ANALYST PRESENTATION

June 10, 2021
Safe Harbor Statement

This presentation contains statements about management’s future expectations, plans and prospects of our business that constitute forward-looking statements, which are found in various places throughout the press release, including, but not limited to, statements relating to expectations of orders, net sales, product shipments, expenses, timing of purchases of assembly equipment by customers, gross margins, operating results and capital expenditures. The use of words such as “anticipate”, “estimate”, “expect”, “can”, “intend”, “believes”, “may”, “plan”, “predict”, “project”, “forecast”, “will”, “would”, and similar expressions are intended to identify forward looking statements, although not all forward looking statements contain these identifying words. The financial guidance set forth under the heading “Outlook” contains such forward looking statements. While these forward looking statements represent our judgments and expectations concerning the development of our business, a number of risks, uncertainties and other important factors could cause actual developments and results to differ materially from those contained in forward looking statements, including any inability to maintain continued demand for our products; failure of anticipated orders to materialize or postponement or cancellation of orders, generally without charges; the volatility in the demand for semiconductors and our products and services; the extent and duration of the COVID-19 pandemic and measures taken to contain the outbreak, and the associated adverse impacts on the global economy, financial markets, and our operations as well as those of our customers and suppliers; failure to develop new and enhanced products and introduce them at competitive price levels; failure to adequately decrease costs and expenses as revenues decline; loss of significant customers, including through industry consolidation or the emergence of industry alliances; lengthening of the sales cycle; acts of terrorism and violence; disruption or failure of our information technology systems; inability to forecast demand and inventory levels for our products; the integrity of product pricing and protection of our intellectual property in foreign jurisdictions; risks, such as changes in trade regulations, currency fluctuations, political instability and war, associated with substantial foreign customers, suppliers and foreign manufacturing operations, particularly to the extent occurring in the Asia Pacific region; potential instability in foreign capital markets; the risk of failure to successfully manage our diverse operations; any inability to attract and retain skilled personnel including as a result of restrictions on immigration, travel or the availability of visas for skilled technology workers as a result of the COVID-19 pandemic; those additional risk factors set forth in Besi’s annual report for the year ended December 31, 2020 and other key factors that could adversely affect our businesses and financial performance contained in our filings and reports, including our statutory consolidated statements. We expressly disclaim any obligation to update or alter our forward-looking statements whether as a result of new information, future events or otherwise.
I. Strategic Overview
Richard Blickman

II. Assembly Market Trends
Richard Blickman

III. End User Trends
Ruum Boomsma

IV. Growth Opportunities
Ruum Boomsma

V. Equipment Portfolio Update
Chris Scanlan

VI. Strategic Initiatives
Chris Scanlan

VII. Supply Chain & ESG
Nickolay Stepanenko

VIII. Q&A
Besi Team
I. STRATEGIC OVERVIEW
CEO Summary

Inflection point reached in assembly market development

• Higher advanced packaging capex required for increased chip performance
• Advanced packaging key to realize <7 nano device ambitions of front-end players
• Besi/AMAT partnership facilitates large scale, wafer level process adoption by leading producers
• Hybrid adoption will help drive investment in all advanced assembly process technologies

Industry upturn could be multi year. Many direct and indirect growth drivers

• Pandemic accelerated technology adoption and increased investment in AI, 5G, Datacenter and HPC
• Global GDP rebound post pandemic also supports favorable investment climate
• Timing and amount of government sponsored spending could extend semi capex cycle

Besi well positioned to increase share of growing addressable market

• Besi’s die attach product group should benefit most from increased capital intensity
• Leadership position in fastest growing assembly segments, particularly at most advanced nodes

Business model initiatives to scale business and drive profit growth

• Increasing existing/hybrid production capacity and R&D/Service to meet €1 billion+ revenue model
• Strategic initiatives in place to aid scalability and enhance profitability in sustainable manner
History of Superior Long-Term Value Creation

**Disciplined Strategic Execution**
- Leader in advanced packaging for assembly equipment
- Superior through cycle performance versus peers
- Best in class financial metrics

**Capital Allocation Program**
- €888 million of dividends and share repurchases since 2011*
- Represents ~20% of total revenue during such period
- Dividend payout ratio 97% past 5 years

