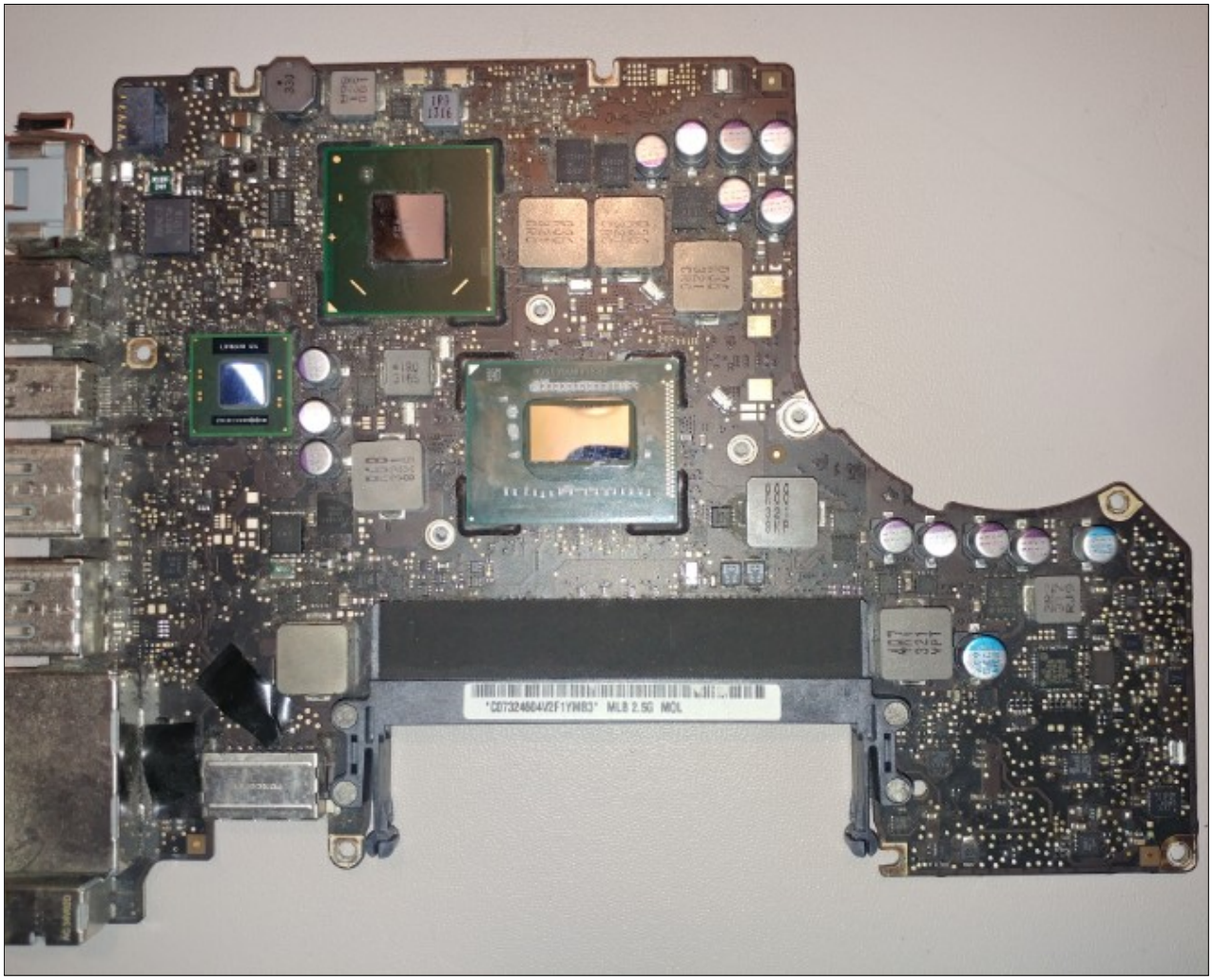


# Device Name: MacBook Pro 2012 13”

Report Main Manager: Joon Kang, Team Optimus 6724B
Photo Credit: Jungkyu Jang, Tyler Shin, Team Optimus 6724B
20 December 2017
Word Count : 487 (Including summary report and conclusion), 1297 (Total)

# SUMMARY REPORT

## MacBook Pro 13”, 2012

The reason to why our team chose this device was because of it’s abundance in unique components. Comparable to other electronic devices, a laptop has far more components that can be analyzed. For example, all electronic devices capable of computing and representing it’s data as a graphical user interface as a CPU. However the modules that allow connections with peripherals differ from the size of the device.

