UBS

Global Research
24 September 2026

# Asia Semiconductors

## Sector Keys

## Sep 2026: Stronger Cloud AI demand driving broader industry tight supply

**Equities**

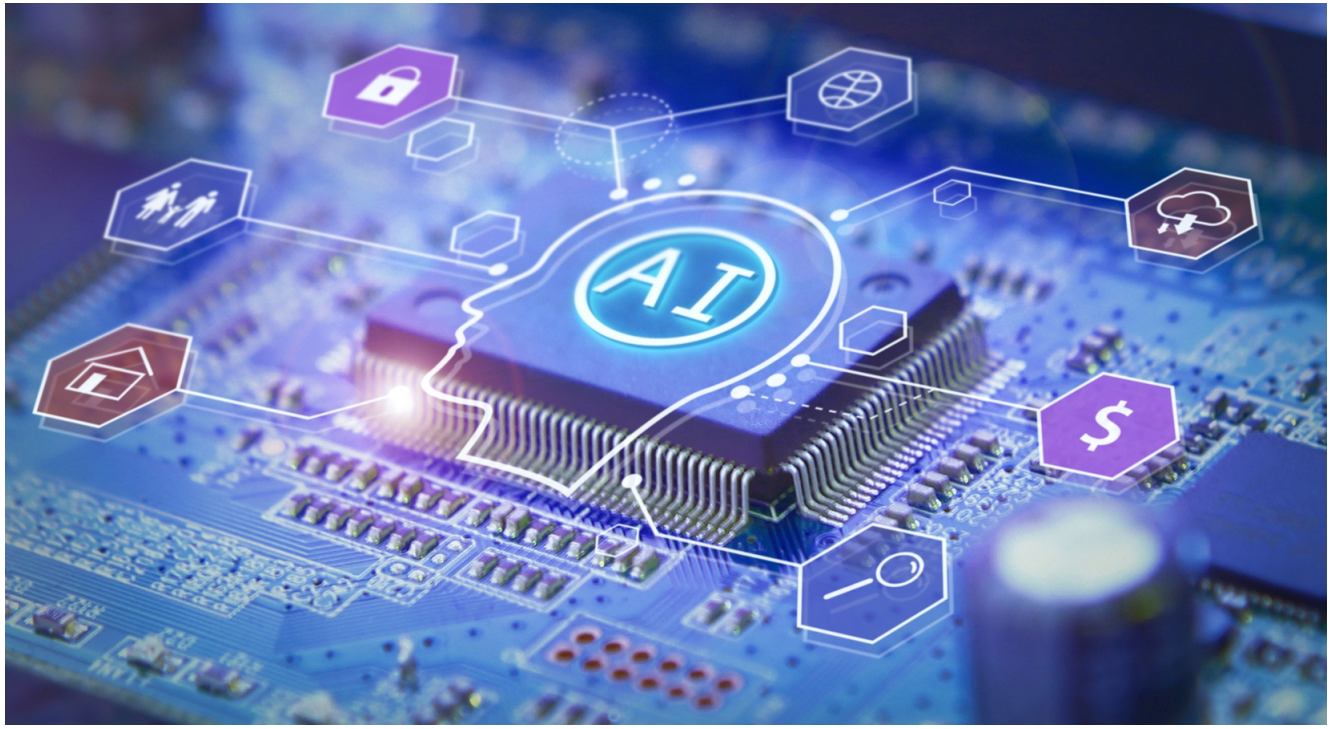
Asia

Semiconductors


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# APAC Semiconductors Valuation: Foundry & fabless

| Company name | Ticker | Rating | Analyst | Market cap (US$m) | Price target (LC) | Share price (LC) | EPS growth (%) | | P/E (x) | | P/BV (x) | | ROE (%) | | Dividend yield (%) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 2027E | 2028E | 2027E | 2028E | 2027E | 2028E | 2027E | 2028E | 2027E | 2028E |
| **Foundry** | | | | | | | | | | | | | | | | |
| Hua Hong | 1347.HK | Neutral | Jimmy Yu | 24,240 | 148 | 109 | 44.0 | 39.3 | 96 | 69 | 3.0 | 2.9 | 3.2 | 4.3 | 0.1 | 0.1 |
| PSMC | 6770.TW | Buy | Sunny Lin | 9,558 | 100.0 | 72 | 33.6 | 16.7 | 7 | 6 | 2.2 | 1.8 | 33.7 | 31.4 | 3.5 | 4.7 |
| SMIC | 0981.HK | Buy | Jimmy Yu | 64,273 | 102 | 63 | 49.5 | 34.6 | 34 | 26 | 2.2 | 2.1 | 6.7 | 8.4 | 0.0 | 0.0 |
| TSMC | 2330.TW | Buy | Sunny Lin | 2,017,065 | 3,650 | 2,475 | 36.9 | 32.9 | 17 | 12 | 6.1 | 4.5 | 42.7 | 41.3 | 1.2 | 1.6 |
| UMC | 2303.TW | Buy | Sunny Lin | 60,923 | 230 | 154 | 2.8 | 50.8 | 19 | 13 | 3.7 | 3.2 | 19.9 | 26.9 | 3.5 | 3.6 |
| Vanguard | 5347.TWO | Neutral | Sunny Lin | 10,004 | 168 | 171 | 32.4 | 36.1 | 20 | 15 | 3.2 | 2.8 | 16.3 | 20.1 | 2.6 | 2.6 |
| WIN Semi | 3105.TWO | Buy | Jerry Su | 6,688 | 500 | 502 | 44.6 | 22.7 | 45 | 36 | 4.7 | 4.4 | 10.8 | 12.4 | 0.8 | 1.1 |
| **Average** | | | | | | | | | **34.2** | **25.4** | **3.6** | **3.1** | | | | |
| **Fabless** | | | | | | | | | | | | | | | | |
| Alchip | 3661.TW | Buy | Jerry Su | 9,636 | 6,600 | 3,770 | 38.3 | 25.2 | 17 | 14 | 4.0 | 3.4 | 25.3 | 26.9 | 0.9 | 2.1 |
| ASMedia | 5269.TW | Buy | Jerry Su | 3,478 | 1,700 | 1,480 | 10.0 | 20.9 | 13 | 11 | 2.3 | 2.1 | 18.8 | 20.5 | 3.9 | 4.2 |
| Aspeed | 5274.TWO | Buy | Sunny Lin | 23,564 | 22,000 | 19,835 | 73.9 | 42.9 | 60 | 42 | 40.9 | 28.0 | 84.3 | 78.7 | 0.7 | 1.2 |
| Faraday | 3035.TW | Neutral | Jerry Su | 1,691 | 190 | 207 | 151.9 | 61.8 | 24 | 15 | 3.4 | 3.0 | 15.2 | 21.7 | 0.9 | 0.9 |
| GUC | 3443.TW | Buy | Jerry Su | 35,887 | 8,660 | 8,525 | 138.9 | 39.7 | 61 | 44 | 34.2 | 20.6 | 72.5 | 58.7 | 0.2 | 0.3 |
| MediaTek | 2454.TW | Buy | Sunny Lin | 266,395 | 7,300 | 5,285 | 162.5 | 104.7 | 30 | 15 | 14.6 | 10.1 | 55.4 | 82.3 | 1.0 | 2.7 |
| Novatek | 3034.TW | Neutral | Jerry Su | 10,384 | 540 | 543 | (1.9) | (3.8) | 16 | 16 | 4.8 | 4.6 | 30.9 | 28.7 | 4.2 | 5.5 |
| Parade | 4966.TWO | Neutral | Jerry Su | 1,419 | 565 | 572 | 33.9 | 47.1 | 14 | 9 | 1.8 | 1.6 | 13.4 | 18.0 | 2.7 | 3.6 |
| Realtek | 2379.TW | Neutral | Sunny Lin | 12,072 | 690 | 749 | 19.6 | 7.2 | 19 | 17 | 7.3 | 6.6 | 42.0 | 40.2 | 3.7 | 4.4 |
| Silergy | 6415.TW | Buy | Sunny Lin | 5,197 | 700 | 426 | 64.7 | 56.9 | 22 | 14 | 3.5 | 3.0 | 17.2 | 23.2 | 1.1 | 2.8 |
| **Average** | | | | | | | | | **27.5** | **19.7** | **11.7** | **8.3** | | | | |
| **Average (ex-Design service/IP)** | | | | | | | | | **24.7** | **17.8** | **10.8** | **8.0** | | | | |

*Note: Priced as of 23 Sep 2026 ; Notes: DPS paid in 2027/2028 are based on 2026/2027 earnings respectively.*

*Source: Company data, LSEG, UBSe*

# APAC Semiconductors Valuation: Semi-backend & silicon wafers

| Company name | Ticker | Rating | Analyst | Market cap (US$m) | Price target (LC) | Share price (LC) | EPS growth (%) | | P/E (x) | | P/BV (x) | | ROE (%) | | Dividend yield (%) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 2027E | 2028E | 2027E | 2028E | 2027E | 2028E | 2027E | 2028E | 2027E | 2028E |
| **Semi-backend** | | | | | | | | | | | | | | | | |
| All Ring | 6187.TWO | Buy | Sunny Lin | 3,662 | 1,700 | 1,195 | 57.4 | 64.0 | 25 | 15 | 9.8 | 7.1 | 43.9 | 54.2 | 1.8 | 2.8 |
| Amkor | AMKR.O | Buy | Randy Abrams | 13,096 | 80 | 53 | 7.9 | 32.0 | 19 | 14 | 2.4 | 2.1 | 13.1 | 15.3 | 0.6 | 0.7 |
| ASE | 3711.TW | Buy | Sunny Lin | 97,710 | 835 | 699 | 63.8 | 25.2 | 23 | 18 | 5.9 | 5.1 | 28.5 | 30.4 | 1.8 | 2.9 |
| ASMPT | 0522.HK | Buy | Sunny Lin | 8,753 | 200 | 166 | 47.7 | 24.4 | 22 | 18 | 3.4 | 2.8 | 16.0 | 17.3 | 1.6 | 2.3 |
| Chipbond | 6147.TWO | Buy | Jerry Su | 4,997 | 290 | 214 | 45.9 | 34.0 | 26 | 19 | 3.1 | 2.8 | 12.1 | 15.2 | 1.3 | 1.8 |
| Chroma ATE | 2360.TW | Buy | Jerry Su | 30,685 | 2,960 | 2,295 | 37.5 | 22.1 | 37 | 30 | 20.3 | 15.8 | 64.0 | 59.0 | 0.8 | 1.4 |
| Gudeng | 3680.TWO | Buy | Sunny Lin | 1,636 | 710 | 542 | 34.5 | 35.0 | 27 | 20 | 3.7 | 3.5 | 14.2 | 18.0 | 2.0 | 2.7 |
| GPTC | 3131.TWO | Buy | Sunny Lin | 2,213 | 4,300 | 2,410 | 66.7 | 65.4 | 25 | 15 | 15.9 | 9.8 | 79.6 | 81.7 | 1.7 | 2.9 |
| Hon Precision | 7769.TW | Buy | Sunny Lin | 32,062 | 10,000 | 5,670 | 85.5 | 49.9 | 23 | 16 | 10.2 | 7.5 | 50.1 | 55.4 | 1.6 | 3.0 |
| KYEC | 2449.TW | Buy | Sunny Lin | 11,951 | 325 | 311 | 61.9 | 24.0 | 21 | 17 | 5.2 | 4.6 | 26.9 | 28.7 | 1.9 | 1.9 |
| Powertech | 6239.TW | Neutral | Jerry Su | 6,847 | 260 | 287 | 21.1 | 16.9 | 19 | 16 | 3.1 | 2.8 | 17.1 | 18.1 | 1.6 | 2.2 |
| **Average** | | | | | | | | | **23.6** | **17.7** | **7.1** | **5.4** | | | | |
| **Silicon wafer** | | | | | | | | | | | | | | | | |
| GlobalWafers | 6488.TWO | Buy | Sunny Lin | 14,244 | 1,750 | 948 | 113.5 | 94.1 | 24.5 | 12.6 | 4.0 | 3.3 | 17.7 | 28.9 | 0.8 | 1.6 |

*Note: Priced as of 23 Sep 2026 ; Notes: DPS paid in 2027/2028 are based on 2026/2027 earnings respectively.*

*Source: Company data, LSEG, UBSe*

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Section 1

# Summary

# Coverage summary

- YTD, the SOX is up 88%; our coverage universe is on average up 90% (TSMC +61%, MediaTek +263%, UMC +225%). In comparison, the Dow is up 7% and TAIEX up 65%.
  - We reiterate our **Buy** on **TSMC**. Fundamentally, we expect N2 foundry demand to reach ~320kwpm by 2028, larger than N3's foundry demand in 3rd year of mass production. Competition is manageable, and TSMC should maintain its >80% market dominance in leading-edge foundry and technology leadership in adv packaging.
  - For the mature foundry segment, we are constructive about improving supply/demand outlook in next 2-3 years, considering more disciplined China competition, TSMC optimizing resource of mature capacity for advanced packaging and demand recovery. We maintain our anti-consensus, positive view for the mature foundry space. Among the mature foundry space, we like **UMC** and recently upgraded **PSMC** for their improving fundamentals and better supply and demand dynamics.
  - We have a Buy rating on **ASE**. With advanced packaging becoming more critical to enable next gen Cloud & Edge AI, we believe ASE should be key beneficiary to significantly increase value add and strengthen margin profile. We are still in early stage of earnings upgrade cycle.
  - Among **Taiwanese fabless** we like **MediaTek** for its structural share gain in a large Google TPU market and new ASIC upside risk. For server, we have a Buy rating on **Aspeed** for its accelerating TAM and silicon content expansion.

Section 2

# Intel EMIB-T vs. TSMC CoPoS

# Our research suggests TSMC should remain structurally well positioned in advanced packaging, even if Intel EMIB-T gains share

- Advanced packaging has become an essential enabler of total chipset performance as front-end process scaling alone is no longer sufficient for Cloud AI compute.
- While Intel EMIB-T could be a meaningful second-source for the industry, CoPoS should remain the preferred platform for customers prioritizing high performance and execution reliability.
- EMIB-T benefits from where customers prioritize cost-efficient scaling and supply-chain diversification.
- In our view, the likely outcome is coexistence rather than winner-takes-all, with EMIB-T as a meaningful second source and CoPoS retaining leadership for highest-performance AI packages.

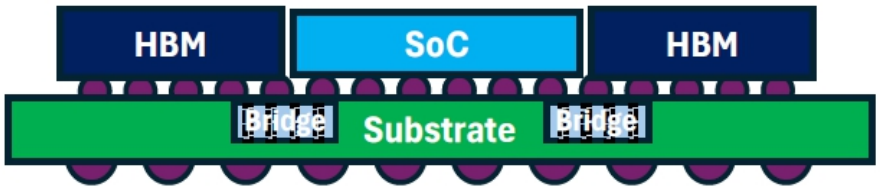
## Intel EMIB-T vs. TSMC CoPoS – strengths and weaknesses

| Category | Intel EMIB-T | TSMC CoPoS | Who wins |
|---|---|---|---|
| **Architecture** | Direct die attach on substrate with localized silicon bridges | Die attach on large interposer / panel before substrate integration | **EMIB-T** *simpler structure* |
| **Performance** | Strong chiplet connectivity, improved power delivery via TSV bridges | Denser interconnect, better signal integrity, richer package integration | **CoPoS** |
| **Power Integrity** | TSV-enabled vertical power delivery; embedded MIM capacitors | More room for embedded capacitors (eDTC / iCAP) and power stabilization | **CoPoS** |
| **Package Complexity** | Fewer process steps, no full-size interposer | More complex package stack and manufacturing flow | **EMIB-T** |
| **Scalability (>12x Reticle)** | Well suited for ultra-large packages using substrate scaling | Scaling constrained by interposer/panel warpage challenges | **EMIB-T** |
| **Manufacturing Risk** | Yield ramp for TSV bridges and large substrates remains key challenge | Warpage and new panel-level tool development are major hurdles | *Tie* |
| **Yield Confidence** | Validation yield ~90%+, but mass-production yield still needs proving | TSMC has strongest industry track record in packaging execution | **CoPoS** |
| **Cost Potential** | Lower BOM due to no large interposer and simpler flow | Higher structural cost but may improve with panel economics | **EMIB-T** *assuming reasonable yield* |
| **Time-to-Market** | Targets H227 commercial ramp | Targets 2028 mass production | **EMIB-T** |
| **Ecosystem Strength** | Growing support from hyperscalers seeking alternative supply | Deep ecosystem spanning foundry, CoWoS, SoIC and future CPO | **CoPoS** |
| **Best For** | Cost-efficient scaling to larger AI packages | Maximum performance and highest integration density | *Depends on customer priorities* |

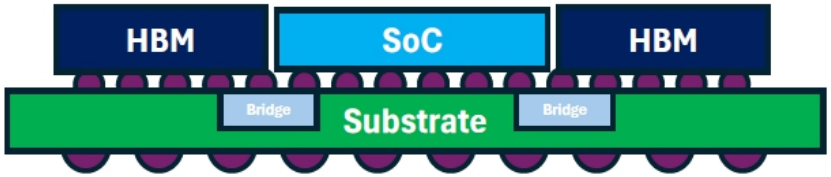
# Intel EMIB-T: Simpler substrate architecture and targets cost-efficient scaling

- Architecture
  - Intel's 2.5D packaging using silicon bridges embedded directly in the substrate
  - Compute dies/HBMs attached directly to substrate, elimination the silicon interposer
  - Incorporates TSVs (through silicon vias) for vertical power delivery to HBM & compute dies.
- Timeline
  - Introduced in late 2024 as Intel's next-gen EMIB platform
  - Targets H227 commercial ramp; Google TPU v9 expected as first major external product
  - manufacturing levels

**EMIB-T with silicon bridge and TSV for vertical power delivery**




**EMIB with silicon bridge**




*Source: UBS*

# Intel EMIB-T: Pros and Cons

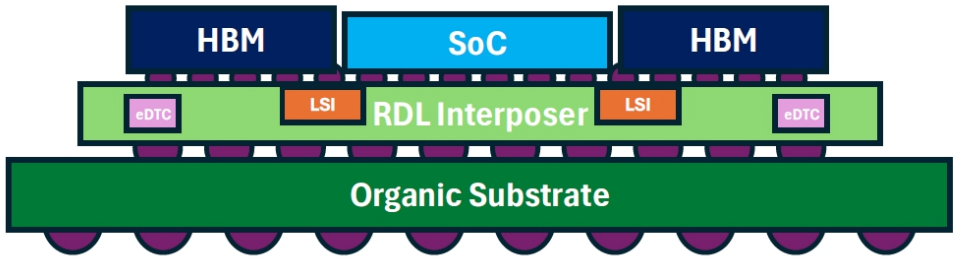
- Advantages/potential strengths
  - **Simpler architecture** vs. CoPoS, competitive cost
  - **Greater scalability to ultra-large package sizes** (beyond 12x reticle packaging scaling)
  - **Competitive cost** through elimination of the interposer.
- Disadvantages/challenges
  - Larger substrate sizes raises production difficulty
  - Substrate yield may currently be at ~50% vs 80% for HPC ABF substrates
  - Intel must demonstrate that it can improve yields to the high 90%
  - Potential challenges between foundry (TSMC) and back-end (Intel) integration
  - Complex silicon bridge integration introduces steeper learning curve for substrate makers

*Source: UBS*

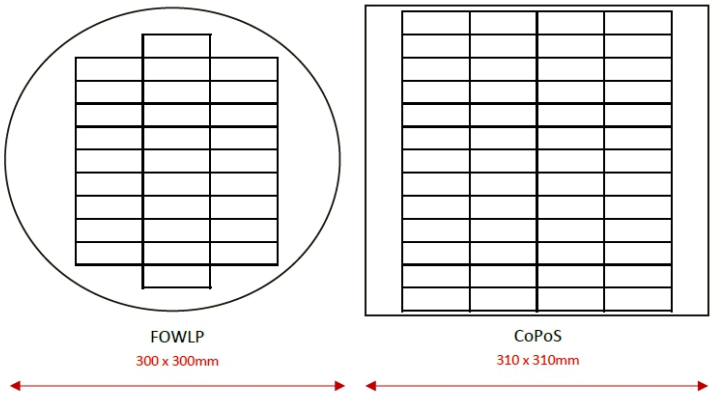
# TSMC CoPoS

- Architecture
  - TSMC's next gen 2.5D platform
  - Migrates from wafer to square-panel format
  - Die attached on interposer/panel before substrate integration
- Timeline/customer
  - Mass production targeted in FY28 with first-gen on 310x310mm² panel, further enhancing to 510 x 515mm².
  - NVIDIA Feynman expected as first major customer, followed by AMD and ASICs in 2029-2030

**CoPoS structure: interposer-based, embedded eDTC, LSI inside/underneath the interposer**




**CoPoS (or panel-level packaging) has better area utilisation and production efficiency than CoWoS**

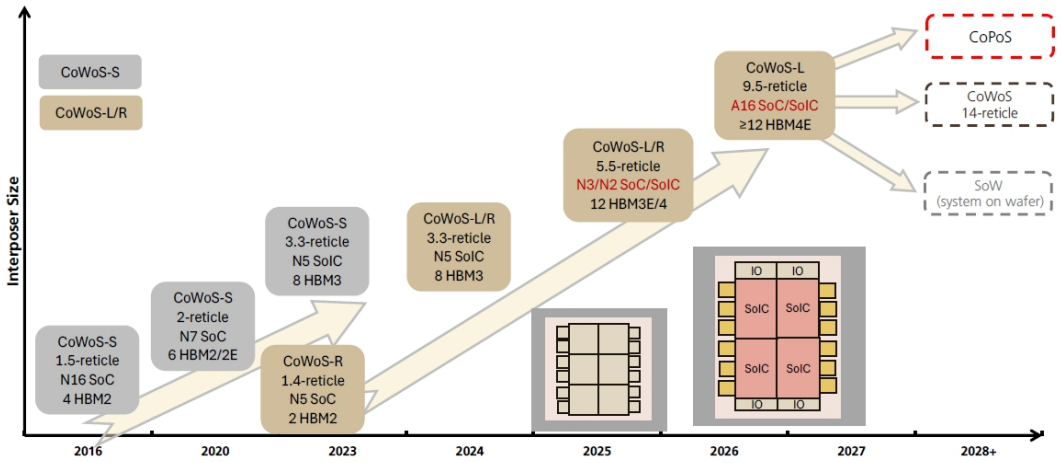



*Source: UBS*

# TSMC CoPoS

- Advantages/potential strengths
  - TSMC holds the **strongest execution track record**
  - A comprehensive tech upgrade (vs. CoWoS & EMIB-T), with higher interconnect density, better signal/power integrity, and richer integration through eDTC, iCap, 3D stacking and eventually CPO
  - Better signal integrity: important as AI packages become larger
- Disadvantages vs CoPoS/potential challenges
  - Must overcome warpage challenges
  - New equipment/tool-chain readiness.

**TSMC's advanced packaging tech roadmap**




*Source: UBS*

# Stress test scenario – TSMC advanced packaging could still sustain 65-70% even with EMIB-T at 13% industry share in 2030E

- In our stress test scenario, we forecast Intel EMIB-T to reach US$16bn sales or 12% industry share by 2030E, yet TSMC advanced packaging still could sustain around 65-70% share by 2030E.
- Even in a lower case scenario, where Intel gains 17% share in 2030E, TSMC's advanced packaging share would still be at 63% in 2030E and grow 49% CAGR 26-30E.

## Stress test scenario: TSMC adv packaging could still sustain 65-70% by 2030E

| (US$mn) | 2026E | 2027E | 2028E | 2029E | 2030E | 26-30E CAGR |
|---|---|---|---|---|---|---|
| Advanced packaging industry revenue | 19,168 | 38,293 | 61,269 | 91,904 | 128,666 | 61% |
| *YoY* | *89%* | *100%* | *60%* | *50%* | *40%* | |
| TSMC's advanced packaging sales | 16,154 | 31,362 | 44,370 | 63,247 | 87,034 | 52% |
| *YoY* | *82%* | *94%* | *41%* | *43%* | *38%* | |
| *% of TSMC total sales* | *9%* | *13%* | *14%* | *17%* | *19%* | |
| Intel's EMIB-T sales for external | | | 5,438 | 9,570 | 15,791 | |
| Google TPU | | | 5,003 | 8,374 | 13,159 | |
| *Units (mn)* | | | *2.3* | *3.5* | *5.0* | |
| *EMIB-T content (US$)* | | | *2,175* | *2,393* | *2,632* | |
| Others | | | 435 | 1,196 | 2,632 | |
| *Units (mn)* | | | *0.2* | *0.5* | *1.0* | |
| *EMIB-T content (US$)* | | | *2,175* | *2,393* | *2,632* | |
| Advanced packaging industry share | | | | | | |
| TSMC | 84% | 82% | 72% | 69% | 68% | |
| Intel | | | 9% | 10% | 12% | |
| OSATs | 16% | 18% | 19% | 21% | 20% | |

## Lower case scenario: If intel gains 17% share in 2030E, TSMC could still hold 63% share in 2030E

| (US$mn) | 2026E | 2027E | 2028E | 2029E | 2030E | 26-30E CAGR |
|---|---|---|---|---|---|---|
| Advanced packaging industry revenue | 19,168 | 38,293 | 61,269 | 91,614 | 126,464 | 60% |
| *YoY* | *89%* | *100%* | *60%* | *50%* | *38%* | |
| TSMC's advanced packaging sales | 16,154 | 31,362 | 44,370 | 60,564 | 79,569 | 49% |
| *YoY* | *82%* | *94%* | *41%* | *36%* | *31%* | |
| *% of TSMC total sales* | *9%* | *13%* | *14%* | *16%* | *17%* | |
| Intel's EMIB-T sales for external | | | 5,438 | 11,963 | 21,054 | |
| Google TPU | | | 5,003 | 10,766 | 17,106 | |
| *Units (mn)* | | | *2.3* | *4.5* | *6.5* | |
| *EMIB-T content (US$)* | | | *2,175* | *2,393* | *2,632* | |
| Others | | | 435 | 1,196 | 3,948 | |
| *Units (mn)* | | | *0.2* | *0.5* | *1.5* | |
| *EMIB-T content (US$)* | | | *2,175* | *2,393* | *2,632* | |
| Advanced packaging industry share | | | | | | |
| TSMC | 84% | 82% | 72% | 66% | 63% | |
| Intel | | | 9% | 13% | 17% | |
| OSATs | 16% | 18% | 19% | 21% | 20% | |

# Major supply chain beneficiaries

## Notable EMIB-T suppliers

| Intel EMIB-T supply chain | Suppliers |
|---|---|
| **Substrate** | Ibiden, Unimicron |
| **OSAT partner** | Amkor |
| **Die attach** | Kulicke & Soffa, ASMPT |

***Ibiden has announced a ¥220bn investment for its Gama plant in February 2026, with mass production for EMIB-T scheduled to begin in late 2027 and a more meaningful ramp expected in 2028.***

## Notable CoPoS suppliers

| TSMC CoPoS supply chain | Suppliers |
|---|---|
| **Desposition and re-distribution layer** | Applied Materials, SCREEN, Tokyo Electron, Canon |
| **Baking and thermal treatment** | APT, C Sun, GMM, Kokusai Electric |
| **Wet process** | GPTC, Scientech |
| **Debonding** | SÜSS MicroTec, Tokyo Electron, EVG, Scientech, E&R engineering, Daxin |
| **CMP** | Applied Materials, Disco, Ebara, LAM research, Tokyo Electron, GPM |
| **Molding equipment** | Apic Yamada, Towa |
| **Pod** | Gudeng, Chung King |
| **Underfill dispenser** | All Ring, Asymtek |
| **Die attach** | Kulicke & Soffa, ASMPT, Shibaura |
| **Metrology, inspection, and automation** | KLA, Chroma, Camtek, Favite, Ta Liang Technology, V5 Technologies |
| **OSAT partner** | ASE/SPIL |
| **Substrate** | Ibiden, Unimicron, Toppan, Shinko, Nanya PCB, Kinsus |

***We believe most existing CoWoS equipment suppliers, along with several new entrants, can capitalize on the next advanced packaging capex cycle***

*Source: Company data, UBS*

Section 3

# Rise of Google's TPUs

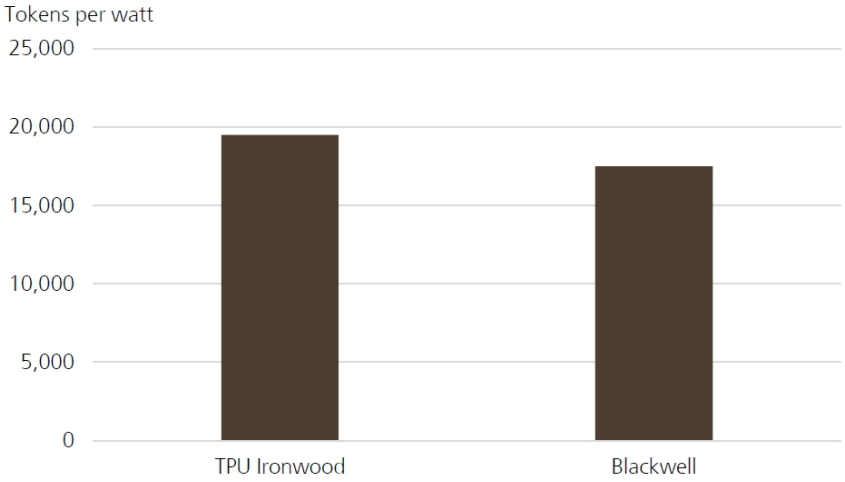
# Google adopting 2 TPU tracks, MediaTek gaining design service share

- Broadcom has been Google's sole TPU design service partner for 10 years. However, our analysis suggests the landscape is shifting: Google has been moving more parts of front-end TPU design in-house in recent years.
- Given tight TSMC capacity, we foresee Google ramping both Broadcom v8i and MediaTek v8t projects over H226 to 2027, and maintaining dual tracks for the TPU v9 ramp in 2028.
- While Broadcom remains a key partner, MediaTek should gain share in coming years.
  - We forecast TPU sales of US$18bn/35bn for MediaTek in 2027/28 with upside longer term.
  - Broadcom could ship 91%/62% of TPUs in 2026/27E, while MediaTek's share expands from 9% in 2026E to 38% in 2027E.
  - Our cost analysis suggests that on a per TPU die basis, MediaTek's service fee is 50% less than Broadcom's.

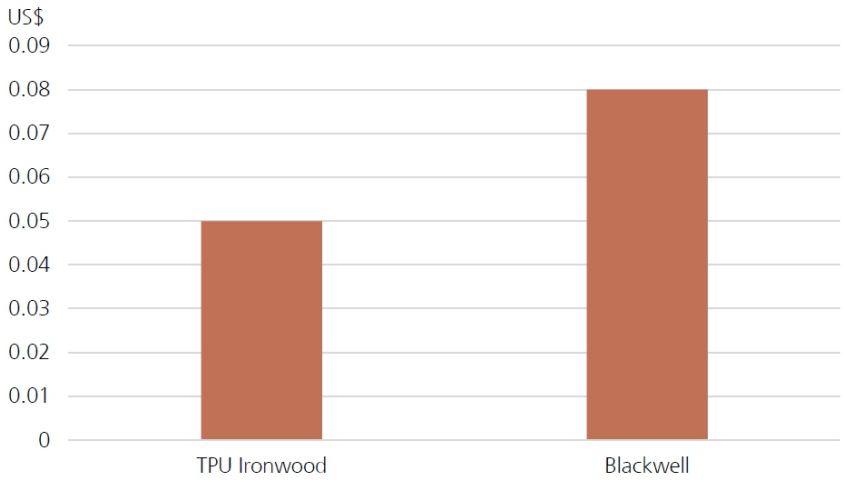
# GPU vs TPU win-win in 2026-27. w/ TPU volume from a lower base

- There are two key features in TPUs. 1)The **Matrix Multiply Unit (MXU)** in TPU's Tensor Core performs large systolic array compute, which allows data to flow through the chip like a heartbeat, which is significantly more energy efficient than GPUs, which need to constantly move data in and out of memory. 2) The **Sparse Core** introduced in TPU v4 is a dedicated unit that handles the "sparse" lookup and routing required by Mixture of Experts (MoE), lifting compute efficiency.

**Analysis of TPUs vs GPUs' performance via tokens-per-watt**




**TPU Ironwood has lower inferencing cost per token than Blackwell**

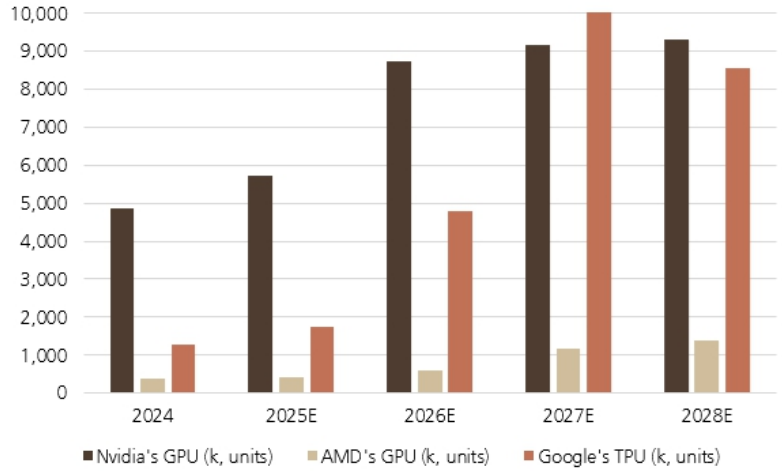



*Source: Company data, UBS estimates*

# TPU demand supported by Google's internal & external demand

1. Google has successfully deployed TPUs for the majority, if not all, of its internal workloads for training and inferencing.
2. Google is a key, major frontier LLM developer, along with OpenAI and Meta, etc Development of frontier models generate substantial training demand for its TPUs.
3. Growing **external demand**. From H225, when Google launched TPU v7 Ironwood, several AI developers like Meta have shown growing interest in using TPUs.
4. Google could also lift TPU penetration through its **cloud service**.

**UBSe on shipment of Nvidia's GPUs, AMD's GPUs, Google's TPUs , from 2024 to 2028E**



# Google to ramp both v8i and v8t in 2027 to support TPU demand

- Given the extreme tight capacity at TSMC for N3 and CoWoS, we expect Google to ramp both v8i (Broadcom) and v8t (MediaTek) to meet fast expanding TPU demand from H226 through 2027.
- We estimate total TPU shipments to come to 4.9m units in 2026E, with Broadcom shipping 90% of volume and MediaTek shipping 10%. In 2027E, we forecast TPU units to grow to 10.1m units, with Broadcom shipping 60% of volume and MediaTek shipping 40%.

**TPU ASIC sales forecast by Broadcom and MediaTek**

| | 2024 | 2025 | 2026E | 2027E | 2028E | 2029E |
|---|---|---|---|---|---|---|
| **ASIC sales (US$m)** | | | | | | |
| Broadcom TPU sales | 7,676 | 13,204 | 42,754 | 73,200 | 101,300 | |
| 2nd US LLM Lab | | | 13,470 | 35,700 | 50,600 | |
| MediaTek | | | 2,100 | 18,000 | 43,500 | 52,500 |
| | | | | | | |
| **TPU units (k)** | | | | | | |
| **Broadcom** | | | | | | |
| v5 | 1,280 | 440 | | | | |
| v6 (Trillium) | | 1,160 | 790 | | | |
| v7 (Ironwood) | | 140 | 3,470 | 2,440 | | |
| v8i (Sunfish) | | | 140 | 3,660 | 6,150 | |
| Next project after 8i | | | | | 890 | |
| Total | 1,280 | 1,740 | 4,400 | 6,100 | 7,040 | - |
| | | | | | | |
| **MediaTek** | | | | | | |
| v8t (Zebrafish) | | | 467 | 4,000 | 2,000 | |
| v9 (Humufish) | | | | | 2,300 | 3,500 |
| Total | | | 467 | 4,000 | 4,300 | 3,500 |
| | | | | | | |
| **TPU ASIC ASP (US$)** | | | | | | |
| **MediaTek** | | | | | | |
| v8t | | | 4,500 | 4,500 | 4,500 | 4,500 |
| v9X | | | | | 15,000 | 15,000 |
| | | | | | | |
| Total units (k) | 1,280 | 1,740 | 4,867 | 10,100 | 11,340 | |
| Broadcom share | 100% | 100% | 90% | 60% | 62% | |
| MediaTek share | 0% | 0% | 10% | 40% | 38% | |
| | | | | | | |
| Total die units (k) | 1,280 | 1,880 | 8,477 | 16,200 | 27,060 | |
| Broadcom share | 100% | 100% | 94% | 75% | 59% | |
| MediaTek share | 0% | 0% | 6% | 25% | 41% | |

**ASIC cost comparison of Broadcom and MediaTek for TPU**

| | TPU 8i | TPU 8t |
|---|---|---|
| ASIC partner | Broadcom | MediaTek |
| ASIC ASP (US$) | 14,000 | 4,500 |
| # of logic dies | 2 | 1 |
| ASIC ASP per logic die basis (US$) | 7,000 | 4,500 |
| ASIC gross margin | 55% | 42% |
| **ASIC service cost Google pays per TPU die** | **3,850** | **1,890** |

*Source: Company data, UBS estimates*

# TPU could shift MediaTek into a true Cloud & Edge AI fabless

- Our scenario analysis estimates MediaTek to potentially ship 4.5m units of TPU v8t 2027, and that translates into US$18bn of sales, and accounts for 46% of MediaTek's business.

**Scenario analysis of MediaTek's TPU opportunity**

| | 2026E | 2027E | 2028E | 2029E | 2030E |
|---|---|---|---|---|---|
| **Google's TPU sales (US$mn)** | **2,113** | **18,000** | **43,500** | **52,500** | **60,000** |
| Google's TPU sales (NT$mn) | 67,200 | 576,000 | 1,392,000 | 1,680,000 | 1,920,000 |
| *% of total sales* | *10%* | *46%* | *65%* | *68%* | *69%* |
| **Gross profits (NT$mn)** | **28,224** | **241,920** | **584,640** | **705,600** | **806,400** |
| *Gross margin* | *42%* | *42%* | *42%* | *42%* | *42%* |
| OPEX (NT$mn) | 13,440 | 28,800 | 41,760 | 50,400 | 57,600 |
| *OPEX ratio* | *20.0%* | *5.0%* | *3.0%* | *3.0%* | *3.0%* |
| **Operating profits (NT$mn)** | **14,784** | **213,120** | **542,880** | **655,200** | **748,800** |
| *Operating margin* | *22%* | *37%* | *39%* | *39%* | *39%* |
| *Tax rate* | *12.9%* | *14.5%* | *14.5%* | *14.5%* | *14.5%* |
| **Net profits (NT$mn)** | **12,875** | **182,218** | **464,162** | **560,196** | **640,224** |
| **EPS contribution (NT$)** | **8.1** | **114.4** | **291.4** | **351.7** | **402.0** |
| | | | | | |
| **Consolidated EPS (NT$)** | **67.6** | **177.5** | **363.4** | **433.7** | **488.0** |

*Source: Company data, UBS estimates*

# Major suppliers along the supply chain

| Semiconductors | Google | NVIDIA |
|---|---|---|
| Foundry + CoWoS | TSMC, ASE | TSMC, ASE |
| Assembly Outsourcing | ASE, Amkor | ASE, Amkor |
| Back-end Test | King Yuan (Broadcom, NVIDIA, MediaTek) | King Yuan, ASE (2nd source) |
| ASIC Design Service | Broadcom through v7/v8AX, Mediatek v8X | N/A |
| IC Distribution | WT Micro (TPU) | N/A |
| HBM | ASIC server: Hynix 70% / Samsung 30% | Hynix 60%+, Micron 24%, Samsung 15% |
| BMC | Google internal, Aspeed (mini-BMC) | Aspeed |
| Test Platform | Advantest | Advantest FT, Chroma SLT |
| Probe Card | MPI (CHPT load board) | Technoprobe |

| Hardware | Google | NVIDIA |
|---|---|---|
| ASIC Server | Celestica, Hon Hai | N/A |
| GPU Server | NVIDIA | NVIDIA |
| GPU Server Racks | Quanta, Hon Hai from VR | Hon Hai, Quanta, Wistron, SMCI etc. |
| Switch/Networking | Celestica | Wistron ODM Spectrum, Hon Hai Switch Tray |
| Substrate | Unimicron, Nanya PCB (late 26) | Ibiden, Unmicron |
| PCB | Victory, ISU Petasys, Shennan | HDI: Victory, Unimicron. MLB: Wus, TTM, ISU, Avary |
| CCL | Panasonic, Shengyi, Elite Material | Panasonic, Isola, Shengyi, Elite, Doosan |
| Heatspreader/Stiffener | GPU lid: Jentech, TPU stiffener: Jentech | Lid/stiffener main: Jentech, legacy: I-Chiun |
| Liquid Cooling (ASIC) | Boyd, Cooler Master, AVC | N/A |
| Liquid cooling GPU | Cooler master, Vertiv, AVC | AVC, Auras, Jentech, CoolerMaster |
| Power Supply Unit | Delta | Delta, Lite-On, Megmeet |

*Source: Company data, UBS estimates*

Section 4

# Quantifying per-GW AI server demand for capacity and sales opportunities

# Capacity/sales implications for TSMC for every 1GW server investment

- Following multiple gigawatt (GW) server projects being announced by Open AI and several hyperscalers for Cloud AI, we analyze the implications for TSMC in terms of capacity, capex and sales upside.
- As key conclusions, for every 1GW server build-out:
  1. We estimate AI accelerators, CPUs and networking to require ~2-5kwpm of leading-edge (N3 or N2) capacity and ~3-6kwpm of CoWoS capacity.
  2. WFE spending for logic could be US$1-2bn, including front-end capacity and CoWoS.
  3. The revenue potential for TSMC, as the major foundry for Cloud AI, could be US$1-2bn, or ~1.0-1.5% sales upside for every incremental 1GW server project.

# TSMC to gain content within Nvidia's new platforms

- Capacity requirements and sales upside for TSMC may vary across Nvidia, AMD and Broadcom (ASICs), given different computing architecture and design power.
- Our analysis shows that TSMC could gain more absolute content in the next several years within Nvidia's AI GPUs.
- For every 1GW, TSMC's sales upside could rise from US$1.1bn for Blackwell Ultra/Rubin to US$1.4-1.9bn for Rubin Ultra/Feynman.
- Higher content may come from a combination of process migration, increasing GPU units per rack and advanced packaging, such as CoWoS, along with a possible transition to panel-level packaging by 2028.

# Broadcom/ASICs offer good content, while AMD is lower

- ASICs, given their nature of better efficiency for specific workloads, may generate more chip unit demand per GW vs. GPUs.
- Broadcom's designed TPU v7p for Google may require ~5kwpm of N3 capacity per 1GW vs. Nvidia's 2-4kwpm.
- TSMC may also get greater content as a percentage of rack value, at 10-11% from ASICs vs. 4-6% from GPUs.
- AMD's AI GPU likely requires the least demand for TSMC's capacity per GW, with ~1kwpm N2 capacity for the upcoming MI455, possibly due to the chiplet design.

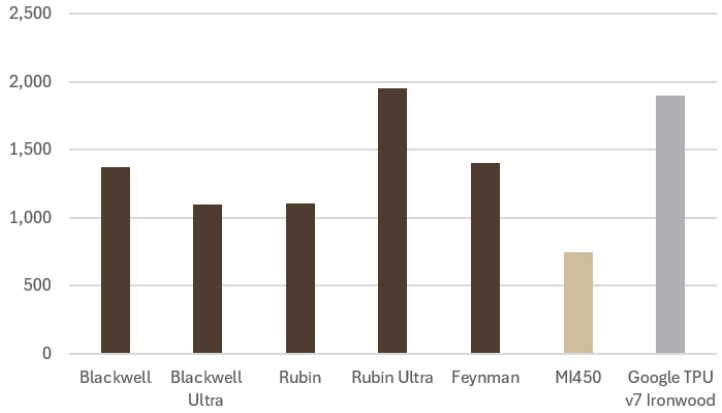
# TSMC's sales and WFE spending per GW

| | Blackwell | Blackwell Ultra | Nvidia Rubin | Rubin Ultra | Feynman | AMD MI450 | Broadcom Google TPU v7 Ironwood |
|---|---|---|---|---|---|---|---|
| Year of introduction | 2024 | 2025 | 2026 | 2027 | 2028 | 2026 | 2026 |
| Process node | N4 | N4 | N3 | N3P | A16 | N2 | N3 |
| | | | | | | | |
| Power for AI Hardware, Net (kW) | 870,000 | 870,000 | 870,000 | 870,000 | 870,000 | 870,000 | 870,000 |
| Power per rack (kW) | 120 | 150 | 225 | 600 | 1000 | 225 | 90 |
| Dies per rack | 144 | 144 | 144 | 576 | 576 | 72 | 128 |
| | | | | | | | |
| **Number of racks per GW** | **7,250** | **5,800** | **3,867** | **1,450** | **870** | **3,867** | **9,667** |
| **Rack ASP (US$mn)** | **$3.3** | **$4.2** | **$5.7** | **$23.8** | **$31.0** | **$4.5** | **$1.8** |
| **Customer sales per GW (US$bn - rack only)** | **$23.9** | **$24.4** | **$21.9** | **$34.5** | **$26.9** | **$17.5** | **$17.4** |
| | | | | | | | |
| **TSMC's revenue opportunity (US$m)** | **1,374** | **1,099** | **1,102** | **1,948** | **1,400** | **746** | **1,895** |
| *% of TSMC's 2025E sales* | *1.1%* | *0.9%* | *0.9%* | *1.5%* | *1.1%* | *0.6%* | *1.5%* |
| *% of customer sales* | *5.7%* | *4.5%* | *5.0%* | *5.6%* | *5.2%* | *4.3%* | *10.9%* |
| Revenue per wafer (US$) | | | | | | | |
| Front end | 18,000 | 18,000 | 24,000 | 26,000 | 35,000 | 28,000 | 24,000 |
| CoWoS | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| | | | | | | | |
| **Foundry capacity requirement (kwpm)** | **4.4** | **3.5** | **2.4** | **3.6** | **2.1** | **1.0** | **4.9** |
| xPU | 2.9 | 2.3 | 1.5 | 2.3 | 1.4 | 0.7 | 3.3 |
| CPU | 0.7 | 0.5 | 0.4 | 0.6 | 0.3 | 0.1 | 0.6 |
| Networking | 0.9 | 0.7 | 0.5 | 0.7 | 0.4 | 0.2 | 1.0 |
| **CoWoS capacity requirement (kwpm)** | **2.9** | **2.3** | **2.9** | **5.8** | **3.5** | **2.9** | **3.4** |
| Good packages per CoWoS wafer | 15.0 | 15 | 8 | 3 | 3 | 8 | 15 |
| | | | | | | | |
| **WFE spending - logic (US$m)** | **1,232** | **986** | **970** | **2,118** | **1,271** | **728** | **1,609** |
| Front end | 797 | 638 | 535 | 1,248 | 749 | 293 | 1,094 |
| CoWoS | 435 | 348 | 435 | 870 | 522 | 435 | 516 |
| WFE spending per kwpm (US$m) | | | | | | | |
| Front end | 180 | 180 | 225 | 350 | 350 | 300 | 225 |
| CoWoS | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| | | | | | | | |
| **xPU** | | | | | | | |
| Watt per XPU die | 600 | 700 | 900 | 900 | 1,500 | 2,500 | 550 |
| Number of accelerator dies per GW | 1,044,000 | 835,200 | 556,800 | 835,200 | 501,120 | 278,400 | 1,237,333 |
| Wafer capacity consumption (kwpm) | 2.9 | 2.3 | 1.5 | 2.3 | 1.4 | 0.7 | 3.3 |
| 12" wafer area (mm²) | 70,686 | 70,686 | 70,686 | 70,686 | 70,686 | 70,686 | 70,686 |
| Die size (mm²) | 814 | 814 | 814 | 814 | 814 | 960 | 800 |
| Yield | 50% | 50% | 50% | 50% | 50% | 60% | 50% |
| Usable area | 70% | 70% | 70% | 70% | 70% | 80% | 70% |
| Known good die per wafer | 30 | 30 | 30 | 30 | 30 | 35 | 31 |
| | | | | | | | |
| **CPU** | | | | | | | |
| Number of CPU dies per GW | 261,000 | 208,800 | 139,200 | 208,800 | 125,280 | 69,600 | 309,333 |
| Wafer capacity consumption (kwpm) | 0.7 | 0.5 | 0.4 | 0.6 | 0.3 | 0.1 | 0.6 |

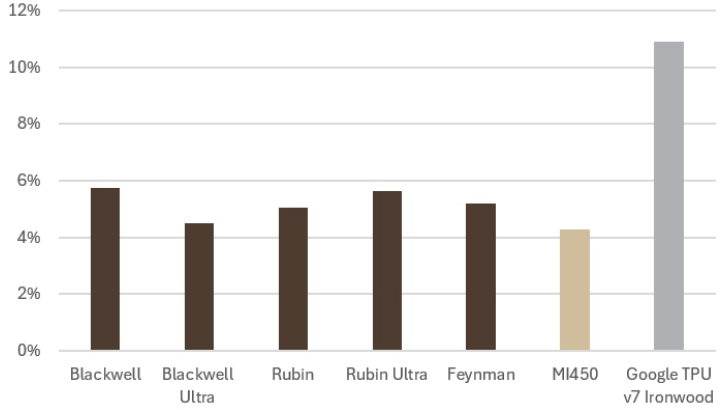
*Source: Company data, UBS estimates*

# TSMC's sales and WFE spending per GW

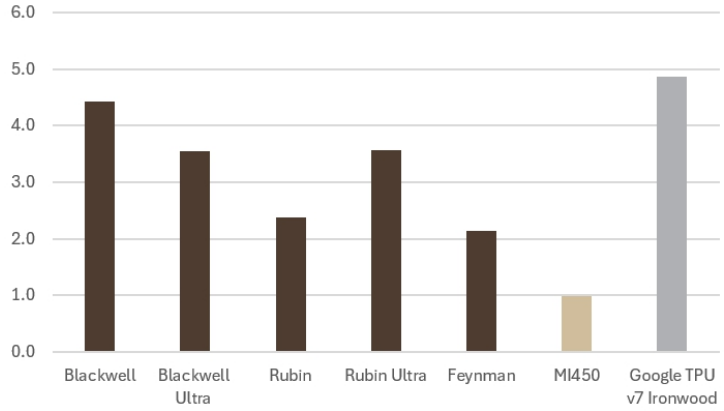
## TSMC's revenue opportunity per 1GW (US$ m)



