

MI：苹果做到了¹

内容概览：

- APU²市场动态：
2020年第四季度APU预期营收近100亿美元。
Yole Développement（Yole）预计2020年该市场的规模为380亿美元。
近期：2020年第一季度的季节性疲软叠加新冠疫情，导致2020年上半年的收益仅比2019年上半年高出3%。
长期：随着2021年需求出现反弹，预计截至2023年，产量和ASP³都将适度增长，两者相结合将令APU营收不断增加。
- 近期消息：
苹果宣布推出两款新型处理器芯片：A14和MI。MI就是人们期待已久的由苹果自主研发的Mac处理器。
受中美关系紧张的影响，海思半导体目前与中国代工厂中芯国际合作开发其麒麟710A处理器芯片。
高通则选择从台积电转为三星代工厂来制造他们的最新旗舰处理器。
- 苹果MI的营销宣传数据 - MI系统级芯片包含以下几个主要IP模块：四个“Firestorm”高性能CPU内核、四个“Icestorm”高效CPU内核、八个GPU内核、机器学习内核“Neural Engine”（神经网络引擎）、双核安全处理器“Secure Enclave”（安全地带）、PCI Express高速串行接口（X2）、显示引擎。

完成了。苹果做到了。去年11月，领先智能手机制造商苹果发布了其首款基于ARM架构的SoC⁴。MI是苹果专为其Macintosh（简称Mac）产品系列而设计的CPU⁵，该公司声称MI SoC是全世界最快的CPU，拥有最佳的每瓦时CPU性能。

“目前有两款新型苹果MacBook以及Mac mini都采用苹果的自研SoC设计”，System Plus Consulting的存储器业务技术与成本分析师Belinda Dube称。她补充道：“不同于英特尔x86处理器的转变已经对整个处理器和计算领域产生了冲击。这款专用于Mac的首款新型SoC具有4个CPU高性能内核、4个CPU高效内核和8个GPU内核。”

¹摘自：《苹果MI系统级芯片报告》，System Plus Consulting，2020 | 《APU季度市场监测》，Yole Développement，2020年第四季度

²APU：应用处理单元

³ASP：平均售价

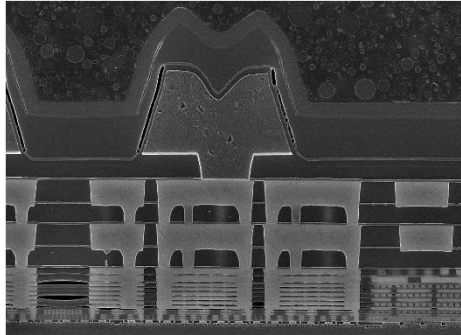
⁴SoC：系统级芯片

⁵CPU：中央处理器

苹果内部的软硬件密切整合带来了这款紧凑而高效的个人电脑处理器，其性能优于许多优质微处理器。它内含160亿个使用台积电5nm工艺的晶体管。其芯片架构优化了电源效率。

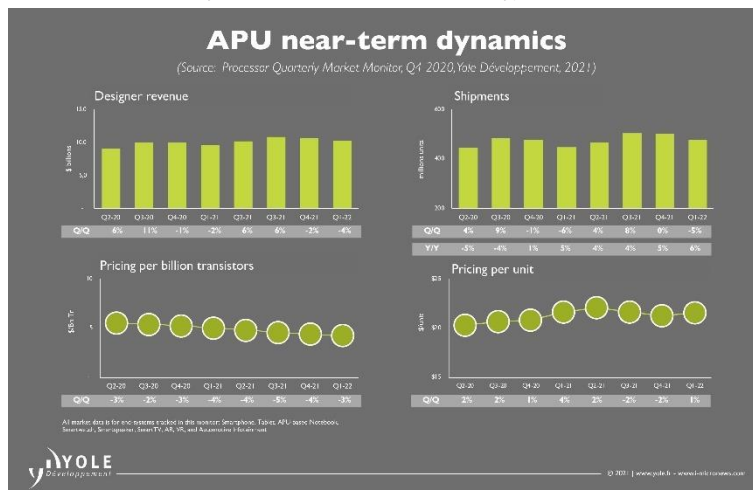
Apple M1 - Die cross section

(Source: Apple M1 System-on-Chip report, System Plus Consulting, 2020)



