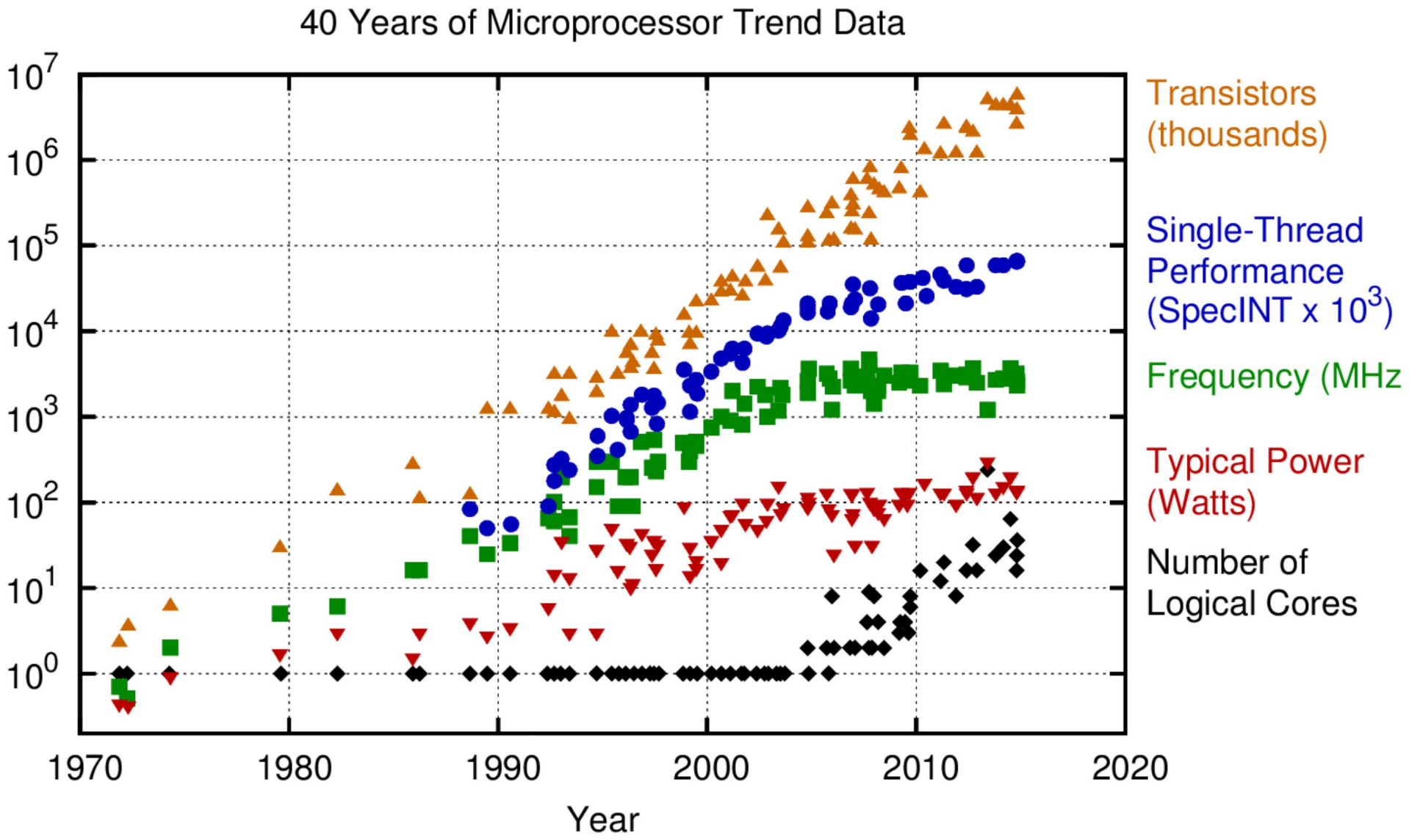
EECS16B

Sept. 1, 2020

https://www.karlrupp.net/wp-content/uploads/2015/06/40-years-processor-trend.png

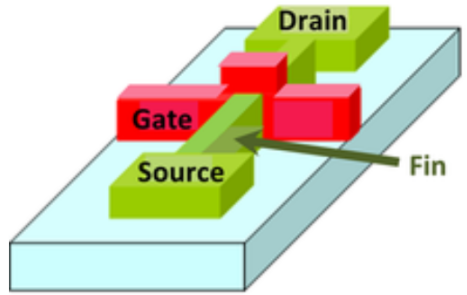


FinFET

https://en.m.wikipedia.org/wiki/FinFET

Language Watch Edit

A **fin field-effect transistor** (**FinFET**) is a multigate device, a MOSFET (metal-oxide-semiconductor field-effect transistor) built on a substrate where the gate is placed on two, three, or four sides of the channel or wrapped around the channel, forming a double gate structure. These devices have been given the generic name "finfets" because the source/drain region forms fins on the silicon surface. The FinFET devices have significantly faster switching times and higher current density than planar CMOS (complementary metal-oxide-semiconductor) technology.



A double-gate FinFET device

FinFET is a type of non-planar transistor, or "3D" transistor.[1] It is the basis for modern nanoelectronic semiconductor device fabrication. Microchips utilizing FinFET gates first became commercialized in the first half of the 2010s, and became the dominant gate design at 14 nm, 10 nm and 7 nm process nodes.

Contents

The potential of Digh Hisamoto's research on DELTA transistors drew the attention of the Defense Advanced Research Projects Agency (DARPA), which in 1997 awarded a contract to a research group at UC Berkeley to develop a deep sub-micron transistor based on DELTA technology.[10] The group was led by Hisamoto along with TSMC's Chenming Hu. The team made the following breakthroughs between 1998 and 2004.[11]

