Glass Core Substrate Market and Development Trends

Sample Report

Foreword: The Evolution of Semiconductor Packaging

SEMI, in collaboration with Global Net Corp (GNC), is pleased to present this market research report, "Glass Core Substrates: Market and Development Trends."

- As the semiconductor industry enters the era of AI-driven high-performance computing (HPC), demand for larger, more reliable, and higher-density packaging solutions is reaching an inflection point. Traditional organic substrates, while foundational, are approaching their physical limits. In this context, glass core substrate (GCS) technology is emerging as a key next-generation option, offering the thermal and dimensional stability required for chiplet-based architectures.
- Since industry attention accelerated in 2023, R&D activity has expanded rapidly. However, the path to high-volume manufacturing (HVM) remains complex, and stakeholders across the supply chain continue to hold differing views on mass-production timing and technical standards.
- This report is intended to provide strategic clarity during this transitional period. By analyzing the global competitive landscape, manufacturing-process challenges, and multi-year market forecasts, we aim to provide members and industry stakeholders with data-driven insights for informed decision-making.
- We extend our sincere appreciation to the industry experts and participating companies whose cooperation, knowledge, and data made this research possible.
- We hope this report serves as a useful reference as your organization defines its next strategy in the evolving advanced packaging landscape.

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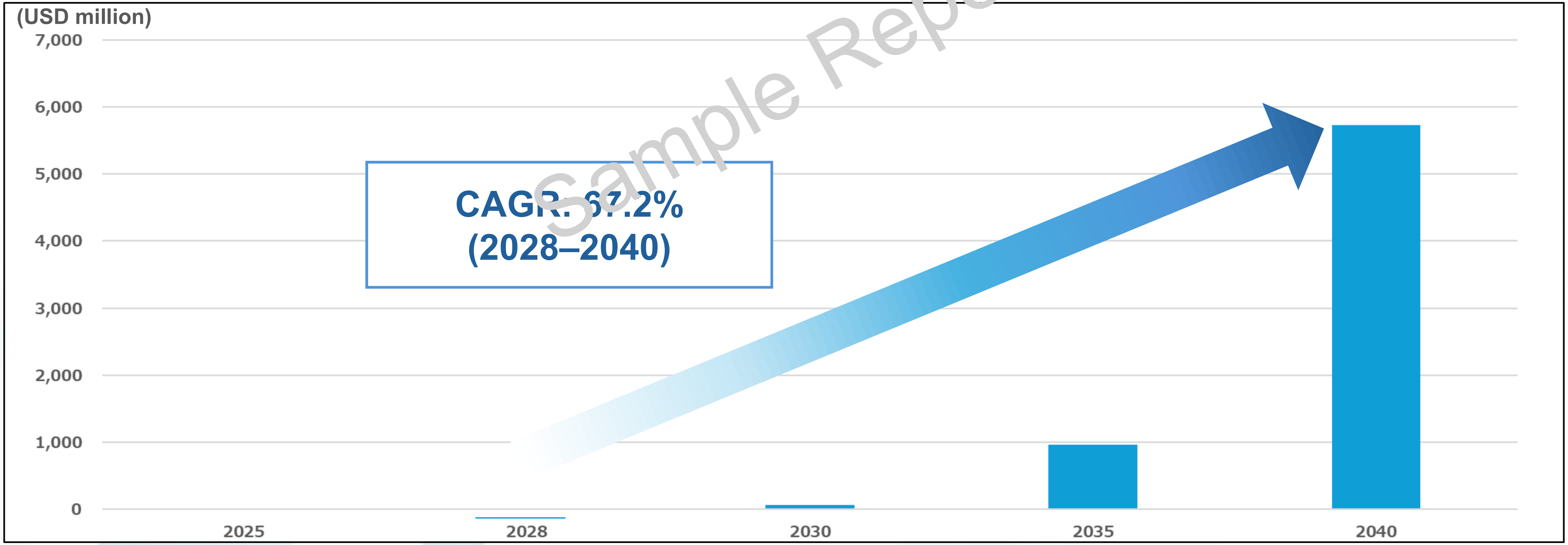
1-1 Overview of Research Results ①

