

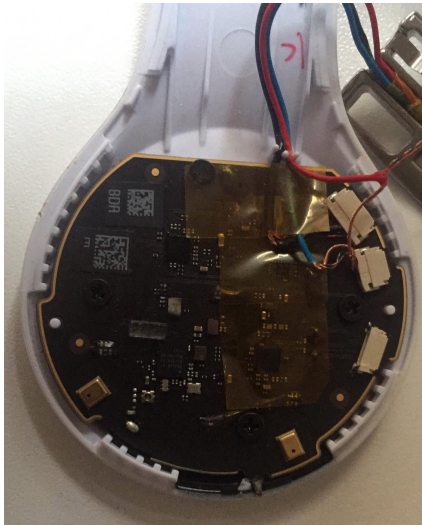
Greetings from Turkey!

As NOVA, we always find gaining first hand experience as the best way to understand a topic, so we thought that “Electronics Online Challenge Sponsored by Texas Instruments” was the best fit for us.

We chose a Beats solo 2 on-ear style headphone to deconstruct because we have always wondered about the inner mechanics of a headphone and it was the most accessible device at that time. With that, we officially started to work on “Electronics Online Challenge”. And when we disassembled it, we found various parts such as;

- PCA9536: s I/O Expander,
- BQ2407:y Li-Ion Battery Charger and Power-Path Management IC,
- BQ27425: Battery Fuel Gauge,
- TCA6507: 7-Bit I 2C and SMBus LED Driver
- TPS782: Ultra-Low Quiescent Current Low-Dropout Linear Regulator
- DMMT3904W: Matched Pair NPN Small Signal Transistor
- CSR8670: Audio System-On-Chip (SoC)
- AMS AS3561 Class-H Stereo Headphone Amplifier



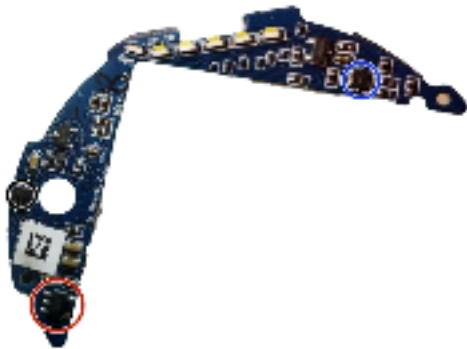


The PCA9536: s I/O Expander: which is a TI piece that provides the ability to implement additional inputs and outputs on a microprocessor or a microcontroller. In the case of the Beats Solo 2 it's connected to a microcontroller. The next

component we researched was the bq27425-G2 fuel gauge which provides fuel gauging to the Lithium batteries. The next part we found and researched was the BQ2407:y Li-Ion Battery Charger and Power-Path Management IC. This component is basically connected to the lithium batteries and it manages the power flow through the headphones. Next we found the TCA6507:

7-Bit I²C and SMBus LED Driver which is a 7-bit LED dimmer designed to control the LEDs. Without this device, the microcontroller must be actively involved in turning the LEDs on and off which uses valuable processor time. The TCA6507 alleviates this issue by limiting the number of operations required by the processor in blinking LEDs and helps to create a more efficient system resulting in the microcontroller focusing on other tasks. The next part we found was the TPS782: Ultra-Low Quiescent Current Low-Dropout Linear Regulator which allows the customization of power consumption for specific applications resulting in no extra power consumption thus making the whole

device more energy efficient, then we found the DMMT3904W: Matched Pair NPN Small Signal Transistor. The Small Signal Transistor is used to amplify low-level signals but can also be used as a switch. In the Beats Solo 2 it is a part of the headset amplifier. In addition we found the CSR8670: Audio System-On-Chip which combines a Bluetooth radio, a low power DSP, an application processor, a battery charger, memory and various audio and hardware interfaces into a chip. Finally we found the AMS AS3561 Class-H Stereo Headphone Amplifier which contains a DCDC converter and is used to improve the overall sound quality. In conclusion thanks to this project we learned about how headphones work, about various components and their features and got a greater understanding of mechanics as a whole.



Here the red circle is the TPS782: Ultra-Low Quiescent Current Low-Dropout Linear Regulator

The black circle is the DMMT3904W: Matched Pair NPN Small Signal Transistor and the blue is the TCA6507: 7-Bit I²C and SMBus LED Driver



Here the orange circle is the BQ2407: y Li-Ion Battery Charger and Power-Path Management IC, the blue is the battery fuel gauge (BQ27425: Battery Fuel Gauge) and the pink is the PCA9536: s I/O Expander



Here the pink circle is the AMS AS3561 Class-H Stereo Headphone Amplifier while the red is the CSR8670: Audio System-On-Chip



Left earphone as a whole when disassembled