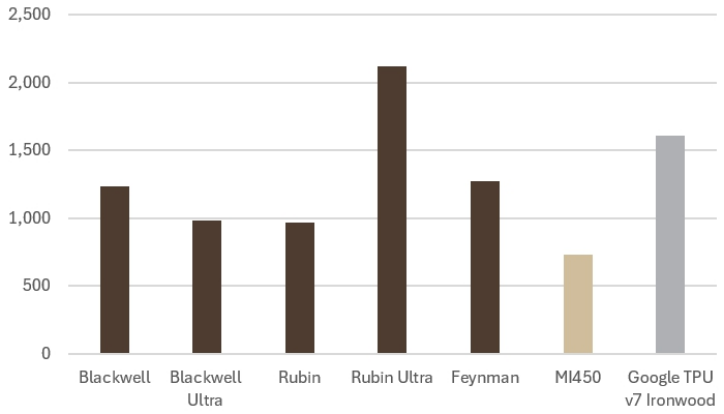

## TSMC's sales opportunity as % of rack value




## Foundry capacity requirement per 1GW (kwpm)




## WFE spending for logic per 1GW (US$ m)




*Source: Company data, UBS estimates*

# TSMC's sales and WFE spending per GW

| OpenAI deals | NVIDIA | AMD | Google | Total OpenAI |
|---|---|---|---|---|
| **Deal Size (GW)** | **10.0** | **6.0** | **10.0** | **26.0** |
| **Racks (k)** | **38.7** | **23.2** | **96.7** | **158.5** |
| Rack ASP (US$mn) | $5.7 | $4.5 | $1.8 | $3.1 |
| Customer compute sales (US$bn) | $219.2 | $104.9 | $174.0 | $498.1 |
| ODM ASP per GW (US$mn) | $20.2 | $16.1 | $16.0 | $17.6 |
| **ODM Revenue (US$bn)** | **$201.7** | **$96.5** | **$160.1** | **$458.3** |
| **ODM Operating Profit (2-4%)** | **$6.1** | **$2.9** | **$4.8** | **$13.7** |
| Power Supply Content GW (US$mn) | $334.5 | $334.5 | $312.6 | $326.1 |
| **Power Supply Revenue (US$bn)** | **$3.3** | **$2.0** | **$3.1** | **$8.5** |
| **Power Supply Operating Profit (20-25%)** | **$0.8** | **$0.5** | **$0.7** | **$1.9** |
| Foundry Revenue per GW (US$mn) | $1,102 | $745.7 | $1,894.9 | $1,324.8 |
| **TSMC Revenue (US$bn)** | **$11.0** | **$4.5** | **$18.9** | **$34.4** |
| **TSMC Operating Profit (40-45%)** | **$4.7** | **$1.9** | **$8.1** | **$14.6** |

*Source: Company data, UBS estimates*

# Monitoring AI data centre builds

| Project | Capacity | Operator | Partner | Details |
|---|---|---|---|---|
| Project Matador | 11 GW (planned) | N/A | Fermi | 5,800 acre HyperGrid AI campus near Amarillo, Texas |
| Colossus 2 | 3 GW | xAI | Solaris Energy | AI training super-cluster in Memphis, Tennessee |
| Jupiter | 2.3 GW | Oracle | BorderPlex, Stack | major data center build in Doña Ana County, New Mexico |
| New Carlisle (Rainier) | 2.25 GW | AWS | Walbridge | first site for Project Rainier in New Carlisle, Indiana |
| Hyperion | 2.0+ GW | Meta | DPR, Turner and Mortenson | 2 GW by 2030 that can eventually scale to 5 GW. AI data center in Richland Parish, Louisiana |
| Horizon | 2.0 GW | Poolside/CoreWeave | N/A | major data center build in West Texas; CoreWeave anchor tenant for first 0.25 GW |
| Cheyenne | 1.8 GW | N/A | Crusoe and Tallgrass | could scale to 10 GW, tenant is unclear but some press reports suggest Oracle for OpenAI |
| Lordstown | 1.5 GW | OpenAI/Oracle | SoftBank/SB Energy | large-scale AI campus in Lordstown, Ohio; the redevelopment of the former GM/Foxconn complex |
| Milam | 1.5 GW | OpenAI/Oracle | SoftBank/SB Energy | major data center build in Milam County, Texas (near Austin) |
| Port of Victoria | 1.5 GW | N/A | Crusoe and Blue Energy | Nuclear-powered data center build in Port of Victoria, Texas; up to 1.5 GW |
| Frontier | 1.4 GW | N/A | Vantage | major data center build near Abilene, in Shackleford, TX, tenant unclear |
| Stargate 1 (Abilene) | 1.2 GW | Oracle | Crusoe and Lancium | Stargate 1, first building is live, material ramp later this calendar year |
| Lighthouse | 1.0 GW | Oracle | Vantage | data center campus in Port Washington, Wisconsin. Midwest location in the 4.5 GW Stargate expansion |
| Stargate UAE | 1.0 GW | Oracle | G42 | major data center build in Abu Dhabi. 0.2 GW expected to go live in 2026 |
| Saline Township | 1.0 GW | Oracle | Related Digital and Walbridge | major data center build in Saline Township, Michigan; part of Stargate expansion |
| Prometheus | 1.0 GW | Meta | Will-Power | AI data center campus in New Albany, Ohio due online in 2026 |
| EL Paso | 1.0 GW | Meta | BorderPlex | AI-focused data center in El Paso, Texas |
| Fairwater 1 | N/A | Microsoft | Walsh, Kiewit | Microsoft AI factory in Mount Pleasant, Wisconsin |
| Pennsylavnia | N/A | AWS | N/A | Amazon investing $20 billion for two AI campuses in Salem and Falls Townships, PA |
| Georgia | N/A | AWS | N/A | data center expansion in Atlanta, Georgia. $11 billion investment |
| North Carolina | N/A | AWS | N/A | data center expansion in Richmond County, North Carolina. $10 billion investment |

*Source: Company press releases, UBS Research US Software & Semi team*

# Announced AI commitments

| Partner | Contract Value | Date Announced | Details |
|---|---|---|---|
| Nvidia | $375bn est. | Sep-25 | Partnership to deploy at least 10 GW of Nvidia GPUs for OpenAI's infrastructure, and Nvidia will invest up to $100 billion progressively as each GW is deployed. Jensen Huang said in a CNBC interview that this is "additive" to the infrastructure projects that had already been announced, including Stargate. First phase targeted to come online in 2H26. |
| Oracle | ~$300bn | Jul-25 | Cloud commitment to Oracle; a key part of the broader Stargate initiative |
| Microsoft | $250bn | Oct-25 | OpenAI contracted to purchase an incremental $250 billion of Azure services with the next chapter of the OpenAI-Microsoft partnership. |
| Other Stargate Commits | $200bn | Jan-25 | Commitments to other partners as part of Stargate. |
| Broadcom | $150bn est. | Oct-25 | Agreement with Broadcom to deploy 10 GW worth of custom AI accelerators, OpenAI's first in-house GPU chip. OpenAI will design the chips, which will be developed and deployed in partnership with Broadcom. Deployment will start in 2H26. |
| AMD | $105bn est. | Oct-25 | Multi-year, multi-generation agreement to deploy 6 GW of AMD GPUs. First 1 GW deployment set to begin in 2H26. As part of the agreement, OpenAI will work with AMD as a core strategic compute partner to drive large-scale deployments and they'll be sharing technical expertise to optimize product roadmaps. AMD also issued OpenAI a warrant for up to 160 million shares of AMD common stock (up to 10% stake), structured to vest as milestones are achieved (GWs deployed). |
| AWS | $38bn | Nov-25 | Multi-year strategic partnership for $38 billion, "which will have continued growth over the next 7 years." AWS is building GPU clusters for OpenAI designed for inference and training. OpenAI immediately starts utilizing AWS compute, with all capacity targeted to be deployed before the end of 2026 and the ability to expand further into 2027 and beyond. |
| CoreWeave | $22.4bn | Sep-25 | Agreement with CoreWeave to "power the training of its most advanced next-gen models." First agreement with CoreWeave was in March 2025 for $11.9 billion, then it was expanded by $4 billion in May 2025 before the latest addition of $6.5 billion in Sept 2025. |
| Google Cloud | N/A | N/A | OpenAI said in July 2025 that they'll use GCP for ChatGPT workloads in a number of geographies. Google and OpenAI's CEOs have both acknowledged the partnership, but there have been no official press releases or dollar values announced. |
| **Total Commitments** | **$1.4tn+** | | |

*Source: Company press releases, UBS Research US Software & Semi team*

Section 5

# Co-packaged optics – lighting the way for AI acceleration

# Industry ramping up for CPO tech maturity in three years

- With bandwidth increasing in the past several years, fibre optics has been replacing copper wires for long-reach interconnects in data centres.
- CPO integrates the optical engine close to the switch/xPU, critical to support higher bandwidth, better signal integrity with less power.
- While CPO is emerging for AI servers, traditional optical transceivers could coexist and remain mainstream solutions for the next 3 years.
- **Global implications and stock picks**
  - 1) For semis, CPO development could strengthen TSMC's moat in Cloud AI. ASE could capture significant market share for fibre array units coupling and switch board packaging.
  - 2) CPO migration would have mixed implications for traditional optical suppliers, eg, Lumentum, Innolight and DSP suppliers, eg, Marvell, but pluggable transceivers should keep most of the volume for the next 2-3 years.
  - 3) The adoption of CPO would be positive for ABF substrate makers as optics on substrate increases routing density and thus potential for higher layer count.
  - 4) Server ODMs would have higher added value.
  - 5) The industry is pushing the limits of traditional copper wires for scale up upgrade.

# Quantifying the revenue opportunities – optical transceivers

- Our base case forecasts the whole optical transceiver SAM CAGR at 22%, from US$12bn in 2025E to US $32bn sales by 2030E, of which CPO solutions could reach 20% to arrive at US$7bn sales by 2030E.
- In our upside scenario, we assume more Cloud AI development to support optical transceiver market to grow at a faster 30% CAGR in 2025-30E.

**Optical transceiver SAM**

| | 2025E | 2026E | 2027E | 2028E | 2029E | 2030E | 25-30E CAGR |
|---|---|---|---|---|---|---|---|
| **Base case** | | | | | | | |
| **Market size (US$bn)** | **12.0** | **15.6** | **19.5** | **23.4** | **28.1** | **32.3** | |
| *Growth* | | *30%* | *25%* | *20%* | *20%* | *15%* | *22%* |
| **o/w pluggable transceivers** | **12.0** | **15.6** | **19.1** | **22.2** | **25.3** | **25.8** | |
| Share in optical transceivers | 100% | 100% | 98% | 95% | 90% | 80% | |
| **o/w CPO** | **0.0** | **0.0** | **0.4** | **1.2** | **2.8** | **6.5** | |
| Share in optical transceivers | 0% | 0% | 2% | 5% | 10% | 20% | |
| **Upside scenario** | | | | | | | |
| **Market size (US$bn)** | **15.0** | **20.3** | **26.7** | **34.7** | **44.1** | **55.2** | |
| *Growth* | | *35%* | *32%* | *30%* | *27%* | *25%* | *30%* |
| **o/w pluggable transceivers** | **15.0** | **20.3** | **26.2** | **32.3** | **38.4** | **41.4** | |
| Share in optical transceivers | 100% | 100% | 98% | 93% | 87% | 75% | |
| **o/w CPO** | **0.0** | **0.0** | **0.5** | **2.4** | **5.7** | **13.8** | |
| Share in optical transceivers | 0% | 0% | 2% | 7% | 13% | 25% | |

*Source: UBS estimates*

# Quantifying the revenue opportunities – TSMC

- We forecast a 35% CAGR for silicon photonics industry sales in 2025-30, faster than the overall optical transceiver market's 22% CAGR in the same period. We forecast the silicon photonics industry sales to reach US$4-6bn in 2028-30. In our upside scenario, we assume a 45% 2025-30E CAGR.

**TSMC**

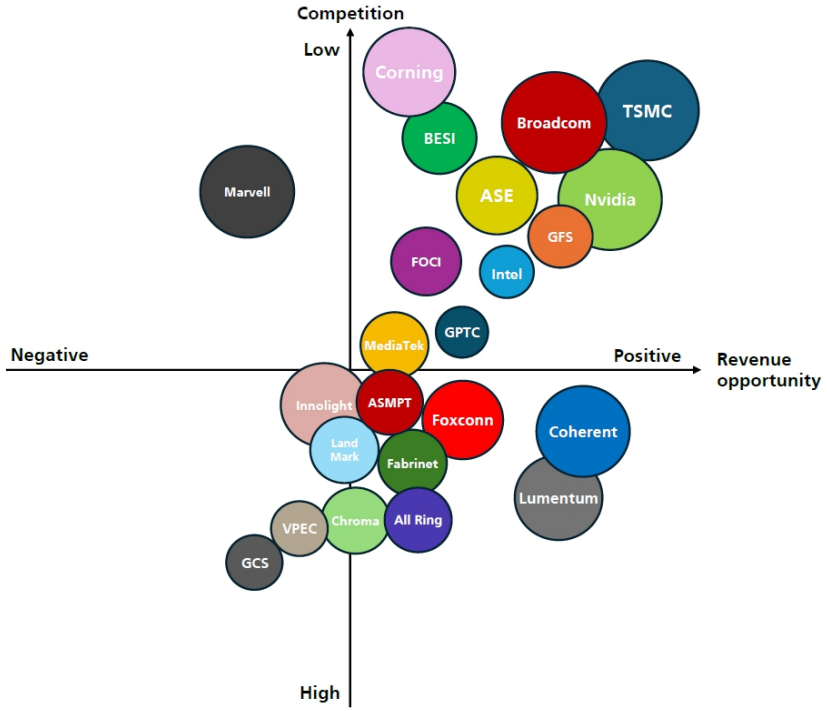
| | 2025E | 2026E | 2027E | 2028E | 2029E | 2030E | 25-30E CAGR |
|---|---|---|---|---|---|---|---|
| **Base case** | | | | | | | |
| **Silicon photonics industry sales (US$bn)** | **1.4** | **2.0** | **2.8** | **3.8** | **4.9** | **6.1** | |
| *Growth* | | *45%* | *40%* | *35%* | *30%* | *25%* | *35%* |
| **TSMC's silicon photonics sales (US$B)** | **0.7** | **1.0** | **1.7** | **2.3** | **3.4** | **4.9** | |
| TSMC's market share | 50% | 50% | 60% | 60% | 70% | 80% | |
| TSMC total sales (US$bn) | 115.9 | 132.4 | 155.1 | 180.9 | 209.7 | 241.1 | |
| % sales contribution | 0.6% | 0.8% | 1.1% | 1.3% | 1.6% | 2.0% | |
| GM assumption | 50% | 52% | 55% | 55% | 55% | 55% | |
| **Upside scenario** | | | | | | | |
| **Silicon photonics industry sales (US$bn)** | **1.3** | **2.0** | **3.0** | **4.4** | **6.1** | **8.5** | |
| *Growth* | | *50%* | *50%* | *45%* | *40%* | *40%* | *45%* |
| **TSMC's silicon photonics sales (US$bn)** | **0.7** | **1.0** | **1.8** | **2.8** | **4.6** | **7.2** | |
| TSMC's market share | 50% | 50% | 60% | 65% | 75% | 85% | |
| TSMC total sales (US$bn) | 115.9 | 132.4 | 155.1 | 180.9 | 209.7 | 241.1 | |
| % sales contribution | 0.6% | 0.8% | 1.2% | 1.6% | 2.2% | 3.0% | |
| GM assumption | 50% | 52% | 55% | 58% | 58% | 58% | |

*Source: UBS estimates*

# Visualising business opportunities and competition

- As CPO is still in the early stage of development, it might be too early to have accurate revenue forecasts for individual companies. We think it would be useful to illustrate our views on business opportunities for the key companies in the CPO market, with the size of bubbles indicating a ballpark for opportunities and the potential competition.

**Value chain analysis when datacentre networking migrates from traditional optical transceiver to CPO**




*Source: UBS estimates*

# Why is fibre replacing copper?

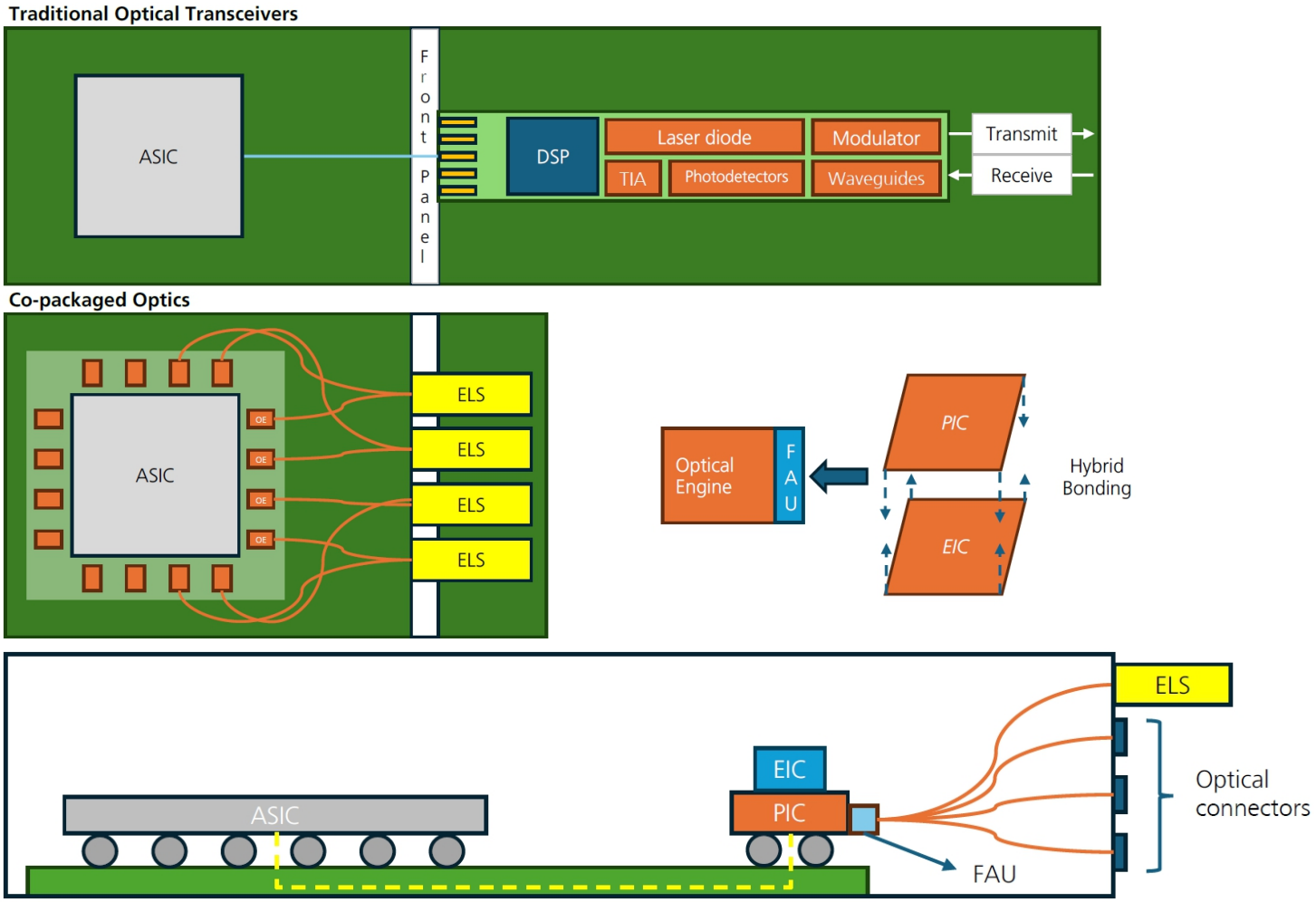
- **Higher bandwidth.** Fibre optics can carry much more data than copper as it uses "light" instead of "electricity".
- **Faster data transmission.** Fibre optics transmits data at a speed of around 2/3 the speed of light, way faster than that of copper cable.
- **Longer transmission distance.** With much less signal degradation, fibre optics can transmit data for a longer distance of up to 100km for a single-mode fibre, vs copper's 10m for high speed transmission given its natural limitations.
- **Better reliability.** Compared with copper cable, fibre optics is less susceptible to environmental factors including temperature changes and moisture, and to EMI
- **Good for space efficiency.** Fibre is also thinner, lighter in weight, and sturdier, thus easier to handle than copper.

**Comparison—fibre optics vs copper cable**

| | Fiber Optics | Copper |
|---|---|---|
| Bandwidth | More suitable for 800G / 1.6T and above especially for longer reach interconnect. | In 800G / 1.6T, the use should be limited to short-reach networking. |
| Transmission distance | Up to 100km. Single mode fiber could transmit data for longer distance than multi-mode fiber. | In general, <100m. For 800G / 1.6T, the transmission distance could be <10m. |
| Environmental factor tolerance | Less susceptible to temperature and moiture | Susceptible to temperature and moisture |
| EMI | Immune | Susceptible to EM interfererence |
| Useful life | 30-50 years | 5 years |
| Handling | Thinner, lighter, stronger pullling strength | Thicker, heavier, more prone to demage and breakage |
| Security | Better | Weaker - possibilty to be tapped or causing fire when damaged |

*Source: UBS*

# What is CPO?




*Source: UBS*

# When will CPO adoption inflection occur?

1. For **scale out** (interconnect between racks), Nvidia may start to push CPO switch (Spectrum X) from H226E for Rubin racks
2. For **scale up** (interconnect within a rack), Nvidia may adopt a hybrid approach to first upgrade the NVLINK switches to CPO from Kyber architecture (Rubin Ultra, Feynman) while GPU compute trays continue to use copper
3. For the **CPO scale up for GPUs**, the technology may mature for adoption in 2029E, if not earlier.

# Supply chain implications for foundry and packaging

- **TSMC** plays a key role in enabling CPO technology through its EIC, PIC and optical engine (OE) stacking manufacturing capability and supply chain integration.
  - Assuming around 50% of Rubin rack shipments from late 2026E to 2027E potentially use CPO for scale out, our analysis suggests a volume of about 3m OEs in 2027E and 0.4-0.5kwpm of SoIC (system on integrated chips) capacity requirements in 2027E.
  - OE demand should meaningfully inflect from H227E to potentially 30-50m units or more in 2028E when Nvidia starts to migrate the scale-up switch to CPO.
- On the **packaging** side, we think ASE/SPIL could support FAU attach and OE attach on substrates; USI could be involved in supporting ASE's CPO packaging and ramping laser modules by itself; final tests could be done at ASE and KYEC.

# Supply chain implications for testing and laser source

- **Testing** has been a major challenge for CPO given the complicated design and requirements for optical alignment in each testing insertion.
  - Teradyne could be major tester supplier for CPO across PIC, OE and FT
  - Advantest could supply testers for EIC wafers; Chroma is strongly positioned for CPO testing solution for OE and laser source
  - Hon Precision could supply final test handlers.
  - All Ring may supply the coupling tools related to FAU and OE alignment.
- For **external laser source (ELS)**, we think Nvidia could closely partner with Lumentum and Coherent following its US$4bn (US$2bn in each) investment.

# CPO value chain: Who are the major players?

- The traditional optical transceivers supply chain is dominated by vertically integrated suppliers such as Coherent, Lumentum, Broadcom, and Chinese module makers such as Innolight and TFC Communications.

**Notable traditional optical transceivers suppliers**

| Traditional Optical Transceivers | Notable Suppliers |
|---|---|
| **Epiwafers** | VPEC, LandMark, IQE, Coherent, Lumentum |
| **Fibers** | Corning |
| **Optical Chips (LD/PD)** | Coherent, Lumentum, Broadcom, GCS, AAOI, HiSilicon |
| **DSPs** | Marvell, Airoha |
| **TIA** | Airoha, Broadcom, Marvell |
| **Module makers** | Cohernet, Lumentum, Broadcom, Innolight, Intel, Cisco, Sumitomo, AAOI, TFC |

- The CPO ecosystem should be fairly different from traditional optical industry, as the silicon semiconductor supply chain gains some value from the optical industry.

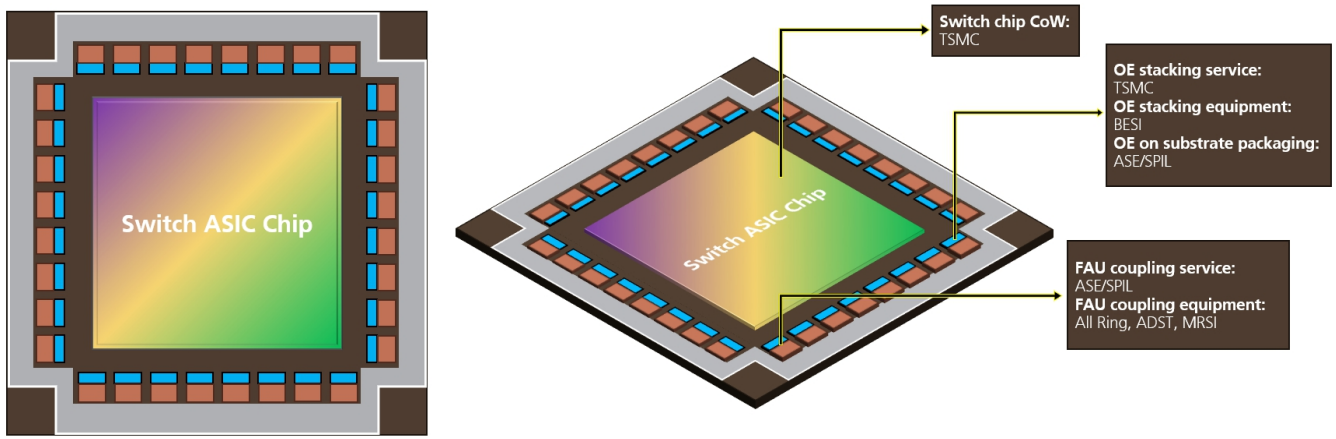
**Notable CPO suppliers**

| CPO Value Chain | Notable Suppliers |
|---|---|
| **Epiwafers** | VPEC, LandMark, IQE, Coherent, Lumentum |
| **Fibers/cables** | Corning, BizLink |
| **FAUs** | FOCI, Browave, TFC Communication, Senko, Sumitomo |
| **Assembly, packaging, and testing** | ASE/SPIL, FOCI, Amkor, ShunSin, Fabrinet, Foxconn, FIT |
| **ELS lasers** | Coherent, Lumentum, Sumitomo, Furukawa, Broadcom, LandMark, GCS |
| **Optical engines** | Nvidia, Broadcom, Marvell, Lightmatter, Ayar Labs |
| **Switch ASICs/SerDes IP** | Broadcom, Marvell, Nvidia, MediaTek |
| **Transimpedance Amplifier (TIA)** | Airoha, Broadcom, Marvell |
| **Chip fabrication** | TSMC, GlobalFoundries, Intel, Tower, UMC |
| **Equipment vendors** | BESI, ASMPT, K&S, All Ring, GPTC, Chroma, Hon Precision, Teradyne, Advantest, Tokyo Electron |

*Source: Company data, UBS*

# CPO value chain: Who are the major players?

## Nvidia's CPO packaging layout and notable suppliers




## Nvidia's CPO test flow chart and notable suppliers

| Insertion 1 (wafer-level) | Insertion 1 (wafer-level) | Insertion 2 (wafer-level) | Insertion 3 (die/chip level) | Insertion 4 (final test) |
|---|---|---|---|---|
| Electronic IC (EIC) | Photonic IC (PIC) | EIC on PIC | Optical Engine (OE) | ASIC + OE Alignment |
| **Testing service provider:**<br>TSMC<br>**Testing solution:**<br>Advantest (tester)<br>Teradyne (tester)<br>Chroma (testing solution)<br>FormFactor (prober) | **Testing service provider:**<br>TSMC<br>**Tester:**<br>Advantest<br>**Prober:**<br>Tokyo Electron<br>**Probe card:**<br>FormFactor | **Testing service provider:**<br>TSMC<br>**Testing solutions:**<br>Advantest<br>MPI<br>ficonTEC<br>**Prober:**<br>Tokyo Electron<br>**Probe card:**<br>FormFactor | **Testing service provider:**<br>TSMC, ASE (incl. SPIL, USI)<br>**Testing solution:**<br>Teradyne (tester)<br>Chroma (testing solution)<br>ficonTEC (tester) | **Testing service provider:**<br>ASE (incl. SPIL, USI), KYEC<br>**Testing solution:**<br>Advantest (tester)<br>Teradyne (tester)<br>Hon Precision (FT package handler)<br>Chroma (ELS tester) |

*Source: Company data, UBS*

Section 6

# Quantifying the multi-year generative AI opportunities

# NVIDIA's product refresh to further drive up advanced foundry and packaging demand

## NVIDIA's mix shifted to Blackwell (B200/B300) and GB200/300 in 2025. Rubin to ramp in H226

| NVIDIA Units | Q324 | Q424 | Q125 | Q225 | Q325 | Q425 | Q126 | Q226E | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A100 | 155,802 | 40,029 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 556,038 | 602,396 | 0 | 0 | 0 |
| H100/H200/H20 | 1,038,678 | 1,000,722 | 661,444 | 324,324 | 93,569 | 60,184 | 78,296 | 46,381 | 0 | 0 | 0 | 0 | 0 | 0 | 994,162 | 3,447,972 | 1,139,522 | 124,677 | 0 |
| B200/B300/B30 | 0 | 133,430 | 476,240 | 372,731 | 730,727 | 594,862 | 541,633 | 497,283 | 433,860 | 153,710 | 104,907 | 34,470 | 13,633 | 0 | 0 | 133,430 | 2,174,560 | 1,626,486 | 153,010 |
| GB200/GB300 (2 GPUs on each) | 0 | 106,744 | 132,289 | 242,033 | 278,478 | 497,681 | 642,066 | 794,875 | 721,515 | 455,414 | 170,054 | 65,187 | 12,277 | 0 | 0 | 106,744 | 1,150,481 | 2,613,870 | 247,518 |
| R200/R300 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 102,641 | 306,956 | 402,935 | 473,300 | 481,261 | 530,698 | 0 | 0 | 0 | 409,596 | 1,888,195 |
| VR200/VR300 (2/4 GPUs on each) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50,920 | 276,240 | 511,581 | 663,363 | 772,000 | 832,200 | 0 | 0 | 0 | 327,160 | 2,779,144 |
| Vera CPU (standalone) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52,728 | 490,104 | 685,076 | 387,841 | 312,212 | 336,000 | 287,280 | 0 | 0 | 0 | 1,227,908 | 1,323,334 |
| Rubin CPX | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26,243 | 61,408 | 70,619 | 39,900 | 45,486 | 0 | 0 | 0 | 26,243 | 217,414 |
| L40S | 64,917 | 26,686 | 26,458 | 19,363 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 111,592 | 298,882 | 45,820 | 0 | 0 |
| Other GPUs | 38,950 | 26,686 | 26,458 | 9,681 | 11,139 | 27,584 | 9,076 | 10,753 | 12,720 | 15,773 | 18,455 | 21,223 | 35,973 | 27,339 | 100,044 | 149,904 | 74,862 | 48,322 | 102,990 |
| **Total Units** | **1,298,347** | **1,334,296** | **1,322,889** | **968,132** | **1,113,913** | **1,180,311** | **1,271,071** | **1,402,019** | **1,811,759** | **1,919,412** | **1,657,182** | **1,640,375** | **1,691,044** | **1,723,003** | **1,761,836** | **4,739,327** | **4,585,245** | **6,404,261** | **6,711,603** |
| **Total GPUs (GB200 ~2 GPUs)** | **1,298,347** | **1,441,040** | **1,455,177** | **1,210,165** | **1,392,391** | **1,677,992** | **1,913,137** | **2,144,166** | **2,094,091** | **1,939,748** | **1,889,567** | **1,986,093** | **2,099,421** | **2,222,437** | **1,761,836** | **4,846,071** | **5,735,726** | **8,091,141** | **8,197,517** |

| NVIDIA ASPs US$ | Q324 | Q424 | Q125 | Q225 | Q325 | Q425 | Q126 | Q226E | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A100 | $14,788 | $14,788 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $16,188 | $14,788 | $0 | $0 | $0 |
| H100/H200/H20 | $22,990 | $20,834 | $16,726 | $22,346 | $23,342 | $21,110 | $26,229 | $41,657 | $0 | $0 | $0 | $0 | $0 | $0 | $27,900 | $22,325 | $19,100 | $50,572 | $0 |
| B200/B300/B30 | $0 | $30,500 | $30,500 | $31,303 | $32,205 | $32,102 | $33,454 | $35,975 | $40,975 | $40,975 | $40,975 | $40,975 | $40,975 | $0 | $0 | $30,500 | $31,649 | $36,942 | $40,975 |
| GB200/GB300 (2 GPUs on each) | $0 | $60,000 | $60,000 | $60,800 | $61,920 | $61,888 | $62,557 | $64,368 | $65,000 | $65,000 | $65,000 | $65,000 | $65,000 | $0 | $0 | $60,000 | $61,450 | $64,208 | $65,000 |
| R200 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $70,105 | $70,105 | $70,105 | $71,619 | $76,275 | $82,281 | $0 | $0 | $0 | $70,105 | $75,479 |
| VR200/VR300 (2/4 GPUs on each) | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $133,000 | $133,000 | $133,000 | $133,710 | $138,513 | $147,357 | $0 | $0 | $0 | $133,000 | $139,000 |
| Vera CPU (standalone) | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $9,500 | $9,500 | $9,500 | $9,500 | $9,500 | $9,500 | $9,500 | $0 | $0 | $0 | $9,500 | $9,500 |
| Rubin CPX | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $40,000 | $40,000 | $40,000 | $40,000 | $40,000 | $0 | $0 | $0 | $40,000 | $40,000 |
| L40S | $10,000 | $8,000 | $8,000 | $8,000 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $12,000 | $10,599 | $8,000 | $0 | $0 |
| Other GPUs | $20,833 | $16,000 | $15,775 | $6,050 | $6,050 | $6,050 | $6,655 | $6,655 | $6,655 | $6,655 | $6,655 | $6,655 | $6,655 | $6,655 | $8,366 | $17,818 | $9,487 | $6,655 | $6,655 |
| **Average content US$** | **$21,292** | **$24,399** | **$25,819** | **$34,958** | **$38,628** | **$43,492** | **$47,519** | **$51,040** | **$46,725** | **$53,596** | **$71,147** | **$81,797** | **$88,717** | **$99,261** | **$22,087** | **$21,563** | **$35,409** | **$49,886** | **$85,394** |

| NVIDIA Sales US$mn | Q324 | Q424 | Q125 | Q225 | Q325 | Q425 | Q126 | Q226E | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A100 | $2,304 | $592 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $9,001 | $8,908 | $0 | $0 | $0 |
| H100/H200/H20 | $23,879 | $20,849 | $11,063 | $7,247 | $2,184 | $1,270 | $2,054 | $1,932 | $1,270 | $1,050 | $0 | $0 | $0 | $0 | $27,737 | $76,975 | $21,765 | $6,305 | $0 |
| B200/B300/B30 | $0 | $4,070 | $14,525 | $11,667 | $23,533 | $19,096 | $18,120 | $17,890 | $17,777 | $6,298 | $4,299 | $1,412 | $559 | $0 | $0 | $4,070 | $68,822 | $60,085 | $6,270 |
| GB200/GB300 (2 GPUs on each) | $0 | $6,405 | $7,937 | $14,716 | $17,243 | $30,800 | $40,166 | $51,165 | $46,898 | $29,602 | $11,053 | $4,237 | $798 | $0 | $0 | $6,405 | $70,697 | $167,831 | $16,089 |
| R200/R300 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $7,196 | $21,519 | $28,248 | $33,897 | $36,708 | $43,667 | $0 | $0 | $0 | $28,715 | $142,520 |
| VR200/VR300 (2 GPUs on each) | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $6,772 | $36,740 | $68,040 | $88,698 | $106,932 | $122,630 | $0 | $0 | $0 | $43,512 | $386,301 |
| Vera CPU (standalone) | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $501 | $4,656 | $6,508 | $3,684 | $2,966 | $3,192 | $2,729 | $0 | $0 | $0 | $11,665 | $12,572 |
| Rubin CPX | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,050 | $2,456 | $2,825 | $1,596 | $1,819 | $0 | $0 | $0 | $1,050 | $8,697 |
| L40S | $649 | $213 | $212 | $155 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,339 | $3,168 | $367 | $0 | $0 |
| Other GPUs | $811 | $427 | $417 | $59 | $67 | $167 | $60 | $72 | $85 | $105 | $123 | $141 | $239 | $182 | $837 | $2,671 | $710 | $322 | $685 |
| **NVIDIA GPU Sales** | **$27,644** | **$32,556** | **$34,155** | **$33,844** | **$43,028** | **$51,334** | **$60,400** | **$71,559** | **$84,654** | **$102,872** | **$117,904** | **$134,177** | **$150,024** | **$171,027** | **$38,914** | **$102,196** | **$162,361** | **$319,485** | **$573,132** |
| **UBS NVIDIA model** | **$27,644** | **$32,556** | **$34,155** | **$33,844** | **$43,028** | **$51,334** | **$60,400** | **$71,559** | **$84,654** | **$102,872** | **$117,904** | **$134,177** | **$150,024** | **$171,027** | **$38,914** | **$102,196** | **$162,361** | **$319,485** | **$573,132** |
| **NVIDIA Networking** | **$3,127** | **$3,024** | **$4,957** | **$7,252** | **$8,187** | **$10,980** | **$14,800** | **$17,464** | **$18,337** | **$20,171** | **$22,591** | **$25,302** | **$28,339** | **$32,023** | **$8,611** | **$12,990** | **$31,376** | **$70,772** | **$108,255** |
| **NVIDIA Data Center Sales** | **$30,771** | **$35,580** | **$39,112** | **$41,096** | **$51,215** | **$62,314** | **$75,200** | **$89,023** | **$102,991** | **$123,043** | **$140,495** | **$159,479** | **$178,363** | **$203,050** | **$47,525** | **$115,186** | **$193,737** | **$390,257** | **$681,387** |

*Published with Q226 TSMC preview Source: Company data, UBS estimates*

# TSMC’s content per system to rise in GB200/RV200 racks

## TSMC's content for a GB200 rack is around 5%

| TSMC's GB200 Content | GB200 | Interposer | CPUs | Connect X7 | NV Link Switch | Bluefield 3 | Spectrum 52-Port | Aspeed BMC |
|---|---|---|---|---|---|---|---|---|
| Tech Node | 4nm | 65nm | 4nm | 4nm | 4nm | 4nm | 4nm | 28nm |
| Transistors (bn) | 208 | NA | NA | 8 | 50 | 22 | 100 | NA |
| Density (1mn trans/mm-sq.) | 127.8 | NA | NA | 76.1 | 122.9 | 122.9 | 122.9 | NA |
| Die size (mm-sq) | 1628 | 2832 | 809 | 105.1 | 407 | 179.1 | 814 | 48 |
| Wafer area (mm-sq) | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 |
| Usable area (Edges/size) | 78% | 65% | 78% | 82% | 82% | 85% | 78% | 90% |
| Usable area (mm-sq) | 55,347.0 | 45,945.8 | 55,135.0 | 57,962.4 | 57,609.0 | 60,351.6 | 55,347.0 | 63,546.6 |
| **Total die per wafer** | **34.0** | **16.2** | **68.2** | **551.6** | **141.5** | **337.0** | **68.0** | **1323.9** |
| Yield % | 45% | 95% | 45% | 80% | 60% | 80% | 40% | 95% |
| **Good die per wafer** | **15.3** | **15.4** | **30.7** | **441.2** | **84.9** | **269.6** | **27.2** | **1257.7** |
| Wafer Price (US$) | $17,000 | $10,500 | $17,000 | $17,000 | $17,000 | $17,000 | $17,000 | $3,500 |
| **Cost per Die (US$)** | **$1,111** | **$681** | **$554** | **$39** | **$200** | **$63** | **$625** | **$2.78** |
| **# of Die per GB200 System** | **72** | **72** | **36** | **72** | **18** | **18** | **2** | **63** |
| **TSMC Content per system** | **$80,007** | **$49,058** | **$19,955** | **$2,774** | **$3,603** | **$1,135** | **$1,250** | **$175** |
| **TSMC content per GB200 System** | **$157,958** | | | | | | | |
| **TSMC content per GPU** | **$2,194** | | | | | | | |

| | |
|---|---|
| **NVIDIA GB200 ASP** | **$3,300,000** |
| **TSMC % of Cloud Budget** | **4.8%** |

## TSMC's content for a VR200 rack is also around 5%

| TSMC's VR200 Content | RV200 | Interposer | CPUs | Connect X9 | NV Link Switch | Bluefield 4 | Spectrum 52-Port | Aspeed BMC |
|---|---|---|---|---|---|---|---|---|
| Tech Node | 3nm | 65nm | 3nm | 4nm | 4nm | 4nm | 4nm | 28nm |
| Transistors (bn) | 208 | NA | NA | 8 | 50 | 64 | 100 | NA |
| Density (1mn trans/mm-sq.) | 127.8 | NA | NA | 76.1 | 122.9 | 64.8 | 122.9 | NA |
| Die size (mm-sq) | 1628 | 3399 | 809 | 105.1 | 407 | 988.1 | 814 | 48 |
| Wafer area (mm-sq) | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 |
| Usable area (Edges/size) | 70% | 45% | 70% | 82% | 82% | 85% | 78% | 90% |
| Usable area (mm-sq) | 49,480.1 | 31,808.6 | 49,480.1 | 57,962.4 | 57,609.0 | 60,351.6 | 55,347.0 | 63,546.6 |
| **Total die per wafer** | **30.4** | **9.4** | **61.2** | **551.6** | **141.5** | **61.1** | **68.0** | **1323.9** |
| Yield % | 50% | 95% | 50% | 80% | 60% | 50% | 40% | 95% |
| **Good die per wafer** | **15.2** | **8.9** | **30.6** | **441.2** | **84.9** | **30.5** | **27.2** | **1257.7** |
| Wafer Price (US$) | $24,000 | $12,000 | $24,000 | $17,000 | $17,000 | $17,000 | $17,000 | $3,500 |
| **Cost per Die (US$)** | **$1,579** | **$1,350** | **$785** | **$39** | **$200** | **$557** | **$625** | **$2.78** |
| **# of Die per VR200 System** | **72** | **72** | **36** | **72** | **18** | **18** | **2** | **63** |
| **TSMC Content per system** | **$113,710** | **$97,181** | **$28,253** | **$2,774** | **$3,603** | **$10,020** | **$1,250** | **$175** |
| **TSMC content per VR200 System** | **$256,966** | | | | | | | |
| **TSMC content per GPU** | **$3,569** | | | | | | | |

| | |
|---|---|
| **NVIDIA VR200 ASP** | **$5,500,000** |
| **TSMC % of Cloud Budget** | **4.7%** |

*Source: Company data, UBS estimates*

# TSMC's content per system in Ampere/Hopper systems

## TSMC represented about 4% of the cloud budget for the A/H100 series

| TSMC's Hopper HGX Content | H100 | A100 | Interposer | Connect X7 | Bluefield 3 | Spectrum X | L40S |
|---|---|---|---|---|---|---|---|
| Tech Node | 4nm | 7nm | 65nm | 4nm | 4nm | 4nm | 5nm |
| Transistors (bn) | 100 | 54.2 | NA | 8 | 22 | 100 | 76.3 |
| Density (1mn trans/mm-sq.) | 122.9 | 65.6 | NA | 76.1 | 122.9 | 122.9 | 125.3 |
| Die size (mm-sq) | 814.0 | 826.0 | 1,450 | 105.1 | 179.1 | 814 | 609.0 |
| Wafer area (mm-sq) | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 | 70,685.8 |
| Usable area (Edges/size) | 78% | 77% | 61% | 82% | 85% | 78% | 74% |
| Usable area (mm-sq) | 55,347.0 | 54,498.8 | 42,764.9 | 58,209.8 | 60,351.6 | 55,347.0 | 52,378.2 |
| **Total die per wafer** | **68.0** | **66.0** | **29.5** | **553.9** | **337.0** | **68.0** | **86.0** |
| Yield % | 45% | 55% | 95% | 80% | 80% | 40% | 55% |
| **Good die per wafer** | **30.6** | **36.3** | **28.0** | **443.1** | **269.6** | **27.2** | **47.3** |
| Wafer Price (US$) | $15,500 | $10,500 | $11,000 | $15,500 | $15,500 | $15,500 | $15,500 |
| **Cost per Die (US$)** | **$507** | **$289** | **$393** | **$35** | **$57** | **$570** | **$328** |
| # of Die per HGX System | 8 | 8 | 8 | 4 | 2 | 0.19 | NA |
| **TSMC Content per system (US$)** | **$4,053** | **$2,315** | **$3,141** | **$140** | **$115** | **$107** | **$328** |
| **TSMC content per HGX System** | **$7,555** | **$5,817** | | | | | |
| **TSMC content per GPU** | **$944** | **$727** | | | | | |

| | | |
|---|---|---|
| **NVIDIA HGX ASP** | **$210,000** | **$140,000** |
| **TSMC % of Cloud Budget** | **3.6%** | **4.2%** |

*Source: Company data, UBS estimates*

# NVIDIA revenue ramp to 20%/22% of TSMC's 2026/27E sales

## We estimate TSMC's Nvidia AI GPU sales of US$19.4bn in 2026E, should reach US$28.2bn in 2027E

| NVIDIA Units | Q125 | Q225 | Q325 | Q425 | Q126 | Q226E | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 556,038 | 602,396 | 0 | 0 | 0 |
| H100/H200/H20 | 661,444 | 324,324 | 93,569 | 60,184 | 78,296 | 46,381 | 0 | 0 | 0 | 0 | 0 | 0 | 994,162 | 3,447,972 | 1,139,522 | 124,677 | 0 |
| B200/B300/B30 | 476,240 | 372,731 | 730,727 | 594,862 | 541,633 | 497,283 | 433,860 | 153,710 | 104,907 | 34,470 | 13,633 | 0 | 0 | 133,430 | 2,174,560 | 1,626,486 | 153,010 |
| GB200/GB300 (2 GPUs on each) | 132,289 | 242,033 | 278,478 | 497,681 | 642,066 | 794,875 | 721,515 | 455,414 | 170,054 | 65,187 | 12,277 | 0 | 0 | 106,744 | 1,150,481 | 2,613,870 | 247,518 |
| R200/R300 | 0 | 0 | 0 | 0 | 0 | 0 | 102,641 | 306,956 | 402,935 | 473,300 | 481,261 | 530,698 | 0 | 0 | 0 | 409,596 | 1,888,195 |
| VR200/VR300 (2/4 GPUs on each) | 0 | 0 | 0 | 0 | 0 | 0 | 50,920 | 276,240 | 511,581 | 663,363 | 772,000 | 832,200 | 0 | 0 | 0 | 327,160 | 2,779,144 |
| Vera CPU (standalone) | 0 | 0 | 0 | 0 | 0 | 52,728 | 490,104 | 685,076 | 387,841 | 312,212 | 336,000 | 287,280 | 0 | 0 | 0 | 1,227,908 | 1,323,334 |
| Rubin CPX | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26,243 | 61,408 | 70,619 | 39,900 | 45,486 | 0 | 0 | 0 | 26,243 | 217,414 |
| L40S | 26,458 | 19,363 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 111,592 | 298,882 | 45,820 | 0 | 0 |
| Other GPUs | 26,458 | 9,681 | 11,139 | 27,584 | 9,076 | 10,753 | 12,720 | 15,773 | 18,455 | 21,223 | 35,973 | 27,339 | 100,044 | 149,904 | 74,862 | 48,322 | 102,990 |
| **Total Units** | **1,322,889** | **968,132** | **1,113,913** | **1,180,311** | **1,271,071** | **1,402,019** | **1,811,759** | **1,919,412** | **1,657,182** | **1,640,375** | **1,691,044** | **1,723,003** | **1,761,836** | **4,739,327** | **4,585,245** | **6,404,261** | **6,711,603** |
| **Total GPUs (GB200 ~2 GPUs)** | **1,455,177** | **1,210,165** | **1,392,391** | **1,677,992** | **1,913,137** | **2,144,166** | **2,094,091** | **1,939,748** | **1,889,567** | **1,986,093** | **2,099,421** | **2,222,437** | **1,761,836** | **4,846,071** | **5,735,726** | **8,091,141** | **8,197,517** |

| TSMC content per unit (US$) | Q125 | Q225 | Q325 | Q425 | Q126 | Q226E | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A100 | $727 | $727 | $727 | $727 | $727 | $727 | $727 | $727 | $727 | $727 | $727 | $727 | $727 | $727 | $0 | $0 | $0 |
| H100/H200/H20 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $944 | $0 |
| B200/B300 | $2,024 | $2,024 | $2,024 | $2,024 | $2,024 | $2,024 | $2,024 | $2,024 | $2,024 | $2,024 | $2,024 | $2,024 | $0 | $2,024 | $2,024 | $2,024 | $2,024 |
| GB200/GB300 (2 GPUs on each) | $4,388 | $4,388 | $4,388 | $4,388 | $4,388 | $4,388 | $4,388 | $4,388 | $4,388 | $4,388 | $4,388 | $4,388 | $0 | $4,388 | $4,388 | $4,388 | $4,388 |
| R200 | $2,998 | $2,998 | $2,998 | $2,998 | $2,998 | $2,998 | $2,998 | $2,998 | $2,998 | $2,998 | $2,998 | $2,998 | $0 | $0 | $0 | $2,998 | $2,998 |
| VR200 (2 GPUs on each) | $7,138 | $7,138 | $7,138 | $7,138 | $7,138 | $7,138 | $7,138 | $7,138 | $7,138 | $7,138 | $7,138 | $7,138 | $0 | $0 | $0 | $7,138 | $7,138 |
| Vera CPU (standalone) | $785 | $785 | $785 | $785 | $785 | $785 | $785 | $785 | $785 | $785 | $785 | $785 | $0 | $0 | $0 | $785 | $785 |
| Rubin CPX | $999 | $999 | $999 | $999 | $999 | $999 | $999 | $999 | $999 | $999 | $999 | $999 | $0 | $0 | $0 | $999 | $999 |
| L40S | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $0 | $328 | $328 | $0 | $0 |
| Other GPUs | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $328 | $0 | $328 | $328 | $328 | $328 |
| **Average content US$** | **$1,653** | **$2,202** | **$2,507** | **$2,926** | **$3,139** | **$3,269** | **$2,817** | **$3,006** | **$3,735** | **$4,165** | **$4,346** | **$4,533** | **$802** | **$966** | **$2,304** | **$3,037** | **$4,199** |

| TSMC AI GPU Sales US$mn | Q125 | Q225 | Q325 | Q425 | Q126 | Q226E | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A100 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $404 | $438 | $0 | $0 | $0 |
| H100/H200/H20 | $625 | $306 | $88 | $57 | $74 | $44 | $0 | $0 | $0 | $0 | $0 | $0 | $939 | $3,256 | $1,076 | $118 | $0 |
| B200/B300 | $964 | $754 | $1,479 | $1,204 | $1,096 | $1,006 | $878 | $311 | $212 | $70 | $28 | $0 | $0 | $270 | $4,401 | $3,292 | $310 |
| GB200/GB300 (2 GPUs on each) | $580 | $1,062 | $1,222 | $2,184 | $2,817 | $3,488 | $3,166 | $1,998 | $746 | $286 | $54 | $0 | $0 | $468 | $5,048 | $11,469 | $1,086 |
| R200 | $0 | $0 | $0 | $0 | $0 | $0 | $308 | $920 | $1,208 | $1,419 | $1,443 | $1,591 | $0 | $0 | $0 | $1,228 | $5,661 |
| VR200/VR300 (2/4 GPUs on each) | $0 | $0 | $0 | $0 | $0 | $0 | $363 | $1,972 | $3,652 | $4,735 | $5,510 | $5,940 | $0 | $0 | $0 | $2,335 | $19,837 |
| Vera CPU (standalone) | $0 | $0 | $0 | $0 | $0 | $41 | $385 | $538 | $304 | $245 | $264 | $225 | $0 | $0 | $0 | $964 | $1,039 |
| Rubin CPX | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $26 | $61 | $71 | $40 | $45 | $0 | $0 | $0 | $26 | $217 |
| L40S | $9 | $6 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $37 | $98 | $15 | $0 | $0 |
| Other GPUs | $9 | $3 | $4 | $9 | $3 | $4 | $4 | $5 | $6 | $7 | $12 | $9 | $33 | $49 | $25 | $16 | $34 |
| **NVIDIA AI/Networking for TSMC** | **$2,186** | **$2,132** | **$2,793** | **$3,453** | **$3,990** | **$4,583** | **$5,104** | **$5,770** | **$6,190** | **$6,832** | **$7,350** | **$7,811** | **$1,413** | **$4,580** | **$10,564** | **$19,447** | **$28,183** |
| Networking to AI GPUs | $147 | $129 | $151 | $187 | $219 | $248 | $249 | $254 | $267 | $292 | $312 | $333 | $157 | $449 | $615 | $971 | $1,204 |
| **NVIDIA AI Sales for TSMC** | **$2,039** | **$2,003** | **$2,642** | **$3,266** | **$3,771** | **$4,334** | **$4,855** | **$5,516** | **$5,923** | **$6,541** | **$7,038** | **$7,478** | **$1,256** | **$4,130** | **$9,949** | **$18,476** | **$26,980** |

## TSMC's sales from NVIDIA should be around 20.3% of sales in 2026E and 21.6% in 2027E

| TSMC NVIDIA Revenue (US$mn) | Q125 | Q225 | Q325 | Q425 | Q126 | Q226E | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AI GPUs | $2,039 | $2,003 | $2,642 | $3,266 | $3,771 | $4,334 | $4,855 | $5,516 | $5,923 | $6,541 | $7,038 | $7,478 | $1,256 | $4,130 | $9,949 | $18,476 | $26,980 |
| Advanced Shipments/Inventory Build | $820 | $787 | $924 | $965 | -$58 | $64 | $429 | $1,126 | $19,173 | $545 | $1,145 | $1,752 | $0 | $0 | $3,495 | $1,561 | $22,614 |
| Networking Sales | $520 | $761 | $860 | $1,153 | $1,554 | $1,834 | $1,925 | $2,118 | $2,372 | $2,657 | $2,976 | $3,362 | $904 | $1,364 | $3,294 | $7,431 | $11,367 |
| TSMC content % of NVIDIA DC | 9.9% | 10.5% | 10.3% | 10.5% | 8.7% | 8.7% | 8.5% | 8.5% | 23.3% | 7.3% | 7.4% | 7.4% | 5.6% | 5.4% | 10.3% | 8.6% | 10.6% |
| Gaming/Rest of NVIDIA | $1,337 | $1,525 | $1,564 | $1,570 | $1,720 | $1,944 | $1,978 | $1,899 | $7,540 | $1,929 | $2,141 | $2,030 | $3,215 | $4,134 | $5,994 | $7,540 | $13,639 |
| **TSMC sales from NVIDIA** | **$4,716** | **$5,075** | **$5,989** | **$6,953** | **$6,987** | **$8,175** | **$9,187** | **$10,659** | **$35,008** | **$11,671** | **$13,299** | **$14,622** | **$5,375** | **$9,628** | **$22,733** | **$35,008** | **$74,600** |
| **TSMC total revenue** | **$25,526** | **$30,070** | **$33,097** | **$33,731** | **$35,898** | **$40,202** | **$45,707** | **$50,278** | **$172,086** | **$52,289** | **$57,518** | **$63,538** | **$69,300** | **$90,083** | **$122,424** | **$172,086** | **$345,431** |
| **NVIDIA % of TSMC** | **18.5%** | **16.9%** | **18.1%** | **20.6%** | **19.5%** | **20.3%** | **20.1%** | **21.2%** | **20.3%** | **22.3%** | **23.1%** | **23.0%** | **7.8%** | **10.7%** | **18.6%** | **20.3%** | **21.6%** |

*Published with Q226 TSMC preview*

*Source: Company data, UBS estimates*

# Analysis of N3 foundry supply & demand

- TSMC's leading edge to be a larger supply bottleneck than CoWoS in 2027E

1. TSMC's N3 capacity could be a larger bottleneck than CoWoS and run at 100%+ loading in 2026-27E, even with meaningful capacity expansion to 210kwpm by the end of 2027E.
2. We forecast server accelerators, CPUs and networking to account for 73% of N3 demand in 2027E versus 36% in 2026E.
3. Our industry analysis shows a robust demand outlook for cloud AI accelerators and server CPUs and that the capacity of TSMC's leading edge and CoWoS packaging will likely remain tight through 2027E.
4. Agentic AI is rapidly driving increased demand for server CPUs.

