

High-Bandwidth Memory (HBM) and Advanced Packaging Materials for Artificial Intelligence (AI) Semiconductors: 2027–2037

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Abstracts

High-bandwidth memory (HBM) and advanced packaging materials form the supply base for artificial intelligence semiconductors. An AI accelerator package combines stacked DRAM, a logic base die, a silicon or glass interposer, a multilayer organic substrate and an integrated thermal solution. Memory and packaging together account for a larger share of package cost than the logic die.

The supply chain comprises five layers. HBM devices represent the largest share of value. Advanced packaging services, including TSMC's CoWoS and SoIC platforms, Intel's EMIB and Foveros, Samsung's I-Cube and X-Cube, and OSAT equivalents, form the second layer. Substrates and interposers form the third. Packaging and memory materials, including build-up dielectric film, copper-clad laminate, glass cloth, photoresist, plating chemistry, underfill and mould compound, form the fourth. Thermal materials and in-package cooling hardware form the fifth.

Demand is driven by accelerator shipments, by the number of HBM stacks per package, and by package body area. All three are increasing. Stack heights are progressing from 8-Hi and 12-Hi toward 16-Hi and beyond, build-up layer counts are rising, and package body areas are growing as reticle multiples increase.

Several technology transitions are underway. Hybrid copper-to-copper bonding is expected to displace micro-bump interconnect in HBM stacks, removing in-stack underfill and solder while introducing bonding dielectrics and associated consumables. Glass core substrates and glass interposers are entering qualification as alternatives to organic cores and silicon interposers. Panel-format packaging is being developed as a successor to wafer-format assembly. Package thermal design power is rising, moving

thermal management from conventional lids and thermal interface materials toward micro-channel lids and direct-to-silicon microfluidic cooling.

The materials layer is characterised by high supplier concentration. Build-up dielectric film, low-coefficient glass cloth and several assembly consumables have limited qualified supply bases. Qualification cycles for these materials are long relative to product generations, which constrains the pace at which alternative sources can be introduced.

Custom HBM, in which accelerator vendors specify the logic base die, is transferring value from memory manufacturers to logic foundries. Production is concentrated in Korea, Taiwan and Japan. Korea and Taiwan account for the majority of value across the chain. The United States is increasing share through domestic memory and packaging investment. China is developing a domestic supply chain under export-control conditions.

High-Bandwidth Memory (HBM) and Advanced Packaging Materials for Artificial Intelligence (AI) Semiconductors: 2027–2037 provides market analysis and eleven-year forecasts for high-bandwidth memory and the advanced packaging materials used in AI semiconductor manufacture. It covers five value layers: HBM devices, advanced packaging services, substrates and interposers, packaging and memory materials, and thermal materials and in-package cooling.

Forecasts are presented annually from 2027 to 2037 in constant 2026 US dollars, segmented by layer, material class, application and region, with base, bear and bull scenarios. Material demand is modelled from physical drivers, including stack heights, build-up layer counts, bonding interface area and package body area, and is presented in both value and volume terms.

The report includes a per-stack materials consumption model for HBM covering through-silicon via and plating chemistry, CMP consumables, bonding dielectrics, underfill and non-conductive film, micro-bump solder, and thinning and handling materials. Supplier concentration is assessed for each material class using CR1, CR3 and Herfindahl-Hirschman Index measures calculated at AI-relevant grade.

The study is intended for materials suppliers, substrate and packaging companies, memory manufacturers, semiconductor equipment suppliers, accelerator vendors, and investors requiring segment-level forecasts and supply-chain risk assessment.

