



# iPad Pro 12.9" Teardown

We've been digging through the cornucopia of...

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## INTRODUCTION

We've been digging through the cornucopia of Apple's fall lineup, and today, we're thankful to have the last morsel on our teardown table. We're wrapping up in the *biggest* way we can—with the iPad Pro, Apple's response to the Surface Pro (which was Microsoft's response to the iPad). Will the new high-end hybrid please repair professionals, or will the iPad Pro prohibit repairs? Stick around and we'll provide all the details.

Apple season may be over, but there's plenty more teardown where that came from. Check us out on [Instagram](#), [Twitter](#), or [Facebook](#) to always get the first look at the latest hardware.

P.S. Thanks for the X-rays, [Creative Electron](#)!

[video: <https://www.youtube.com/watch?v=YES79oiEdtc>]

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### TOOLS:

[iOpener](#) (1)

[iFixit Opening Picks \(Set of 6\)](#) (1)

[Phillips #00 Screwdriver](#) (1)

[Spudger](#) (1)

[Heavy-Duty Suction Cups \(Pair\)](#) (1)

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## Step 1 — iPad Pro 12.9" Teardown



- It's time to pluck the last fall offering from the Apple tree. These are all the juicy details we have so far:
- Fully laminated, 12.9" Multi-Touch LCD with a 2,732 × 2,048 resolution at 264 ppi and anti-reflective coating
- 3rd generation 64-bit A9X chip paired with M9 motion coprocessor
- Self-balancing, four-speaker audio
- 8-megapixel 1080p rear-facing iSight camera + 1.2-megapixel 720p front-facing FaceTime HD camera
- 802.11a/b/g/n/ac MIMO Wi-Fi + Bluetooth 4.2
- Touch ID fingerprint sensor + 3-axis gyro + accelerometer + barometer + ambient light sensor
- 32 GB or 128 GB on-board storage

## Step 2



- This 12.9" display has a prolific number of pixels per inch—264 of them to be exact—just a hair shy of the 267 ppi screen on the [Surface Pro 4](#).
- With Apple's new A9X chip and a 78% larger display, the Pro packs nearly twice the [performance](#) of the iPad Air 2, at less than twice the price.
  - This also means, thanks to [Multitasking](#), you can use a full Air-sized app, and a secondary app *at the same time*.
- ⓘ Hopefully, Apple's engineers have also designed the Pro to be twice as repairable as the difficult-to-repair [iPad Air 2](#).
- Enough about doubling. The Pro's buttons, microphones, and rear-facing camera are the same size and in the same location as the Air 2's setup.

## Step 3



- Peeking along the edge of the iPad, we spot a new accessory port—Apple's Smart Connector—making its debut appearance.
  - ① The Smart Connector supports Apple's own [Smart Keyboard](#) as well as third-party accessories that transfer power and data, like keyboards and docking stations.
- On the bottom edge, two of the four speakers in the highly touted speaker array live on either side of a now-familiar Lightning Connector.
- Turning our attention to the rear case, we find all the usual regulatory information, including a never-before-seen model number: A1584.

## Step 4



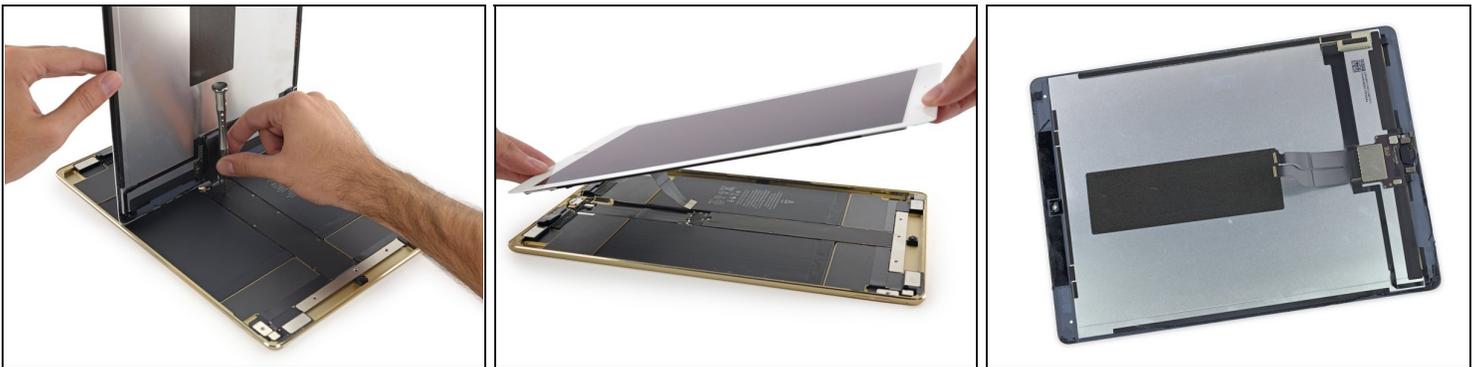
- It's time for a face-off between the two biggest contenders in the tablet category!
- The iPad Pro has a slightly larger 12.9" display—as opposed to the 12.3" display found in the Surface Pro 4.
- Despite the larger screen, the iPad Pro manages to be *lighter* than the Surface Pro 4 (1.57 pounds vs. 1.73 pounds for the i5 and i7 models of the Surface).
- The iPad Pro is also thinner than the Surface, with a thickness of 6.9 mm vs. the Surface's 8.45 mm.
- For the spec geeks out there, the iPad Pro's dimensions are: 305.7 × 220.6 × 6.9 mm, while the Surface Pro 4's dimensions are: 292.10 × 201.42 × 8.45 mm.