**Total Shareholder Return**
- Consistent outperformance vs. peers
- Total shareholder return
  - +574% (5 year)
  - +3,205% (10 year)
- Upper quartile of all SOX listed semi equipment companies

*Includes shares repurchases up to May 31, 2021
Step Function, Through Cycle Revenue and Profit Growth

€ millions

Revenue
Gross Margin

Gross Margin


Revenue
Gross Margin

-21% +22% +28% 59.0%

Gross Margin


Revenue
Gross Margin

34.1% 39.5% 51.1% 59.0%

300 400 500 600 700


Revenue
Gross Margin

191 164 351 302 379 302 379 424 593 51.1% 51.1% 434 434 555 555

* LTM including midpoint of guidance for Q2-21.
Revenue and Operating Profit Levels Significantly Above Last Cycle

- Orders up 33.5% vs. 2017 cycle*
  - Approaching € 800MM target
- LTM Revenue +18.6% vs. LTM H1-17
- Operating profit +59%
- Operating margin up 9.6 points to 38.1%

* Orders tracked: LTM Q1-21 vs. LTM Q1-17
LTM H1-21 revenue, operating profit and operating margin includes midpoint of guidance for Q2-21
Liquidity Position Also Enhanced

Total cash +96% from Q1-17 to reach € 605.8 million
- Strong foundation for future growth

Similarly, net cash +23% vs. Q1-17
- Despite € 559.2 million in dividends and share repurchases
• Baseline Opex limited to range of € 23-26 million over past 11 quarters
• % of revenue declined to 18.2% in Q1-21
• % of revenue should decrease in upcoming quarters even as absolute levels rise in upcycle

* Other Opex includes both short term and long-term incentive comp, seasonal effects, restructuring costs, net R&D capitalization/amortization and certain one-time items.
** Q2-21 Opex assumes midpoint of guidance
Besi’s margins and ROE have exceeded direct peers through cycles:

- Investment in business model has yielded high returns
- Structurally higher gross and operating margins over past 5 years
- Gap vs. peers growing, particularly during last down cycle
- Besi capital allocation strategy has also helped drive ROE outperformance

### Structural, Through Cycle Outperformance Achieved vs. Peers

#### Gross Margin

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Besi</td>
<td>51.0%</td>
<td>57.1%</td>
<td>56.8%</td>
<td>55.8%</td>
<td>59.6%</td>
<td>59.8%</td>
<td>+8.8pts</td>
</tr>
<tr>
<td>ASM PT (Back-end)</td>
<td>43.4%</td>
<td>47.9%</td>
<td>45.9%</td>
<td>41.1%</td>
<td>38.2%</td>
<td>41.6%</td>
<td>-1.8pts</td>
</tr>
<tr>
<td>K&amp;S*</td>
<td>44.8%</td>
<td>47.2%</td>
<td>46.1%</td>
<td>47.1%</td>
<td>47.8%</td>
<td>45.8%</td>
<td>+1.0pt</td>
</tr>
</tbody>
</table>

#### Operating Margin

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</tr>
</thead>
<tbody>
<tr>
<td>Besi</td>
<td>20.0%</td>
<td>35.3%</td>
<td>32.9%</td>
<td>25.8%</td>
<td>34.6%</td>
<td>37.0%</td>
<td>+17.0pts</td>
</tr>
<tr>
<td>ASM PT (Back-end)</td>
<td>20.6%</td>
<td>25.1%</td>
<td>21.7%</td>
<td>6.8%</td>
<td>8.6%</td>
<td>14.8%</td>
<td>-5.8pts</td>
</tr>
<tr>
<td>K&amp;S*</td>
<td>6.2%</td>
<td>14.7%</td>
<td>6.3%</td>
<td>1.4%</td>
<td>9.4%</td>
<td>18.3%</td>
<td>+12.1pts</td>
</tr>
</tbody>
</table>

*A K&S on fiscal year basis. **LTM through Q1-21.
**Besi Addressable Market Share Increasing Particularly in Key Die Attach Markets**

