



ChinaTM

Virtual Event

November 1 – 4, 2022

Virtual Event

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TestConX China 2022

Cost of Test – Impact of TCS

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TechInsights



Virtual ▪ November 1-4, 2022



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- Introduction to Test Connectivity Systems
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- Memory & Non-Memory Test Market

ECONOMIC ENVIRONMENT

Macro Concerns against Continued Growth

1. Inflation...Feds increasing rates

- Which means reducing money supply

2. China's shut down because COVID-19

- Permanent damage to supply chain reliability/security

3. War in Ukraine

- Energy shortage in short term
- Mis-directing resources away from growth driving initiatives/industries

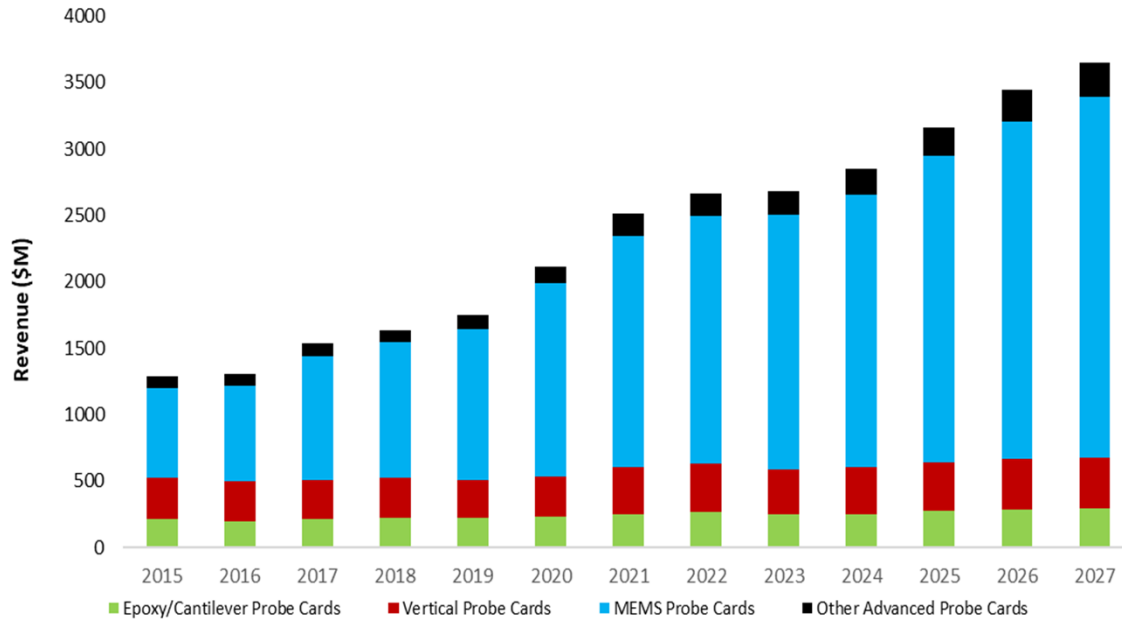
4. U.S Export Controls to China

- Advanced chips and equipment

TEST CONNECTIVITY SYSTEM

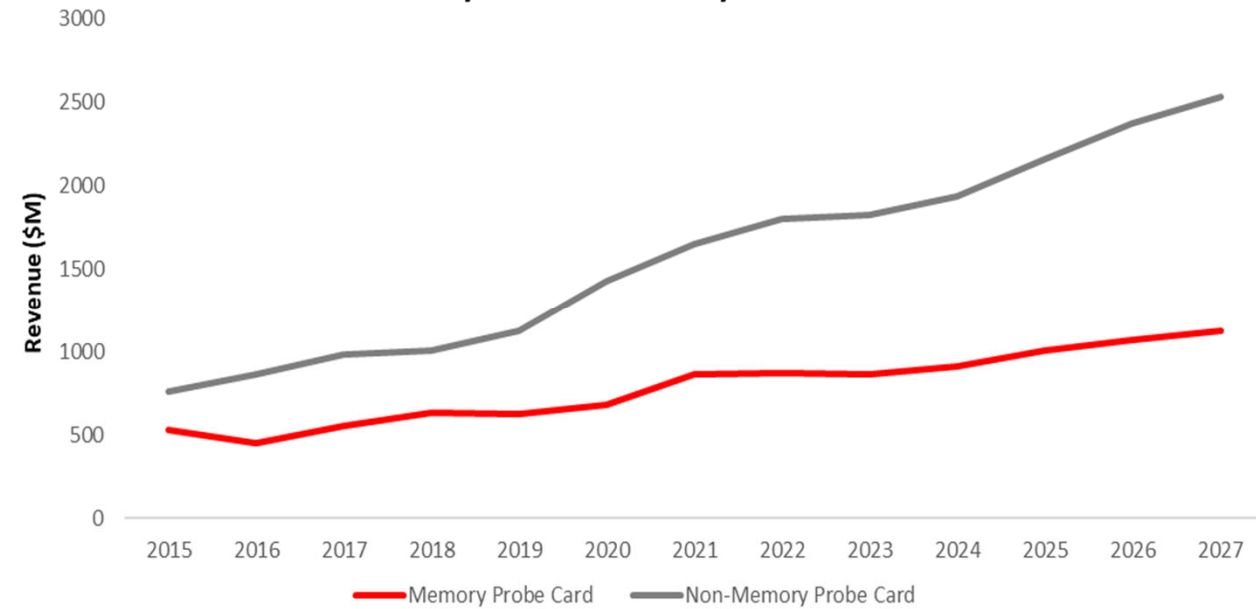
Probe Card Revenue & Forecast

Probe Card Revenue by Application



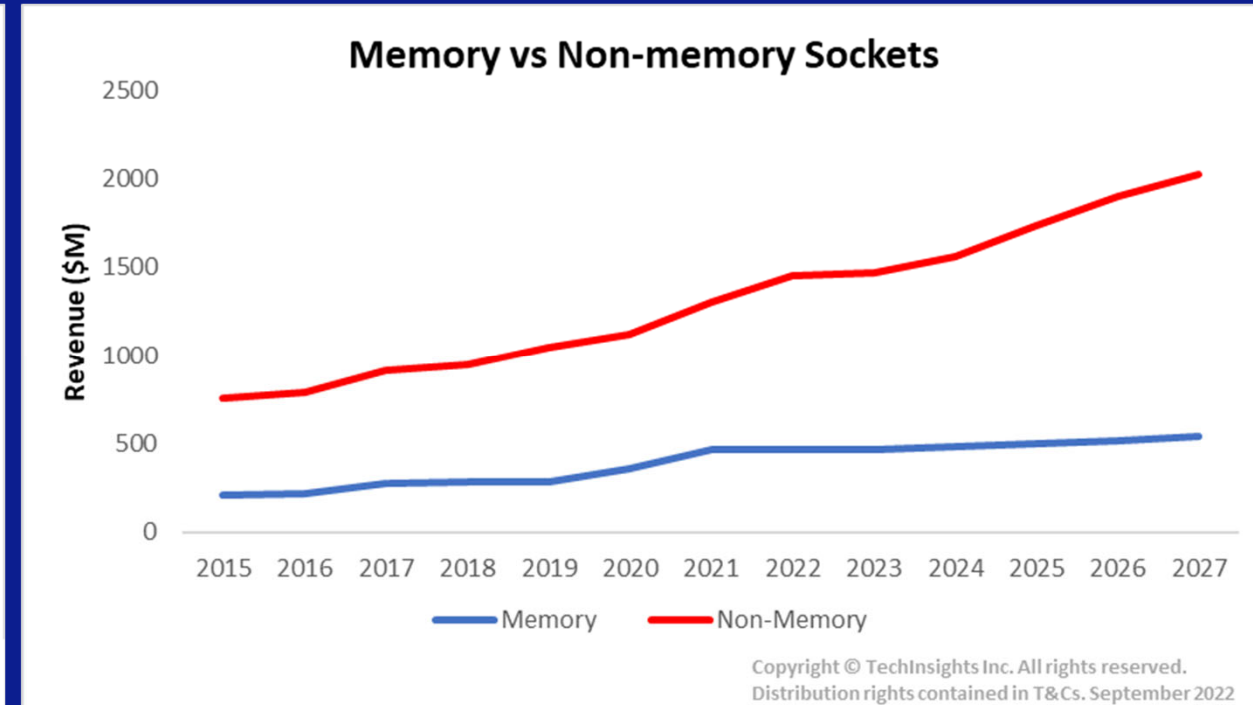
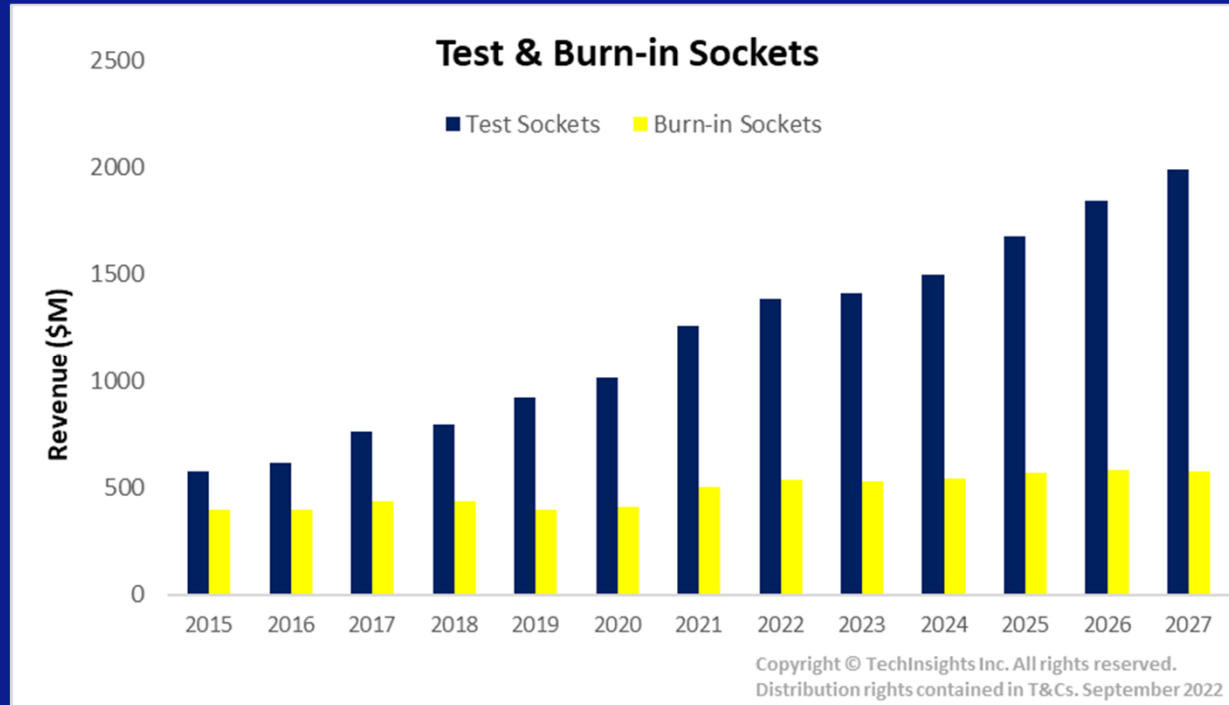
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Memory Vs. Non-Memory Probe Card



