What Does the Rapid Growth in System Level Test Mean for You?

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First, we need to talk about the market environment

Impact of COVID-19

What we know for sure..

Fundamental market drivers still in place

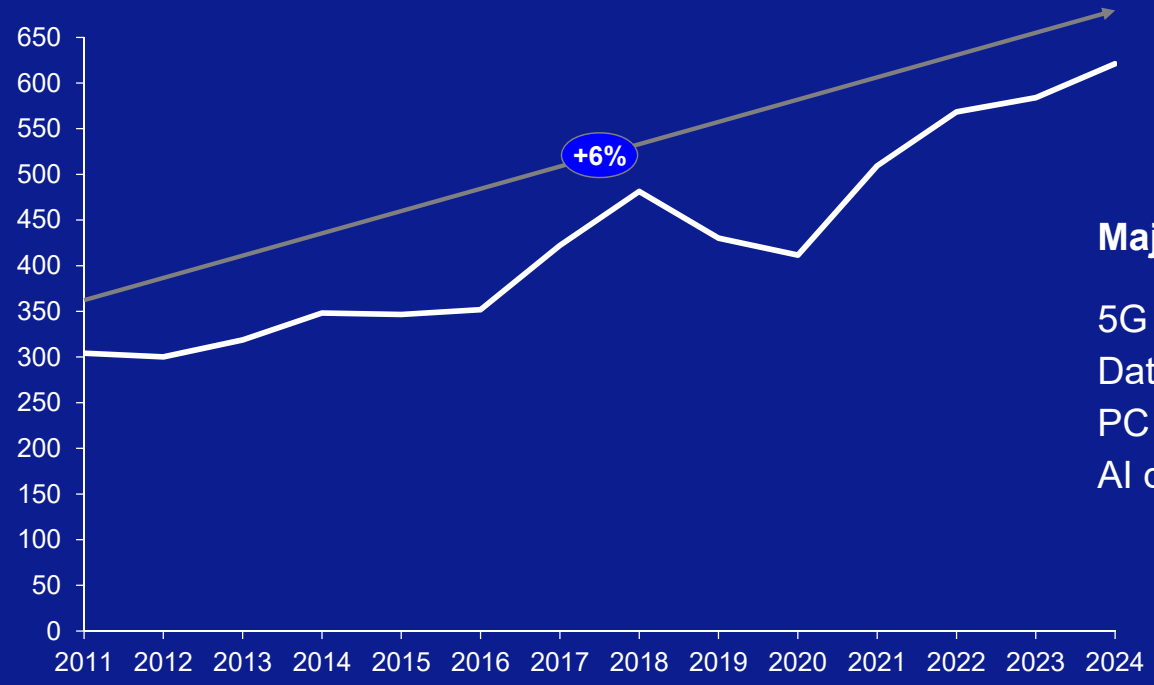
Chips still need testing

Technical problems not going away

Economic challenges just got a little harder

Semiconductors, $Bn

Long-term growth drivers still in place



Major Investments Continue for:

5G Phones and 5G Infrastructure
Datacenter
PC upgrade cycle
AI development

Semiconductors: Uncertainty in the Supply Chain Inventory Build?

