

Flip Chip Market Assessment, By Wafer Bumping Technology [Copper Pillar, Lead-Free, Tin/Lead Eutectic Solder, Gold Stud+ Plated Solder], By Packaging Method [2D IC, 2.5D IC, 3D IC], By Product [Memory, Light Emitting Diode, CMOS Image Sensor, Soc, GPU, CPU], By Industry [IT & Telecommunication, Industrial, Electronic, Automotive, Healthcare, Aerospace & Defense, Others], By Region, Opportunities and Forecast, 2016-2030F

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Abstracts

Global flip chip market has experienced significant growth in recent years and is expected to maintain a strong pace of expansion in the coming years. With projected revenue of approximately USD 28.04 billion in 2022, the market is forecasted to reach a value of USD 48.47 billion by 2030, displaying a robust CAGR of 7.1% from 2023 to 2030.

The flip chip market provides benefits like higher performance, electrical and thermal conductivity, lower power consumption, and smaller form factors. It enables faster and more reliable microelectronics, making it perfect for applications such as enhanced semiconductor packaging, mobile devices, and high-performance computing, promoting innovation and efficiency.

The flip chip market is expanding rapidly owing to rising demand for smaller and more powerful electronic devices such as smartphones and IoT devices. Second, advances in



semiconductor technology, such as 5G and AI, fuel demand for highperformance CPUs. Finally, the automotive industry's push toward electrified and selfdriving automobiles increases demand for flip chip technology to increase vehicle communication and safety features.

The surge in the electric vehicle sector, as highlighted by the International Energy Agency (IEA), holds substantial implications for the flip chip market. EVs rely on advanced semiconductor technology, including flip chips, for various applications like power management, motor control, and battery management systems. As EV sales continue to rise globally, the demand for compact, high-performance chips, like flip chips, is expected to grow significantly. The trend aligns with the broader automotive sector's move towards electrification, creating a promising outlook for the flip chip market, which plays a vital role in enabling the EV revolution.

For instance, in September 2023, Camtek purchased FormFactor's FRT Metrology business for USD 100 million, bolstering its expertise in high-precision metrology solutions for the Advanced Packaging and Silicon Carbide sectors, solidifying its standing in the semiconductor industry.

5G Revolution to Fuel Flip Chip Market

The proliferation of 5G networks contributes significantly to the growth of the flip chip market. Flip chips are an excellent choice for 5G technology since they require high-performance circuits that can manage higher data throughput and reduced latency. These chips have enhanced electrical and thermal properties, allowing faster data processing and less heat generation. Furthermore, their small size corresponds to the space-saving requirements of 5G infrastructure. As 5G continues to roll out internationally and its applications expand beyond smartphones towards IoT, autonomous vehicles, and industrial automation, the demand for high-performance flip chips will likely skyrocket, propelling market development and innovation.

For example, in November 2022, SET launched the FC150 PLATINUM, an advanced flip-chip bonder with improved precision and alignment accuracy of \pm 0.1 µm for telecom, quantum, automotive, defense, HPC, AI, and VR applications.

Innovating Automotive Electronics with Flip Chips

Fueled by advanced driver-assistance systems (ADAS) and electric vehicles (EVs), the flourishing automotive electronics sector is a critical component driving the flip chip



market's growth. For tasks such as collision avoidance, adaptive cruise control, and selfparking, ADAS relies on high-performance CPUs, necessitating small and efficient semiconductor solutions. With their complicated battery management systems and onboard computers, EVs require reliable and power efficient semiconductors. Flip chips, noted for their small form factor and improved performance, successfully satisfy these automotive electronics needs. As the automotive sector moves toward electrification and automation, demand for flip chips continues to rise, strengthening the market growth.

For example, in October 2023, Advanced Semiconductor Engineering (ASE) unveiled its Integrated Design Ecosystem (IDE), optimizing package architecture design for the VIPack platform. IDE simplifies SoC to multi-die integration, yielding 50% design efficiency improvements and substantial cycle time reduction. It supports chiplet, memory, and advanced fanout structures in package design.

Dominance of Copper Pillars in the Market

Copper pillars are emerging as a leading segment in the flip chip market, owing to their several advantages, such as great electrical and thermal conductivity, allowing for efficient heat dissipation and fast data transport. Copper's mechanical strength and dependability make it perfect for advanced semiconductor packing, allowing smaller form factors. Furthermore, their compatibility with fine-pitch designs and low-resistance properties aid in performance. As the demand for high-performance, miniaturized electronic devices grows, copper pillars become more popular, fueling their dominance in the flip chip market.