## Ti components

In the MacBook Pro, there is a Texas Instruments Stellaris LM4FS1AH micro controller with integrated ARM core.

## Components and Roles

### Logic Board

Intel Core i5-3210M 2.50 GHz quad-core processor
Intel E2088369 Platform Controller Hub
Broadcom BCM57765B0KMLG Integrated Gigabit Ethernet Controller
Parade PS8301
Texas Instruments Stellaris LM4FS1AH micro controller with integrated ARM core
Cirrus Logic 4206BCNZ Audio Controller
Maxim MAX15119 Apple-specific IMVP7 CPU/GPU power controller
SMSC USB25138 USB controller
Lattice Semiconductor LFXP2-5E FPGA
Cypress Semiconductor CY8C24794-24L

### Peripherals

Samsung 4GB DDR3 PC3-12800 RAM

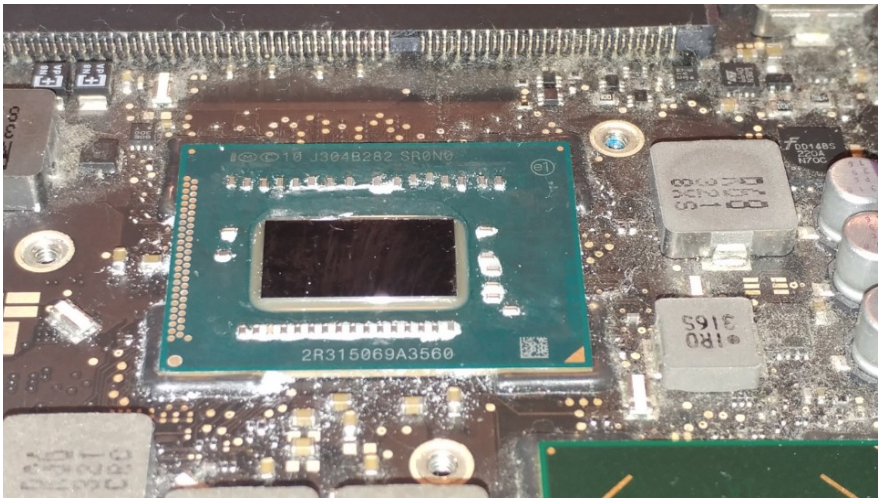
Apple manufactured 77.5Wh10.95V Battery
Toshiba 500Gb TL15HDD
Apple manufactured laptop fan
Apple manufactured Single module speaker
LCD
Optical Drive, Apple specific

