Retina MacBook 2016 Teardown

Teardown of the Retina Macbook 2016 performed on April 21, 2016.

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INTRODUCTION

A year after release, Apple just announced its first update to the 12" MacBook with Retina Display. It's sort of a baby update, so we decided to match it with a baby teardown. Besides a faster processor and zippier flash memory, what changed? There's only one way to know: crack it open and spill its secrets. Join us for a mini-teardown of the Retina MacBook 2016.

For a no-holds-barred disassembly of the initial Retina MacBook release, check out our Retina MacBook 2015 teardown.

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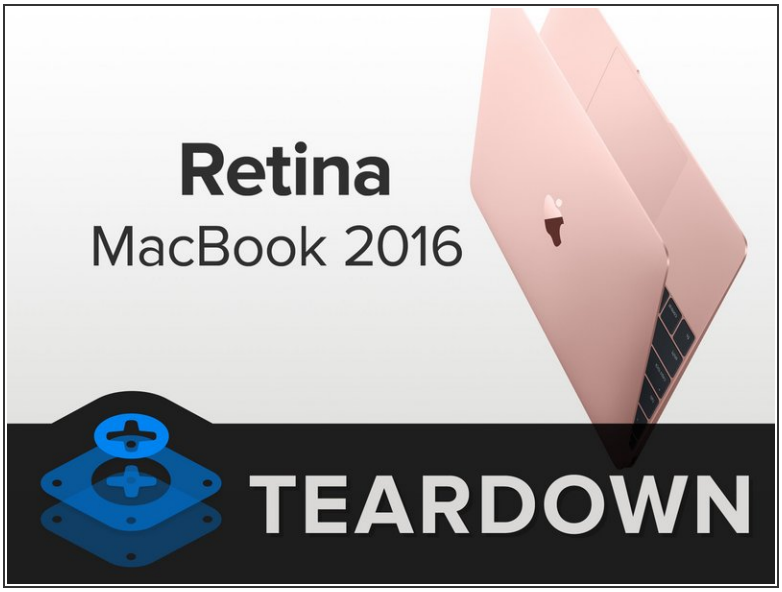
TOOLS:

- P5 Pentalobe Screwdriver Retina MacBook Pro and Air (1)
- T5 Torx Screwdriver (1)
- Spudger (1)
- Tweezers (1)
- iPad Battery Isolation Pick (1)
- Phillips #00 Screwdriver (1)
- T8 Torx Screwdriver (1)

Step 1 — Retina MacBook 2016 Teardown



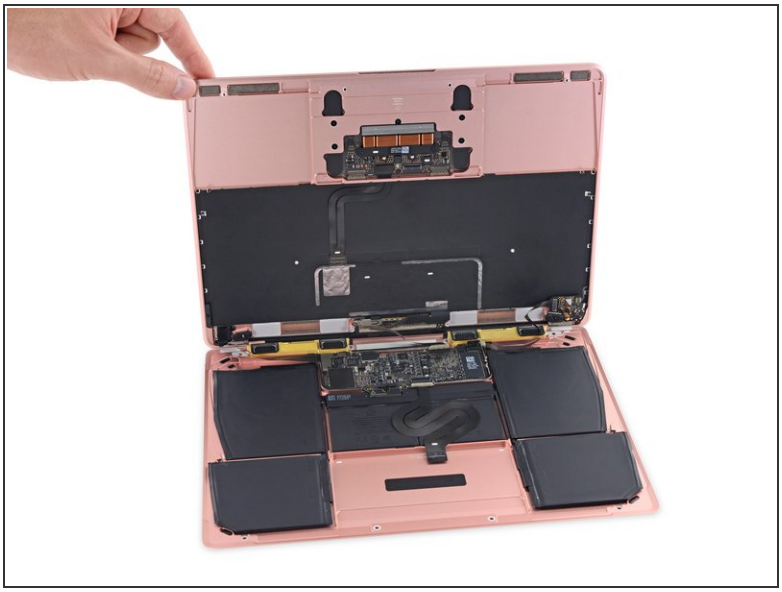
- With the MacBook jumping on the Rose Gold bandwagon, who knows what's lurking *inside*? Here's the lowdown so far:
  - 12-inch 2304 × 1440 (226 ppi) IPS Retina Display
  - 1.1 GHz dual-core Intel Core m3 processor (configurable up to 1.3 GHz dual-core Intel Core m7)
  - 8 GB of 1866 MHz LPDDR3 RAM
  - 256 or 512 GB PCIe-based flash storage
  - Intel HD Graphics 515
  - 802.11a/b/g/n/ac Wi-Fi wireless networking and Bluetooth 4.0
  - Single USB-C port and 3.5 mm headphone jack