*Source: Company data, UBS estimates*



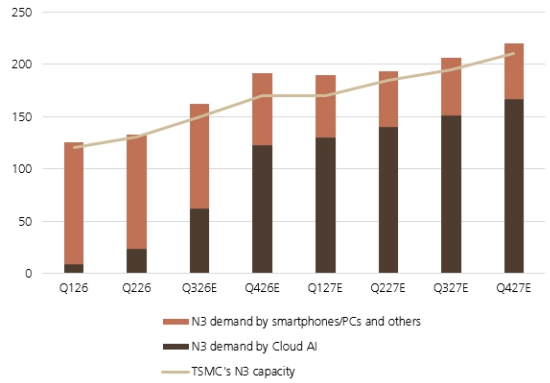
# Analysis of N3 foundry supply & demand

| Client | Products | Die size (mm2) | N3 capacity requirement (kwpm) Q126E | Q226E | Q326E | Q426E | 2026 demand (k) | Q127E | Q227E | Q327E | Q427E | 2027 demand (k) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nvidia | Rubin | 1,628 | 0 | 2 | 15 | 31 | 141 | 37 | 40 | 33 | 19 | 384 |
| | Rubin Ultra | 1,628 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 16 | 36 | 169 |
| | Vera CPU | 800 | 0 | 1 | 5 | 11 | 51 | 11 | 13 | 17 | 19 | 178 |
| Broadcom | Google - TPU v7 Ironwood | 1,400 | 6 | 11 | 16 | 21 | 158 | 14 | 8 | 6 | 0 | 85 |
| | Google - TPU v8i | 1,400 | 0 | 0 | 2 | 4 | 18 | 7 | 17 | 25 | 35 | 250 |
| | Meta - MTIA v3 | 1,600 | 0 | 1 | 1 | 2 | 11 | 2 | 2 | 3 | 3 | 29 |
| | OpenAI | 1,600 | 0 | 0 | 0 | 3 | 10 | 3 | 3 | 3 | 3 | 32 |
| AMD | MI355 | 840 | 2 | 2 | 1 | 1 | 17 | 1 | 1 | 0 | 0 | 7 |
| Alchip | Amazon - Trainium 3 | 1,600 | 0 | 4 | 12 | 23 | 115 | 24 | 18 | 12 | 6 | 181 |
| Marvell | Amazon - Trainium 2.5 | 1,600 | 0 | 0 | 0 | 2 | 6 | 0 | 0 | 0 | 0 | 2 |
| MediaTek | Google - TPU v8t | 800 | 0 | 0 | 1 | 4 | 15 | 9 | 11 | 11 | 13 | 129 |
| Other CPUs / accelerators and products like networking | | | 2 | 4 | 10 | 20 | 109 | 22 | 23 | 25 | 33 | 310 |
| **Capacity requirement - Cloud AI (kwpm)** | | | **9** | **24** | **62** | **122** | **652** | **130** | **140** | **151** | **167** | **1,763** |
| ***% of N3 demand*** | | | ***7%*** | ***18%*** | ***38%*** | ***64%*** | ***36%*** | ***69%*** | ***72%*** | ***73%*** | ***76%*** | ***73%*** |
| Apple | iPhone's apps processor | 110 | 43 | 43 | 39 | 22 | 442 | 13 | 11 | 9 | 10 | 128 |
| | Mac's processor | 165 | 10 | 10 | 8 | 7 | 106 | 7 | 6 | 6 | 6 | 74 |
| | iPad's M processor for Pro & Air | 160 | 14 | 12 | 12 | 8 | 135 | 11 | 10 | 8 | 8 | 111 |
| | iPad's A17 Pro processor | 104 | 2 | 2 | 1 | 1 | 15 | 3 | 2 | 2 | 2 | 30 |
| Qualcomm | Flagship smartphone SoC | 120 | 17 | 13 | 9 | 3 | 129 | 5 | 5 | 4 | 3 | 51 |
| MediaTek | 5G smartphone SoC | 120 | 5 | 4 | 3 | 1 | 39 | 2 | 2 | 2 | 1 | 19 |
| Intel | Outsourced PC CPUs | 100 | 15 | 15 | 8 | 8 | 137 | 8 | 8 | 5 | 4 | 70 |
| Others like Bitcoin, tablet, ARM based PC CPU | | | 10 | 10 | 20 | 20 | 180 | 10 | 10 | 20 | 20 | 180 |
| **Capacity requirement - Consumer and other devices (kwpm)** | | | **116** | **109** | **100** | **69** | **1,183** | **60** | **53** | **55** | **53** | **663** |
| ***% of N3 demand*** | | | ***93%*** | ***82%*** | ***62%*** | ***36%*** | ***64%*** | ***31%*** | ***28%*** | ***27%*** | ***24%*** | ***27%*** |
| **Total N3 demand** | | | **125** | **133** | **162** | **191** | **1,834** | **190** | **193** | **206** | **220** | **2,426** |
| **TSMC's N3 installed capacity** | | | **120** | **130** | **150** | **170** | **1,710** | **170** | **185** | **195** | **210** | **2,280** |
| *Capacity utilisation* | | | *104%* | *102%* | *108%* | *113%* | *107%* | *112%* | *104%* | *106%* | *105%* | *106%* |

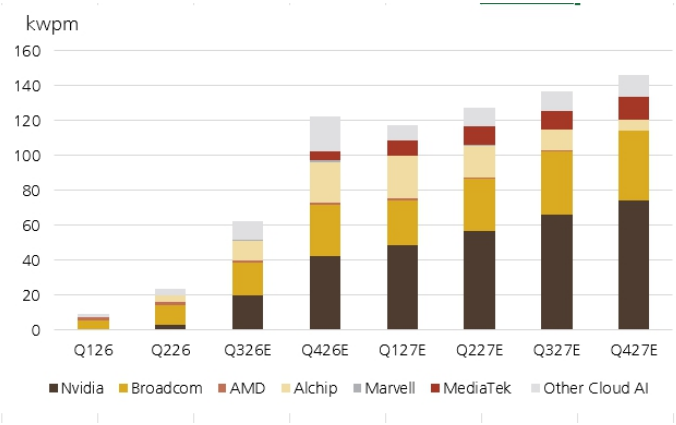
*Source: Company data, UBS estimates*

# Analysis of N3 foundry supply & demand

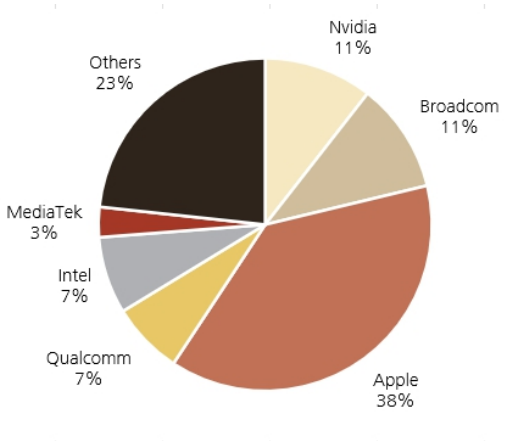
## TSMC is accelerating N3 capacity expansions to meet the strong demand from Cloud AI



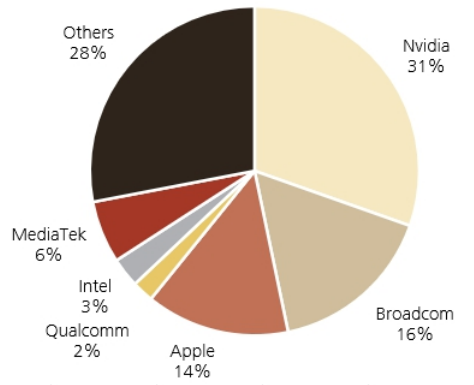

## N3 demand from Cloud AI could strongly pick up in H226




## N3 capacity share by clients in 2026E




## N3 capacity share by clients in 2027E




*Source: Company data, UBS estimates*

# Advanced packaging key in enabling HPC and generative AI

## A comparison of technologies—TSMC, Intel and Samsung Foundry

| Packaging type | 2.5D | | | | | 3D | |
|---|---|---|---|---|---|---|---|
| Approach | Chip first (RDL last) | | Chip last (RDL first) | | | Bumped (Microbump) | Bumpless (Copper-to-copper) |
| Interconnect | Organic film (polyamide, polyimide, etc.) | Organic film + Silicon bridge | Silicon interposer | Organic interposer (polyimide, ABF, etc.) | Organic interposer + Silicon bridge | Chip-on-wafer Wafer-on-wafer | Chip-on-wafer Wafer-on-wafer |
| TSMC | InFO_PoP<br>InFO_B<br>InFO_M<br>InFO_oS (with substrate) | InFO_LSI (with substrate) | CoWoS-S | CoWoS-R | CoWoS-L | SoIC-P<br>InFO_3D | SoIC-X |
| Intel | - | - | - | - | Co-EMIB (Foveros + EMIB) | Foveros<br>Foveros Omni | Foveros Direct |
| Samsung Foundry | iPoP/ FOPLP-PoP | - | I-CubeS | -<br>H-Cube (with hybrid substrate) | I-CubeE | X-Cube (u-Bump) | X-Cube (Hybrid copper bonding) |

## OSATs' advanced packaging solutions

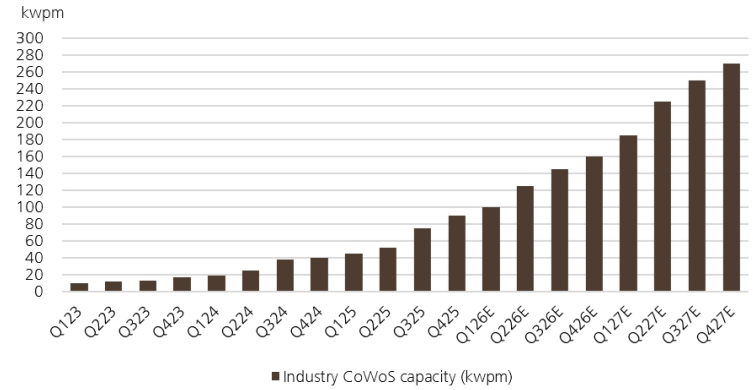
| Packaging type | 2.5D | | | | | | | 3D | |
|---|---|---|---|---|---|---|---|---|---|
| Approach | Chip first (RDL last) | | | | Chip last (RDL first) | | | Bumped (Microbump) | Bumpless (Copper-to-copper) |
| TSMC's solution | InFO_PoP<br>InFO_B | InFO_M | InFO_oS (with substrate) | InFO_LSI (with substrate) | CoWoS-S | CoWoS-R | CoWoS-L | SoIC-P<br>InFO-3D | SoIC-X |
| ASE Group | FOPoP (chip last) | | FOCoS-CF | | 2.5D | FOCoS-CL | FOCoS-B (FOEB) | 3D (Developing) | 3D (Developing) |
| Amkor | SWIFT (chip last) | | | | 2.5D (CoS / CoW) | Substrate SWIFT (S-SWIFT) | S-Connect (Developing) | SWIFT 3D (Developing) | CoW Hybrid Cu-Cu (Pathfinding) |
| JCET | eWLB/FO-ECP | | eWLB | | | XDFOI | | | |
| Huatian | | | eSiFO | | | 2.5D (Developing) | | | |
| Tongfu | FO on FCBGA | | | | | 2.5D | | | |

*Source: Company data, UBS*

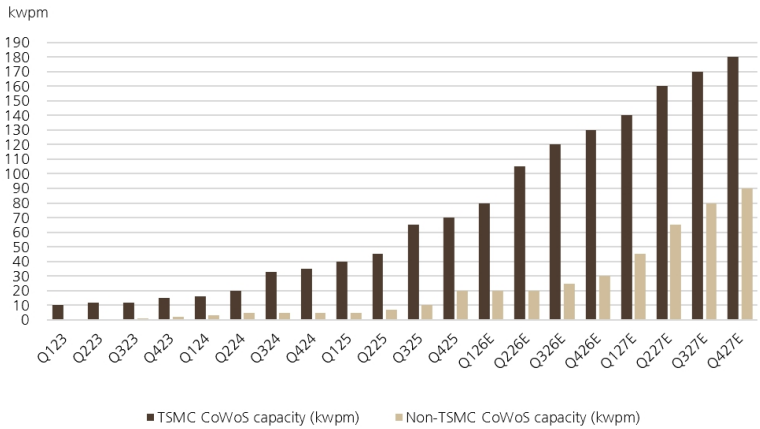
# TSMC's CoWoS to remain tight through 2027E

- CoWoS industry capacity should expand from 160kwpm at the end of 2026E to 270kwpm at the end of 2027E, with TSMC/OSATs reaching 180/90kwpm.
- Demand side:
  - We forecast Nvidia to represent 57%/50%/46% of Industry CoWoS capacity in 2025, 2026, and 2027.
  - Google TPU CoWoS capacity requirement likely to grow significantly, +185% YoY in 2027E.
  - AMD's CoWoS demand could triple in 2027E, driven by a stronger ramp-up of MI450 and the Venice server CPU.
- Supply is expected to become more **diversified** in 2027-28 and beyond, as ASE and Amkor gain increased opportunities in H2 2026 and 2027. ASE is also accelerating its capacity expansion in 2027.

**UBS estimates on industry CoWoS capacity**




**TSMC's vs non-TSMC CoWoS capacity**

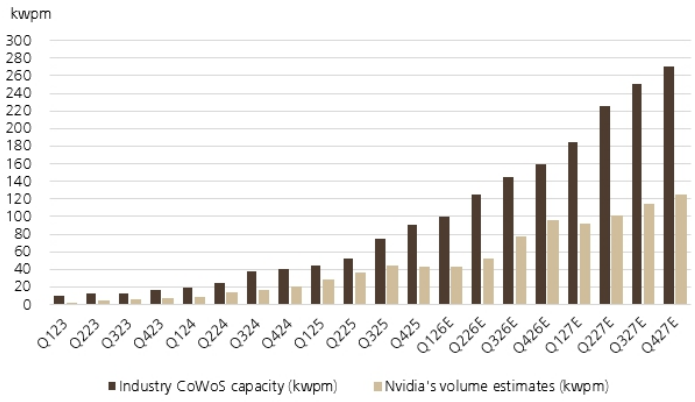



*Source: Company data, UBS estimates*

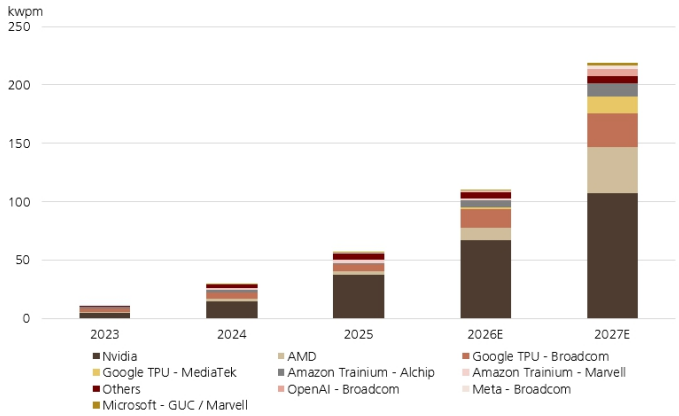
# Robust server CPU demand; Nvidia Rubin ramp to accelerate in H226

- Rubin GPU ramp is slower in Q226 given re-design, but we think should pick up in H226 to reach 2.0m units. We forecast Nvidia's total CoWoS demand to grow 61% in 2027 to 1,290k wafers, supported by Rubin, Rubin Ultra, and Vera CPUs.
- We forecast Vera CPU production volume to grow to 5.5m in 2027E.
- For Feynman's launch in 2028E, we believe Nvidia is looking to use TSMC's SoIC to stack two GPU dies on top of another two GPU dies (i.e. two GPU stacks) within a CoWoS package, effectively upgrading to a 4-GPU-die package.
- We may see further design changes for Feynman if TSMC's CoPoS enters mass production in 2028.

**Industry CoWoS capacity vs Nvidia's volumes**




**CoWoS demand for major customers**




*Source: Company data, UBSe*

# Quantifying the advanced packaging market size

## Detailed analysis of advanced packaging Interposer wafer demand and supply chain build units

| Interposer Wafer Demand (kps) | Q126 | Q226 | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nvidia** | **128** | **154** | **231** | **286** | **274** | **300** | **342** | **374** | **174** | **444** | **799** | **1,290** |
| **AMD** | **11** | **11** | **30** | **77** | **91** | **122** | **124** | **138** | **37** | **42** | **129** | **475** |
| **ASICs and others** | **79** | **98** | **106** | **110** | **173** | **216** | **233** | **242** | **147** | **193** | **393** | **865** |
| Google TPU - Broadcom | | | | | | | | | 60 | 76 | 195 | 338 |
| Google TPU - MediaTek | | | | | | | | | 0 | 0 | 21 | 182 |
| Amazon Trainium - Alchip | | | | | | | | | 26 | 5 | 71 | 131 |
| Amazon Trainium - Marvell | | | | | | | | | 17 | 38 | 21 | 3 |
| Meta | | | | | | | | | 7 | 8 | 9 | 41 |
| Others | | | | | | | | | 37 | 65 | 62 | 72 |
| **Total** | **218** | **264** | **367** | **473** | **538** | **637** | **700** | **755** | **358** | **679** | **1,321** | **2,630** |

| Nvidia Supply Chain Build Units (k chips) | Q126 | Q226 | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ampere | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 134 | 0 | 0 | 0 |
| Hopper | 180 | 251 | 215 | 100 | 0 | 0 | 0 | 0 | 4,086 | 1,402 | 747 | 0 |
| Blackwell B200/B300 and GB200/GB300 | 1,703 | 1,855 | 1,715 | 953 | 350 | 111 | 81 | 0 | 314 | 5,520 | 6,225 | 542 |
| Rubin R200 and VR200 | 0 | 70 | 678 | 1,399 | 1,676 | 1,814 | 1,497 | 844 | 0 | 0 | 2,148 | 5,832 |
| Rubin R300 and VR300 | 0 | 0 | 0 | 0 | 0 | 137 | 639 | 1,416 | 0 | 0 | 0 | 2,193 |
| Rubin CPX | 0 | 0 | 0 | 26 | 61 | 71 | 40 | 45 | 0 | 0 | 26 | 217 |
| Vera CPU | 0 | 100 | 428 | 1,054 | 1,025 | 1,180 | 1,543 | 1,754 | 0 | 0 | 1,582 | 5,502 |
| **Total** | **1,883** | **2,276** | **3,036** | **3,532** | **3,112** | **3,313** | **3,800** | **4,060** | **4,534** | **6,921** | **10,728** | **14,286** |

| AMD Supply Chain Build Units (k chips) | Q126 | Q226 | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MI300 + MI325X + MI308X+MI355X | 163 | 170 | 87 | 89 | 93 | 82 | 15 | 4 | 544 | 626 | 510 | 194 |
| MI400 | 0 | 0 | 38 | 225 | 295 | 433 | 415 | 369 | 0 | 0 | 263 | 1,510 |
| MI500 | 0 | 0 | 0 | 0 | 0 | 0 | 66 | 177 | 0 | 0 | 0 | 242 |
| Venice CPU | 0 | 0 | 400 | 900 | 1,000 | 1,300 | 1,300 | 1,400 | 0 | 0 | 1,300 | 5,000 |
| Others | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 11 | 4 | 6 | 13 |
| **Total** | **164** | **171** | **526** | **1,217** | **1,390** | **1,817** | **1,799** | **1,954** | **555** | **630** | **2,079** | **6,960** |

| ASIC Supply Chain Build Units (k chips) | Q126 | Q226 | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Google TPU - Broadcom | | | | | | | | | 2,045 | 2,565 | 3,680 | 5,000 |
| Google TPU - MediaTek | | | | | | | | | 0 | 0 | 467 | 4,000 |
| Amazon Trainium - Alchip | | | | | | | | | 1,000 | 176 | 1,780 | 3,080 |
| Amazon Trainium - Marvell | | | | | | | | | 600 | 1,335 | 686 | 85 |
| Meta | | | | | | | | | 348 | 421 | 165 | 445 |
| Microsoft | | | | | | | | | 26 | 34 | 104 | 400 |
| Others | | | | | | | | | 251 | 188 | 64 | 0 |
| **Total** | | | | | | | | | **4,270** | **4,719** | **7,096** | **13,660** |

| SoIC (kps) | Q126 | Q226 | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SoIC volume** | **14** | **17** | **23** | **29** | **44** | **52** | **57** | **61** | **20** | **42** | **83** | **214** |

| TSMC's backend sales (US$m) | Q126 | Q226 | Q326E | Q426E | Q127E | Q227E | Q327E | Q427E | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sales from adv packaging | 2,704 | 3,247 | 4,437 | 5,766 | 6,295 | 7,462 | 8,347 | 9,258 | 5,240 | 8,899 | 16,154 | 31,362 |
| Sales from bumping & testing | 919 | 1,016 | 1,173 | 1,290 | 1,342 | 1,476 | 1,624 | 1,721 | 2,348 | 3,156 | 4,399 | 6,163 |
| **Total TSMC's backend sales** | **3,623** | **4,263** | **5,610** | **7,056** | **7,637** | **8,938** | **9,971** | **10,979** | **7,588** | **12,056** | **20,553** | **37,525** |
| % of TSMC's sales | 10.1% | 10.6% | 12.3% | 14.0% | 14.6% | 15.5% | 15.7% | 16.3% | 8.4% | 9.8% | 11.9% | 15.6% |

*Source: Company data, UBS estimates.*

# Quantifying the advanced packaging market size

## Detailed analysis of advanced packaging supply chain build units and total CoWoS demand by customers

| ASIC Supply Chain Build Units (k chips) | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|
| Google TPU - Broadcom | 2,045 | 2,565 | 3,680 | 5,000 |
| Google TPU - MediaTek | 0 | 0 | 467 | 4,000 |
| Amazon Trainium - Alchip | 1,000 | 176 | 1,780 | 3,080 |
| Amazon Trainium - Marvell | 600 | 1,335 | 686 | 85 |
| Meta | 348 | 421 | 165 | 445 |
| Microsoft | 26 | 34 | 104 | 400 |
| Others | 251 | 188 | 64 | 0 |
| **Total** | **4,270** | **4,719** | **7,096** | **13,660** |

| ASIC vendor as a % of CoWoS wafers demand | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|
| **Google** | 17% | 11% | 16% | 20% |
| *Broadcom* | *17%* | *11%* | *15%* | *13%* |
| *MediaTek* | *0%* | *0%* | *2%* | *7%* |
| **Amazon** | 12% | 6% | 7% | 5% |
| *Alchip* | *7%* | *1%* | *5%* | *5%* |
| *Marvell* | *5%* | *6%* | *2%* | *0%* |
| **Meta** | 2% | 1% | 1% | 2% |
| **Intel / Habana** | 2% | 1% | 0% | 0% |
| **Microsoft** | 0% | 0% | 1% | 1% |
| **Tesla** | 0% | 0% | 0% | 0% |
| **Others** | 8% | 9% | 5% | 3% |
| **Total ASIC** | **41%** | **28%** | **30%** | **33%** |
| **GPU vendors as a % of CoWoS wafers demand** | | | | |
| **Nvidia** | 49% | 65% | 60% | 49% |
| **AMD** | 10% | 6% | 10% | 18% |
| **Total GPU** | **59%** | **72%** | **70%** | **67%** |
| **Total** | **100%** | **100%** | **100%** | **100%** |

*Source: Company data, UBS estimates.*

# Summary of Nvidia chip production and rack assembly

## UBS summary of Blackwell and Rubin hardware assembly: 77.5K/95.1K racks in 2026E-27E

| GB200/GB300 Rack Units | 2025 | Q126E | Q226E | Q326E | Q426E | 2026E | Q127E | Q227E | Q327E | Q427E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quanta | 6,420 | 4,000 | 5,200 | 5,800 | 4,500 | 19,500 | 2,700 | 1,200 | 705 | 700 | 5,305 |
| Hon Hai | 10,550 | 5,400 | 6,200 | 7,620 | 6,000 | 25,220 | 3,500 | 2,500 | 1,000 | 500 | 7,500 |
| Wistron | 5,860 | 3,905 | 4,250 | 4,800 | 4,000 | 16,955 | 2,700 | 1,400 | 900 | 500 | 5,500 |
| Total (Top 3) | 22,830 | 13,305 | 15,650 | 18,220 | 14,500 | 61,675 | 8,900 | 5,100 | 2,605 | 1,700 | 18,305 |
| SMCI, Wiwynn, GigaByte, Inventec, Asus, Lenovo, Pega, etc | 4,204 | 2,861 | 3,130 | 3,644 | 2,900 | 12,535 | 1,335 | 765 | 261 | 170 | 2,531 |
| Others share % | 18% | 22% | 20% | 20% | 20% | 20% | 15% | 15% | 10% | 10% | 14% |
| GB200 racks (market-wide) | 20,690 | 7,275 | 5,634 | 4,373 | 1,740 | 19,021 | 1,024 | 293 | 143 | 0 | 1,460 |
| mix % | 77% | 45% | 30% | 20% | 10% | 26% | 10% | 5% | 5% | 0% | 7% |
| GB300 racks (market-wide) | 6,344 | 8,891 | 13,146 | 17,491 | 15,660 | 55,188 | 9,212 | 5,572 | 2,722 | 1,870 | 19,375 |
| mix % | 23% | 55% | 70% | 80% | 90% | 74% | 90% | 95% | 95% | 100% | 93% |
| Total GB200/300 racks (market-wide) | 27,034 | 16,166 | 18,780 | 21,864 | 17,400 | 74,210 | 10,235 | 5,865 | 2,866 | 1,870 | 20,836 |
| Total GB200/300 GPUs into racks | 1,946,412 | 1,163,921 | 1,352,160 | 1,574,208 | 1,252,800 | 5,343,089 | 736,920 | 422,280 | 206,316 | 134,640 | 1,500,156 |

| VR200 NVL72 Rack Units | 2025 | Q126E | Q226E | Q326E | Q426E | 2026E | Q127E | Q227E | Q327E | Q427E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quanta | | | | | 1,420 | 1,420 | 4,000 | 6,400 | 5,100 | 4,300 | 19,800 |
| Hon Hai | | | | | 1,500 | 1,500 | 6,500 | 7,000 | 6,700 | 6,500 | 26,700 |
| Wistron | | | | 20 | 200 | 220 | 2,600 | 4,400 | 3,900 | 3,500 | 14,400 |
| Total (Top 3) | | | | 20 | 3,120 | 3,140 | 13,100 | 17,800 | 15,700 | 14,300 | 60,900 |
| SMCI, Wiwynn, GigaByte, Inventec, Asus, Lenovo, Pega, etc | | | | 0 | 156 | 156 | 2,227 | 3,560 | 3,140 | 2,860 | 11,787 |
| Others share % | | | | 2% | 5% | 5% | 17% | 20% | 20% | 20% | 19% |
| Total VR200 racks (market-wide) | | | | 20 | 3,276 | 3,296 | 15,327 | 21,360 | 18,840 | 17,160 | 72,687 |
| Total VR200 GPUs into racks | | | | 1,469 | 235,872 | 237,341 | 1,103,544 | 1,537,920 | 1,356,480 | 1,235,520 | 5,233,464 |

| VR300 Rack Units | 2025 | Q126E | Q226E | Q326E | Q426E | 2026E | Q127E | Q227E | Q327E | Q427E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quanta | | | | | | | | | | 475 | 475 |
| Hon Hai | | | | | | | | | | 900 | 900 |
| Wistron | | | | | | | | | | 200 | 200 |
| Total (Top 3) | | | | | | | | | | 1,575 | 1,575 |
| SMCI, Wiwynn, GigaByte, Inventec, Asus, Lenovo, Pega, etc | | | | | | | | | | 0 | 0 |
| Others share % | | | | | | | | | | 0% | 0% |
| Total VR300 (market-wide) | | | | | | | | | | 1,575 | 1,575 |
| Total VR300 GPUs into racks | | | | | | | | | | 113,400 | 113,400 |

| Total NVIDIA Racks | 2025 | Q126E | Q226E | Q326E | Q426E | 2026E | Q127E | Q227E | Q327E | Q427E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GB200/GB300 | 27,034 | 16,166 | 18,780 | 21,864 | 17,400 | 74,210 | 10,235 | 5,865 | 2,866 | 1,870 | 20,836 |
| VR200 | 0 | 0 | 0 | 20 | 3,276 | 3,296 | 15,327 | 21,360 | 18,840 | 17,160 | 72,687 |
| VR300 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,575 | 1,575 |
| Total Racks | 27,034 | 16,166 | 18,780 | 21,884 | 20,676 | 77,506 | 25,562 | 27,225 | 21,706 | 20,605 | 95,098 |
| Total GPUs into Racks | 1,946,412 | 1,163,921 | 1,352,160 | 1,575,677 | 1,488,672 | 5,580,430 | 1,840,464 | 1,960,200 | 1,562,796 | 1,483,560 | 6,847,020 |

*Source: Company data, UBS estimates.*

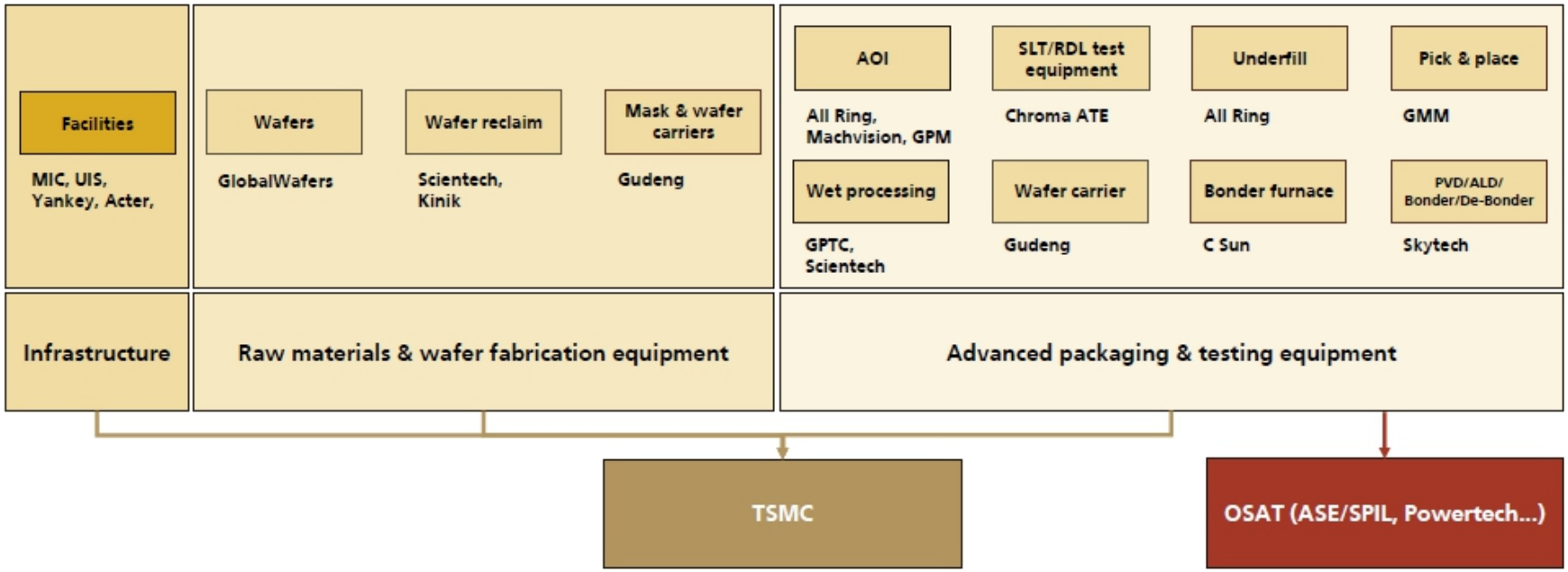
# Quantifying the potential upside to foundry and back-end

- We believe TSMC should be a major beneficiary of the GPU opportunities as a key foundry provider for generative AI and high-performance computing.
  - TSMC is currently the sole foundry supplier of Nvidia's data centre grade GPUs and AMD's AI GPUs.
- Our proprietary analysis suggests TSMC's revenue from every Nvidia's Rubin GPU to expand to ~US$3,569 vs ~US$2,194 for Blackwell vs ~US$944 for Hopper. TSMC may earn US$158k for a NVL72 Blackwell server and potentially US$257k for Rubin server. As a customer, Nvidia may grow to 20%/23% of sales to TSMC in 2026E/27E from 19% in 2025.
- TSMC quantified that cloud accelerators may grow high 50% CAGR next couple of years.
- Beyond the cloud, gen AI may also drive more silicon content to edge including smartphones and PCs, and re-accelerate the process migration to leading edge for better compute capability, lower power. We forecast 6% silicon content growth for the main processors in smartphones and PCs.

# TSMC establishing critical semi supply chain in Taiwan

- After over 30 years, TSMC has managed to establish a resilient supply chain in Taiwan where and when possible, mostly for infrastructure and facility construction, selective equipment, and advanced packaging tools.

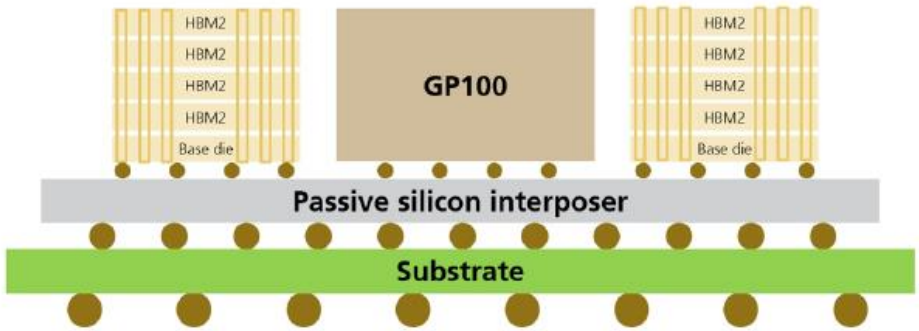
**Taiwan's supply chain for TSMC and advanced packaging**



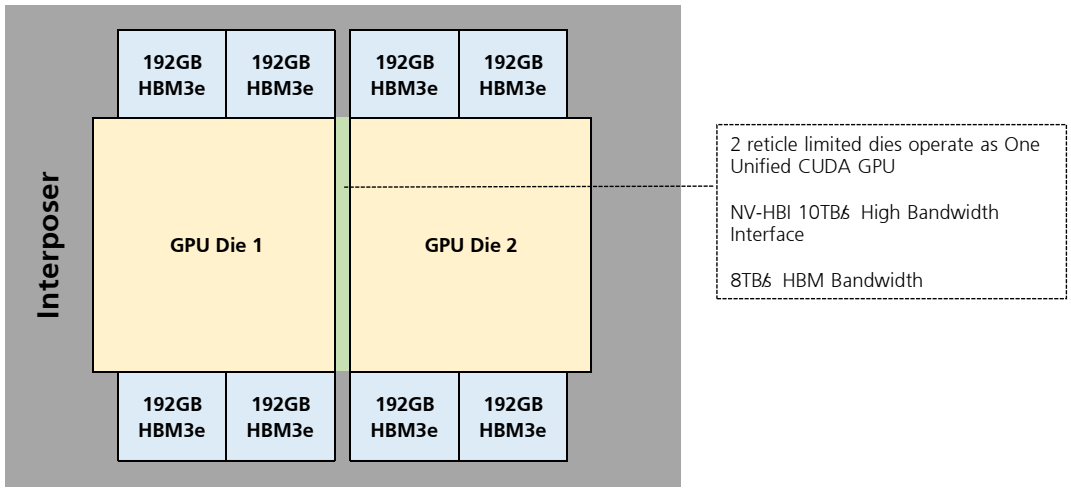

*Source: UBS*

# Quantifying the potential upside to foundry and back-end

## Nvidia's CoWoS package of GP100 and HBM2




## Blackwell GPU dies are connected together using TSMC CoWoS-L




*Source: Company data, UBS*

# Supply chain implications?

- For equipment, 2.5D packaging expansion could drive demand for high-precision die attach, wet process, underfill, inspection tools, etc. Thermocompression bonding (TCB) could have demand upside from HBM and the next generation die attach process.

## A summary of major advanced packaging equipment vendors

| Product category | Ticker | Company name | Market cap (US$m) | Share price (LCY) | Stock YTD performance | P/E (x) 2026E | P/E (x) 2027E | P/E (x) 2028E | Major equipment offering(s) |
|---|---|---|---|---|---|---|---|---|---|
| Die attach | 0522.HK | ASMPT | 9,037 | HKD 171.0 | 120.8% | 34.0 | 23.0 | 18.5 | • Die bonder for on-substrate (mass reflow)<br>• Thermo-compression bonder (Chip-to-substrate/Chip-to-wafer)<br>• Hybrid bonder |
| | BESI.AS | BE Semiconductor Industries | 16,620 | € 189.5 | 41.7% | 43.7 | 28.9 | 18.7 | • Hybrid bonder<br>• Thermo-compression bonder<br>• Flip chip bonder |
| | 042700.KS | Hanmi Semiconductor | 16,964 | KRW 243,500.0 | 91.1% | 72.2 | 45.9 | 38.4 | • Thermo-compression bonder |
| | KLIC.O | Kulicke and Soffa | 6,975 | $90.9 | 99.4% | 23.5 | 15.4 | 16.9 | • Thermo-compression bonder (Chip-to-substrate/Chip-to-wafer)<br>• Ball bonder in InFO |
| | 6590.T | Shibaura Mechatronics | 1,698 | JPY 3,790.0 | 0.1% | 16.4 | 12.4 | 8.7 | • Die bonder for chip-on-wafer (mass reflow)<br>• Hybrid bonder |
| Wet process | 3131.TWO | Grand Process Technology | 2,176 | TWD 2,365.00 | 51.6% | 40.1 | 24.1 | 14.6 | • Wet process cleaning tool |
| | 3583.TW | Scientech | 1,830 | TWD 691.00 | 106.9% | 34.7 | 23.3 | 16.4 | • Wet process cleaning tool<br>• Temporary bonding/debonding system |
| Underfill | 6187.TWO | All Ring | 3,740 | TWD 1,205.00 | 231.0% | 42.5 | 27.5 | 20.8 | • Underfill dispenser<br>• Automated optical inspection (AOI) tool |
| | NDSN.O | Nordson Corporation | 18,383 | $321.4 | 33.7% | 27.0 | 24.9 | 22.5 | • Underfill dispenser |
| Metrology | 2360.TW | Chroma ATE | 31,231 | TWD 2,325.00 | 200.0% | 52.2 | 34.9 | 26.8 | • Redistribution layer measurement |
| Temporary bonding | SMHNn.DE | SÜSS MicroTec | 1,558 | € 71.7 | 83.2% | 36.4 | 22.6 | 17.0 | • Temporary bonding/debonding system |
| | | | | | Average | 38.4 | 25.7 | 19.9 | |

*Source: Company data, LSEG, priced as of Sep 23, 2026.*

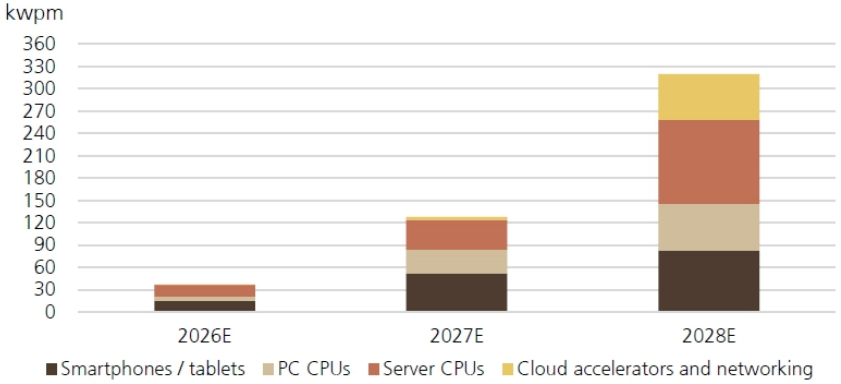
Section 7

# Leading-edge foundry

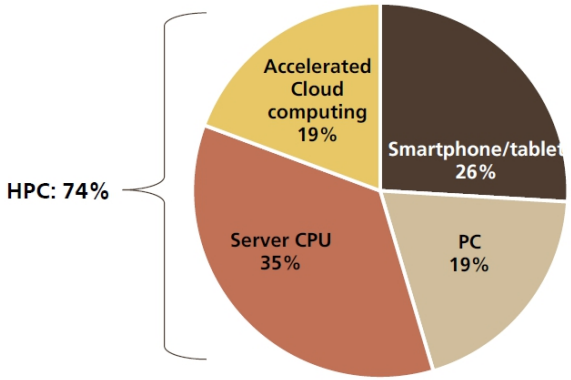
# Faster leading-edge expansions

- We see accelerating advanced capacity expansion across the big 3 and China
- Key drivers include:
  - 1) TSMC's faster N2 expansion, we see 90kwpm installed capacity by end 2026E and potentially reaching 210kwpm by 2028E.
  - 2) Samsung Foundry and Intel should resume expansion given improving execution.
  - 3) China major players increasingly prioritize capital allocation toward leading-edge technologies. We forecast SMIC's N7 capacity to reach 30kwpm in 2026 and 40kwpm in 2027.

**Quantifying N2 demand opportunities for foundry**




**N2 foundry demand by application (2028E)**

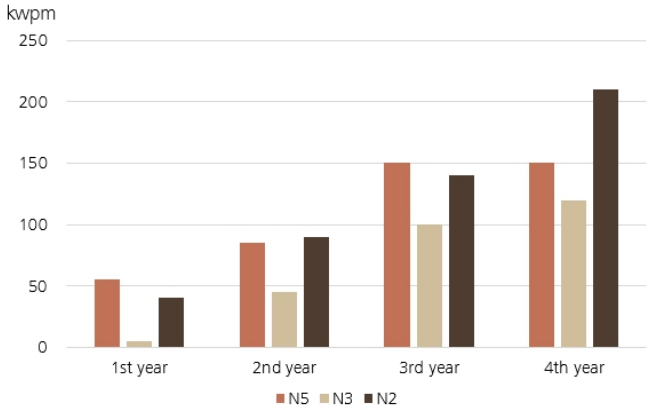



*Source: Company data, UBS estimates*

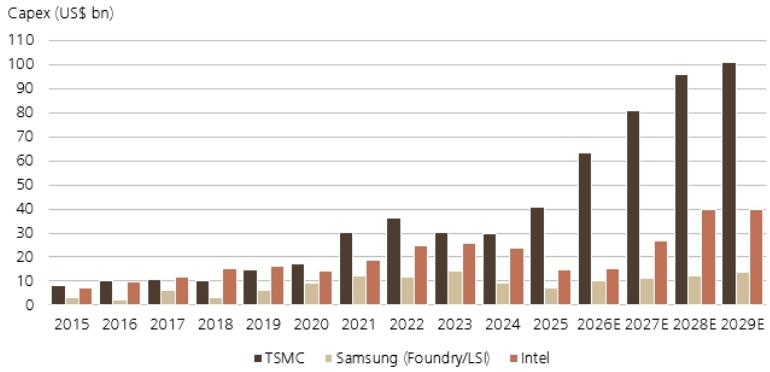
# Much larger N2 TAM and faster A14 expansion

- N2 demand is inflecting faster than expected, driven by stronger server CPU and AI accelerator adoption. We raise 2028 foundry TAM to 312kwpm (from 230kwpm) and reinforcing TSMC's leading-edge growth outlook through 2028-29.
- TSMC has the highest probability to navigate through the technology migrations for N2 and A14 with wide customer base.
- TSMC is accelerating leading-edge expansion across N3/N2 and pulling forward A14 capacity ramp. We forecast N2 installed capacity to reach 90kwpm by end-2026 and 140kwpm by end-2027.
- TSMC's A14 node remains on track for mass production in 2028.