## Roles

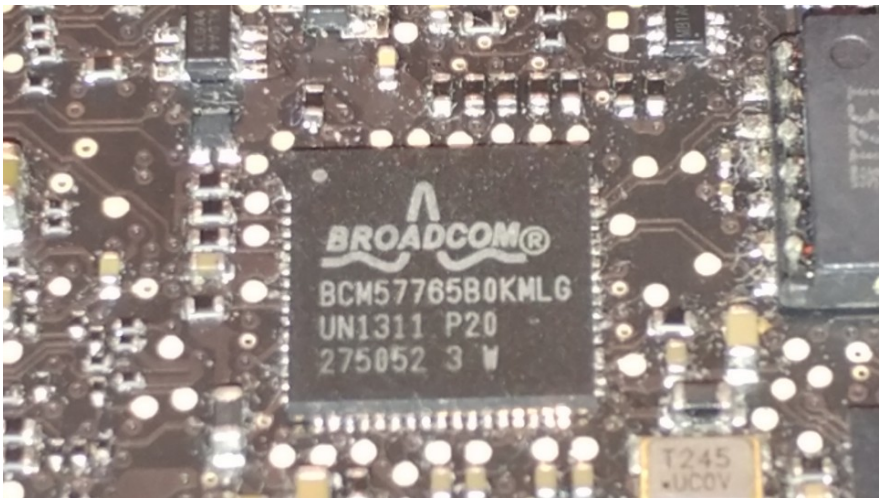
The main components of the computer is the CPU. The i5-3210M processor contains the component ‘IG 4000’, which works as a GPU alternate. The E2088369 chipset works together with the CPU to control the platform. These components are circulated power from the battery using the Maxim MAX15119. The main system retrieves power from the Parade PS8301 chipset, where it distributes power supplies to external sources. FPGA is a logic gate that allows a user program to rewrite its values to reconfigure the gate of the system. Cypress Semiconductors allow enabling key analytics and hardware acceleration while integrating CPU, DSP, ASSP, and mixed signal functionality on a single device. The Cirrus Logic Audio Controller controls all audio outputs of the computer. Wireless connections, which are the heart of laptop computers, are controlled by Broadcom Integrated Ethernet Controller. The inputs from any USB types are controlled by SMSC USB 25128 controller. The Stellaris LM4FS1AH micro controller is a separate computer part that features advanced motion control features, as motion-control PWM outputs dead-band, quadrature encoder inputs for precise position monitoring, and intelligent analog capability, including analog comparators and channels of highly accurate 10-bit analog-to-digital conversion. These are the electronic components that makes the MacBook pro run.