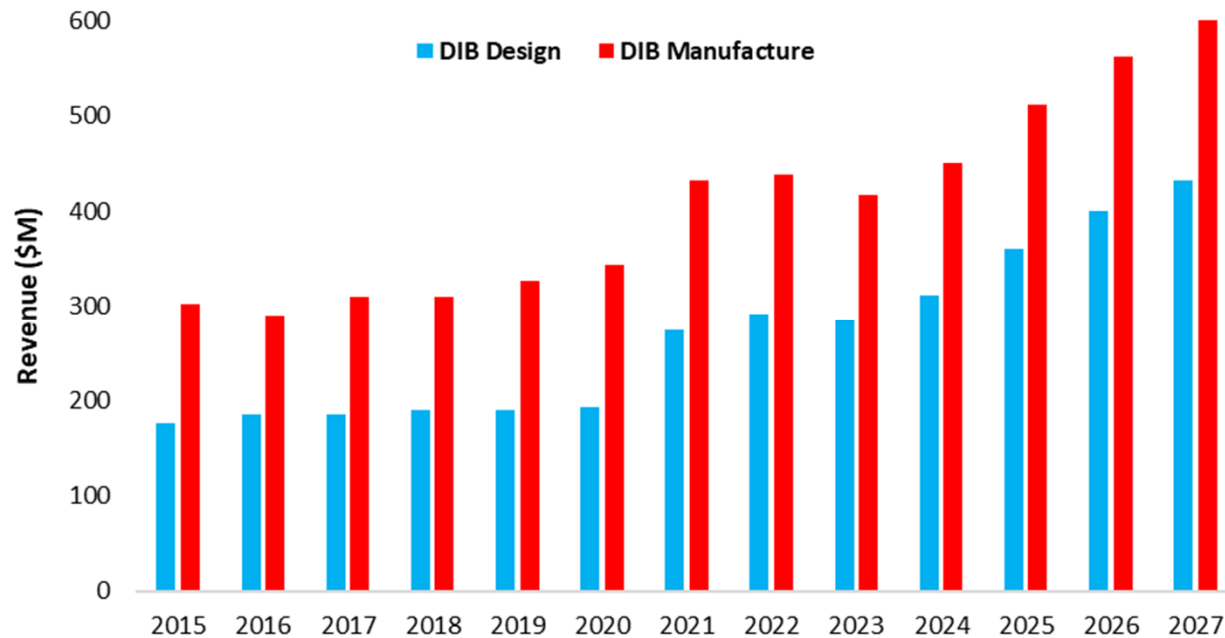
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Test & Burn-in Socket Revenue & Forecast



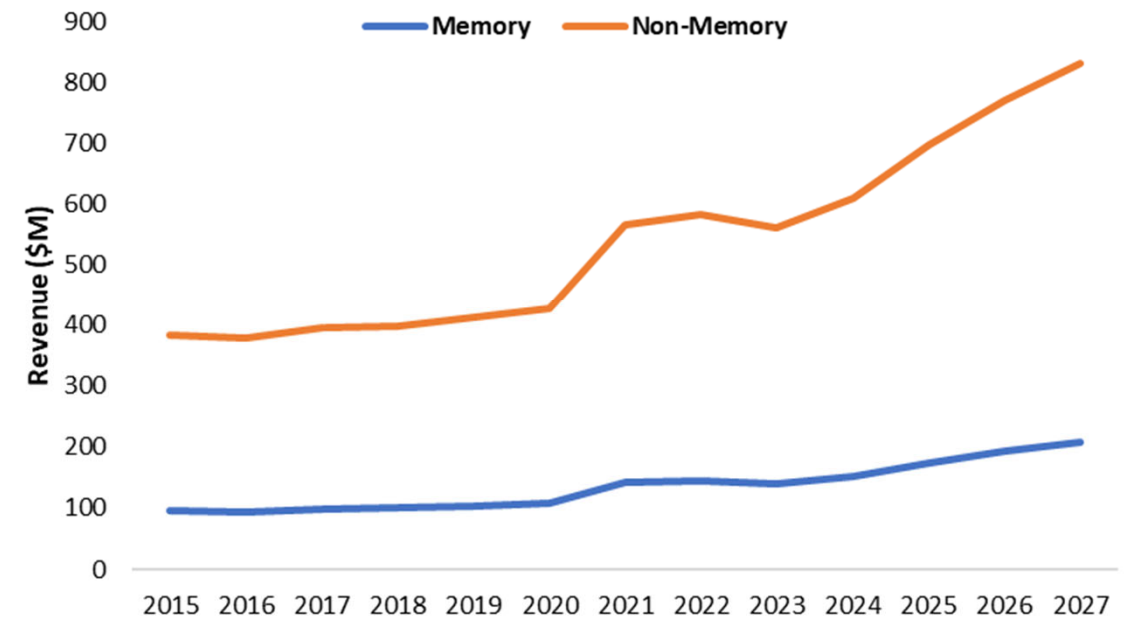
Device Interface Board Revenue & Forecast

Device Interface Board - Revenue



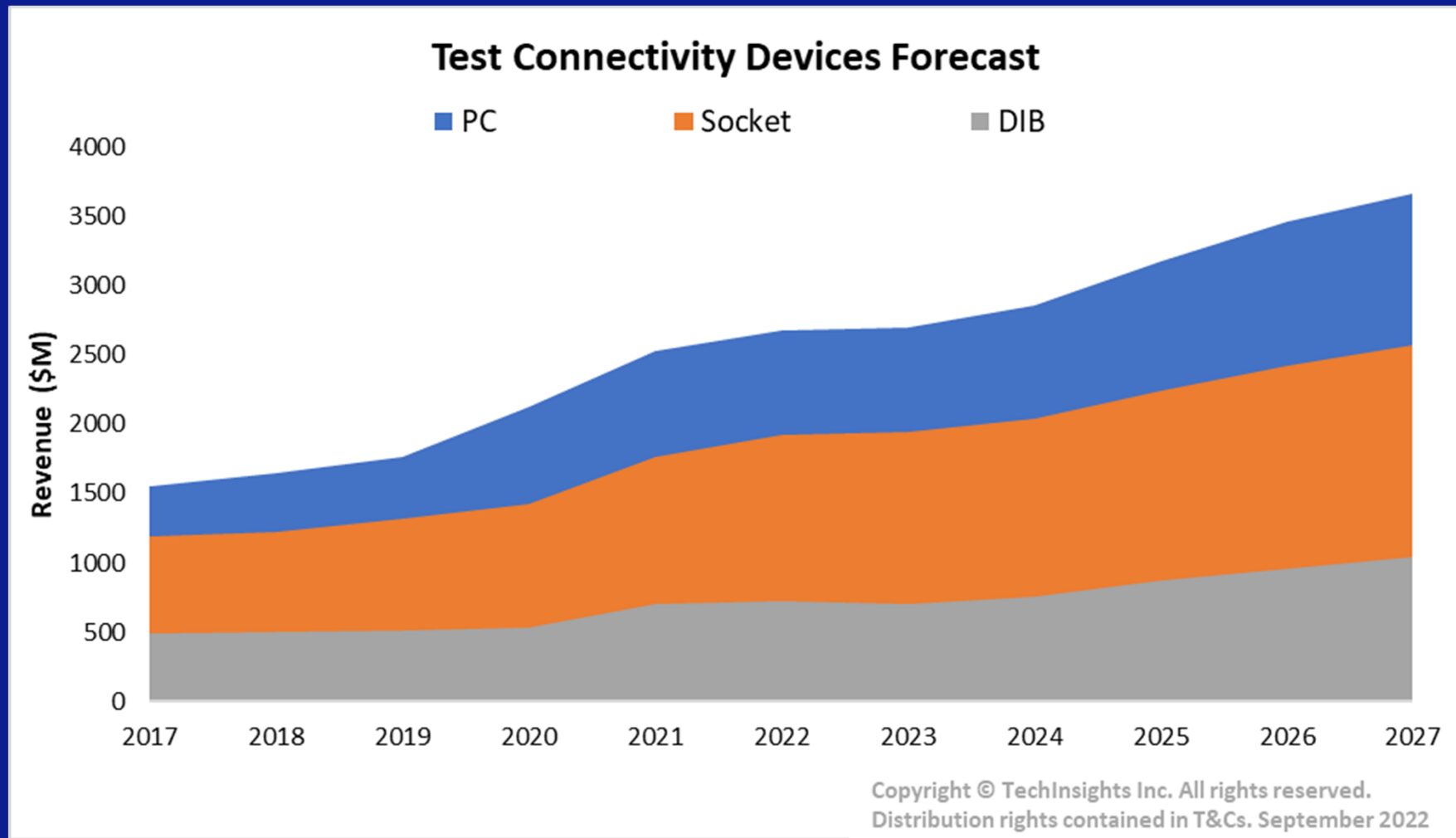
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Device Interface Board - Memory vs. Non-Memory