**TSMC's N5 vs N3 vs N2 capacity ramp in the same year of mass productions**




**Capex of TSMC vs Intel vs Samsung foundry**




*Source: Company data, UBS estimates*

# Intel's outsourcing to stay at TSMC for longer

## Intel's outsourcing to TSMC could stay for longer

| TSMC's Sales from Intel (US$mn) | 2020 | 2021 | 2022 | 2023 | 2024 | 2025E | 2026E | 2027E | 23-27E CAGR |
|---|---|---|---|---|---|---|---|---|---|
| Client Computing Group (CCG) | $589 | $1,074 | $1,296 | $1,909 | $6,361 | $8,479 | $8,810 | $6,238 | 34% |
| Data Center & AI Group (DCAI) | $182 | $236 | $320 | $262 | $300 | $302 | $435 | $614 | 24% |
| Network and Edge | $271 | $368 | $450 | $407 | $412 | $0 | $0 | $0 | -100% |
| Mobileye | $290 | $416 | $561 | $624 | $496 | $497 | $523 | $541 | -4% |
| Accel Compute & Graphics (AXG) | $273 | $325 | $427 | $0 | $0 | $0 | $0 | $0 | NM |
| IFS | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | NM |
| Other/NAND | $186 | $34 | $56 | $72 | $46 | $210 | $197 | $247 | 36% |
| **TSMC Sales from Intel** | **$1,792** | **$2,453** | **$3,110** | **$3,274** | **$7,615** | **$9,489** | **$9,964** | **$7,640** | **23.6%** |
| **Intel % of TSMC Sales** | **3.9%** | **4.3%** | **4.1%** | **4.7%** | **8.4%** | **7.8%** | **5.8%** | **3.2%** | |
| **Additional Growth from Intel** | | **0.5%** | **-0.3%** | **0.6%** | **5.1%** | **-1.0%** | **-3.0%** | **-3.9%** | |
| **Net Profit from Intel (36% Net Margin)** | **$645** | **$883** | **$1,120** | **$1,179** | **$2,741** | **$3,416** | **$3,587** | **$2,751** | **44.9%** |
| **EPS contributed from Intel** | **$0.73** | **$1.01** | **$1.33** | **$1.48** | **$3.36** | **$3.97** | **$4.27** | **$3.24** | **Avl:** |
| **% of TSMC EPS** | **11.3%** | **13.9%** | **13.1%** | **12.5%** | **26.1%** | **30.0%** | **31.5%** | **24.3%** | **6.3%** |
| **TSMC revenue** | **$45,505** | **$56,822** | **$75,881** | **$69,300** | **$90,184** | **$122,031** | **$172,213** | **$240,695** | **36.5%** |
| **YoY** | | **24.9%** | **33.5%** | **-8.7%** | **30.1%** | **35.3%** | **41.1%** | **39.8%** | |
| **TSMC US$ (Ex-Intel)** | **$43,714** | **$54,368** | **$72,770** | **$66,027** | **$82,569** | **$112,543** | **$162,248** | **$233,055** | **37.1%** |
| **YoY** | | **24.4%** | **33.8%** | **-9.3%** | **25.1%** | **36.3%** | **44.2%** | **43.6%** | |

*Updated with TSMC Q126 Preview*

*Source: Company data, UBS estimates*

# Our expanded foundry database

## Our updated overall foundry industry capacity forecasts

| Period-end capacity (kwpm) | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|
| **Overall foundry industry capacity (kwpm)** | | | | | | | | | |
| **FinFET** | **424** | **547** | **686** | **720** | **840** | **904** | **1,035** | **1,155** | **1,296** |
| *YoY* | *39%* | *29%* | *25%* | *5%* | *17%* | *8%* | *14%* | *12%* | *12%* |
| **Mature 12"** | **1,124** | **1,364** | **1,554** | **1,758** | **1,940** | **2,174** | **2,413** | **2,676** | **2,879** |
| *YoY* | | *21%* | *14%* | *13%* | *10%* | *12%* | *11%* | *11%* | *8%* |
| **8"** | **2,762** | **2,786** | **2,995** | **3,227** | **3,370** | **3,416** | **3,459** | **3,449** | **3,337** |
| *YoY* | | *1%* | *8%* | *8%* | *4%* | *1%* | *1%* | *0%* | *-3%* |
| **Total foundry capacity** (12" equivalent kwpm) | **2,776** | **3,150** | **3,572** | **3,913** | **4,278** | **4,597** | **4,986** | **5,364** | **5,658** |
| *YoY* | | *13%* | *13%* | *10%* | *9%* | *7%* | *8%* | *8%* | *5%* |
| **Non Chinese foundry capacity (kwpm)** | | | | | | | | | |
| **FinFET** | | **535** | **670** | **704** | **824** | **883** | **1,014** | **1,118** | **1,230** |
| *YoY* | | | *25%* | *5%* | *17%* | *7%* | *15%* | *10%* | *10%* |
| **Mature 12"** | | **1,078** | **1,155** | **1,267** | **1,332** | **1,411** | **1,476** | **1,523** | **1,502** |
| *YoY* | | | *7%* | *10%* | *5%* | *6%* | *5%* | *3%* | *-1%* |
| **8"** | | **2,144** | **2,213** | **2,339** | **2,394** | **2,400** | **2,413** | **2,403** | **2,291** |
| *YoY* | | | *3%* | *6%* | *2%* | *0%* | *1%* | *0%* | *-5%* |
| **Total non China foundry capacity** (12" equiv) | | **2,566** | **2,809** | **3,010** | **3,220** | **3,361** | **3,562** | **3,710** | **3,750** |
| *YoY* | | | *9%* | *7%* | *7%* | *4%* | *6%* | *4%* | *1%* |
| **Major Chinese foundry capacity (kwpm)** | | | | | | | | | |
| **FinFET** | | **12** | **16** | **16** | **16** | **21** | **21** | **36** | **66** |
| *YoY* | | | *32%* | *0%* | *0%* | *30%* | *0%* | *70%* | *83%* |
| **Mature 12"** | | **286** | **399** | **491** | **607** | **763** | **938** | **1,153** | **1,377** |
| *YoY* | | | *39%* | *23%* | *24%* | *26%* | *23%* | *23%* | *19%* |
| **8"** | | **642** | **782** | **888** | **977** | **1,016** | **1,046** | **1,046** | **1,046** |
| *YoY* | | | *22%* | *14%* | *10%* | *4%* | *3%* | *0%* | *0%* |
| **Total major China foundry capacity** (12" equiv) | | **584** | **763** | **903** | **1,058** | **1,236** | **1,424** | **1,654** | **1,908** |
| *YoY* | | | *31%* | *18%* | *17%* | *17%* | *15%* | *16%* | *15%* |
| **Chinese foundry as % of industry capacity** | | | | | | | | | |
| FinFET | | 2% | 2% | 2% | 2% | 2% | 2% | 3% | 5% |
| Mature 12" | | 21% | 26% | 28% | 31% | 35% | 39% | 43% | 48% |
| 8" | | 23% | 26% | 28% | 29% | 30% | 30% | 30% | 31% |
| **Total China foundry capacity as % of industry** | | **19%** | **21%** | **23%** | **25%** | **27%** | **29%** | **31%** | **34%** |

*Source: Company data, UBS estimates*

# Our expanded foundry database

## Our updated leading edge foundry capacity forecasts

| Period-end capacity (kwpm) | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|
| **FinFET foundry capacity (kwpm)** | | | | | | | | | |
| TSMC | 235.0 | 280.0 | 335.0 | 405.0 | 445.0 | 470.0 | 570.0 | 650.0 | 740.0 |
| Samsung Foundry | 80.0 | 120.0 | 160.0 | 175.0 | 180.0 | 190.0 | 193.0 | 215.0 | 255.0 |
| Intel | 81.3 | 111.0 | 151.3 | 100.3 | 175.3 | 199.5 | 225.6 | 232.5 | 205.9 |
| UMC | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 13.0 |
| GlobalFoundries | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 18.0 | 16.0 |
| China | 3.0 | 11.0 | 15.0 | 15.0 | 15.0 | 20.0 | 21.3 | 36.3 | 66.3 |
| **Total FinFET supply** | **424.3** | **547.0** | **686.3** | **720.3** | **840.3** | **904.5** | **1,035.0** | **1,154.8** | **1,296.2** |
| *YoY* | *39%* | *29%* | *25%* | *5%* | *17%* | *8%* | *14%* | *12%* | *12%* |

## N2 foundry capacity forecasts

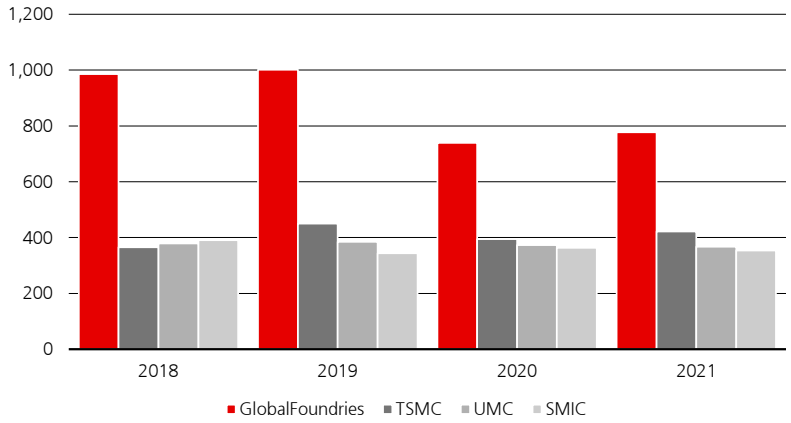
| Period-end capacity (kwpm) | 2025 | 2026E | 2027E | 2028E |
|---|---|---|---|---|
| **2nm** | | | | |
| TSMC | 40.0 | 90.0 | 140.0 | 210.0 |
| Samsung Foundry | 3.0 | 10.0 | 25.0 | 40.0 |
| Intel | 4.0 | 11.0 | 35.0 | 61.7 |
| **Total wafer supply** | **47.0** | **111.0** | **200.0** | **311.7** |
| *YoY* | | *136%* | *80%* | *56%* |

*Source: Company data, UBS estimates. Note: Our Intel estimates are based on wafer output.*

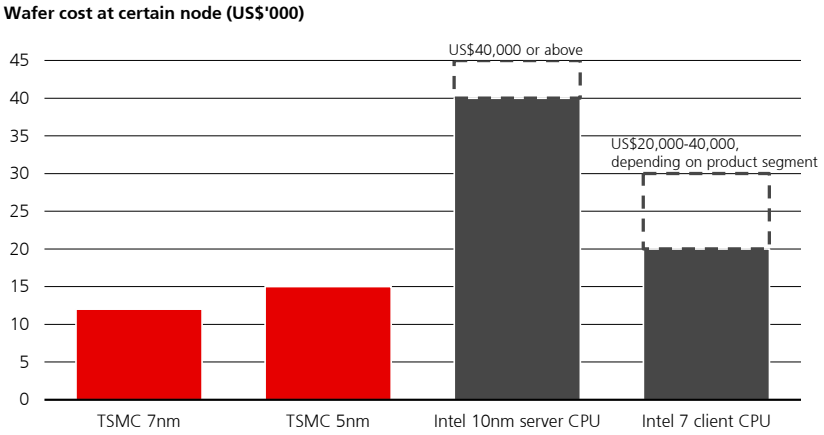
# Less likely Leading-edge foundry oversupply risks

- On industry supply, while the US/Europe are pushing local capacity and subsidies, we believe "cost" still matters for customer orders.

## Variable cost per wafer (US$)




## Intel's wafer cost analysis




*Source: Company data, UBSe*

Section 8

# Trailing-edge foundry

# Mature foundry pricing firming with manageable consumer weakness

- Utilization and pricing trends have continued to improve throughout 2026, and we expect more meaningful earnings upside in 2027-28.
- Our updated analysis suggests 8-inch foundry utilization could rise to 95% in 2027, up from 85% in 2026, supported by growing server PMIC demand.
- While 12-inch 28/40nm demand may face near-term headwinds from weaker smartphone and consumer demand, we still expect utilization to improve to 88% in 2027 from 84% in 2026, supported by modest capacity growth
- We also believe competitive behaviour from Chinese foundries should remain rational into 2027, as major Chinese players increasingly prioritize capital allocation toward leading-edge technologies.

# Mature foundry pricing firming with manageable consumer weakness

- 1) Moderating Chinese competition. We believe China's larger foundries are re-focusing on leading edge in the coming years to support Cloud AI. Meanwhile, we believe tier-1 foundry firms in China are looking to hike prices given tight supply.
- 2) TSMC's strategic optimization of mature foundry resources for advanced packaging.
- 3) Demand wise, AI servers with rising power semis content are consuming increasing capacity across 8" and mature 12".

# Thesis #1: 12" 28/40nm supply-demand improving

## UBS forecasts—12" 28/40nm foundry supply versus demand

| (kwpm 12") | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|
| **Demand** | | | | | | | | | |
| OLED driver ICs | 38 | 37 | 51 | 50 | 59 | 81 | 98 | 102 | 108 |
| WiFi SoC | 92 | 105 | 128 | 138 | 145 | 151 | 161 | 159 | 167 |
| MCU - Auto | 17 | 14 | 18 | 25 | 32 | 31 | 41 | 48 | 51 |
| MCU - General purpose & IoT | 21 | 22 | 50 | 64 | 73 | 74 | 88 | 100 | 100 |
| TV SoC | 114 | 109 | 98 | 88 | 80 | 82 | 82 | 80 | 79 |
| STB SoC | 20 | 21 | 21 | 19 | 17 | 18 | 19 | 19 | 20 |
| RF Transceivers for 4G / Legacy | 19 | 15 | 12 | 8 | 7 | 6 | 6 | 5 | 5 |
| SSD controllers | 15 | 18 | 21 | 20 | 20 | 19 | 19 | 20 | 21 |
| Others | 195 | 254 | 312 | 326 | 238 | 266 | 320 | 368 | 404 |
| **Total 12" wafer demand** | **533** | **603** | **727** | **762** | **709** | **775** | **892** | **959** | **1,020** |
| *Demand growth* | | *13.1%* | *20.6%* | *4.8%* | *-6.9%* | *9.3%* | *15.1%* | *7.5%* | *6.4%* |
| | | | | | | | | | |
| **Supply** | | | | | | | | | |
| TSMC | 305 | 318 | 335 | 365 | 385 | 395 | 425 | 430 | 380 |
| UMC | 87 | 94 | 106 | 116 | 131 | 153 | 158 | 168 | 183 |
| SMIC | 50 | 50 | 60 | 61 | 71 | 110 | 135 | 165 | 200 |
| HLMC | 20 | 40 | 40 | 40 | 45 | 45 | 45 | 65 | 75 |
| Samsung Foundry | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| GlobalFoundries | 70 | 70 | 74 | 105 | 126 | 145 | 169 | 196 | 209 |
| Qingdao SiEn | 0 | 0 | 0 | 5 | 10 | 10 | 10 | 10 | 10 |
| XMC | 0 | 0 | 5 | 10 | 10 | 10 | 10 | 10 | 10 |
| Hua Hong | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 10 |
| Powerchip | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vanguard | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| **Total 12" wafer supply** | **592** | **632** | **680** | **762** | **838** | **928** | **1,012** | **1,109** | **1,142** |
| *Supply growth* | | *6.9%* | *7.5%* | *12.2%* | *9.9%* | *10.8%* | *9.0%* | *9.6%* | *2.9%* |
| **Supply vs Demand** | **11.0%** | **4.9%** | **-6.5%** | **0.1%** | **18.2%** | **19.8%** | **13.5%** | **15.7%** | **11.9%** |
| | | | | | | | | | |
| **Implied 28/40nm industry utilisation** | **89.0%** | **95.1%** | **106.5%** | **99.9%** | **81.8%** | **80.2%** | **86.5%** | **84.3%** | **88.1%** |

*Source: Company data, Gartner, UBS estimates. Note: Expansion tracks of companies not covered (HLMC, and Qingdao SiEn) are based on company news, management comments, or IPO prospectuses.*

# Other mature foundry supply/demand analysis

## UBS forecasts—12" 65/90nm foundry expansion

| (kwpm 12") | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|
| **Total 12" 90/65nm foundry wafer supply** | **532** | **732** | **875** | **996** | **1,102** | **1,245** | **1,401** | **1,567** | **1,737** |
| *YoY* | | *38%* | *19%* | *14%* | *11%* | *13%* | *12%* | *12%* | *11%* |
| **Net addition** | | **200** | **142** | **121** | **106** | **144** | **156** | **166** | **170** |
| TSMC | | 235 | 245 | 255 | 255 | 255 | 255 | 255 | 255 |
| UMC | | 94 | 97 | 99 | 99 | 102 | 104 | 105 | 105 |
| Samsung Foundry | | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Powerchip | | 49 | 58 | 66 | 66 | 72 | 72 | 72 | 72 |
| GlobalFoundries | | 33 | 36 | 36 | 25 | 24 | 28 | 37 | 40 |
| Vanguard | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |
| Nexchip | | 30 | 70 | 100 | 110 | 140 | 155 | 165 | 165 |
| United Nova Technology (formerly SMEC) | | 0 | 0 | 0 | 10 | 20 | 40 | 60 | 85 |
| CanSemi | | 10 | 20 | 36 | 45 | 57 | 65 | 75 | 80 |
| CR Micro Foundry | | 0 | 0 | 0 | 0 | 0 | 10 | 40 | 65 |
| GTA Semi | | 0 | 1 | 3 | 15 | 25 | 35 | 50 | 65 |
| SiEn | | 0 | 0 | 5 | 20 | 40 | 45 | 52 | 55 |
| XMC | | 40 | 47 | 50 | 50 | 60 | 75 | 95 | 110 |
| SMIC | | 58 | 58 | 78 | 89 | 113 | 137 | 148 | 180 |
| Hua Hong | | 20 | 60 | 65 | 95 | 95 | 137 | 160 | 185 |
| HLMC | | 38 | 38 | 38 | 38 | 38 | 38 | 48 | 50 |
| Others | | 50 | 70 | 90 | 110 | 130 | 130 | 130 | 130 |

*Source: Company data, Gartner, UBS estimates. Note: Expansion tracks of companies not covered (Nexchip, CanSemi, GTA Semi, SiEn and UNT (formerly SMEC), HLMC) are based on company news, management comments, or IPO prospectuses.*

# Other mature foundry supply/demand analysis

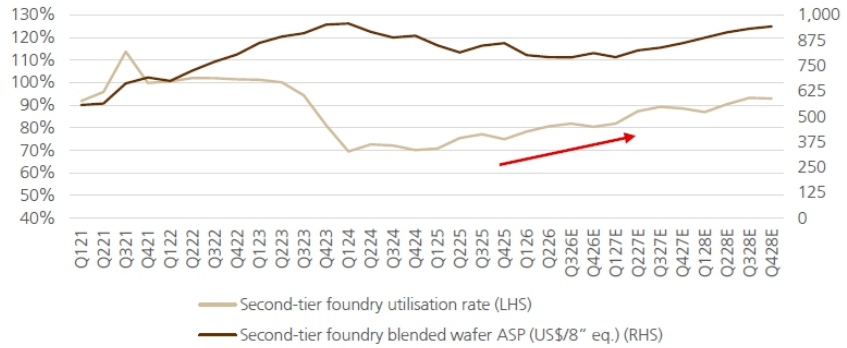
## UBS forecasts—8" foundry supply vs demand

| (kwpm 8") | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|
| **Demand** | | | | | | | | | |
| Power ICs | 1,446 | 1,496 | 1,687 | 1,521 | 1,408 | 1,513 | 1,662 | 1,649 | 1,788 |
| Display driver ICs | 198 | 211 | 212 | 190 | 168 | 152 | 147 | 145 | 147 |
| MCU - non-auto | 349 | 377 | 423 | 387 | 362 | 284 | 269 | 266 | 251 |
| Others | 875 | 745 | 797 | 877 | 614 | 687 | 825 | 949 | 996 |
| **Total 8" wafer demand** | **2,868** | **2,828** | **3,119** | **2,976** | **2,552** | **2,636** | **2,903** | **3,009** | **3,182** |
| *Demand growth* | | *-1.4%* | *10.3%* | *-4.6%* | *-14.2%* | *3.3%* | *10.1%* | *3.6%* | *5.8%* |
| **Supply** | | | | | | | | | |
| TSMC | 581 | 581 | 581 | 581 | 581 | 581 | 581 | 581 | 511 |
| UMC | 313 | 322 | 329 | 341 | 363 | 363 | 367 | 367 | 367 |
| Samsung Foundry | 250 | 250 | 250 | 250 | 260 | 260 | 260 | 260 | 200 |
| Vanguard | 211 | 243 | 252 | 270 | 287 | 287 | 293 | 280 | 297 |
| SMIC | 228 | 249 | 318 | 358 | 398 | 398 | 398 | 398 | 398 |
| Hua Hong | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 |
| PSMC | 85 | 95 | 110 | 118 | 118 | 123 | 123 | 123 | 123 |
| UNT (formerly SMEC) | 5 | 40 | 80 | 100 | 110 | 130 | 160 | 160 | 160 |
| GlobalFoundries | 142 | 112 | 117 | 122 | 122 | 122 | 122 | 122 | 122 |
| Key Foundry / Magnachip Fab 4 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 |
| Skywater | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Dongbu Hitek | 119 | 130 | 138 | 151 | 151 | 151 | 151 | 151 | 151 |
| TowerJazz | 141 | 141 | 148 | 148 | 148 | 148 | 148 | 148 | 148 |
| GTA Semi | 28 | 35 | 48 | 65 | 83 | 100 | 100 | 100 | 100 |
| CSMC | 60 | 122 | 132 | 140 | 140 | 140 | 140 | 140 | 140 |
| Qingdao SiEn | 0 | 3 | 9 | 20 | 25 | 25 | 25 | 25 | 25 |
| NSEMII (SMIC Ningbo) | 15 | 15 | 17 | 28 | 43 | 45 | 45 | 45 | 45 |
| SilTerra | 35 | 35 | 35 | 35 | 41 | 41 | 41 | 41 | 41 |
| X Fab | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 |
| Lfoundry | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 |
| Other | 148 | 12 | 30 | 100 | 100 | 102 | 104 | 106 | 108 |
| **Total 8" wafer supply** | **2,762** | **2,786** | **2,995** | **3,227** | **3,370** | **3,416** | **3,459** | **3,449** | **3,337** |
| *Supply growth* | | *0.9%* | *7.5%* | *7.7%* | *4.4%* | *1.4%* | *1.3%* | *-0.3%* | *-3.2%* |
| **Supply vs Demand** | **-3.7%** | **-1.5%** | **-4.0%** | **8.5%** | **32.0%** | **29.6%** | **19.2%** | **14.6%** | **4.9%** |
| **Implied 8" industry utilisation** | **103.7%** | **101.5%** | **104.0%** | **91.5%** | **68.0%** | **70.4%** | **80.8%** | **85.4%** | **95.1%** |

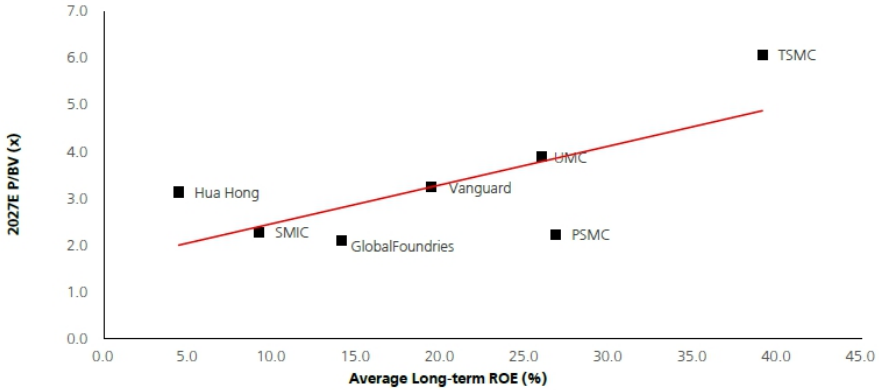
*Source: Company data, Gartner, UBS estimates. Note: Expansion tracks of companies not covered (UNT (formerly SMEC), TowerJazz, Dongbu Hitek, X Fab, Key Foundry, CSMC, L Foundry, SilTerra, GTA Semi, Skywater and Qingdao SiEn) are based on company news, management comments, or IPO prospectuses.*

# Other mature foundry supply/demand analysis

## Mature foundry utilisation vs ASP




## Foundry 2027E P/BV versus average 2027-29E ROE




*Source: Company data, Gartner, LSEG, UBSe. Note: We include UMC, SMIC, PSMC, Vanguard and Hua Hong in the second-tier foundry analysis.*

Section 9

# Company specifics

# TSMC – Buy with PT NT$3,650

- More robust Cloud AI outlook
  - At Q226 earnings conference, TSMC guided for 2026 sales growth of over 30% (in US$ terms)
  - AI accelerator sales grew to the high teens as a percentage of sales in 2025, and TSMC lifted 2024-29 sales CAGR guidance for the segment to high 50%.
- TSMC further raised 2026 capex to US$60-64bn at Q226 earnings conference, from US$54-56bn prior. Key drivers include:
  - 1) N3 capacity expansion in addition to CoWoS expansion, to support the migration of AI accelerators from 2026E. TSMC's N3 capacity is expected to increase meaningfully from 120kwpm at end-2025 to over 2027E by 2027E.
  - 2) N2 capacity ramp is set to be substantial, potentially reaching 160kwpm by 2028E, with upside.
  - 3) Faster US expansion. We believe TSMC should install tools for the second phase in Arizona in 2026 for earlier mass production in H227. With more overseas fan build up to follow.
- Optimism on profitability outlook improves in 2027E
  - TSMC flagged rising dilution from N2 ramp and overseas expansion into H226 though should still hold up with improving scale, product mix, and price increases from Q127.
- Discount to the SOX
  - TSMC trading at 17x/12x 2027/28E PE vs. SOX at 29/20x FY1/FY2 PE.

# TSMC bottom-up supports strong growth

| TSMC Revenue | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apple | $6,906 | $8,158 | $11,928 | $15,156 | $17,753 | $17,521 | $19,393 | $20,926 | $28,712 | $35,077 | 25.3% | 21.5% | 17.1% | 16.7% | 14.6% |
| AMD | $1,302 | $1,232 | $3,148 | $5,562 | $7,572 | $7,750 | $8,336 | $11,523 | $16,796 | $31,700 | 11.2% | 9.2% | 9.4% | 9.8% | 13.2% |
| Qualcomm | $1,915 | $1,994 | $3,187 | $4,280 | $6,574 | $6,314 | $7,910 | $9,448 | $8,880 | $9,506 | 9.1% | 8.8% | 7.7% | 5.2% | 3.9% |
| NVIDIA | $2,302 | $2,024 | $2,802 | $2,987 | $3,144 | $6,097 | $10,865 | $22,973 | $35,008 | $56,010 | 8.8% | 12.0% | 18.8% | 20.3% | 23.3% |
| Mediatek | $1,423 | $1,424 | $2,683 | $5,114 | $3,962 | $3,379 | $4,425 | $5,182 | $6,175 | $13,325 | 4.9% | 4.9% | 4.2% | 3.6% | 5.5% |
| Broadcom | $3,314 | $2,517 | $2,686 | $3,770 | $4,919 | $3,719 | $4,024 | $5,281 | $13,762 | $24,472 | 5.4% | 4.5% | 4.3% | 8.0% | 10.2% |
| Intel | $1,092 | $1,120 | $1,792 | $2,453 | $3,110 | $3,274 | $7,615 | $9,489 | $9,964 | $7,640 | 4.7% | 8.4% | 7.8% | 5.8% | 3.2% |
| Marvell | $544 | $514 | $568 | $970 | $1,293 | $1,362 | $1,505 | $2,333 | $3,536 | $5,640 | 2.0% | 1.7% | 1.9% | 2.1% | 2.3% |
| Renesas / Intersil / Dialog | $267 | $229 | $267 | $1,087 | $1,292 | $1,090 | $1,021 | $1,069 | $1,445 | $1,601 | 1.6% | 1.1% | 0.9% | 0.8% | 0.7% |
| NXP | $700 | $526 | $569 | $911 | $1,167 | $1,158 | $1,149 | $1,273 | $1,435 | $1,555 | 1.7% | 1.3% | 1.0% | 0.8% | 0.6% |
| **TSMC sales from its top 10** | **$20,600** | **$19,836** | **$29,013** | **$41,361** | **$52,780** | **$51,663** | **$66,243** | **$89,496** | **$125,713** | **$186,526** | **75%** | **73%** | **73%** | **73%** | **77%** |
| **TSMC YoY at its top 10** | **0%** | **-4%** | **46%** | **43%** | **28%** | **-2%** | **28%** | **35%** | **40%** | **48%** | | | | | |
| **TSMC sales from its top 30** | **$31,048** | **$31,220** | **$41,181** | **$50,572** | **$61,790** | **$60,204** | **$74,577** | **$99,120** | **$136,515** | **$198,859** | **87%** | **83%** | **81%** | **79%** | **83%** |
| **TSMC YoY at its top 30** | **7%** | **1%** | **32%** | **23%** | **22%** | **-3%** | **24%** | **33%** | **38%** | **46%** | | | | | |
| Rest of TSMC/Inventory | $2,404 | $3,838 | $4,240 | $6,235 | $14,261 | $9,094 | $15,606 | $22,911 | $35,698 | $41,837 | **13%** | **17%** | **19%** | **21%** | **17%** |
| **Rest of TSMC YoY** | **-31%** | **60%** | **10%** | **47%** | **129%** | **-36%** | **72%** | **47%** | **56%** | **17%** | | | | | |
| **TSMC Sales (UBS Estimate)** | **$33,452** | **$35,059** | **$45,422** | **$56,808** | **$76,051** | **$69,298** | **$90,184** | **$122,031** | **$172,213** | **$240,695** | **100%** | **100%** | **100%** | **100%** | **100%** |
| **TSMC Overall YoY** | **3%** | **5%** | **30%** | **25%** | **34%** | **-9%** | **30%** | **35%** | **41%** | **40%** | | | | | |

*Based on Q326 preview note*
*Source: Company data, UBS estimates*

# Stock driven by the HPC segment

| HPC Silicon Market (US$bn) | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E | 15-20 CAGR | 20-27E CAGR |
|---|---|---|---|---|---|---|---|---|---|---|
| Servers and CPUs | $66.9 | $75.1 | $65.6 | $55.8 | $64.6 | $79.1 | $107.0 | $146.2 | 7% | 12% |
| Graphics and Gaming | $12.4 | $21.8 | $18.8 | $19.6 | $17.9 | $26.1 | $30.6 | $32.6 | 12% | 15% |
| AI Accelerators | $4.2 | $6.0 | $7.7 | $16.6 | $40.3 | $80.0 | $154.7 | $310.3 | 66% | 85% |
| Cryptocurrency | $1.5 | $3.5 | $5.0 | $2.5 | $3.5 | $6.5 | $5.0 | $5.0 | 38% | 19% |
| Programmable Logic | $4.9 | $5.6 | $7.5 | $8.5 | $5.4 | $5.0 | $4.6 | $5.1 | 5% | 1% |
| Networking & Infrastructure | $17.2 | $18.9 | $21.7 | $23.2 | $24.9 | $34.8 | $48.8 | $68.3 | 6% | 22% |
| Computing Peripherals | $8.5 | $9.76 | $10.2 | $10.5 | $10.7 | $10.8 | $9.7 | $10.7 | 1% | 3% |
| **HPC - Market** | **$115.6** | **$140.7** | **$136.5** | **$136.6** | **$167.2** | **$242.3** | **$360.3** | **$578.1** | 8% | 26% |
| **YoY Growth** | **14%** | **22%** | **-3%** | **0%** | **22%** | **45%** | **49%** | **60%** | | |
| **HPC Wafer Opportunity (US$bn)** | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** | **2026E** | **2027E** | **15-20 CAGR** | **20-27E CAGR** |
| Servers and CPUs | $31.6 | $35.4 | $31.0 | $26.3 | $30.5 | $37.3 | $50.5 | $69.0 | 7% | 12% |
| Graphics and Gaming | $4.7 | $8.2 | $7.0 | $7.4 | $6.7 | $9.8 | $11.5 | $12.2 | 12% | 15% |
| AI Accelerators | $1.1 | $1.5 | $2.0 | $4.6 | $12.1 | $25.8 | $52.2 | $104.7 | 60% | 93% |
| Cryptocurrency | $0.8 | $1.8 | $2.6 | $1.3 | $1.8 | $3.4 | $2.6 | $2.6 | 38% | 19% |
| Programmable Logic | $1.3 | $1.5 | $2.0 | $2.3 | $1.5 | $1.4 | $1.3 | $1.4 | 5% | 1% |
| Networking & Infrastructure | $5.8 | $6.4 | $7.3 | $7.8 | $8.4 | $11.8 | $16.5 | $23.0 | 6% | 22% |
| Computing Peripherals | $3.6 | $4.2 | $4.4 | $4.5 | $4.6 | $4.6 | $4.1 | $4.6 | 1% | 3% |
| **HPC - Market** | **$48.8** | **$59.0** | **$56.4** | **$54.2** | **$65.5** | **$94.0** | **$138.7** | **$217.6** | 7% | 24% |
| **YoY Growth** | **14%** | **21%** | **-4%** | **-4%** | **21%** | **43%** | **47%** | **57%** | | |
| **TSMC HPC estimates (UBS)** | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** | **2026E** | **2027E** | **15-20 CAGR** | **20-27E CAGR** |
| Servers and CPUs | $6.0 | $8.5 | $10.1 | $9.7 | $17.6 | $22.5 | $33.6 | $43.8 | NM | 33% |
| Graphics and Gaming | $3.2 | $4.0 | $5.3 | $6.1 | $6.4 | $9.4 | $11.0 | $11.7 | 10% | 21% |
| AI Accelerators | $1.1 | $1.5 | $2.0 | $4.6 | $12.1 | $25.8 | $52.2 | $104.7 | 60% | 93% |
| Cryptocurrency | $0.6 | $1.5 | $2.1 | $1.0 | $1.5 | $2.7 | $2.1 | $2.1 | 38% | 19% |
| Programmable Logic | $0.7 | $1.0 | $1.4 | $1.8 | $1.2 | $1.2 | $1.2 | $1.4 | 4% | 9% |
| Networking & Network Processors | $1.7 | $1.9 | $2.8 | $3.4 | $3.9 | $5.6 | $7.9 | $11.1 | 1% | 31% |
| Computing Peripherals | $1.8 | $1.9 | $2.5 | $2.5 | $2.8 | $3.1 | $2.8 | $3.1 | 6% | 8% |
| Inventory builds | -$0.1 | $0.8 | $5.1 | $0.8 | $0.7 | $0.0 | -$1.0 | -$3.0 | | |
| **TSMC HPC revenue (US$bn)** | **$14.9** | **$21.0** | **$31.3** | **$30.0** | **$46.0** | **$70.3** | **$113.7** | **$178.7** | 21% | 43% |
| **YoY Growth** | **46%** | **41%** | **49%** | **-4%** | **54%** | **53%** | **62%** | **57%** | | |
| **TSMC share of HPC production** | **31%** | **36%** | **55%** | **55%** | **70%** | **75%** | **82%** | **82%** | | |
| **TSMC revenue (US$bn)** | **$45.5** | **$56.8** | **$75.9** | **$69.3** | **$90.2** | **$122.0** | **$172.2** | **$240.7** | 11% | 27% |
| **HPC % of TSMC Sales** | **33%** | **37%** | **41%** | **43%** | **51%** | **58%** | **66%** | **74%** | | |

*Based on Q326 preview note*

*Source: Company data, UBS estimates*

# TSMC - Quantifying the server CPU demand

- Agentic AI driving new demand for server CPUs
  - We forecast global server CPU shipments increase from 23m in 2025 to 63-70m units in 2030, a 30% CAGR.
  - We expect ARM to take unit shipment share from 16% in 2025 to 42% in 2030E; AMD should also gain share from 24% to 29%, while Intel's share could decline from 60% to 29% in the same period.
- TSMC to be a key beneficiary of ARM and AMD's share gains
  - We view higher server CPU unit shipments by 2030E and meaningful share expansion by ARM-based and AMD as strong potential tailwinds for TSMC.
  - Our analysis indicates that server CPUs may require 200kwpm of leading edge foundry capacity by 2030E, underpinned by higher units and larger die size vs. 71kwpm capacity demand in 2025.
  - We assume TSMC's capacity demand from ARM and AMD could rise meaningfully to 122kwpm by 2030E from 18kwpm in 2025.
  - Translating to a US$44.1bn revenue opportunity for TSMC by 2030E, reaching 11% of total sales from only US$3.7bn in 2025 or 3% of sales.
- We expect much larger leading edge TAM
  - Historically, a good leading edge node (e.g. N16/12, N7) for TSMC generally peaked at 120-130kwpm capacity, but we think scale will expand to c200kwpm for N3 based on Cloud AI upside potential.
  - We expect TAM of new nodes such as N2 and A14 to reach 300-350kwpm.

# UBS server CPU TAM estimates suggest a US$170bn market by 2030E

| Estimate | 2025 | 2027E | 2030E | Comment |
|---|---|---|---|---|
| **Traditional CPU Market** | | | | |
| Traditional CPU Market, MM | 20 | 26 | 30 | Grows from 2025 at 8% CAGR like C2005-2020 |
| Traditional CPU ASP, (US$, K) | $1,200 | $1,348 | $1,606 | Grows from 2025 at 1.5x 4% CAGR like C2005-2020 |
| Traditional Market, US$bn | 24 | 35 | 48 | Implied by units and ASPs |
| **AI CPU (Bottom-Up)** | | | | |
| AI Accelerator units (Bottom-up), MM | 9 | 23 | 40 | Largest programs (NVDA, AMD, TPU, Trn), ex-China |
| AI CPU Market (Bottom-up Ests), MM | 3 | 12 | 33 | |
| Head Node | 3 | 10 | ~20 | UBSe based announced systems |
| Standalone | 0 | 2 | 13 | Additional CPU units outside of rack |
| AI CPU ASP, (US$, K) | $2,420 | $3,175 | $3,769 | Higher core count and clock speed increasing ASPs |
| AI CPU Market (Bottom-up Ests), US$bn | 7 | 39 | 125 | |
| **AI CPU (Top-Down)** | | | | |
| AI CPU Market (Top-Down Ests), MM | | | 40 | TAM based on 3-4T AI Spend, and 1-to-1 CPU/GPU attach |
| AI CPU ASP, K | | | $3,000 | UBS ASP ests |
| AI CPU Market, US$bn | | | 120 | Implied by units and ASPs |
| **Total Market** | | | | |
| Bottom-up units, MM | 23 | 36 | 63 | Traditional + Bottom-up Ests |
| Bottom-up TAM, US$bn | 31 | 74 | 173 | |
| Top-Down CPU Market, MM | | | 70 | Traditional demand + Top-Down Est |
| Top-Down CPU Market, US$bn | | | 168 | |

*Source: Company data, UBS estimates*

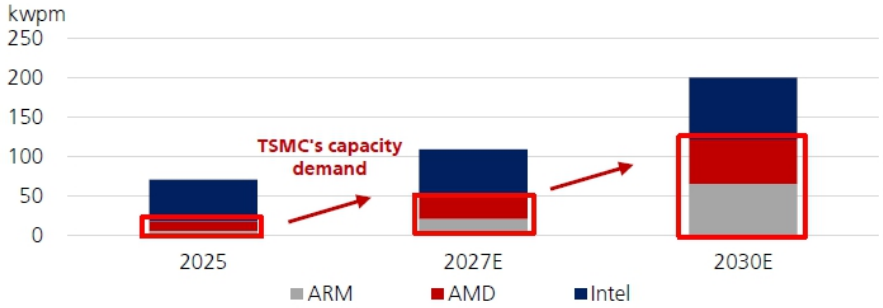
# Larger TAM and ARM/AMD's higher share to drive a US$44bn sales opportunity for TSMC by 2030E

| | 2025 | 2027E | 2030E |
|---|---|---|---|
| **Server CPU units (mn)** | | | |
| - Traditional servers | 20 | 26 | 30 |
| - AI server: head node | 3 | 10 | 20 |
| - AI server: standalone | 0 | 2 | 13 |
| **Total** | **23** | **38** | **63** |
| | | | |
| **Server CPU market share based on units** | | | |
| ARM | 16% | 32% | 42% |
| AMD | 24% | 27% | 29% |
| Intel | 60% | 40% | 29% |
| | | | |
| **Server CPU adv capacity requirement (kwpm)** | | | |
| ARM | 6.1 | 21.0 | 65.7 |
| AMD | 11.8 | 27.6 | 56.7 |
| Intel | 53.3 | 60.9 | 78.3 |
| **Total** | **71.3** | **109.5** | **200.7** |
| | | | |
| **TSMC's capacity demand (kwpm)** | **18.0** | **48.6** | **122.4** |
| *Wafer ASP (US$)* | *17,000* | *24,000* | *30,000* |
| **TSMC's sales opportunity (US$m)** | **3,667** | **14,003** | **44,068** |
| **Server CPU as % sales** | **3%** | **6%** | **11%** |

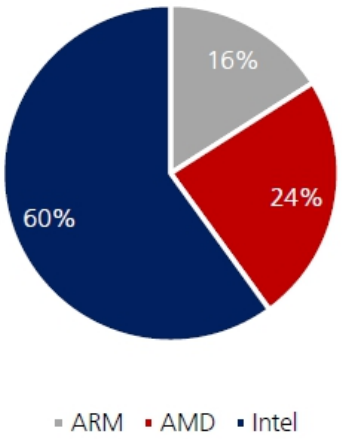
*Source: Company data, UBS estimates*

# TSMC is a key beneficiary of agentic AI lead CPU demand boom

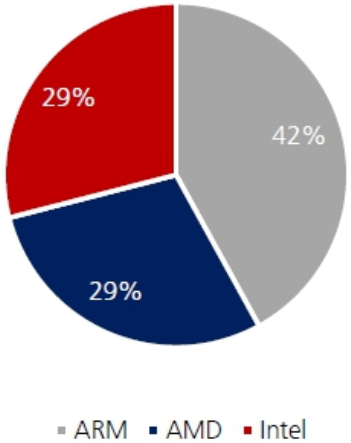
**Server CPU's advanced capacity demand to triple to 200kwpm by 2030E, of which TSMC could serve 122kwpm**




**Server CPU market share in 2025**



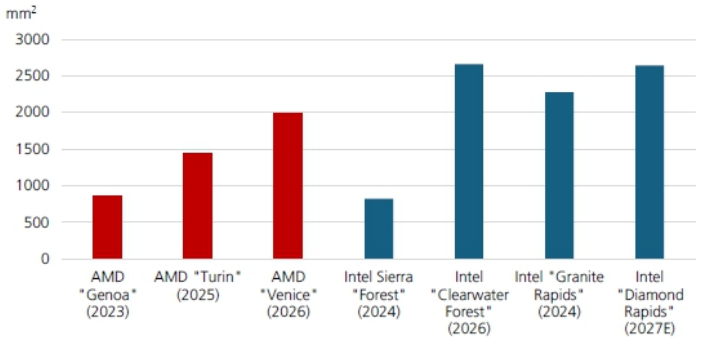

**Server CPU market share in 2030E**



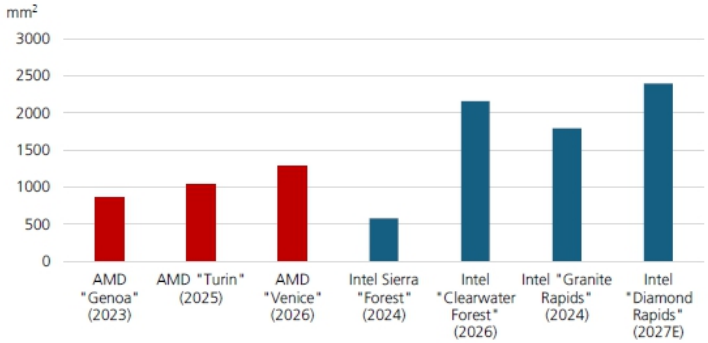

*Source: Company data, UBSe*

# TSMC is a key beneficiary of agentic AI lead CPU demand boom

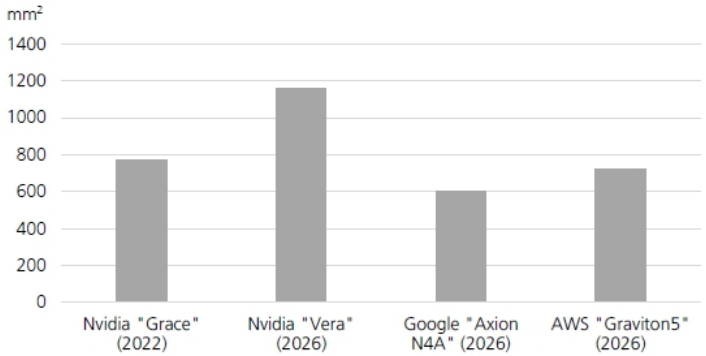
**x86 server CPU die size estimates - total die area. Die area has been steadily increasing**



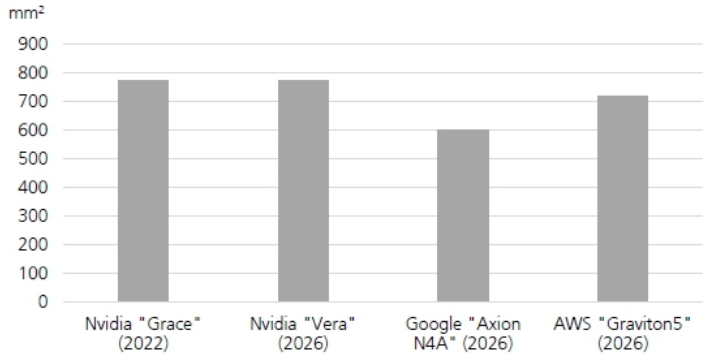

**x86 server CPU die size estimates - compute die area. Die area has been steadily increasing**




**ARM server CPU die size estimates - total die area. ARM-based is smaller than x86 currently**



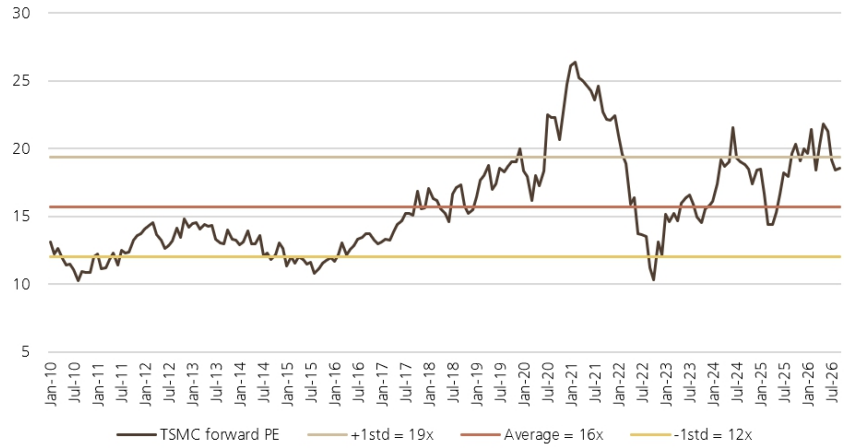

**ARM server CPU die size estimates - compute die area. We expect die area to increase**



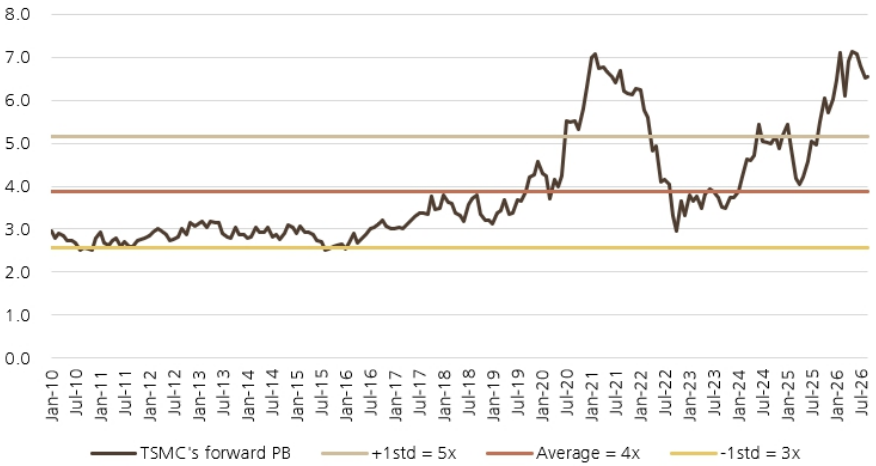

*Source: Company data, UBSe*

# TSMC Valuation PT NT$3,650

**1-yr forward P/E (x)**




**1-yr forward P/B (x)**




*Source: Company data, LSEG, UBSe*

# MediaTek – Key Call Buy, PT NT$7,300

- 4 key catalysts for further re-rating over next 6-9 months
  - TPUv9 "Humufish" tape-out by **Nov 2026**
  - Google's system-level validation in **H127** – providing better visibility into v9 performance and 2028 deployment volumes in Q1-Q227.
  - Continued **Intel EMIB execution**; so far so good
  - Potential upward revisions to TPU-related guidance during Oct 26 and Jan/Feb 27 earnings call.
- Upside risk from new ASIC projects – SpexA Dojo 3 and Tesla's AI6
- Expanding Google TPU addressable market w/ strong operating leverage
  - MediaTek raised its TPU v8t sales target to be U$2bn/US$12-16bn 2026/27. Guidance clearly reflects
    - 1) its TPU v8 shipment is on track for large volume from Q426 with no delays.
    - 2) MediaTek's TPU will be utilized for training which has volume demand.
    - 3) MediaTek is getting more supply chain capacity support.

*Source: Company data, UBSe*

# MediaTek – Key Call Buy, PT NT$7,300

- Beyond the disruption of memory supply, we see potential for smartphone upgrade cycle re-accelerating as AI proliferates to edge applications.
  - MediaTek's flagship 5G achieved breakthrough and we expect volume to rise from 19m in 2026E to 27m in 2027E with upside risk.
  - MediaTek may finally penetrate into Samsung's flagship phone in 2027E, starting with the fan edition S27 using the D9600 SoC.
  - MediaTek also appears to be working with OpenAI on edge AI devices like wearables and IoT, which may use D9600 in 2027.