Step 2

- If it weren't for the rose gold finish, we'd be hard-pressed to distinguish between this year's Retina MacBook, and the one of yesteryear.
- The exteriors look identical, from the Pentalobe screws in the lower case all the way down to the model number—A1534.

The only telltale sign that something's different is the updated EMC number: 2991 compared to last year's 2746.

Step 3

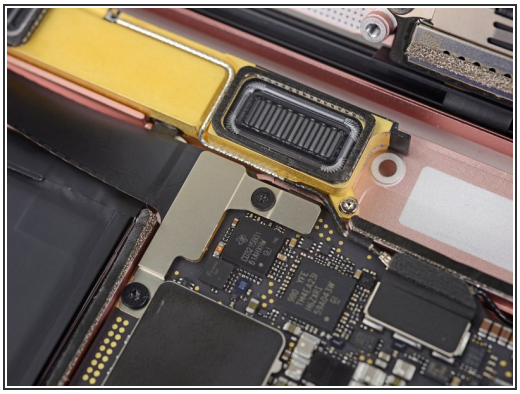
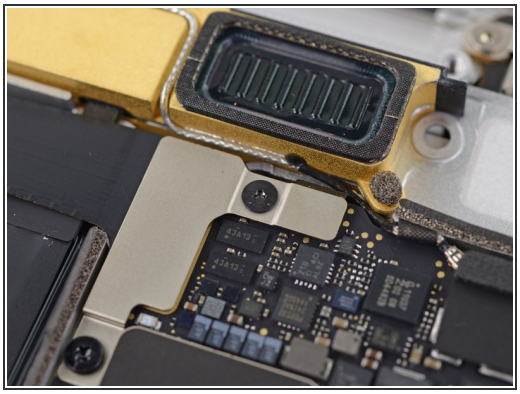
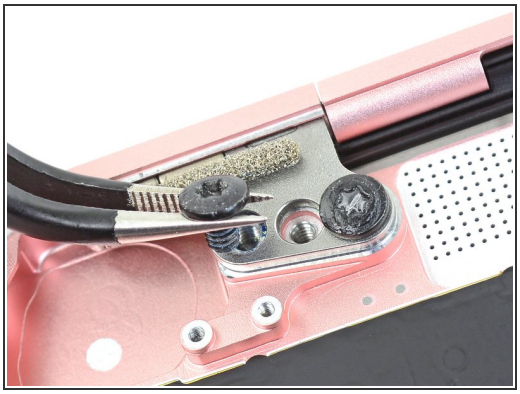


- Popping the hood on this MacBook gives us an indication that the rose gold beauty is much more than skin deep.
- Before delving any deeper into *this* beauty, we take a quick look at the chips powering the trackpad:
  - Broadcom BCM5976 touchscreen controller
  - STMicroelectronics STM32F103 32-bit ARM Cortex-M3 microcontroller
  - Monolithic Power Systems MP24830HL White LED driver and International Rectifier IRFH3702 power MOSFET
  - Maxim Integrated MAX11290 analog-to-digital converter (likely)
  - Macronix MX25L2006EZUI-12G 2 Mb Serial NOR flash memory
  - Maxim Integrated MAX9028 comparator

Step 4

- Touchpad sensors:
  - Bosch Sensortec BMA282 accelerometer
  - Texas Instruments TMP421 temperature sensor