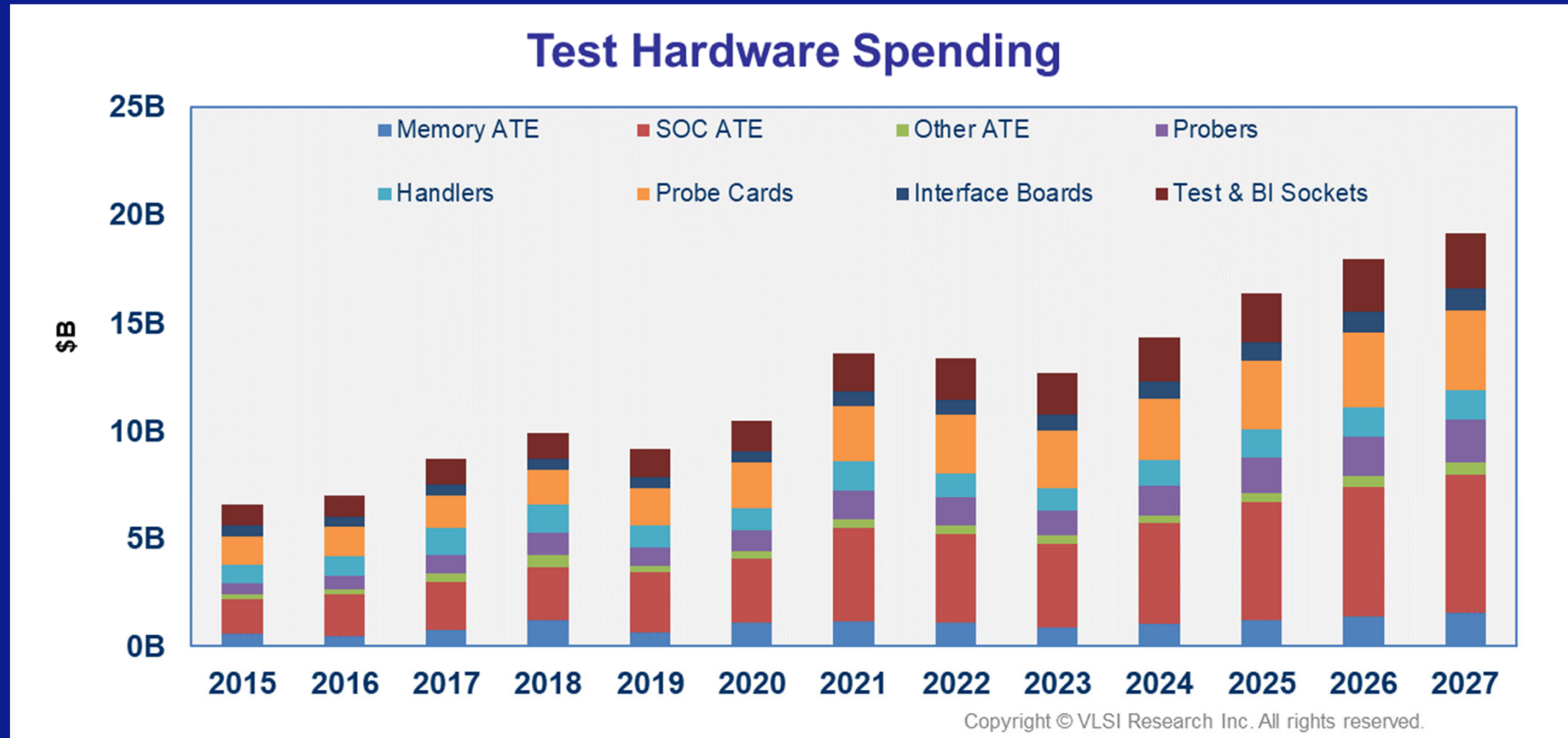
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Test Connectivity Forecast



