Motorola Moto X Teardown

Moto X was taken apart on August 23, 2013.

Written By: Walter Galan

INTRODUCTION

What does $12.5 billion dollars buy you nowadays? In Google's case, it buys Motorola, Inc. and all of its designs and patents. Is it what we would have spent the money on? Probably not, but the result of the acquisition is Motorola's first smartphone, designed and assembled in the United States—the Moto X.

Keep it goofy with us on Instagram, get serious with our Facebook, or make it short and sweet with a tweet. Your choice.

[video: http://www.youtube.com/watch?v=9SwX20DB-A8]

🔧 TOOLS:

- T3 Torx Screwdriver (1)
- iFixit Opening Tools (1)
- Spudger (1)
- iOpener (1)
- Tweezers (1)

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Step 1 — Motorola Moto X Teardown

- The love child of Motorola and Google is here, and we are dying to crack open the little Motoroogle.

- Technical Specifications:

  - Dual-core 1.7 GHz Qualcomm Snapdragon S4 Pro processor

  - 2 GB RAM

  - 4.7-inch 1280x720 pixels AMOLED display

  - 16 or 32 GB internal storage

  - Qualcomm Adreno 320 GPU

  - 10 MP rear-facing camera

Step 2

- The top of the Moto X houses the centered headphone jack. We haven't seen this placement on too many recent smartphones.

- (i) Does it make more sense than a headphone jack on the bottom of a phone? Only time will tell… (but yes, it probably makes more sense).

- Since we tend to have a lot of devices laying around, we might as well do some comparisons! The Moto X is certainly not small, but it is a bit smaller than the S4, and we are fans of the contoured back.

- This is the first and only smartphone that's "Designed & *Assembled* in the USA," to our knowledge.

Step 3

- Our Moto X has a small defect next to the SIM card tray. Hmmmm...

  (i) Hopefully this sort of flaw will be limited to the first run phones, and my custom teal model will be made with a little more care.

- Using the fancy SIM eject tool provided by Motoroogle, we remove the SIM card tray from the side of the device.