# Photos

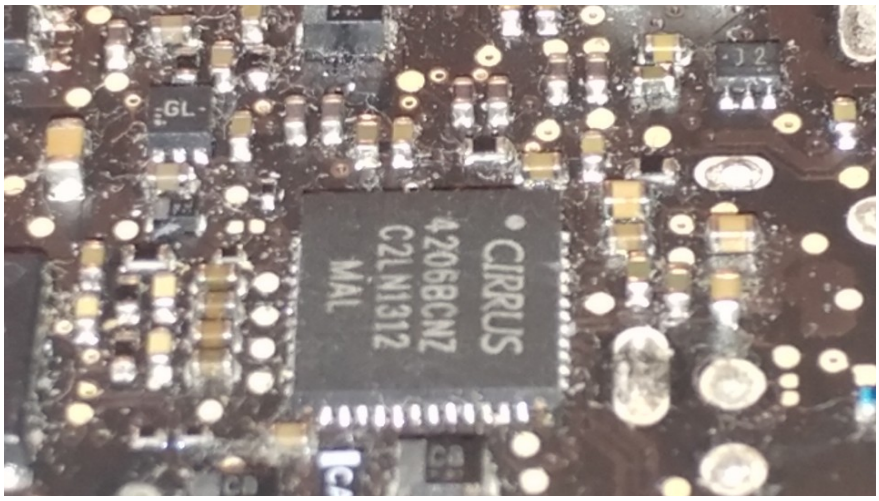
### Parts



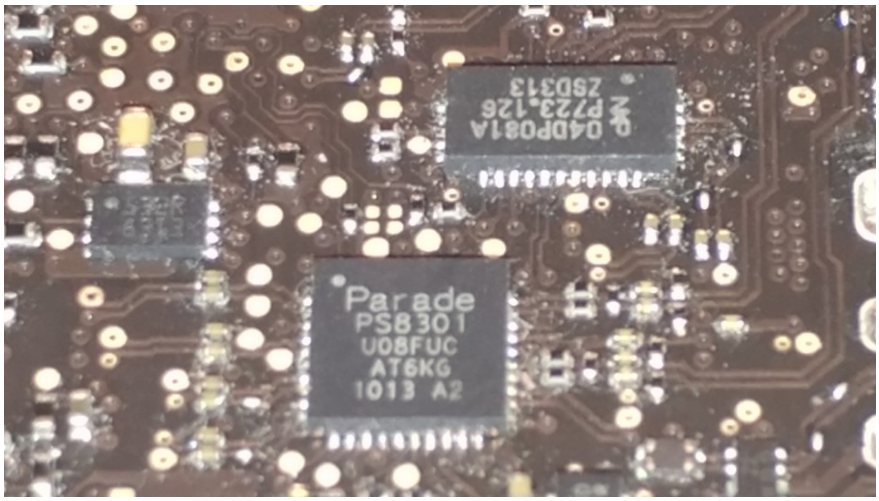

Intel core i5-3210M is a specific processing unit for the MacBook computers.  It is the components that serves as the brain of the laptop.



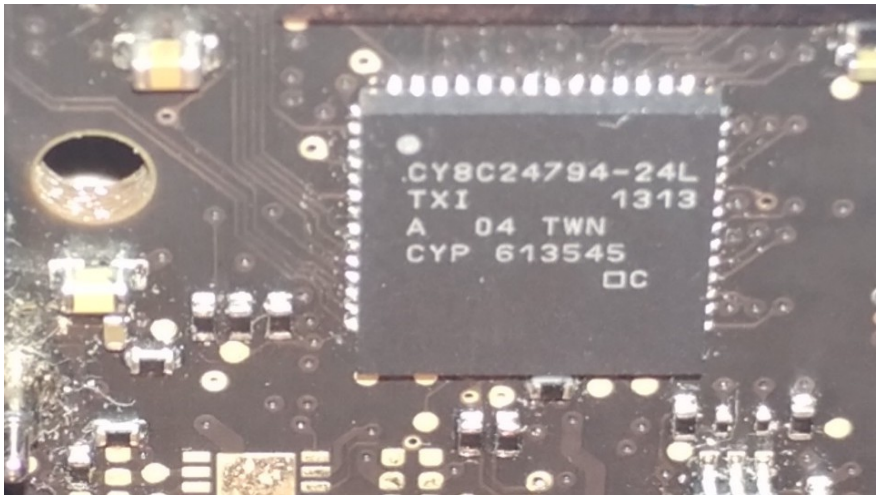

Broadcom BCM57765B0KMLG Integrated Ethernet is a network module that allows connection between the Web and the computer with the ethernet or the wifi.



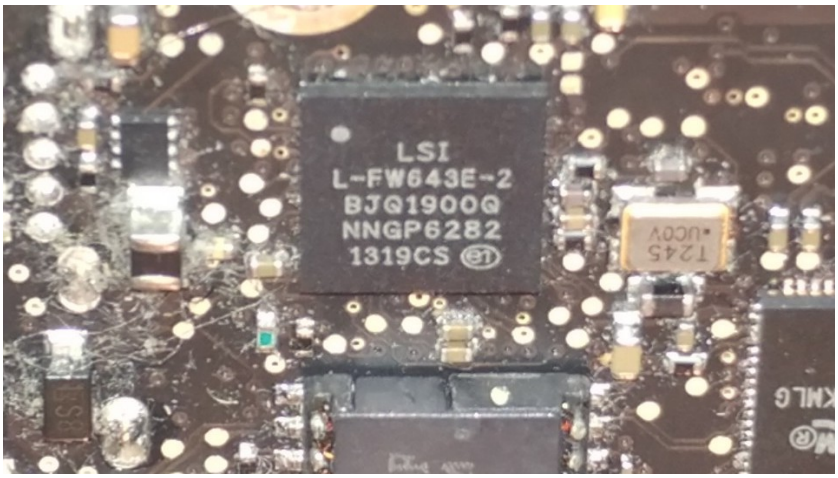

Cirrus Logic 4206BCNZ Audio Controller is the audio codec chipset. It takes care of all incoming and outgoing audio signals, translated into electric code.