Contents include:

Executive summary, headline findings and market summary tables

Scope, methodology, model architecture and scenario definitions

AI demand base: accelerator shipments, HBM stacks per package, package bill of materials, package area roadmap

HBM technology: HBM2 to HBM6 specifications, custom HBM, base-die value migration, bonding roadmap, in-stack thermal management, 3D DRAM

HBM market forecasts: shipments, average selling prices, revenue, generation mix, supplier shares, capacity and demand by customer

HBM stack materials: per-stack consumption model and forecasts by material class

Advanced packaging platforms: CoWoS variants, SoIC, EMIB and Foveros, OSAT platforms, panel-level packaging, co-packaged optics, capacity analysis

Advanced packaging and substrate materials: build-up dielectric film, core materials, copper foil and plating, photoresist, interposers, glass core transition

Thermal materials and in-package cooling: thermal interface materials by chemistry, micro-channel lids, microfluidic cooling

Supply chain analysis: concentration, chokepoints, export controls, regional production and consumption

Consolidated forecasts by layer, application, region and material class, with price indices and scenario analysis

142 company profiles, including ownership, financial data, funding history and technology positions. Companies profiled include 3M, Advanced Micro Devices (AMD), AGC (Asahi Glass), Ajinomoto Fine-Techno, Akhan Semiconductor, Alibaba T-Head (PingTouGe), Alpha Assembly Solutions (MacDermid Alpha), Alphabet (Google), Amazon Web Services (AWS), Amkor Technology, Apple, Applied Materials, ASE Technology Holding, Asetek, Asia Vital Components

(AVC), ASMPT, Asperitas, Astera Labs, AT&S, Auras Technology, Avalanche Technology, BE Semiconductor Industries (BESI), Biren Technology, Broadcom, Cambricon Technologies, Carbice, Cerebras Systems, Chemours, ChipMOS Technologies, Cooler Master, CoolIT Systems, CoreWeave, Corintis, Corning, Crossbar, CXMT (ChangXin Memory Technologies), Delta Electronics, d-Matrix, Dow, Element Six, Eliyan, Engineered Fluids, Etched, EV Group, Everspin Technologies, Fabric8Labs, Ferroelectric Memory Company (FMC), Foxconn Industrial Internet (FII), Frore Systems, Fujipoly, Furiosa AI, G42, Green Revolution Cooling (GRC), Groq, Henkel, Heraeus, Hesheng Silicon Industry, Hon Hai (Foxconn), Honeywell International, Hua Tian Technology, Huawei Technologies (HiSilicon), Ibiden, Iceotope Technologies, Iluvatar CoreX, Indium Corporation, Intel, Intel Foundry, JCET Group, JetCool Technologies, Kaneka, Kinsus Interconnect Technology, Kioxia Holdings, Kulicke & Soffa, Kyocera, Lam Research, Lambda, LG Innotek, Liquid Wire, LiquidStack, Macronix International, Marvell Technology, MatX, MediaTek, Meta Platforms, M&I Materials, Micron Technology, Microsoft, Montage Technology, Moore Threads Technology, Multibeam, Murata Manufacturing, Nan Ya PCB, Nanya Technology, Neo Semiconductor and more.....

Market outlook, technology roadmap and strategic conclusions

Contents

1. EXECUTIVE SUMMARY

- 1.1 Scope and headline definitions
- 1.2 Key findings
- 1.3 Market size, growth and CAGR summary
- 1.4 Headline forecasts by material class
- 1.5 Headline forecasts by region
- 1.6 Supply concentration at a glance
- 1.7 The asymmetry between device growth and material growth
- 1.8 Strategic implications for suppliers
- 1.9 Strategic implications for buyers
- 1.10 Major market players

2. INTRODUCTION, SCOPE AND METHODOLOGY

- 2.1 Report objectives
- 2.2 Product scope: the five value layers
- 2.3 Geographic scope
- 2.4 Units, conventions and abbreviations
- 2.5 Forecast methodology
 - 2.5.1 Device shipments to stack demand
 - 2.5.2 Stack demand to material demand
 - 2.5.3 Price modelling and ASP erosion
- 2.6 Demand scenario definitions