© 2021 | www.yole.fr | www.systemplus.com

Yole Développement (Yole) 的处理器业务技术与市场分析师**John Lorenz**评论道：“转为采用M1 处理器让苹果推动了ARM架构个人电脑的前景，以前这一领域仅限于低性能的Chromebook。对苹果而言，这不仅是一个规格配置良好的解决方案，还可能会为MacBook的部件节省部分成本。其他笔记本电脑OEM⁶肯定也会加以注意，并且可能会进一步检视他们自己的基于x86的解决方案。不过苹果能在控制操作系统时在硬件和软件之间进行更多协调，而大多数基于Windows的OEM做不到这点。”



很高兴介绍您逆向工程和成本分析公司**System Plus Consulting**发布对苹果公司这一最新创新的一项专题分析。本报告题为：**《苹果M1系统级芯片》**。

为了揭示Apple M1的所有细节，**System Plus Consulting**的报告囊括了多项分析：平面模块图分析通过芯片上的不同IP⁷模块面积分布来了解芯片的整体架构，前端构造分析揭

⁶OEM: 原始设备制造商

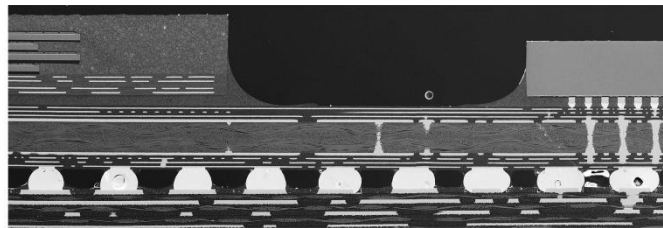
⁷IP: 知识产权

示了台积电新型5nm工艺中最有趣的特性，还有针对封装结构的后端构造分析和一份详细的制造成本分析。

System Plus Consulting的Belinda Dube评论道：“在SoC方面，M1的芯片面积所做的优化似乎是针对功能而非SRAM缓存。”根据这份苹果M1报告，根据移动SoC设计对UMA⁸概念和外部LPDDR4X DRAM的依赖推断，片上缓存有限。相当大的芯片面积被专门用作标准单元功能，这表明苹果正在利用内部芯片设计的优势来优化硬件以配合操作系统。

Apple M1 - Package cross section

(Source :Apple M1 System-on-Chip report, System Plus Consulting, 2020)



 SYSTEM Plus Consulting

© 2021 | www.yole.fr | www.micronews.com

在封装方面，苹果的A12X和A12Z采用相同的结构，即将DRAM集成在SoC基板上，并将硅电容器嵌入基板。

Don Scansen与System Plus Consulting的团队合作对苹果M1进行了分析。Don在EETIMES的一篇专题文章中写道：“苹果芯片设计团队为个人电脑产品线设计的第一款产品超越了许多竞争对手的微处理器和目前苹果的其他产品中的几乎所有处理器芯片，特别是单核和GPU测评方面.....”。[阅读全文：点击此处。](#)

System Plus Consulting与Yole Développement合作，全年持续发布大量报告和产业跟踪信息。此外，专家们还会进行各种重要讲演并组织关键性会议。关注Micronews，不要错过我们的精彩活动。

媒体联络人

Sandrine Leroy，公共关系主管，leroy@yole.fr

Marion Barrier，公共关系助理，marion.barrier@yole.fr

Le Quartz, 75 Cours Emile Zola – 69100 Villeurbanne – Lyon – France – +33472830189

www.yole.fr - www.i-micronews.com - [LinkedIn](#) - [Twitter](#)

⁸UMA：通用内存架构

About our analysts

Belinda Dube serves as a Technology & Cost Analyst at System Plus Consulting, part of Yole Développement (Yole). Belinda's core expertise is memory technology, especially DRAM and 3D NAND flash memory. At the same time, she also investigates IC technologies as well as advanced packaging.

Belinda's mission is to develop reverse engineering & costing reports. She also works on custom projects, where she works closely with the laboratory team to set up significant physical & chemical analyses of innovative memory chips. Based on the results, Belinda identifies and analyzes the overall manufacturing process and all technical choices made by the memory makers. The objectives of these analyses are to understand the structure of the device, identify all materials used, and point out the link between functionality and technology selected by the memory company.