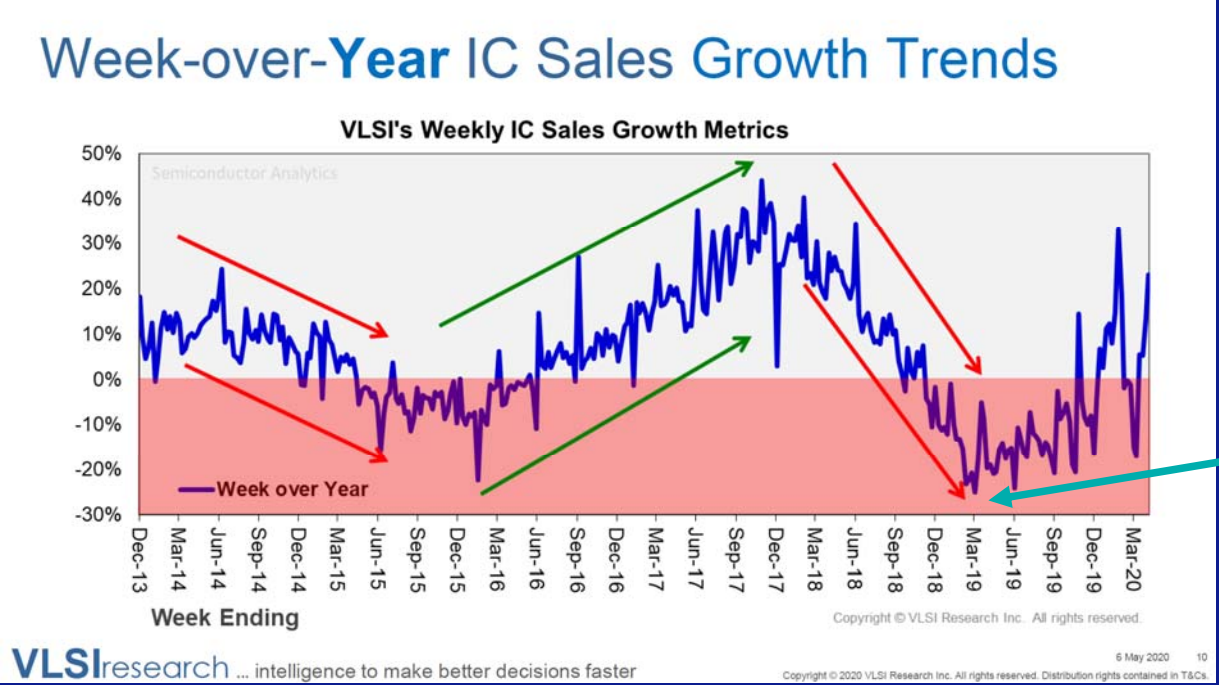
End demand remains strong across multiple segments

Is this real, or are companies in the supply chain moving away from a “just in time” strategy and building inventory “just in case”?

Some evidence of going back to “traditional” inventory levels, but not excessive

Semiconductors: Uncertainty in the Supply Chain

Increased Volatility

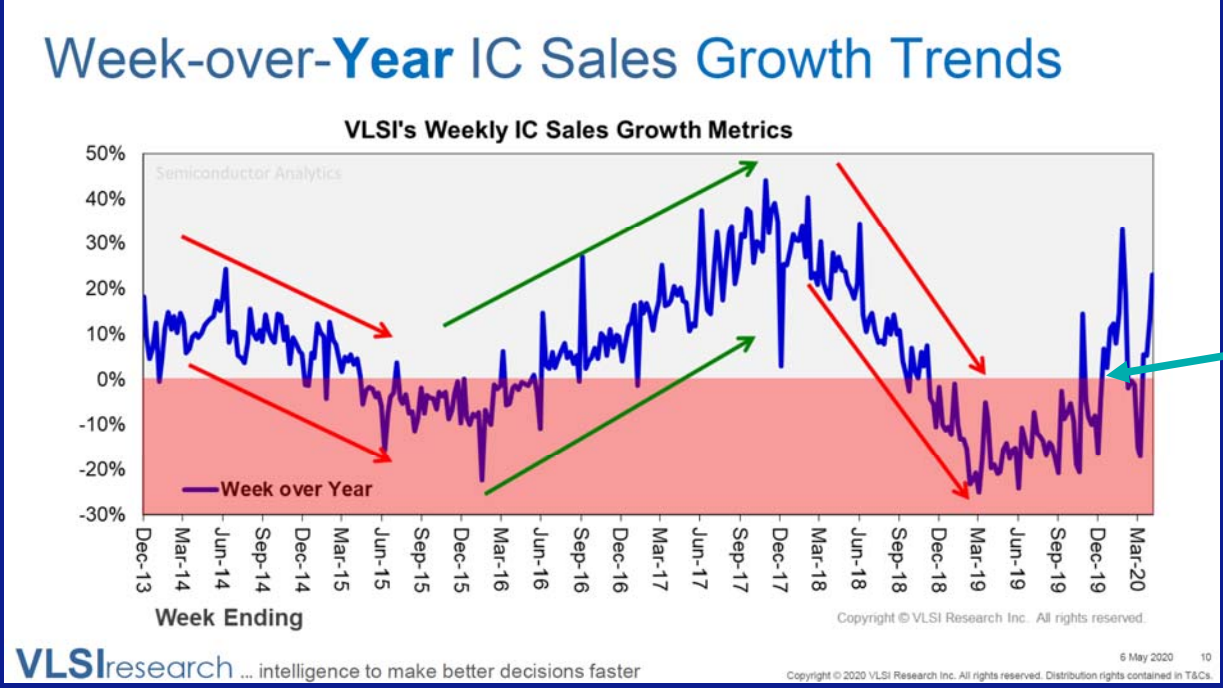


Week over year:
Sales of semiconductors this week compared to the same week last year