- 1998 – N-channel FinFET (17 nm) – Digh Hisamoto, Chenming Hu, Tsu-Jae King Liu, Jeffrey Bokor, Wen-Chin Lee, Jakub Kedzierski, Erik Anderson, Hideki Takeuchi, Kazuya Asano[12]
- 1999 – P-channel FinFET (sub-50 nm) – Digh Hisamoto, Chenming Hu, Xuejue Huang, Wen-Chin Lee, Charles Kuo, Leland Chang, Jakub Kedzierski, Erik Anderson, Hideki Takeuchi[13]
- 2001 – 15 nm FinFET – Chenming Hu, Yang-Kyu Choi, Nick Lindert, P. Xuan, S. Tang, D. Ha, Erik Anderson, Tsu-Jae King Liu, Jeffrey Bokor[14]
- 2002 – 10 nm FinFET – Shibly Ahmed, Scott Bell, Cyrus Tabery, Jeffrey Bokor, David Kyser, Chenming Hu, Tsu-Jae King Liu, Bin Yu, Leland Chang[15]
- 2004 – High-κ/metal gate FinFET – D. Ha, Hideki Takeuchi, Yang-Kyu Choi, Tsu-Jae King Liu, W. Bai, D.-L. Kwong, A. Agarwal, M. Ameen

They coined the term "FinFET" (fin field-effect transistor) in a December 2000 paper,[16] used to describe a non-planar, double-gate transistor built on an SOI substrate.[17]

https://www.techinsights.com/blog/apple-iphone-11-pro-max-teardown

Apple iPhone 11 Pro Max Teardown

Posted: September 23, 2019 - Updated: October 1, 2019
Contributing Authors: Daniel Yang, Stacy Wegner, Albert Cowsky

We are always excited to see a new Apple iPhone, and this year's iPhone 11 line is no exception. This is the first ever Apple event to launch an iPhone with three rear cameras. There is also the mysterious U1 chip which appeared on screen at the Apple event, but which no one on stage made mention of. And, let's not forget Apple is replacing the 7000 grade Aluminum body with 100% recycled aluminum - a choice aimed at environmental responsibility.

The iPhone 11 Pro Max we have in our hands is a Midnight Green Model A2161 with 512 GB of storage.