3. THE AI DEMAND BASE

- 3.1 The compute stack and where memory sits in it
- 3.2 AI accelerator shipments and package demand
- 3.3 Stacks per package and the HBM demand bridge
- 3.4 Why memory and packaging dominate accelerator cost
- 3.5 The memory wall in serving
- 3.6 Package area growth and the reticle constraint
- 3.7 Hyperscaler capital expenditure and the demand envelope
- 3.8 Sovereign and Chinese demand

4. HIGH-BANDWIDTH MEMORY: Technology and Roadmap

High-Bandwidth Memory (HBM) and Advanced Packaging Materials for Artificial Intelligence (AI) Semiconductors:...

- 4.1 HBM architecture and TSV stacking fundamentals
- 4.2 Generation roadmap
 - 4.2.1 HBM3E: the generation that funded the transition
 - 4.2.2 HBM4 and HBM4E: interface doubling and the logic base die
 - 4.2.3 HBM5, HBM5E and HBM6
- 4.3 Custom HBM and the base-die transfer of value
- 4.4 The bonding integration roadmap
- 4.5 Thermal architecture inside the stack
- 4.6 Processing-in-memory and near-memory compute
- 4.7 The memory tier behind HBM
- 4.8 3D DRAM and the post-2032 path

5. HBM MARKET FORECASTS 2027–2037

- 5.1 Unit, ASP and revenue forecast
- 5.2 Revenue by generation
- 5.3 Supplier share and competitive structure
- 5.4 Capacity outlook
- 5.5 HBM demand by customer
- 5.6 Regional HBM manufacture
- 5.7 HBM pricing dynamics

6. HBM STACK MATERIALS AND CONSUMABLES

- 6.1 The HBM materials bill
- 6.2 Material consumption per stack by generation
- 6.3 TSV formation: plating, barrier and seed
- 6.4 CMP: the class that hybrid bonding creates
- 6.5 Micro-bump metallurgy and its decline
- 6.6 Underfill: capillary, non-conductive film and molded
- 6.7 Hybrid bonding dielectric and consumables
- 6.8 Thinning, carrier bonding and handling
- 6.9 HBM materials market forecast
- 6.10 Concentration and qualification in the HBM material base

7. ADVANCED PACKAGING PLATFORMS FOR AI SEMICONDUCTORS

- 7.1 The 2.5D and 3D architecture continuum

- 7.2 CoWoS and the capacity constraint
 - 7.2.1 The CoWoS sub-variants
- 7.3 SoIC and 3D hybrid-bonded logic
- 7.4 Intel and Samsung platforms
- 7.5 The OSAT layer
- 7.6 Panel-level packaging
- 7.7 The photonics interface
- 7.8 Advanced packaging services market forecast

8. ADVANCED PACKAGING AND SUBSTRATE MATERIALS

- 8.1 The package materials stack
- 8.2 Substrate architecture and body size
- 8.3 Build-up dielectric film
- 8.4 Copper-clad laminate, prepreg, glass cloth and fillers
- 8.5 Copper foil, plating chemistry and photoresist
- 8.6 Interposer materials
- 8.7 The glass core transition and its material consequences
- 8.8 Assembly materials: underfill, mold compound and solder
- 8.9 Package materials market forecast
- 8.10 Regional supply of package materials

9. THERMAL MATERIALS AND IN-PACKAGE COOLING

- 9.1 The thermal problem at the package
- 9.2 The thermal interface stack
- 9.3 Liquid metal, phase change and the confinement problem
- 9.4 In-package and direct-to-silicon cooling
- 9.5 Diamond and engineered carbon
- 9.6 Thermal materials market forecast
- 9.7 Supplier consolidation in thermal

10. SUPPLY CHAIN, CONCENTRATION AND GEOPOLITICS

- 10.1 The chain from material to accelerator
- 10.2 Export controls and the parallel stack
- 10.3 Qualification duration as the binding constraint
- 10.4 Capacity investment asymmetry
- 10.5 Risk register

