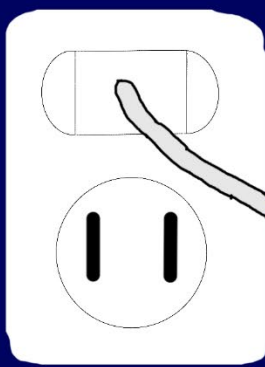


# Reverse engineering iPhone 5c



Team: 40693U

Location: Gillette, WY

We live in a world connected by electronics, and we use them every day, from smartphones to cars. Even this document was typed on an electronic device. For this project, I chose to take apart an iPhone 5c because I am interested in how it works. Why do smartphones deserve attention in this document? The reason is that smartphones are small and light and can complete complex tasks, and all the small unintelligent components come together to form a handheld computer capable of doing things we couldn't think phones could do in 1950. In this research, you will find the role of each iPhone 5c component.

The first two components are ICs made by apple. The **Apple A6** is a processor package with a dual-core CPU at 1.3 GHz, triple-core GPU at 266 MHz, and 1GB of Ram. The Apple A6 handles all the data in the phone, sort of like the brain. The **Apple 33861131-B2** is a power supply management chip, which manages charging, battery life, and energy consumption.

The following components are ICs not made by Apple. The **339S0171** is the Wi-Fi chip in the phone. It allows the phone to connect to a network where other devices are connected. The **Qualcomm MDM9615MOBA** is a 28 nm LTE modem with multimode LTE support that enables the device to connect to a cellular network. The **Toshiba THGBX2GD2JOTLAO1** is a 16 GB Nand flash memory. A NAND gate is a gate that requires all inputs to be true to return false. The **PM8018** is the base-band power management chip. The **AGD4** is the gyroscope and accelerometer. The gyroscope allows the screen to rotate, so it is always upright, and the accelerometer enables the phone to use shaking as an input. The **SWUA127** is an antenna switch module that can switch to a different frequency, for example, GSM, EDGE, UMTS, CDMA, and LTE. The **77352-15** is a power amplifier, works as a transformer, increasing the voltage. This chip is used for the SWUA127 chip above.

These last few components are not ICs. The **speaker** is a controlled magnet moving back and forth to change the air pressure. The **microphone** works similarly to our ears, having a resistor controlled by the air pressure. The **screen** is the main user interface. The screen consists of a liquid crystal display, a large group of wires for touchscreen input, and a protective layer made of glass. The **vibration motor** shakes your phone when you get a call or a notification, simply to get your attention. Our last component belonging inside the phone is the **battery**. The battery is the power source of the device. Without this, the whole phone cannot function at all.

In conclusion, I learned that smartphones are even more complex than they seem. The most unexpected finding was the antenna switching module (ASM). I did not think there was an FM radio antenna inside the phone. I also learned that Reverse engineering could help people understand how complex machines work.

Parts list:

**Power:**

1. Battery

**ICs:**

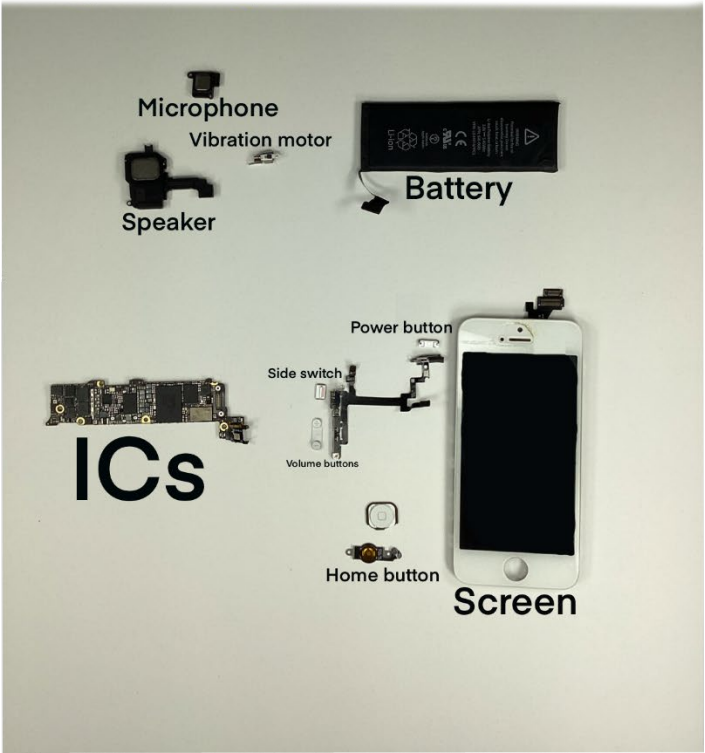
1. Apple A6
2. Apple 33861131-B2
3. 339S0171
4. Qualcomm MDM9615MOBA
5. Toshiba THGBX2GD2JOTLAO1
6. PM8018
7. AGD4
8. SWUA127
9. 77352-15