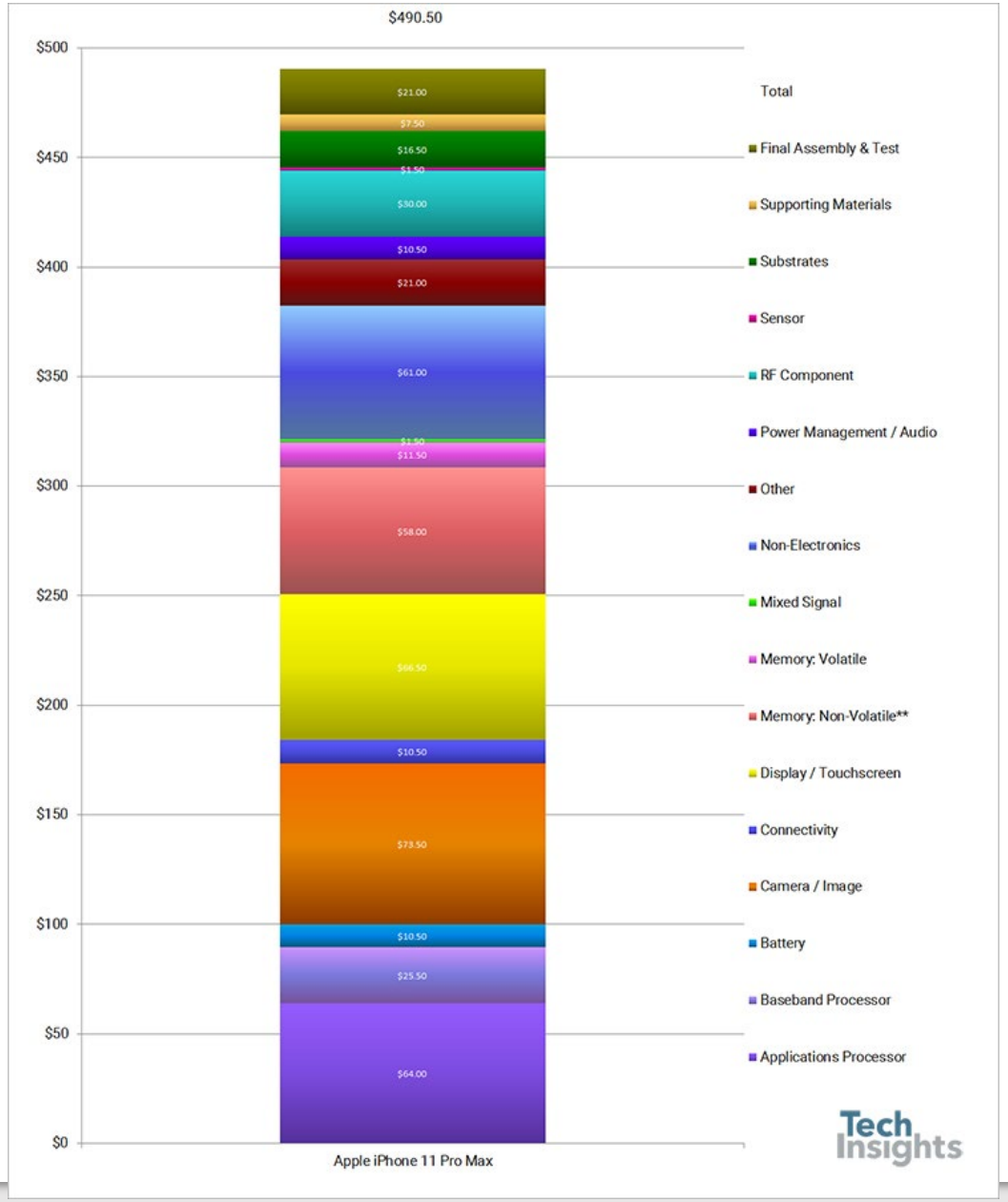


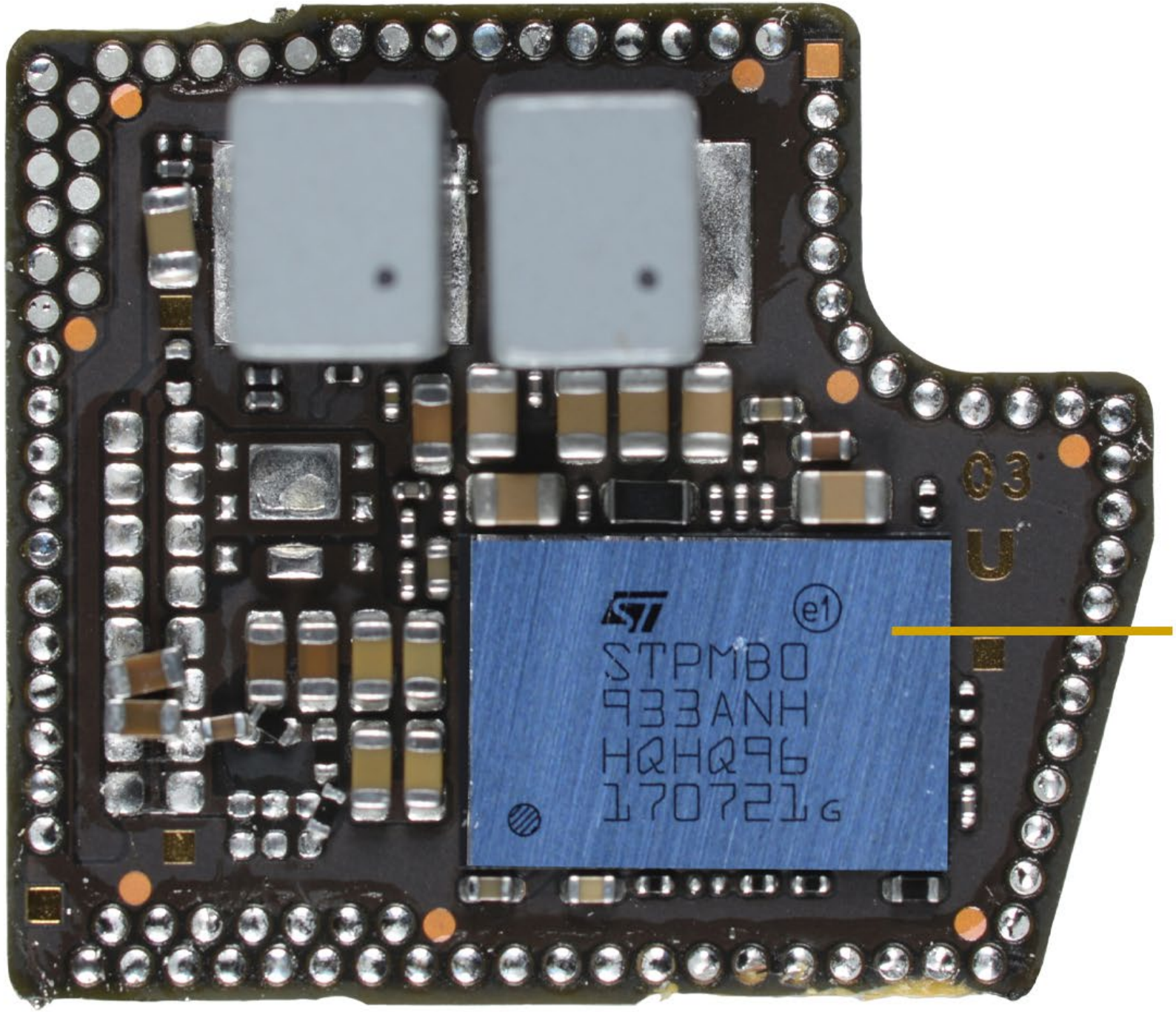

Board Images

The following annotated board images show the design wins we have identified so far.

Design Wins
ST Microlectronics STPMB0 Wireless Charging Receiver IC


Rechargeable
Li-ion Battery 616-00651
3.79V ⎓ 15.04Wh
WARNING
Authorized Service Provider
Only, Potential for fire or burning,
Do not disassemble, puncture, crush,
heat, or burn. Avert Statement
Li-ion
TAPTIC ENGINE


$490.50
$500
$450
$400
$350
$300
$250
$200
$150
$100
$50
$0
$21.00
$7.50
$16.50
$1.50
$30.00
$10.50
$21.00
$61.00
$1.50
$11.50
$58.00
$66.50
$10.50
$73.50
$10.50
$25.50
$64.00
Total
Final Assembly & Test
Supporting Materials
Substrates
Sensor
RF Component
Power Management / Audio
Other
Non-Electronics
Mixed Signal
Memory: Volatile
Memory: Non-Volatile**
Display / Touchscreen
Connectivity
Camera / Image
Battery
Baseband Processor
Applications Processor
Tech Insights
Apple iPhone 11 Pro Max



STM STPMB0
Wireless Charging Receiver IC
(likely)