(i) We're interested to see the internal layout of this device, with so many components lined up along the center.
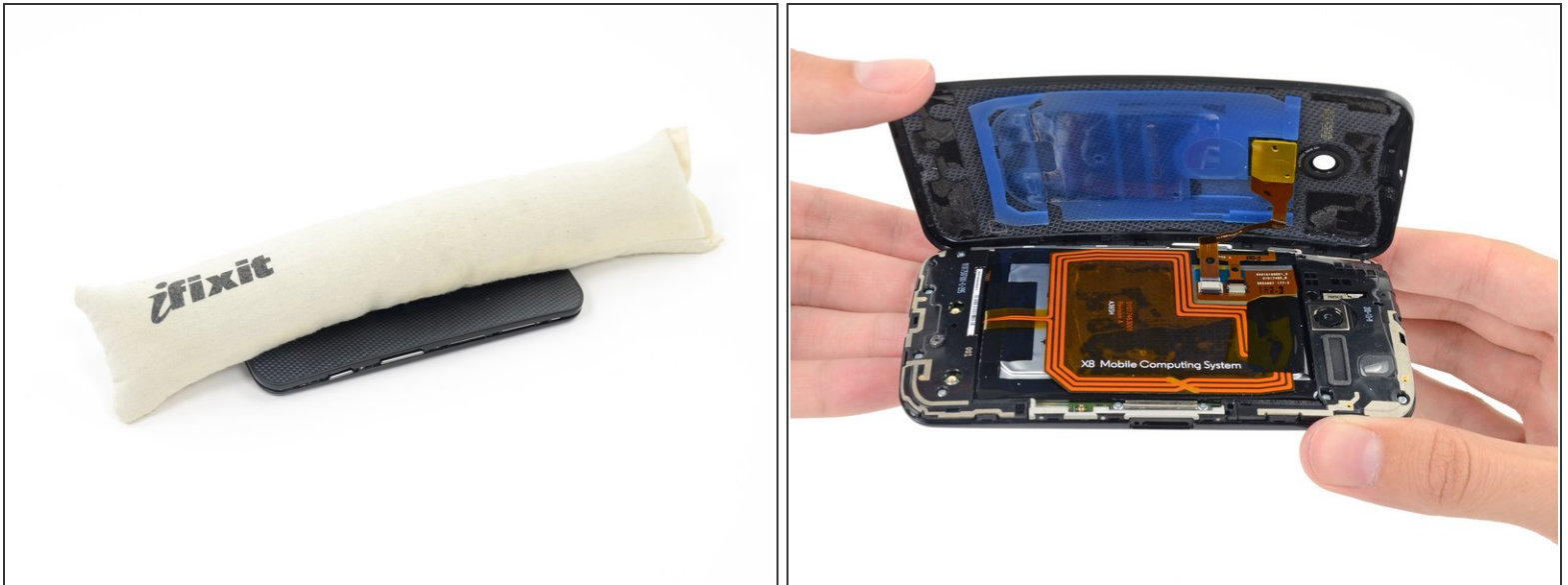
Step 4
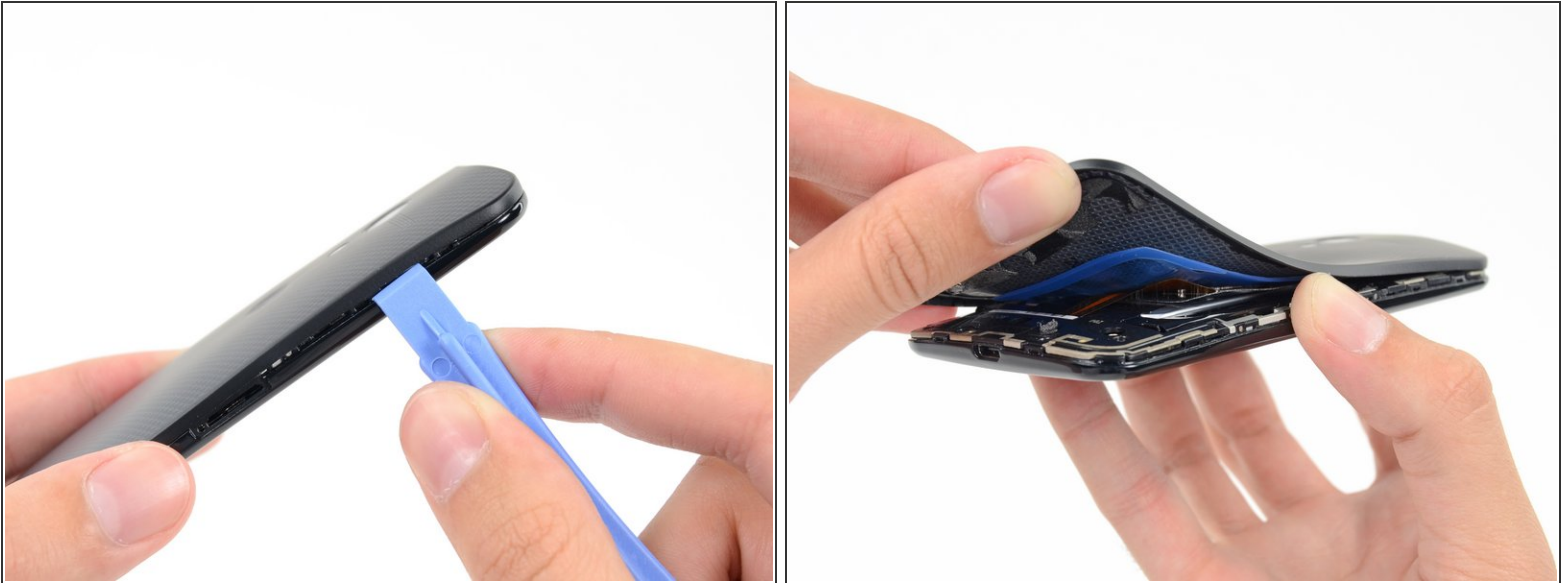
- *Snap snap SNAP!*
  - The melodious sound of easy teardown access fills our ears as we release clips holding the rear panel in place.

- *What is this? Google! Motorola! How could you do this to us?*
  - To our dismay, the unexpectedly flexible rear panel, though clipped to the device, is also adhered. Time to bring in some reinforcements.

Step 5

- Designed to penetrate the impenetrable, to de-here the adhered, to unfasten the hard-fastened, the iOpener has yet to meet gobs of adhesive it couldn't handle.

  ⓘ OEMs please take note, this is **not** a challenge…

- Whilst removing the rear panel, we get our first glimpse at the NFC antenna.

Step 6

- Even after defeating Big Blue, the rear panel still does not yield.

- We release the ZIF connector of a big ol' rear-case-mounted flash assembly, and after 6 full steps, we are finally into the device.

  - ⓘ Our guess is that the adhesive pad was added to make the phone feel more solid than one purely secured with clips. The pad also keeps the flash firmly in place, and may act as as padding to protect internal components.

- Our "Woven Black" case has a nice weave. While it's probably not actual kevlar fibers, the molding makes for a nice view — you can see right through it!