TEST MARKET

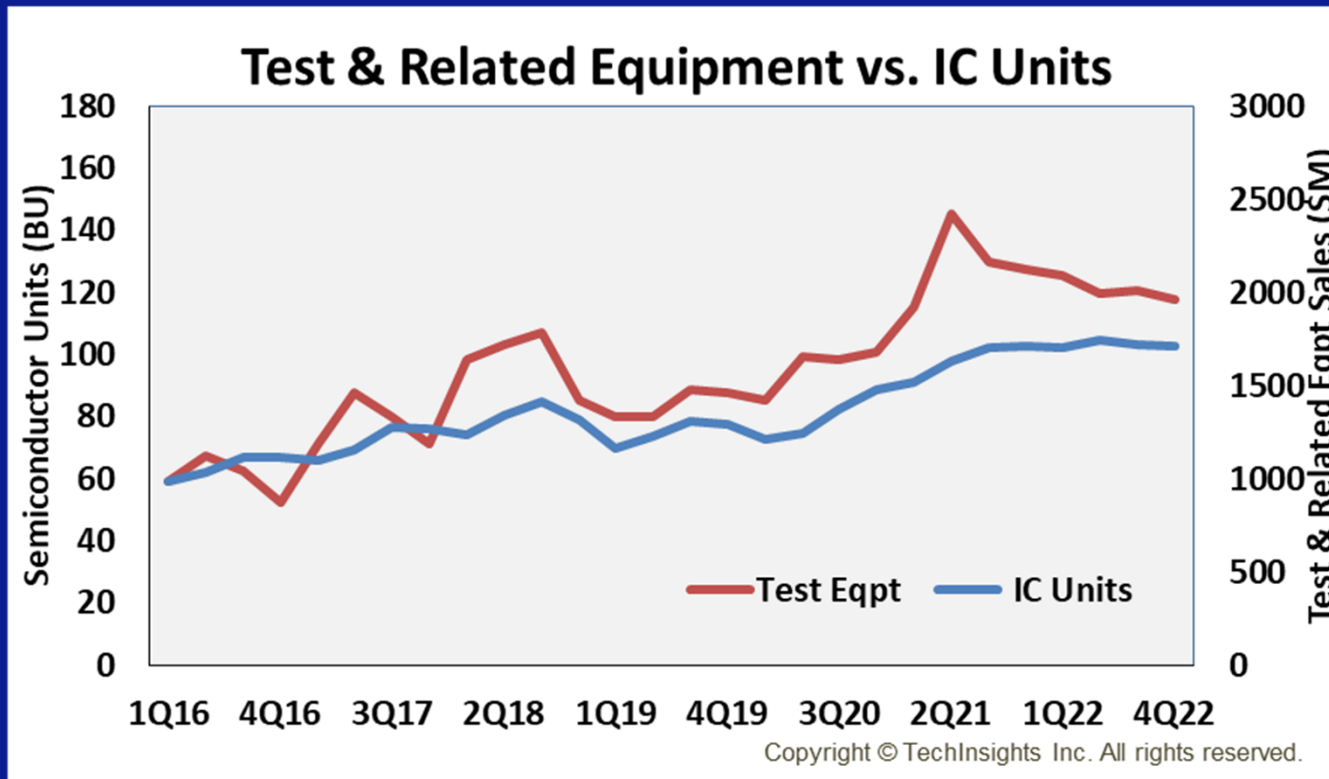
Overall Semiconductor Test Market



Semiconductor Test Market

- Probe Cards, Test & Burn-in Sockets and Device Interface Board strong growth following the Semiconductor market
- Short term downgrade in TCS forecast, Potential for a decline in 2023
- Long term Socket growth of 6% until 2027
 - Driven by non-memory
- Long term Probe card growth of 8% until 2027
 - MEMS, non-memory etc.
- Long terms DIB growth of 7% until 2027
- ATE Market is expected to grow from \$7B in 2022 to \$8.8B in 2027 where memory has slower growth while Logic ATE market is growing rapidly

Semiconductor Test Market and IC Unit Demand

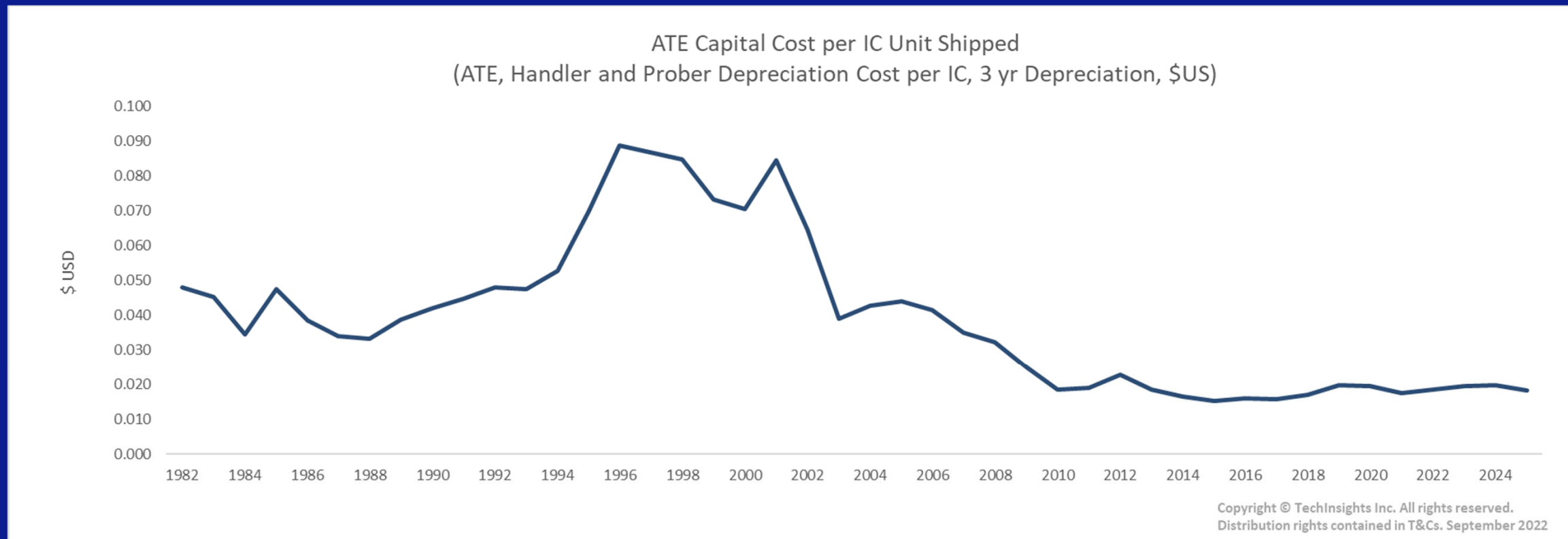


- Closely correlated and foundation to analyze Cost of Test
- ATE demand is trending lower from peak
- Probers and handlers follow overall industry trends
- Test & Related Equipment sales are ahead of IC unit demand