**UBS forecasts for MediaTek's TPU business**

| | 2026E | 2027E | 2028E | 2029E | 2030E |
|---|---|---|---|---|---|
| **Google's TPU sales (US$mn)** | **2,113** | **18,000** | **43,500** | **52,500** | **60,000** |
| Google's TPU sales (NT$mn) | 67,200 | 576,000 | 1,392,000 | 1,680,000 | 1,920,000 |
| *% of total sales* | *10%* | *46%* | *65%* | *68%* | *69%* |
| **Gross profits (NT$mn)** | **28,224** | **241,920** | **584,640** | **705,600** | **806,400** |
| *Gross margin* | *42%* | *42%* | *42%* | *42%* | *42%* |
| OPEX (NT$mn) | 13,440 | 28,800 | 41,760 | 50,400 | 57,600 |
| *OPEX ratio* | *20.0%* | *5.0%* | *3.0%* | *3.0%* | *3.0%* |
| **Operating profits (NT$mn)** | **14,784** | **213,120** | **542,880** | **655,200** | **748,800** |
| *Operating margin* | *22%* | *37%* | *39%* | *39%* | *39%* |
| *Tax rate* | *12.9%* | *14.5%* | *14.5%* | *14.5%* | *14.5%* |
| **Net profits (NT$mn)** | **12,875** | **182,218** | **464,162** | **560,196** | **640,224** |
| **EPS contribution (NT$)** | **8.1** | **114.4** | **291.4** | **351.7** | **402.0** |
| | | | | | |
| **Consolidated EPS (NT$)** | **67.6** | **177.5** | **363.4** | **433.7** | **488.0** |

*Source: Company data, UBSe*

# MediaTek's key growth drivers for the next 3 years

## MediaTek's key growth drivers

| Base case (NT$m) | 2025 | 2026E | 2027E | 2028E |
|---|---|---|---|---|
| **5G flagship** | **110,921** | **107,181** | **159,929** | **174,779** |
| % of sales | 19% | 16% | 13% | 8% |
| Units (m) | 21.5 | 19.0 | 26.5 | 28.0 |
| ASP (US$) | 165.3 | 177.4 | 188.6 | 195.1 |
| **5G non-flagship** | **166,745** | **124,168** | **117,948** | **135,831** |
| % of sales | 28% | 18% | 9% | 6% |
| Units (m) | 189.0 | 145.0 | 140.0 | 160.0 |
| ASP (US$) | 28.3 | 26.9 | 26.3 | 26.5 |
| **PC CPUs** | | **4,744** | **9,217** | **15,190** |
| % of sales | | 1% | 1% | 1% |
| Units (m) | | 3.7 | 7.2 | 11.9 |
| *- Total NB units (m)* | | *186* | *192* | *198* |
| *- WOA penetration in PC market* | | *10%* | *15%* | *20%* |
| *- NVIDIA/MediaTek's share* | | *20%* | *25%* | *30%* |
| Royalty fee (US$ per chip) | | 40.0 | 40.0 | 40.0 |
| **Cloud ASICs** | | **67,200** | **576,000** | **1,392,000** |
| % of sales | | 10% | 46% | 65% |
| **Edge AI ASICs** | | | **16,000** | **32,000** |
| % of sales | | | 1% | 1% |
| **Automotive** | **11,233** | **15,139** | **20,480** | **56,000** |
| % of sales | 2% | 2% | 2% | 3% |
| TAM for cockpit, connectivity (US$bn) | 24 | 28 | 32 | 35 |
| MediaTek's share | 2% | 2% | 2% | 5% |
| **Wi-Fi 7** | **4,487** | **7,735** | **12,096** | **16,769** |
| % of sales | 1% | 1% | 1% | 1% |
| Units (m) | 17.8 | 33.4 | 54.6 | 79.6 |
| ASP (US$) | 8.1 | 7.3 | 6.9 | 6.6 |
| **Revenue from new growth drivers (NT$m)** | **293,386** | **326,167** | **911,670** | **1,822,569** |
| % of sales | 49% | 48% | 73% | 85% |
| **Total MediaTek sales (NT$m)** | **595,966** | **673,973** | **1,248,996** | **2,139,567** |
| *YoY growth* | *12%* | *13%* | *85%* | *71%* |

*Source: Company data, UBS estimates*

# Edge AI – inflection point for smartphone SoC content

## MediaTek sharpening its SoC computing capabilities

| Model number | MediaTek Dimensity 9000 | MediaTek Dimensity 9200 | MediaTek Dimensity 9300 | MediaTek Dimensity 9400 | MediaTek Dimensity 9500 |
|---|---|---|---|---|---|
| Year introduced | 2021 | 2022 | 2023 | 2024 | 2025 |
| Fabrication | TSMC N4 (FinFET) | TSMC N4 (FinFET) | TSMC N4 (FinFET) | TSMC N3E (FinFET) | TSMC N3P (FinFET) |
| Packaging | FCCSP | FCCSP | FCCSP | FCCSP | FCCSP |
| Transistors (bn) | 15.3 | 17.0 | 22.7 | 29.1 | 30.0 |
| Die area (sq-mm) | 112.8 | 123.2 | 140.4 | 129.1 | 129.1 |
| MTr/mm² | 135.7 | 138.0 | 161.7 | 225.4 | 232.3 |
| CPU cores | 1x Cortex-X2 (Prime-core, 3.1GHz)<br>+ 3x Cortex-A710 (P-cores, 2.9GHz)<br>+ 4x Cortex-A510 (E-cores, 1.8GHz) | 1x Cortex-X3 (Prime-core, 3.4GHz)<br>+ 3x Cortex-A715 (P-cores, 3.0GHz)<br>+ 4x Cortex-A510 (E-cores, 2.0GHz) | 1x Cortex-X4 (Prime-core, 3.3GHz)<br>+ 3x Cortex-X4 (P-cores, 2.9GHz)<br>+ 4x Cortex-A720 (E-cores, 2.0GHz) | 1x Cortex-X925 @ 3.63 GHz<br>3x Cortex-X4 @ 3.3 GHz<br>4x Cortex-A720 @ 2.4 GHz | 1x Arm C1-Ultra @ 4.21 GHz<br>3x Arm C1-Premium @ 3.5GHz<br>4x Arm C1-Pro @ 2.7GHz |
| GPU cores | Mali-G710 MP7 | Immortalis G715 MP11 | 12x Immortalis G720 MP12 | Arm Immortalis-G925 MC12 | Arm Mali-G1 Ultra MC12 |
| Neural engine cores | APU 590 | APU 690 | APU 790 | MediaTek NPU 890 | MediaTek NPU 990 |
| Neural engine performance | 20 TOPS | 24 TOPS | >48 TOPS | >65 TOPS | ~100 TOPS |
| Memory | 24GB LPDDR5X | 24GB LPDDR5X | 24GB LPDDR5T | 24GB LPDDR5X | 24GB LPDDR5X |

## Qualcomm also drives more powerful AI computing engines on chipsets

| Model number | Qualcomm Snapdragon 8 Gen 1 | Qualcomm Snapdragon 8 Gen 2 | Qualcomm Snapdragon 8 Gen 3 | Qualcomm Snapdragon 8 Elite | Qualcomm Snapdragon 8 Elite Gen 5 |
|---|---|---|---|---|---|
| Year introduced | 2021 | 2022 | 2023 | 2024 | 2025 |
| Fabrication | Samsung Foundry 4LPX (FinFET) | TSMC N4 (FinFET) | TSMC N4 (FinFET) | TSMC N3E (FinFET) | TSMC N3P (FinFET) |
| Packaging | FCCSP | FCCSP | FCCSP | FCCSP | FCCSP |
| Transistors (bn) | 16.0 | 16.0 | 19.5 | 26.8 | 28.3 |
| Die area (sq-mm) | 128.5 | 118.4 | 137.3 | 124.1 | 126.3 |
| MTr/mm² | 124.5 | 135.2 | 142.0 | 216.0 | 224.0 |
| CPU cores | 1x Cortex-X2 (Prime-core, 3.0GHz)<br>+ 3x Cortex-A710 (P-cores, 2.5GHz)<br>+ 4x Cortex-A510 (E-cores, 1.8GHz) | 1x Cortex-X3 (Prime-core, 3.2GHz)<br>+ 2x Cortex-A715 (P-cores, 2.8GHz)<br>+ 2x Cortex-A710 (P-cores, 2.8GHz)<br>+ 3x Cortex-A510 (E-cores, 2.0GHz) | 1x Cortex-X4 (Prime-core, 3.4GHz)<br>+ 3x Cortex-A720 (P-cores, 3.2GHz)<br>+ 2x Cortex-A720 (P-cores, 3.0GHz)<br>+ 2x Cortex-A520 (E-cores, 2.3GHz) | 2x Oryon Gen 2 (Prime core, 4.32 GHz)<br>6x Oryon Gen 2 (P-cores, 3.53 GHz) | up to 4.6 GHz<br>2x Oryon Gen 3 (Prime core, 4.6 GHz)<br>6x Oryon Gen 3 (P-cores, 3.62 GHz) |
| GPU cores | Adreno 730 | Adreno 740 | Adreno 750 | Adreno 830 | Adreno 840 |
| Neural engine cores | Hexagon 790 NPU | Hexagon NPU | Hexagon NPU | Hexagon NPU | Hexagon NPU |
| Neural engine performance | 26 TOPS | 26 TOPS | 45 TOPS | >65 TOPS | >80 TOPS |
| Memory | 24GB LPDDR5 | 24GB LPDDR5X | 24GB LPDDR5X | 24GB LPDDR5X | 24GB LPDDR5X |

*Source: Company data, UBS estimates*

# Meaningful price uptick for upcoming flagship SoCs

## Cost bump in Dimensity 9500 could lead to higher chip selling price

| | Dimensity 9000 | Dimensity 9200 | Dimensity 9300 | Dimensity 9400 | Dimensity 9500 |
|---|---|---|---|---|---|
| Year | 2021 | 2022 | 2023 | 2024 | 2025 |
| Process node | TSMC N4 (FinFET) | TSMC N4 (FinFET) | TSMC N4 (FinFET) | TSMC N3E (FinFET) | TSMC N3P (FinFET) |
| Transistors (bn) | 15.3 | 17.0 | 22.7 | 29.1 | 30.0 |
| Density (MTr/mm²) | 135.7 | 138.0 | 161.7 | 225.4 | 232.3 |
| 12" wafer area (mm²) | 70,686 | 70,686 | 70,686 | 70,686 | 70,686 |
| Die size (mm²) | 112.8 | 123.2 | 140.4 | 129.1 | 129.1 |
| Yield | 75% | 80% | 80% | 70% | 70% |
| Usable area | 88% | 88% | 88% | 88% | 88% |
| Known good die per wafer | 414 | 404 | 355 | 337 | 337 |
| Wafer price (US$) | 15,000 | 15,000 | 15,000 | 18,000 | 18,900 |
| Die fabrication cost (US$) | 36.3 | 37.1 | 42.3 | 53.4 | 56.0 |
| Back-end cost (~25% of front-end; US$) | 9.1 | 9.3 | 10.6 | 13.3 | 14.0 |
| Other component cost (US$) | 8.2 | 8.4 | 9.5 | 12.0 | 12.6 |
| **Total cost (US$)** | **53.5** | **54.8** | **62.4** | **78.7** | **82.7** |

## Apple has seen manufacturing cost inflation migrating to the 3nm process

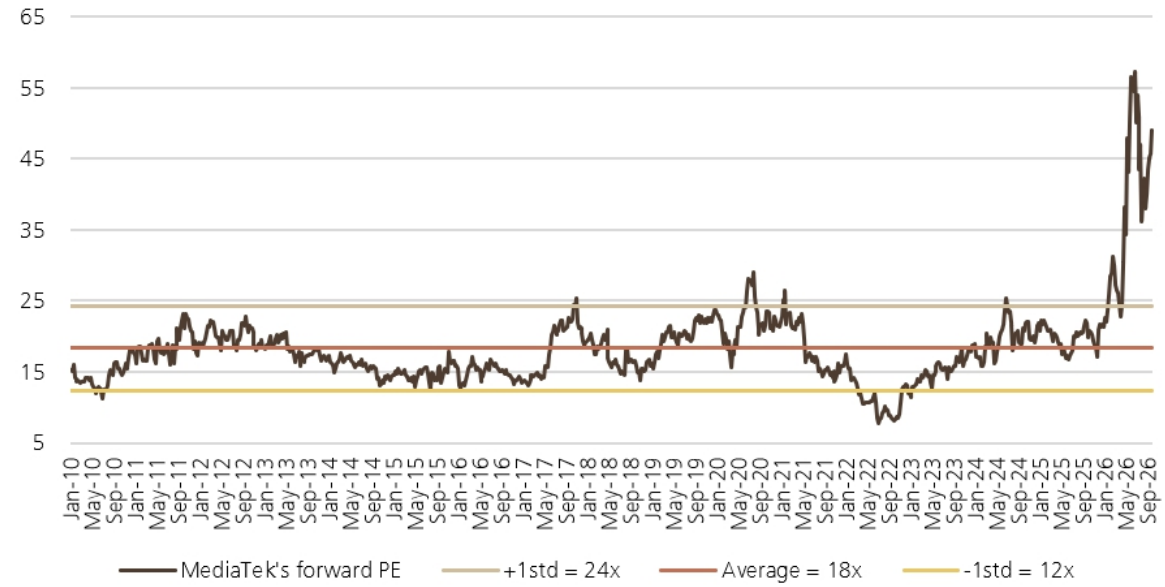
| | Apple A14 Bionic | Apple A15 Bionic | Apple A16 Bionic | Apple A17 Pro | Apple A18 Pro |
|---|---|---|---|---|---|
| Year | 2020 | 2021 | 2022 | 2023 | 2024 |
| Process node | TSMC N5 (FinFET) | TSMC N5P (FinFET) | TSMC N4P (FinFET) | TSMC N3B (FinFET) | TSMC N3E (FinFET) |
| Transistors (bn) | 11.8 | 15.0 | 16.0 | 19.0 | 20.0 |
| Density (MTr/mm²) | 134.5 | 139.3 | 141.9 | 183.0 | 190.5 |
| 12" wafer area (mm²) | 70,686 | 70,686 | 70,686 | 70,686 | 70,686 |
| Die size (mm²) | 87.8 | 107.7 | 112.8 | 103.8 | 105.0 |
| Yield | 70% | 75% | 78% | 70% | 70% |
| Usable area | 88% | 88% | 88% | 88% | 88% |
| Known good die per wafer | 496 | 433 | 430 | 419 | 415 |
| Wafer price (US$) | 15,000 | 15,000 | 15,500 | 18,000 | 18,000 |
| Die fabrication cost (US$) | 30.2 | 34.6 | 36.0 | 42.9 | 43.4 |
| Back-end cost (~25% of front-end) | 7.6 | 8.7 | 9.0 | 10.7 | 10.9 |
| Other component cost (US$) | 3.8 | 4.3 | 4.5 | 5.4 | 5.4 |
| **Manufacturing cost (US$)** | **37.8** | **43.3** | **45.0** | **53.6** | **54.3** |

*Source: Company data, UBS estimates*

# MediaTek – Valuation

- Our price target is NT$7,300, based on 27x 2027-28E PE.

**MediaTek 1-year forward P/E (x)**




*Source: Company data, LSEG, UBSe*

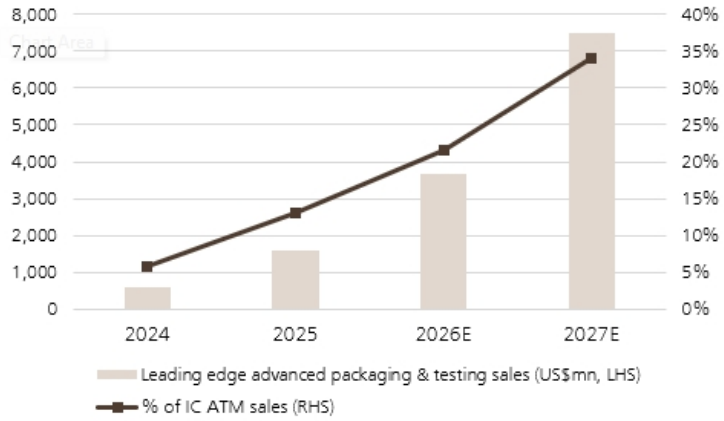
# ASE –Buy with PT of NT$835

- Higher capex to power larger advanced packaging opportunity
  - ASE further raised 2026 capex to US$10.5bn from previous US$8.5bn, another step up from US$5.5bn in 2025.
    - 70% of equipment capex will be spent on leading edge packaging and testing
    - This is supported by robust future demand for cloud AI in coming years.
  - We forecast strong LEAP and testing sales of US$3.5/7.5bn in 2026/27E.
- GM expansion could accelerate into late 2026E and 2027E
  - We foresee structural tailwinds to ASE's margin expansion and expect substantial improvement into late 2026-27, when LEAP sales grow even faster, while full-process CoWoS, with higher margins, ramps up and scale improves.
    - Management guided IC ATM GM to exceed 30% in Q426
    - Improving mainstream business with favorable pricing should further help margin expansion

# ASE –Buy with PT of NT$835

– Management guided that LEAP & testing sales to more than double to over US$3.5bn in 2026, from US$1.6bn in 2025. We forecast sales for the segment to rise to US$3.7bn/7.5bn in 2026/27E driven by:
  – 1) more TSMC substrate outsourcing; we expect content per unit to rise due to larger package sizes;
  – 2) tighter CoWoS supply vs. demand at TSMC should support ASE's full process service as clients diversify; and
  – 3) an increase in the chip probing business with upside from final testing of AI accelerators

**ASE's leading edge adv packaging & testing sales see increasing contribution to IC ATM**



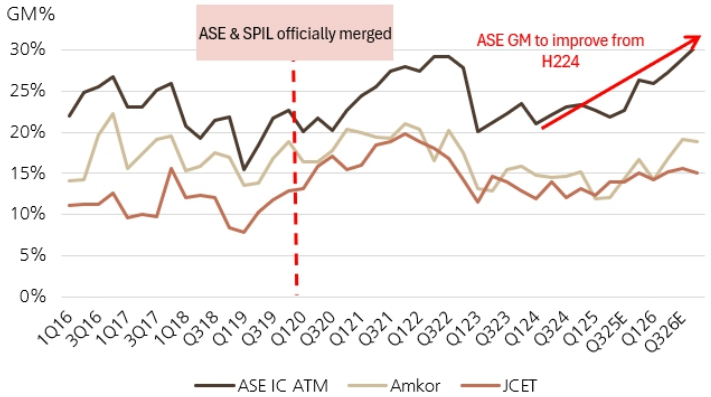

**ASE's leading edge advanced packaging business**

| | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|
| **Leading edge adv packaging** | **250** | **550** | **1,200** | **2,720** | **5,971** |
| **Non CoWoS** | **250** | **250** | **275** | **303** | **333** |
| **CoWoS** | | **350** | **925** | **2,417** | **5,639** |
| **- TSMC's outsourced WoS** | | **311** | **886** | **2,098** | **3,119** |
| Units (k per month) | | 432 | 923 | 1,165 | 1,529 |
| Unit service revenue (US$) | | 60 | 80 | 150 | 170 |
| **- CoWoS S outsourcing (kwpm)** | | **14** | **15** | **10** | **10** |
| - Units per interposer | | 30 | 30 | 30 | 30 |
| **- CoWoS L outsourcing (kwpm)** | | | **32** | **87** | **137** |
| - Units per interposer | | | 15 | 10 | 9 |
| **- ASE's own CoWoS** | | **39** | **39** | **320** | **2,520** |
| Units (kwpm) | | 0.5 | 0.5 | 4.1 | 30 |
| Unit revenue (US$) | | 6,500 | 6,500 | 6,500 | 7,000 |
| **Testing** | | **50** | **400** | **950** | **1,500** |
| **LEAP & testing revenue (US$mn)** | **250** | **600** | **1,600** | **3,670** | **7,471** |
| *YoY* | | *140%* | *167%* | *129%* | *104%* |
| *% of IC ATM sales* | *2%* | *6%* | *13%* | *22%* | *34%* |
| *% of whole company's sales* | *1%* | *3%* | *8%* | *14%* | *22%* |

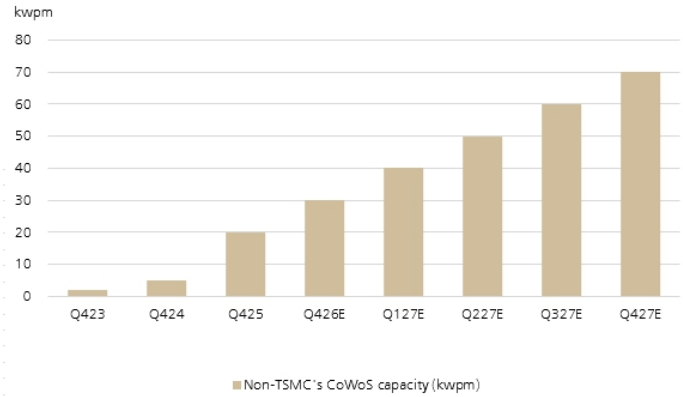
*Source: Company data, UBSe*

# ASE – Margin Recovery, CoWoS Ramp, Capex

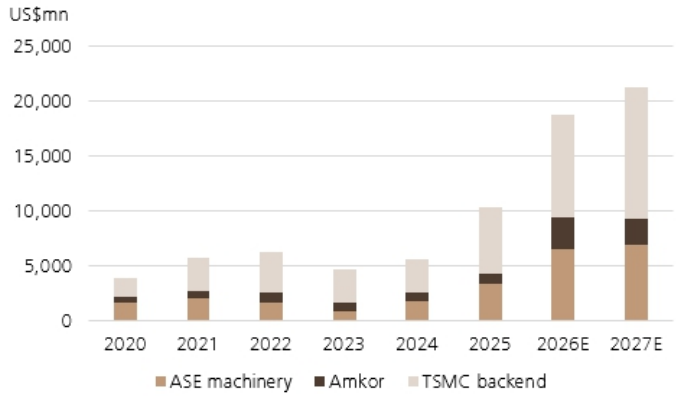
## OSAT's GM now structurally better given improved competition



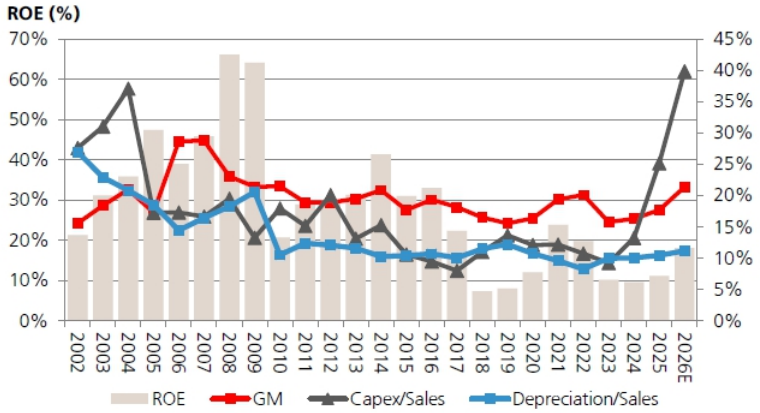

## ASE/Amkor's CoWoS capacity in 2023-27E (installed capacity at end of the year)




## Capex of TSMC, ASE and Amkor




## Capex spending increasing significantly

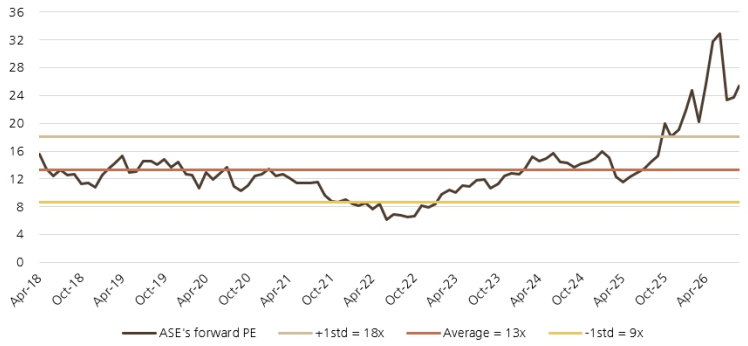



*Source: Company data, UBSe*

# ASE – Valuation

- Our NT$835 price target is based on 24x 2027-28E P/E

**1-yr forward P/E (x)**




**1-yr forward P/BV (x)**




**ASE's forward PE band before SPIL consolidation**




**ASE's forward PB band before SPIL consolidation**




*Source: Company data, LSEG, UBSe*

# UMC – Buy with PT NT$230

- Mature foundry and UMC fundamentals turning around fast
  - YTD we have had an anti-consensus Buy on the strengthening competitive dynamics of mature foundry as of mid-2025, and the trend appears to be playing out in 2026.
- Industry dynamics strengthening faster than expected
  - 1) Large foundries continue to reallocate resources on mature nodes, including a potential new opportunity if TSMC were to reallocate 28nm capacity in Taiwan. Our industry studies suggest UMC can see increasing number of new product opportunities from diversified clients.
  - 2) China's mature node expansion should slow down from here as they refocus on leading edge
  - 3) Price hikes: mature foundry pricing inflecting upward YTD and we believe UMC can raise prices 5-10% on selected products in H226, and an additional 10% increase for broader product rage in early 2027.
- New drivers for the next three to four years:
  - 1) **Advanced packaging**, for which the company guided for meaningful sales growth in 2027 and beyond.
  - 2) Its **Intel partnership** in 12" foundry. We expect this business to be margin-accretive and contribute 6% of operating profit by 2028E. (see our scenario analysis on the following slide).
  - 3) UMC's **differentiated 22nm offering.**
  - 4) UMC could benefit from tight **silicon photonics** supply, with pluggables possibly adding 2% (USD 0.2–0.3bn) to 2028E sales if it secures a 10% share of a USD $2–3bn TAM
  - 5) AI-related revenue could exceed US$1bn within three years.

*Source: Company data, UBS*

# UMC – Buy with PT NT$230

- Intel's 12nm collaboration to contribute to earnings starting 2028
  - First-wave products for mass production include TV controllers, connectivity and high-speed I/O.
  - UMC aims to release early PDKs to the first wave of customers in May 2026 and expects to deliver tape-outs in 2027
    - UMC aims to broaden its specialty portfolio and maintain strategic alignment with Intel.
    - We believe OLED driver IC is also under development for iPhone demand in 2028-29.
  - This collaboration should be key to support UMC's sales / profits growth, attributing more meaningfully in 2028, and its technology differentiation vs Chinese foundries.

## Our Intel partnership scenario analysis

**Scenario analysis**

| | 2028E |
|---|---|
| Wafer volume (kwpm) | 25.0 |
| N12 wafer ASP (US$) | 5,500 |
| **Total wafer revenue (US$mn)** | **1,650** |
| *% recognition by UMC* | *50%* |
| **Sales to UMC (US$mn)** | **825** |
| *% of UMC sales* | *5.6%* |
| **Gross profit (US$mn)** | **371** |
| *Assumed GM* | *45%* |
| *% of UMC gross profit* | *5.6%* |
| OPEX | 58 |
| as % of sales | 7% |
| **Operating income** | **314** |
| *OPM* | *38.0%* |
| | |
| Operating profit to UMC (US$mn) | 314 |
| Operating profit to UMC (NT$mn) | 10,032 |
| % to UMC's operating profit | 6.0% |

## Silicon photonic foundry TAM and revenue by leaders including Tower Semiconductor and GlobalFoundries

| US$ | 2024 | 2025 | 2026F | 2027F | 2028F | 2029F | 2030F | 2031F | 2032F | Implied CAGR |
|---|---|---|---|---|---|---|---|---|---|---|
| Silicon Photonics Wafer SAM | | | ~$700m | | | | | | ~$6.5bn | ~45% CAGR FY26-32F |

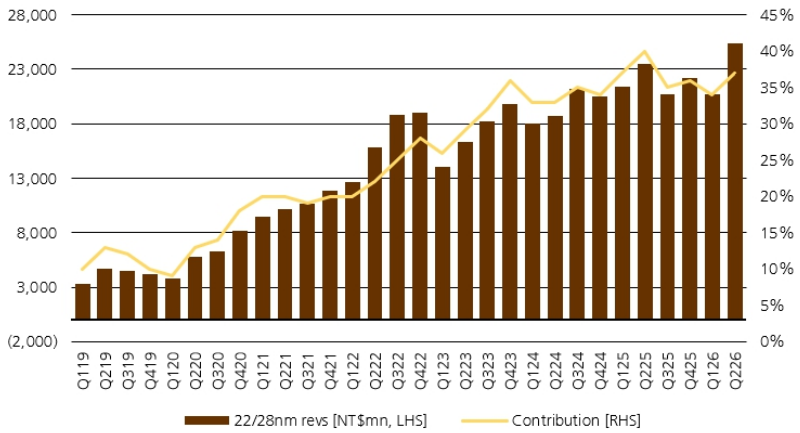
| US$ Silicon Photonics Revenue | 2024 | 2025 | 2026F | 2027F | 2028F | 2029F | 2030F | 2031F | 2032F | Implied CAGR |
|---|---|---|---|---|---|---|---|---|---|---|
| Tower Semiconductor | $106m | $228m | Q1 grew 3x yoy | $1.3Bn | | | | | | |
| GlobalFoundries | ~$100m | ~$200m | $400m target | | >$1Bn exit run rate | | ~$2Bn | | | ~50% CAGR FY26-30F |

*Source: Company data and company targets, UBS estimates. Note: SiPh wafer SAM source from Nov 2025 GFS presentation .*

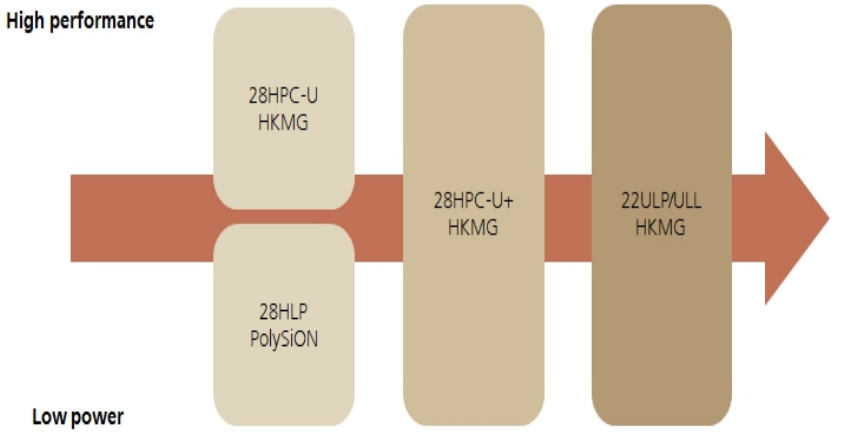
# UMC – Buy with PT NT$230

- We still see plenty of earnings upside potential for UMC as it has enhanced its customer/product base for mature technology over the past couple of years, and gradually moved away from some commodity products, eg, display driver ICs.

**UMC's 22/28nm revenue trend and contribution**




**UMC's 22/28nm technology roadmap**




*Source: Company data, UBSe*

# UMC – Buy with PT NT$230

- Silicon photonics:
  - Relative to incumbent 8" PIC solutions, UMC's 12" process is positioned to deliver superior optical interconnect performance while offering meaningful advantages in cost efficiency and manufacturing scale.
  - UMC is confident in achieving its AI-related revenue target of over US$1bn by 2029, which includes contribution not only from silicon photonic but also other AI components like peripherals, interposers, hybrid bonding, TSVs, and silicon capacitor technologies to address future power and bandwidth requirements.
  - We anticipate pluggables to contribute more meaningfully by 2028E

**SiPh foundry TAM and revenue by leaders including Tower Semiconductor and GlobalFoundries**

| US$ | 2024 | 2025 | 2026F | 2027F | 2028F | 2029F | 2030F | 2031F | 2032F | Implied CAGR |
|---|---|---|---|---|---|---|---|---|---|---|
| Silicon Photonics Wafer SAM | | | ~$700m | | | | | | ~$6.5bn | ~45% CAGR FY26-32F |

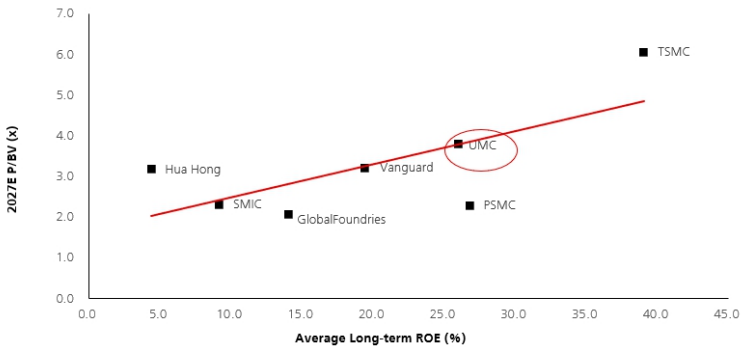
| US$ Silicon Photonics Revenue | 2024 | 2025 | 2026F | 2027F | 2028F | 2029F | 2030F | 2031F | 2032F | Implied CAGR |
|---|---|---|---|---|---|---|---|---|---|---|
| Tower Semiconductor | $106m | $228m | Q1 grew 3x yoy | $1.3Bn | | | | | | |
| GlobalFoundries | ~$100m | ~$200m | $400m target | | >$1Bn exit run rate | | ~$2Bn | | | ~50% CAGR FY26-30F |

*Source: Company data and company targets, UBS. Note: SiPh wafer SAM source from Nov 2025 GFS presentation*

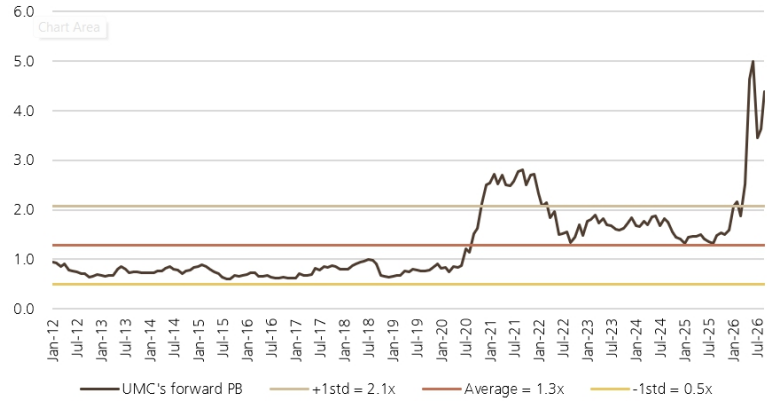
# UMC – Buy with PT NT$230

- Our price target of NT$230 is based on 25x forward 2027-28E P/E, justified by 1)a structural shift in fundamentals and a 2) 32% earnings CAGR in 2027-2030E.

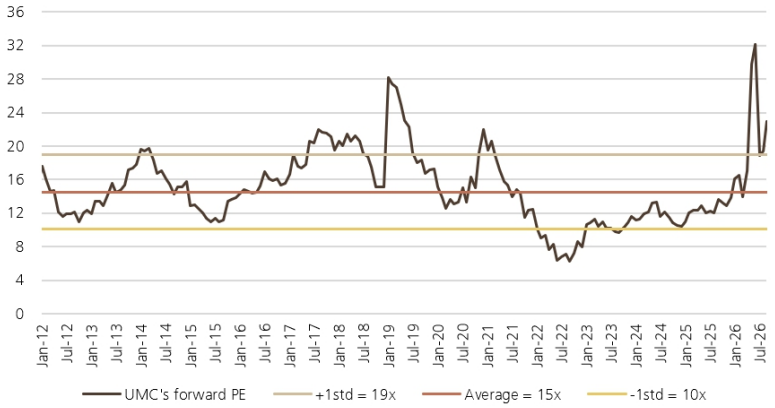
**Industry PB vs ROE**




**UMC's 12-month forward P/BV (x)**




**UMC's 12-month forward P/E (x)**




*Source: Company data, LSEG, UBSe*

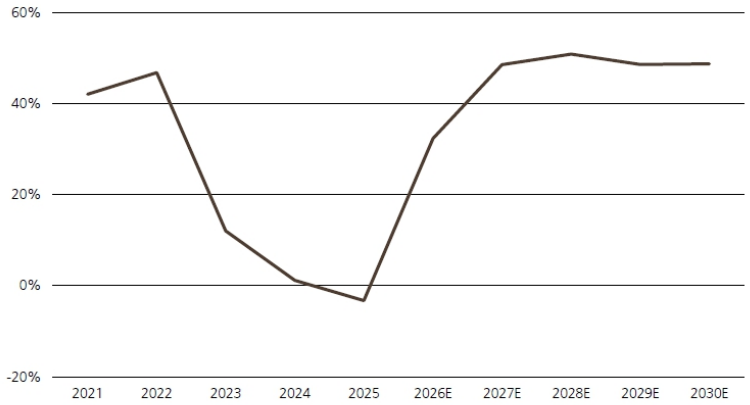
# PSMC – Buy, PT NT$100

- We are turning more constructive on PSMC's sales and EPS outlook in coming years
- **Memory**: meaningful price hike in H226 with tech upgrade in 2027-28
  - DRAM foundry business (~46% of Q226 sales) to benefit meaningfully from tight DRAM supply through 2027-28
  - Foundry business model implies a 4-5 month lag in recognizing DRAM ASP increases versus market prices, implying significant ASP/revenue upside to come in coming quarters
  - Management announced a 45% DRAM price hike in July 2026, which would be reflected in November sales
- **Logic**: dual drivers from advanced packaging and better foundry outlook
  - 3D AI foundry to reach 20% of sales in 3 years.
  - Potential to reach 20% of sales in three years
  - Improving supply/demand in mature foundry with more rational competition from Chinese peers
- **3D AI foundry**: emerging growth engine with increasing revenue contribution
  - Four key focus: Silicon Capacitors (IPD), PWF, WoW stacking, and interposers
  - Reached 5.4% of total sales in Q226, up 115% QoQ in absolute terms
  - We are increasingly optimistic about its potential to reach management's target for 3D AI foundry to reach 20% of total sales in three years

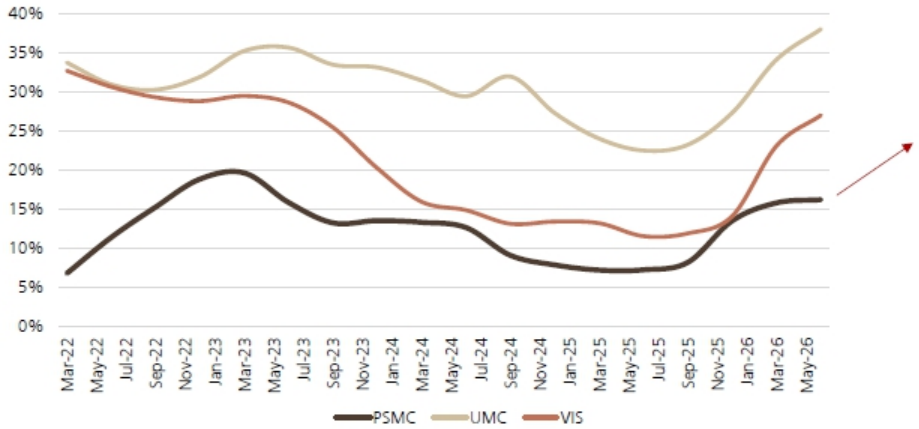
*Source: Company data, UBS estimates*

# PSMC – Buy, PT NT$100

**We are optimistic about PSMC's structural gross margin outlook, underpinned by better memory supply and demand, a product mix upgrade, and its 3D AI foundry strategy**




**PSMC's FINI holding% has lagged peers, but we see room for it to catch up as its business transitions with earnings upside to come**

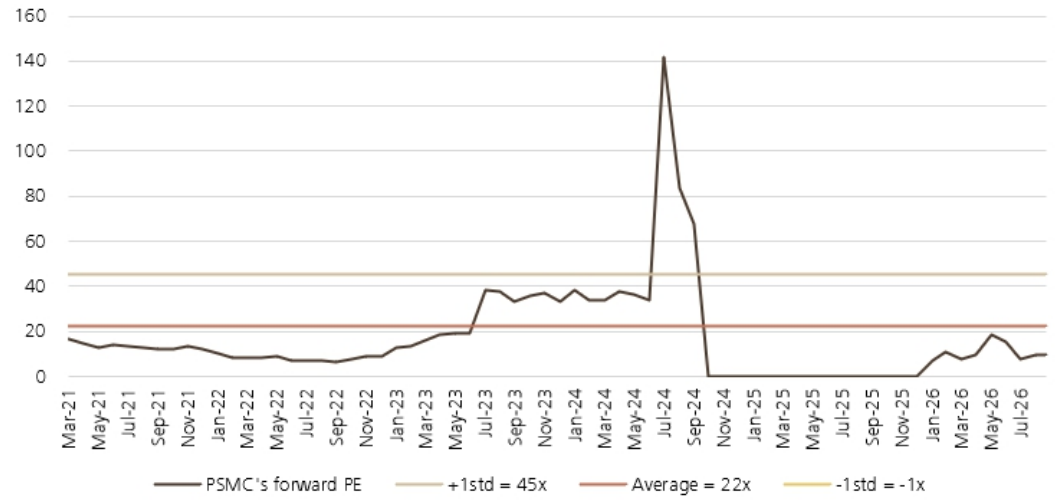



*Source: Company data, TEJ, UBSe*

# PSMC – Valuation

- Our price target of NT$100 is based on 10x 2027E PE.
  - We utilized a 10x forward P/E to reflect improving earnings power over the next 3-4 years, driven by a more robust memory and logic business outlook, we utilized a 10x 2027E PE.
  - With improved earnings capability, PSMC should enhance shareholder returns and distribute dividends, which should support its valuation.

**1-yr forward P/E (x)**



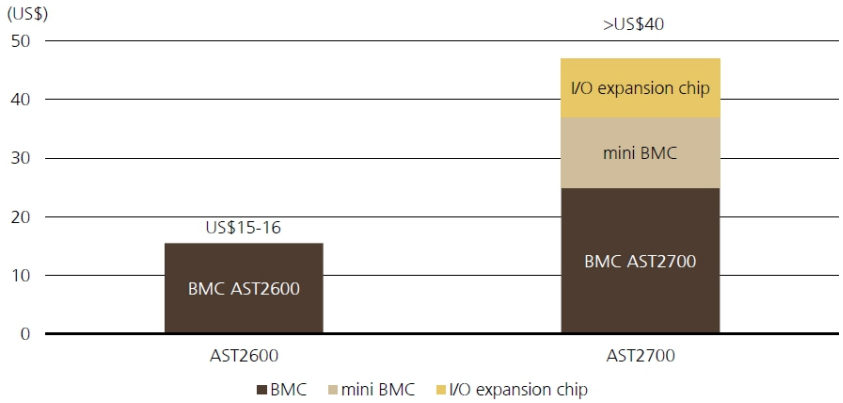

*Source: LSEG, UBS. Note: P/E was not meaningful in certain periods due to earnings loss*

# Aspeed – Buy, PT NT$22,000

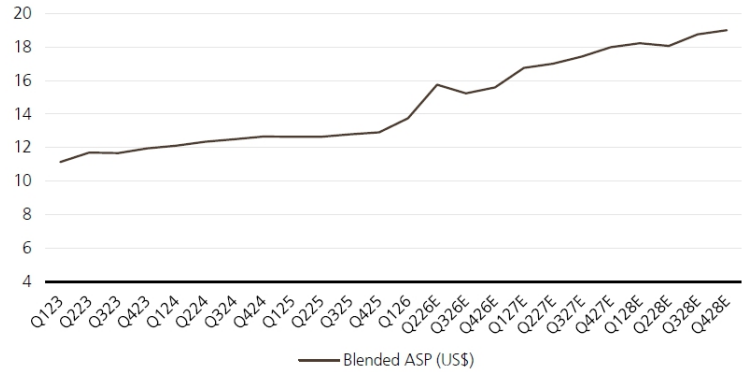
- We expect the addressable market for server BMC to structurally expand to 77m units by 2030
  - Our forecast implies 30% CAGR in the next five years from 21m units in 2025.
  - We estimate the blended BMC attach rate at over 1 per CPU due to the higher attach rate in GPU and ASIC servers with further upside from non-CPU boards such as switches and storage modules.
- Steep ramp of new AST2700 in 2027-28E
  - The new AST2700 is set to ramp quickly. We estimate AST2700 to reach 26% of total shipment in 2027E.
  - Underpinned by the smoother, timely rollout of new server CPU platforms from AMD and Intel, the adoption of new AI accelerators ramping in 2027 (including Nvidia's Rubin Ultra), and key ASIC programs.
- Aspeed has unveiled a robust product roadmap through 2030 with upgrades across main BMC, BIC (or called AMC), I/O expander, and security chips.
- Recently at 2026 Computex, Aspeed showcased several new products, including AST1840, AST1040, and AST1800.
  - Of note, AST1840 is a new collaboration with Lattice for FPGAs, which is an upgraded SMC that could save critical board space and is crucial for future multi-node servers.

# Aspeed – Buy, PT NT$22,000

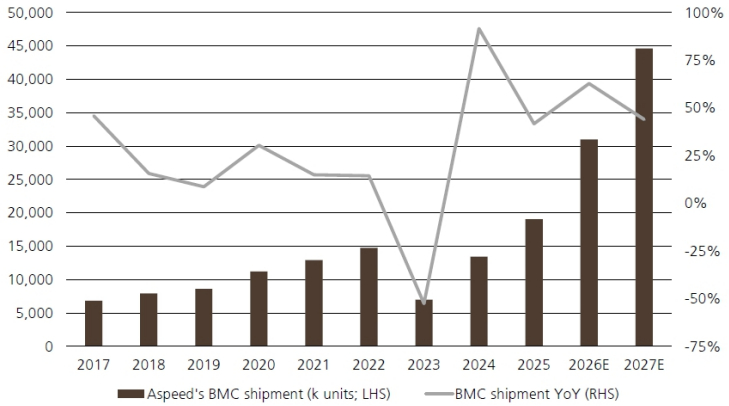
## Increasing silicon content within servers through BMC migration and I/O expanders



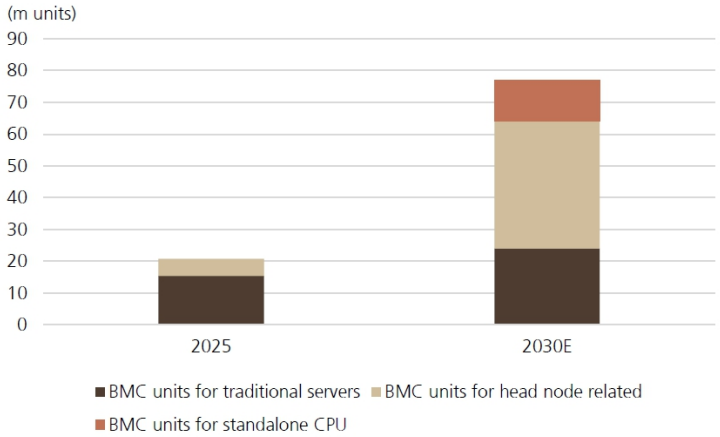

## AST2700/2750 to meaningfully lift Aspeed's BMC ASP




## Expanding addressable market for Aspeed's BMC units




## Server BMC TAM analysis




*Source: Company data, UBS estimates*

# Aspeed – Buy, PT NT$22,000

## Server BMC TAM analysis

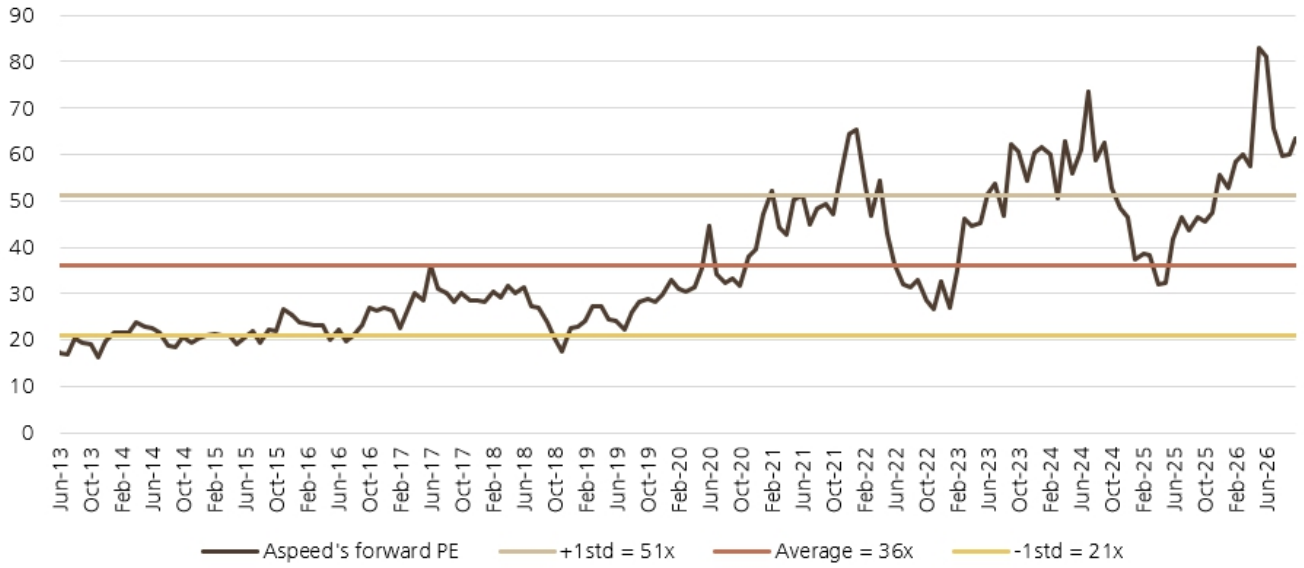
| Server CPU units (m units) | 2025 | 2030E | 25-30 CAGR | Comment |
|---|---|---|---|---|
| **Traditional server** | **20** | **30** | **8%** | Grows from 2025 at 8% CAGR like C2005-2020 |
| **AI related** | **3** | **33** | **62%** | |
| *Head node related* | *3* | *20* | *46%* | UBSe based announced systems |
| *Standalone CPU* | *0* | *13* | *NA* | Additional CPU units outside of rack |
| **Total server CPU units** | **23** | **63** | **22%** | 22% unit CAGR growth in 2025-30E |
| **BMC attach rate per CPU** | | | | |
| **Traditional server** | 0.77 | 0.80 | | Expect slight increase given AMD's share gain and content from non CPU boards |
| **AI related** | | | | |
| *Head node related* | *1.80* | *2.00* | | Expect rising attach rate to satisfy more complicated AI server architecture |
| *Standalone CPU* | *0.90* | *1.00* | | |
| **BMC TAM** (mn units) | | | | |
| **Traditional server** | **15.4** | **24.0** | **9%** | |
| **AI related** | **5.4** | **53.0** | **58%** | |
| *Head node related* | *5.4* | *40.0* | *49%* | |
| *Standalone CPU* | *0.0* | *13.0* | *NA* | |
| **BMC TAM** | **20.8** | **77.0** | **30%** | |

*Source: Company data, UBS estimates*

# Aspeed – Buy, PT NT$22,000

- Our price target of NT$22,000 is based on a 55x 2027-28E PE. Aspeed's valuation has surged following the emergence of the cloud AI theme.

**Aspeed 1-year forward P/E (x)**



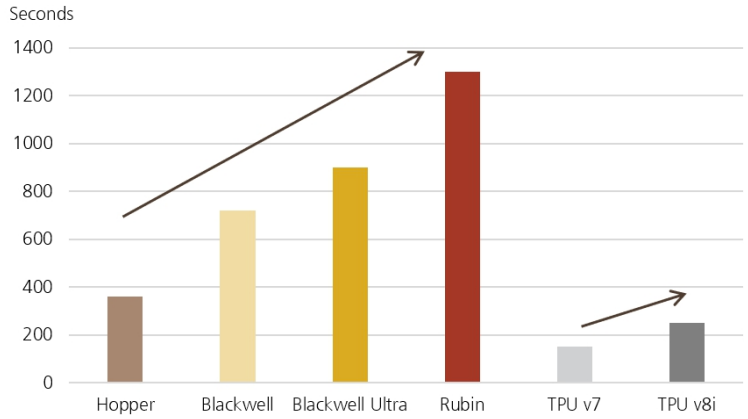

*Source: Company data, LSEG, UBSe*

# Hon Precision – Buy with PT of NT$10,000

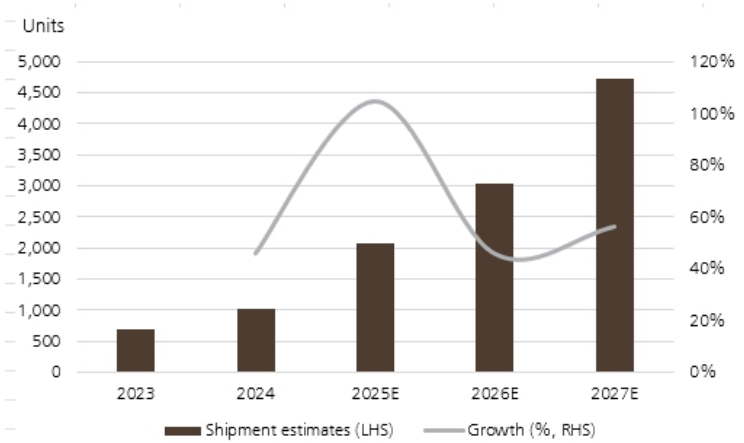
- We view Hon Precision's 2027's 50% shipment growth as somewhat conservative
  - Hon Precision has announced the acquisition of new land and a building near its existing Taichung facilities, and updated its expansion plan to factor in a more robust demand outlook from AI/HPC applications.
  - Management lifted targeted capacity expansion for 2026 from 40% to 50%, and is aiming to expand capacity by another 50% in 2027.
- Server CPU expanding AI/HPC TAM
  - For final test, 2027 outlook is robust, driven by Tesla/SpaceX, China AI/HPC, Google TPU, AMD Venice CPU and a US auto chipmaker. Hon also expects rapid SLT growth from China AI/auto, AMD CPUs and Tesla auto applications.
  - For SLT, Hon Precision has started to develop its next gen SLT for Google's TPU v9 + CPU, to secure its TPU SLT share after MediaTek's TPU v8 win.
- CPO development underway, with shipments starting from October 2026
  - Following its customer's production schedule, Hon Precision received strong orders for CPO switch ASIC FT handlers, with shipments poised for Q426 or early 2027.
  - This batch of FT handlers will be for pure electrical test.