## Step 5



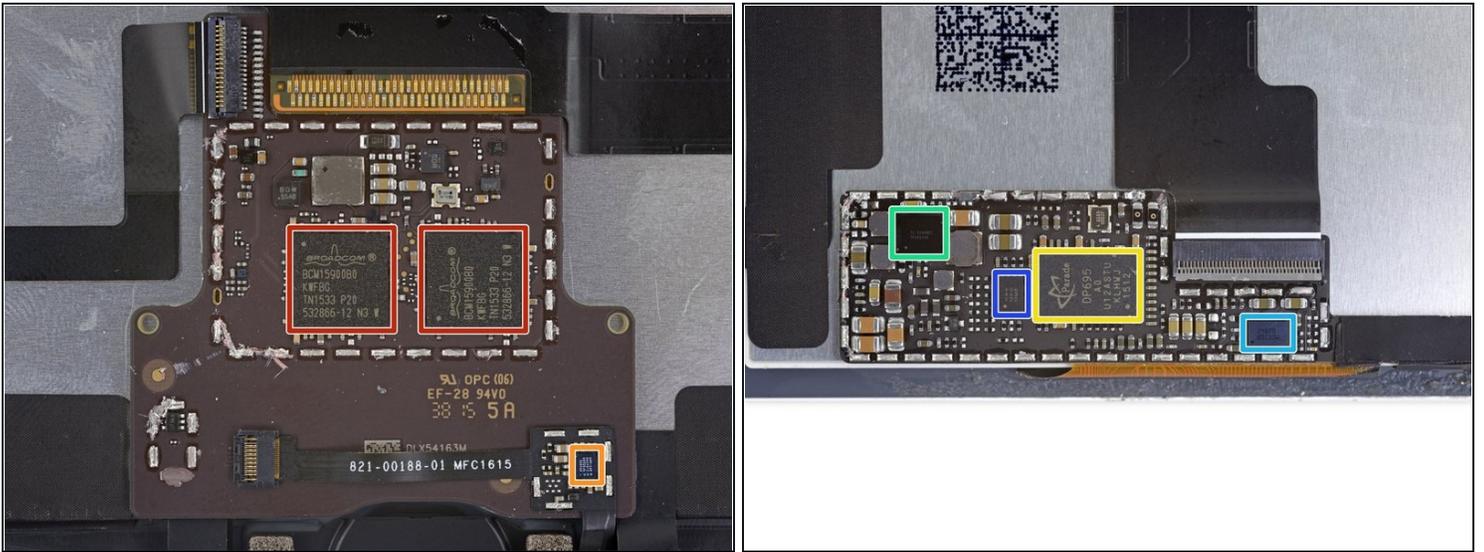
- After a little heat-to-heat with our [iOpener](#), we bring in our opening picks and [heavy duty suction](#) cup to open up the conversation.
- The Pro's display is packing the same adhesive as its smaller counterparts—it's tough and there's way too much—but it's still no match for our seasoned teardown hands.
- With the adhesive finally out of the way, we get our first glimpse of the Pro's interior.