Step 5

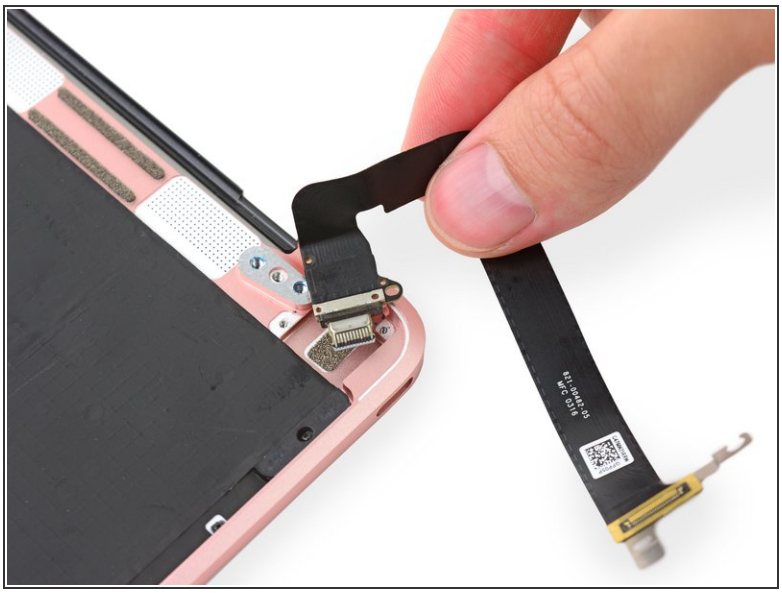
- *What's that?* The pesky tri-wing screw we saw last year grew another, um, wing—now it's a regular ol' repair-friendly Phillips.

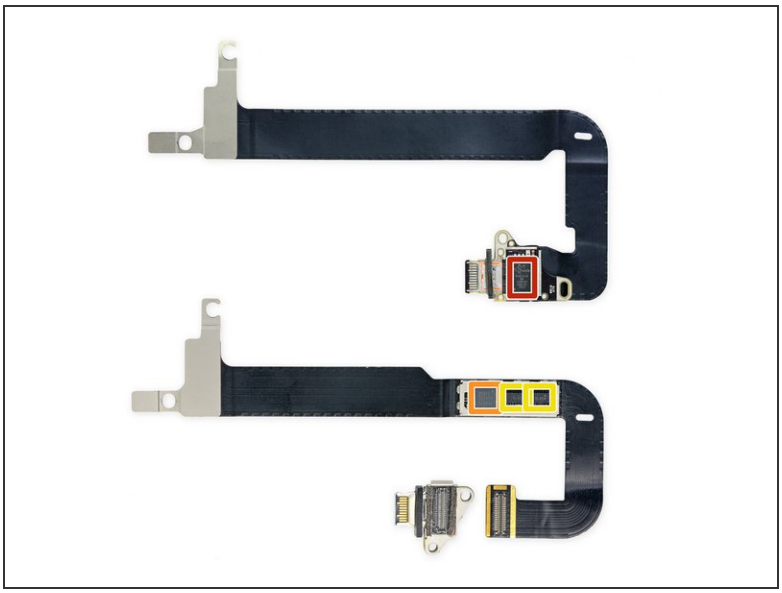
  If you weren't put off by the Pentalobes on the lower case, then a tri-wing probably won't slow you down much—but hey, we'll take what we can get!

- Thankfully, all the other internal screws remain standard Phillips and Torx screws.

However, another surprise awaits at the hinge screws, whose Torx heads are filled with some sort of substance that disintegrates when you insert a screwdriver. Are you sealing our MacBook with tamper-evident screws, Apple?