Process	Overview
Market Overview	As package sizes increase and performance requirements become more demanding, addressing warpage and reliability issues has become a major challenge. In this context, glass core substrates—characterized by a coefficient of thermal expansion (CTE) close to that of silicon (Si), along with high rigidity and excellent flatness—have attracted attention as a promising candidate for next-generation semiconductor package substrates. Following Intel's public discussion of glass core substrates in 2023, a series of announcements on related technologies and new market entrants led to a rapid increase in interest in this field. Subsequently, as the first wave of development activity progressed and Intel's public momentum appeared to ease, interest in the field temporarily moderated, also influenced by reports that the company may have paused development activity. Nevertheless, Intel publicly reaffirmed its glass-substrate efforts in 2026, suggesting that development activity could accelerate again in the coming years. At present, views on glass-core substrates and on the timing of mass production vary considerably by region, process stage, and company position. In particular, stakeholders closer to downstream manufacturing and package assembly tend to take a more cautious view of commercialization. As a result, the glass core substrate market remains in an exploratory phase.
Country/ Region	Development efforts related to glass core substrates have been confirmed across Japan, the United States, Korea, Taiwan, China, and Europe, but the level of enthusiasm differs by region. In Taiwan and Korea, there is a relatively strong push to evaluate glass core substrates positively as a way to strengthen competitiveness in next-generation package substrates. In Japan, by contrast, companies with a strong position in high-end organic-core substrates tend to treat glass core substrates as one of several next-generation material options and to assess manufacturability, cost, and reliability more cautiously. Many industry participants also point to the absence of clear standards or a shared roadmap. At present, most companies are still advancing development independently. Because Intel again disclosed its glass-substrate work in 2026, future progress by Intel could help re-energize regional R&D and influence the timing of mass production and market formation.
Process	Looking across the process flow, upstream areas such as bare-glass supply and TGV formation tend to receive relatively positive assessments regarding technical feasibility. In contrast, downstream steps—including plating, build-up layer formation, dicing, and inspection—are viewed more cautiously because of glass-specific risks such as cracking and breakage, as well as the difficulty of inspection. Many substrate manufacturers are evaluating several next-generation materials in parallel, including glass-core, organic, and ceramic-based substrates, and are prioritizing flexibility rather than committing to a single material path. At the same time, some companies focused on glass core substrates have reportedly moved into customer qualification, and new Intel-related developments have also emerged. Depending on future adoption, the timing of market ramp-up could still change materially.

1-2 Market Size and Growth Forecast

- This report analyzes growth prospects for the glass core substrate market by focusing on the mass production of end products that incorporate glass core substrates. Three scenarios—Positive, Base, and Negative—were defined and analyzed separately. In the Executive Summary, the graph shows the average of these three scenarios.
- Based on this analysis, limited-volume production of glass core substrates is expected to begin around 2028 in selected applications, initially led by high-performance HPC use cases such as AI accelerators. Thereafter, the market is projected to expand as package sizes increase and adoption broadens into areas such as co-packaged optics, resulting in a projected CAGR of 67.2% through 2040.



2-1 Purpose of This Report

- This report was prepared to examine market and technology trends related to glass core substrates.
- The scope of this study covers **glass core substrates**; glass interposers and glass carriers are not included.

