YOLE Développement

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截至2025年FCBGA封装将达120亿美元新高

先进封装季度市场监测 - 2020年第4季度

市场动态：

- 市场预测：
  在AI[1]、数据中心和HPC[2]发展势头的推动下，FCBGA[3]封装的营收预期将从2020年的100亿美元增长至2025年的120亿美元。
  FCBGA封装未来五年中的预期增速（营收）达到3％的CAGR[4]。
  截至2025年，FCBGA营收预期将超过100亿美元。
  晶圆需求主要来自3D堆叠器件，与2020年相比，晶圆总体增速为8.5％的CAGR[4]。其中包含FCBGA、扇出型、WLCSP[5]和3D堆叠封装。
  3D堆叠IC[6]的目标是在未来五年中以24.8％的CAGR增长，其中HBM[7]占48％，3D占27％，而3D NAND占82％。
- 供应链：
  台积电仍保持领先地位，其2019年占扇出型封装市场69%的份额。
  WLCSP封装在智能手机生态系统中已经强势立足。
  日月光半导体、江苏长电科技、安靠科技和矽品是WLCSP晶圆市场的领头羊。

在AI，数据中心和HPC发展势头的推动下，截至2025年，FCBGA封装将达到120亿美元的新高度。

FCBGA封装的盈利预期将从2020年的100亿美元增长至2025年的120亿美元。这种前所未有的增长来自于汽车、高性能计算、笔记本电脑和客户端计算这些细分市场的需求增加，以及消费类与服务器应用中对图像处理的需求增加。

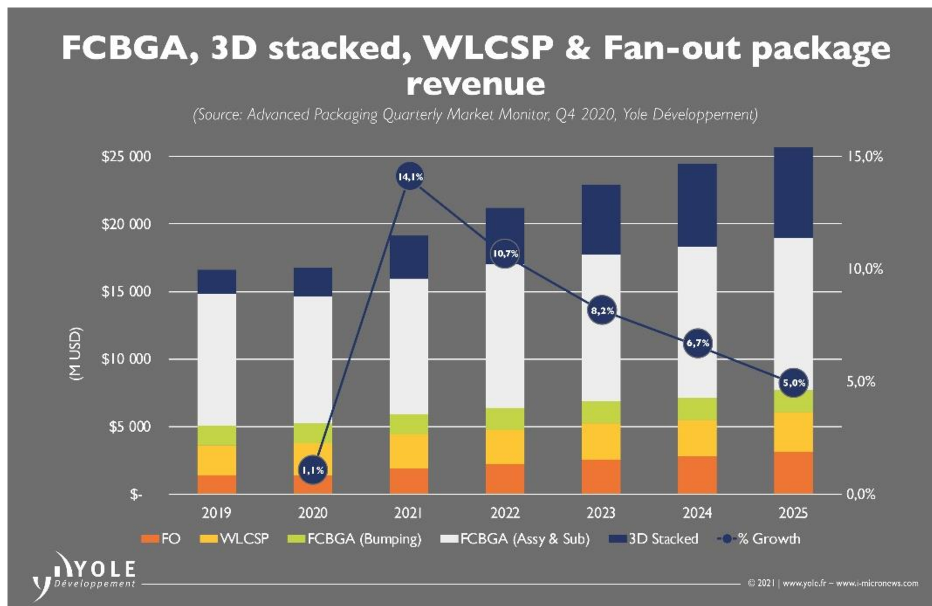
Yole Développement（Yole）半导体与软件部门的高级技术与市场分析师 **Vaibhav Trivedi** 认为：*"FCBGA封装传统上被用于工作站、笔记本电脑和桌上型电脑应用，如*

[1]AI：人工智能
[2]HPC：高性能计算
[3]FCBGA：倒装芯片球栅阵列
[4]CAGR：年均复合增长率
[5]WLCSP：晶圆级芯片规模封装
[6]IC：集成电路
[7]HBM：人体模型

CPU[8] 和服务器 CPU。这些市场中占主导地位的一直是英特尔和 AMD 这样的巨头。随着近年来摩尔定律的脚步放缓，在 SoC[9] 中组装、封装和集成各种功能模块变得越来越具挑战性。基板上异构集成了更多布线和多芯片，高密度 FCBGA 基板也随之不断发展，以更加精细的线条和空间实现更高密度。”

FCBGA 封装可分解为几个关键要素，例如使用 CuP[10]的晶圆凸块，以及包含芯片切单、贴片、底部填充和安装散热解决方案（因为许多 SoC 具有对 TDP[11]要求较高的集成散热器和热接口材料）各步骤的封装。