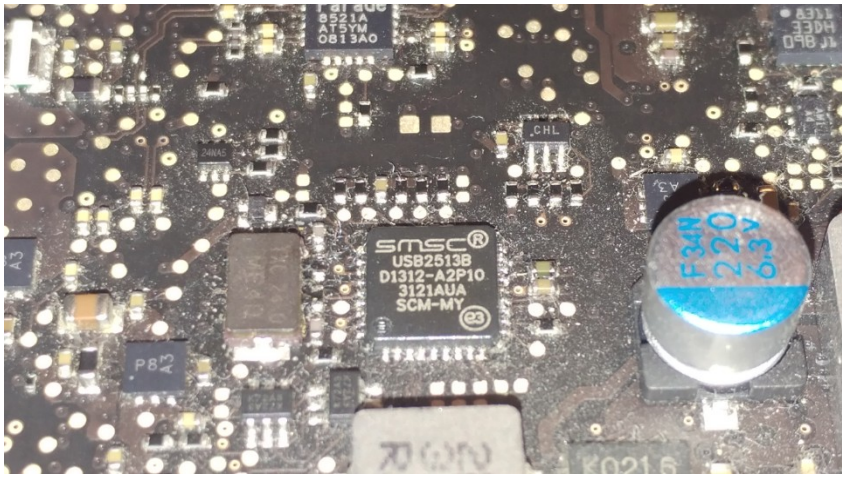

Parade PS8301 is a chipset for power distribution. Power from the battery is sent to the chipset, analyzes and decides on its route.



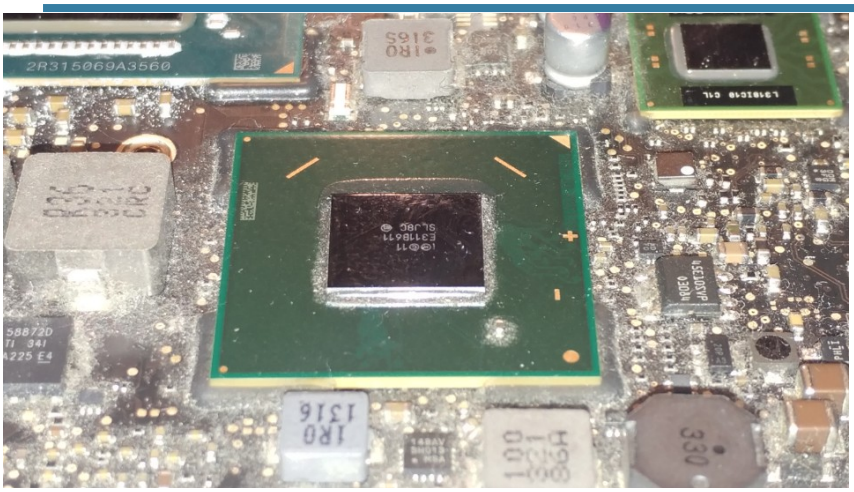

Cypress Semiconductors allow enabling key analytics and hardware acceleration (HAX) while integrating CPU, DSP, ASSP, and mixed signal functionality on a single device.