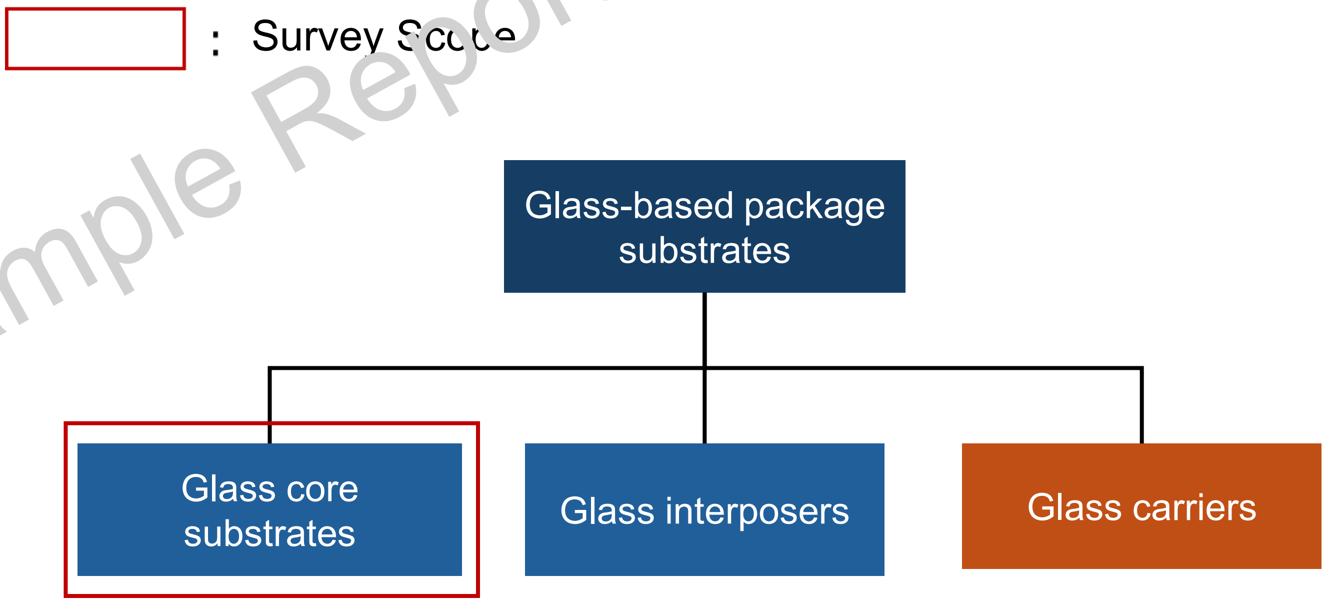
Research Purpose

In recent years, AI-oriented HPC packaging has moved toward larger formats that integrate multiple GPUs and other semiconductor devices, including HBM, on a single package substrate. This trend is driving demand for larger semiconductor package substrates. However, the copper-clad laminate (CCL) core substrates used today have a coefficient of thermal expansion (CTE) that is significantly higher than that of semiconductor chips, creating warpage risk and potential reliability concerns at the chip-to-substrate interface.

Against this backdrop, glass core substrates are being considered as next-generation package substrates because they offer a CTE close to that of silicon, high rigidity, low dielectric loss, excellent flatness, and better property retention at elevated temperatures.

This study aims to provide a comprehensive view of the technology and industry environment surrounding glass core substrates by organizing expected market trends and the initiatives of participating companies.

Scope of the Study

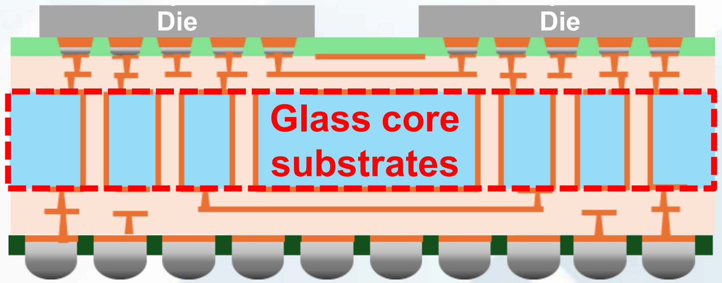


2-2 Definition of Glass Core Substrate

- Glass substrates can broadly be divided into three categories: **glass core substrates, glass interposers, and glass carriers**.
- The glass core substrates covered in this study serve as the structural base for directly mounting IC chips and provide the electrical connection between the package and the board-level system.

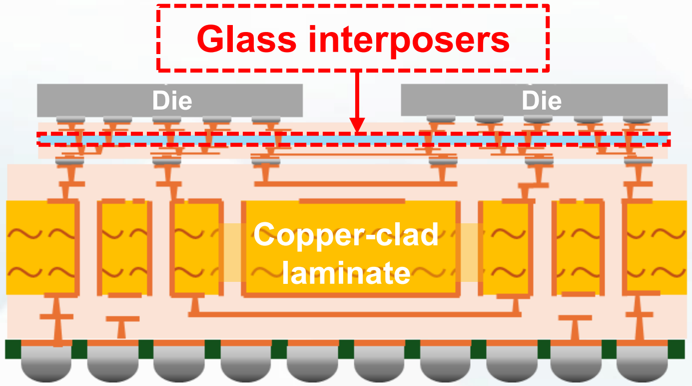
Glass core substrates

A glass core substrate functions as the package substrate that physically supports the semiconductor chip and provides external electrical interconnection to the motherboard or system board.