COST OF TEST

Traditional View of Cost of Test

ATE Focused



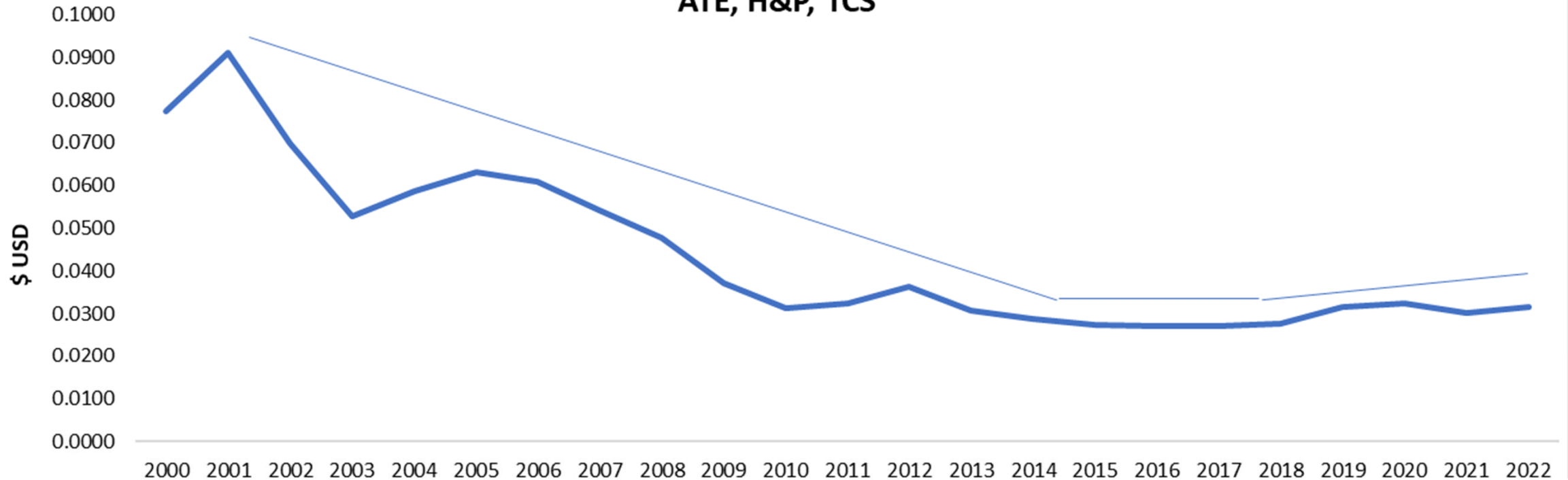
Cost of Test Definition

$$\text{Cost of Test} = \frac{(\text{ATE, H\&P Depreciation}) + (\text{Probe card} + \text{Socket} + \text{DIB})}{\text{Total IC Units}}$$

Broader Cost of Test View

Include Probe Cards, Sockets and Boards

ATE, H&P, TCS



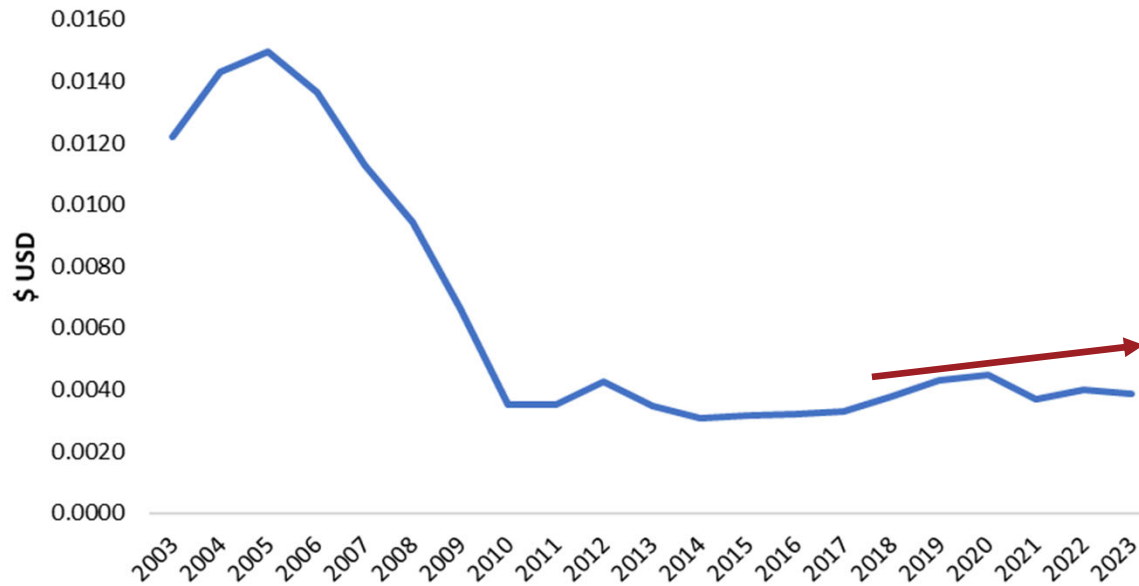
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MEMORY & NON-MEMORY COST OF TEST

Memory Cost of Test

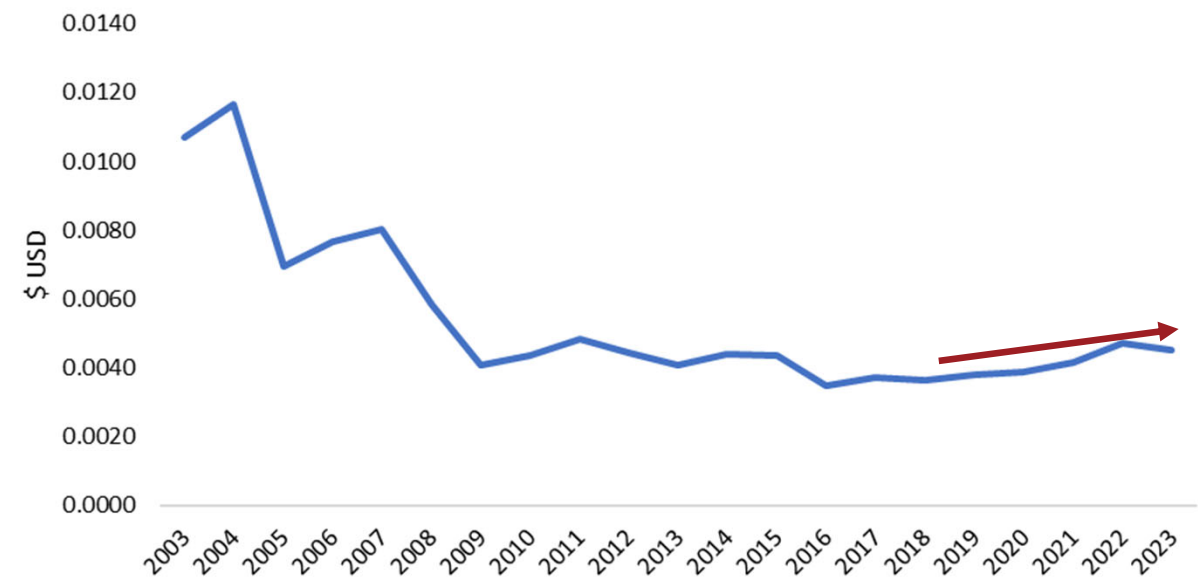
Probe Cards, Sockets and Boards Included

