Where Are We Going?

- Cycle Analysis 2021
- Looking Forward 2022
- What About the Electronics & Components Supply Chain?
- Economic Impact
Cycle Analysis

~ 2022 ~
Electronic Component Revenue Growth

Source: World Semiconductor Trade Statistics (WSTS), World Passive Trade Statistics (WPTS)
IP&E – Interconnect, Passive, Electro-Mechanical Orders

Index of North American Components Orders Received
Index Based on Average Week of Previous Year

TURNING POINT

Source: ECIA
IP&E – Interconnect, Passive, Electro-Mechanical Orders

Index of North American Components Orders Received
Index Based on Average Week of Previous Year

SOLID DOWNTURN

Source: ECIA
Semiconductor Revenue Growth Cycle

- Quarter-over-Quarter growth dives to -14.7% at end of 2022
- Annual revenue cycle drives lower than expected and ends year slightly positive at +3.2%
- Annual growth driving to negative range in 2023 – How Deep?
- Demand drivers shifting from consumer markets
- Asia pushing global market down – Americas following
- Question – What does a “Soft Landing” look like?

Source – WSTS
Semiconductor Growth Trends

Quarter-over-Quarter Growth

Source: WSTS
Unified Downward Slide – No Market is Immune

- Memory ICs Amplifying / Distorting the Cycle
- All other components started downturn in mid-2021
- Analog ICs and Discretes still positive!
- Americas growth still positive for all components except Memory and Sensors/Actuators
- Pricing dynamic now undermining growth after temporary boost
Current Cycle Moving Down Backside – How Steep?
Upside of current cycle = 29 months; Most cycles last about 48 months

Note: Low point in current cycle is -12.7 in Nov ‘19
Source – WSTS
Looking Forward

~ 2023 + ~
Observations:

- 2022 Worldwide and Americas growth drops well below Spring ‘22 forecast.
- Fall WSTS forecast recognizes strong trend pushing market negative in 2023. Can it rebound to 5+% in 2024?
- Greater hope for Americas markets to avoid decline by end of 2023 and rebound to 10% in 2024
- Once again, Memory ICs play the role of the spoiler in growth
- Cyclical pattern supports hope for future growth
North America Sentiment Survey Trends

North American Sales Performance Compared to Prior Month

Source: ECIA Electronic Component Sales Trends Survey
North America Sales Sentiment Survey Trends

OVERALL MARKET
Market Status and Outlook

Percentage Response

- Red: Worse (Current vs. Prior)
- Green: Better (Current vs. Prior)
- Red dashed: Worse (Next vs. Current)
- Green dashed: Better (Next vs. Current)

What About the Electronics Components Supply Chain?

~ Worldwide / Americas~
Worldwide Semiconductor Unit Shipments

Source: WSTS

Increase From:
- Discretes: -7.1%
- Analog ICs: 20.3%
- Logic ICs: 16.5%

Previous Peak
- Discretes: 14.9%
- Analog ICs: 46.2%
- Logic ICs: 36.4%

Recovery Start
Americas Semiconductor Unit Shipments

Increase From:

- Discretes: 62.7%
- Monolithic ICs: 53.4%

Source: WSTS

Recovery Start:
- Discretes: 126.1%
- Monolithic ICs: 84.4%
Hopeful Outlook forModerating Pressure
Supply Chain Pressure

Global Supply Chain Pressure Index, showing monthly deviations from the long-term trend

1998

Financial Crisis 2008

Japan Earthquake 2011

Pandemic 2020

2023

Source: New York Federal Reserve
### Lehigh University Supply Chain Risk Index – Q1 2023

<table>
<thead>
<tr>
<th>Risk Type</th>
<th>4th Quarter 2022 Risk Index</th>
<th>1st Quarter 2023 Risk Index</th>
<th>Trend</th>
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<tbody>
<tr>
<td>Economic Risk</td>
<td>84.38</td>
<td>87.97</td>
<td>+3.59</td>
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<tr>
<td>Cybersecurity and Data Risk</td>
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<td>73.42</td>
<td>-0.96</td>
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<tr>
<td>Customer Risk</td>
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<td>Technological or Competitive Risk</td>
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<td>Operational Risk</td>
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<td>Environmental Risk</td>
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<td>Quality Risk</td>
<td>50.00</td>
<td>56.33</td>
<td>+6.33</td>
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<tr>
<td><strong>Average Risk Index</strong></td>
<td><strong>65.04</strong></td>
<td><strong>66.96</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Lehigh Univ, CSCMP

- **ECONOMIC RISK:** 87.97 (Increase 78%)
- **CYBERSECURITY AND DATA RISK:** 73.42 (Increase 48%)
- **CUSTOMER RISK:** 72.78 (Increase 49%)

**Connect. Influence. Optimize.**
Lehigh University Supply Chain Risk Index – Q1 2023

Overall Risk Index Trends

Source: Lehigh Univ, CSCMP
NAM Economic Headlines

- 68.9% of respondents felt somewhat or very positive in their company outlook, down from 75.6% in Q3
  - Weakest reading since the Q3 2020
- 62.4% of manufacturing leaders believed that the U.S. economy would slip officially into a recession in 2023
  - Despite worries about a downturn, manufacturers plan to continue to invest in their companies
- Manufacturing employment in 2022 rose by the sector hired 396,000
  - Most of any year since 1994
  - Currently, 12,999,000 employees total, the most since November 2008
The Conference Board Leading Economic Indicator (LEI)

Note: Shaded areas represent recessions as determined by the NBER Business Cycle Dating Committee.
Inflation Falls from 40 Year High

U.S. Annualized Inflation Rate (CPI)

Nov '81 = 9.6%

Source – Bureau of Labor Statistics (BLS)
Raw Material Pricing Trends – IHS Markit Index

- Data through February 2023
- The MPI sits 15% lower year on year (y/y)
- However, remain far higher (45%) than the pre-pandemic levels of the fourth quarter 2019
- Falling energy prices were the major driver of decline in the MPI
Inflation Falls from 40 Year High

Source – Bureau of Labor Statistics (BLS)
The Danger of History Repeating

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Source – Bureau of Labor Statistics (BLS)
In discussions of the “death of Moore’s Law” the quote from Mark Twain might be appropriate. When one major American newspaper actually printed his obituary and, when Twain was told about this by a reporter, he quipped: “The reports of my death are greatly exaggerated.”

TSMC recently announced that it is introducing 3nm chips in the second half of 2022 and will bring 2nm technology to the world stage in 2025.

Looking ahead to 2024, Intel expects to finalize the design for its first chips with transistors smaller than 1 nanometer. They'll be measured by angstroms, instead. The "Intel 20A" node will be powered by "RibbonFET" transistors, the company's first new architecture since the arrival FinFET in 2011.

Until the periodic table is exhausted, we will be relentless in our pursuit of Moore’s Law and our path to innovate with the magic of silicon.” – Intel CEO, Pat Gelsinger
Thank you!

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