WLCSP / Fan-In has been selected by Apple for its latest iPhones

The packaging platform secures its place in the mobile world.

OUTLINE:

- Market trends:
  WLCSP/Fan-In packaging market wil reach more than US$ 2.5 Billion by 2025 with a 3.2% CAGR between 2019 and 2025.
  In the mobile market segment, WLCSP/Fan-In packaging confirms its leading position.
- Competitive landscape:
  ASE with SPIL, Amkor, and JCET dominate the WLCSP/Fan-In packaging market.
  More than 60% of the total market is shared by the foundries.
  TSMC and Samsung are trying to break into this market...
- iPhone 12 – Technology choices from Apple:
  Latest iPhones include WLCSP packages ranging from 1x1 mm package size to as large as 7x7 mm package size.
  Thanks to excellent wafer thinning processes and capabilities at OSATs, WLCSP offers very attractive solution at best price with needed scalability & reliability.
- COVID-19 pandemic:
  The semiconductor industry is expected to be hit in 2H’2020 as global trade tensions are on the rise and US/EU economies severely impacted through airline, travel, and restaurant business restrictions resulting from the lockdown.
- Power and RF Packaging Forums powered by CITC and Yole Développement on Nov. 24, 2020 & Dec. 1, 2020 – Register today on i-Micronews.

“WLCSP / Fan-In packages are here to stay as they offer “best in class” solution for mobile applications,” asserts Vaibhav Trivedi, Senior Technology & Market analyst, Advanced Packaging at Yole Développement (Yole). “WLCSP/Fan-In solutions are increasing scalability and offering best cost with reliable performance.”

---

1 Extracted from:
- WLCSP/Fan-In Packaging Technologies and Market 2020 report, Yole Développement, 2020
- Advanced Packaging Quarterly Market Monitor, Q3 2020, Yole Développement
- APPLE iPHONE 12 SERIES: Teardown & Bill of Material, System Plus Consulting, 2020
2 WLCSP: Wafer Level Chip Scale Package
3 CAGR: Compound Annual Growth Rate
4 OSAT: Outsourced Semiconductor Assembly and Test
5 EU: European Union
Generally speaking, the global WLP market was worth US$3.3 Billion in 2019 and is expected to grow at an 8.9% CAGR to reach US$5.5 Billion by 2025. WLCSP / Fan-In was worth more than $2 Billion in 2019 and is expected to grow at a CAGR of 3.2% to exceed $2.5 Billion by 2025.

Yole, the market research and strategy consulting company, and its partner, System Plus Consulting, research the advanced packaging industry all year long. Thanks to daily exchanges with leading advanced packaging companies, analysts develop an extensive expertise in the technology evolution and market trends. This knowledge is delivered through an impressive collection of technical and market reports and monitors. The WLCSP / Fan-In Packaging Technologies and Market 2020 report is part of this compilation. Released today, it delivers a comprehensive overview of the WLCSP / Fan-In packaging market with detailed market figures and competitive landscape, together with an accurate analysis of the supply chain and business models. It also offers a relevant vision of the packaging technologies with their applications.

Yole’s analysts follow the WLCSP industry, amongst many other advanced packaging platforms, and report back on a quarterly basis with its Advanced Packaging Quarterly Market Monitor. The advanced packaging monitor analyzes the WLP market’s evolution in terms of revenue, shipments, capex, market pricing, capacity, application & process technology mix, as well as supplier market shares. More information is supplied on i-Micronews. And, in the future, the company will extend its coverage to Flip Chip packaging and 2.5D/3D packaging.

In parallel, System Plus Consulting analyzed in-depth the Apple iPhone 12 series and presents a dedicated teardown & bill of materials. In this analysis, the reverse engineering & costing company highlights the WLCSP packaging technologies selected by Apple for its latest smartphones. System Plus Consulting gives a full overview of the systems and components present in them and details the technologies selected by this leading smartphone manufacturer. Each step of the teardown process is carefully documented by System Plus Consulting’s experts to present detailed insights into component parts and costs, as well as chip system functionality.

---

6 WLP : Wafer Level Packaging
What is the status of the WLCSP / Fan-In industry and the overall packaging market? What are the economic and technological challenge? What are the impacts of the COVID-19 outbreak? Which are the leading companies to watch? How will the market and its supply chain evolve?

Yole and System Plus Consulting analysts present today their vision of the WLCSP / Fan-In technologies and its applications.

In advanced packaging technologies, WLP is becoming more and more popular due to its promise of the smallest and thinnest form factor with reasonable reliability. Wafer level Fan-Out, or Fan-Out and WLCSP, and Fan-In remain two powerful wafer level package families.

Unlike Fan-Out, Fan-In offers the simplest process flow while providing thin, small form factors, easy to assemble, which populate many SiP\(^7\) and smartphone board assemblies. WLCSP also offers BSP\(^8\) while maintaining the same footprint as the die area. Fan-In packaging is expected to reach new heights driven by the explosive growth of WLCSP form factors in smartphones, tablets, and the wearable market in mobile and consumer segment. WLCSP package revenue is driven by rapid growth in earbuds and smartwatch markets in addition to 5G deployment where many devices such as antenna tuners are leveraging WLCSP form factors.

WLCSP platform offers package size as small as 1x1 mm to as large as 7x7 mm with low temperature dielectrics as new developments in this arena. In addition to low temperature dielectric, another emerging trend in WLCSP platform is “6S” side mold protected package as offered by Deca Technologies’ M-Series product line.