Step 6

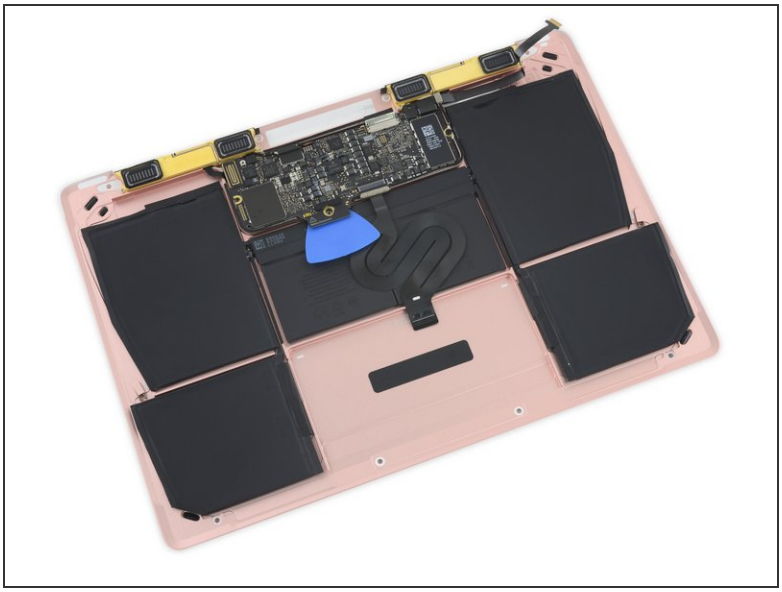




- And at the other end of the MacBook, it seems the USB-C hardware has also changed. The cable is now perma-fixed to the USB board, condensing the two components into a single unit.
- ...Also, the silicon is new and moved from the cable itself to the USB board. Here's a comparison of the new USB-C hardware (top) with that of the 2015 Retina MacBook (bottom).
  - Parade Technologies PS8741A (likely an iteration of the PS8740 USB-C redriving switch)
  - Diodes Incorporated PI1EQX7502 USB 3.0 redriver (likely)
  - NXP Semiconductor CBTL04043A1 4-Ch. bidirectional crossbar switch

This new USB and cable arrangement is one thing that's *not* compatible with previous Retina MacBooks.

Step 7

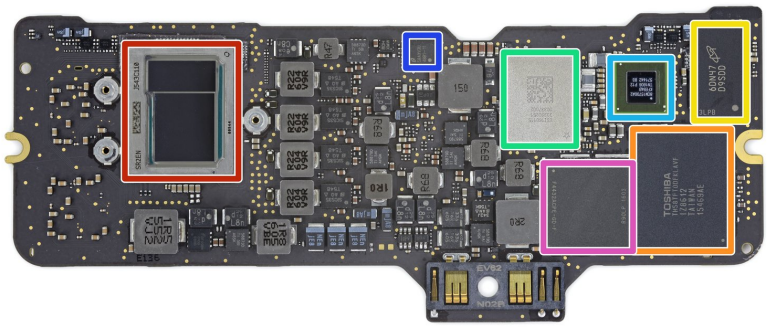


- The battery's form factor seems 100% identical to the multi-lobed cell we found in the 2015 Macbook.
- And yet somehow, Apple managed to squeeze in a 4% capacity increase from the 7.55 V, 39.71 Wh battery in last year's model. Apple claims this new 7.56 V, 41.41 Wh Li-ion power source should provide up to 11 hours of iTunes movie playback.

  We're guessing this capacity increase is owed to improved battery chemistry (though it's also possible that Apple's engineers have shaved away *just* enough material from the lower case to allow for a thicker battery).
- Unfortunately, they did *not* squeeze in any of those nifty adhesive pull tabs we've seen in Apple's iDevices.

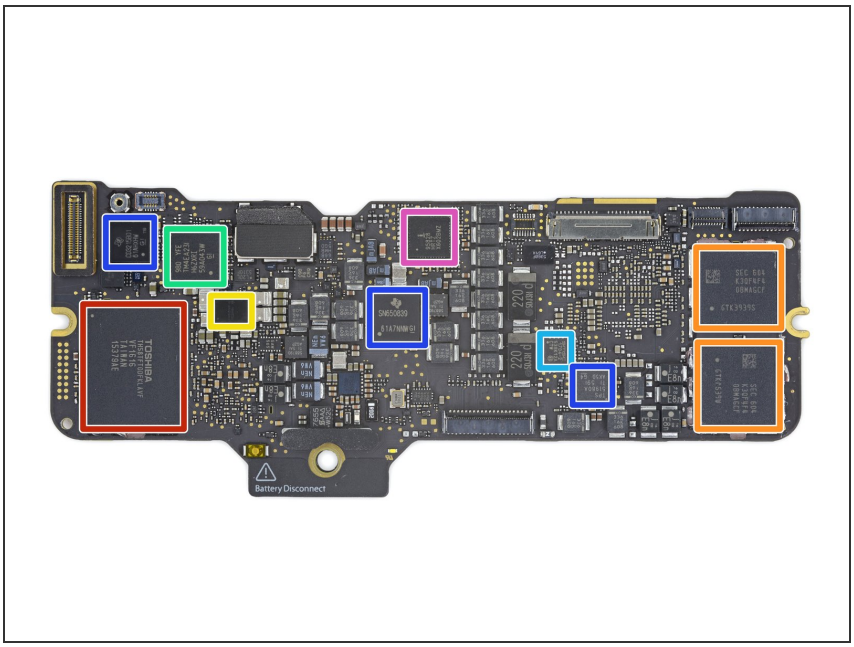
Regardless, our tests indicate this beefier battery is compatible with last year's MacBook. Nice!