11. CONSOLIDATED MARKET FORECASTS 2027–2037

- 11.1 Total value pool
- 11.2 Forecast by application segment
- 11.3 Forecast by region
- 11.4 Consolidated materials forecast
- 11.5 Price and ASP trajectories
- 11.6 Scenario analysis
 - 11.6.1 Sensitivity to the stacks-per-package coefficient
 - 11.6.2 Sensitivity to hybrid bonding timing
 - 11.6.3 Sensitivity to glass core adoption

12. COMPANY PROFILES

- 12.1 Memory manufacturers (21 company profiles)
- 12.2 AI accelerator, hyperscaler and system vendors (35 company profiles)
- 12.3 Foundries, IDMs and OSATs (18 company profiles)
- 12.4 Substrate, interposer and glass suppliers (15 company profiles)
- 12.5 Packaging and electronic materials suppliers (15 company profiles)
- 12.6 Thermal management and in-package cooling (26 company profiles)
- 12.7 Equipment and process technology (12 company profiles)

13. MARKET OUTLOOK

- 13.1 Market outlook 2027–2037
- 13.2 Technology outlook
- 13.3 Ten strategic conclusions
- 13.4 What would change this forecast
- 13.5 Closing observation

List Of Tables

LIST OF TABLES

Table 1. Headline findings summary (Base case).

Table 2. The AI memory and advanced packaging value pool, 2027–2037 (US\$ billion).

Table 3. Materials and consumables summary by stream, 2027–2037 (US\$ million).

Table 4. Value pool by region of manufacture, 2027–2037 (US\$ billion).

Table 5. Concentration summary, HBM and advanced packaging material classes (concentration ratios in per cent; qualification in months).

Table 6. Indexed growth, 2027 = 100.

Table 7. Model architecture and principal coefficients (coefficients and their units as stated).

Table 8. Scenario summary, total value pool 2027–2037 (US\$ billion).

Table 9. Training versus inference: memory and packaging requirements (qualitative comparison).

Table 10. AI accelerator package shipments by class, 2026–2037 (thousand units).

Table 11. HBM stacks per package by accelerator class, 2026–2037 (HBM stacks per package).

Table 12. HBM stack demand bridge, 2026–2037 (million stacks).

Table 13. Indicative flagship accelerator package cost structure, 2024–2037 (per cent of factory cost).

Table 14. Compute-to-bandwidth ratio by accelerator generation (relative throughput indexed to Volta = 1.0; bandwidth in TB/s).

Table 15. Package area roadmap for flagship accelerators, 2024–2037 (package body area in mm²; layers per side).

Table 16. AI infrastructure capital expenditure and derived component demand, 2026–2037 (capital expenditure in US\$ billion; derived demand as stated).

Table 17. Non-hyperscaler AI accelerator demand, 2027–2037 (thousand packages).

Table 18. HBM stack construction elements and their function (descriptive).

Table 19. HBM generation technical specifications, HBM2 to HBM6 (specifications per stack).

Table 20. HBM4 supplier status and positioning, mid-2026 (status as at mid-2026).

Table 21. Custom HBM programmes, suppliers and base-die sources (programmes and first volume year).

Table 22. Standard versus custom HBM revenue split, 2026–2037 (US\$ billion).

Table 23. HBM bonding integration roadmap (bond pitch in µm; interconnect density in I/O per mm²).

Table 24. Hybrid bonding adoption in DRAM stacks, 2026–2037 (per cent of stacks)

shipped).

Table 25. In-stack thermal architecture adoption and content per stack (adoption in per cent of stacks; content in US\$ per stack).

Table 26. Near-memory and in-memory computing landscape (qualitative landscape).

Table 27. Memory tier characteristics for AI serving (bandwidth in GB/s; latency in ns; cost in US\$ per GB).