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<tr>
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</thead>
<tbody>
<tr>
<td><strong>Assembly Market ($MM)</strong></td>
<td>3,587</td>
<td>4,503</td>
<td>4,391</td>
<td>2,998</td>
<td>3,603</td>
<td>+20.1%</td>
<td>+0.4%</td>
</tr>
<tr>
<td><strong>Besi Market Share</strong></td>
<td>9.9%</td>
<td>13.1%</td>
<td>11.6%</td>
<td>10.8%</td>
<td>11.4%</td>
<td>+0.6pts</td>
<td>+1.5pts</td>
</tr>
</tbody>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Addressable Market ($MM)</strong></td>
<td>1,507</td>
<td>1,942</td>
<td>1,850</td>
<td>1,247</td>
<td>1,399</td>
<td>+12.2%</td>
<td>-7.2%</td>
</tr>
<tr>
<td><strong>Besi Market Share</strong></td>
<td>23.7%</td>
<td>30.3%</td>
<td>27.5%</td>
<td>25.9%</td>
<td>29.3%</td>
<td>+3.4pts</td>
<td>+5.6pts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>∆ 1yr</th>
<th>∆ 4yr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Die Attach</strong></td>
<td>30.4%</td>
<td>38.2%</td>
<td>33.2%</td>
<td>30.8%</td>
<td>36.8%</td>
<td>+6.0pts</td>
<td>+6.4pts</td>
</tr>
<tr>
<td><strong>Packaging &amp; Plating</strong></td>
<td>13.6%</td>
<td>14.8%</td>
<td>17.3%</td>
<td>17.0%</td>
<td>15.4%</td>
<td>-1.6pts</td>
<td>+1.8pts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>∆ 1yr</th>
<th>∆ 4yr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>% of Besi Revenue</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Die Attach</strong></td>
<td>75%</td>
<td>82%</td>
<td>76%</td>
<td>76%</td>
<td>82%</td>
<td>+6pts</td>
<td>+7pts</td>
</tr>
<tr>
<td><strong>Packaging &amp; Plating</strong></td>
<td>25%</td>
<td>18%</td>
<td>24%</td>
<td>24%</td>
<td>18%</td>
<td>-6pts</td>
<td>-7pts</td>
</tr>
</tbody>
</table>

Besi’s addressable market and total assembly market expected to grow 43.9% and 39.2% in 2021 to reach $2.0 billion and $5.1 billion, respectively

Source: VLSI June 2021
Leader in Addressable Market, Die Attach Market and Advanced Die Placement

2020 Assembly Mkt
($3.6 Billion)

Addressable Mkt*
($1.4 Billion)

Die Attach
($911 Million)

Packaging & Plating
($488 Million)

Besi
67%

ASM-PT
12%

SNK
6%

Others
15%

Besi
37%

ASM-PT
29%

Fasford
11%

Towa
13%

Other
23%

Besi
29%

ASM-PT
23%

Hanmi
11%

Towa
13%

Other
21%

* Besi addressable market excludes wire bonding, dicing, and other assembly segments
** Advanced die placement defined as <7 micron accuracy as per VLSI

Source: VLSI June 2021. Equipment only
Shareholder Base and Market Liquidity Has Expanded

**Market Profile**

- **Symbol/ Index**
  - BESI
  - Euronext AEX

- **Market Cap**
  - € 4.9 billion ($5.9 billion)

- **Dividend Policy**
  - Pay out 40-100% of net income per annum

**Share Ownership**

**Top 10 Shareholders**

<table>
<thead>
<tr>
<th>Year</th>
<th>BESI</th>
<th>Euronext AEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>56%</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>45%</td>
<td></td>
</tr>
</tbody>
</table>

**By Geography**

- **Europe ex. NL**
  - 14% 2015
  - 15% 2018
  - 16% 2020

- **NL**
  - 45% 2015
  - 25% 2018
  - 17% 2020

- **US / UK**
  - 27% 2015
  - 47% 2018
  - 57% 2020

**Avg. Daily Volume & Liquidity**

*As of May 31, 2021  ** Besi estimates
### Business Model Objectives

<table>
<thead>
<tr>
<th>Category</th>
<th>Current Target</th>
<th>New Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>€ 800MM</td>
<td>€ 1,000MM+</td>
</tr>
<tr>
<td><strong>Addressable Market Share</strong></td>
<td>40%+</td>
<td>40%+</td>
</tr>
<tr>
<td><strong>Gross Margin</strong></td>
<td>55-60%</td>
<td>57-62%</td>
</tr>
<tr>
<td><strong>Net Margin</strong></td>
<td>30-35%</td>
<td>30-35%</td>
</tr>
<tr>
<td><strong>Headcount Split</strong></td>
<td>80% Asia/20% Europe/NA</td>
<td>80% Asia/20% Europe/NA</td>
</tr>
<tr>
<td><strong>Scope 1 and 2 Emissions</strong></td>
<td>60% Reduction</td>
<td>60% Reduction</td>
</tr>
<tr>
<td><strong>Global Energy Needs</strong></td>
<td>65% from renewable sources</td>
<td>65% from renewable sources</td>
</tr>
</tbody>
</table>