欲了解更多信息，欢迎阅读 Vaibhav Trivedi 发表在 i-Micronews 上的文章：《新冠疫情中 FCBGA 封装的崛起》。



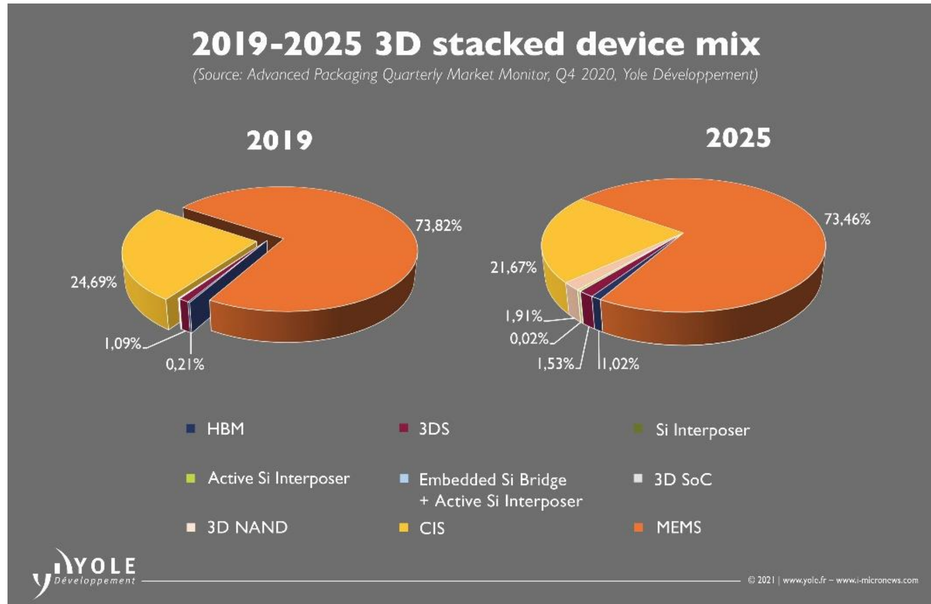
晶圆级封装平台服务于移动和消费市场

WLCSP/扇入型封装由于成本最低且具有可扩展性而被许多智能手机器件所采用。在 PMIC[12]、PMU[13]、音频编解码器、RF[14]收发器、开关、天线调谐器、CMOS 图像传感器以及许多其他面向消费市场的应用，例如智能手机和可穿戴设备中，都能找到 WLCSP。由于具有不错的可靠性、工艺成熟，且成本最低，WLSCP 仍是一个有吸引力的选择。WLCSP 制造领域的龙头依然是 OSAT，它们已经形成了一个商品市场。

Yole 的分析师们密切关注先进封装行业，并每年发布 OSAT 排名。

[8]CPU：中央处理器
[9]SoC：系统级芯片
[10]CuP：铜柱
[11]TDP：热设计功耗
[12]PMIC：电源管理集成电路
[13]PMU：电源管理单元
[14]RF：射频

2020 年，**Vaibhav Trivedi** 和 **Yole 封装、组装与衬底业务部的技术与市场分析师 Favier Shoo** 为 Chip Scale Review 杂志撰写了《OSAT 的未来》一文。您可以在 i-Micronews 网站上阅读该文章。



扇出型封装几年前开始在有限领域得到应用，但如今作为一种成熟可靠的封装技术，它已在高端封装领域担当关键角色，占据了应有的地位。事实上，2015 年，苹果推出了采用 InFO-PoP 技术的 A10，由此台积电的 InFO 封装外形尺寸也将 FO[15]技术带到了新的高度。

在 **Yole 的 Favier Shoo** 看来：*"FO 封装主要用于移动和消费领域，也在汽车雷达领域略有普及。随着 5G，AI 和自动驾驶在未来几年内的飞速发展，FO 封装预期也将得到更广泛的采用，截至 2025 年其营收预计将达到 20 亿-25 亿美元."*

扇出型面板级封装主要是力成科技和三星电子在发力，本监测报告也带来了对采用扇出型封装技术的面板级生产的分析。

Yole 的《先进封装监测报告》在每年 3 月初（第一季度）、6 月（第二季度）、9 月（第三季度）和 12 月（第四季度）发布。我们之所以提供这些服务，主要是为了深入报道快速变化的市场动态和主要竞争企业的态势与战略。订阅这一件监测报告可为您提供单位出货量、晶圆生产和长短期营收的季度更新。除了封装级预测，它还提供对新兴市场的容量、资本支出和供应链，以及对成熟市场增长率的洞察：