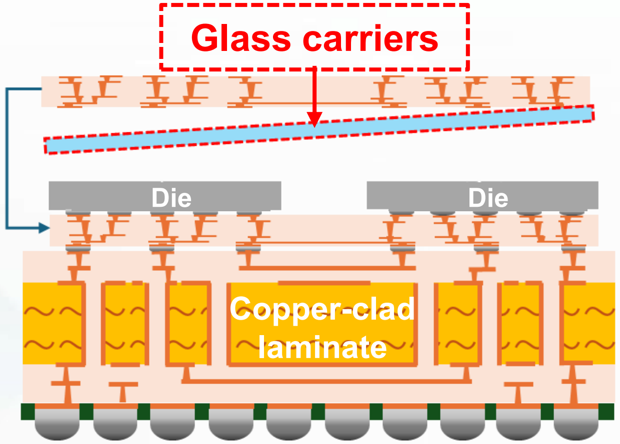
Glass interposers

A glass interposer is an intermediate substrate that enables high-speed interconnection among multiple semiconductor chips, such as CPUs, GPUs, and DRAM, within a single package. Its purpose is to shorten the physical distance between chips and reduce data-transfer delay.



Glass carriers

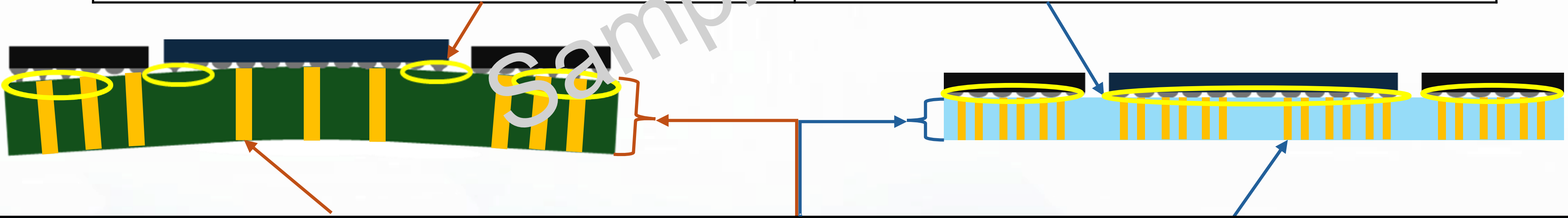
Glass carriers are used in advanced semiconductor packaging as temporary support substrates during interposer or RDL fabrication. Their high flatness and rigidity help stabilize fine wiring formation on large substrates. After processing is completed, the carrier is detached.



3-1 Why Glass Core Substrates?

- In the future, package substrates will need to support larger package sizes and lower power-delivery impedance as chip performance rises and the number of chips in a package increases.
- Glass core substrates are expected to be adopted as one possible solution to these challenges.

Accommodating larger substrate sizes	
Organic substrates	**Glass core substrates**
Because the warpage of a package substrate differs from that of a semiconductor chip, it can cause mounting and wiring defects. Additionally, increased stress on electrodes (bumps) may lead to failure at the bonding interface.	Because the CTE of a glass core substrate is close to that of the chip (Si), a stable connection between the chip and the package substrate can be achieved. In addition, its excellent flatness facilitates the formation of fine wiring patterns.



Reducing power supply impedance due to higher density and thinner substrates	
Organic substrates	**Glass core substrates**
Because holes are formed by laser drilling, via diameters and pitches tend to increase. In addition, substrate thickness must be increased to maintain rigidity. A thicker core lengthens the transmission path, which in turn raises power supply impedance.	Vias formed through laser modification and wet etching can achieve smaller diameters and pitches, enabling higher density. Furthermore, the high rigidity of glass core substrates allows the core to be thinner, which shortens the transmission path and reduces power supply impedance.

3-8 Manufacturing Process (Overall)