## Step 6



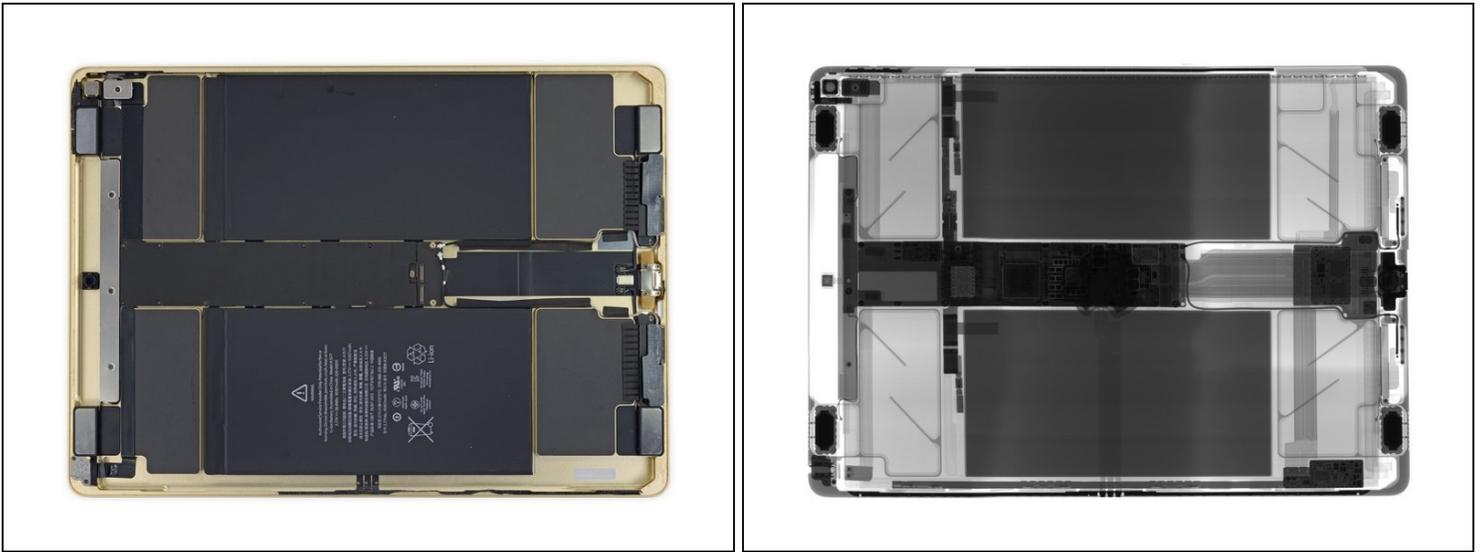
- Now to remove that (massive) display...
- This isn't quite [what we're used to!](#) With the logic board situated in the *center* of the iPad, the display cables connect in the very middle of the device, so we can't even lay the display down while we work.
- Instead, we first have to support the weight of the display while removing the screws that secure the display cable bracket.
  - Is this a giant iPad? Or a giant [iPhone](#)?

## Step 7



- On the back of the display, we find some juicy silicon!
  - 2 × Broadcom BCM15900B0 Touch Screen Controller
  - NXP Semiconductors [8416A1](#) (NVT8416) Touch ID Sensor
  - Parade Technologies DP695 Timing Controller
    - ⓘ Apple says this is an iteration of the DP665 LCD timing controller found in the iMac Retina 5K, modified to support the display's [variable refresh rate](#).
  - Texas Instruments TPS65144 (Likely an iteration of the [TPS65143A](#) LCD Bias found in the Air 2)
  - Renesas (formerly Intersil) ISL24879 precision programmable LCD reference voltage generator
  - Rohm [BR24G64NUX-3A](#) 64 KB Serial EEPROM Memory