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Step 7
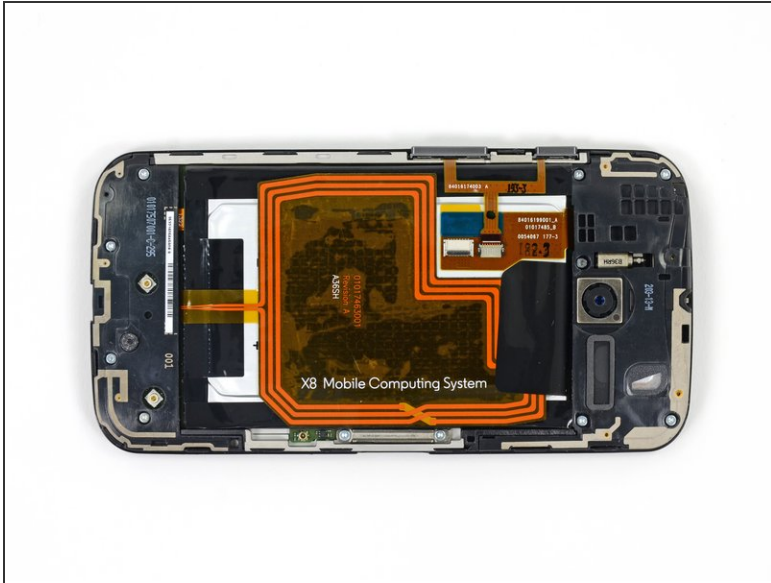
- The pattern of these NFC coils triggers some powerful nostalgia.

  - (i) The good ol' days of slot car bliss. Back when toy cars were as easy to drive as Autopia racers. Hold down a button. Watch them race around for hours and hours. Ahh…

- Snap back to reality, there go the volume and sleep buttons, all on one handy cable.

Step 8
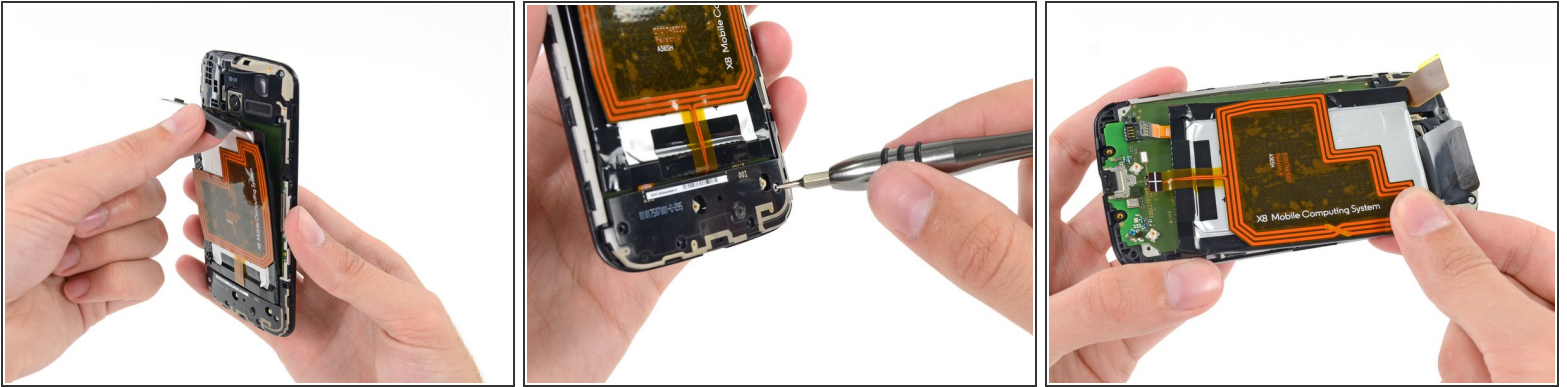
- "We'll just wrestle this battery off here…Or not."

  - Time to chase down the end of the NFC antenna ribbon cable.

- We interrogate the antenna assembly about the whereabouts of the cable's end. Nothing like a 54 Bit Driver Kit to encourage stubborn hardware.

- Eureka! Adios, battery!

Step 9

- Motorola claims the Moto X battery can power through an amazing 24 hours of "mixed usage."

- How does the Moto X accomplish such a feat with a 3.8 volt, 2200 mAh Lithium ion battery? The secret is in the X8 Mobile Computing System.

- (i) The Motorola X8 Mobile Computing System is comprised of a Qualcomm Snapdragon S4Pro family processor, a natural language processor and a contextual computing processor.

- Motorola developed a custom system architecture, which, when coupled with eight processor cores, allows for the delegation of processing power:

  - 4 graphics processor cores for "stunning clarity"

  - 2 application processor cores for "swift action"

  - 2 low-power cores—"awaiting your next command"

Step 10

- Out comes the upper midframe panel, housing the speaker, headphone jack, more antennas, and pressure contacts.
  - *Yay, pressure contacts!* We like spring pressure contacts because they don't require any work to disconnect.
- This is possibly the most modular headphone jack we've ever seen. It pops right out of the upper midframe panel, spring contacts and all.