**June 10, 2021**
II. ASSEMBLY MARKET TRENDS
Industry Upturn Continues Post Pandemic Downturn

VLSI's GLOBAL CHIP MAKING CLIMATE TREND INDEX
(Average of Regional Order Activity Patterns in Chip Equipment)

Negative Concerns:
- World economy slowing
- Shortages
- COVID-19 pandemic
- Tech Cold War with China
- Made-in-China capacity glut

Positive Drivers:
- Work-from-home economy
- 5nm & 7nm ramp
- EUV adoption
- China IC expansion
- 5G ramp
- Mobile IC content increasing
- Cloud, Auto, Visual Computing

Source: VLSI, June 2021

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June 10, 2021
### 2021 TOP IDM & FOUNDRY CAPEX SPENDERS

(Capital expenditures by company, $B, ranked by 2021 Forecast)

<table>
<thead>
<tr>
<th>Company</th>
<th>2018</th>
<th>2019</th>
<th>2020P</th>
<th>2021F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung</td>
<td>21.6</td>
<td>19.3</td>
<td>28.1</td>
<td>31.1</td>
</tr>
<tr>
<td>TSMC</td>
<td>10.5</td>
<td>14.9</td>
<td>17.2</td>
<td>30.0</td>
</tr>
<tr>
<td>Intel</td>
<td>15.2</td>
<td>16.2</td>
<td>14.3</td>
<td>19.5</td>
</tr>
<tr>
<td>SK hynix</td>
<td>14.6</td>
<td>12.0</td>
<td>8.4</td>
<td>11.2</td>
</tr>
<tr>
<td>Micron Technology</td>
<td>8.8</td>
<td>8.6</td>
<td>8.8</td>
<td>9.5</td>
</tr>
<tr>
<td>KIOXIA/WD</td>
<td>3.2</td>
<td>2.9</td>
<td>3.5</td>
<td>5.9</td>
</tr>
<tr>
<td>SMIC</td>
<td>1.8</td>
<td>2.0</td>
<td>5.7</td>
<td>4.3</td>
</tr>
<tr>
<td>XMC/YMTC</td>
<td>2.4</td>
<td>2.1</td>
<td>3.0</td>
<td>3.4</td>
</tr>
<tr>
<td>Sony</td>
<td>1.4</td>
<td>2.3</td>
<td>2.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Innotron</td>
<td>1.3</td>
<td>1.4</td>
<td>2.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Huahong Group</td>
<td>2.2</td>
<td>2.0</td>
<td>2.2</td>
<td>2.5</td>
</tr>
<tr>
<td>STMicroelectronics</td>
<td>1.3</td>
<td>1.2</td>
<td>1.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Infineon</td>
<td>1.4</td>
<td>1.3</td>
<td>1.1</td>
<td>1.9</td>
</tr>
<tr>
<td>UMC</td>
<td>0.7</td>
<td>0.6</td>
<td>1.0</td>
<td>2.3</td>
</tr>
<tr>
<td>GLOBALFOUNDRIES</td>
<td>1.2</td>
<td>0.7</td>
<td>0.8</td>
<td>1.4</td>
</tr>
<tr>
<td>Nexchip</td>
<td>0.8</td>
<td>0.6</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Others</td>
<td>12.1</td>
<td>9.3</td>
<td>8.3</td>
<td>11.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.3</td>
<td>97.3</td>
<td>109.3</td>
<td>143.0</td>
</tr>
</tbody>
</table>

y-o-y growth

- Top 3 (% of Total) 8% 52% 55% 57%
- Top 5 (% of Total) 70% 73% 70% 71%

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**2021 Semi capex growth upped to +31% by VLSI**

- 55% of estimated increase represented by TSMC and Intel
- Powered by Advanced Logic and Foundry (+43% vs. 2020)