## Step 8



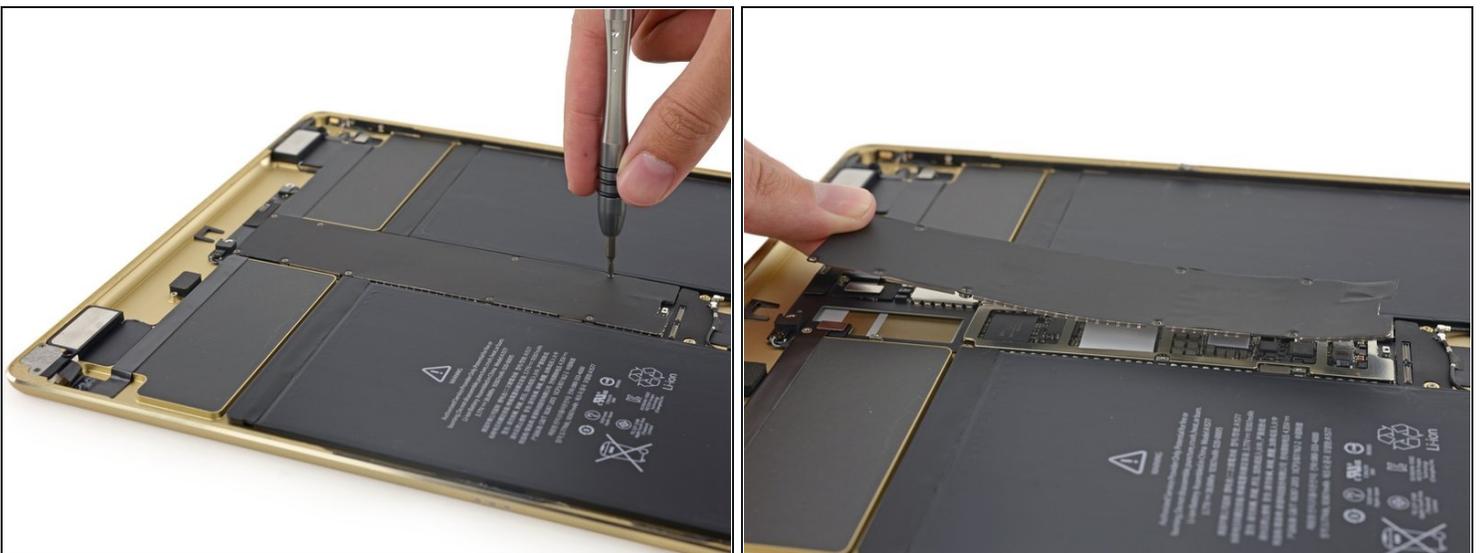
- And now back to the body!
- A logic board relocation isn't the only easily-recognized layout difference between the iPad Pro and previous iPads. While the iPad Air 2's interior real estate was dominated by a [proportionately massive battery](#), the iPad Pro dedicates a significant amount of room to speaker enclosures.
- ① It appears that the Pro's self-balancing, four-speaker audio comes at the cost of battery capacity. Based on our measurements, the speaker enclosures occupy about half as much space as the battery.
- That's space that could have potentially been used for an extra 50% battery capacity. We're sure Apple was very careful setting the balance between battery capacity, weight, and sound quality.

## Step 9



- Next, we lend a hand to the FaceTime HD (left) and iSight cameras, which are trapped behind a bracket not unlike the one we dug up in Microsoft's new [laplet](#).
- While just about everything in this tablet has been billed as bigger and better than previous devices, these cameras seem to be the same as those found in the iPad [Air 2](#).
  - ⓘ For those of you keeping score: the rear-facing camera captures the same 8 MP images and 1080p video at 30 fps, while the front-facing selfie cam shoots identical 1.2 MP images and 720p video.

## Step 10



- Here's a first in iPad history: we have to remove the logic board's [EMI shielding](#) to remove the logic board itself.
  - ⓘ This shielding not only protects the logic board from interference, but also hides cable connectors and secures the logic board to the rear case.

## Step 11



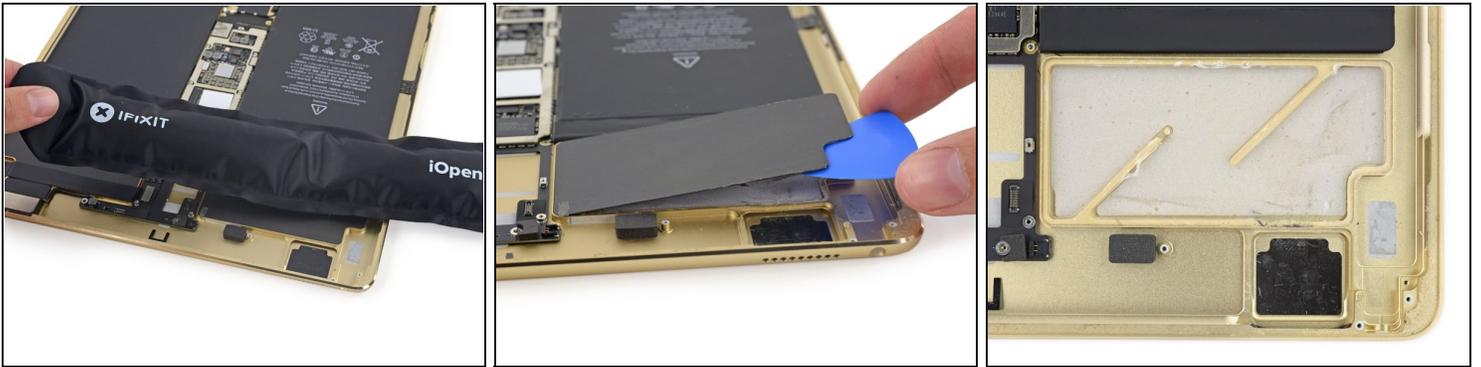
- As we continue to mine deeper into this iPad Pro, the next ~~Barog~~ component we find is the headphone jack.
- Just like the 3.5 mm jack in the [iPad Air 2](#), the ribbon cable on this headphone jack harbors one of the Pro's two front-facing ambient light sensors.