Step 11
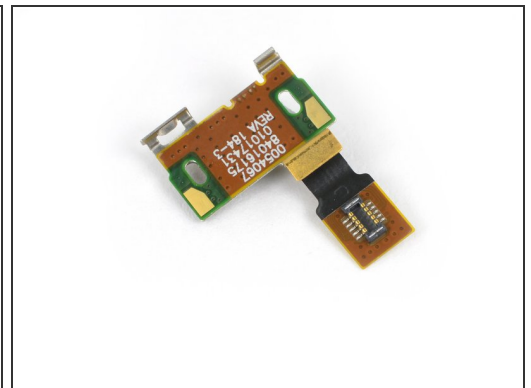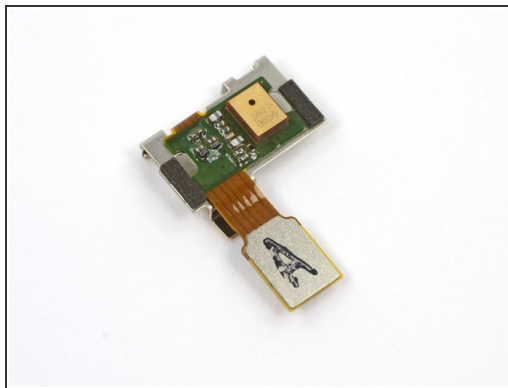
- A spudger helps us unclip a small microphone board from the earpiece speaker.
- The microphone assembly clings (like a baby sloth) to the earpiece speaker to maintain a solid connection with the spring contacts below.
- Naturally, we love design innovation. We can tell that a considerable amount of effort went in to the internal design of this device; the number of clips and contacts we've found so far is a great testament to that.

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Step 12

- After selecting our favorite pair of precision tweezers, we remove the 2 MP front-facing camera from the Moto X.

