

Chapter 13: Test and Assembly

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9 Inside Beijing’s Chipmaking Offensive. Center for Security and Emerging Technology (CSET) · 14 July 2025 [A](https://cset.georgetown.edu/article/inside-beijings-chipmaking-offensive/)
cset.georgetown.edu/article/inside-beijings-chipmaking-offensive/

8 Investors Guide July 29, 2026. Advantest · 30 July 2026 · p. 12 [A](https://www.advantest.com/document/en/investors/ir-library/investors-guide/Investors_Guide_2607E.pdf#page=12) www.advantest.com/document/en/investors/ir-library/investors-guide/Investors_Guide_2607E.pdf#page=12

Test and Assembly

Testing finds bad chips before they go into an expensive package. Japan's Advantest took about 65 percent of 2025 spending on chip testers, by its own estimate.

IN PLAIN TERMS

Before a chip can be sold, a machine called a tester has to check that it works. While the chips are still on the wafer, thousands of needles press onto small metal pads on each one. The tester sends signals through the needles and reads what comes back, and any chip that fails goes no further. A modern AI accelerator is a dozen expensive pieces bonded into one package, and if one piece is bad, all of them are thrown away. So the industry now tests chips earlier, at higher temperatures and for longer, to make weak ones fail during testing before they reach a finished product. Two firms, Advantest in Japan and Teradyne in the United States, sell most of the testers.

IN SHORT

In a TrendForce ranking cited by CSET, four of the ten largest chip assembly and test contractors by 2024 revenue are headquartered in China ⁹. Georgetown's CSET, analyzing TechInsights data, finds that between 2019 and 2024 Chinese toolmakers gained 5 percentage points of share in test tools ⁹. Across assembly, test and packaging tools, they still lag significantly behind foreign suppliers ⁹. Advantest says that switching to another tester maker means rebuilding a customer's whole test setup, at significant extra cost ⁸.

⁹ Inside Beijing's Chipmaking Offensive. Center for Security and Emerging Technology (CSET) · 14 July 2025 [A](https://cset.georgetown.edu/article/inside-beijings-chipmaking-offensive/)
cset.georgetown.edu/article/inside-beijings-chipmaking-offensive/

⁸ Investors Guide July 29, 2026. Advantest · 30 July 2026 · p. 12 [A](https://www.advantest.com/document/en/investors/ir-library/investors-guide/Investors_Guide_2607E.pdf#page=12) www.advantest.com/document/en/investors/ir-library/investors-guide/Investors_Guide_2607E.pdf#page=12

CHOKEPOINT CARD		HIGH CONCENTRATION
		MODERATELY HARD TO SUBSTITUTE
CONCENTRATION	SUBSTITUTABILITY	
High	Moderate Rated on test tools, where Advantest held 62.7 percent of the market in 2025 and Teradyne 21.8 percent, by CSET's analysis of TechInsights data ¹ .	
		PRICE OR MARKET SIZE About \$9.0 billion market for chip testers in 2025, by Advantest's estimate ²
WHO LEADS	JP Advantest About 65% of the tester market in 2025, by its own estimate² US Teradyne \$2.52bn of semiconductor test revenue in 2025, service included³ TW ASE Ran 8,348 testers in Q2 2026, up from 6,797 a year earlier⁴ US Amkor \$6.71bn of 2025 revenue⁵ JP Disco 87% of the \$1.9bn market for dicing saws and grinders in 2025, on CSET's analysis of TechInsights data⁶	
WHERE IT IS MADE	TW Taiwan Taiwanese firms such as ASE and Powertech lead outsourced assembly and test JP Japan Advantest testers, Accretech and Tokyo Electron probers, Disco and Accretech dicing and grinding US United States Test equipment from Teradyne, FormFactor, Cohu and Aehr, and Amkor's planned Arizona packaging plant CN China Four of the top ten assembly and test firms by 2024 revenue, in a TrendForce ranking cited by CSET MY Malaysia Malaysia said in July 2026 that it ships 13% of the world's packaged chips	
WHY SUBSTITUTION IS POSSIBLE	Customers such as ASE already buy testers from both firms ⁷ . The barrier is the cost of switching, which Advantest says means rebuilding a customer's whole test setup ⁸ .	
WHERE CHINA STANDS Georgetown's CSET, analyzing TechInsights data, finds that between 2019 and 2024 Chinese toolmakers gained 5 percentage points of share in test tools and 4 points in fabrication tools built for advanced packaging ⁹ . But they lost share in bonding and other conventional assembly and packaging tools ⁹ .		WHERE THE US STANDS American firms held 23.5 percent of the market for test tools in 2025 and Japanese firms 63.0 percent, by CSET's analysis of TechInsights data ¹ . Amkor raised its planned investment in an Arizona packaging and test campus to \$7 billion in October 2025 ¹⁰ . In June 2026 it announced a long-term partnership with TSMC, which will buy packaging and test services from it in Arizona ¹¹ .