# Hon Precision – Buy with PT of NT$10,000

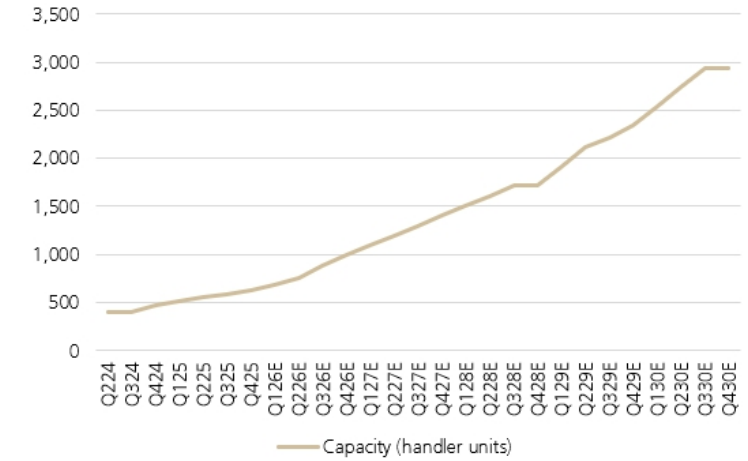
### Nvidia GPU's FT time vs ASIC (TPU as an example)—estimated



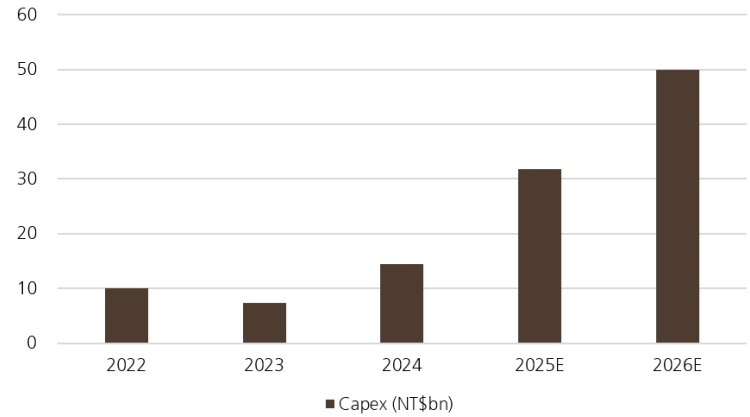

### Hon Precision's handler shipments and YoY growth




### Hon Precision's estimated capacity (tools per quarter)



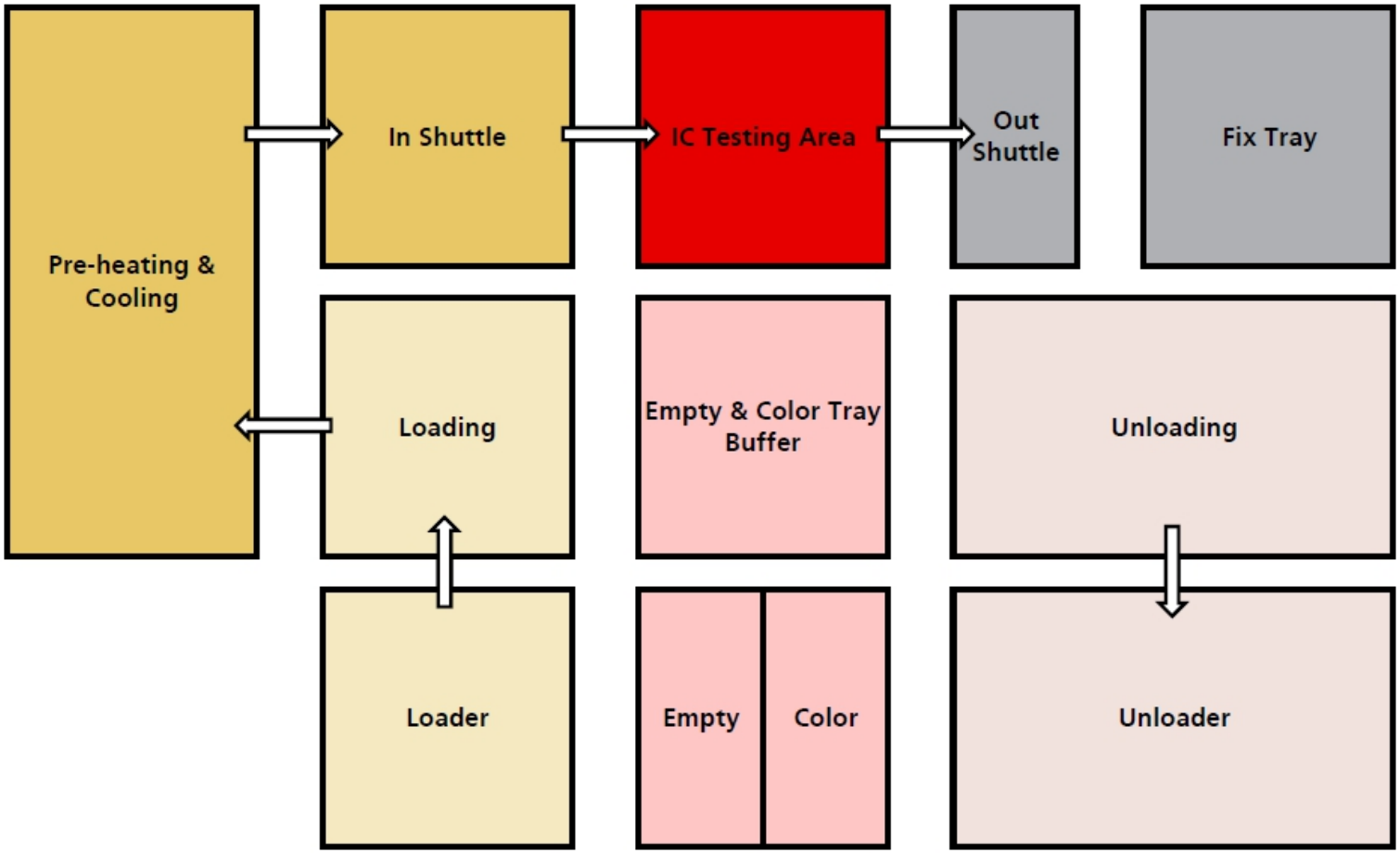

### KYEC's CAPEX (2022-26E)




*Source: Company data, UBS estimates*

# Hon Precision – Buy with PT of NT$10,000

**Process flow within FT handlers**

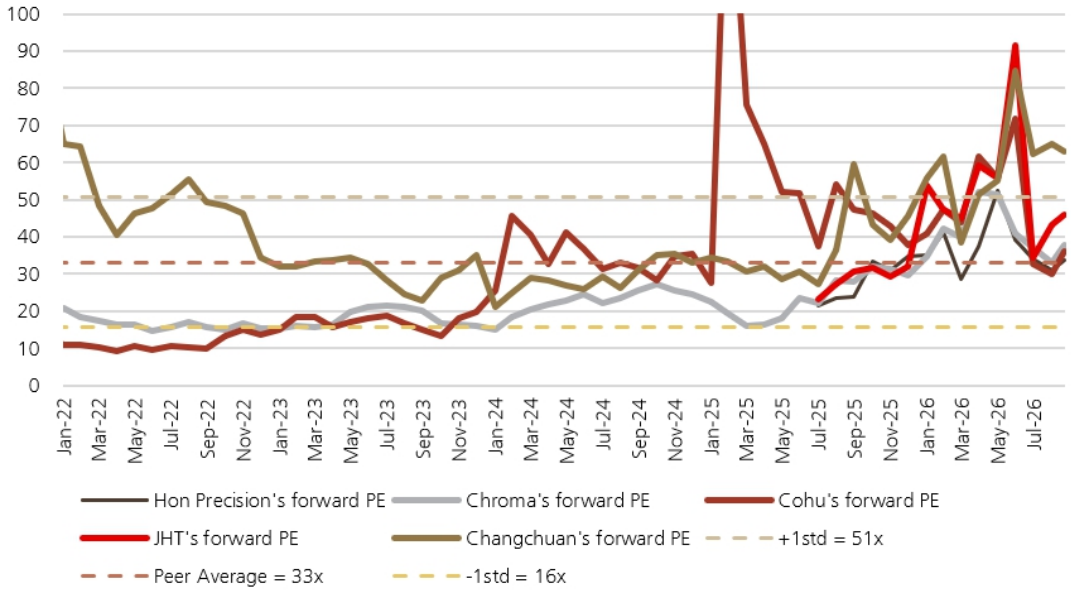



*Source: UBS*

# Hon Precision – Valuation

- Our price target of NT$10,000, based on 33x 2027E PE, in line with handler industry average PE of 33x in the past 5 years.

**Hon Precision's 12-month forward PE band (x) vs peers**




*Source: Company data, LSEG, UBSe*

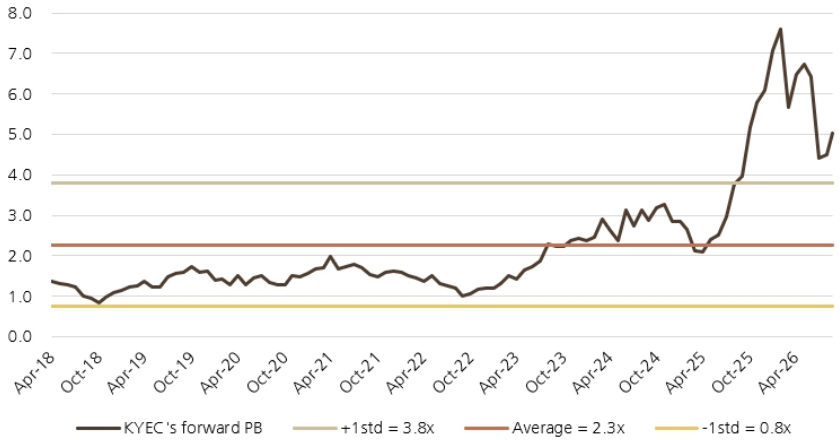
# KYEC – Buy with PT of NT$325

- **A long-term beneficiary of testing opportunity with Cloud AI**
  - We expect KYEC's fundamentals to remain steady in the coming years, underpinned by structural growth of test insertions, stable to slightly higher test time, expanding TAM of Cloud AI chips including accelerators, CPUs, networking, and TSMC's outsourced probing business.
- **KYEC a solid server CPU proxy**
  - AI CPU should expand KYEC's Cloud AI TAM on top of AI accelerators. KYEC is the sole final test provider of key ARM based server CPU projects including Google's Axion CPU with significant growth potential ahead.
  - We believe Google CPU may be ~2% sales in 2026, and could potentially reach over 5% in 2027E. The new server CPUs, especially for AI use, have good test content with burn in, final test, and system level test.
- **Diversifying footprint in Singapore and the US**
  - The new Singapore fab just started mass production in Q226, with KYEC recently announced its plan for the US expansion.
  - In terms of implication to profitability, our view is the dilution should be manageable if KYEC could negotiate with key clients for tool consignment.

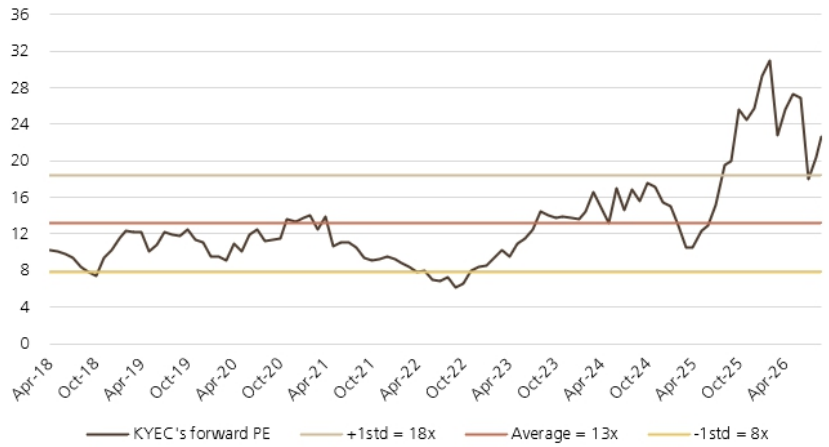
# KYEC – Valuation

- Our price target of NT$325 is based on 22x 2027E PE

**KYEC's 12-month forward PE band (x)**




**KYEC's 12-month forward P/BV band (x)**




*Source: Company data, LSEG, UBSe*

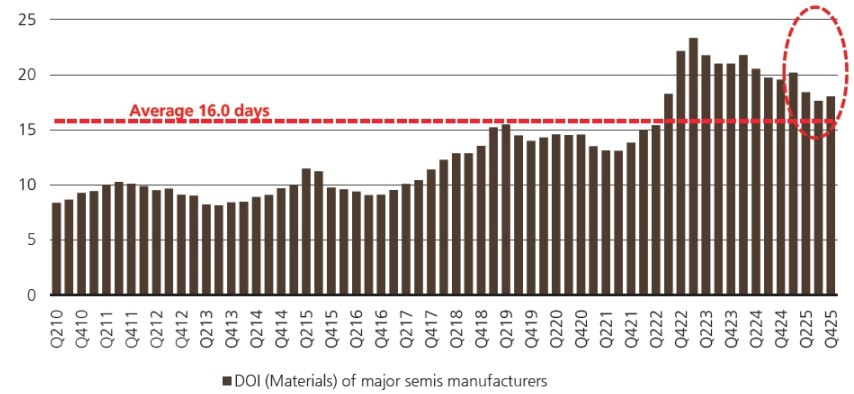
# GlobalWafers – Buy with PT of NT$1,750

- More structural and across the board demand improvement ahead
  - GWC is seeing demand upside across all wafer diameters. Its existing 12" capacity (ex new expansion) is at full capacity. 8", 6", and GaN and silicon lines are also nearly fully loaded, while SiC utilization is improving rapidly.
- Increasing customer engagements for LTAs
  - GWC announced a 10 year LTA contract with Micron to support Micron's US capacity expansion.
  - GWC indicated increasing client discussions for new contracts across memory and logic.
  - LTAs should significantly increase prepayments from H127 and higher pricing in the next 2-3 quarters.
- While Q3 sales may trail vs. expectation due to the fire incident at its Italy 8" fab, we expect sales to pick back up starting September.
- We remain positive on the structural upcycle of silicon wafer
  - In our view, tightening supply across 8" and 12" could lead to 20%+ price hike each year in 2027-28.

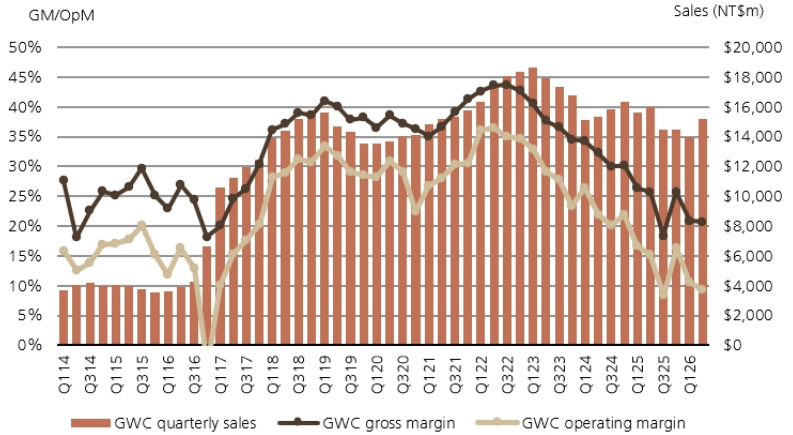
*Source: Company data, UBS estimates*

# GlobalWafers – Buy with PT of NT$1,750

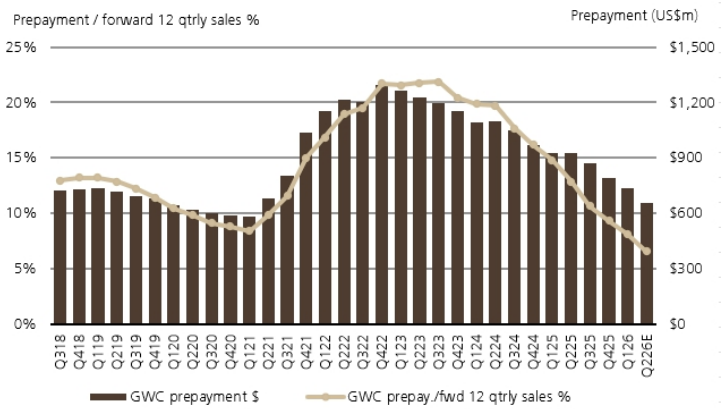
## Raw material inventory days at customers



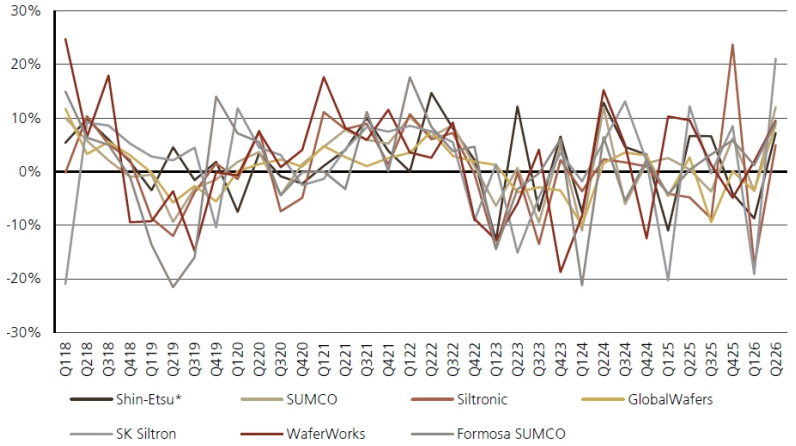

## GWC sales, GM, OPM




## Prepayments down from peak




## Wafer companies' OP (EBIT) margins



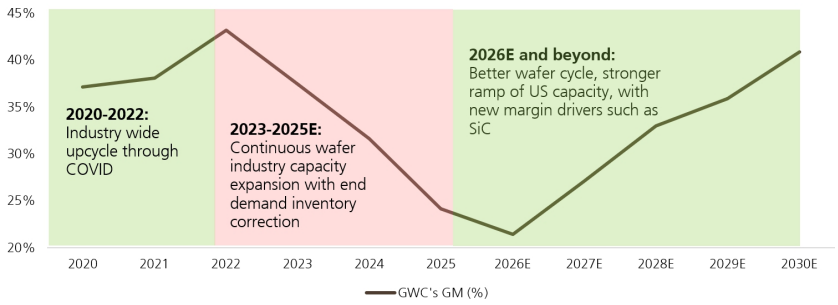

*Source: Company data, UBS estimates*

# GlobalWafers – Buy with PT of NT$1,750

## Capex of major wafer makers

| (US$mn) | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shin-Etsu* | 150 | 139 | 469 | 623 | 545 | 442 | 408 | N/A | N/A | N/A | N/A | N/A |
| SUMCO | 130 | 152 | 203 | 534 | 540 | 502 | 620 | 984 | 1,811 | 1,620 | 534 | 509 |
| Siltronic | 83 | 98 | 143 | 299 | 406 | 217 | 495 | 1,129 | 1,424 | 563 | 425 | 650 |
| GlobalWafers | 36 | 46 | 112 | 222 | 246 | 277 | 198 | 406 | 1,173 | 1,488 | 887 | 189 |
| SK Siltron | 58 | 60 | 138 | 615 | 466 | 267 | 320 | 585 | 651 | 689 | 427 | N/A |
| **Total** | **456** | **495** | **1,065** | **2,294** | **2,203** | **1,704** | **2,041** | **3,621** | **5,621** | **4,844** | **2,755** | **1,806** |

## GM outlook improving with a better cycle, stronger ramp-up of US capacity, and SiC opportunities




## UBSe GlobalWafer's SiC opportunity in 2028E

| | Upside case | Base case |
|---|---|---|
| AI accelerator die units (mn) | 20 | 15 |
| KGDs per wafer | 30 | 30 |
| SiC carrier demand (k) | 667 | 500 |
| SiC carrier demand (kwpm) | 56 | 42 |
| SiC carrier price (US$) | 2000 | 1500 |
| GWC's share | 50% | 50% |
| Revenue opportunity (NT$m) | 19,800 | 11,138 |
| Upside to 2028 sales | 20% | 11% |

*Source: Company data, UBS estimates.*

# 12" silicon wafers – Substantial price hikes necessary for sufficient wafer supply over the next 2 years

## 300mm wafer supply and demand

| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E | 2028E | 2029E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total inventory-adjusted demand (k pcs/mon)** | **5,018** | **5,694** | **6,269** | **5,620** | **6,228** | **7,273** | **7,736** | **6,783** | **6,975** | **7,721** | **8,572** | **9,812** | **11,075** | **12,011** |
| *YoY* | | *13.5%* | *10.1%* | *-10.3%* | *10.8%* | *16.8%* | *6.4%* | *-12.3%* | *2.8%* | *10.7%* | *11.0%* | *14.5%* | *12.9%* | *8.5%* |
| **DRAM** | 1,083 | 1,180 | 1,254 | 1,312 | 1,341 | 1,496 | 1,644 | 1,475 | 1,558 | 1,784 | 1,921 | 2,119 | 2,431 | 2,748 |
| **NAND** | 1,366 | 1,495 | 1,544 | 1,444 | 1,500 | 1,618 | 1,737 | 1,388 | 1,294 | 1,331 | 1,347 | 1,310 | 1,350 | 1,422 |
| **Logic & others** | 2,703 | 2,851 | 3,284 | 3,209 | 3,624 | 4,216 | 4,337 | 3,907 | 4,186 | 4,627 | 5,312 | 6,284 | 7,144 | 7,781 |
| **Inventory adjustment** | -135 | 168 | 188 | -345 | -238 | -58 | 18 | 13 | -63 | -21 | -8 | 0 | 0 | 0 |
| **Total output (k pcs/mon)** | **5,143** | **5,605** | **6,281** | **6,032** | **6,490** | **7,324** | **7,752** | **7,419** | **7,299** | **7,827** | **8,791** | **9,736** | **10,341** | **10,696** |
| *YoY* | | *9.0%* | *12.1%* | *-4.0%* | *7.6%* | *12.8%* | *5.9%* | *-4.3%* | *-1.6%* | *7.2%* | *12.3%* | *10.8%* | *6.2%* | *3.4%* |
| **Shin-Etsu** | 1,533 | 1,729 | 2,043 | 1,880 | 1,997 | 2,186 | 2,295 | 2,369 | 2,409 | 2,409 | 2,648 | 2,804 | 2,885 | 2,969 |
| **SUMCO** | 1,311 | 1,406 | 1,562 | 1,522 | 1,683 | 1,880 | 1,910 | 1,699 | 1,607 | 1,775 | 1,908 | 2,101 | 2,110 | 2,122 |
| **Siltronic** | 816 | 956 | 1,021 | 890 | 944 | 1,039 | 1,075 | 849 | 850 | 871 | 1,085 | 1,178 | 1,285 | 1,324 |
| **GlobalWafers** | 712 | 722 | 792 | 748 | 815 | 986 | 1,034 | 1,008 | 895 | 950 | 1,031 | 1,254 | 1,431 | 1,585 |
| **SK Siltron** | 770 | 791 | 863 | 993 | 1,052 | 1,128 | 1,256 | 1,213 | 1,146 | 1,093 | 1,142 | 1,226 | 1,300 | 1,347 |
| **China and others effective capacity** | 0 | 0 | 0 | 0 | 0 | 104 | 182 | 282 | 392 | 729 | 976 | 1,174 | 1,331 | 1,349 |
| **Total Industry Capacity** | **5,137** | **5,623** | **6,347** | **6,989** | **7,146** | **7,730** | **8,008** | **8,289** | **8,816** | **9,427** | **10,174** | **10,762** | **11,198** | **11,584** |
| **Industry Utilization %** | **97.7%** | **101.3%** | **98.8%** | **80.4%** | **87.1%** | **94.1%** | **96.6%** | **81.8%** | **79.1%** | **81.9%** | **84.3%** | **91.2%** | **98.9%** | **103.7%** |

*Source: Company data, UBS estimates*

# 8" silicon wafer – Substantial price hikes necessary for sufficient wafer supply over the next 2 years

## 200mm wafer supply and demand

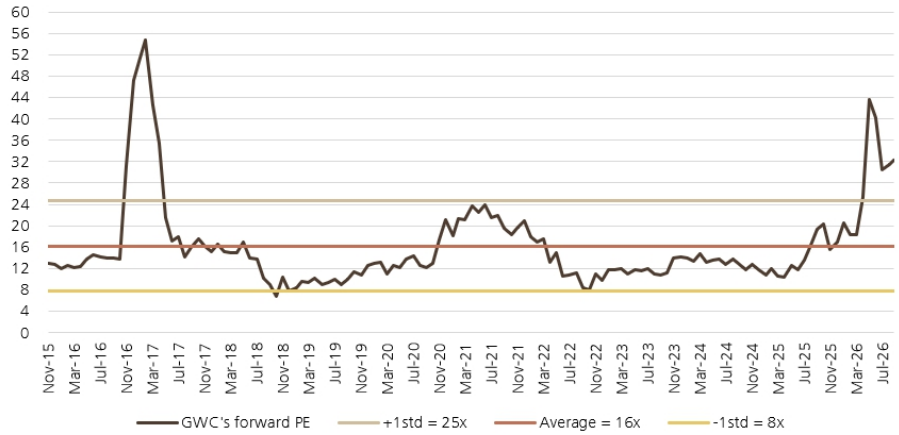
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E | 2028E | 2029E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wafer demand** | | | | | | | | | | | | | | | |
| **Total inventory-adjusted demand (k pcs/mon)** | **4,297** | **4,550** | **5,291** | **5,636** | **4,943** | **4,980** | **5,958** | **6,050** | **4,631** | **4,120** | **3,989** | **4,421** | **4,858** | **5,287** | **5,610** |
| *YoY* | | *5.9%* | *16.3%* | *6.5%* | *-12.3%* | *0.7%* | *19.6%* | *1.5%* | *-23.5%* | *-11.0%* | *-3.2%* | *10.8%* | *9.9%* | *8.8%* | *6.1%* |
| **Inventory adjustment (k pcs/mon)** | -100 | -50 | 30 | 30 | -130 | -60 | 70 | 150 | 0 | 0 | -20 | 0 | 0 | 10 | 10 |
| **Total capacity (k pcs/mon)** | **4,920** | **5,136** | **5,202** | **5,581** | **5,792** | **5,939** | **6,019** | **6,328** | **5,973** | **5,726** | **5,814** | **5,527** | **5,427** | **5,460** | **5,460** |
| *YoY* | | *4.4%* | *1.3%* | *7.3%* | *3.8%* | *2.5%* | *1.3%* | *5.1%* | *-5.6%* | *-4.1%* | *1.5%* | *-4.9%* | *-1.8%* | *0.6%* | *0.0%* |
| **Shin-Etsu** | 1,200 | 1,236 | 1,285 | 1,363 | 1,403 | 1,432 | 1,460 | 1,471 | 1,133 | 869 | 752 | 760 | 777 | 777 | 777 |
| **SUMCO** | 1,250 | 1,288 | 1,200 | 1,200 | 1,200 | 1,250 | 1,163 | 1,375 | 1,211 | 1,038 | 1,175 | 850 | 700 | 700 | 700 |
| **GlobalWafers** | 1,000 | 1,032 | 1,095 | 1,106 | 1,117 | 1,128 | 1,139 | 1,151 | 1,162 | 1,174 | 1,174 | 1,174 | 1,174 | 1,174 | 1,174 |
| **Siltronic** | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 | 650 |
| **SK Siltron** | 550 | 630 | 649 | 655 | 662 | 669 | 675 | 682 | 689 | 696 | 696 | 696 | 696 | 696 | 696 |
| **WaferWorks** | 200 | 200 | 218 | 297 | 388 | 413 | 476 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| **Ferrotec JV** | | 0 | 0 | 51 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **China and others effective capacity** | 70 | 100 | 105 | 259 | 272 | 298 | 355 | 399 | 528 | 700 | 767 | 798 | 830 | 863 | 863 |
| **Industry Utilization %** | **87.3%** | **88.6%** | **101.7%** | **101.0%** | **85.3%** | **83.9%** | **99.0%** | **95.6%** | **77.5%** | **71.9%** | **68.6%** | **80.0%** | **89.5%** | **96.8%** | **102.7%** |

*Source: Company data, UBS estimates*

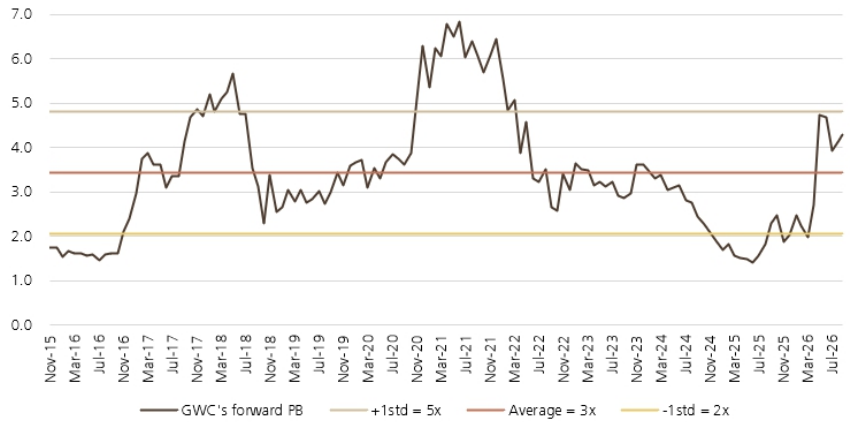
# GlobalWafers – Valuation

- Our price target of NT$1,750 is based on 7.5x 2027E P/BV.

**1-yr forward P/E (x)**




**1-yr forward P/BV (x)**




*Source: Company data, LSEG, UBSe*

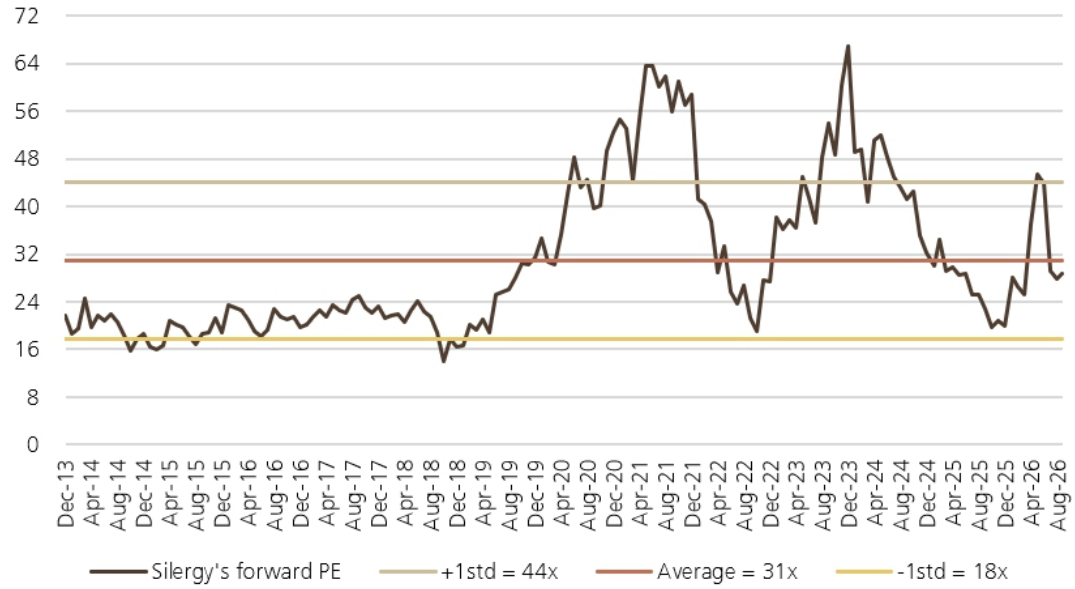
# Silergy – Buy with PT of NT$700

- Management more optimistic on 2026, with further acceleration into 2027
  - Management foresees more robust growth in 2026 and beyond, driven by stronger server demand, a faster ramp of new products based on the gen 4 technology platform and an expanding customer base in China and overseas.
  - Tight 8" foundry capacity favours Silergy, which is ramping up 12" foundry products earlier than most fabless peers.
- Updates on auto- and server-related businesses
  - AI accelerator power supply demand is increasing a lot more rapidly to support better compute. Silergy is seeing strong upside from server motherboards and optical transceivers, on top of PSU & storage growth.
  - Silergy is sampling the key V-core PMIC to AI servers and aims to enter mass production by end-2026.
  - For auto, management thinks sales growth may resume in Q2 after the Q1 low season, and Silergy could outgrow China's auto market, given a focus on EV/HEV, with an expanding product portfolio and customer base in a global auto ecosystem.
  - Management expects Silergy to lift silicon content per car from US$120 in 2025 to US$250+ in 2026.
- Temporary GM setback in H126 but it could recover from H226
  - H126 GM was softer due to higher upstream costs.
  - With Gen 5's introduction in 2027, we think Silergy can further gain market share along with better ASP
  - GM could recover from H226 with better pricing, product mix, and market share gains, enhanced cost structure through Gen 4 upgrade

# Silergy – Valuation

- Our price target of NT$700 is based on 36x 2027E P/E.

**Silergy 1-year forward P/E (x)**



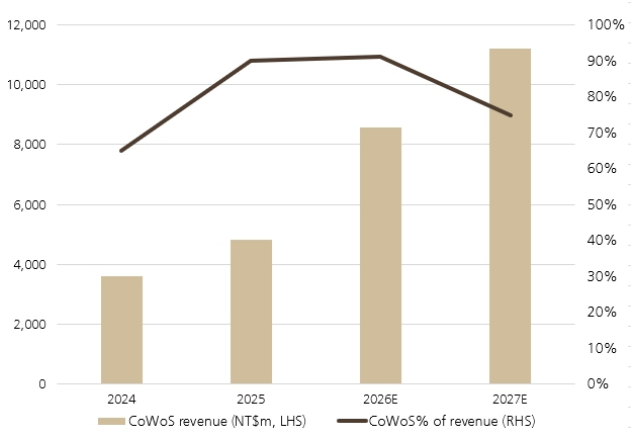

*Source: Company data, LSEG, UBSe*

# All Ring – Buy with PT of NT$1,700

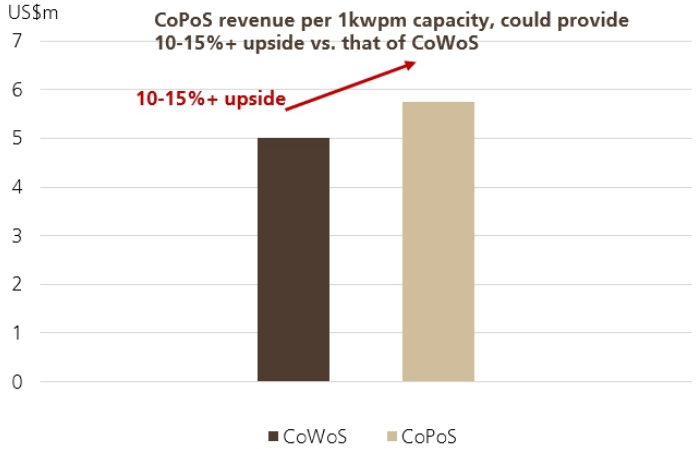
- Major beneficiary of rising advanced packaging investment
  - All Ring is a major supplier for lid placement, underfill dispenser and AOI tools in the on-substrate process of CoWoS.
  - All Ring have and will continue to benefit from sustained AI-driven advanced packaging capex cycle over the next 2-3 years
  - Strong exposure to leading advanced packaging customers including TSMC, ASE, and OSATs.
- Key beneficiary of CoWoS expansion since 2023 and should sustain into 2027E
  - We estimate TSMC and ASE to accelerate CoWoS expansion in 2027E, supported by strong capex guidance by both.
- CoPoS presents as the next major opportunity beyond CoWoS
  - We estimate CoPoS tools ASP to be 10-15%+ higher than that of CoWoS
- CPO would also become a meaningful growth driver from 2027E
  - Major opportunity resides in FAU coupling with Optical engine.
  - Throughput and performance advantages to potentially achieve > 50% share in FAU coupling equipment
  - We forecast CPO to contribute 12%/23% of total revenue in 2027/2028E

# All Ring – Buy with PT of NT$1,700

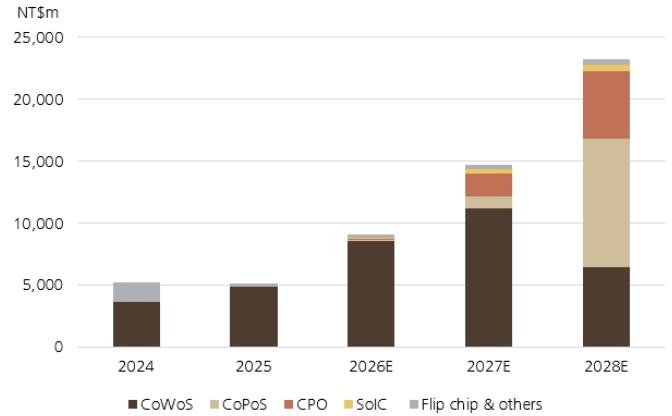
## Sales from CoWoS, amount and as % of total sales



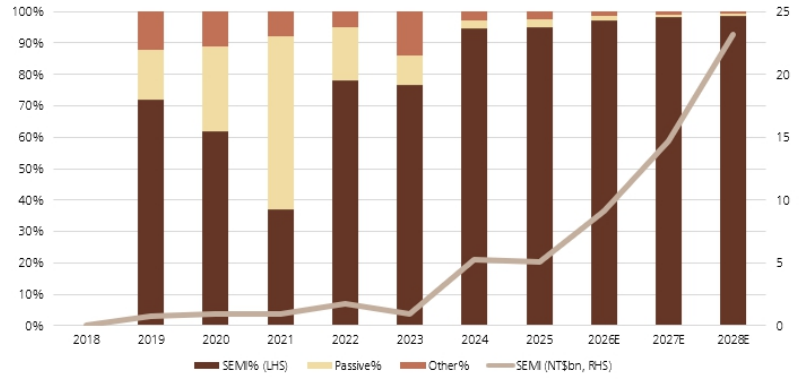

## Revenue opportunity per 1 kwpm of CoWoS and CoPoS




## SEMI sales by CoWoS, CoPoS, SoIC, CPO, and others in 2024- 28E




## SEMI sales by CoWoS, CoPoS, SoIC, CPO, and others in 2024-28E

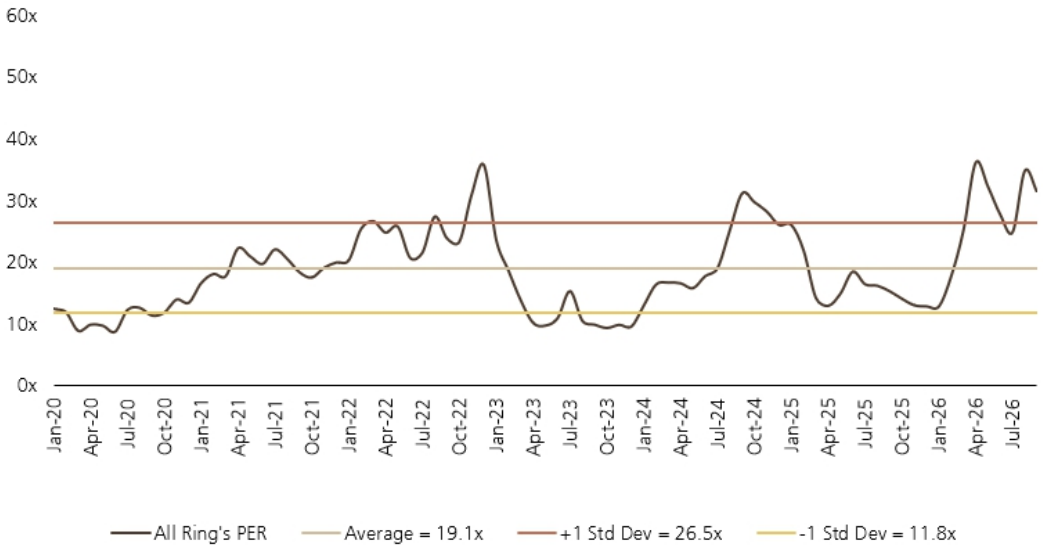



*Source: Company data, UBS estimates. Note: TSMC's advanced node is defined as N7 and below*

# All Ring – Buy with PT of NT$1,700

- Our price target is based on 27x 2027-28E PE, supported by a 33% long-term earnings CAGR

**All Ring 1-year forward PE (x)**




*Source: Company data, LSEG, UBSe*

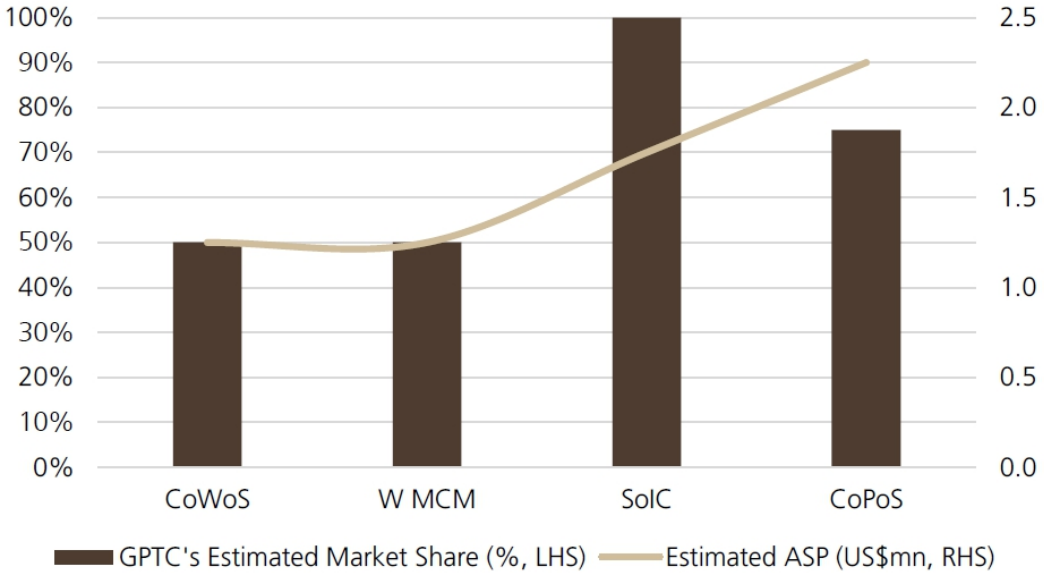
# GPTC – Buy with PT of NT$4,300

- Bright order outlook for 2026 and beyond. **Our top pick in the advanced packaging space.** We forecast its tool shipment to reach 220 units in 2026 and 330/400 units in 2027/28. Key growth drivers are:
  - 1) The accelerating CoWoS capacity expansion across TSMC and OSATs. The pick up of ASE's CoWoS expansion is positive for GPTC, as it has >80-90% share in ASE vs ~50% share in TSMC.
  - 2) Beyond CoWoS, the industry is also ramping up new solutions including panel level packaging, 3D IC stacking and co-packaged optics (CPO). The TAM for equipment demand is set to grow rapidly, with higher tool value.
  - 3) We forecast GPTC's tool delivery to ASE and Micron to double or more in 2027.
- Development of new advanced packaging solutions
  - TSMC should be ramping up meaningful SoIC capacity in the next 3-4 years, as more high performance compute chips to shift to "chiplet" design. We believe Nvidia may consider adopting SoIC for Feynman coming out in 2028.
  - On panel level packaging, we are more optimistic and believe TSMC should be working toward mass production of 310x310mm2 technology in 2028.
  - For CPO, GPTC is more relevant for "XPU" integration, which may enter commercialization in 2029 for tool move in from 2028.

# GPTC – Buy with PT of NT$4,300

- Tool ASP set to rise in coming years. Price of panel level packaging tools could be 2-2.5x of CoWoS's. SoIC's tools are also 30-50% more expensive than CoWoS's. We forecast GPTC's blended tool ASP to increase by 22%/16% in 2027/28E.
- GPTC could more than double annual capacity from ~100 units in 2025 to close to 300 by end-2026. Capacity may further increase in 2027.

**GPTC tool price set to steadily rise with new technology and stable market share**

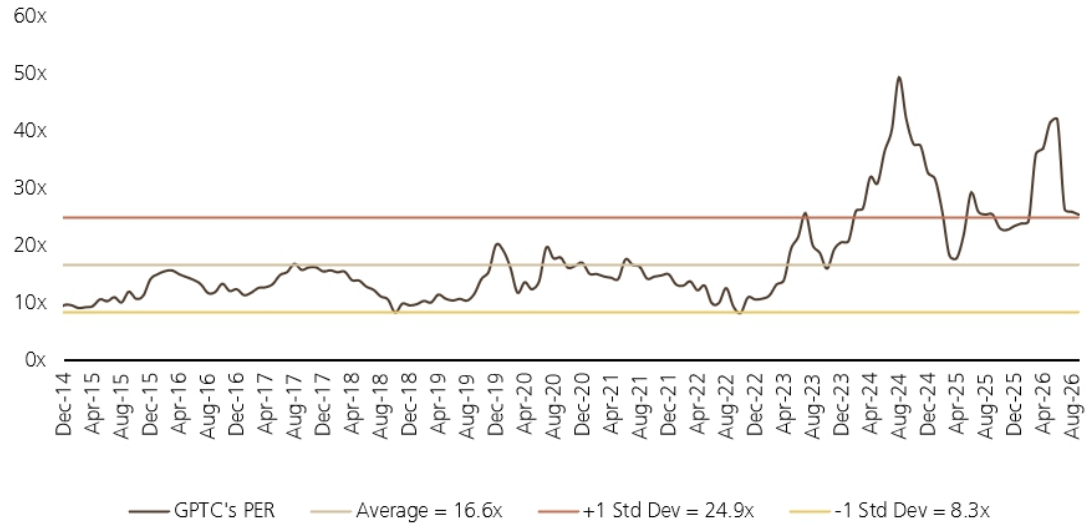



*Source: Company data, UBS estimates*

# GPTC – Valuation

- Our price target of NT$4,300 is based on 33x 2027-28E P/E.

**GPTC's 1-yr forward P/E (x)**



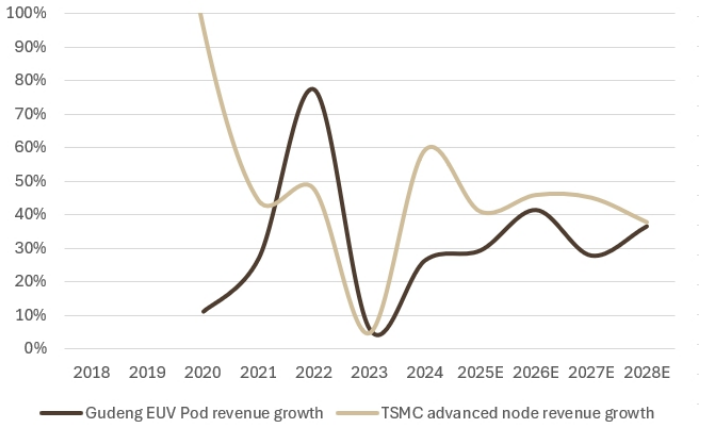

*Source: Company data, LSEG, UBSe*

# Gudeng – Buy with PT of NT$710

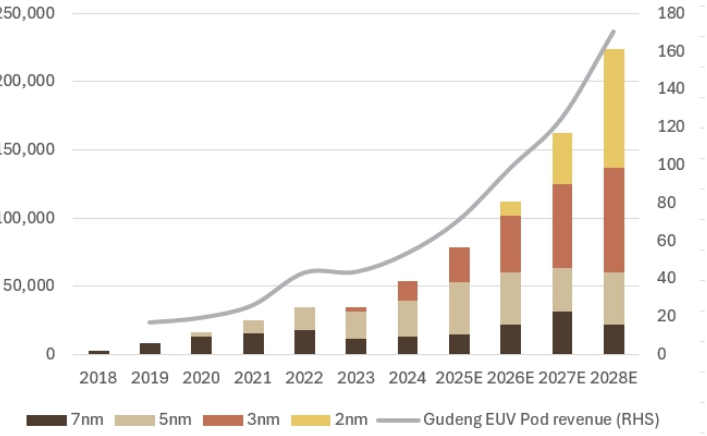
- Beneficiary of larger advanced node TAM
  - Gudeng is set to be a major beneficiary from structurally larger leading edge logic capacity TAM, which should lift its growth of EUV mask pod, DUV mask pod and FOUP.
  - Historically a good leading edge node (e.g. N16/12, N7) for TSMC generally peaked at 120-130kwpm capacity.
  - Larger TAM is underpinned by the strong contribution from server CPU and accelerators and re-accelerating process migration for smartphones and PCs given edge AI applications.
  - Gudeng with its >85% share in EUV pods should be a key beneficiary of TSMC ramping up the N2 capacities faster in 2026-27. AI and HPC should increase the types of projects at N2 and lift the demand for the mask and the pod too. From 2027-28, high NA adoption may enable an upgrade cycle with better ASP for Gudeng.
- FOUP growth to re-accelerate in 2026 on TSMC share gain and China recovery
  - We are constructive on Gudeng's growth opportunities from EUV mask carriers in the next 2-3 years
  - 1) TSMC's N3 expansion, with TSMC migrating N5/N4 into N3 due to increasing tightness from AI related demand.
  - 2) Faster overall process migration into N2 vs N3.
  - 3) Greater product variety for N2 with more high performance compute opportunities, which is positive for the mask units and the carriers.

# Gudeng – Buy with PT of NT$710

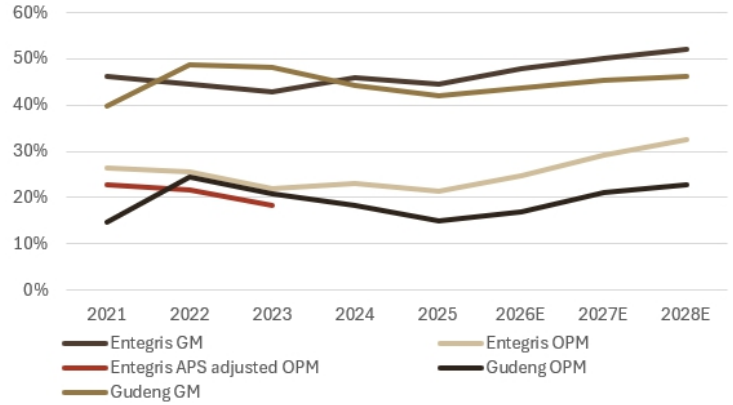
## Gudeng's EUV Pod revenue growth vs. TSMC's advanced node revenue growth




## TSMC's advanced capacity ramp vs. Gudeng's EUV revenue (US$mn)




## Gudeng vs. Entegris margin trend



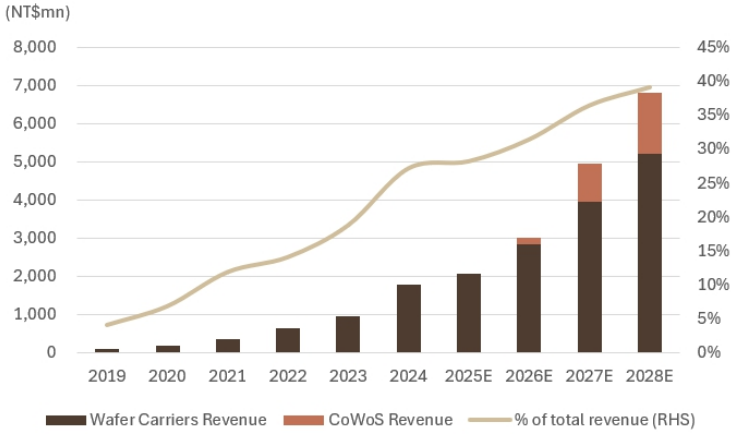

*Source: Company data, UBS estimates. Note: TSMC's advanced node is defined as N7 and below*

# Gudeng – Buy with PT of NT$710

## Gudeng's Sales forecasts by product segment

| (NT$m) | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E | 2028E |
|---|---|---|---|---|---|---|---|---|---|---|
| **Revenue** | 2,375 | 2,513 | 3,121 | 4,494 | 5,078 | 6,545 | 7,347 | 9,489 | 12,897 | 16,062 |
| *- YoY chg* | *45%* | *6%* | *24%* | *44%* | *13%* | *29%* | *12%* | *29%* | *36%* | *25%* |
| | | | | | | | | | | |
| **Breakdown by product line** | | | | | | | | | | |
| **Reticle Carriers** | 1,028 | 1,141 | 1,449 | 2,334 | 2,262 | 2,209 | 2,895 | 4,042 | 4,997 | 6,611 |
| *- YoY chg* | | *11%* | *27%* | *61%* | *-3%* | *-2%* | *31%* | *40%* | *24%* | *32%* |
| **Wafer Carriers** | 99 | 174 | 373 | 636 | 957 | 1,781 | 2,076 | 2,451 | 3,539 | 4,653 |
| *- YoY chg* | | *76%* | *114%* | *71%* | *50%* | *86%* | *17%* | *18%* | *44%* | *31%* |
| **Carrier - Others** | 2 | 4 | 24 | 71 | 78 | 83 | 0 | 0 | 0 | 0 |
| *- YoY chg* | | *100%* | *500%* | *196%* | *10%* | *6%* | *-100%* | | | |
| **Equipment** | 207 | 462 | 558 | 987 | 1,074 | 1,231 | 1,191 | 1,500 | 1,820 | 2,184 |
| *- YoY chg* | | *123%* | *21%* | *77%* | *9%* | *15%* | *-3%* | *26%* | *21%* | *20%* |
| **Others** | 1,039 | 732 | 717 | 466 | 707 | 1,241 | 1,186 | 1,496 | 2,541 | 2,614 |
| *- YoY chg* | | *-30%* | *-2%* | *-35%* | *52%* | *75%* | *-4%* | *26%* | *70%* | *3%* |

## Advanced packaging a new catalyst for Gudeng's wafer carrier growth

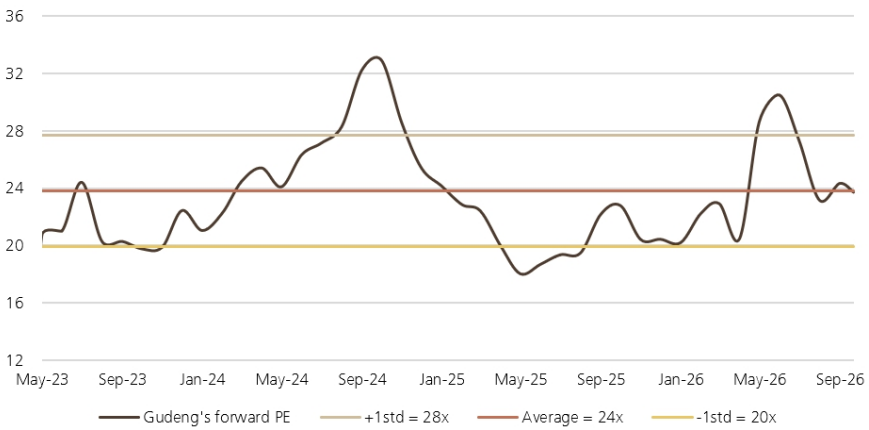



*Source: Company data, UBS estimates*

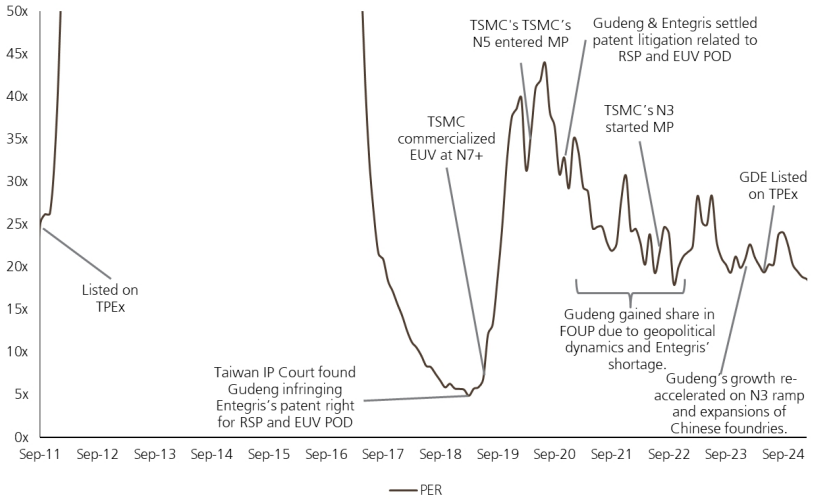
# Gudeng – Valuation

- Our price target of NT$710 is based on 30x 2027/28E P/E.