- The front-facing camera is labeled as 84016172 REV A 0054067 01017429 142-3.
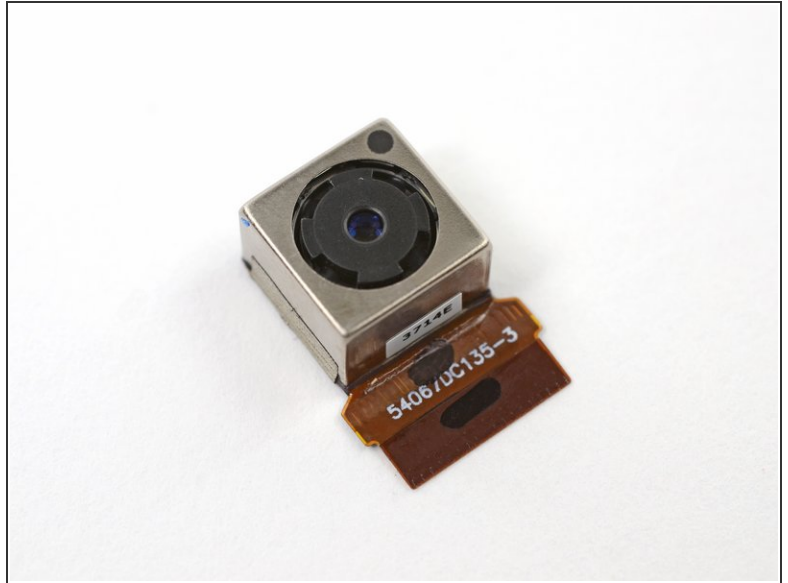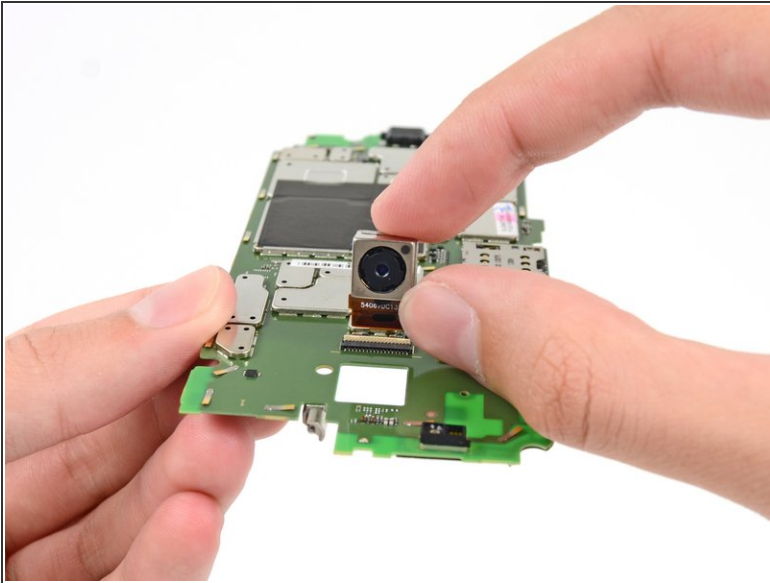
Step 13
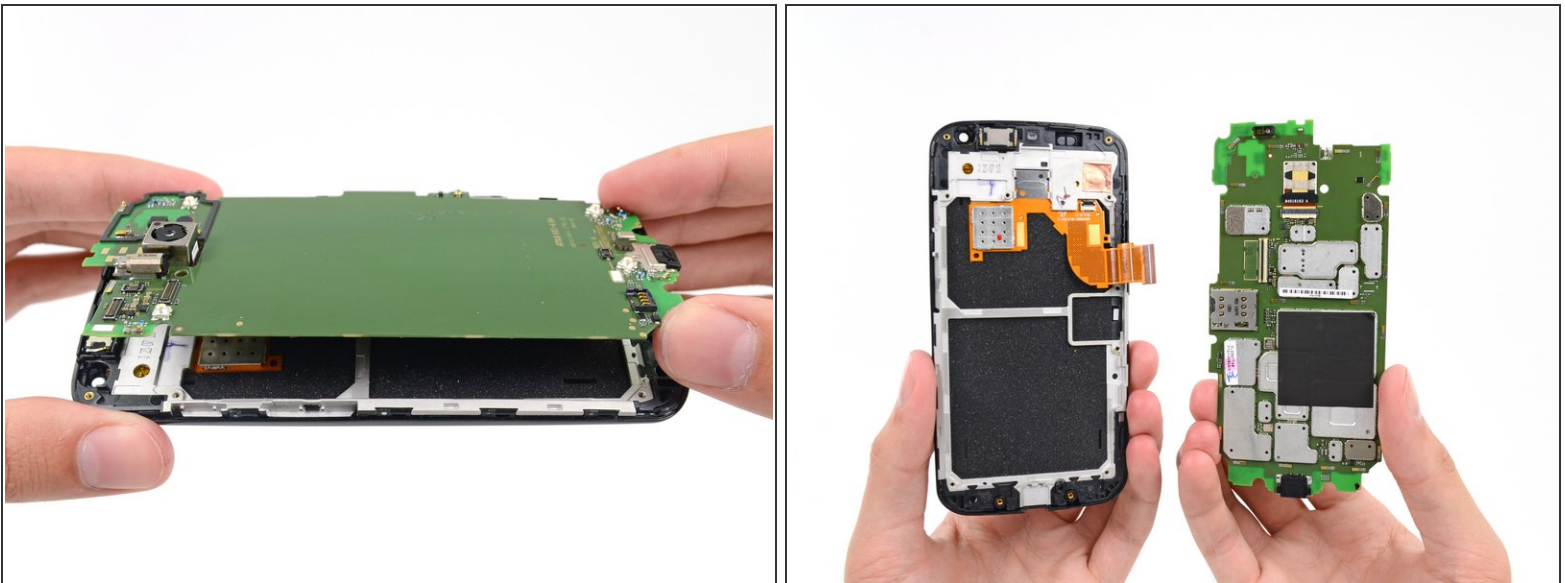
- The motherboard is ours for the taking, and take we will. Let's just hope there's a little more excitement on the other side of the board.

- Alas, the streets of this circuit city are looking a little bare. We're going to guess there's a lot more fun to be found under the myriad EMI shields. Only one way to find out…
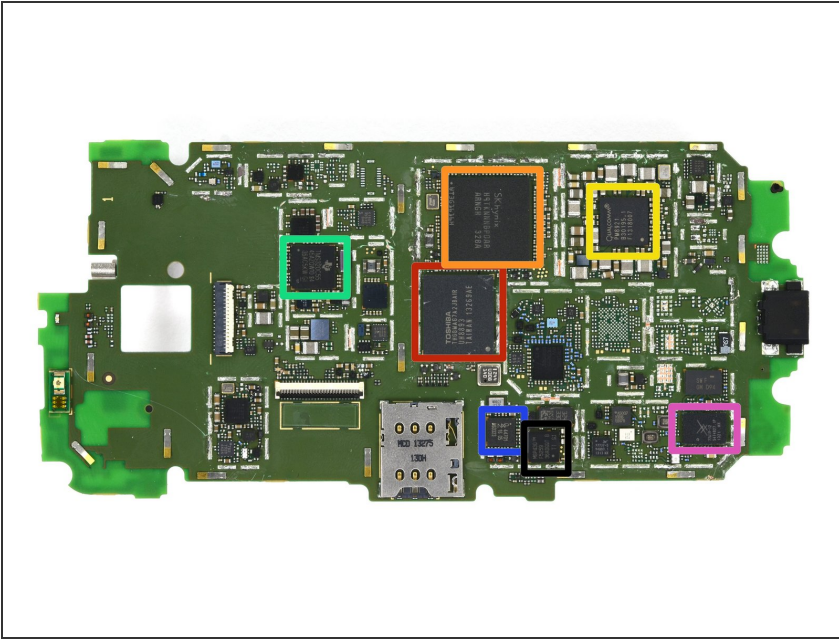
Step 14