1 Supply Chain Explorer: Advanced Chips. Emerging Technology Observatory (ETO) · Accessed 20 October 2026 [\[A\]](#)
chipexplorer.eto.tech/?parentNode=N78&selectedNode=N120

2 Advantest, presentation notes for the FY2025 (year ended 31 March 2026) results briefing, 27 April 2026. Advantest · 27 April 2026 · p. 13 [\[A\]](#) www.advantest.com/document/en/investors/ir-library/result/JE_BIZ_260427_note.pdf#page=13

Turning silicon into a finished, packaged chip takes 1,000 to 1,500 steps, depending on how complex the chip is, the Semiconductor Industry Association estimated in 2025 ¹². Advantest's investor guide of July 2026 says test is the only step that puts electrical signals through the chip ¹³. The earlier stages of chipmaking make dies, the individual chips on a wafer. The back end of the industry, assembly and test, checks which of them work and puts the good ones into packages.

How it works

Each round of test catches failures the round before it cannot see.

- **Wafer sort.** Thousands of needles land on each die while it is still on the wafer. A tester sends in test patterns and checks the answers, and dies that fail go no further.

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- 2 Advantest, presentation notes for the FY2025 (year ended 31 March 2026) results briefing, 27 April 2026. Advantest · 27 April 2026 · p. 13 [\[A\]](http://www.advantest.com/document/en/investors/ir-library/result/JE_BIZ_260427_note.pdf#page=13)
- 3 TERADYNE, INC, Form 10-K annual report for the period ended 2025-12-31 (10-K). U.S. Securities and Exchange Commission (filing by TERADYNE, INC) · 19 February 2026 [\[A\]](http://www.sec.gov/Archives/edgar/data/97210/000119312526059002/ter-20251231.htm)
- 4 ASE Technology Holding Co., Ltd., Form 6-K report of foreign private issuer for the period ended 2026-07-30. U.S. Securities and Exchange Commission (filing by ASE Technology Holding Co., Ltd.) · 30 July 2026 [\[A\]](http://www.sec.gov/Archives/edgar/data/1122411/000095010326011351/dp250868_6k.htm)
- 5 AMKOR TECHNOLOGY, INC., Form 8-K current report for the period ended 2026-02-09 (8-K). U.S. Securities and Exchange Commission (filing by AMKOR TECHNOLOGY, INC.) · 9 February 2026 [\[A\]](http://www.sec.gov/Archives/edgar/data/1047127/000104712726000007/amkr123125erex-991.htm)
- 6 Supply Chain Explorer: Advanced Chips. Emerging Technology Observatory (ETO) · Accessed 9 September 2026 [\[A\]](http://chipexplorer.eto.tech/?parentNode=N69&selectedNode=N71)
- 7 ASE Technology Holding Co., Ltd., Form 20-F annual report for the period ended 2025-12-31. U.S. Securities and Exchange Commission (filing by ASE Technology Holding Co., Ltd.) · 1 April 2026 [\[A\]](http://www.sec.gov/Archives/edgar/data/1122411/000119312526135585/d50802d20f.htm)
- 8 Investors Guide July 29, 2026. Advantest · 30 July 2026 · p. 12 [\[A\]](http://www.advantest.com/document/en/investors/ir-library/investors-guide/Investors_Guide_2607E.pdf#page=12)
- 9 Inside Beijing's Chipmaking Offensive. Center for Security and Emerging Technology (CSET) · 14 July 2025 [\[A\]](http://cset.georgetown.edu/article/inside-beijings-chipmaking-offensive/)
- 10 Supply Chain Explorer: Advanced Chips. Emerging Technology Observatory (ETO) · Accessed 20 October 2026 [\[A\]](http://chipexplorer.eto.tech/?parentNode=N78&selectedNode=N120)
- 10 Amkor Technology Breaks Ground on New Semiconductor Advanced Packaging and Test Campus in Arizona; Expands Investment to \$7 Billion. Amkor Technology · 6 October 2025 [\[A\]](http://ir.amkor.com/news-releases/news-release-details/amkor-technology-breaks-ground-new-semiconductor-advanced)
- 11 TSMC and Amkor Technology Announce Long Term Partnership to Accelerate Advanced Packaging in the United States. Amkor Technology · 16 June 2026 [\[A\]](http://ir.amkor.com/news-releases/news-release-details/tsmc-and-amkor-technology-announce-long-term-partnership)
- 12 Testimony of David Isaacs, Semiconductor Industry Association, hearing on "Trade in Critical Supply Chains". U.S. Senate Committee on Finance · 14 May 2025 · p. 2 [\[A\]](http://www.finance.senate.gov/download/051425-isaacs-testimony&download=1#page=2)
- 13 Investors Guide July 29, 2026. Advantest · 30 July 2026 · p. 10 [\[A\]](http://www.advantest.com/document/en/investors/ir-library/investors-guide/Investors_Guide_2607E.pdf#page=10)

