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From Back-End Commodity to Performance Driver: The Strategic Role of Advanced Semiconductor Packaging in Automotive and ADAS Systems

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Abstract
Advanced semiconductor packaging has emerged as a critical bottleneck and differentiator in the global semiconductor industry at a time when demand for compute, bandwidth, and energy efficiency is rising across multiple sectors. While front-end scaling is slowing and becoming increasingly capital-intensive, advanced packaging enables continued system-level performance gains through heterogeneous integration, chiplets, and multi-die architecture.

From a macroeconomic perspective, this shift intersects with several structural trends:
• the global race for semiconductor competitiveness and supply-chainresilience,
• increasing geopolitical concentration of advanced packaging capacity,
• and accelerating digitalization of industries such as automotive, AI, andindustrial automation.

In automotive in particular, the transition toward software-defined vehicles and higher levels of driver assistance concentrates computing power into fewer, more capable electronic control units. This amplifies the importance of packaging technologies that can deliver high bandwidth, low latency, robust thermal behavior, and automotive-grade reliability—making advanced packaging a strategic topic not only for engineers, but also for executives responsible for sourcing, operations, and long-term competitiveness.

Biography
Marco Paul is a Senior Expert at Porsche Consulting, specializing in semiconductor strategy, innovation and industrialization. His work spans smart-factory transformation, emerging semiconductor technologies - including wide-bandgap semiconductors and advanced packaging - and the semiconductor requirements of AI-enabled physical systems in automotive and robotics. He represents Porsche Consulting on SEMI Smart Manufacturing and has authored industry perspectives on semiconductor strategy, silicon carbide and advanced packaging. Marco holds an M.Eng. in Mechanical Engineering and an Executive MBA and combines technical depth with a strategic perspective on translating emerging technologies into scalable industrial and business impact.

Jonas Altmann is a Senior Manager at Porsche Consulting specializing in technology strategy, R&D transformation, and innovation-driven operating model design. His expertise spans corporate technology strategies, organizational transformations, technology ecosystems, and international partnerships. With extensive experience across the automotive industry, China, and Southeast Asia, he focuses on innovation ecosystems, technology partnerships, and the development of future-ready R&D organizations and operating models. Jonas participates in the SEMI Global Automotive Advisory Council and holds an M.Sc. in Aerospace Engineering, combining deep technical expertise with broad experience in technology.

References

Materials Matter: Enabling Advanced Packaging Performance at Scale

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Abstract
As advanced packaging becomes the primary path to **system-level performance**, success increasingly depends on how well materials and interfaces are controlled throughout the integration flow. The shift to **heterogeneous integration**, high-density interconnects, and advanced bonding schemes places new requirements on material purity, stability, and interaction at various technology nodes.

Performance is now tightly linked to **interface integrity**, where contamination, defects, or variability can directly impact **yield and long-term reliability**. At the same time, increasing thermal loads and new architectures require materials with enhanced thermal conductivity, electrical performance, and compatibility with emerging integration schemes.

Scaling these technologies from development to **high-volume manufacturing** introduces additional challenges in handling, cleaning, planarization, and process consistency – particularly with the transition toward larger formats such as panel-level packaging.

Entegris supports this evolution through **materials-driven solutions** and process-enabling technologies spanning Cu deposition, cleaning, CMP, high-viscosity material handling, thermal management, contamination control, and filtration – ensuring that performance achieved at the design stage is preserved through industrial-scale manufacturing.

Biography
Gilbert Parry joined Entegris in 1995 as an application engineer in its semiconductor business. He then held various technical and product management positions in gas purification, liquid and specialty chemicals filtration.

Over the past 20 years, Mr. Parry has been responsible for cross-divisional Business Development activities in a variety of industries, including energy production and storage, graphic arts, water treatment or life sciences. Now involved in analyzing semiconductor technology trends to guide the company's investments and research directions, M. Parry explores the opportunities presented by the most critical applications of Advanced Packaging, particularly those requiring new materials.

Mr. Parry is a graduate engineer (Master of Science) in chemistry, polymers and materials from ECPM, Strasbourg, France.

References

W. Yang
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Biography
Wenge Yang, Ph.D.
Vice President, Market Strategy

Dr. Yang joined Entegris in 2012 to serve as leader of Entegris Market Strategy. In his role, he is responsible for product and market strategy, market research and market trend analysis, strategic marketing, and maintenance of the company's strategic technology roadmap.
Prior to joining Entegris, Dr. Yang was an equity research analyst at Citigroup covering the semiconductor equip-ment and materials sector. He also served in various executive roles at Advanced Micro Devices, Tokyo Electron and two start-up companies.
Dr. Yang received a Ph.D. in Materials Science and an MBA from Rensselaer Polytechnic Institute, a Master of Science degree in mechanical engineering from the New Jersey Institute of Technology and a Bachelor of Science degree in materials science and engineering from Shanghai Jiao Tong University.

References

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Biography
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References

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References

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References

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