Step 8



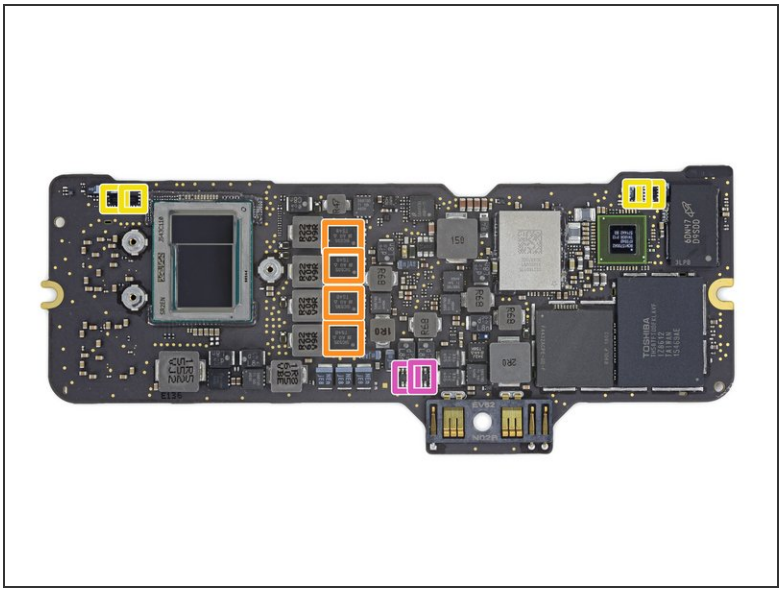
- Logic Board! What chips is *this* MacBook serving up?
  - Intel SR2EN Intel Core m3-6Y30 Processor (4M Cache, up to 2.20 GHz)
  - Toshiba TH58TFT0DFKLAVF 128 GB MLC NAND Flash (+ 128 GB on the reverse side for a total of 256 GB)
  - Micron MT41K256M16LY-107:N 512 Mb DDR3L SDRAM memory
  - Universal Scientific Industrial 339S0250 Wi-Fi module
  - Broadcom BCM15700A2 (as seen in several other MacBook models) webcam controller (likely)
  - National Semiconductor 48B1-11 (LP8548B1) backlight driver
  - Micron EDF4432ACPE-GD-F 4 GB LPDDR3 SDRAM Memory (with SSD controller presumably layered underneath)