## Step 12



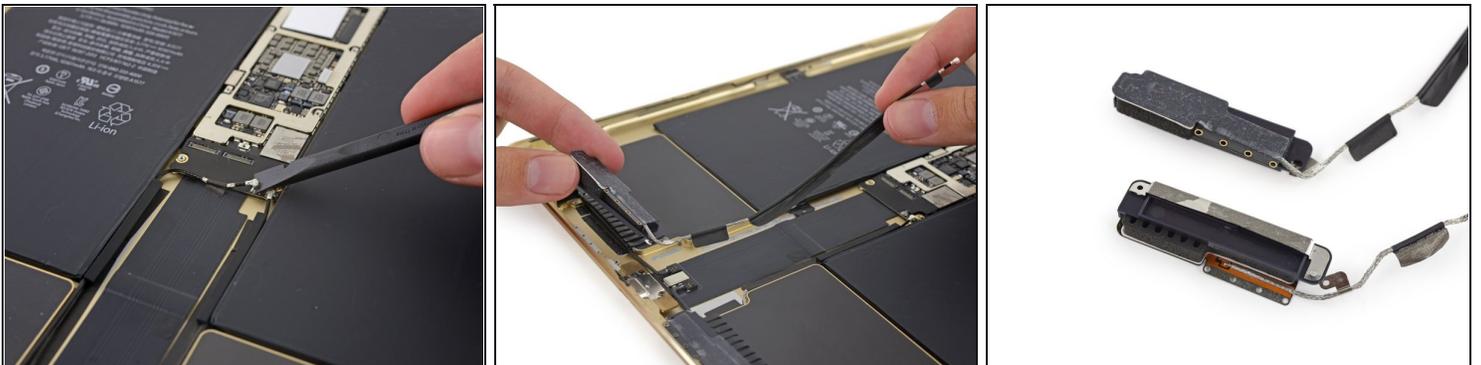
- Finally, we get to (one of) the highly anticipated self-balancing speaker drivers.
  - ① Yes, speaker *drivers*. The whole speaker consists of the driver and its capped resonance chamber. More on those later...
- Although these speakers share a common design, their function changes depending on the tablet's orientation. Whether in portrait or landscape mode, the Pro always sends [higher frequencies](#) to the topmost speakers to produce a more balanced sound.

## Step 13



- The speakers are nice, but what makes them *really* sing are the fancy back volume chambers, machined directly into the unibody enclosure.
  - ① Apple claims that this new design provides up to three times more output than previous iPad models.
- After removing the carbon fiber caps, we find the enclosures are filled with foam. Apple's [own renders](#) don't actually show this foam, but we're betting that it's used to [amplify the effective volume](#) of the enclosure.
- That, or the stuffing indicates Apple got into the Thanksgiving spirit early this year.