Skyworks SKY78223-17
Front-End Module

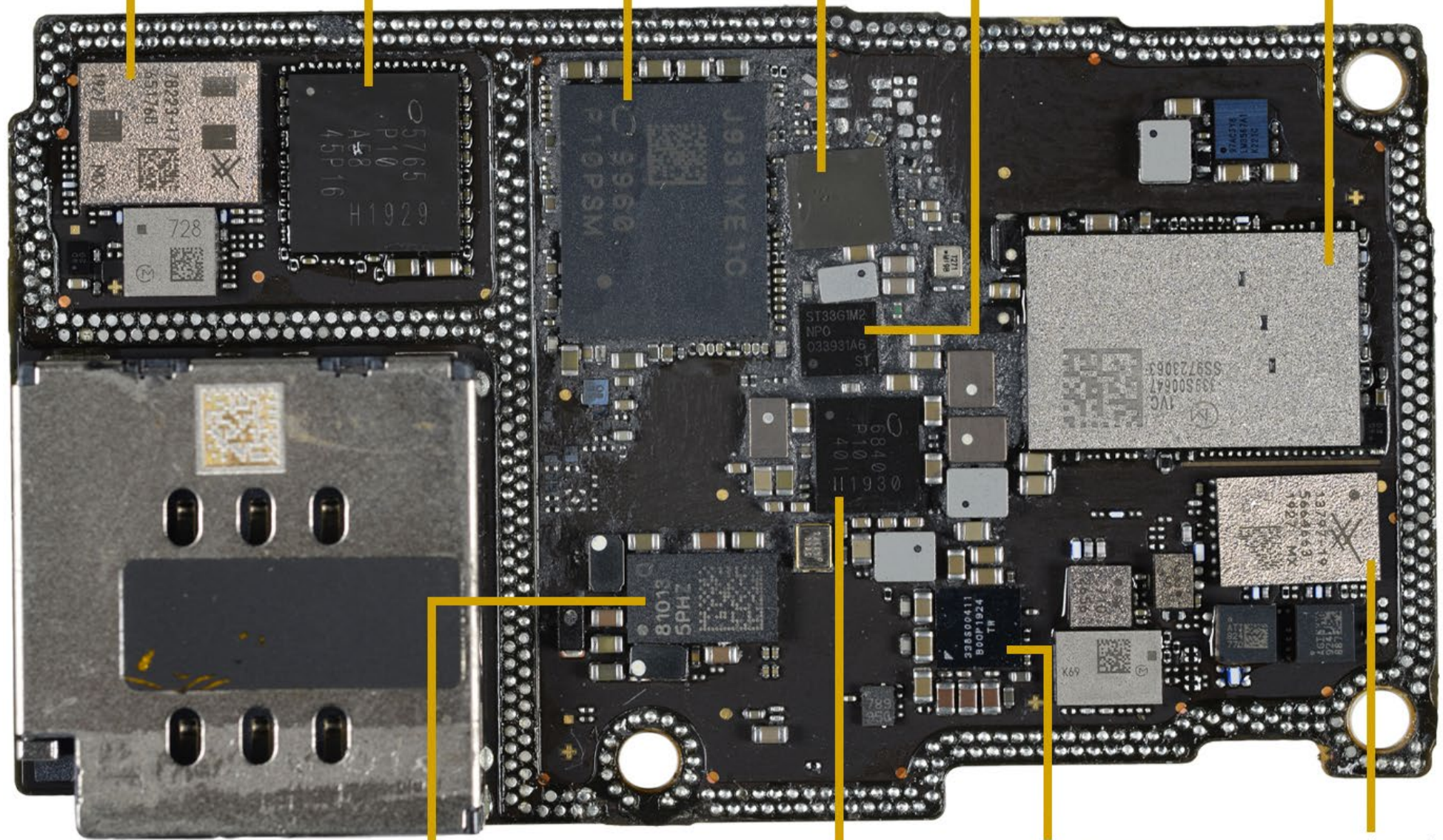
Intel PMB5765
RF Transceiver

Intel PMB9960
Baseband Processor
(likely XMM7660)

NXP SN200
NFC&SE Module

STMicroelectronics
ST33G1M2 MCU

Murata 339S00647
Wi-Fi/BT Wireless Combo IC



Qorvo QM81013
Envelope Tracker IC
(likely)