- **Burn-in.** The part runs hot and at raised voltage for minutes to days, on the wafer or in the package, so that early-life failures happen in the factory, before the part ships ¹⁴.
- **Final test.** The tester checks the packaged part again, because packaging adds failures of its own.
- **System-level test.** The finished part sits in a socket and runs something close to a real workload, because some failures appear only when everything runs at once.

As the parts in a package grow more valuable, finding a bad die before packaging matters more ¹⁵. Aehr's wafer-level burn-in systems look for early-life and hidden failures before dies are cut from the wafer ¹⁵. Catching those failures early lowers the risk of packaging high-bandwidth memory and an expensive substrate with a processor that may later fail ¹⁵. Aehr says its lead AI customer is moving all burn-in for its AI accelerators from the system level to the wafer ¹⁶. The FOX-XP systems that customer ordered from Aehr in August 2026 each burn in nine 300 mm wafers at a time ¹⁵.

Variants and trade-offs

Wafer sort and known-good die

The hard part of wafer sort is the probe card, the circuit board that holds the needles. FormFactor says the high-frequency capability of its probe cards lets it compete favorably in testing high-bandwidth memory, a stack of eight, twelve or sixteen memory dies ¹⁷. For a large logic die every needle must sit in the same plane, survive repeated touchdowns without drifting, and do it hot. Each card is built for one chip design, so every new design needs a new card and a new qualification.

Final test, burn-in and system-level test

The bigger the package, the more one bad die can cost. TSMC has told investors that its CoWoS packaging roadmap runs beyond 14 times the area a

¹⁴ AEHR TEST SYSTEMS, Form 10-K annual report for the period ended 2026-05-29. U.S. Securities and Exchange Commission (filing by AEHR TEST SYSTEMS) · 27 July 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1040470/000165495426006919/aeht10k.htm) www.sec.gov/Archives/edgar/data/1040470/000165495426006919/aeht10k.htm

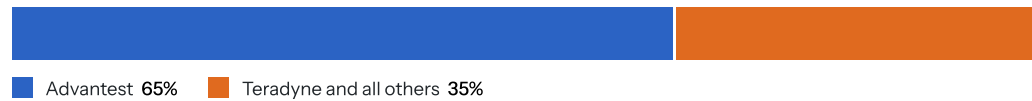
¹⁵ Aehr Receives \$22 Million Follow-On Order for AI Processor Wafer-Level Burn-In Systems. Aehr Test Systems · 12 August 2026 [\[A\]](https://www.aehr.com/2026/08/aeht-receives-22-million-follow-on-order-for-ai-processor-wafer-level-burn-in-systems/) www.aehr.com/2026/08/aeht-receives-22-million-follow-on-order-for-ai-processor-wafer-level-burn-in-systems/

¹⁶ Aehr Test Systems Reports Fiscal 2026 Fourth Quarter and Full Year Financial Results with Record Quarterly Bookings and \$100 Million Effective Backlog. Aehr Test Systems · 14 July 2026 [\[A\]](https://www.aehr.com/2026/07/aeht-test-systems-reports-fiscal-2026-fourth-quarter-and-full-year-financial-results-with-record-quarterly-bookings-and-100-million-effective-backlog/) www.aehr.com/2026/07/aeht-test-systems-reports-fiscal-2026-fourth-quarter-and-full-year-financial-results-with-record-quarterly-bookings-and-100-million-effective-backlog/