## Step 14



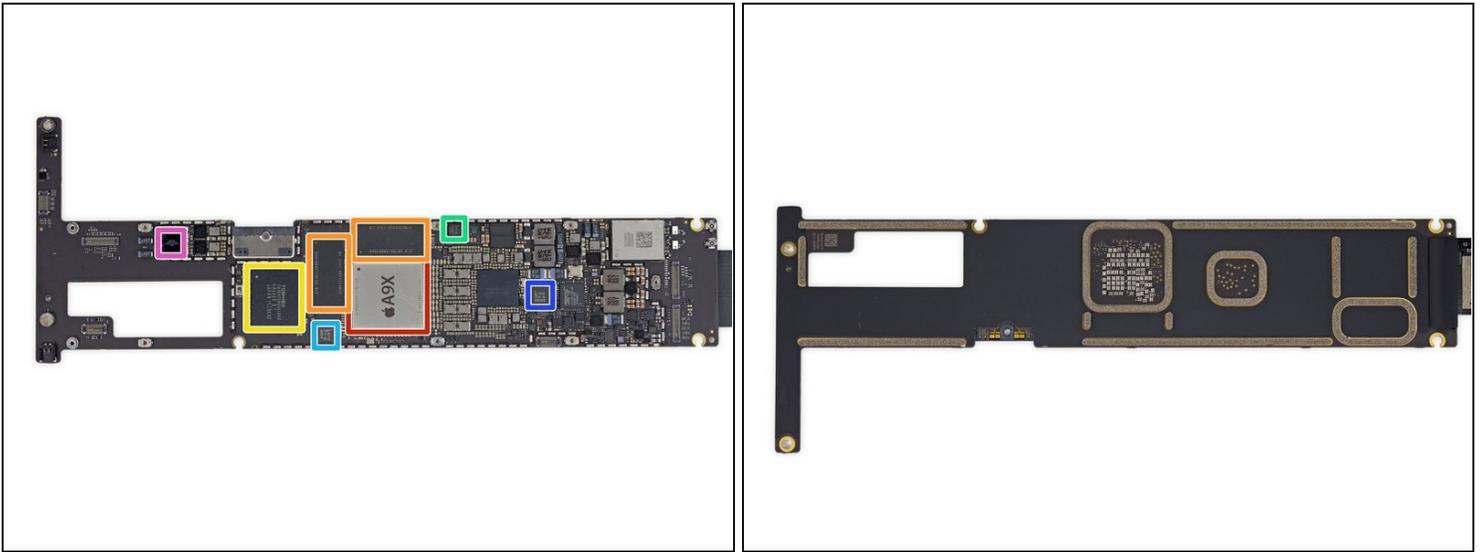
- On our way to the logic board, we stop to smell the ~~flowers~~ antennas.
- Just like the iPad Air 2, the Pro's two antennas use [MIMO technology](#) to provide 802.11ac Wi-Fi speeds of up to 866 Mbps, and LTE speeds of up to 150 Mbps.

## Step 15



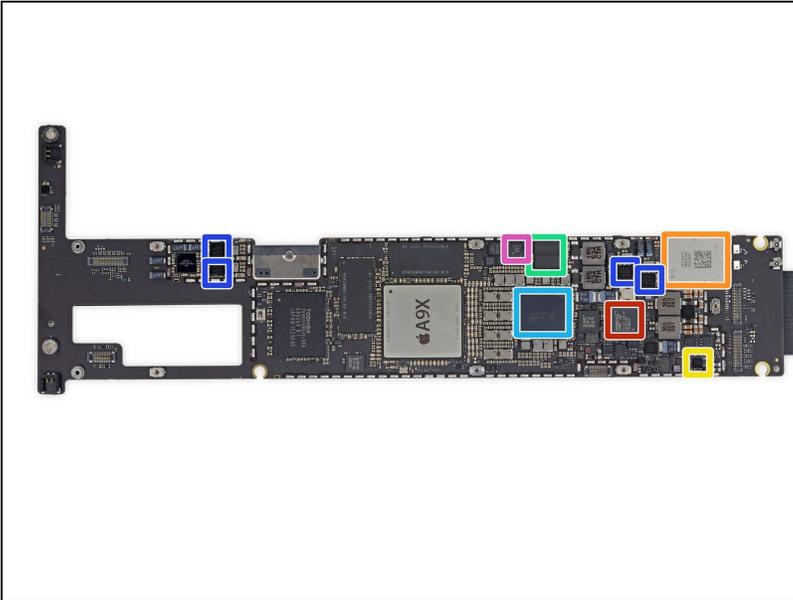
- There are just a few things left standing between us and the logic board.
- A bit of deft spudgering frees the remaining speaker connectors, and a flex cable that appears to run beneath the left battery cell to drive the Smart Connector contacts.
- At long last we've extracted the logic board—and its (sadly) soldered on Lightning connector.