**Electromechanical:**

1. Speaker
2. Microphone
3. Vibration motor

**User Interface:**

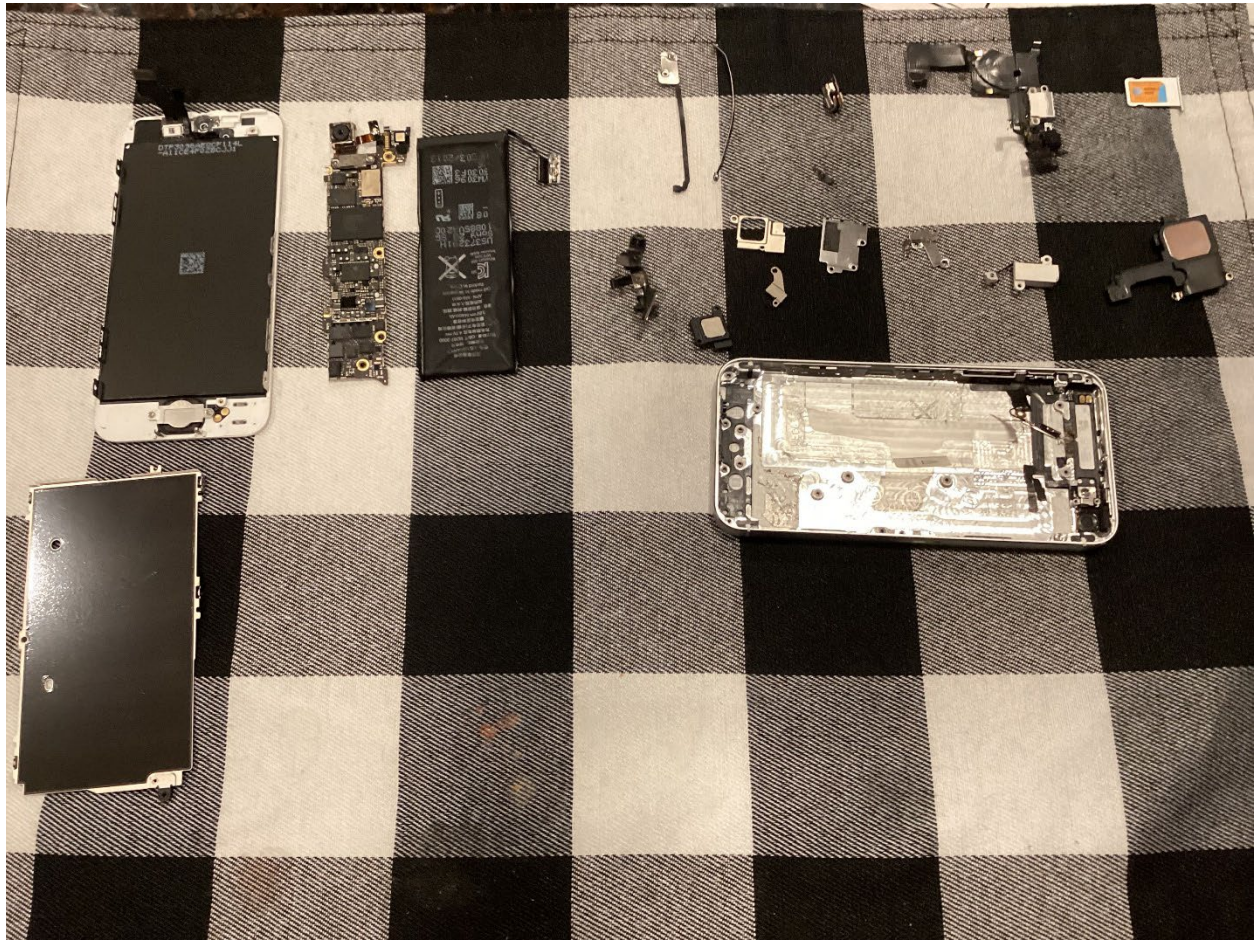
1. Screen
2. Volume buttons (+ -)
3. Power button
4. Home button
5. Side switch



Parts list image



first look inside the phone and removal of phone screen.



everything inside the phone including fastening plates, cushions, wires, etc.

## Works cited

<https://www.infineon.com/cms/en/product/rf-wireless-control/antenna-switch-modules-asm/>

<https://www.deviceparts.com/77352-15-power-amplifier-ic-for-iphone-5s-brand-new.html>

<https://www.aliexpress.com/item/32300218750.html>

<https://www.theverge.com/2017/11/30/16719724/apple-power-management-chips-dialog-semiconductor>

<https://www.theiphonewiki.com/wiki/MDM9615>

<https://mobile-668.en.made-in-china.com/product/CBTQxldKXqWE/China-339s0171-Tw-Ss2831034-WiFi-IC-for-iPhone-5-Repair-Parts.html>

<https://www.aliexpress.com/item/32891415950.html>

[https://en.wikipedia.org/wiki/Apple\\_A6](https://en.wikipedia.org/wiki/Apple_A6)

<https://www.idownloadblog.com/2013/09/20/ifixit-tears-apart-the-iphone-5c/>