¹⁷ FORMFACTOR INC, Form 10-K annual report for the period ended 2025-12-27 (10-K). U.S. Securities and Exchange Commission (filing by FORMFACTOR INC) · 20 February 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1039399/000103939926000009/form-20251227.htm) www.sec.gov/Archives/edgar/data/1039399/000103939926000009/form-20251227.htm

lithography machine can print in one shot ¹⁸. A die that fails after assembly wastes the memory and substrate joined to it ¹⁵. ASE, a Taiwanese assembly and test contractor, ran 6,797 testers in the second quarter of 2025 and 8,348 a year later ⁴.

Automated test equipment: share of the ~\$9.0bn tester market, 2025 %



Source: Advantest FY2025 results briefing, April 2026

Who makes it

Advantest puts its own share at about 65 percent of an estimated \$9.0 billion tester market in 2025 ². Its share of system-on-chip (SoC) testers, the machines that test processors and other non-memory chips, rose about ten points in a year to 66 percent ². It held about 60 percent of memory test ².

Teradyne, Advantest's main rival, took \$2.52 billion of semiconductor test revenue in 2025, service included ³. Of that, \$1.89 billion came from SoC testers and \$505 million from memory testers ³. Teradyne's total revenue grew 13 percent to \$3.19 billion in 2025, with fourth-quarter revenue up 44 percent on AI demand ¹⁹.

Georgetown University's CSET, analyzing TechInsights data, gives Advantest 62.7 percent of the \$9.1 billion market for test tools in 2025 and Teradyne 21.8 percent ¹. Japanese firms held 63.0 percent of that market and American firms 23.5 percent ¹.

¹⁸ Q2 2026 Taiwan Semiconductor Manufacturing Co Ltd Earnings Call (Chinese, English) — edited transcript. LSEG StreetEvents (transcript of a TSMC earnings call), via TSMC · 16 July 2026 · p. 16 [\[A\]](https://investor.tsmc.com/english/encrypt/files/encrypt_file/reports/2026-08/3e494f0c14dd0890f897aa044415e21d93486cc4/TSMC%20Q26%20Transcript.pdf#page=16)

¹⁵ Aehr Receives \$22 Million Follow-On Order for AI Processor Wafer-Level Burn-In Systems. Aehr Test Systems · 12 August 2026 [\[A\]](https://www.aehr.com/2026/08/aehr-receives-22-million-follow-on-order-for-ai-processor-wafer-level-burn-in-systems/)

⁴ ASE Technology Holding Co., Ltd., Form 6-K report of foreign private issuer for the period ended 2026-07-30. U.S. Securities and Exchange Commission (filing by ASE Technology Holding Co., Ltd.) · 30 July 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1122411/000095010326011351/dp250868_6k.htm)

² Advantest, presentation notes for the FY2025 (year ended 31 March 2026) results briefing, 27 April 2026. Advantest · 27 April 2026 · p. 13 [\[A\]](https://www.advantest.com/document/en/investors/ir-library/result/JE_BIZ_260427_note.pdf#page=13)

³ TERADYNE, INC, Form 10-K annual report for the period ended 2025-12-31 (10-K). U.S. Securities and Exchange Commission (filing by TERADYNE, INC) · 19 February 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/97210/000119312526059002/ter-20251231.htm)

¹⁹ Teradyne Reports Fourth Quarter and Full Year 2025 Results. Teradyne · 2 February 2026 [\[A\]](https://investors.teradyne.com/news-events/press-releases/detail/433/teradyne-reports-fourth-quarter-and-full-year-2025-results)

¹ Supply Chain Explorer: Advanced Chips. Emerging Technology Observatory (ETO) · Accessed 20 October 2026 [\[A\]](https://chipexplorer.eto.tech/?parentNode=N78&selectedNode=N120)

Where the tester money went in calendar 2025 \$BN



Source: Advantest FY2025 results briefing, April 2026

The rest of the test and assembly equipment market splits into niches, each with its own suppliers.