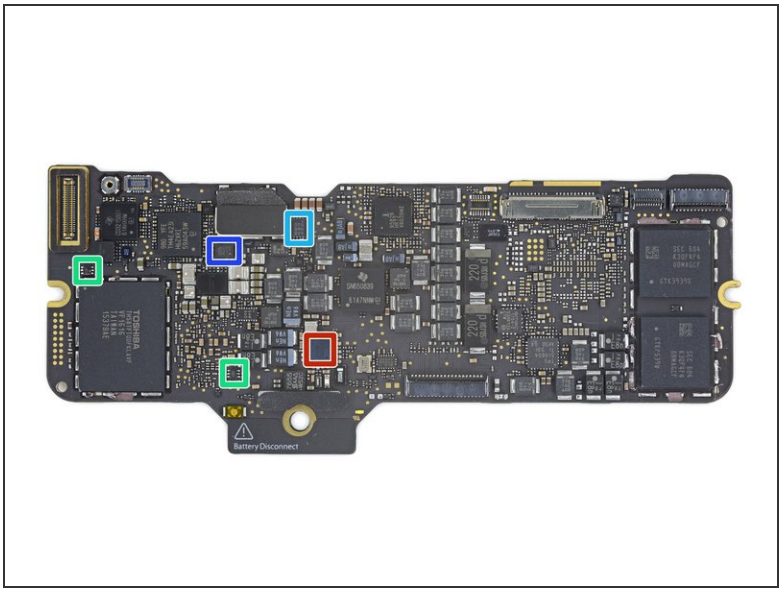
Step 9



- But wait, there's even more chips on the back:
  - Toshiba TH58TFT0DFKLAVF 128 GB MLC NAND flash memory
  - Samsung K3QF4F40BM-AGCF 4 GB LPDDR3 SDRAM (x2, for a total of 8 GB)
  - Apple 338S00066 power management IC
  - Texas Instruments/Stellaris LM4FS1EH SMC controller (replacement codename for TM4EA231)
  - Microchip (formerly SMSC) EMC1704-2 temperature sensor
  - Texas Instruments SN650839 step down DC-DC converter (likely), TPS51980A PMIC, and CD3215B01 USB-C controller
  - Intersil ISL95828 Intel CPU PWM controller

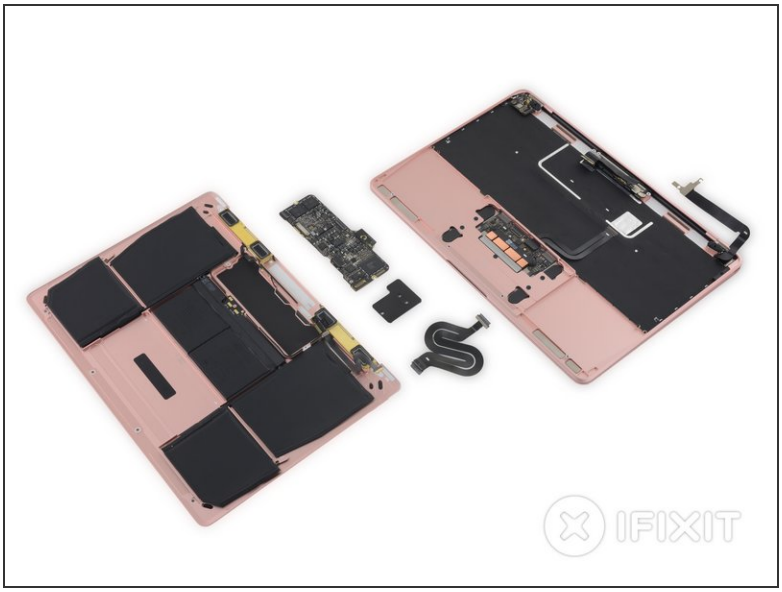
Step 10





- IC identification, continued:
  - Renesas ISL95530 battery charger
  - Vishay SiC535 power stage
  - Maxim Integrated MAX98357B audio amplifier
  - Texas Instruments TMP102 temperature sensor
  - Microchip (formerly Atmel) AT93C66B 4 K serial EEPROM memory
  - Macronix MX25L2006EZUI-12G 2 Mb flash memory
  - Texas Instruments INA211 and INA214 current sense amplifier

Step 11



- Retina Macbook 2016 Repairability Score: **1 out of 10** (10 is the easiest to repair)
  - Those pesky tri-wing screws are gone, replaced with lovely standard Phillips screws—but tamper-evident hinge screws make you feel like a hoodlum for repairing your own machine.
  - The processor, RAM, and flash memory are still soldered to the logic board.
  - The battery assembly remains entirely, and very solidly, glued into the lower case.
  - The Retina display is still a fused unit with no separate, protective glass. If the display needs replacing, it'll cost a pretty penny.

While it's no more repairable than last year's edition, it does benefit from sharing a lot of the same parts and repair procedures.