- *模块一：扇出型封装监测——晶圆和面板级（2019 年第四季度发布)*

[15]FO：扇出型

- *模块二：WLCSP/扇入型封装监测（2020 年第一季度发布)*
- *模块三：2.5D/3D 堆叠封装（2020 年第三季度发布)*
- *模块四：FCBGA 封装（2020 年第四季度发布）**最新***
- *模块五：FcCSP 封装（2021 年第一季度)*

此外，市场研究与战略咨询公司 Yole 还发布了其年度先进封装技术与市场报告：《2020 年先进封装产业现状》。

*Yole 的分析师们也将参加技术联合全球峰会（Technology Unites Global Summit）。2021 年 2 月 16 日上午 11:00，**Yole Développement 半导体与软件部门主管 Emilie Jolivet** 将在高级封装论坛上做关于高级封装市场的演讲。*

敬请关注 i-Micronews，以获取我们关于高级封装、半导体制造与存储器的更多精彩活动信息！

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About the packaging, assembly and substrate team at Yole Développement

Favier Shoo is a Technology and Market Analyst in the Semiconductor, Memory and Computing Division at Yole Développement, part of Yole Group of Companies. Based in Singapore, Favier is engaged in the development of technology & market reports as well as the production of custom consulting reports. During 7 years at Applied Materials as a Customer Application Technologist in the advanced packaging marketspace, Favier developed an in-depth understanding of the supply chain and core business values. As an acknowledged expert in this field, Favier has provided training and held numerous technical review sessions with industry players. In addition, he has obtained 2 patents. Prior to that, Favier worked at REC Solar as a Manufacturing Engineer to maximize production capacity. Favier holds a Bachelor's in Materials Engineering (Hons) and a Minor in Entrepreneurship from Nanyang Technological University (NTU) (Singapore).Favier was also the co-founder of a startup company where he formulated business goals, revenue models and marketing plans.

Vaibhav Trivedi is a Senior Technology & Market analyst at Yole Développement (Yole) working with the Semiconductor & Software division. Based in the US, he is a member of Yole's advanced packaging team and contributes to analysis of ever-changing advanced packaging technologies. Vaibhav has 17+ years of field experience in semiconductor processing and semiconductor supply chain, specifically on memory and thermal component sourcing and advanced packaging such as SiP and WLP. Vaibhav has held multiple technical and commercial lead roles at various semiconductor corporations prior to joining Yole. Vaibhav holds a Bachelor of Science in Chemical Engineering, and Master of Science of Material Science from University of Florida in addition to an MBA from Arizona State University.

Santosh Kumar is currently working as Principal Analyst and Director Packaging, Assembly & Substrates for Yole Développement's activities in Korea. Based in Seoul, Santosh is involved in the market, technology and strategic analyses of the microelectronic assembly and packaging technologies. His main interest areas are advanced IC packaging technology including equipment & materials. He is the author of several reports on fan-out / fan-in WLP, flip chip, and 3D/2.5D packaging. Santosh Kumar received the Bachelor's and Master's Degree in Engineering from the Indian Institute of Technology (IIT), Roorkee and University of Seoul respectively. He has published more than 40 papers in peer reviewed journals and has obtained 2 patents. He has presented and given talks at numerous conferences and technical symposiums related to advanced microelectronics packaging.

Emilie Jolivet is Director of the Semiconductor & Software Division at Yole Développement, part of Yole Group of Companies, where her specific interests cover package & assembly, semiconductor manufacturing, memory and software & computing fields. Based on her valuable experience in the semiconductor industry, Emilie manages the expansion of the technical and market expertise of the Semiconductor and Software Team. The team interacts daily with leading companies allowing semiconductor & software analysts to collect a large amount of data and integrate their understanding of the evolution of the market with technology breakthroughs. In addition, Emilie's mission focusses on the management of business relationships with semiconductor leaders and the development of market research and strategy consulting activities inside the Yole group. Emilie Jolivet holds a Master's degree in Applied Physics specializing in Microelectronics from INSA (Toulouse, France). After an internship in failure analysis at Freescale (France), she was an R&D engineer for seven years in the photovoltaic business where she co-authored several scientific articles. Enriched by this experience, she graduated with an MBA from IAE Lyon and then joined EV Group (Austria) as a business development manager in 3D & Advanced Packaging before joining Yole Développement in 2016.

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

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