## Step 16



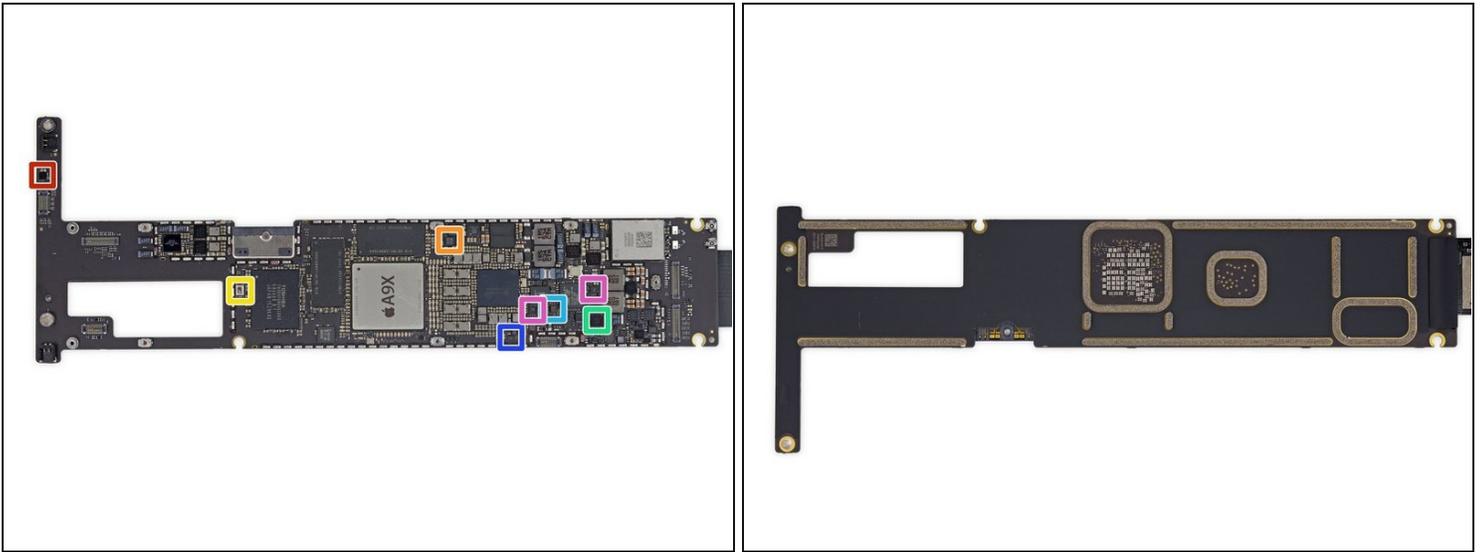
- We've finally found the brains of the operation, the logic board!
  - Apple APL1021 A9X 64-bit Processor
  - SK Hynix H9HCNNNBTUMLNR-NLH 16 Gb (2 GB) LPDDR4 RAM (2 GB × 2 = 4 GB total)
  - Toshiba THGBX5G8D4KLDXG 32 GB NAND Flash
  - InvenSense [MP67B](#) (MPU-6700B) 6-axis Gyroscope and Accelerometer Combo
  - NXP [65V10](#) NFC Controller (also found in the [iPhone 6/6 Plus](#), as well as Nexus [5X](#) and [6P](#) marked NXP 54802)
  - NXP Semiconductors [LPC11U37](#) ARM [Cortex-M0](#) Microcontroller
  - Apple (Cirrus Logic) [338S1213](#) Audio Codec

## Step 17



- Even more chips on the logic board:
  - Fresco Logic [FL1100SX](#) 2-port USB 3.0 Host Controller
  - Universal Scientific Industrial 339S00045 Wi-Fi Module
  - NXP Semiconductor 1610A3 (also found in iPhone 6s/6s Plus, likely an iteration of the [1610A1](#) found in the iPad Mini 4) Display Port Multiplexer (likely)
  - Dialog Semiconductor 343S00025-A1 Power Management
  - Dialog Semiconductor 343S00052-A1
  - Maxim Integrated MAX98721CEWV (likely an iteration of the [MAX98721BEWV](#) found in the iPad Air 2) Audio Amplifier
  - Fairchild Semiconductor FDMC 6683 MOSFET