Table 28. 3D DRAM readiness assessment, 2026 (readiness assessment, 2026).

Table 29. HBM unit shipments, ASP and revenue forecast, 2026–2037 (shipments in millions; ASP in US\$ per stack; revenue in US\$ billion).

Table 30. HBM revenue by generation, 2026–2037 (per cent of HBM revenue).

Table 31. HBM capacity per stack and bit shipment forecast, 2026–2037 (capacity in GB per stack; bit shipments in exabytes).

Table 32. HBM revenue share by supplier, 2022–2037F (per cent).

Table 33. HBM wafer capacity and share of total DRAM wafer starts, 2026–2037 (wafer starts in thousand wafers per month; share in per cent).

Table 34. Announced HBM-related capacity investments, 2025–2030 (announced investment in US\$ billion).

Table 35. HBM consumption by customer, 2026–2037 (million stacks).

Table 36. HBM manufacture by region, 2027–2037 (US\$ billion).

Table 37. HBM pricing by generation and configuration, 2026–2037 (US\$ per stack).

Table 38. HBM stack material classes, function and supply base (descriptive; supply base as stated).

Table 39. Material consumption per HBM stack by generation (consumption per stack, units as stated per row).

Table 40. TSV formation material demand, 2027–2037 (US\$ million).

Table 41. CMP and cleaning consumables demand, 2027–2037 (US\$ million).

Table 42. Micro-bump and solder material demand, 2027–2037 (US\$ million).

Table 43. Underfill and encapsulation demand, 2027–2037 (US\$ million).

Table 44. Hybrid bonding consumables demand, 2027–2037 (US\$ million).

Table 45. Thinning, carrier and handling consumables demand, 2027–2037 (US\$ million).

Table 46. HBM stack materials and consumables market, 2027–2037 (US\$ million).

Table 47. HBM material class concentration and entry conditions.

Table 48. Advanced packaging platform comparison for AI applications.

Table 49. CoWoS-class capacity forecast by variant, 2026–2037 (thousand wafer equivalents per month).

Table 50. CoWoS-class supply and demand balance, 2026–2033.

Table 51. SoIC variants and AI adoption.

Table 52. Comparative platform roadmap, TSMC / Intel / Samsung.

Table 53. OSAT capacity, AI exposure and advanced packaging platforms.
Table 54. Panel-level packaging adoption forecast, 2027–2037.
Table 55. Co-packaged optics packaging demand, 2027–2037.
Table 56. Advanced packaging services revenue for AI semiconductors, 2027–2037 (US\$ billion).
Table 57. Package material classes mapped to process step and multiplier.
Table 58. Substrate specification roadmap for AI accelerators, 2027–2037.
Table 59. Build-up dielectric film demand, 2027–2037.
Table 60. Core material demand, 2027–2037.
Table 61. Plating, foil and resist demand, 2027–2037.
Table 62. Interposer material comparison.
Table 63. Interposer material mix and value, 2027–2037.
Table 64. Glass core adoption and material redistribution, 2027–2037.
Table 65. Package assembly materials demand, 2027–2037 (US\$ million).
Table 66. Advanced package materials and consumables market, 2027–2037 (US\$ million).
Table 67. Package material supply by producing region, 2037.
Table 68. Thermal design power and flux by package generation.
Table 69. Thermal interface material families for AI packages.
Table 70. In-package cooling architecture adoption, 2027–2037 (per cent of flagship AI packages).
Table 71. Advanced thermal materials, readiness and application.
Table 72. Thermal materials and in-package cooling market for AI semiconductors, 2027–2037 (US\$ million).
Table 73. TIM demand by chemistry family, AI packages, 2027–2037 (US\$ million).
Table 74. Supply chain tier concentration and geographic exposure.
Table 75. Chinese domestic HBM and packaging stack, 2027–2037.
Table 76. Qualification cycle by class and implied earliest volume entry.
Table 77. Announced capacity investment by tier, 2025–2030 commitments (US\$ billion, indicative).
Table 78. Key risk register, probability and impact.
Table 79. Total AI memory and advanced packaging value pool, 2027–2037 (US\$ billion).
Table 80. Value pool by end application, 2027–2037 (US\$ billion).
Table 81. Value pool by region of manufacture, 2027–2037 (US\$ billion).
Table 82. Total materials and consumables market, 2027–2037 (US\$ million).
Table 83. Top fifteen material classes by 2037 value.
Table 84. Indexed real price trajectories by class, 2027 = 100.
Table 85. Scenario detail by layer, 2037 (US\$ billion).