Recovery started in March 2019

Semiconductors: Uncertainty in the Supply Chain

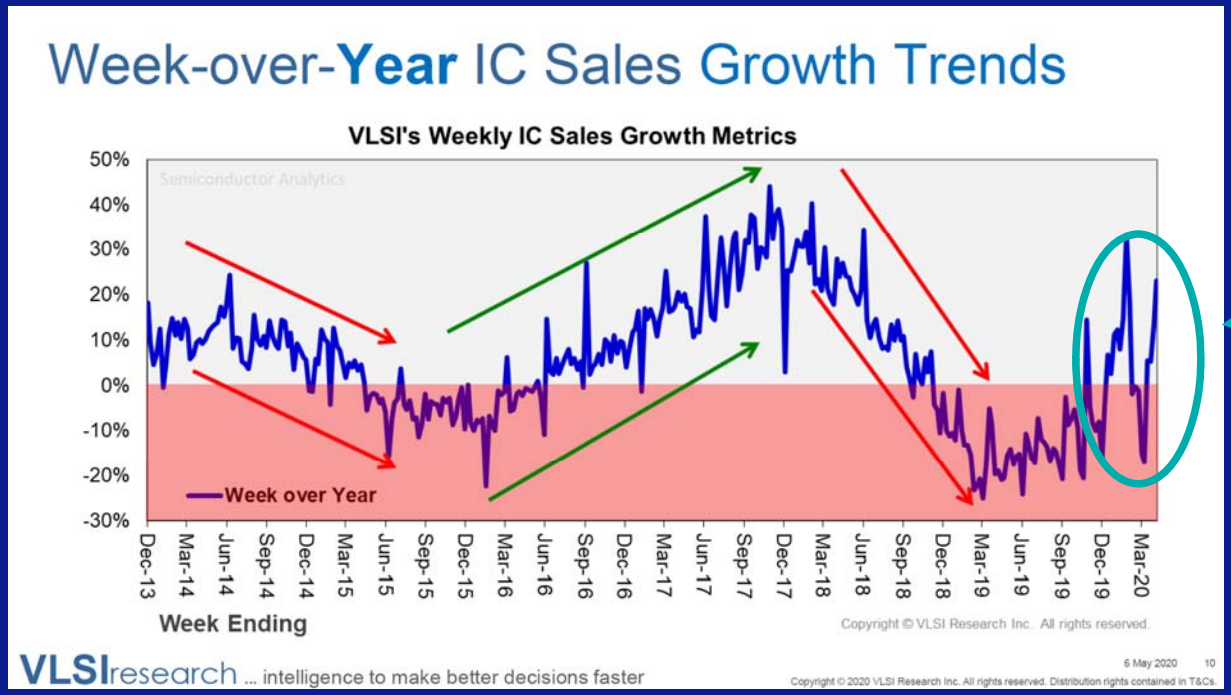
Increased Volatility



Semiconductor sales were going back into positive territory at the end of 2019

2020 was looking like being a great year before COVID-19

Semiconductors: Uncertainty in the Supply Chain
Increased Volatility

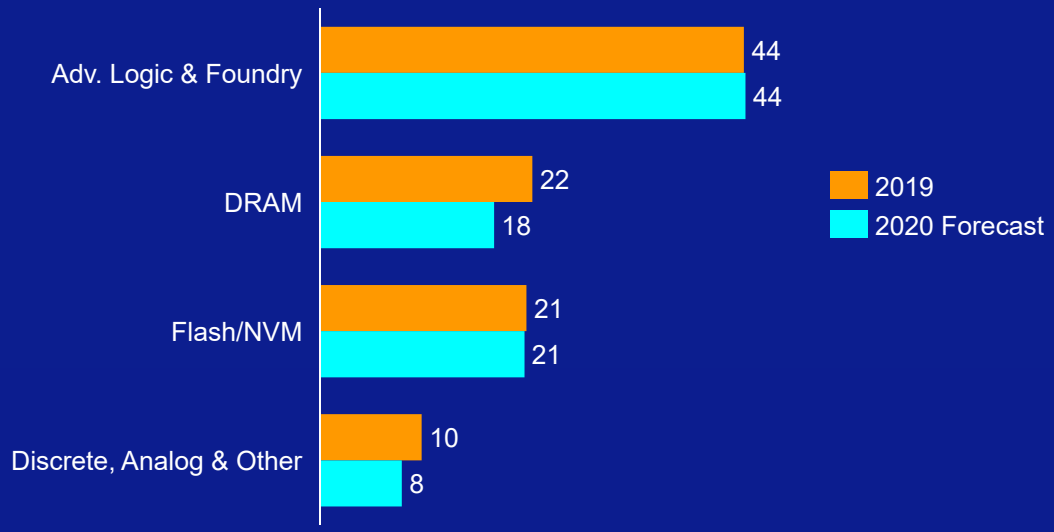


Market becoming increasingly volatile

Semiconductors: Uncertainty in the Supply Chain

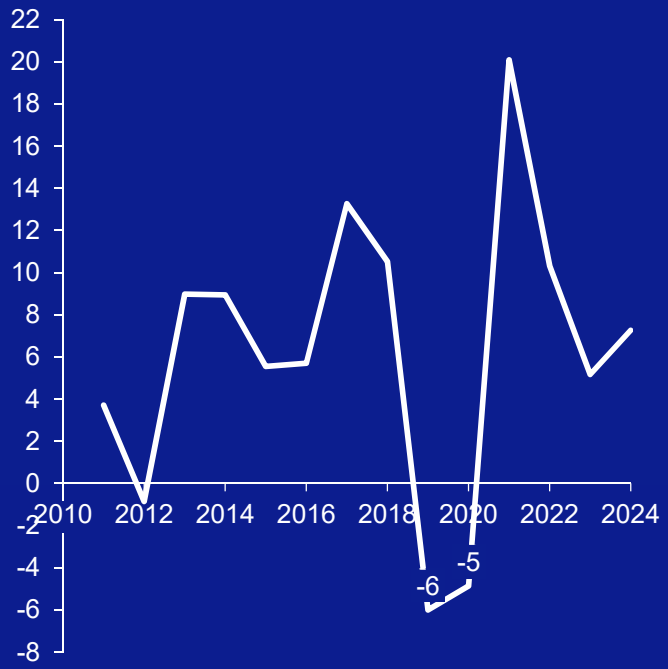
Chipmakers are Still Investing

Capital Expenditures in $Bn by Application



Semiconductors: Uncertainty in the Supply Chain

IC Unit Shipment Growth, %



IC unit shipments on track to be down for a second year in a row

That's never happened before!