Cost of Test - Memory ATE and H&P



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Cost of Test - Memory Test Connectivity

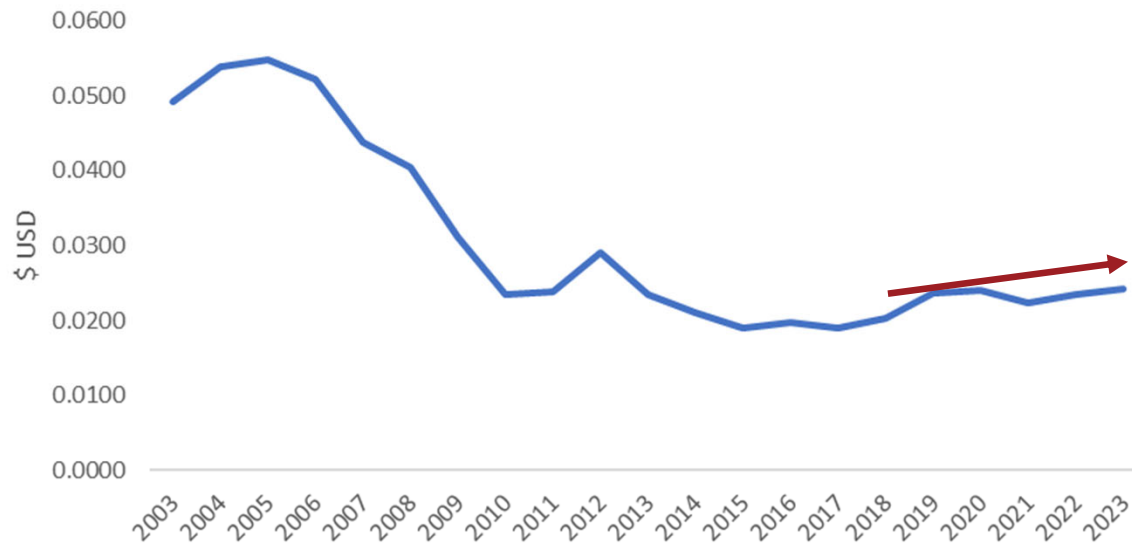


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Non-Memory Cost of Test

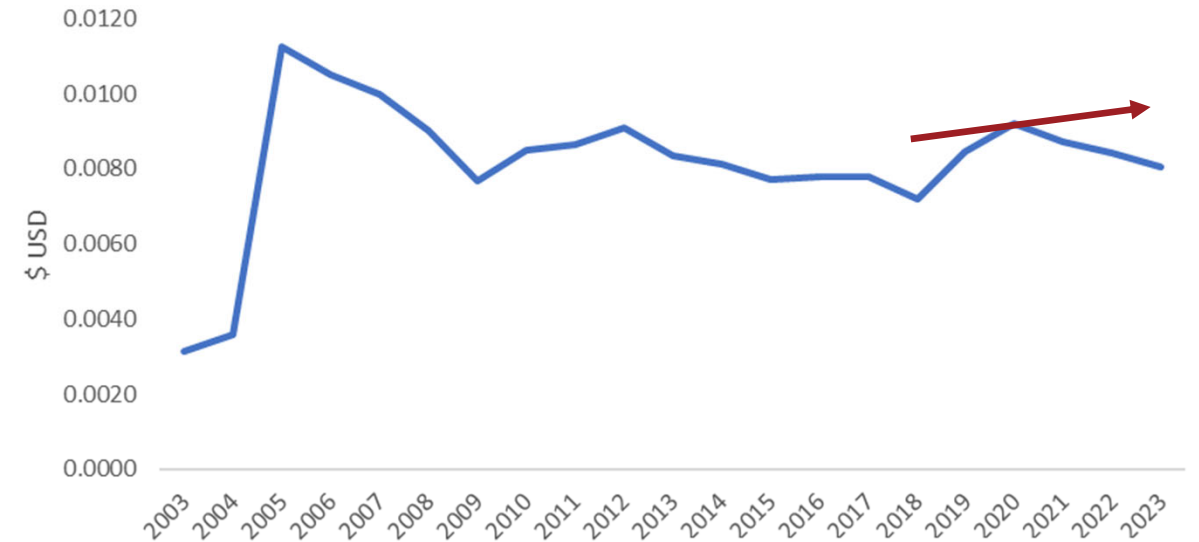
Probe Cards, Sockets and Boards Included