- Before we can fully examine the motherboard, though, we must remove the 10 megapixel rear-facing camera.

- 10 MP is 25% more pixels than the camera in the iPhone 5, but isn't quite on the Lumia 1020's level, though we can hardly fault it for that.

Step 15

- Notable ICs on the motherboard:

  - Toshiba THGBMAG7A2JBAIR 16 GB eMMC NAND Flash

  - SK Hynix H9TKNNNBPDAR RAM (we assume that the Snapdragon S4 Pro is also layered under this IC)

  - Qualcomm PM8921 Power Management IC

  - Texas Instruments TMS320C55 Digital Signal Processor

  - NXP 44701 NFC Chip

  - Skyworks 77619-12 Multiband Multimode Power Amplifier Module for Quad-Band GSM / EDGE and Penta-Band (Bands I, II, IV, V, VIII) WCDMA/ HSDPA/ HSUPA/ HSPA+/ LTE

  - Texas Instruments MSP430 F5259 Mixed Signal Microcontroller

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Step 16
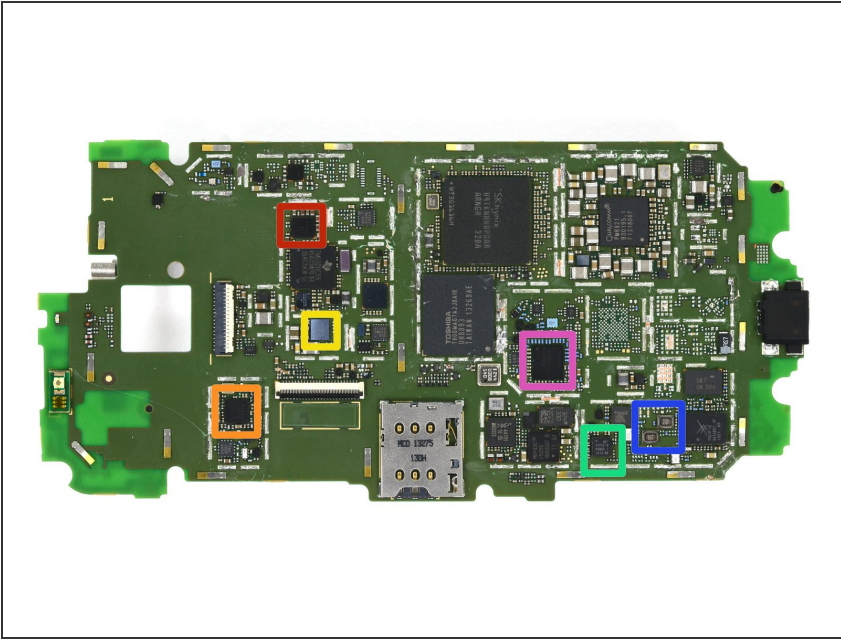
- Additional ICs:
  - Qualcomm [WCD9310](#) Audio Codec
  - Qualcomm [WCN3680](#) 802.11ac Combo Wi-Fi/Bluetooth/FM
  - NXP [TFA9890](#) High Efficiency Class-D Audio Amplifier
  - Skyworks [77737](#) SkyHi™ Power Amplifier Module for LTE Bands 12/17 (698-716 MHz)
  - EPCOS [7959](#) Wireless LAN/Bluetooth Filters (IF)
 - Qualcomm [WTR16505L](#) LTE/HSPA+/CDMA2K/TDSCDMA/ EDGE/GPS Transceiver