Semiconductors:
Short-term concerns, long-term certainty

Current business activity surprisingly strong given the situation

Short-term view: 2020 IC revenues forecast scenarios

- Mild Impact – ICs down 5%, strong recovery starting Q4 2020
- Severe Impact – IC s down 20%, no recovery until 2021

Long-term view remains unchanged

- Compound annual growth rate of ICs between 6% and 7%

System Level Test (SLT)

So, what does the rapid growth in SLT mean for you?

How will the emergence of STL change the cost structure of test?

Is this an additional cost to the industry…
… or will costs shift from one place to another?

What's the overall impact on cost of test?

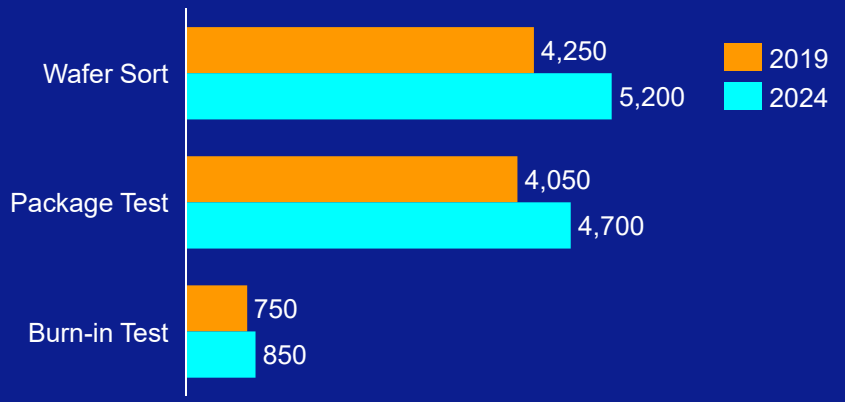
Cost of Test

Test, test, test and test:

Wafer Sort
Package Test
Burn-in Test
System Level Test

Cost of Test: Wafer Sort, Package Test, & Burn-in Test

Revenues, $M



Wafer Sort: ATE, Probers, Probe Cards
Compound annual growth (CAGR) of 4.1% 2019 to 2024

Package Test: ATE, Handlers, Device Interface Boards, Test Sockets
CAGR of 3.0% 2019 to 2024

Burn-in Test: Testers, Burn-in Boards, Burn-in Sockets
CAGR of 2.5% 2019 to 2024

Total costs are $9Bn in 2019, growing to $10.75Bn in 2024
CAGR of 3.5% 2019 to 2024

Cost of Test: System Level Test (SLT)

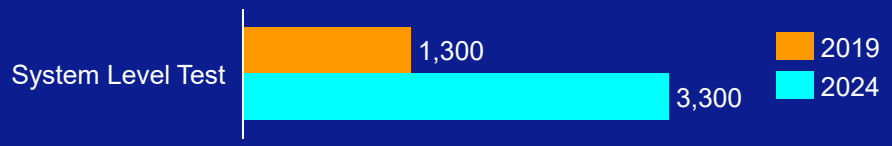
The market for SLT equipment and consumables not easy to measure

- Until recently, quite small
- Suppliers not well known (generic equipment suppliers, subcontractors, etc.)

SLT now entering the mainstream and attracting companies well known to the semiconductor industry

Cost of Test: : System Level Test (SLT)

Testers, Handlers, Boards, Sockets: Revenues, $M



System Level Test: Testers, Handlers, Boards, Sockets
CAGR of 20.5% 2019 to 2024

Cost of Test: System Level Test

Revenues, $M

Wafer Sort: ATE, Probers, Probe Cards
Compound annual growth (CAGR) of 4.1% 2019 to 2024

Package Test: ATE, Handlers, Device Interface Boards, Test Sockets
CAGR of 3.0% 2019 to 2024

Burn-in Test: Testers, Burn-in Boards, Burn-in Sockets
CAGR of 2.5% 2019 to 2024

System Level Test: Testers, Handlers, Boards, Sockets
CAGR of 20.5% 2019 to 2024

Including System Level Test, the costs are $10.35Bn in 2019, growing to $14.05Bn in 2024
CAGR of 6.3% 2019 to 2024

TestConX™

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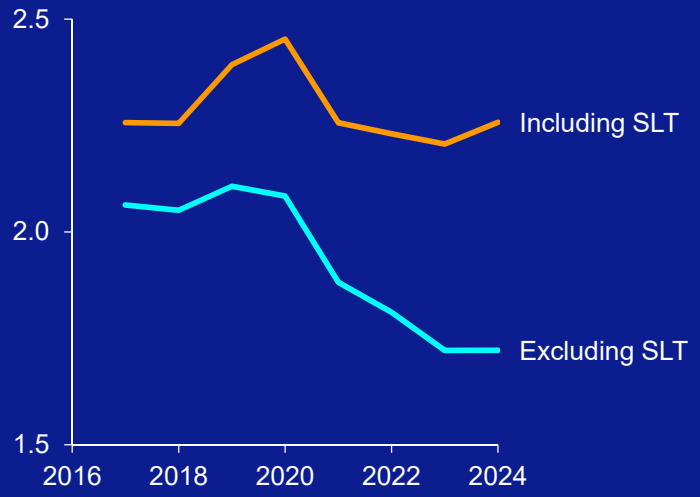
Cost of Test:

Test Equipment and Consumable Costs as a % of total Semiconductor Sales



Rapid growth of SLT costs are changing the dynamics of test cost

Will put pressure on wafer sort, package test, and burn-in test

Cost of Test: : Sockets for System Level Test (SLT)

Sockets for SLT estimated to be > $150M in 2019

Potential to grow to > $450M in 2024

However, it's too early to know how this market will play out

Cost of Test: : System Level Test (SLT)

What we don't know…

Is the recent ramp up just the start of something big, or will it take time for the first round of capacity expansion to be digested?

What are the efficiency gains to be made, if any?

Who will be the winners and losers?

Final Thoughts:

2020 is going to be an unusual year

Semiconductor sales still strong

Confidence levels low – uncharted territory

VLSI forecasts for 2020

- Semiconductors down 4.3%
- Test and burn-in sockets down 4.6%

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