**Growth in Advanced Logic and Foundry has significantly exceeded memory spending in recent years**

- CAGR of 20.6% 2017-2021 vs. DRAM/Flash/NVM CAGR 3.4%
- Represents 54% of total WFE spending in 2021

**Industry consolidating: top 5 producers now represent 71%**
Leading Producers Announced Significant Capex Expansion in H1-21
Total Announcements Through May = $1 Trillion+

$78.4 Billion Direct and $125.5 Billion Indirect Spending Per Annum

<table>
<thead>
<tr>
<th>Source: VLSI June 2021</th>
<th>Date</th>
<th>Amount $</th>
<th>Timing</th>
<th>$ p.a.</th>
<th>Location</th>
<th>Purpose</th>
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<tbody>
<tr>
<td><strong>Direct Investments</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSMC</td>
<td>Mar 2021</td>
<td>100.0B</td>
<td>3 years</td>
<td>33.0B</td>
<td>Taiwan/AZ</td>
<td>Advanced packing capacity and R&amp;D</td>
</tr>
<tr>
<td>TSMC</td>
<td>May 2021</td>
<td>12.0B</td>
<td>5 years</td>
<td>2.4B</td>
<td>AZ</td>
<td>New 5nm fab</td>
</tr>
<tr>
<td>Intel</td>
<td>Mar 2021</td>
<td>20.0B</td>
<td>4 years</td>
<td>5.0B</td>
<td>AZ</td>
<td>2 new fabs &lt;7nm</td>
</tr>
<tr>
<td>Intel</td>
<td>May 2021</td>
<td>3.5B</td>
<td>3-4 years</td>
<td>1.0B</td>
<td>NM</td>
<td>Fab upgrade Adv. Packaging</td>
</tr>
<tr>
<td>Samsung</td>
<td>May 2021</td>
<td>151.0B</td>
<td>9 Years</td>
<td>16.7B</td>
<td>KO/CN/US</td>
<td>Foundry &lt;3nm and Adv. Memory</td>
</tr>
<tr>
<td>SK Hynix</td>
<td>May 2021</td>
<td>203.0B</td>
<td>10 Years</td>
<td>20.3B</td>
<td>KO/CN</td>
<td>Adv. Memory and capacity expansion</td>
</tr>
<tr>
<td><strong>Indirect Investments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td>Apr 2021</td>
<td>430.0B</td>
<td>5 years</td>
<td>86.0B</td>
<td>USA</td>
<td>Next-gen silicon, 5G innovation, data centers</td>
</tr>
<tr>
<td>USA</td>
<td>May 2021</td>
<td>52.0B</td>
<td>5 years</td>
<td>10.4B</td>
<td>USA</td>
<td>Semi capacity and R&amp;D</td>
</tr>
<tr>
<td>EU</td>
<td>Dec 2020</td>
<td>€ 30.0B</td>
<td>5 years</td>
<td>€ 6.0B</td>
<td>EU</td>
<td>Semi capacity and R&amp;D. ESG</td>
</tr>
<tr>
<td>Korea</td>
<td>May 2021</td>
<td>100.0B</td>
<td>5 years</td>
<td>20.0B</td>
<td>KO</td>
<td>Semi manufacturing incentives</td>
</tr>
<tr>
<td>Japan (Sony/TSMC)</td>
<td>May 2021</td>
<td>9.2B</td>
<td>3 years</td>
<td>3.1B</td>
<td>JP</td>
<td>&lt;20nm fab</td>
</tr>
</tbody>
</table>

June 10, 2021
Assembly Equipment Forecast Upgraded Through 2023

**Besi Revenue**

- **June 10, 2021**

- **+41% growth now estimated for 2021**
  - 60% growth forecast 2020-2023E
  - Expected to reach $6.0B+
  - Ex service revenue

**Strong secular market fundamentals:**
- 5G, Datacenter, AI and HPC primary drivers
- New process technologies like hybrid bonding/CSP emerging

---

**Source:** VLSI, June 2021. Assembly equipment revenues includes hybrid bonding forecast beginning 2021.

* Market size excludes service revenues. ** LTM H1-21 revenue assumes midpoint of Q2-21 guidance.