Step 17
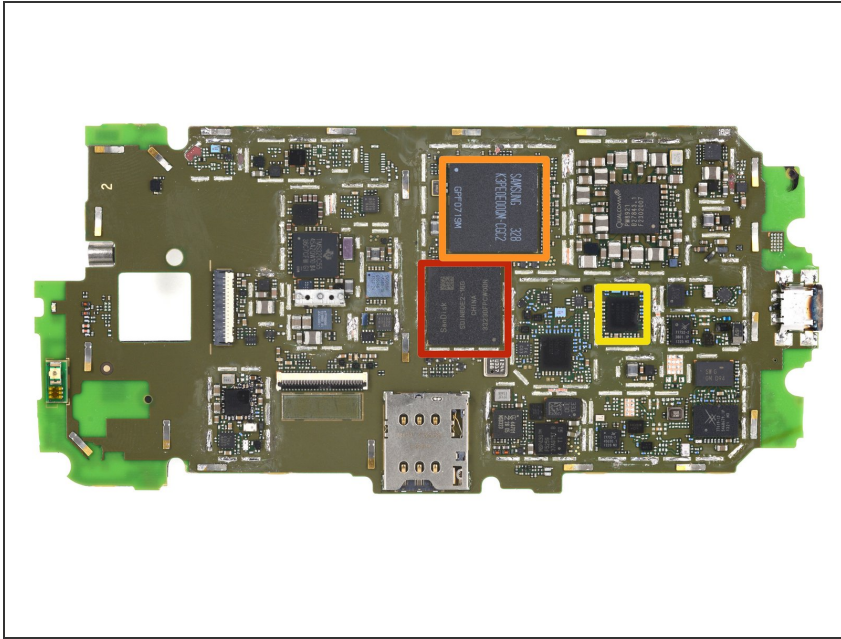
- **Teardown update:** We got ahold of a Verizon version of the Moto-X and played a little game of 'spot the difference' with the motherboard:

  - SanDisk [SDIN8DE2-16G](#) 16 GB NAND Flash replaces the Toshiba

  - Samsung [K3PE0E00QM-CGC2](#) 2 GB LPDDR2 RAM instead of SK Hynix

  - The Verizon model adds another Qualcomm modem, the [WTR1605](#) (in addition to the WTR1606L, possibly used solely for LTE support on this model)

Step 18
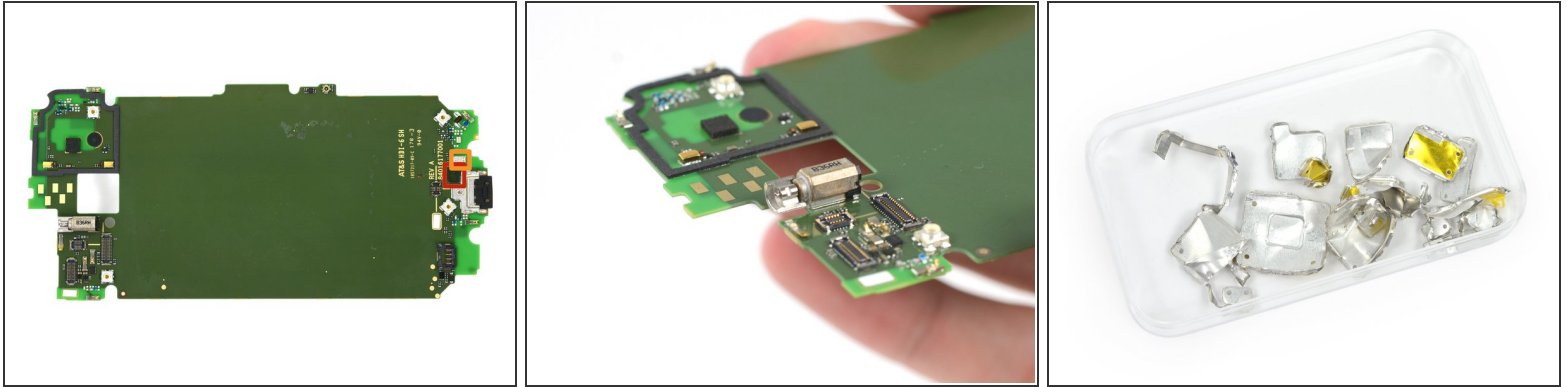
- The back of the motherboard may look bare, but upon closer inspection we found two microphones:

  - Wolfson Microelectronics [WM7121](WM7121) Top Port Analogue Silicon Microphone

  - Wolfson Microelectronics [WM7132](WM7132) Bottom Port Analogue Silicon Microphone

- Motoroogle again shows off its novelty; the X's vibrator motor is soldered right to the motherboard. The wonders never cease.

- Like any good warrior, we hold onto the ~~ears~~ EMI shields of our enemies.