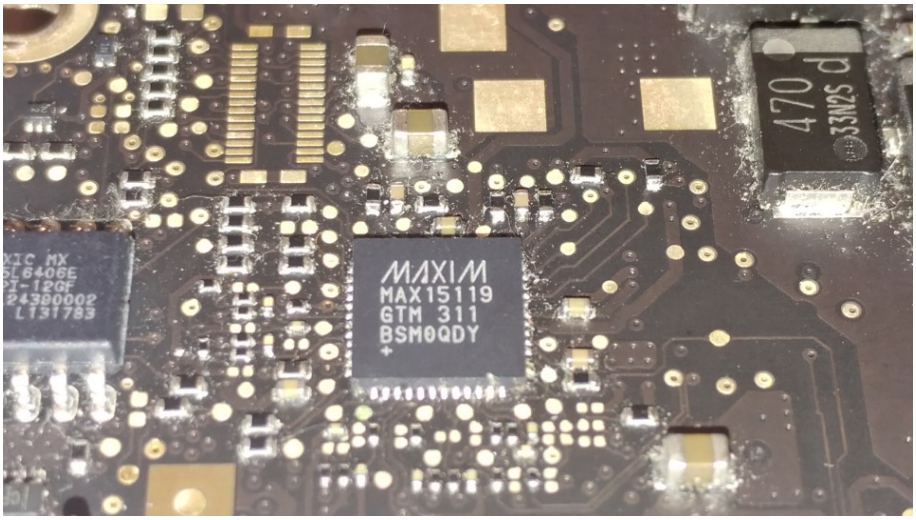

Lattice Semiconductor LFXP2-5E is a Field-programmable gate array. FPGAs can be reprogrammed to desired application or functionality requirements after manufacturing.



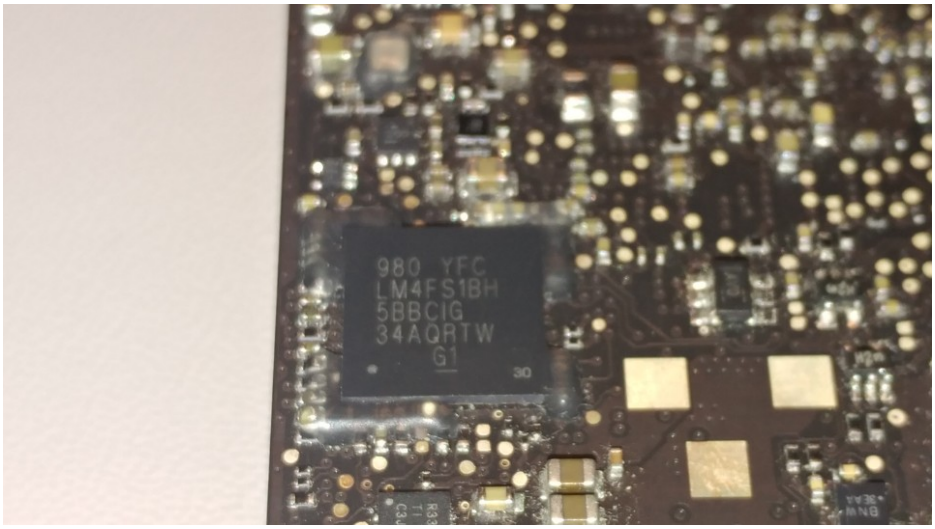

SMSC USB25138 USB controller is a universal bus controller chipset that allows incoming connections with the usb ports. All usb data are sent through this.



Intel E2088369 involves the display, the IO controller, IME, and RTC. Serves as bottleneck solution to southbridge and Northbridge functions. Runs the DMI and FDI.




Maxim MAX15119 power controller is a power circulation system specifically for the CPU. It works with the parade system to circulate electricity in the CPU.




Texas Instruments Stellaris LM4FS1AH micro controller with integrated ARM core is a separate computer that features advanced motion control features, and intelligent analog capability.

## TEARDOWN PROCESS

Detachment of lid, removal of the Samsung RAMs were taken place. RAMs are modules that allow quick access to the data needed by a program.

Fan and speaker was removed straight after taking out the battery from the system, which could cause potential harm.

Removed battery, which provides the power necessary to the machine.

Removed Optical Drive, or ODD, allowing CD or DVD read/write ability for the MacBook pro.

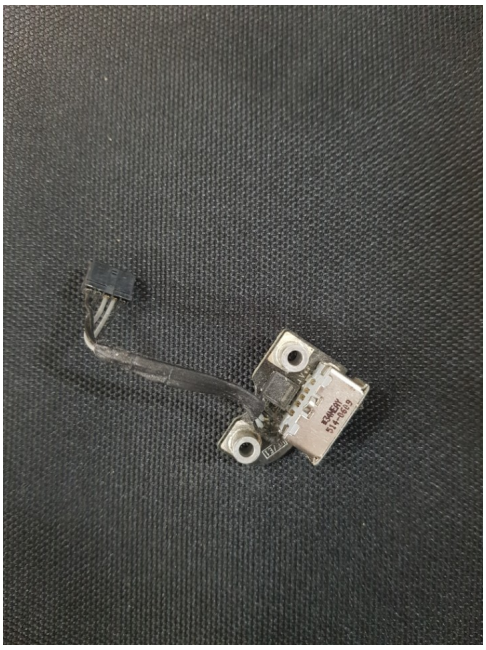
The RAM and the Fan is shown here, responsible of quick data retrieval from a program.