For instance, in March 2023, Jupiter Systems unveiled the Zavus Xtreme Pixel (XP) Flip Chip COB MicroLED, expanding its 21:9 ultra-wide display offerings for enterprise and industrial applications.

Asia-Pacific Dominates Flip Chip Market

Asia-Pacific is at the leading edge of the flip chip market owing to several factors. The region is a global semiconductor manufacturing powerhouse, with important businesses situated in Taiwan, South Korea, and China. Furthermore, Asia-Pacific has a large consumer electronics market, which drives the demand for miniature and high-performance CPUs in products such as smartphones and wearables. The growing adoption of IoT and proliferation of 5G technology in the region has increased the demand for superior flip chip technology. Hence, Asia-Pacific leads the global flip chip



market due to its manufacturing capabilities and robust demand.

For instance, in June 2022, Luminus Devices introduced the MP-3030-110F flip-chip LEDs, which offer high efficacy, brightness, and durability. These wire-bond-free LEDs were ideal for horticulture and outdoor lighting, with improved sulfur resistance and a long life exceeding 50,000 hours.

Government Initiatives Acting as Catalyst to Flip Chip Market

The United States government, through the National Institute of Standards and Technology (NIST), is launching a substantial initiative to strengthen the domestic semiconductor sector, including the flip chip market. Under the CHIPS Incentives Program, especially the 2023-NIST-CHIPS-CFF-01 funding opportunity, the program is designed to enhance the United States' economic and national security. It is inviting applications for the construction, expansion, or modernization of semiconductor manufacturing facilities, encompassing those related to flip chip technology. Notably, the program strongly encourages projects with capital investments exceeding USD 300 million, emphasizing the government's commitment to fortify semiconductor infrastructure and maintain global tech competitiveness.

Impact of COVID-19

The flip chip market experienced a dual-phase impact from the COVID-19 pandemic. In the initial stages, supply chain disruptions, reduced consumer demand, and labor shortages led to manufacturing and production setbacks. However, the post-pandemic scenario saw a resurgence in the global flip chip market. With increased reliance on remote work technology, healthcare equipment, consumer electronics, and substantial investments in 5G infrastructure, the market has rebounded. Industry players adapted to the new normal, and the significance of high-performance and compact chips in various applications fueled the market's strong recovery, underscoring the resilience of the semiconductor sector.

Future Market Scenario (2024 - 2030F)

Advancements in materials, such as low-temperature solder and high-performance underfill substances, are poised to elevate the flip chip process.

The continuous growth of 5G infrastructure and the rising adoption of artificial intelligence are set to boost the need for high-performance flip chips in data centers,

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edge computing, and the telecommunications sector.

The expansion of the Internet of Things (IoT) is expected to persist, generating prospects for the utilization of flip chips in smart devices, wearables, and sensor applications.

There will be a growing focus on energy-efficient flip chips in the market, especially for devices that rely on battery or renewable energy sources.

Key Players Landscape and Outlook

The global flip chip market exhibits vigorous activity and fierce competition, driven by major industry players such as IBM Corporation, ASE Technology Holding Co., Ltd, Intel Corporation, Samsung Electronics Co., Ltd, and Taiwan Semiconductor Manufacturing Company Limited, dedicated to push the boundaries of innovation. Key market dynamics encompass a relentless pursuit of size reduction, the growing significance of 5G and AI technologies, and the expanding role of automotive electronics. This competitive landscape underscores a future characterized by advanced materials, heterogeneous integration, and enhanced energy efficiency, catering to a wide array of sectors. With the ever-increasing demand for compact, high-performance devices, the market's outlook remains highly promising.

In May 2023, FormFactor introduce the FRT MicroProf PT, a semiconductor metrology and inspection tool designed for larger rectangular panels, offering automation and hybrid metrology for 3D measurements and defect detection.

In September 2023, GlobalFoundries inaugurated a USD 4 billion expansion fabrication facility in Singapore, generating 1,000 high-value positions, predominantly focused on technicians and engineers. The facility's objective is to improve supply chain adaptability.



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*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work.

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