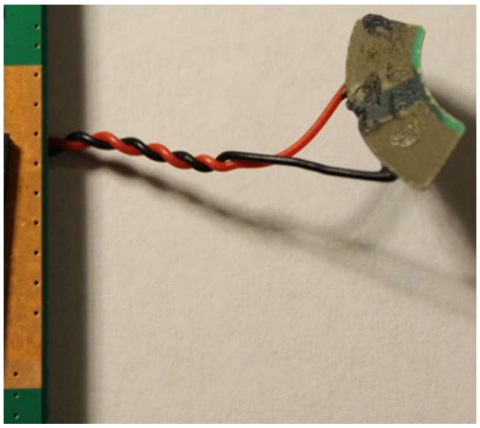
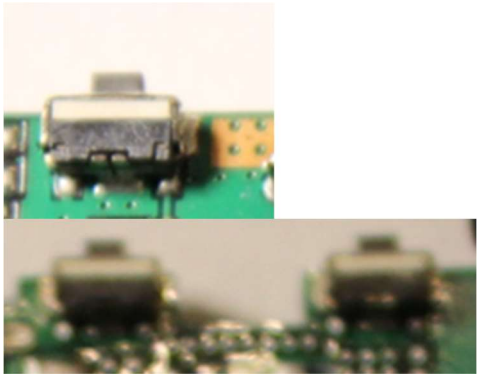
Serial #	Image	Description
4		Inductor (various sizes and values) Used to control the spikes of energy and store any extra energy.
5		Capacitor (Various sizes and values) Used to collect and store extra electricity.
6		Resistor (various sizes and values) Used to restrict the flow of current so that too much doesn't come through the trace and cause problems.

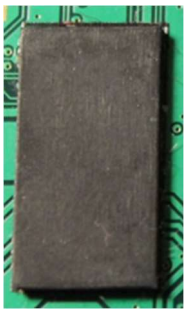
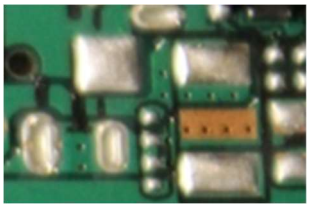
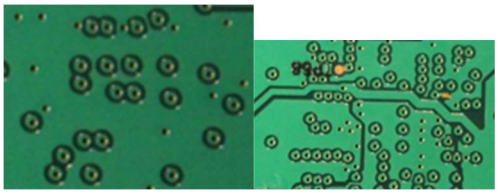
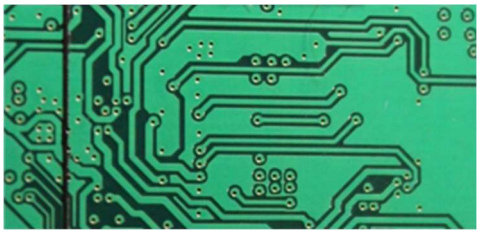
7		Diode An electronic part with two terminals but only transfers current mostly in one direction.
8		Transistor (various sizes and values) Used to decide which way the electricity goes and control it through a semiconductor type of material.
9		Integrated Circuit (MediaTek MT6323LGA) A Power Management System Chip Power Management Integrated Circuits (PMIC) is a chip that is responsible for the conversion, distribution, detection and other power management of electrical energy in electronic equipment systems.

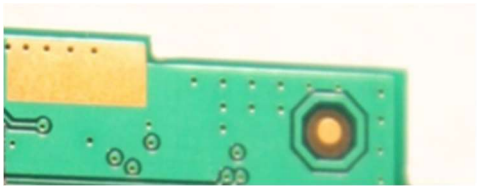
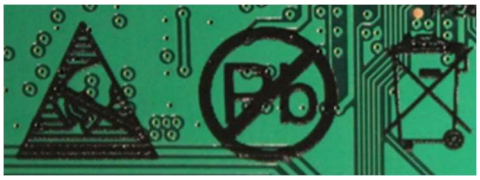
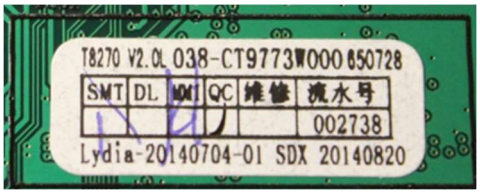
10		Integrated Circuit (SM 4DA78-D9QJX) We found that this part is used in Samsung watches to measure ECG but we are unsure what it is used for this tablet.
11		Integrated Circuit (MediaTek ARM MT8127A) A highly integrated system on a chip. It is a quad core platform which is used to do many different things. This is usually used on high performance media tablets with a PC-like browser, 3D gaming and cinema class home entertainment experiences
12		Integrated Circuit (SanDisk) SDTNRGAMA-008g) 8GB NAND flash memory chip

13		Integrated Circuit MT6627 is a 4-in-1 connectivity chip which contains a Wi-Fi/Bluetooth transceiver front-end, a GPS receiver front-end and a complete FM receiver.
14		Integrated Circuit Capacitive Touchscreen controller It has anti-Radio Frequency, LCD and power supply interference. It also has a auto tuning and auto calibration
15		Integrated Circuit We are unsure what this integrated circuit does because we cannot see the numbers and letters on it.
16		Integrated Circuit This integrated circuit is a voltage regulator which is used to regulate the voltage which passes through.

17		SD Card slot (Secure Digital Flash memory card slot) This is where you put in the memory card for extra data storage.
18		Power adapter connector Where you insert the power source.
19		USB connector (Universal Serial Bus communication) You can connect external devices which have a USB.
20		Multi-pin Connectors internal to the tablet (connecting to display) Used to hold the 3 flex wires on the tablet.

21		Push pin Switch
22		Speaker wire: The wire which is supposed to be connected to the speaker but when you take the tablet off you must break it.
23		Push pin switch on the side of the PCB for power ON, and Volume high/low control
24		Microphone: A transducer which converts sound into an electrical signal.

25		Thermal pad at the back of the integrated circuit to improve heat dissipation to the tablet case
26		Un-installed spaces on board (possibly for optional components)
27		Via holes on the PCB to connect board traces between different layers of the board
28		Interconnect traces on the PCB

29		Exposed metal at places on the PCB for ground connection or for testing during manufacturing
30		Markings on the PCB for 1. Electro Static Discharge (ESD) sensitive 2. Lead Free component 3. Recycle (Do not put in trash
31		Label indicating manufacturing date, quality control, serial number

4.0 Reference

1. What is an LCD?
2. What does an Intel Atom 1.2 GHz Quad-Core processor do and mean? .
3. What is a capacitor and what is it used for? .
4. What is a transistor?
5. https://www.britannica.com/technology/inductor
6. How to disassemble the RCA tablets
7. https://www.mediatek.com/products/tablets/mt8127
8. MT6627 Datasheet PDF - MediaTek Inc (datasheetq.com)
9. https://www.utmel.com/blog/categories/integrated%20circuit/power-management-integrated-circuit-pmic-guide