The Logic Board of the computer, without the cooler taken off. Responsible for the connection of all components in one specified spot.

The Logic Board, Detached Cooler for the CPU and the Platform Hub.

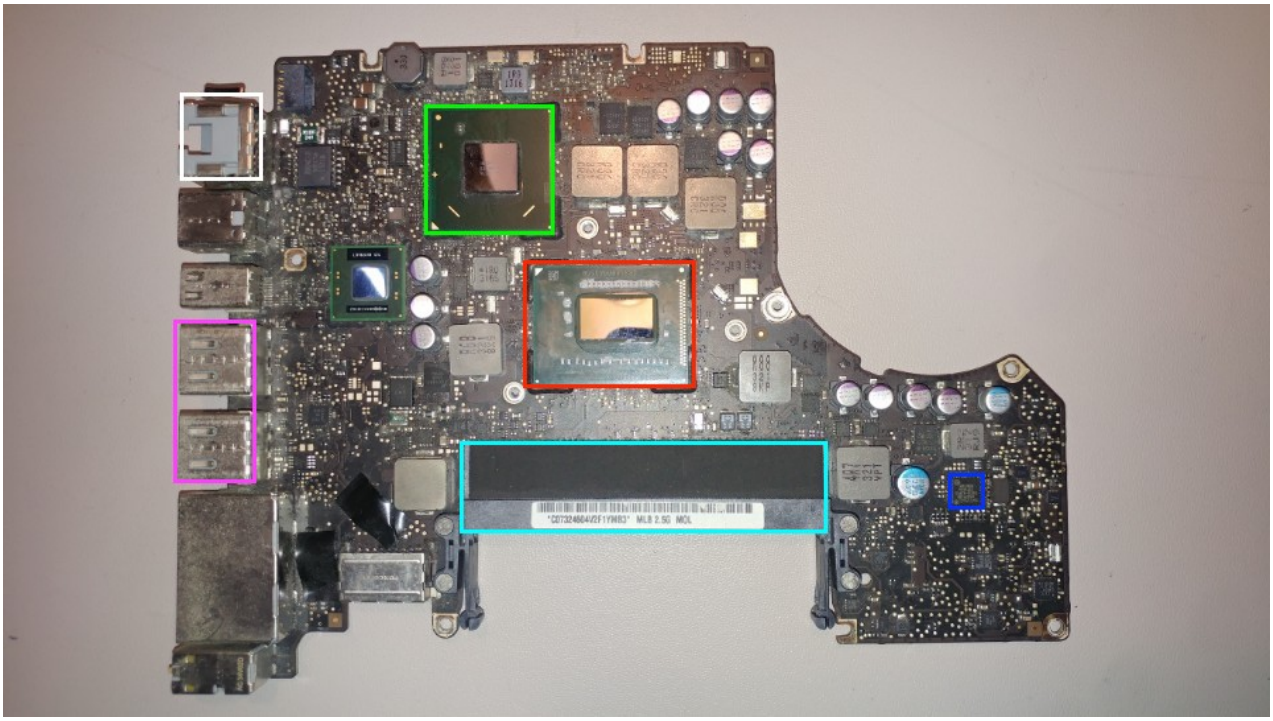
Detached LCD, providing display and GUI for the calculations done in the logic board for user integration.