- **Probe cards.** FormFactor took \$785.0 million of revenue in fiscal 2025, most of it from probe cards ¹⁷. Technoprobe's revenue grew 15.7 percent to EUR 628.4 million in 2025, about 38 percent of it from AI ²⁰. It aims to double its manufacturing capacity by the end of 2027 ²⁰.
- **Probers,** the machines that move each wafer under the probe card and keep it at a set temperature. Tokyo Seimitsu, which sells under the Accretech name, says its own research gives it the largest global share in probers ²¹. Tokyo Electron makes probers too ²². CSET's analysis of TechInsights data gives Tokyo Electron 19.9 percent and Accretech 17.1 percent of the \$2.9 billion market for handlers and probers in 2025 ²³.

¹⁷ FORMFACTOR INC, Form 10-K annual report for the period ended 2025-12-27 (10-K). U.S. Securities and Exchange Commission (filing by FORMFACTOR INC) · 20 February 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1039399/000103939926000009/form-20251227.htm)

²⁰ Technoprobe, press release: the Board of Directors approves the draft statutory and consolidated annual report as at 31 December 2025. Technoprobe · 18 March 2026 · p. 1 [\[A\]](https://technoprobe.com/wp-content/uploads/2026/03/PR-FY-2025_.pdf#page=1)

²¹ Tokyo Seimitsu Integrated Report 2025. Accretech · 3 December 2025 · p. 6 [\[A\]](https://www.accretech.com/en/ir/index/main/00/teaserItems1/00/linkList/02/link/IntegratedReport2025_E.pdf#page=6)

²² Precio™ Series. Tokyo Electron · Accessed 9 September 2026 [\[A\]](https://www.tel.com/product/precio.html)

²³ Supply Chain Explorer: Advanced Chips. Emerging Technology Observatory (ETO) · Accessed 20 October 2026 [\[A\]](https://chipexplorer.eto.tech/?parentNode=N78&selectedNode=N83)

- **Handlers and burn-in**, the machines that feed packaged parts into a tester and hold them at a set temperature, and the systems that run burn-in. Cohu took \$453.0 million of revenue in fiscal 2025 ²⁴. Aehr's revenue was \$50.0 million in fiscal 2026, but it booked a record \$60.7 million of orders in the fourth quarter alone ¹⁶. It expects revenue of \$130 million to \$150 million in fiscal 2027 ¹⁶.
- **Dicing and grinding**. Dicing saws cut wafers into dies, and grinders thin them. CSET's analysis of TechInsights data found that in 2025 Disco held 87 percent and Accretech 8.1 percent of the \$1.9 billion market for these machines ⁶. In December 2025 Disco announced a saw that cuts panels as large as 400 by 400 mm into individual packages ²⁵.
- **Bonding**. Kulicke and Soffa took \$654.1 million of revenue in fiscal 2025 ²⁶. Besi's second-quarter 2026 revenue rose 68.7 percent to EUR 249.9 million on hybrid bonding and data center demand ²⁷.

Thermocompression bonders use heat and force to press memory dies into a stack and to attach chiplets to substrates. ASMPT says it remained the leader in that market in 2025 and aims for a 35 to 40 percent share ²⁸. In its 2025 results it said it expects the market to reach \$1.6 billion by 2028 ²⁸. In July 2026 ASMPT announced new bulk orders for more than 50 of its chip-to-substrate bonders for AI chips, from outsourced assembly and test firms ²⁹. Hanmi Semiconductor in Korea also sells thermocompression bonders, including dual bonders for high-bandwidth memory ³⁰. See Memory and HBM.

24 COHU, INC., Form 10-K annual report for the period ended 2025-12-27 (10-K). U.S. Securities and Exchange Commission (filing by COHU, INC.) · 17 February 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/21535/000143774926004339/cohu20251227_10k.htm) www.sec.gov/Archives/edgar/data/21535/000143774926004339/cohu20251227_10k.htm

16 Aehr Test Systems Reports Fiscal 2026 Fourth Quarter and Full Year Financial Results with Record Quarterly Bookings and \$100 Million Effective Backlog. Aehr Test Systems · 14 July 2026 [\[A\]](https://www.aehr.com/2026/07/aehr-test-systems-reports-fiscal-2026-fourth-quarter-and-full-year-financial-results-with-record-quarterly-bookings-and-100-million-effective-backlog/) www.aehr.com/2026/07/aehr-test-systems-reports-fiscal-2026-fourth-quarter-and-full-year-financial-results-with-record-quarterly-bookings-and-100-million-effective-backlog/