Step 19
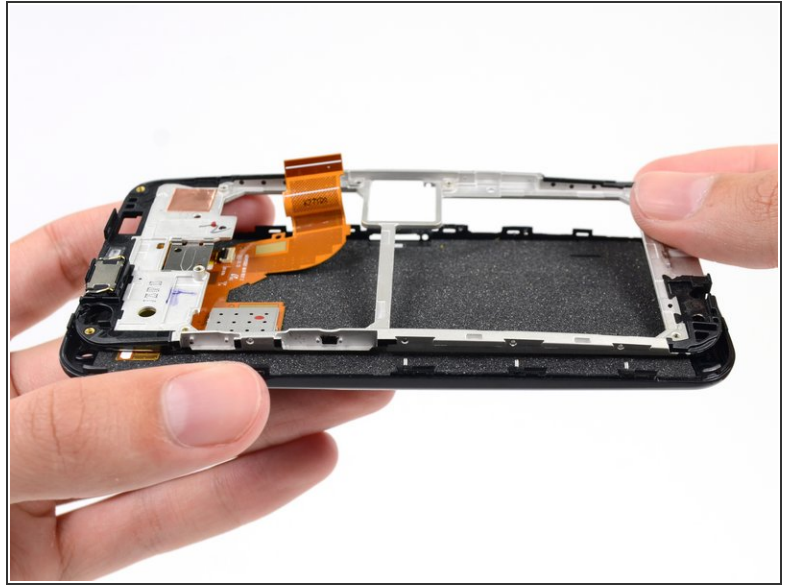
- The mobo is no mo', and we get to examine the backside of the display assembly, which is adorned by some nice comfy foam.

- One thing about this device is certain: the design choices are nothing if not unique. The midframe is held in place by pins protruding from the edges of the display assembly bezel.
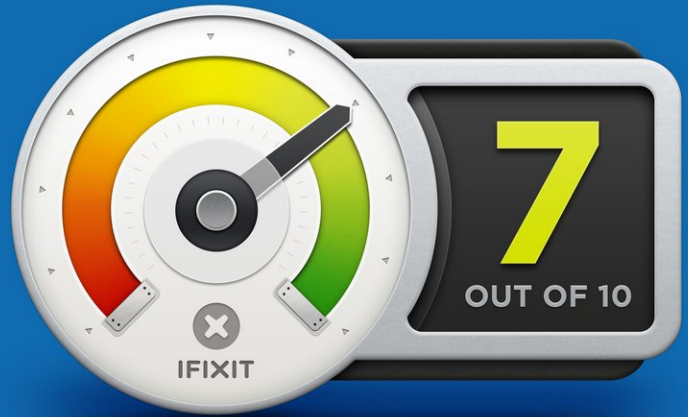
Step 20
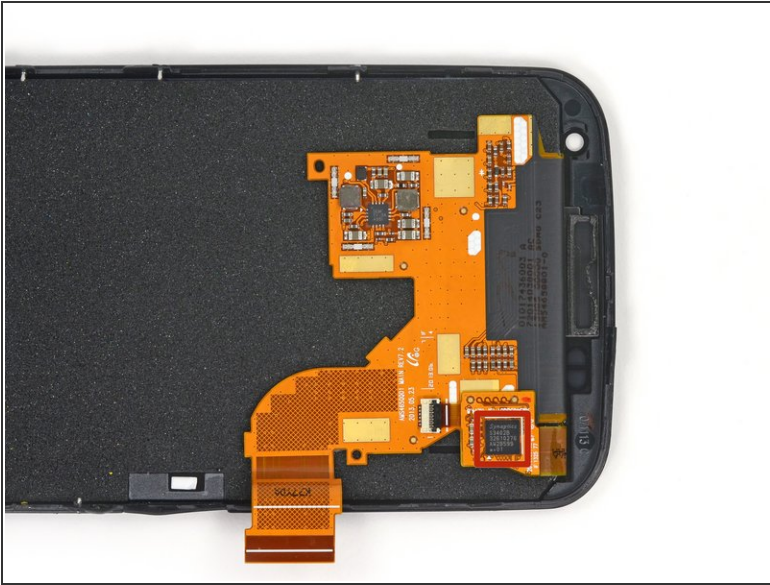
- The hefty display cable assembly is home to the Synaptics touchscreen controller.

- Rumor has it that there's some magic in this display glass, we don't see anything special, what do your elf eyes see?

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Step 21

- Motorola Moto X Repairability Score: **7 out of 10** (10 is easiest to repair)

- Pressure contacts and cable connectors make the modular components (cameras, buttons, headphone jack and speakers) easy to replace.

- The Moto X uses a single kind of screw, although it's a fairly uncommon size (T3).

- The taped-in battery is less accessible than we'd like, but at least it's near the top of the stack once you get the rear cover off (as opposed to the HTC One).

- The digitizer is fused to the display, increasing repair costs for a cracked screen. But the display midframe can be separated, potentially lowering the cost of the replacement part.

- Sticky adhesive on the back cover is annoying and will slow opening the phone.

To reassemble your device, follow these instructions in reverse order.