3 way speaker/camera connection port



Battery Connector

## MAINFRAME LOGIC BOARD (LOCATION)



Red - CPU, Intel i5 3210M

Green - Intel Platform Hub

Blue - MAXIM Power controller

Purple - USB, Linked to SMSC

Sky blue  - RAM Slot

White - Ethernet Slot, linked to Broadcom Processor

## PARTS LIST

| Parts | Serial # | Purpose | Data(Link) | Photo |
|---|---|---|---|---|
| 13.3" LCD TFT Display | LP133WX2 | LCD Display | https://www.powerbookmedic.com/133-MacBook-Unibody-Display-LCD-Screen-NEW-p-17281.html |  |
| back Cover | 604-1622-B | Back Cover for MacBook | https://www.powerbookmedic.com/Bottom-Case-for-MacBook-Pro-13-Unibody-p-17323.html |  |
| Fan Assembly | 661-4946 | Cooling the computer from the inside | https://www.powerbookmedic.com/Fan-Assembly-for-MacBook-13-Unibody-p-17239.html |  |
| Left Speaker Assembly | 922-9058 | Speaker for left side | https://www.powerbookmedic.com/MacBook-13-Unibody-Left-Speaker-Assembly-p-19734.html |  |
| A1322 Battery | 661-5229 | Battery | https://www.powerbookmedic.com/MacBook-Pro-13-A1322-Battery-p-17740.html |  |

| Parts | Serial # | Purpose | Data(Link) | Photo |
| --- | --- | --- | --- | --- |
| i-sight camera board | 661-4820 | Camera board | https://www.powerbookmedic.com/MacBook-Pro-13-iSight-Camera-Board-p-18064.html |  |
| Battery Indicator Light | 922-9061 | Battery indicator | https://www.powerbookmedic.com/MacBook-Pro-13-Battery-Indicator-Light-p-17664.html |  |
| i-sight camera | 821-1202-A | Camera | https://www.powerbookmedic.com/MacBook-Pro-13-iSight-Camera-p-18058.html |  |
| Microphone Cable | 922-9059 | Mic | https://www.powerbookmedic.com/MacBook-Pro-13-Microphone-Cable-p-17811.html |  |
| Right speaker and subwoofer | 922-9057 | Speaker | https://www.powerbookmedic.com/MacBook-Pro-13-Right-Speaker-and-Subwoofer-Assembly-p-18066.html |  |

| Parts | Serial # | Purpose | Data(Link) | Photo |
| --- | --- | --- | --- | --- |
| Logic Board | 661-6588 | Logic Board, Mainboard | https://www.powerbookmedic.com/MacBook-Pro-13-Unibody-25GHz-Core-i5-Logic-Board-p-24166.html |  |
| Unibody trackpad | 922-9063 | Trackpad | https://www.powerbookmedic.com/MacBook-Pro-13-Unibody-Trackpad-p-17444.html |  |
| Superdrive GS21N 9.5mm | 661-4736 | ODD | https://www.powerbookmedic.com/Macbook-Pro-Superdrive-GS21N-95mm-SATA-UltraSlim-Slot-Loading-p-17566.html |  |
| Magsafe connector | 661-495 | Power supply connection | https://www.powerbookmedic.com/Magsafe-DC-IN-Board-for-MacBook-Pro-15-Unibody-p-17273.html |  |

Picture Citation: *MacBook Pro 13" Unibody*, www.powerbookmedic.com/xcart1/home.php?cat=597&sort=category&sort_direction=0&page=1,2,3.

## Conclusion

We learned mostly about the components of a computer during this process of writing the report. We learned about types of chipsets, how they are used and why. The ‘anatomy’ of the computer was interesting, but we soon realized that we had to divide up the components to Logic Board and Peripherals, as the logic board had more components inside than peripherals combined. We learned that in order to create such a sophisticated machine, we need collaboration and contributions from many renowned companies that possess vast knowledges of technology.

## Works Cited

"MacBook Pro 15" Unibody Mid 2012 Teardown." *IFixit*, 17 Nov. 2017, www.ifixit.com/Teardown/MacBook Pro 15-Inch Unibody Mid 2012 Teardown/9515.