6 Supply Chain Explorer: Advanced Chips. Emerging Technology Observatory (ETO) · Accessed 9 September 2026 [\[A\]](https://chipexplorer.eto.tech/?parentNode=N69&selectedNode=N71) chipexplorer.eto.tech/?parentNode=N69&selectedNode=N71

25 DISCO develops the DFD6080 fully automatic dicing saw for work sizes up to 400 mm square (最大400mm角のパッケージ切断に対応したダイシングソー「DFD6080」を開発). DISCO Corporation · 15 December 2025 [\[A\]](https://www.disco.co.jp/eg/news/corp/20251215_1.html) www.disco.co.jp/eg/news/corp/20251215_1.html

26 KULICKE AND SOFFA INDUSTRIES, INC., Form 8-K, exhibit 99.1: results for the fourth quarter and fiscal 2025 (8-K). U.S. Securities and Exchange Commission (filing by KULICKE AND SOFFA INDUSTRIES, INC.) · 19 November 2025 [\[A\]](https://www.sec.gov/Archives/edgar/data/56978/000005697825000078/ex991liveq42025.htm) www.sec.gov/Archives/edgar/data/56978/000005697825000078/ex991liveq42025.htm

27 BE Semiconductor Industries N.V. Announces Q2-26 and H1-26 Results. BE Semiconductor Industries (Besi) · 23 July 2026 [\[A\]](https://www.besi.com/investor-relations/press-releases/2025/details-1/be-semiconductor-industries-nv-announces-q2-26-and-h1-26-results/) www.besi.com/investor-relations/press-releases/2025/details-1/be-semiconductor-industries-nv-announces-q2-26-and-h1-26-results/

28 ASMPT Announces 2025 Annual Results AI-Driven Structural Growth Underpins Group Performance. ASMPT · 4 March 2026 [\[A\]](https://www.asmpt.com/en/investor-relations/news-events/asmpt-announces-2025-annual-results/) www.asmpt.com/en/investor-relations/news-events/asmpt-announces-2025-annual-results/

29 ASMPT Secures Significant Wins for More than 50 Chip-to-Substrate Thermo-Compression Bonding Tools. ASMPT · 29 July 2026 [\[A\]](https://www.asmpt.com/en/investor-relations/news-events/asmpt-secures-significant-wins/) www.asmpt.com/en/investor-relations/news-events/asmpt-secures-significant-wins/

30 Hanmi Semiconductor, products page. Hanmi Semiconductor · Accessed 9 September 2026 [\[A\]](https://www.hanmisemi.com/en/product/index.html) www.hanmisemi.com/en/product/index.html

The back end's geography

Taiwanese firms lead outsourced assembly and test, the OSAT business, and Chinese firms are large challengers. ASE billed \$20,573.4 million in 2025 ⁷. Packaging made up about 48 percent of that, testing about 11 percent and its electronics manufacturing arm about 40 percent ³¹. In a TrendForce ranking that CSET cites, four of the top ten OSATs by 2024 revenue are headquartered in China ⁹.

Malaysia's investment agency said in July 2026 that the country ships 13 percent of the world's packaged chips ³². It said a consortium of five Malaysian firms aims to help the country capture 7 percent of world advanced packaging shipments by 2035 ³². A 2024 study by the Semiconductor Industry Association and Boston Consulting Group gave Malaysia 7 percent of global assembly, test and packaging capacity in 2022, the largest share in Southeast Asia ³³. The study measured capacity by factory floor space at contractors and chipmakers' own plants ³⁴.

ASE spent \$2.7 billion on machinery and \$1.4 billion on buildings, facilities and automation in the first half of 2026 ³⁵. It says revenue from leading-edge advanced

7 ASE Technology Holding Co., Ltd., Form 20-F annual report for the period ended 2025-12-31. U.S. Securities and Exchange Commission (filing by ASE Technology Holding Co., Ltd.) · 1 April 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1122411/000119312526135585/d50802d20f.htm)
www.sec.gov/Archives/edgar/data/1122411/000119312526135585/d50802d20f.htm