In addition, a significant portion of her mission is dedicated to a strategic technology watch, where her aim is to identify innovative memory chips and manufacturing processes. Based on her expertise, Belinda updates internal simulation tools and runs custom training sessions and demos with industrials.

Belinda attends many international trade shows & conferences where she collects valuable information and meets leading memory players. She regularly has an opportunity to reveal pertinent results during key onsite presentations and webcasts.

Prior to System Plus Consulting, Belinda had the opportunity to work on several R&D projects dedicated to MEMS technologies and new substrates at INSA (Lyon, France).

With a core Micro & Nano Electronics expertise, Belinda graduated from INSA (Lyon, France) with a master's degree in Instrumentation & Nanotechnology Engineering.

Stéphane Elisabeth, PhD is Senior Technology and Cost Analyst at System Plus Consulting, part of Yole Développement (Yole). Stéphane regularly works on numerous reverse engineering and costing reports while also managing custom projects in the RF electronics and advanced packaging fields.

His mission at System Plus Consulting is to provide an in-depth understanding of the technologies selected by the leading semiconductor companies as well as the ecosystem around a device.

In this context, Stéphane is leading a strategic watch to identify the latest innovative devices and collaborates closely with System Plus Consulting's laboratory to analyze devices or components. His aim is to reveal the link between functionality and the technical choice made by the device maker. Based on the identification of each process step and process flow, our analysts can then provide an accurate evaluation of the manufacturing cost. His significant industrial and technical knowledge allows him also to update internal simulation tools developed by System Plus Consulting's experts.

In addition, Stéphane supports the development of RF electronics activities through key customer projects, including presentation of their results.

Prior to this collaboration with System Plus Consulting, Stéphane worked on projects in partnership with THALES for the development of innovative hybrid RF circuits. He also regularly publishes articles and interviews within key RF electronics and packaging magazines.

Stéphane holds an engineering degree in electronics and numerical technology (Université de Nantes, France) as well as a PhD. in Materials for Microelectronics (Université de Nantes, France).

John Lorenz is a Technology and Market Analyst within the Computing & Software division at Yole Développement (Yole), part of Yole Group of Companies. John is engaged in the development of market and technology monitors for the logic segment of advanced semiconductors, with an initial focus on processors. Prior to joining Yole, John held various technical and strategic roles at Micron Technology.

On the engineering side, his roles included thin film process development and manufacturing integration on DRAM, NAND, and emerging memory technologies and industrial engineering / factory physics for the R&D fab.

On the strategic side, John ran the memory industry supply & capex model for corporate strategy / market intelligence, and established the industry front-end costing model within strategic finance.

John has a Bachelor of Science degree in Mechanical Engineering from the University of Illinois Urbana-Champaign (USA), with a focus on MEMS devices."

And this analysis has been developed in collaboration with Don Scansen:

Don Scansen has partnered with System Plus Consulting to launch the new die architecture and front-end process analysis of advanced SoC devices including APU, CPU, GPU, and FPGA. Don previously supported clients ranging from individual patent owners to Fortune 500 companies providing competitive analysis and intellectual property support.

He holds a PhD in electrical engineering.

About the report and monitor

Apple M1 System-on-Chip

A deep-dive analysis of Apple's first in-house CPU for Mac – A reverse engineering & costing report performed by System Plus Consulting.

This report is a complete teardown with detailed photos, floor plan analysis, precise measurements, materials analysis, front-end structural analysis with TEM, back-end structural analysis with CT-Scan, supply-chain evaluation, and manufacturing cost analysis...

Application Processor Quarterly Market Monitor

With SMIC, China is positioning as a competitor in foundry business and thereby catching the dynamic of the APU market. – Yole Développement

The Quarterly Market Monitor examines and forecasts the application processor segment of the semiconductor industry, as dissected across multiple dimensions. The monitor tracks processor revenue, units, and wafer volumes at both fabless chip designers and at the foundries themselves, sliced across various relevant parameters including process node, end-product segment, core and IP type, etc..

Related reports

- [Intel Foveros 3D Packaging Technology](#) – System Plus Consulting
- [Advanced System-in-Package Technology in Apple's AirPods Pro](#) – System Plus Consulting

About Yole Développement

Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide...

[More](#)

About System Plus Consulting

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product... [More](#)

For more information and images, please visit our website [i-Micronews](#)

###