Cost of Test - Non-memory ATE and H&P



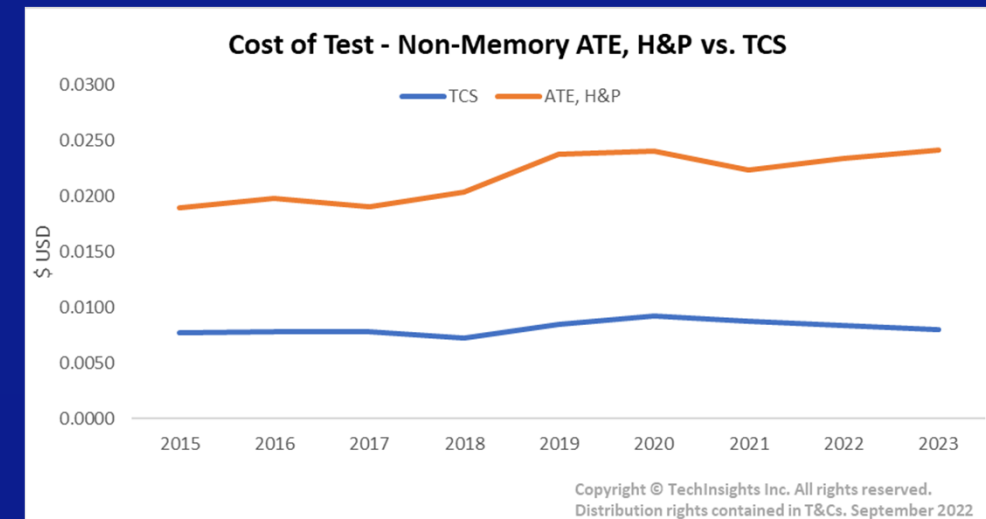
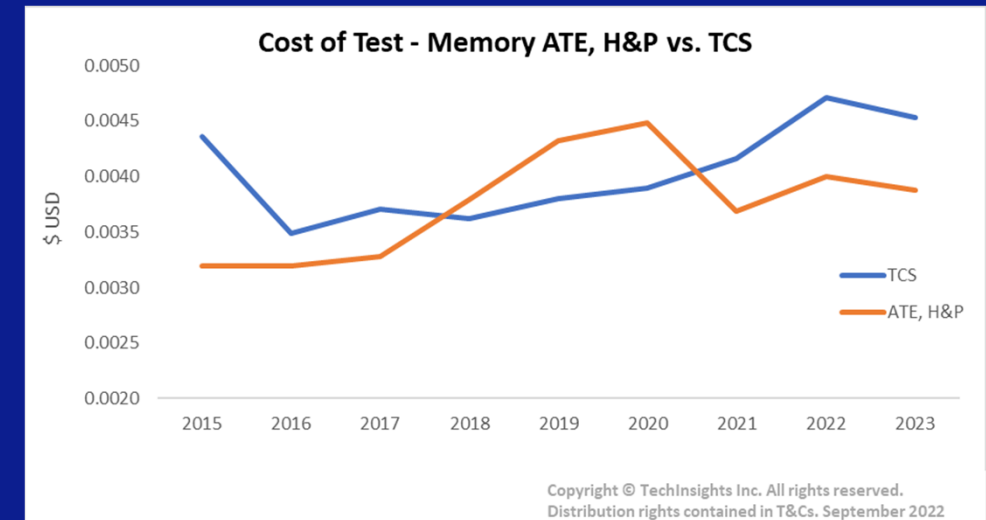
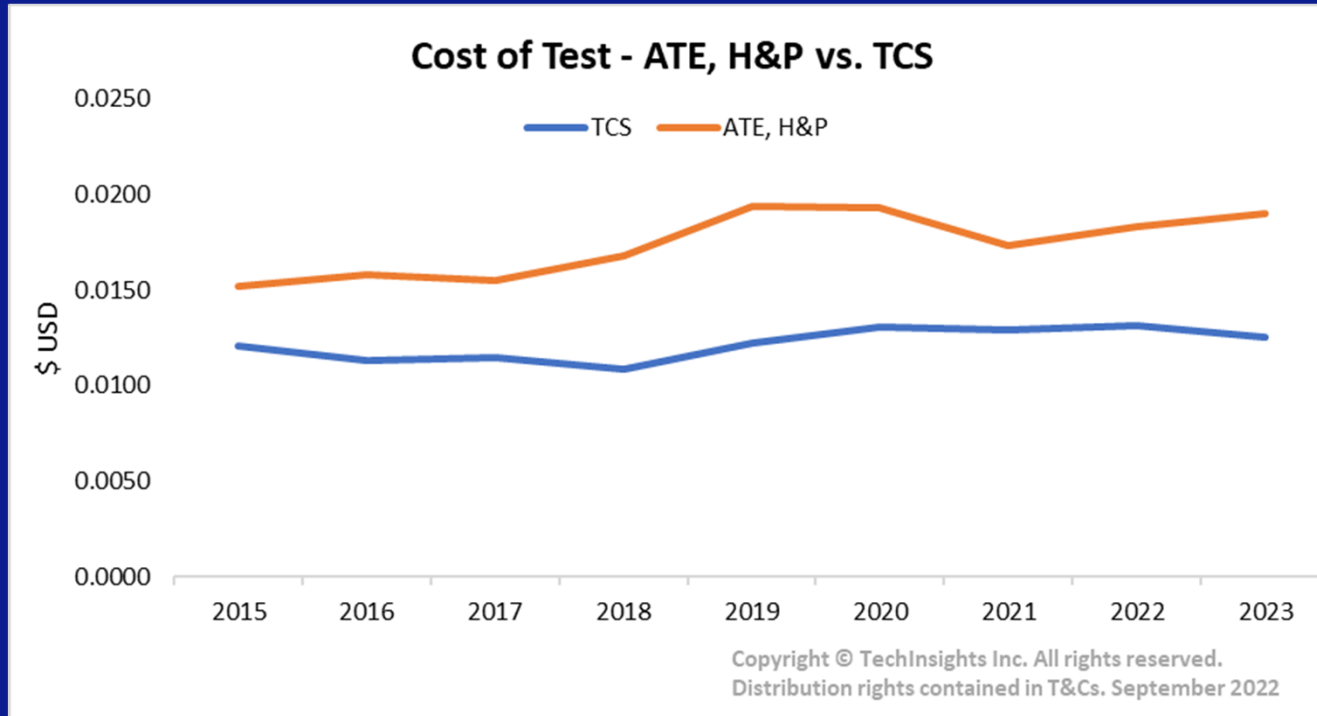
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Cost of Test - Non-memory Test Connectivity



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Overall Cost of Test



Conclusions

- Overall Test Connectivity costs are 2/3 of ATE, Handlers and Probers
 - Substantial difference between memory and non-memory
- Modest increase in Cost of Test both in memory and non-memory since 2017/18
 - Steadily declining trend between 2012 and 2017
- The CoT has grown between 2 and 4% per year since 2017
 - Reflects well over cost trends in the industry
- Test Connectivity systems have not impacted in the growth of CoT

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