Intel PMB6840
PMIC

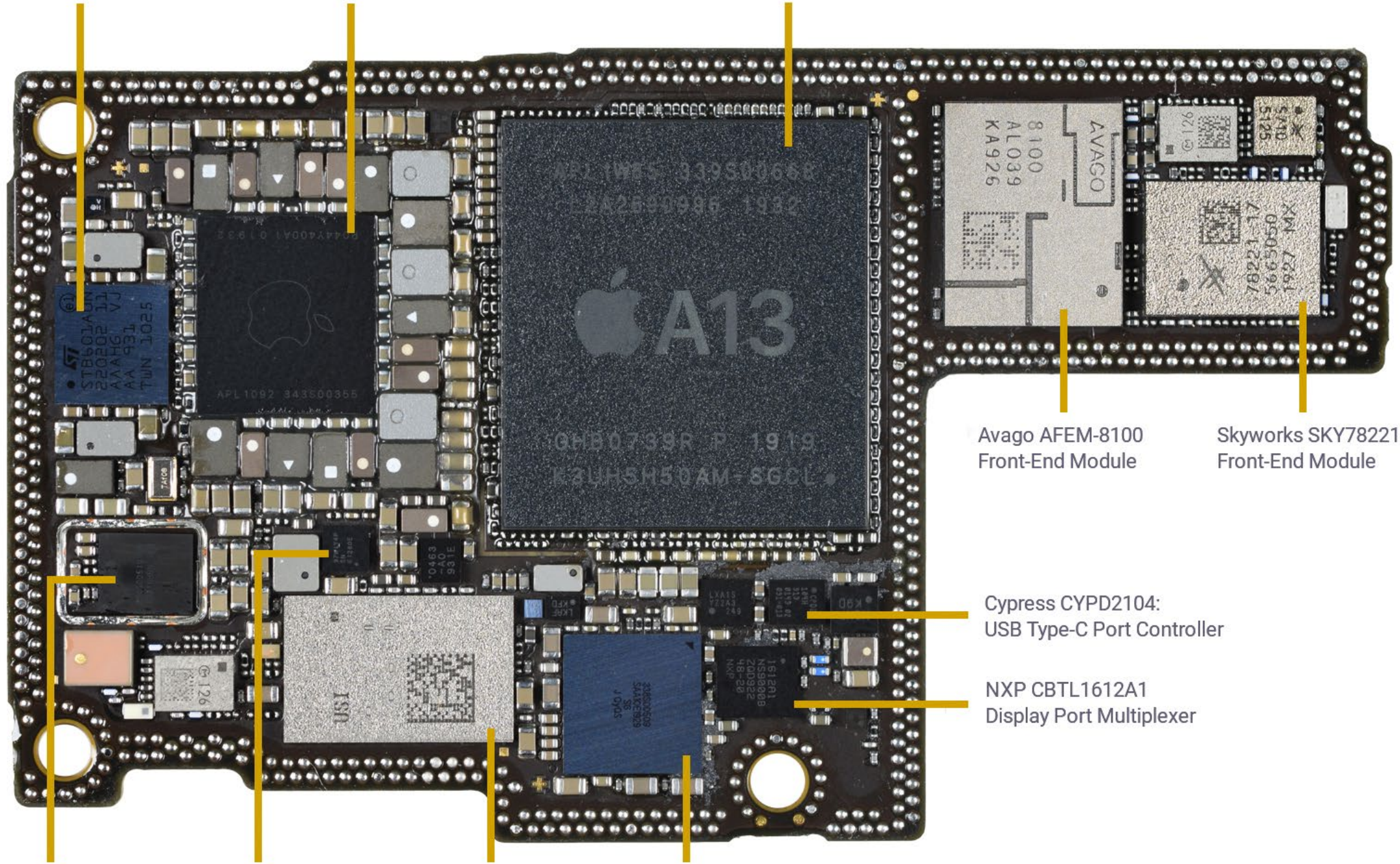
Apple 338S00411
Audio Amplifier

Skyworks SKY13797-19
PAM

STMicroelectronics
STB601 PMIC

Apple 343S00355/
APL1092 PMIC

Apple A13 APL1W85 PoP
(A13 AP+Samsung K3UH5H50AM-SGCL 4GB LPDDR4X SDRAM)



Avago AFEM-8100
Front-End Module

Skyworks SKY78221-17
Front-End Module

Cypress CYPD2104:
USB Type-C Port Controller

NXP CBTL1612A1
Display Port Multiplexer


Rechargeable
Li-ion Battery 616-00651
3.79V ⎓ 15.04Wh
WARNING
Authorized Service Provider
Only. Potential for fire or burning.
Do not disassemble, puncture, crush,
heat, or burn. Avertissement
Li-ion
TAPTIC ENGINE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