**1-yr forward P/E (x)**




**Forward P/E and major events**



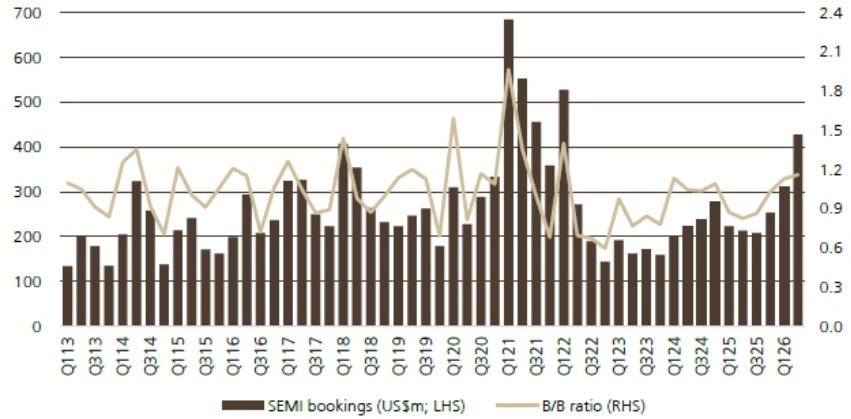

*Source: Company data, FactSet, UBSe*

# ASMPT – Buy with PT HK$200

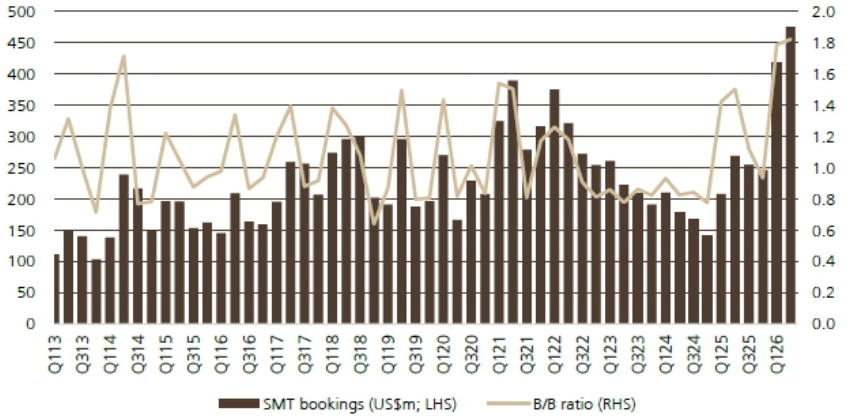
- Strong order recovery across SEMI and SMT.
  - In Q126 ASMPT saw a strong order recovery across SEMI and SMT segments, with SMT at record bookings in Q2 and 1H26. AI is driving structural strong  growth across multiple products including TCB, Photonics, pluggable optical transceivers, CPO, and mainstream wire and die bonding.
  - ASMPT is seeking strategic options for SMT, and has divested NEXX under SEMI to focus its business on advanced packaging.
- TCB (Thermo-Compression Bonding) TAM Expansion and Opportunity for ASMPT
  - 1) HBM should be a larger portion of the TCB TAM heading into 2026 and in the near future with HBM4 12hi orders from multiple customers and 16hi development ongoing.
  - 2) Logic chip-to-wafer (C2W) opportunity should start to play out for high interconnect advanced package. ASMPT secured an order from a leading global IDM in Q2 and expects demand to increase in '27.
  - 3) Logic chip-to-substrate (C2S) – The company received new bulk orders for >50 C2S TCB tools in July '26. Longer term, logic could become a larger driver of TCB demand if C2W opportunity takes off.
- We also note that ASMPT is involved in CoPoS-related solutions and believe Intel's EMIB-T could be an opportunity in 2027E.
- Photonics and CPO as new drivers
  - In 1H26, Optical segment came in as a bright spot with pluggable optical transceiver revenue nearly tripling YoY to ~US$75m. Longer-term, we are optimistic about photonics demand and the fast evolution to CPO with CPO packaging-equipment inflection expected around 2027-28.

# ASMPT – Buy with PT HK $200

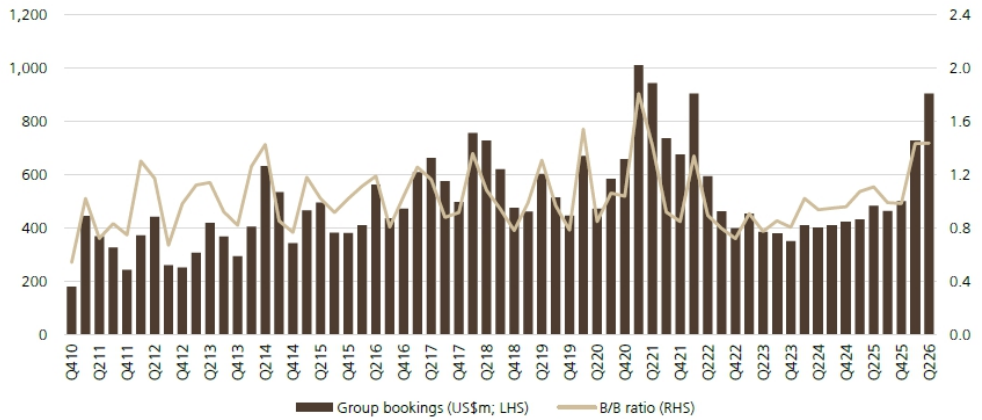
## Semi quarterly bookings trend




## SMT quarterly bookings trend




## ASMPT's group bookings and book-to-bill ratio trend

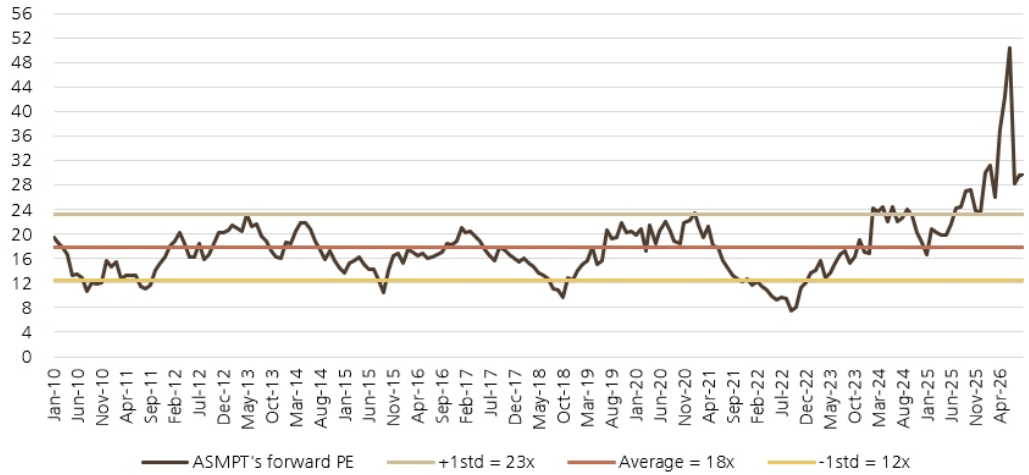



*Source: Company data, UBS estimates*

# ASMPT – Buy with PT HK $200

- Our price target is based on 27x 2027E PE, with a 25% long-term earnings CAGR
- We continue to see improving business visibility for advanced packaging, photonics, rebounding traditional packaging and SMT.

**ASMPT 1-year forward PE (x)**




*Source: Company data, LSEG, UBSe*

# Realtek – Neutral with PT NT$690

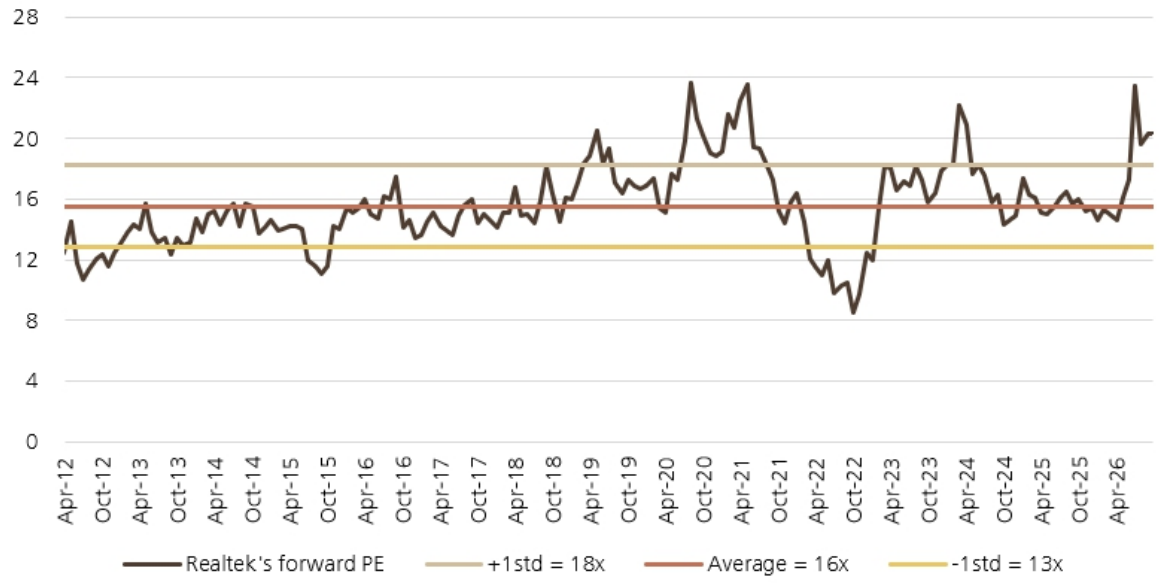
- In the next 3-5 years, we see Realtek as a major beneficiary of networking backbone upgrade in Wireless and Wireline to support growing data amount and faster transmission demand.
  - Wi-Fi / Ethernet / switch / PON could be the major growth drivers. These products account for close to 60% of Realtek's sales, with 5-10% ASP upside per year and expanding application base.
- June product price hike, especially from memory price-increase, should help sustain H2 sales even with continued consumer demand weakness across certain segments.
- Realtek's customers continue to pre-build inventory given tightening industry supply, especially at backend and memory YTD.
  - 1) replacement cycle among TV, gaming, and home appliances; and
  - 2) ongoing memory price inflation, component shortage, and OSAT capacity constraints encourage customers to stock up in 2026.
  - 3) Into H2, networking demand from router, Ethernet, switch, PON is set to sustain strength on structural AI infrastructure build out.
- Realtek shifts business model to invest aggressively for leading-edge process for datacenter, enterprise and ASICs.

*Source: Company data, UBSe*

# Realtek – Valuation

- Our price target of NT$690 is based on 17x 2026E PE.

**Realtek 1-year forward P/E (x)**




*Source: Company data, LSEG, UBSe*

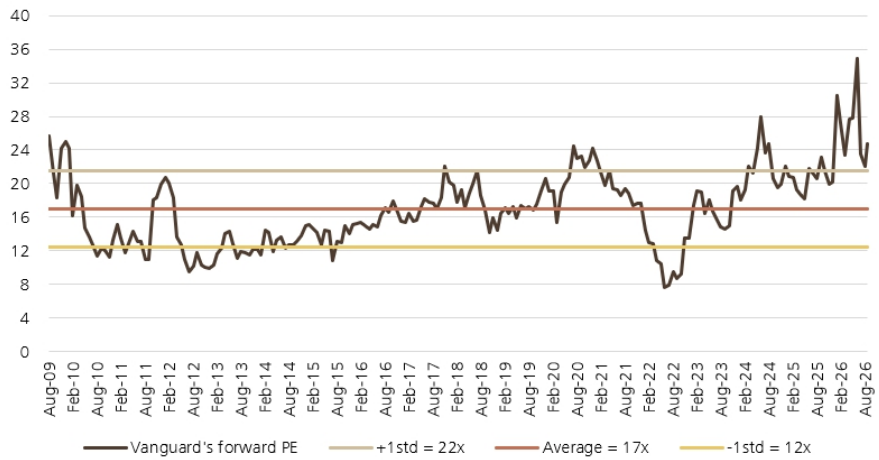
# Vanguard – Neutral, PT NT$168

- Mature node industry dynamics continue to improve in 2027
  - Management expects supply/demand to further tighten into 2027
  - We estimate Vanguard to raise ASPs by 10% for selected products in 2026 and management indicated further price hikes in 2027.
- Steady utilization improvement
  - Vanguard guided utilization to reach 90% in Q326
  - We forecast utilization to be 86% in 2026 and 93% in 2027 vs 74% in 2025.
- AI-related sales would reach DD% of 2026 total revenue, more than doubled from 2025, and 2027 absolute sales should increase even more significantly.
- VSMC 12" expansion in SG
  - On Q226 earnings conference, management indicated that phase 1 capacity fully sold out
  - Mass production progressing ahead of schedule and should start in Q127, including interposer opportunity collaboration with TSMC.

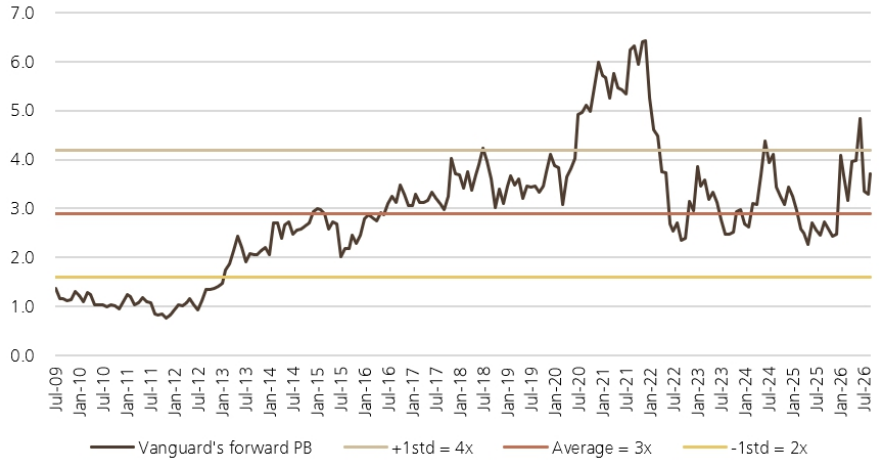
# Vanguard – Valuation

- Our price target of NT $168 is based on 20x 2027E PE

**Vanguard's 12-month forward P/E (x)**




**Vanguard's 12-month forward P/BV (x)**




*Source: Company data, LSEG, UBSe*

Section 10

# Appendix

# How far-reaching is the US ambition for leading edge semis reshoring?

- **What about for DRAM and NAND?**
  - DRAM and NAND are key components of leading edge semis too, and all of the devices are manufactured outside of the US, including Micron and SanDisk.
  - Micron has two major front end expansions planned in the US, including 1) 80kwpm capacity in Boise likely for DRAM and HBM. We think equipment move-in should begin from mid 2026. The fab may take two years to reach full capacity. 2) 200kwpm capacity in New York likely for DRAM.
  - We expect equipment move-in to start in 2028. The fab may take four years to reach full capacity.
  - Our demand analysis indicates the US may need 415kwpm of DRAM capacity and 144kwpm of NAND capacity. This means a more significant challenge for memory than advanced logic foundry for US self sufficiency in the next 3-4 years.

# Analyzing US logic supply and demand

## TSMC's US capacity expansion plan

| Plant Location | Online Timing | Investment (US$bn) | Nodes | Capacity (12" WPM) | Sales potential (US$bn) |
|---|---|---|---|---|---|
| Arizona Phase I | H125 | $12.0 | 4nm | 20k | $3.4 |
| Arizona Phase II | 2027 | $28.0 | 3/2nm | 30k | $7.6 |
| Arizona Phase III | 2029-30 | $25.0 | 2/1.4nm | 30k | $9.0 |
| Arizona Phase IV-V* | After 2029-30 | $60.0 | 2/1.4nm | 60k | $18.0 |
| Arizona Phase VI* | After 2029-30 | $40.0 | 1.4/1nm | 30k | $9.7 |
| **Total** | | **$165.0** | | **170k** | **$47.7** |

## US logic wafer demand analysis, next 3-4 years

| | Apple's iPhones, PCs, iPads etc | Samsung smartphones | PCs | | Server CPUs | | | Server accelerators | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AMD | Intel | AMD | Intel | ARM | Nvidia | AMD | ASICs, Networking & Others |
| Device unit (mn) | | 220.0 | 80.1 | 160.1 | 4.2 | 11.8 | 5.0 | 10.0 | 1.0 | 5.0 |
| Adv logic wafer consumption (kwpm) | 91.4 | 44.0 | 32.6 | 65.7 | 11.0 | 65.6 | 8.6 | 25.1 | 1.3 | 9.2 |
| **Total adv logic wafer consumption (kwpm)** | **91.4** | **44.0** | **98.3** | | | **85.1** | | | **35.6** | |
| *US %* | *30%* | *13%* | *24%* | | | *45%* | | | *60%* | |
| **US wafer demand (kwpm)** | **27.4** | **5.7** | **23.6** | | | **38.3** | | | **21.3** | |

| | |
|---|---|
| **Total US demand for the leading edge logic foundry (kwpm)** | **116.4** |

*Source: Company data, UBS estimates. Note: Our Apple demand analysis covers most of its major tech products, including iPhones, MacBooks, iPads, Apple Watch etc. *Arizona Phase IV-V, and VI based on our estimates.*

# Analyzing US memory supply and demand

## US NAND wafer demand analysis, next 3-4 years

| | iPhones | Samsung smartphone | PC | Server |
|---|---|---|---|---|
| Units Total (M) | 225 | 220 | 267 | 15 |
| Content Per Unit (GB) | 527 | 365 | 915 | 4,821 |
| *US as % of Units* | *30%* | *13%* | *24%* | *45%* |
| **US NAND Demand (M GB)** | **35,519** | **10,439** | **58,614** | **31,674** |
| | | | | |
| **Required Bit Shipment (M GB)** | **35,519** | **10,439** | **58,614** | **31,674** |
| Bit Shipments (M 1Gb equiv) | 284,153 | 83,512 | 468,909 | 253,390 |
| *3-Bit (TLC) Mix Assumption %* | *50%* | *50%* | *65%* | *65%* |
| *4-Bit (QLC) Mix Assumption %* | *50%* | *50%* | *35%* | *35%* |
| Unit/Die Shipments (M 1Gb equiv) | 96,323 | 28,309 | 163,099 | 88,136 |
| *Yield %* | *80%* | *80%* | *80%* | *80%* |
| **Blended Gross Units Per Wafer (64Gb Equiv)** | **4,350** | **4,350** | **4,207** | **4,207** |
| *176L Equivalent* | *3,300* | *3,300* | *3,300* | *3,300* |
| *232L Equivalent* | *4,350* | *4,350* | *4,350* | *4,350* |
| *27XL Equivalent* | *5,212* | *5,212* | *5,212* | *5,212* |
| Implied Wafer Capa (k wpy) | 432 | 127 | 757 | 409 |
| **Implied Wafer Capa (k wpm)** | **36** | **11** | **63** | **34** |

| | |
|---|---|
| Total Implied Wafer Capa (k wpy) | 1,726 |
| **Total US demand for NAND wafer capacity (k wpm)** | **144** |

*Source: UBS estimates.*

# Analyzing US memory supply and demand

## US DRAM wafer demand analysis, next 3-4 years

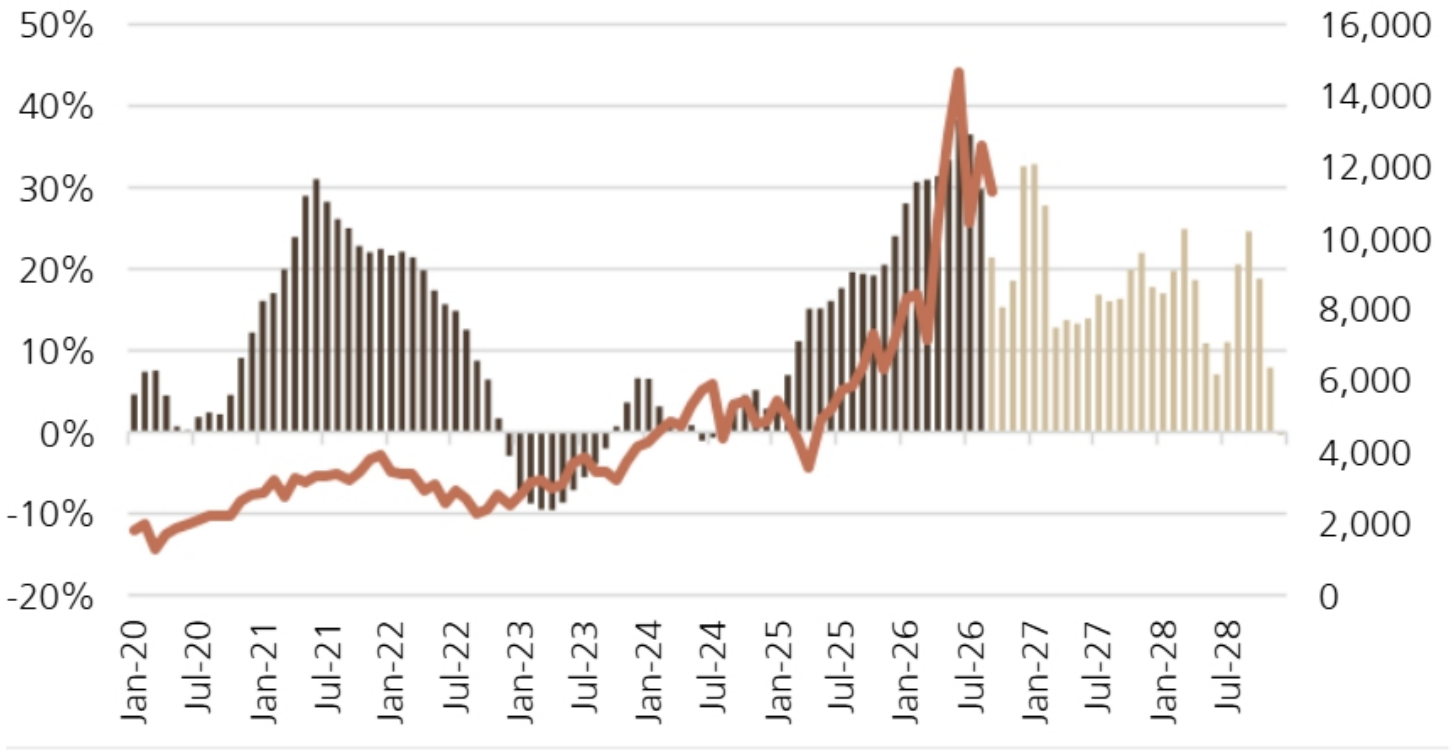
| | iPhones | Samsung smartphone | PC | Servers | | |
|---|---|---|---|---|---|---|
| | | | | DDR | HBM | |
| Units Total (M) | 225 | 220 | 267 | 15 | Global HBM Demand (M GB) | 3,785 |
| Content Per Unit (GB) | 10 | 11 | 15 | 877 | | |
| *US as % of Units* | *30%* | *13%* | *24%* | *45%* | *US as % of Server HBM Demand* | *60%* |
| **US DRAM Demand (M GB)** | **683** | **317** | **933** | **5,765** | **US Server HBM Demand (M GB)** | **2,271** |
| | | | | | | |
| **Required Bit Shipment (M GB)** | **683** | **317** | **933** | **5,765** | **Required HBM Bit Shipment (M GB)** | **2,271** |
| Bit Shipments (M 1Gb equiv) | 5,464 | 2,540 | 7,467 | 46,120 | Bit Shipments (M 1Gb equiv) | 18,169 |
| *Yield %* | *89%* | *89%* | *89%* | *89%* | *Yield %* | *60%* |
| **Blended Gross Dies Per Wafer (1Gb)** | **35,795** | **35,795** | **25,858** | **26,676** | **Blended Gross Dies Per Wafer (1Gb)** | **12,330** |
| *1a nm Equivalent* | *20,067* | *20,067* | *19,064* | *19,064* | *1b nm (HBM3E)* | *13,117* |
| *1b nm Equivalent* | *28,179* | *28,179* | *26,770* | *26,770* | *1b nm (HBM4)* | *10,494* |
| *1c nm Equivalent* | *35,795* | *35,795* | *34,006* | *34,006* | | |
| Implied Wafer Capa (k wpy) | 171 | 80 | 324 | 1,943 | Implied Wafer Capa (k wpy) | 2,456 |
| **Implied Wafer Capa (k wpm)** | **14** | **7** | **27** | **162** | **Implied Wafer Capa (k wpm)** | **205** |

| | |
|---|---|
| Total Implied Wafer Capa (k wpy) | 4,974 |
| **Total US demand for DRAM wafer capacity (k wpm)** | **415** |

*Source: UBS estimates.*

# Cycle updates

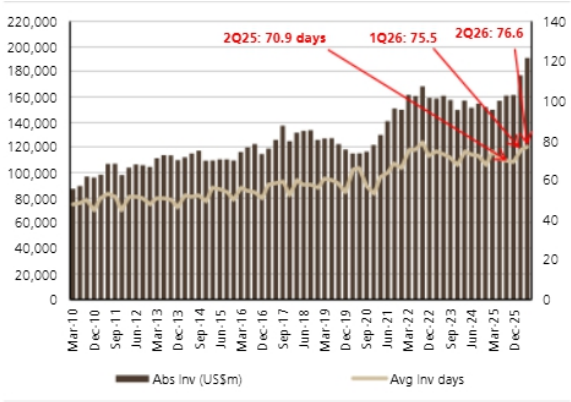
**Semis (ex-memory) YoY 3MMA revs growth (Sell In) vs. the semis SOX index**



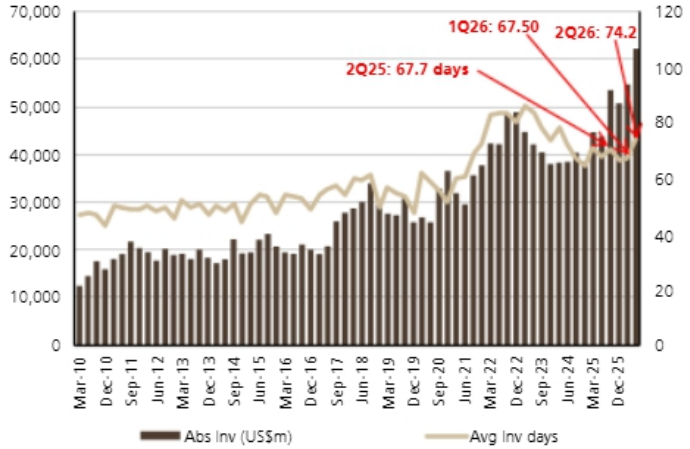

*Source: SIA, Bloomberg, UBS*

# Cycle updates

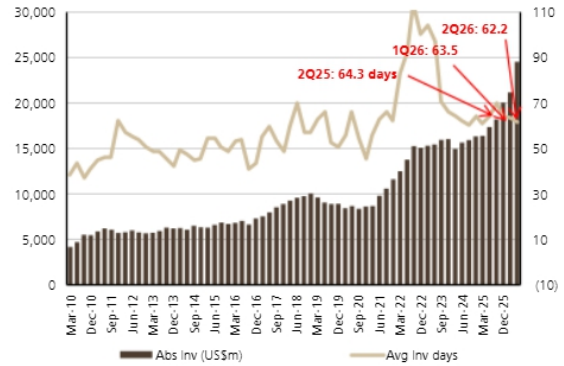
## OEMs – Absolute inventory & Inventory days



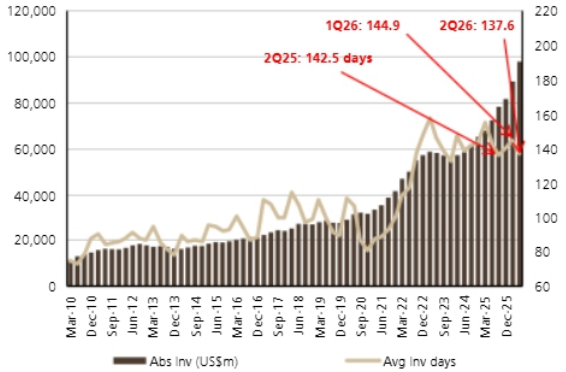

## EMS – Absolute inventory & Inventory days




## Distributors – Absolute inventory & Inventory days

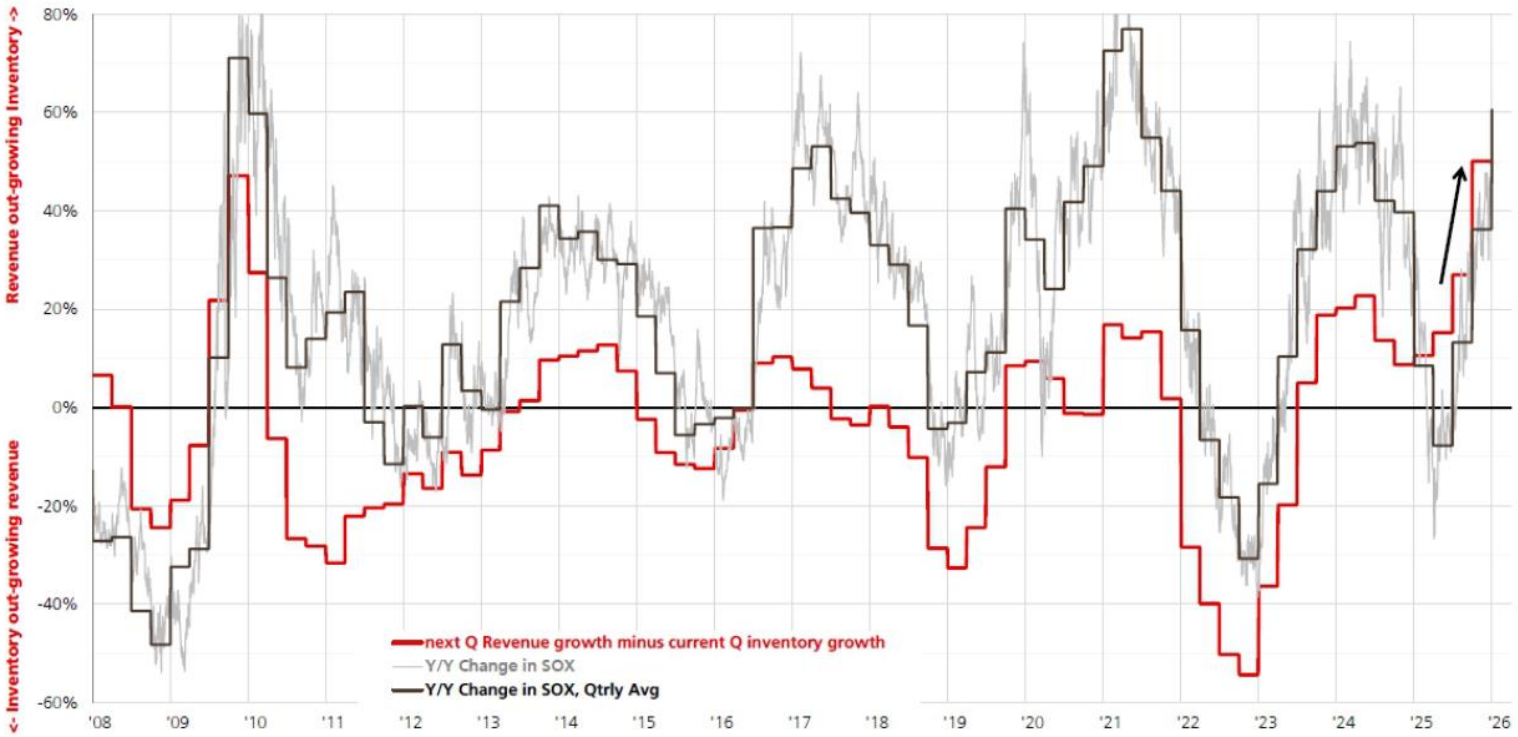



## Non Memory Semis – Absolute inventory & Inventory days



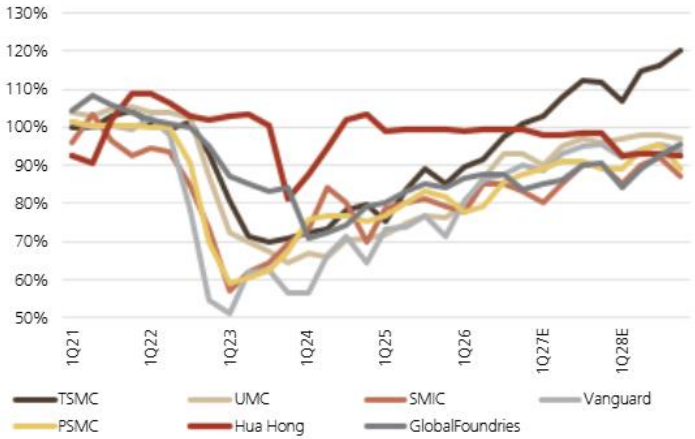

*Source: Company data, Gartner, UBSe*

# Cycle updates – Inventory Momentum Analysis

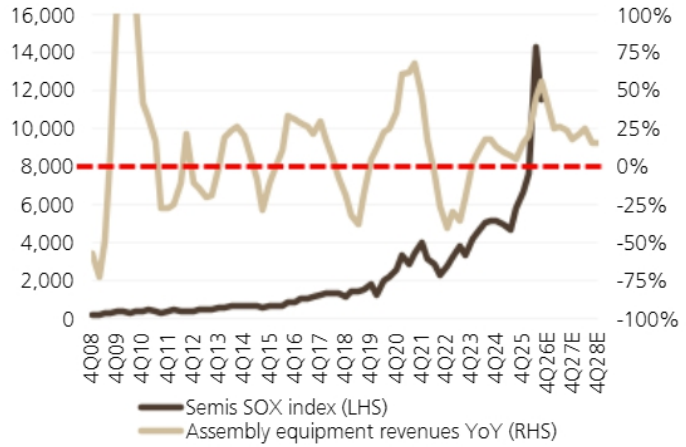


# What are the leading indicators for cycles?

**Foundry capacity utilisation rates (Q111-Q427E)**



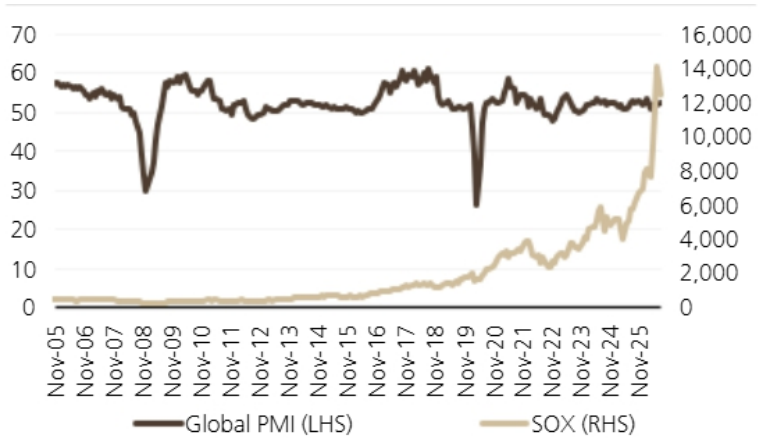

**Assembly equipment revenues growth YoY (%) vs. semis SOX index**




*Source: Company data, Bloomberg, UBSe; Notes: Companies include KLIC, BE Semis, ASMPT(excl SMT), Disco (Japan) and Towa (Japan).*

# What are the leading indicators for cycles?

**SOX vs. Global PMI**




**SOX vs. Global Growth Surprise Index**




*Source: Datastream, Bloomberg, UBSe*

# Semi capex estimates

| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E | 2028E |
|---|---|---|---|---|---|---|---|---|---|---|
| **Capex US$m** | | | | | | | | | | |
| Memory Total | 41,189 | 47,010 | 61,035 | 60,807 | 47,747 | 61,833 | 75,850 | 121,736 | 154,253 | 167,266 |
| DRAM | 17,816 | 23,790 | 31,252 | 35,248 | 36,283 | 47,121 | 60,522 | 98,070 | 118,370 | 124,537 |
| NAND/non-volatile | 23,373 | 23,221 | 29,783 | 25,559 | 11,463 | 14,712 | 15,328 | 23,666 | 35,883 | 42,729 |
| Large non Memory IDMs | 18,960 | 16,384 | 22,312 | 33,734 | 35,754 | 30,778 | 23,655 | 24,957 | 30,043 | 42,640 |
| Tier-one/two foundries | 25,340 | 35,125 | 51,103 | 60,782 | 58,099 | 52,673 | 62,760 | 90,093 | 108,850 | 124,874 |
| Other & SAT | 17,044 | 19,049 | 28,713 | 32,016 | 32,170 | 30,188 | 36,786 | 32,365 | 33,712 | 27,692 |
| **Total** | **102,533** | **117,569** | **163,163** | **187,338** | **173,769** | **175,472** | **199,051** | **269,151** | **326,858** | **362,472** |
| **% YoY** | | | | | | | | | | |
| Memory Total | -25.4% | 14.1% | 29.8% | -0.4% | -21.5% | 29.5% | 22.7% | 60.5% | 26.7% | 8.4% |
| DRAM | -28.9% | 33.5% | 31.4% | 12.8% | 2.9% | 29.9% | 28.4% | 62.0% | 20.7% | 5.2% |
| NAND/non-volatile | -22.5% | -0.7% | 28.3% | -14.2% | -55.1% | 28.3% | 4.2% | 54.4% | 51.6% | 19.1% |
| Large non Memory IDMs | 29.1% | -13.6% | 36.2% | 51.2% | 6.0% | -13.9% | -23.1% | 5.5% | 20.4% | 41.9% |
| Tier-one/two foundries | 25.8% | 38.6% | 45.5% | 18.9% | -4.4% | -9.3% | 19.2% | 43.6% | 20.8% | 14.7% |
| **Total** | **-4.0%** | **14.7%** | **38.8%** | **14.8%** | **-7.2%** | **1.0%** | **13.4%** | **35.2%** | **21.4%** | **10.9%** |
| **% Capital intensity** | | | | | | | | | | |
| Memory Total | 38.7% | 40.0% | 39.7% | 46.9% | 51.7% | 37.5% | 33.0% | 12.7% | 9.4% | |
| DRAM | 28.5% | 37.0% | 33.6% | 45.3% | 69.9% | 49.7% | 39.2% | 15.0% | 10.5% | |
| NAND | 58.2% | 47.0% | 53.2% | 54.3% | 31.8% | 22.3% | 21.6% | 7.9% | 7.1% | |
| Non-memory | 20.1% | 21.9% | 25.4% | 28.6% | 29.4% | 26.0% | 23.9% | 22.2% | 23.3% | |
| **Total** | **24.9%** | **26.7%** | **29.4%** | **32.7%** | **33.3%** | **29.1%** | **26.7%** | **16.6%** | **13.7%** | |

*Source: Company data, Gartner, UBSe*

# WFE by segment

| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E | 2028E |
|---|---|---|---|---|---|---|---|---|---|---|
| **WFE US$m** | | | | | | | | | | |
| Memory Total | 22,850 | 29,450 | 44,650 | 39,000 | 27,500 | 37,450 | 46,500 | 69,500 | 98,500 | 107,500 |
| DRAM | 10,250 | 13,400 | 23,100 | 22,500 | 20,750 | 29,400 | 34,750 | 52,000 | 74,000 | 78,000 |
| NAND | 12,600 | 16,050 | 21,550 | 16,500 | 6,750 | 8,050 | 11,750 | 17,500 | 24,500 | 29,500 |
| Non-memory Total | 28,050 | 30,550 | 45,850 | 61,550 | 62,900 | 64,050 | 69,500 | 77,500 | 99,500 | 140,000 |
| **Total** | **51,500** | **61,500** | **90,500** | **100,550** | **90,400** | **101,500** | **116,000** | **147,000** | **198,000** | **247,500** |
| China WFE | 7,000 | 14,000 | 17,000 | 22,800 | 30,500 | 39,000 | 44,500 | 47,500 | 56,000 | 64,000 |
| *% of total* | *13.6%* | *22.8%* | *18.8%* | *22.7%* | *33.7%* | *38.4%* | *38.4%* | *32.3%* | *28.3%* | *25.9%* |
| Domestic China (excl. multinational) | 3,500 | 9,100 | 12,750 | 18,510 | 28,000 | 37,800 | 43,500 | 47,000 | 55,300 | 63,300 |
| **% YoY** | | | | | | | | | | |
| Memory Total | -33.5% | 28.9% | 51.6% | -12.7% | -29.5% | 36.2% | 24.2% | 49.5% | 41.7% | 9.1% |
| DRAM | -34.1% | 30.7% | 72.4% | -2.6% | -7.8% | 41.7% | 18.2% | 49.6% | 42.3% | 5.4% |
| NAND | -33.0% | 27.4% | 34.3% | -23.4% | -59.1% | 19.3% | 46.0% | 48.9% | 40.0% | 20.4% |
| Non-memory Total | 43.8% | 8.9% | 50.1% | 34.2% | 2.2% | 1.8% | 8.5% | 11.5% | 28.4% | 40.7% |
| **Total** | **-4.4%** | **19.4%** | **47.2%** | **11.1%** | **-10.1%** | **12.3%** | **14.3%** | **26.7%** | **34.7%** | **25.0%** |
| China WFE | 16.7% | 100.0% | 21.4% | 34.1% | 33.8% | 27.9% | 14.1% | 6.7% | 17.9% | 14.3% |
| Domestic China (excl. multinational) | 29.6% | 160.0% | 40.1% | 45.2% | 51.3% | 35.0% | 15.1% | 8.0% | 17.7% | 14.5% |
| **Segment % of total WFE** | | | | | | | | | | |
| Memory Total | 44.4% | 47.9% | 49.3% | 38.8% | 30.4% | 36.9% | 40.1% | 47.3% | 49.7% | 43.4% |
| DRAM | 19.9% | 21.8% | 25.5% | 22.4% | 23.0% | 29.0% | 30.0% | 35.4% | 37.4% | 31.5% |
| NAND | 24.5% | 26.1% | 23.8% | 16.4% | 7.5% | 7.9% | 10.1% | 11.9% | 12.4% | 11.9% |
| Non-memory Total | 54.5% | 49.7% | 50.7% | 61.2% | 69.6% | 63.1% | 59.9% | 52.7% | 50.3% | 56.6% |
| **Total** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** |

*Source: Company data, Gartner, UBSe*

# Bottom-up Semis Capex Model (US$m)

| | 2024 | % YoY | 2025 | % YoY | 2026E | % YoY | 2027E | % YoY | 2028E | % YoY |
|---|---|---|---|---|---|---|---|---|---|---|
| **North America** | | | | | | | | | | |
| Intel | 23,944 | -7% | 17,672 | -26% | 18,236 | 3% | 21,500 | 18% | 35,000 | 63% |
| Micron | 9,796 | 39% | 18,040 | 84% | 30,887 | 71% | 42,000 | 36% | 41,500 | -1% |
| Texas Instruments | 4,820 | -5% | 4,550 | -6% | 2,251 | -51% | 1,600 | -29% | 2,560 | 60% |
| Global Foundries | 625 | -65% | 722 | 16% | 1,730 | 140% | 2,335 | 35% | 1,845 | -21% |
| SanDisk | 601 | -38% | 1,197 | 99% | 1,750 | 46% | 2,750 | 57% | 2,750 | 0% |
| **Europe** | | | | | | | | | | |
| ST Micro | 2,642 | -36% | 1,843 | -30% | 2,174 | 18% | 2,350 | 8% | 2,196 | -7% |
| Infineon | 2,892 | -12% | 2,390 | -17% | 3,047 | 27% | 5,193 | 70% | 4,444 | -14% |
| NXP | 876 | -13% | 537 | -39% | 1,136 | 112% | 1,322 | 16% | 1,274 | -4% |
| **Korea** | | | | | | | | | | |
| Samsung Memory | 22,805 | -10% | 24,520 | 8% | 37,538 | 53% | 44,576 | 19% | 47,821 | 7% |
| Samsung Foundry / LSI | 13,987 | 20% | 9,428 | -33% | 10,232 | 9% | 11,415 | 12% | 11,730 | 3% |
| SK Hynix | 6,283 | -57% | 11,644 | 85% | 29,664 | 155% | 35,326 | 19% | 38,826 | 10% |
| **Japan** | | | | | | | | | | |
| Kioxia | 1,463 | 78% | 1,249 | -15% | 1,977 | 58% | 3,033 | 53% | 3,228 | 6% |
| Sony | 1,300 | -50% | 1,750 | 35% | 1,500 | -14% | 1,000 | -33% | 1,000 | 0% |
| Rapidus | | | 3,500 | NA | 3,500 | 0% | 1,120 | -68% | 1,120 | 0% |
| **Taiwan** | | | | | | | | | | |
| TSMC | 29,755 | -2% | 40,726 | 37% | 63,000 | 55% | 80,000 | 27% | 95,000 | 19% |
| UMC | 2,701 | -9% | 1,536 | -43% | 1,530 | 0% | 1,595 | 4% | 1,530 | -4% |
| Nanya | 509 | 6% | 425 | -17% | 1,644 | 287% | 1,750 | 6% | 1,800 | 3% |

*Source: Company data, Gartner, UBSe (Intel, Micron, TXN, WDC, STM, Infineon, NXP, Samsung, SK Hynix, Sony, TSMC, UMC, Nanya, SMIC, Hua Hong, CR Micro, Silan, Sanan)*

# Bottom-up Semis Capex Model (US$m)

| | 2024 | % YoY | 2025 | % YoY | 2026E | % YoY | 2027E | % YoY | 2028E | % YoY |
|---|---|---|---|---|---|---|---|---|---|---|
| **China** | | | | | | | | | | |
| SMIC | 7,664 | *0%* | 8,100 | *6%* | 8,100 | *0%* | 8,100 | *0%* | 8,100 | *0%* |
| Hua Hong | 2,739 | *202%* | 1,814 | *-34%* | 2,100 | *16%* | 2,000 | *-5%* | 2,100 | *5%* |
| Shanghai Huali | 2,500 | *100%* | 4,500 | *80%* | 5,500 | *22%* | 5,500 | *0%* | 6,000 | *9%* |
| Unigroup/YMTC | 3,500 | *250%* | 4,000 | *14%* | 6,000 | *50%* | 8,000 | *33%* | 9,000 | *13%* |
| Chengdu Gaozhen | 400 | *100%* | 400 | *0%* | 400 | *0%* | 400 | *0%* | 400 | *0%* |
| CXMT (Innotron) | 10,000 | *11%* | 6,000 | *-40%* | 10,000 | *67%* | 11,000 | *10%* | 12,000 | *9%* |
| Nexchip | 1,837 | *75%* | 1,358 | *-26%* | 1,629 | *20%* | 1,874 | *15%* | 2,155 | *15%* |
| SMEC | 494 | *-66%* | 466 | *-6%* | 513 | *10%* | 564 | *10%* | 621 | *10%* |
| CR Micro | 990 | *-15%* | 1,271 | *28%* | 1,315 | *3%* | 1,594 | *21%* | 1,093 | *-31%* |
| Silan | 383 | *24%* | 553 | *44%* | 399 | *-28%* | 824 | *106%* | 810 | *-2%* |
| Yandong Micro | 496 | *47%* | 1,925 | *288%* | 1,500 | *-22%* | 1,600 | *7%* | 1,600 | *0%* |
| Sanan | 376 | *6%* | 200 | *-47%* | 214 | *7%* | 214 | *0%* | 214 | *0%* |
| Yangjie | 120 | *85%* | 142 | *19%* | 142 | *0%* | 142 | *0%* | 142 | *0%* |
| GalaxyCore | 228 | *38%* | 328 | *44%* | 361 | *10%* | 397 | *10%* | 437 | *10%* |
| Jiejie Micro | 85 | *-50%* | 94 | *12%* | 109 | *15%* | 125 | *15%* | 144 | *15%* |
| **Other** | | | | | | | | | | |
| Others | 18,232 | *-10%* | 20,455 | *12%* | 17,235 | *-16%* | 19,401 | *13%* | 12,566 | *-35%* |
| **Total** | **175,472** | ***1%*** | **199,051** | ***13%*** | **269,151** | ***35%*** | **326,858** | ***21%*** | **362,472** | ***11%*** |
| **WFE** | **101,500** | ***12%*** | **116,000** | ***14%*** | **147,000** | ***27%*** | **198,000** | ***35%*** | **247,500** | ***25%*** |

*Source: Company data, Gartner, UBSe (Intel, Micron, TXN, WDC, STM, Infineon, NXP, Samsung, SK Hynix, Sony, TSMC, UMC, Nanya, SMIC, Hua Hong, CR Micro, Silan, Sanan)*

# WFE model projecting +27%/+35% for 2026E/27E

| | 2024 | % YoY | 2025 | % YoY | 2026E | % YoY | 2027E | % YoY | 2028E | % YoY |
|---|---|---|---|---|---|---|---|---|---|---|
| **China** | | | | | | | | | | |
| SMIC | 7,664 | *0%* | 8,100 | *6%* | 8,100 | *0%* | 8,100 | *0%* | 8,100 | *0%* |
| Hua Hong | 2,739 | *202%* | 1,814 | *-34%* | 2,100 | *16%* | 2,000 | *-5%* | 2,100 | *5%* |
| Shanghai Huali | 2,500 | *100%* | 4,500 | *80%* | 5,500 | *22%* | 5,500 | *0%* | 6,000 | *9%* |
| Unigroup/YMTC | 3,500 | *250%* | 4,000 | *14%* | 6,000 | *50%* | 8,000 | *33%* | 9,000 | *13%* |
| Chengdu Gaozhen | 400 | *100%* | 400 | *0%* | 400 | *0%* | 400 | *0%* | 400 | *0%* |
| CXMT (Innotron) | 10,000 | *11%* | 6,000 | *-40%* | 10,000 | *67%* | 11,000 | *10%* | 12,000 | *9%* |
| Nexchip | 1,837 | *75%* | 1,358 | *-26%* | 1,629 | *20%* | 1,874 | *15%* | 2,155 | *15%* |
| SMEC | 494 | *-66%* | 466 | *-6%* | 513 | *10%* | 564 | *10%* | 621 | *10%* |
| CR Micro | 990 | *-15%* | 1,271 | *28%* | 1,315 | *3%* | 1,594 | *21%* | 1,093 | *-31%* |
| Silan | 383 | *24%* | 553 | *44%* | 399 | *-28%* | 824 | *106%* | 810 | *-2%* |
| Yandong Micro | 496 | *47%* | 1,925 | *288%* | 1,500 | *-22%* | 1,600 | *7%* | 1,600 | *0%* |
| Sanan | 376 | *6%* | 200 | *-47%* | 214 | *7%* | 214 | *0%* | 214 | *0%* |
| Yangjie | 120 | *85%* | 142 | *19%* | 142 | *0%* | 142 | *0%* | 142 | *0%* |
| GalaxyCore | 228 | *38%* | 328 | *44%* | 361 | *10%* | 397 | *10%* | 437 | *10%* |
| Jiejie Micro | 85 | *-50%* | 94 | *12%* | 109 | *15%* | 125 | *15%* | 144 | *15%* |
| **Other** | | | | | | | | | | |
| Others | 18,232 | *-10%* | 20,455 | *12%* | 17,235 | *-16%* | 19,401 | *13%* | 12,566 | *-35%* |
| **Total** | **175,472** | ***1%*** | **199,051** | ***13%*** | **269,151** | ***35%*** | **326,858** | ***21%*** | **362,472** | ***11%*** |
| **WFE** | **101,500** | ***12%*** | **116,000** | ***14%*** | **147,000** | ***27%*** | **198,000** | ***35%*** | **247,500** | ***25%*** |