## Step 18



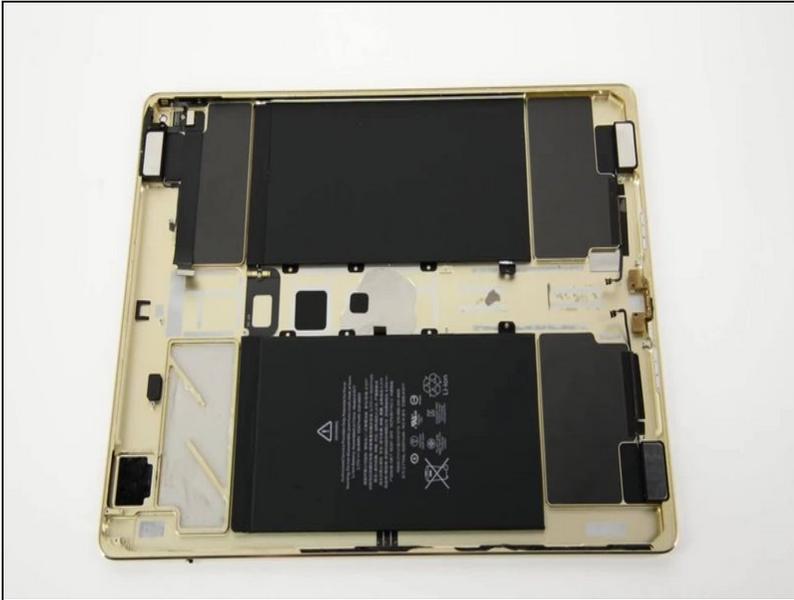
- Even, even more chips on the logic board:
  - AKM Semiconductor [AK8963C](#) 3-Axis Electronic Compass
  - Bosch Sensortec [BMA282](#) Accelerometer
  - Bosch Sensortec [BMP282](#) Pressure Sensor
  - STMicroelectronics [STM32L052T8](#) 32-Bit Arm Cortex-M0+ Microcontroller w/ 64 Kb Flash
  - Diodes Incorporated [PI3USB102E](#) 480 Mbps USB 2.0 Switch
  - Texas Instruments [TPS3898](#) Adjustable Voltage Monitor
  - ON Semiconductor [FXMA2102](#) 2-Bit Voltage Translator/Buffer/Repeater Isolator

## Step 19



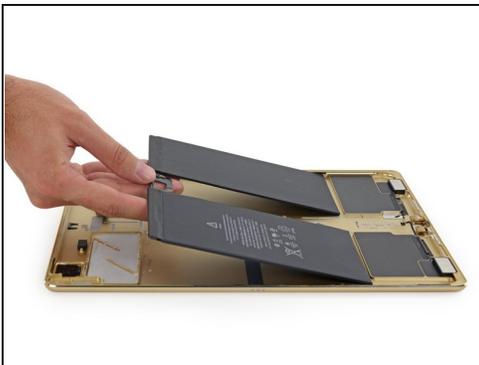
- [Great Scott!](#) Do our eyes deceive us?
- We must have been extra good this year—we've received the gift of adhesive pull tabs under *iPad batteries*.
  - We've only been asking for iPad tabs since the very first pull tabs showed up in the [iPhone 5s](#)...
- These new pull tabs are even cooler than their iPhone counterparts; there's no need to worry about tweezer grip or stubby fingers—these tabs have a handy spudger hole!

## Step 20



- We have so much fun pulling out these adhesive tabs that we thought we'd include a video.
- ⓘ And unlike on iPhones where we only get two or three tabs to tug, the iPad Pro comes with *eight*.

## Step 21



- Thanks to those pull tabs, the battery is freed with ease.
- The iPad Pro's 3.77 V battery weighs in at an impressive 10307 mAh.
  - ⓘ This prodigious, 38.8 Wh power source offers a 40 percent increase over the 27.62 Wh battery in the [iPad Air 2](#), but just barely edges out the 38.2 Wh battery we found in the [Surface Pro 4](#).
- In addition to some obscure markings, the underside of the battery still bears the anchoring strips(?) for the adhesive pull tabs.

## Step 22



- The last component we'll try to remove on the road to teardown glory is the Smart Connector port cable.
  - "Try" being the operative word...
  - There are no visible screws, and after a lot of Jedi mind tricks, i.e. elbow grease (and totally mangling the cable bracket), the port is still not budging.
  - After literally smashing the contacts through with a hammer, we manage to free the cable.
- ⓘ Check that crusty glue! Gross!

## Step 23



## REPAIRABILITY SCORE:



- iPad Pro Repairability Score: **3 out of 10** (10 is easiest to repair)
    - The battery is not soldered to the logic board, and can now be removed with adhesive tabs, greatly simplifying battery removal.
    - The Smart Connector port is virtually impossible to replace—but incorporates no moving parts and is unlikely to fail.
    - The LCD and front panel glass are fused together. This slightly simplifies the opening procedure.
    - The fused front panel increases the cost of screen repair, and the risk of damaging the LCD when opening.
    - Gobs of adhesive hold everything in place making all repairs more difficult.
-