31 ASE Technology Holding Co., Ltd., Form 6-K report of foreign private issuer for the period ended 2026-02-05. U.S. Securities and Exchange Commission (filing by ASE Technology Holding Co., Ltd.) · 5 February 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1122411/000095010326001661/dp241159_6k.htm)
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32 Advanced Packaging: How Malaysia is Packaging the Future of AI. Malaysian Investment Development Authority · 1 July 2026 [\[A\]](https://www.mida.gov.my/advanced-packaging-how-malaysia-is-packaging-the-future-of-ai/)
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33 Emerging Resilience in the Semiconductor Supply Chain. Boston Consulting Group and Semiconductor Industry Association · May 2024 · p. 21 [\[A\]](https://www.semiconductors.org/wp-content/uploads/2024/05/Report_Emerging-Resilience-in-the-Semiconductor-Supply-Chain.pdf#page=21)
www.semiconductors.org/wp-content/uploads/2024/05/Report_Emerging-Resilience-in-the-Semiconductor-Supply-Chain.pdf#page=21

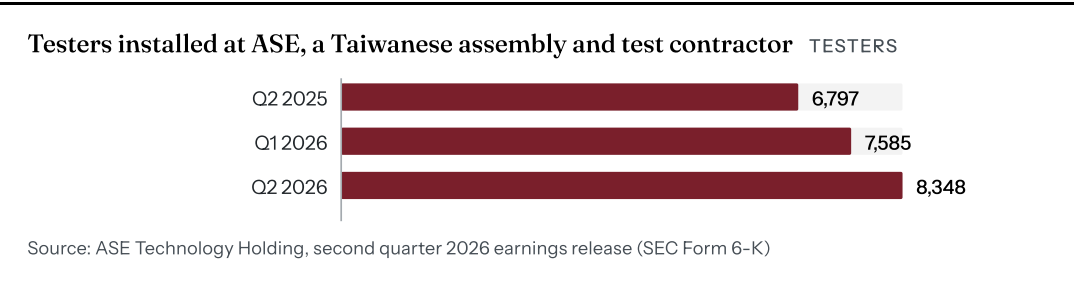
34 Emerging Resilience in the Semiconductor Supply Chain. Boston Consulting Group and Semiconductor Industry Association · May 2024 · p. 35 [\[A\]](https://www.semiconductors.org/wp-content/uploads/2024/05/Report_Emerging-Resilience-in-the-Semiconductor-Supply-Chain.pdf#page=35)
www.semiconductors.org/wp-content/uploads/2024/05/Report_Emerging-Resilience-in-the-Semiconductor-Supply-Chain.pdf#page=35

35 ASE Technology Holding Co., Ltd., Form 6-K report of foreign private issuer for the period ended 2026-07-30. U.S. Securities and Exchange Commission (filing by ASE Technology Holding Co., Ltd.) · 30 July 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1122411/000095010326011353/dp250875_6k.htm)
www.sec.gov/Archives/edgar/data/1122411/000095010326011353/dp250875_6k.htm

packaging is running ahead of its \$3.5 billion forecast for the year ³⁵. Powertech, another Taiwanese assembly and test firm, aims to run the first panel-level packaging line for AI chips in 2027 ³⁶.

Amkor, an American assembly and test contractor, took \$6.71 billion of revenue in 2025 ⁵. Its revenue in the second quarter of 2026 alone was \$1.90 billion, up 26 percent year on year ³⁷. It has raised the planned investment in its Arizona campus to \$7 billion ¹⁰.

In October 2024 TSMC and Amkor signed a memorandum of understanding for TSMC to buy packaging and test services from Amkor's planned plant in Peoria, Arizona ³⁸. TSMC would use those services for its customers, especially those using its Phoenix fabs ³⁸. The two announced a long-term partnership in June 2026 ¹¹.



The chokepoint

Advantest says that switching to another tester maker means rebuilding the whole test setup used for development, evaluation and mass production, at

35 ASE Technology Holding Co., Ltd., Form 6-K report of foreign private issuer for the period ended 2026-07-30. U.S. Securities and Exchange Commission (filing by ASE Technology Holding Co., Ltd.) · 30 July 2026 [A](https://www.sec.gov/Archives/edgar/data/1122411/000095010326011353/dp250875_6k.htm)

36 Powertech eyes world's first panel-level packaging for AI chips in 2027. Nikkei Asia · 27 August 2026 [B](https://asia.nikkei.com/business/tech/semiconductors/powertech-eyes-world-s-first-panel-level-packaging-for-ai-chips-in-2027)

5 AMKOR TECHNOLOGY, INC., Form 8-K current report for the period ended 2026-02-09 (8-K). U.S. Securities and Exchange Commission (filing by AMKOR TECHNOLOGY, INC.) · 9 February 2026 [A](https://www.sec.gov/Archives/edgar/data/1047127/000104712726000007/amkr123125erex-991.htm)