*Source: Company data, Gartner, UBSe (Intel, Micron, TXN, WDC, STM, Infineon, NXP, Samsung, SK Hynix, Sony, TSMC, UMC, Nanya, SMIC, Hua Hong, CR Micro, Silan, Sanan)*

# Chinese Fab project pipeline in China

| No. | Project name | Location | Wafer size | Investment (US$ m) | Current status |
|---|---|---|---|---|---|
| **Foundry** | | | | | |
| 1 | SMIC | | | | Will add 60kwpm 12" capacity at the end of 2024 vs 2023, ahead of original plan of 30-50kwpm addition |
| 1.1 | Dongfang | Shanghai | 12" | 8,870 | Ramping up from Q124 |
| 1.2 | Jingcheng | Beijing | 12" | 7,600 | Ramping up from Q323 |
| 1.3 | Xiqing | Tianjin | 12" | 7,500 | Fab shell under construction |
| 1.4 | Shenzhen | Shenzhen | 12" | 2,350 | Ramping up from Q422 |
| 2 | HuaHong Wuxi Fab 9 | Wuxi | 12" | 6,700 | Fab shell completed and 1st batch of tool moved-in in Aug 2024 |
| 3 | Huali Chengdu | Chengdu | 12" | 3,257 | Fab shell under construction; designed capacity 30kwpm |
| 4 | Huali Shanghai Phase II | Shanghai | 12" | | Fab shell under construction |
| 5 | ICRD | Shanghai | 12" | | 40/28nm |
| 6 | Nexchip (Phase II & III) | Hefei | 12" | 5,714 | Capacity by July 2024: 120kwpm 12"; plan to add 30-50kwpm in 2024 and another 30-40kwpm in 2025 |
| 7 | Sien | Qingdao | 12" | | Ramping up capacity |
| 8 | GTA Shanghai (Phase II) | Shanghai | 8"/12" | 5,129 | Ramping up; designed capacity: 70kwpm 6", 110kwpm 8", 50kwpm 12", 30kwpm SiC |
| 9 | UNT-C (formerly SMEC) 12-inch production line | Shaoxing | 12" | 3,171 | Running at 10kwpm, expect to reach 20kwpm/30kwpm by Q324/YE2024 |
| 10 | UNT-C compound semi production line | Shaoxing | 6"/8" | 714 | 5kwpm exiting 2023; expect to reach 10kwpm by YE2024; expect to MP 8" SiC from 2025 |
| 11 | Cansemi (Phase III) | Guangzhou | 12" | 2,321 | Expect to start production in 2024 |
| 12 | RongSemi | Ningbo | 12" | | 90-40nm CIS, power IC, TDDI, power discrete, NOR Flash, etc.; ramping up from 2025 |
| 13 | PXW Micro | Shenzhen | 12" | | 28/20nm, covering logic, analog, RF, CIS, etc. |
| 14 | PST | Shenzhen | 12" | | 40/28nm |
| 15 | ZSemi 12-inch MEMS and specialty process line | Guangzhou | 12" | 1,000 | Designed capacity: 20kwpm; start production from June 2024 |
| **IDM** | | | | | |
| 1 | CXMT | | | | |
| 1.1 | Hefei Fab2 | Hefei | 12" | | DRAM; designed capacity: 120kwpm; planned |
| 1.2 | Beijing Fab | Beijing | 12" | | DRAM; under construction |
| 1.3 | Shanghai Fab | Shanghai | 12" | | DRAM; under construction |
| 2 | YMTC | | | | |
| 2.1 | Wuhan Fab2 | Wuhan | 12" | | NAND; designed capacity: 200kwpm; ramping up |
| 2.2 | Wuhan Fab3 | Wuhan | 12" | | Under evaluation |
| 3 | SwaySure | Shenzhen | 12" | | Memory; ramping up capacity |
| 4 | CR Micro 12-inch line | Shenzhen | 12" | 3,143 | Designed capacity: 40kwpm; equipment move-in; ramping up from 2025 |
| 5 | CR Micro 12-inch power semi production line | Chongqing | 12" | 1,071 | Ramping up; expect to reach 35kwpm by YE2024 |
| 6 | CHIPSEMI 12-inch power semi production line | Chongqing | 12" | 2,071 | Fab shell under construction; Phase I designed capacity: 20kwpm |
| 7 | Hangzhou Fullsemi 12-inch Analog IC production line | Hangzhou | 12" | 2,571 | Equipment move-in |
| 8 | Silan Hangzhou 12-inch fab | Hangzhou | 12" | 557 | Designed capacity: 30kwpm; construction under progress; Silan will keep expanding capacity over the next 3-5 |
| 9 | Silan advanced compound semi SiC power production line | Xiamen | 6" | 214 | Ramping up; expect to reach 12kwpm by YE2024 |
| 10 | Wingtech Nexperia Lingang 12-inch line | Shanghai | 12" | 1,714 | Designed capacity: 100kwpm (phase 1: 30-50kwpm); ramping up |
| 11 | Zhuzhou CRRC mid-low voltage power device line | Zhuzhou | 8" | 1,589 | Fab shell under construction |
| 12 | Shaoxing BYD semi power device and MEMS | Shaoxing | 8" | 1,429 | Construction of Phase I completed |
| 13 | GalaxyCore CIS 12-inch line | Shanghai | 12" | 978 | Ramping up |
| 14 | Haining Lion Micro 6-inch RF line | Haining | 6" | 714 | Ramping up |
| 15 | Yandong Micro 12-inch line | Beijing | 12" | 643 | Ramping up |
| 16 | Beijing Electric Control Integrated Circuit Manufacturing | Beijing | 12" | 31,500 | Designed capacity: 50kwpm; equipment move-in expected from Q425; MP from YE2026 |
| 17 | Ascenpower SiC production line | Guangzhou | 8" | 500 | Ramping up |
| 18 | Starpower specialty power & SiC chip | Jiaxing | 6" | 286 | Expect to start production in 2024 |

*Source: Company Data, UBS China Semiconductors: Jimmy Yu*

# Summary of CHIPS Act Grants

| Grantee | Grant Awarded | Status | Project Size | Grant % | Project Type | Technology Type |
|---|---|---|---|---|---|---|
| **Leading Edge** | | | | | | |
| Intel | $7.8B | Final | $100B | 7.8% | Modernization, expansion, 2 plants | Leading-edge, advanced packaging |
| TSMC | $6.6B | Final | $65B | 10.2% | 3 new fabs | Leading-edge |
| Samsung | $4.7B | Final | $45B | 10.5% | 2 new fabs, new facility, expansion | Leading-edge, mature-node, adv. packaging |
| Micron Technology | $6.4B | Final | $127B | 5.0% | 3 new fabs (1 Idaho, 2 NY), expansion (PMT) | Leading-edge |
| Entegris | $77MM | Final | $722MM | 10.7% | New facility | Advanced materials |
| Absolics | $75MM | Final | $600MM | 12.5% | New facility | Advanced packaging |
| **Total Grants Allocated** | **$25.67B** | | **$338.3B** | **7.6%** | | |
| **Total Leading-Edge Allocation** | **$28B** | | | | | |
| Allocation Remaining | $2.33B | | | | | |
| **Mature Node** | | | | | | |
| Texas Instruments | $1.6B | Final | $18.0B | 8.9% | New facilities | Mature-node |
| GlobalFoundries | $1.5B | Final | $12.5B | 12.0% | New facility + expansion and revitalization | Mature-node |
| Wolfspeed | $750MM | PMT | $6.0B | 12.5% | New SiC wafer fabs in NC and NY | Mature-node |
| Global Wafers | $400MM | PMT | $4.0B | 10.0% | New facilities + expansion | Wafers |
| SK hynix | $450MM | PMT | $3.87B | 11.6% | New facility | Advanced packaging and R&D |
| Amkor | $400MM | PMT | $2.0B | 20.0% | New facility | Advanced packaging and test |
| Hemlock | $325MM | PMT | $800MM | 40.6% | New facility | Polysilicon production |
| Microchip | $162MM | PMT | N/A | | Modernization, expansion | Mature-node |
| Polar Semi | $123MM | Final | $525MM | 23.4% | Modernization, expansion | Mature-node |
| Akash Systems | $18MM | PMT | $121MM | 15.0% | New facility | Mature-node |
| Infinera (Nokia) | $93MM | PMT | | | New facilities | Mature-node |
| HP | $50MM | PMT | N/A | | Modernization, expansion | Mature-node |
| X-FAB | $50MM | PMT | $200MM | 25.0% | Modernization, expansion | Mature-node |
| BAE Systems | $35.5MM | Final | N/A | | Modernization | Mature-node |
| Coherent | $33.0MM | PMT | N/A | | Modernization, expansion | InP/Optoelectronics |
| Corning | $32.0MM | PMT | $315MM | 10.2% | Modernization, expansion | Semi supply chain (Litho glass) |
| SolAero (Rocket Lab) | $24MM | Final | $98MM | 24.5% | Modernization, expansion | Mature-node |
| Edwards Vacuum | $18MM | PMT | $319MM | 5.6% | New facility | Semi supply chain (Dry pumps) |
| SkyWater Technology | $16MM | PMT | N/A | | Modernization | Mature-node |
| Rogue Valley | $6.7MM | PMT | $25MM | 26.8% | Modernization | Mature-node |
| Powerex | $3.0MM | PMT | $15MM | 20.0% | Modernization, expansion | Advanced packaging |
| **Total Grants Allocated** | **$6.1B** | | **$48.8B** | **12.5%** | | |
| Total Mature-Node Allocation | $11B | | | | | |
| **Allocation Remaining** | **$4.9B** | | | | | |

*Source: Company Data, US Department of Commerce*

# UBS forecasts on smartphone volume

| Smartphone volume (m) | 2024 | 1Q25 | 2Q25 | 3Q25 | 4Q25 | 2025 | 1Q26 | 2Q26E | 3Q26E | 4Q26E | 2026E | 1Q27E | 2Q27E | 3Q27E | 4Q27E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Samsung** | **224** | **61** | **58** | **61** | **60** | **240** | **60** | **65** | **66** | **60** | **250** | **67** | **64** | **66** | **61** | **258** |
| *% YoY* | *0%* | *1%* | *7%* | *5%* | *15%* | *7%* | *-2%* | *12%* | *8%* | *0%* | *4%* | *12%* | *-1%* | *0%* | *2%* | *3%* |
| *% of total* | *18%* | *20%* | *20%* | *19%* | *18%* | *19%* | *20%* | *23%* | *24%* | *20%* | *22%* | *24%* | *23%* | *23%* | *19%* | *22%* |
| **Apple** | **222** | **52** | **46** | **54** | **90** | **241** | **60** | **56** | **55** | **90** | **261** | **63** | **59** | **58** | **94** | **273** |
| *% YoY* | *-3%* | *1%* | *5%* | *4%* | *19%* | *9%* | *17%* | *23%* | *3%* | *0%* | *8%* | *5%* | *5%* | *5%* | *4%* | *5%* |
| *% of total* | *18%* | *17%* | *15%* | *17%* | *26%* | *19%* | *20%* | *20%* | *20%* | *30%* | *23%* | *22%* | *21%* | *20%* | *30%* | *24%* |
| **Huawei** | **48** | **13** | **13** | **11** | **12** | **48** | **14** | **15** | **14** | **13** | **56** | **15** | **15** | **13** | **14** | **57** |
| *% YoY* | *33%* | *0%* | *8%* | *5%* | *-10%* | *0%* | *3%* | *19%* | *27%* | *12%* | *15%* | *11%* | *0%* | *-7%* | *8%* | *3%* |
| *% of total* | *4%* | *4%* | *4%* | *3%* | *3%* | *4%* | *5%* | *5%* | *5%* | *4%* | *5%* | *5%* | *5%* | *4%* | *4%* | *5%* |
| **OPPO*** | **105** | **24** | **24** | **28** | **27** | **102** | **31** | **29** | **21** | **18** | **99** | **22** | **22** | **26** | **25** | **95** |
| *% YoY* | *2%* | *-7%* | *-7%* | *-4%* | *8%* | *-3%* | *31%* | *20%* | *-24%* | *-33%* | *-3%* | *-28%* | *-24%* | *24%* | *39%* | *-4%* |
| *% of total* | *9%* | *8%* | *8%* | *9%* | *8%* | *8%* | *10%* | *10%* | *8%* | *6%* | *9%* | *8%* | *8%* | *9%* | *8%* | *8%* |
| **Vivo** | **100** | **23** | **27** | **29** | **27** | **106** | **21** | **21** | **20** | **21** | **83** | **20** | **20** | **22** | **21** | **83** |
| *% YoY* | *9%* | *1%* | *18%* | *7%* | *0%* | *6%* | *-7%* | *-22%* | *-31%* | *-22%* | *-21%* | *-6%* | *-6%* | *10%* | *0%* | *0%* |
| *% of total* | *8%* | *7%* | *9%* | *9%* | *8%* | *8%* | *7%* | *8%* | *7%* | *7%* | *7%* | *7%* | *7%* | *8%* | *7%* | *7%* |
| **Xiaomi** | **169** | **42** | **42** | **43** | **38** | **165** | **34** | **31** | **29** | **29** | **123** | **31** | **32** | **33** | **30** | **126** |
| *% YoY* | *16%* | *3%* | *0%* | *0%* | *-12%* | *-2%* | *-19%* | *-26%* | *-32%* | *-24%* | *-26%* | *-8%* | *3%* | *13%* | *4%* | *2%* |
| *% of total* | *14%* | *14%* | *14%* | *13%* | *11%* | *13%* | *12%* | *11%* | *11%* | *10%* | *11%* | *11%* | *12%* | *11%* | *10%* | *11%* |
| **Transsion** | **106** | **21** | **24** | **29** | **22** | **96** | **19** | **20** | **19** | **18** | **76** | **19** | **20** | **19** | **20** | **77** |
| *% YoY* | *10%* | *-24%* | *-6%* | *16%* | *-19%* | *-9%* | *-10%* | *-16%* | *-34%* | *-21%* | *-21%* | *0%* | *-3%* | *0%* | *10%* | *1%* |
| *% of total* | *8%* | *6%* | *8%* | *9%* | *6%* | *7%* | *6%* | *7%* | *7%* | *6%* | *6%* | *6%* | *7%* | *6%* | *6%* | *6%* |
| **Lenovo** | **53** | **12** | **14** | **14** | **15** | **55** | **13** | **13** | **13** | **13** | **51** | **12** | **12** | **13** | **13** | **51** |
| *% YoY* | *17%* | *-5%* | *7%* | *1%* | *10%* | *3%* | *6%* | *-8%* | *-10%* | *-15%* | *-7%* | *-5%* | *-1%* | *3%* | *3%* | *0%* |
| *% of total* | *4%* | *4%* | *5%* | *4%* | *4%* | *4%* | *4%* | *5%* | *5%* | *4%* | *4%* | *4%* | *5%* | *5%* | *4%* | *4%* |
| **Honor** | **64** | **17** | **16** | **18** | **19** | **69** | **19** | **14** | **14** | **14** | **61** | **16** | **12** | **16** | **17** | **61** |
| *% YoY* | *16%* | *3%* | *3%* | *9%* | *16%* | *8%* | *12%* | *-13%* | *-20%* | *-24%* | *-12%* | *-16%* | *-14%* | *14%* | *21%* | *0%* |
| *% of total* | *5%* | *6%* | *5%* | *5%* | *5%* | *5%* | *6%* | *5%* | *5%* | *5%* | *5%* | *6%* | *4%* | *6%* | *5%* | *5%* |
| **Other** | **133** | **42** | **34** | **37** | **32** | **143** | **24** | **13** | **20** | **22** | **79** | **16** | **19** | **24** | **21** | **80** |
| *% YoY* | *-4%* | *107%* | *7%* | *-13%* | *-19%* | *8%* | *-42%* | *-62%* | *-44%* | *-30%* | *-45%* | *-34%* | *50%* | *19%* | *-5%* | *1%* |
| *% of total* | *11%* | *14%* | *11%* | *11%* | *9%* | *11%* | *8%* | *5%* | *8%* | *7%* | *7%* | *6%* | *7%* | *8%* | *7%* | *7%* |
| **Total** | **1,223** | **305** | **297** | **323** | **341** | **1,265** | **294** | **276** | **272** | **297** | **1,139** | **281** | **275** | **290** | **315** | **1,161** |
| *% YoY* | *5%* | *5%* | *4%* | *2%* | *3%* | *3%* | *-4%* | *-7%* | *-16%* | *-13%* | *-10%* | *-4%* | *-1%* | *7%* | *6%* | *2%* |

*Source: Company data, Gartner, UBSe*

# UBS forecasts on PC/Notebook shipments

## PC

**UBS global PC model**

| (mil units) | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025E | 2026E | 2027E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Desktop units** | **118.2** | **108.0** | **102.3** | **99.8** | **100.3** | **79.8** | **85.3** | **76.1** | **62.4** | **61.1** | **68.3** | **59.6** | **60.4** |
| *% YoY* | *-11.5%* | *-8.7%* | *-5.3%* | *-2.4%* | *0.5%* | *-20.4%* | *6.9%* | *-10.9%* | *-17.9%* | *-2.1%* | *11.8%* | *-12.7%* | *1.3%* |
| **Notebook units** | **176.3** | **171.6** | **173.2** | **174.9** | **178.6** | **228.3** | **256.4** | **208.0** | **179.9** | **186.3** | **202.5** | **182.0** | **186.2** |
| *% YoY* | *-5.2%* | *-2.7%* | *0.9%* | *1.0%* | *2.1%* | *27.8%* | *12.3%* | *-18.9%* | *-13.5%* | *3.6%* | *8.7%* | *-10.1%* | *2.3%* |
| Chromebook | 6.8 | 9.4 | 12.8 | 14.9 | 16.3 | 32.6 | 35.3 | 19.4 | 16.6 | 18.3 | 19.9 | 16.7 | 18.1 |
| *% YoY* | *18.8%* | *38.2%* | *35.7%* | *16.8%* | *9.4%* | *100.0%* | *8.2%* | *-45.2%* | *-14.2%* | *10.2%* | *8.8%* | *-16.2%* | *8.3%* |
| **Consumer PC units** | **138.4** | **123.3** | **111.1** | **105.9** | **98.4** | **117.5** | **130.2** | **105.3** | **88.4** | **86.9** | **93.8** | **81.9** | **84.4** |
| *% YoY* | *-10.2%* | *-10.9%* | *-9.9%* | *-4.7%* | *-7.0%* | *19.4%* | *10.7%* | *-19.1%* | *-16.1%* | *-1.7%* | *7.9%* | *-12.7%* | *3.1%* |
| **Commercial PC units** | **156.1** | **156.2** | **164.3** | **168.8** | **180.5** | **190.6** | **211.6** | **178.8** | **153.9** | **160.5** | **177.0** | **159.8** | **162.2** |
| *% YoY* | *-5.6%* | *0.1%* | *5.2%* | *2.8%* | *6.9%* | *5.6%* | *11.0%* | *-15.5%* | *-13.9%* | *4.3%* | *10.3%* | *-9.8%* | *1.6%* |
| **Total units** | **294.5** | **279.5** | **275.4** | **274.7** | **278.9** | **308.2** | **341.7** | **284.1** | **242.3** | **247.5** | **270.8** | **241.6** | **246.6** |
| ***% YoY*** | ***-7.8%*** | ***-5.1%*** | ***-1.5%*** | ***-0.3%*** | ***1.5%*** | ***10.5%*** | ***10.9%*** | ***-16.9%*** | ***-14.7%*** | ***2.1%*** | ***9.4%*** | ***-10.8%*** | ***2.1%*** |

## Notebook

| ('000 units) | 2023 | 2024 | 1Q25 | 2Q25 | 3Q25 | 4Q25 | 2025 | 1Q26 | 2Q26 | 3Q26E | 4Q26E | 2026E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Quanta** | **46,900** | **45,900** | **10,800** | **12,100** | **12,700** | **10,900** | **46,500** | **10,000** | **11,500** | **9,500** | **9,100** | **40,100** |
| *%QoQ* | | | *-3%* | *12%* | *5%* | *-14%* | | *-8%* | *15%* | *-17%* | *-4%* | |
| *%YoY* | *-18.7%* | *-2.1%* | *3%* | *3%* | *1%* | *-2%* | *1.3%* | *-7%* | *-5%* | *-25%* | *-17%* | *-13.8%* |
| **Compal** | **33,900** | **32,300** | **7,000** | **7,100** | **7,100** | **6,800** | **28,000** | **5,900** | **6,200** | **6,150** | **6,200** | **24,450** |
| *%QoQ* | | | *-10%* | *1%* | *0%* | *-4%* | | *-13%* | *5%* | *-1%* | *1%* | |
| *%YoY* | *-13.7%* | *-4.7%* | *-7%* | *-18%* | *-14%* | *-13%* | *-13.3%* | *-16%* | *-13%* | *-13%* | *-9%* | *-12.7%* |
| **Pegatron** | **7,925** | **8,055** | **1,885** | **2,375** | **2,400** | **2,410** | **9,070** | **1,800** | **1,750** | **1,700** | **1,800** | **7,050** |
| *%QoQ* | | | *-3%* | *26%* | *1%* | *0%* | | *-25%* | *-3%* | *-3%* | *6%* | |
| *%YoY* | *-1.9%* | *1.6%* | *22%* | *16%* | *-4%* | *24%* | *12.6%* | *-5%* | *-26%* | *-29%* | *-25%* | *-22.3%* |
| **Inventec** | **18,700** | **20,000** | **5,000** | **5,600** | **5,400** | **5,300** | **21,300** | **5,400** | **5,400** | **4,900** | **4,200** | **19,900** |
| *%QoQ* | | | *-7%* | *12%* | *-4%* | *-2%* | | *2%* | *0%* | *-9%* | *-14%* | |
| *%YoY* | *-5.6%* | *7.0%* | *11%* | *14%* | *4%* | *-2%* | *6.5%* | *8%* | *-4%* | *-9%* | *-21%* | *-6.6%* |
| **Wistron** | **19,000** | **20,200** | **4,900** | **5,900** | **6,400** | **6,900** | **24,100** | **6,100** | **5,500** | **4,650** | **4,900** | **21,150** |
| *%QoQ* | | | *-8%* | *20%* | *8%* | *8%* | | *-12%* | *-10%* | *-15%* | *5%* | |
| *%YoY* | *-10.4%* | *6.3%* | *7%* | *16%* | *23%* | *30%* | *19.3%* | *24%* | *-7%* | *-27%* | *-29%* | *-12.2%* |
| **Total** | **126,425** | **126,455** | **29,585** | **33,075** | **34,000** | **32,310** | **128,970** | **29,200** | **30,350** | **26,900** | **26,200** | **112,650** |
| ***%QoQ*** | | | *-6%* | *12%* | *3%* | *-5%* | | *-10%* | *4%* | *-11%* | *-3%* | |
| ***%YoY*** | *-13%* | *0%* | *3%* | *2%* | *1%* | *2%* | *2%* | *-1%* | *-8%* | *-21%* | *-19%* | *-13%* |

*Source: Gartner, UBSe*

# UBS forecasts on server shipments

**UBS global server model forecasts**

| | 2023 | 2024 | 2025 | 2026E | 2027E |
|---|---|---|---|---|---|
| **Total Server shipments (K unit)** | **14,087** | **16,025** | **20,078** | **23,874** | **27,844** |
| ***Yoy growth (%)*** | ***-5.7%*** | ***13.8%*** | ***25.3%*** | ***18.9%*** | ***16.6%*** |
| **Out of which conventional servers** | **13,304** | **14,435** | **18,835** | **22,728** | **26,085** |
| *Yoy growth (%)* | *-6.4%* | *8.5%* | *30.5%* | *20.7%* | *14.8%* |
| *% of total* | *94%* | *90%* | *94%* | *95%* | *94%* |
| **Traditional Enterprise** | **4,217** | **4,283** | **4,214** | **4,298** | **4,384** |
| *Yoy growth (%)* | *-16.1%* | *1.6%* | *-4.0%* | *-6.0%* | *-6.0%* |
| *% of total* | *30%* | *27%* | *21%* | *18%* | *16%* |
| **Hyperscalers** | **9,915** | **9,883** | **11,102** | **15,864** | **19,576** |
| *Yoy growth (%)* | *12.4%* | *-0.3%* | *12.3%* | *42.9%* | *23.4%* |
| *% of total* | *70%* | *62%* | *55%* | *66%* | *70%* |
| **Standard servers** | **8,873** | **8,047** | **9,600** | **14,452** | **17,543** |
| *Yoy growth (%)* | *13.4%* | *-9.3%* | *19.3%* | *50.5%* | *21.4%* |
| *% of total hyperscalers* | *89%* | *81%* | *86%* | *91%* | *90%* |
| *% of total servers* | *63%* | *50%* | *48%* | *61%* | *63%* |
| **AI Servers** | **783** | **1,591** | **1,243** | **1,146** | **1,759** |
| *Yoy growth (%)* | *7.3%* | *103.1%* | *-21.8%* | *-7.8%* | *53.5%* |
| *% of total hyperscalers* | *8%* | *16%* | *11%* | *7%* | *9%* |
| *% of total servers* | *6%* | *10%* | *6%* | *5%* | *6%* |
| **Database Servers** | **259** | **246** | **258** | **266** | **274** |
| *Yoy growth (%)* | *2.0%* | *4.0%* | *4.0%* | *5.0%* | *5.0%* |
| *% of total hyperscalers* | *3%* | *2%* | *2%* | *2%* | *1%* |
| *% of total servers* | *2%* | *2%* | *1%* | *1%* | *1%* |

*Source: Company data, Dell'Oro, UBSe*

# UBS forecasts on automobile sales volume

| Sales, m units | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | Q126 | Q226 | Q326 | Q426 | 2026E | 2027E | 2028E | 2029E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Western Europe** | **16.1** | **17.2** | **17.8** | **17.9** | **18.1** | **13.8** | **13.9** | **13.0** | **14.8** | **15.1** | **15.2** | **4.0** | **4.0** | **3.7** | **4.0** | **15.7** | **16.0** | **16.2** | **16.4** |
| *% growth* | *17.8%* | *7.2%* | *3.2%* | *0.5%* | *1.3%* | *-23.6%* | *0.2%* | *-6.2%* | *14.0%* | *1.6%* | *1.0%* | *3.6%* | *3.0%* | *3.6%* | *3.7%* | *3.5%* | *1.6%* | *1.5%* | *1.0%* |
| of which: Germany | 3.5 | 3.6 | 3.7 | 3.7 | 3.9 | 3.2 | 2.9 | 2.9 | 3.1 | 3.1 | 3.1 | 0.8 | 0.8 | 0.8 | 0.9 | 3.3 | 3.3 | 3.4 | 3.4 |
| *% growth* | *5.5%* | *4.8%* | *2.5%* | *0.6%* | *5.1%* | *-18.6%* | *-9.3%* | *-0.3%* | *7.7%* | *-0.2%* | *0.9%* | *4.0%* | *4.2%* | *4.7%* | *5.1%* | *4.5%* | *2.0%* | *1.5%* | *1.0%* |
| of which: France | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.1 | 2.1 | 1.9 | 2.2 | 2.1 | 2.0 | 0.5 | 0.6 | 0.4 | 0.6 | 2.1 | 2.1 | 2.1 | 2.1 |
| *% growth* | *5.9%* | *5.6%* | *4.3%* | *4.1%* | *2.3%* | *-23.9%* | *1.9%* | *-10.2%* | *14.7%* | *-2.5%* | *-5.0%* | *-0.9%* | *4.3%* | *4.7%* | *3.9%* | *3.0%* | *1.5%* | *1.5%* | *1.0%* |
| of which: Italy | 1.7 | 2.0 | 2.2 | 2.1 | 2.1 | 1.5 | 1.6 | 1.5 | 1.8 | 1.8 | 1.7 | 0.5 | 0.5 | 0.4 | 0.4 | 1.8 | 1.8 | 1.9 | 1.9 |
| *% growth* | *15.6%* | *19.8%* | *6.2%* | *-4.0%* | *0.8%* | *-26.6%* | *6.6%* | *-10.1%* | *19.3%* | *-0.3%* | *-2.4%* | *8.2%* | *4.1%* | *3.0%* | *3.9%* | *5.0%* | *1.5%* | *1.5%* | *1.0%* |
| of which: Spain | 1.2 | 1.3 | 1.4 | 1.5 | 1.5 | 1.0 | 1.0 | 0.9 | 1.1 | 1.2 | 1.3 | 0.3 | 0.4 | 0.3 | 0.4 | 1.4 | 1.4 | 1.4 | 1.5 |
| *% growth* | *22.7%* | *11.0%* | *8.5%* | *7.1%* | *-4.0%* | *-31.5%* | *0.1%* | *-7.7%* | *17.5%* | *7.9%* | *12.9%* | *8.3%* | *2.0%* | *4.5%* | *5.7%* | *5.0%* | *1.5%* | *1.5%* | *1.0%* |
| of which: UK | 3.0 | 3.1 | 2.9 | 2.7 | 2.7 | 1.9 | 2.0 | 1.9 | 2.3 | 2.3 | 2.3 | 0.7 | 0.6 | 0.7 | 0.5 | 2.5 | 2.5 | 2.5 | 2.6 |
| *% growth* | *7.4%* | *2.0%* | *-5.2%* | *-6.3%* | *-1.8%* | *-28.1%* | *4.1%* | *-5.3%* | *18.4%* | *2.8%* | *1.5%* | *4.3%* | *3.2%* | *5.3%* | *5.2%* | *4.5%* | *1.5%* | *1.5%* | *1.0%* |
| RoWE | 4.4 | 4.7 | 5.0 | 5.1 | 5.2 | 4.1 | 4.2 | 3.9 | 4.4 | 4.6 | 4.7 | 1.2 | 1.2 | 1.1 | 1.2 | 4.7 | 4.8 | 4.9 | 4.9 |
| *% growth* | *49.6%* | *7.6%* | *5.8%* | *2.6%* | *1.5%* | *-21.3%* | *2.4%* | *-6.9%* | *13.2%* | *3.6%* | *1.8%* | *1.6%* | *1.3%* | *1.5%* | *1.5%* | *1.5%* | *1.5%* | *1.5%* | *1.0%* |
| **Eastern Europe** | **2.8** | **2.6** | **2.8** | **2.7** | **2.5** | **2.9** | **2.9** | **2.0** | **3.1** | **3.6** | **3.6** | **0.7** | **0.9** | **0.9** | **1.1** | **3.6** | **3.6** | **3.7** | **3.8** |
| *% growth* | *-39.3%* | *-7.6%* | *6.9%* | *-3.7%* | *-5.6%* | *14.3%* | *-0.1%* | *-31.5%* | *55.7%* | *17.0%* | *-1.6%* | *2.9%* | *4.2%* | *-2.3%* | *0.2%* | *1.0%* | *1.0%* | *2.0%* | *2.0%* |
| of which: Russia | 1.6 | 1.4 | 1.6 | 1.8 | 1.8 | 1.6 | 1.7 | 0.7 | 1.1 | 1.6 | 1.4 | 0.3 | 0.3 | 0.4 | 0.4 | 1.4 | 1.4 | 1.5 | 1.5 |
| *% growth* | *-35.6%* | *-11.2%* | *11.6%* | *13.1%* | *-2.5%* | *-8.7%* | *4.5%* | *-57.9%* | *59.5%* | *46.0%* | *-15.8%* | *5.0%* | *17.4%* | *-2.4%* | *-3.2%* | *3.0%* | *0.0%* | *2.0%* | *2.0%* |
| **Europe** | **18.9** | **19.8** | **20.6** | **20.6** | **20.6** | **16.7** | **16.8** | **15.0** | **17.9** | **18.7** | **18.8** | **4.7** | **4.9** | **4.6** | **5.1** | **19.3** | **19.6** | **19.9** | **20.2** |
| *% growth* | *3.3%* | *5.0%* | *3.7%* | *-0.1%* | *0.4%* | *-18.9%* | *0.1%* | *-10.6%* | *19.5%* | *4.3%* | *0.5%* | *3.5%* | *3.2%* | *2.4%* | *2.9%* | *3.0%* | *1.5%* | *1.6%* | *1.2%* |
| **North America** | **20.7** | **21.1** | **20.8** | **20.7** | **20.3** | **17.1** | **17.7** | **16.5** | **18.7** | **19.5** | **19.9** | **4.5** | **5.1** | **4.9** | **5.0** | **19.4** | **19.2** | **19.2** | **19.3** |
| *% growth* | *6.4%* | *1.7%* | *-1.5%* | *-0.2%* | *-2.0%* | *-15.8%* | *3.8%* | *-7.0%* | *13.2%* | *4.2%* | *2.3%* | *-5.6%* | *-1.8%* | *-3.6%* | *1.3%* | *-2.4%* | *-1.2%* | *0.2%* | *0.1%* |
| of which: USA | 17.5 | 17.6 | 17.2 | 17.3 | 17.1 | 14.6 | 15.1 | 13.9 | 15.6 | 16.0 | 16.4 | 3.7 | 4.2 | 3.8 | 4.3 | **16.0** | **15.8** | **15.8** | **15.8** |
| *% growth* | *5.8%* | *0.4%* | *-2.1%* | *0.8%* | *-1.3%* | *-14.6%* | *3.3%* | *-7.9%* | *12.4%* | *2.8%* | *2.1%* | *-6.6%* | *-1.6%* | *-7.2%* | *6.3%* | *-2.3%* | *-1.3%* | *0.0%* | *0.0%* |
| **South America** | **4.4** | **3.9** | **4.4** | **4.7** | **4.5** | **3.2** | **3.8** | **3.9** | **4.0** | **4.2** | **4.6** | **1.1** | **1.2** | **1.3** | **1.1** | **4.8** | **4.9** | **5.1** | **5.2** |
| *% growth* | *-18.5%* | *-10.9%* | *12.7%* | *6.5%* | *-3.6%* | *-28.8%* | *16.9%* | *2.2%* | *3.1%* | *5.5%* | *10.6%* | *13.8%* | *9.0%* | *5.0%* | *-10.8%* | *3.5%* | *3.0%* | *3.0%* | *3.0%* |
| of which: Brazil | 2.5 | 2.0 | 2.2 | 2.5 | 2.7 | 2.0 | 2.0 | 2.0 | 2.2 | 2.5 | 2.6 | 0.6 | 0.7 | 0.7 | 0.7 | 2.6 | 2.7 | 2.8 | 2.9 |
| *% growth* | *-25.6%* | *-19.9%* | *9.7%* | *13.0%* | *8.2%* | *-26.6%* | *1.2%* | *-1.0%* | *11.4%* | *14.0%* | *2.4%* | *15.4%* | *16.6%* | *-1.4%* | *-11.2%* | *3.5%* | *3.0%* | *3.0%* | *3.0%* |
| **Asia** | **38.0** | **41.3** | **42.6** | **42.1** | **39.0** | **35.9** | **37.0** | **38.3** | **40.5** | **40.5** | **42.5** | **9.0** | **9.4** | **9.5** | **11.2** | **39.0** | **40.1** | **41.1** | **42.2** |
| *% growth* | *3.1%* | *8.7%* | *3.0%* | *-1.0%* | *-7.3%* | *-8.1%* | *3.0%* | *3.6%* | *5.7%* | *0.0%* | *5.0%* | *-10.2%* | *-7.2%* | *-9.9%* | *-5.7%* | *-8.1%* | *2.7%* | *2.6%* | *2.6%* |
| of which: Japan | 4.9 | 4.8 | 5.1 | 5.2 | 5.1 | 4.5 | 4.4 | 4.2 | 4.7 | 4.3 | 4.5 | 1.2 | 1.1 | 1.1 | 1.0 | 4.4 | 4.4 | 4.3 | 4.3 |
| *% growth* | *-9.6%* | *-2.0%* | *5.9%* | *0.5%* | *-1.3%* | *-11.5%* | *-3.3%* | *-3.7%* | *12.0%* | *-7.9%* | *3.4%* | *-2.9%* | *4.3%* | *4.1%* | *-6.0%* | *-2.0%* | *-1.0%* | *-1.0%* | *-1.0%* |
| of which: China | 24.4 | 27.6 | 28.0 | 27.0 | 24.7 | 23.7 | 23.9 | 24.1 | 25.5 | 25.9 | 27.3 | 4.8 | 5.5 | 5.5 | 7.4 | 23.2 | 23.7 | 24.2 | 24.7 |
| *% growth* | *5.8%* | *12.8%* | *1.6%* | *-3.5%* | *-8.6%* | *-4.2%* | *1.0%* | *0.9%* | *5.6%* | *1.8%* | *5.4%* | *-21.0%* | *-15.2%* | *-20.2%* | *-5.6%* | *-15.0%* | *2.2%* | *2.2%* | *2.2%* |
| of which: India | 3.2 | 3.4 | 3.7 | 4.0 | 3.5 | 2.8 | 3.5 | 4.4 | 4.7 | 4.9 | 5.2 | 1.5 | 1.4 | 1.3 | 1.4 | 5.6 | 6.0 | 6.3 | 6.7 |
| *% growth* | *7.0%* | *8.2%* | *9.1%* | *7.3%* | *-11.6%* | *-20.6%* | *26.5%* | *23.7%* | *7.4%* | *4.1%* | *5.4%* | *13.2%* | *14.6%* | *10.4%* | *-1.0%* | *9.0%* | *6.0%* | *6.0%* | *6.0%* |
| of which: South Korea | 1.8 | 1.8 | 1.8 | 1.8 | 1.7 | 1.8 | 1.7 | 1.6 | 1.7 | 1.6 | 1.6 | 0.4 | 0.4 | 0.4 | 0.4 | 1.7 | 1.7 | 1.7 | 1.7 |
| *% growth* | *11.4%* | *-1.0%* | *-1.6%* | *1.4%* | *-3.3%* | *6.9%* | *-8.7%* | *-2.4%* | *3.3%* | *-6.5%* | *3.3%* | *5.6%* | *0.4%* | *-10.4%* | *9.3%* | *1.0%* | *1.0%* | *1.0%* | *1.0%* |
| of which: ASEAN | 3.0 | 3.0 | 3.2 | 3.4 | 3.3 | 2.5 | 2.8 | 3.3 | 3.3 | 3.1 | 3.3 | 0.8 | 0.8 | 0.8 | 0.9 | 3.3 | 3.5 | 3.7 | 3.8 |
| *% growth* | *-4.9%* | *2.4%* | *5.8%* | *5.5%* | *-1.6%* | *-26.2%* | *12.0%* | *21.0%* | *-1.1%* | *-5.5%* | *4.3%* | *10.0%* | *5.0%* | *3.2%* | *-3.4%* | *0.3%* | *6.6%* | *4.7%* | *4.4%* |
| Other | 0.7 | 0.7 | 0.7 | 0.8 | 0.6 | 0.6 | 0.7 | 0.6 | 0.6 | 0.6 | 0.6 | 0.2 | 0.2 | 0.3 | 0.2 | 0.9 | 0.9 | 0.9 | 0.9 |
| *% growth* | *13.0%* | *-3.3%* | *7.4%* | *7.6%* | *-16.5%* | *-8.0%* | *19.0%* | *-12.8%* | *-4.2%* | *3.7%* | *2.3%* | *14.6%* | *9.4%* | *127.2%* | *4.2%* | *37.0%* | *3.0%* | *3.0%* | *3.0%* |
| **ROW** | **6.2** | **6.1** | **6.2** | **5.6** | **4.9** | **4.2** | **5.0** | **5.4** | **5.7** | **5.9** | **6.2** | **1.4** | **1.2** | **1.6** | **2.0** | **6.2** | **6.4** | **6.6** | **6.8** |
| *% growth* | *-3.2%* | *-2.3%* | *1.9%* | *-10.0%* | *-11.4%* | *-14.0%* | *18.6%* | *6.3%* | *6.0%* | *4.0%* | *5.1%* | *-15.7%* | *-16.7%* | *7.1%* | *24.0%* | *0.0%* | *3.0%* | *3.0%* | *3.0%* |
| **Total** | **88.2** | **92.2** | **94.5** | **93.7** | **89.5** | **77.2** | **80.3** | **79.0** | **86.7** | **88.7** | **92.0** | **20.7** | **21.7** | **21.9** | **24.5** | **88.8** | **90.2** | **91.9** | **93.6** |
| *% growth* | *2.0%* | *4.5%* | *2.5%* | *-0.9%* | *-4.5%* | *-13.7%* | *4.0%* | *-1.6%* | *9.8%* | *2.3%* | *3.7%* | *-5.7%* | *-3.6%* | *-4.2%* | *-0.9%* | *-3.5%* | *1.6%* | *1.9%* | *1.8%* |

*Source: UBS estimates*

# UBS forecasts on EV

| | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026E | 2027E | 2028E | 2029E | 2030E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Europe** | **1,393,744** | **2,331,037** | **2,690,005** | **3,153,215** | **3,074,476** | **4,075,583** | **5,502,037** | **6,492,404** | **7,466,264** | **8,212,891** | **9,855,469** |
| *growth y/y* | *136%* | *67%* | *15%* | *17%* | *-2%* | *33%* | *35%* | *18%* | *15%* | *10%* | *20%* |
| *% of LV sales* | *8.4%* | *13.9%* | *18.0%* | *17.6%* | *16.5%* | *21.7%* | *28.5%* | *33.1%* | *37.5%* | *40.7%* | *48.9%* |
| *% share of BEV from EV* | *55.9%* | *55.3%* | *62.2%* | *68.6%* | *69.1%* | *68.8%* | *65.0%* | *67.0%* | *68.0%* | *69.0%* | *70.0%* |
| BEV sales | 779,299 | 1,288,565 | 1,672,935 | 2,163,278 | 2,123,355 | 2,804,648 | 3,576,324 | 4,349,910 | 5,077,060 | 5,666,895 | 6,898,828 |
| PHEV sales | 614,445 | 1,042,472 | 1,017,070 | 989,937 | 951,121 | 1,270,935 | 1,925,713 | 2,142,493 | 2,389,205 | 2,545,996 | 2,956,641 |
| | | | | | | | | | | | |
| **US** | **320,971** | **616,152** | **983,376** | **1,465,968** | **1,632,548** | **1,564,823** | **1,200,000** | **1,311,400** | **1,422,000** | **1,896,000** | **2,528,000** |
| *growth y/y* | *-3%* | *92%* | *60%* | *49%* | *11%* | *-4%* | *-23%* | *9%* | *8%* | *33%* | *33%* |
| *% of LV sales* | *2.2%* | *4.1%* | *7.1%* | *9.4%* | *10.2%* | *9.6%* | *7.5%* | *8.3%* | *9.0%* | *12.0%* | *16.0%* |
| *% share of BEV from EV* | *81.1%* | *79.6%* | *82.4%* | *81.3%* | *80.5%* | *81.4%* | *80.0%* | *78.3%* | *77.8%* | *75.0%* | *75.0%* |
| BEV sales | 260,193 | 490,456 | 810,466 | 1,191,414 | 1,313,806 | 1,273,747 | 960,000 | 1,027,000 | 1,106,000 | 1,422,000 | 1,896,000 |
| PHEV sales | 60,778 | 125,696 | 172,910 | 274,554 | 318,742 | 291,076 | 240,000 | 284,400 | 316,000 | 474,000 | 632,000 |
| | | | | | | | | | | | |
| **China** | **1,213,823** | **3,170,344** | **6,072,308** | **8,059,213** | **11,341,035** | **13,398,261** | **14,738,087** | **16,211,896** | **17,539,159** | **19,315,106** | **21,275,403** |
| *growth y/y* | *14%* | *161%* | *92%* | *33%* | *41%* | *18%* | *10%* | *10%* | *8%* | *10%* | *10%* |
| *% of LV sales* | *5.1%* | *13.3%* | *25.2%* | *31.7%* | *43.8%* | *49.1%* | *63.5%* | *68.4%* | *72.4%* | *78.1%* | *85.1%* |
| *% share of BEV from EV* | *83.9%* | *83.2%* | *76.7%* | *67.2%* | *57.5%* | *63.1%* | *63.1%* | *65.1%* | *66.1%* | *67.1%* | *68.1%* |
| BEV sales | 1,017,968 | 2,638,241 | 4,655,935 | 5,412,710 | 6,519,158 | 8,447,911 | 9,299,733 | 10,546,210 | 11,585,017 | 12,951,222 | 14,478,400 |
| PHEV sales | 195,855 | 532,103 | 1,416,373 | 2,646,503 | 4,821,877 | 4,950,350 | 5,438,354 | 5,665,686 | 5,954,142 | 6,363,884 | 6,797,003 |
| | | | | | | | | | | | |
| **Japan** | **26,894** | **47,935** | **98,632** | **120,711** | **80,655** | **104,213** | **140,000** | **190,000** | **290,000** | **390,000** | **490,000** |
| *growth y/y* | *-28%* | *78%* | *106%* | *22%* | *-33%* | *29%* | *34%* | *36%* | *53%* | *34%* | *26%* |
| *% of LV sales* | *0.6%* | *1.0%* | *2.3%* | *2.6%* | *1.9%* | *2.3%* | *3.2%* | *4.4%* | *6.7%* | *9.1%* | *11.7%* |
| *% share of BEV from EV* | *57.9%* | *52.2%* | *61.9%* | *61.4%* | *57.7%* | *60.6%* | *64.3%* | *73.7%* | *65.5%* | *61.5%* | *59.2%* |
| BEV sales | 15,578 | 25,035 | 61,096 | 74,085 | 46,569 | 63,101 | 90,000 | 140,000 | 190,000 | 240,000 | 290,000 |
| PHEV sales | 11,316 | 22,900 | 37,536 | 46,626 | 34,086 | 41,112 | 50,000 | 50,000 | 100,000 | 150,000 | 200,000 |
| | | | | | | | | | | | |
| **ROW** | **289,568** | **608,532** | **679,679** | **1,382,893** | **1,571,286** | **1,557,120** | **1,868,544** | **2,242,253** | **2,690,703** | **3,094,309** | **3,558,455** |
| *growth y/y* | *13%* | *110%* | *12%* | *103%* | *14%* | *-1%* | *20%* | *20%* | *20%* | *15%* | *15%* |
| *% of LV sales* | *1.6%* | *3.0%* | *3.1%* | *6.0%* | *6.6%* | *6.2%* | *7.2%* | *8.4%* | *9.7%* | *10.8%* | *12.3%* |
| *% share of BEV from EV* | *70.0%* | *75.0%* | *80.0%* | *75.0%* | *75.0%* | *75.0%* | *70.0%* | *70.0%* | *70.0%* | *70.0%* | *70.0%* |
| BEV sales | 202,698 | 456,399 | 543,743 | 1,037,170 | 1,178,465 | 1,167,840 | 1,307,981 | 1,569,577 | 1,883,492 | 2,166,016 | 2,490,919 |
| PHEV sales | 86,870 | 152,133 | 135,936 | 345,723 | 392,822 | 389,280 | 560,563 | 672,676 | 807,211 | 928,293 | 1,067,537 |
| | | | | | | | | | | | |
| **Total** | **3,245,000** | **6,774,000** | **10,524,000** | **14,182,000** | **17,700,000** | **20,700,000** | **23,448,668** | **26,447,952** | **29,408,127** | **32,908,306** | **37,707,327** |
| ***% growth y/y*** | ***42.6%*** | ***108.8%*** | ***55.4%*** | ***34.8%*** | ***24.8%*** | ***16.9%*** | ***13.3%*** | ***12.8%*** | ***11.2%*** | ***11.9%*** | ***14.6%*** |
| ***% of global LV sales*** | ***4.2%*** | ***8.4%*** | ***13.3%*** | ***16.4%*** | ***20.0%*** | ***22.5%*** | ***26.4%*** | ***29.3%*** | ***32.0%*** | ***35.2%*** | ***40.1%*** |
| BEV | 2,275,736 | 4,898,696 | 7,744,175 | 9,878,657 | 11,181,353 | 13,757,247 | 15,234,038 | 17,632,698 | 19,841,569 | 22,446,133 | 26,054,147 |
| *BEV % of total LV sales* | *2.9%* | *6.1%* | *9.8%* | *11.4%* | *12.6%* | *15.0%* | *17.2%* | *19.5%* | *21.6%* | *24.0%* | *27.7%* |
| PHEV | 969,264 | 1,875,304 | 2,779,825 | 4,303,343 | 6,518,648 | 6,942,753 | 8,214,630 | 8,815,255 | 9,566,558 | 10,462,173 | 11,653,180 |
| *PHEV % of total LV sales* | *1.3%* | *2.3%* | *3.5%* | *5.0%* | *7.4%* | *7.5%* | *9.3%* | *9.8%* | *10.4%* | *11.2%* | *12.4%* |

*Source: UBS estimates*

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We value GPTC based on PE methodology.
Downside risks include: 1) slower-than-expected CoWoS capacity expansion; 2) competitors achieving technological advancements; 3) geopolitical uncertainty; and 4) worse-than-expected AI growth.

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|---|---|---|---|
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| **Neutral** | FSR is between -6% and 6% of the MRA. | 40% | 21% |
| **Sell** | FSR is > 6% below the MRA. | 6% | 21% |

Source: UBS. Rating allocations are as of 30 June 2026.
1:Percentage of companies under coverage globally within the 12-month rating category.
2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.

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**UBS Securities Pte. Ltd., Taipei Branch:** Christine Chen, CFA, Ryan Sun, Sunny Lin.

**Company Disclosures**

| Company Name | Reuters | 12-month rating | Price | Price date |
|---|---|---|---|---|
| **ASE Industrial**[16,28] | 3711.TW | Buy | NT$699.00 | 24 Sep 2026 |
| **ASMPT Limited**[28] | 0522.HK | Buy | HK$166.00 | 24 Sep 2026 |
| **ASPEED Technology Inc**[28] | 5274.TWO | Buy | NT$20,280 | 23 Sep 2026 |
| **Alchip Technologies**[28] | 3661.TW | Buy | NT$3,770 | 24 Sep 2026 |
| **All Ring Tech** | 6187.TWO | Buy | NT$1,205 | 23 Sep 2026 |
| **Chroma ATE**[28] | 2360.TW | Buy | NT$2,295 | 24 Sep 2026 |
| **GlobalWafers** | 6488.TWO | Buy | NT$950.00 | 23 Sep 2026 |
| **Grand Process Technology**[13] | 3131.TWO | Buy | NT$2,365 | 23 Sep 2026 |
| **Gudeng Precision Industrial** | 3680.TWO | Buy | NT$528.00 | 23 Sep 2026 |
| **Hon.Precision, Inc.** | 7769.TW | Buy | NT$5,670 | 24 Sep 2026 |
| **King Yuan Electronics**[28] | 2449.TW | Buy | NT$311.00 | 24 Sep 2026 |
| **MediaTek Inc.**[28] | 2454.TW | Buy | NT$5,285 | 24 Sep 2026 |
| **Powerchip Semiconductor Manufacturing**[2,4,6] | 6770.TW | Buy | NT$72.00 | 24 Sep 2026 |
| **Realtek Semiconductor Corp**[28] | 2379.TW | Neutral | NT$749.00 | 24 Sep 2026 |
| **Silergy Corporation**[13] | 6415.TW | Buy | NT$425.50 | 24 Sep 2026 |
| **Taiwan Semiconductor Manufacturing**[16] | 2330.TW | Buy | NT$2,475 | 24 Sep 2026 |
| **UMC**[16,28] | 2303.TW | Buy | NT$154.00 | 24 Sep 2026 |
| **Vanguard**[2,4,6] | 5347.TWO | Neutral | NT$173.00 | 23 Sep 2026 |

Source: UBS Global Research; LSEG Eikon. All prices as of local market close. Ratings in this table are the most current published ratings prior to this report. They may be more recent than the stock pricing date.

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