“Deca’s M-Series offers superior BLR\(^9\) performance and many OEMs\(^{10}\) have slowly started to look at this novel approach where the die is protected from all sides without “fanning out the I/Os,” explains

---

7 SiP: System in Packages
8 BSP: Backside Protection
9 BLR : Board Level Reliability
10 OEM : Original Equipment Manufacturers
Stéphane Elisabeth, Technology & Cost Analyst at System Plus Consulting. “This entails some level of price impact, but many applications are being looked at due to better performance and a lower rate of field returns. Many OSATs have also started offering similar side mold process options to the customer with a slightly higher price than WLCSP.”

The WLCSP platform initially was used with a high number of PMIC\(^{12}\) devices, however it has exploded to include various switches, antenna tuners, RF\(^{13}\) transceivers, filters, wireless charging IC\(^{14}\), some CIS\(^{15}\) devices, and NFC\(^{16}\) controller type applications. The breadth of application envelope provided by the WLCSP platform is the most compared to any other packaging family, and it has the best cost structure and lowest cycle time.

The majority of WLCSP volume is driven by smartphone demand as it remains the biggest consumer for this platform. The WLCSP platform has replaced wafer level fan-out and FCCSP\(^{17}\) platforms whenever it is feasible from a performance and design standpoint.

“OEMs, such as Apple, have become the leaders in increasingly adopting this platform as a first-choice packaging given its lowest cost and simple process flow,” explains Vaibhav from Yole. “New frontiers in WLCSP packaging remain side mold protection and low temperature dielectrics as well as larger die size support to 7x7 mm” …

System Plus Consulting and Yole teams are deeply engaged in the advanced packaging industry with valuable analyses, presentations, articles, and interviews. Make sure to get a comprehensive understanding of the ecosystem and business opportunities and follow them on i-Micronews.

---


\(^{12}\) PMIC: Power Management Integrated Circuit

\(^{13}\) RF: Radio Frequency

\(^{14}\) IC: Integrated Circuit

\(^{15}\) CIS: CMOS Image Sensor

\(^{16}\) NFC: Near-Field-Communication

\(^{17}\) FCCSP: Flip Chip Scale Package
CITC and Yole Développement organize Power and RF Packaging Forums - Nov. 24, 2020 & Dec. 1, 2020 - online
Speakers are revealed: Amkor, AT&S, Danfoss, Dupont, Fachhochschule Henkel, Heraeus, Kiel, Fraunhofer IISB, Osaka University, University of Twente, AT&S, Dupont, Henkel, IMST GmbH VTT Technical Research Centre of Finland and others!

In addition, save the date with the next advanced packaging webcast: 3D Packaging is breaking new ground on Dec. 3, 2020. Speakers are Favier Shoo from Yole & Stéphane Elisabeth from System Plus Consulting. Registration are now open on i-Micronews.

Press contacts
Sandrine Leroy, Director, Public Relations, leroy@yole.fr
Marion Barrier, Assistant, Public Relations, marion.barrier@yole.fr
Le Quartz, 75 Cours Emile Zola – 69100 Villeurbanne – Lyon – France – +33472830189
www.yole.fr - www.i-micronews.com – LinkedIn – Twitter
About our analysts

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 everchanging 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 working as Principal Analyst and Director Packaging, Assembly & Substrates, Yole Korea, part of Yole Développement (Yole). Based in Seoul, Santosh is strongly involved in the market, technology and strategic analysis of the microelectronic assembly & packaging technologies and present his vision of the industry in numerous conferences as well as through papers and patents publication. Santosh Kumar received the bachelor and master’s degree in engineering from the Indian Institute of Technology (IIT), Roorkee and University of Seoul respectively

Favier Shoo is a Technology and Market Analyst in the Semiconductor & Software 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 a deep 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 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.

Stéphane Elisabeth, PhD has joined System Plus Consulting’s team in 2016. Stéphane is Expert Cost Analyst in RF, Sensors and Advanced Packaging. He has a deep knowledge of materials characterizations and electronics systems. He holds an Engineering Degree in Electronics and Numerical Technology, and a PhD in Materials for Microelectronics.

Nicolas Radufe is in charge of physical analysis at System Plus Consulting. He has a deep knowledge in chemical and physical analyses. He previously worked in microelectronics R&D for CEA/LETI in Grenoble and for STMicroelectronics in Crolles.

About the report & monitor

WLCSP / Fan-In Packaging Technologies and Market 2020

WLCSP (Wafer Level CSP)/Fan-In packaging market secures its place as a “mainstream workhorse” driven by mobile & consumer adoption as WLCSP remains leading packaging form factor for latest iPhone 12. WLCSP / Fan-In packaging market to reach 32Bunits by 2025 as top smartphone OEMs continue to adopt this packaging platform across various devices for next decade. — Performed by Yole Développement

Companies cited:

Advanced Packaging Quarterly Market Monitor
Despite weak semiconductor demand, Wafer Level Packaging reaches new heights as Fan-Out package revenue to surpass $2B by 2025 and Wafer Level Chip Scale Packaging revenue to peak to $3B by 2025.- Performed by Yole Développement.

Apple iPhone 12 SERIES, Teardown & Bill of Material
From system to components, get a quick access to all the data of the latest released Apple smartphones. - System Plus Consulting and Fomalhaut join forces to provide you a quick and complete access to the latest teardowned Apple products and in order to give a full overview of the systems and components present in them, through a combined offer.

Related reports
- Advanced Packaging Quarterly Market Monitor
- Fan-Out Packaging Technologies and Market 2020
- Status of the Advanced Packaging Industry 2020
- Mediatek Autus R10 (MT2706) 77/79 GHz eWLB/AiP Radar Chipset
- Fan-Out Packaging Processes Comparison 2020

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

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

For more information and images, please visit i-Micronews
###