Table 86. Scenario trajectories, total value pool 2027–2037 (US\$ billion).

Table 87. Structural corporate events in the AI hardware and thermal supply base, 2024–2026.

Table 88. Technology roadmap summary, 2027–2037.

Table 89. Strategic conclusions mapped to stakeholder and action window.

List Of Figures

LIST OF FIGURES

- Figure 1. The AI memory and packaging value pool, layer map 2027–2037.
- Figure 2. Value pool by layer, stacked area 2027–2037.
- Figure 3. Materials market value by class, 2027–2037.
- Figure 4. Value pool by region, 2027–2037.
- Figure 5. Concentration heat map by material class.
- Figure 6. Material demand growth versus device unit growth, indexed.
- Figure 7. Bull, Base and Bear scenario comparison, 2027–2037.
- Figure 8. AI accelerator package shipments by class, 2026–2037.
- Figure 9. HBM stack demand versus modelled supply, 2026–2037.
- Figure 10. Accelerator package cost structure evolution, 2024–2037.
- Figure 11. Package area and build-up layer roadmap, 2024–2037.
- Figure 12. Non-hyperscaler accelerator demand by pool, 2027–2037.
- Figure 13. HBM stack architecture, cross-section.
- Figure 14. HBM bandwidth and capacity evolution, HBM2 to HBM6.
- Figure 15. HBM generation transition timeline and bond-type migration, 2024–2037.
- Figure 16. Custom HBM share and base-die value migration, 2026–2037.
- Figure 17. Micro-bump versus hybrid bond stack cross-sections and interconnect density.
- Figure 18. DRAM cell architecture roadmap and its intersection with the HBM generation cadence.
- Figure 19. HBM unit shipments and revenue, 2026–2037.
- Figure 20. HBM revenue share by supplier, 2022–2037.
- Figure 21. HBM consumption by customer, 2026–2037.
- Figure 22. HBM price per gigabyte by generation, 2026–2037.
- Figure 23. Material consumption per HBM stack by generation, indexed.
- Figure 24. Underfill versus bonding dielectric demand crossover, 2027–2037.
- Figure 25. HBM stack materials market by class, 2027–2037.
- Figure 26. Advanced packaging platform positioning by reticle multiple and interconnect density.
- Figure 27. CoWoS-class capacity by variant, 2026–2037.
- Figure 28. Advanced packaging capacity by provider and geography, 2026–2037.
- Figure 29. Co-packaged optics adoption in AI packages, 2027–2037.
- Figure 30. The AI accelerator package materials stack, exploded cross-section.
- Figure 31. Build-up dielectric film demand and constrained-grade share, 2027–2037.
- Figure 32. Interposer material mix by area, 2027–2037.

Figure 33. Advanced package materials market by class, 2027–2037.

Figure 34. Material production versus consumption by region, 2037.

Figure 35. In-package cooling architecture adoption, 2027–2037.

Figure 36. TIM demand by chemistry family, 2027–2037.

Figure 37. Risk matrix, probability against impact.

Figure 38. Total value pool by layer, 2027–2037.

Figure 39. Value pool by region, 2027–2037.

Figure 40. Material classes by 2037 value and growth rate.

Figure 41. Scenario trajectories, 2027–2037.

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