37 AMKOR TECHNOLOGY, INC., Form 8-K current report for the period ended 2026-07-27 (8-K). U.S. Securities and Exchange Commission (filing by AMKOR TECHNOLOGY, INC.) · 27 July 2026 [A](https://www.sec.gov/Archives/edgar/data/1047127/000104712726000043/amkr6302026erex-991.htm)

10 Amkor Technology Breaks Ground on New Semiconductor Advanced Packaging and Test Campus in Arizona; Expands Investment to \$7 Billion. Amkor Technology · 6 October 2025 [A](https://ir.amkor.com/news-releases/news-release-details/amkor-technology-breaks-ground-new-semiconductor-advanced)

38 Amkor and TSMC to Expand Partnership and Collaborate on Advanced Packaging in Arizona. TSMC · 4 October 2024 [A](https://pr.tsmc.com/english/news/3174)

11 TSMC and Amkor Technology Announce Long Term Partnership to Accelerate Advanced Packaging in the United States. Amkor Technology · 16 June 2026 [A](https://ir.amkor.com/news-releases/news-release-details/tsmc-and-amkor-technology-announce-long-term-partnership)

significant extra cost to the customer ⁸. Still, ASE says it buys testers with similar functions from different makers, including Teradyne and Advantest ⁷.

CSET, analyzing TechInsights data, finds that between 2019 and 2024 Chinese toolmakers gained 5 percentage points of share in test tools and 4 points in fabrication tools built for advanced packaging ⁹. But they lost share in bonding and other conventional assembly and packaging tools ⁹. They still lag significantly behind foreign suppliers ⁹.

ASE's packaging business took \$9,829.2 million from outside customers in 2025, and its testing business \$2,292.0 million ⁷. Amkor took \$6.71 billion ⁵. Global semiconductor sales that year were \$791.7 billion ³⁹.

THREE THINGS TO REMEMBER

- Chips are tested early and often because one bad chip can ruin a package of expensive ones.
 - Advantest and Teradyne account for most spending on chip testers.
 - In a TrendForce ranking cited by CSET, four of the top ten outsourced assembly and test firms by 2024 revenue are based in China.
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Made by **Yashvardhan Sharma** with Claude. Corrections and questions: contact@chipsupplychain.org.

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⁸ Investors Guide July 29, 2026. Advantest · 30 July 2026 · p. 12 [\[A\]](https://www.advantest.com/document/en/investors/ir-library/investors-guide/Investors_Guide_2607E.pdf#page=12) www.advantest.com/document/en/investors/ir-library/investors-guide/Investors_Guide_2607E.pdf#page=12

⁷ ASE Technology Holding Co., Ltd., Form 20-F annual report for the period ended 2025-12-31. U.S. Securities and Exchange Commission (filing by ASE Technology Holding Co., Ltd.) · 1 April 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1122411/000119312526135585/d50802d20f.htm) www.sec.gov/Archives/edgar/data/1122411/000119312526135585/d50802d20f.htm

⁹ Inside Beijing's Chipmaking Offensive. Center for Security and Emerging Technology (CSET) · 14 July 2025 [\[A\]](https://cset.georgetown.edu/article/inside-beijings-chipmaking-offensive/) cset.georgetown.edu/article/inside-beijings-chipmaking-offensive/

⁵ AMKOR TECHNOLOGY, INC., Form 8-K current report for the period ended 2026-02-09 (8-K). U.S. Securities and Exchange Commission (filing by AMKOR TECHNOLOGY, INC.) · 9 February 2026 [\[A\]](https://www.sec.gov/Archives/edgar/data/1047127/000104712726000007/amkr123125erex-991.htm) www.sec.gov/Archives/edgar/data/1047127/000104712726000007/amkr123125erex-991.htm

³⁹ Global Annual Semiconductor Sales Increase 25.6% to \$791.7 Billion in 2025. Semiconductor Industry Association · 6 February 2026 [\[A\]](https://www.semiconductors.org/global-annual-semiconductor-sales-increase-25-6-to-791-7-billion-in-2025/) www.semiconductors.org/global-annual-semiconductor-sales-increase-25-6-to-791-7-billion-in-2025/

A company filings, governments, standards bodies, universities and research institutions; **B** SemiAnalysis, Reuters, the Financial Times and Nikkei Asia.

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