---

**Revenue**

- **375** 7.5%
- **593** 57.9%
- **525** -11.4%
- **356** -32.2%
- **434** 21.7%
- **398** 39.4%
- **555**

**YoY Growth Rate**

- **525**
- **356**
- **434**
- **398**
- **555**

---

**Market Size**

- **3.6**
- **4.5**
- **4.4**
- **3.0**
- **3.6**
- **5.1**
- **5.9**
- **6.0**

**YoY Growth Rate**

- **25.7%**
- **-2.4%**
- **20.6%**
- **41.7%**
- **15.0%**
- **2.5%**
- **-40%**
- **-30%**
- **-20%**
- **-10%**
- **0%**
- **10%**
- **20%**
- **30%**
- **40%**
- **50%**

---

**US$ billions**

- **2016**
- **2017**
- **2018**
- **2019**
- **2020E**
- **2021E**
- **2022E**
- **2023E**
2021 Could Be Inflection Point for Assembly Spending Post Significant Underinvestment Since Last Cycle

- Traditional component assembly investment has lagged WFE in recent years
- Capital intensity declined to 20 year low in 2020 (4.9%)
- VLSI anticipates capital intensity to increase to ~6% via increased investment in <10nm devices


June 10, 2021
Increased Investment Expected to Favor Besi’s Product Portfolio, Particularly Die Attach

CAGR (2020-2023)
- Die Attach: 30.6%
- Packaging & Plating: 15.3%
- Other Assembly: 13.7%
- Total: 18.7%

Market Share

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Die Attach</td>
<td>27%</td>
<td>25%</td>
<td>27%</td>
<td>32%</td>
<td>34%</td>
</tr>
<tr>
<td>Packaging &amp; Plating</td>
<td>15%</td>
<td>14%</td>
<td>13%</td>
<td>13%</td>
<td>12%</td>
</tr>
<tr>
<td>Other Assembly</td>
<td>58%</td>
<td>61%</td>
<td>61%</td>
<td>55%</td>
<td>54%</td>
</tr>
</tbody>
</table>

III. END USER TRENDS
All Key Besi End User Markets Growing Post Pandemic

<table>
<thead>
<tr>
<th>Mobile Internet (39%)</th>
<th>Computing (21%)</th>
<th>Automotive (13%)</th>
<th>Industrial/Other (10%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5G Ramp Underway</td>
<td>Digital Society Accelerating</td>
<td>Development Continues</td>
<td>Energy Efficient/Green</td>
</tr>
</tbody>
</table>

**ALL CONNECTED IN MANY DIFFERENT WAYS**

Percentages based on Besi’s 2020 estimated revenue per end market application. Spares/service revenue was ~17% of 2020 revenue.

June 10, 2021
Move to digital society drives computing advancements

- Widespread use of digital applications:
  - Social media
  - e-commerce
  - Work from home
  - School from home

- Requires ever faster computation, data transfer and data storage

Source: INTEL
Mobile: 5G Adoption Increasing
Driven By New Smartphone Applications and Features

Number of mobile phones sold per year now fairly constant at about 1.7 billion
- of which 80%+ are represented by smart phones

Growth driven by new features and innovation:
- 5G broader spectrum including mm waves
- More and better cameras
- Next generation face recognition
- Bio sensors
- Spacial sensors like Lidar
- Better displays and foldable
- More powerful application processors 5nm and 4nm
- More powerful modems 5nm technology
- Requiring denser packages

Several additional growth drivers:
- Device to device
- Smart watches, earbuds etc.
- 5G infrastructure expansion

Growth in new features and functionality requires new/advanced assembly systems
- To achieve higher performance and more compact form factors
Mobile: Technology Converging With Computing World

Source: Qualcomm

Source: NXP
Mobile: Besi’s Largest End User Market

<table>
<thead>
<tr>
<th>RF Front End</th>
<th>Antennas</th>
<th>GPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Tranceiver</td>
<td>Modem</td>
<td></td>
</tr>
<tr>
<td>Local Connectivity</td>
<td>WiFi/NFC</td>
<td></td>
</tr>
<tr>
<td>Microphone</td>
<td>Cameras</td>
<td>Sensors</td>
</tr>
<tr>
<td>Display</td>
<td>TouchScreen</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>Battery</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Application Processor

Source: Unitedlex.com and ifixit.com and System plus

Besi Involved in Almost All Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Besi system Utilized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>880KHM, AMS-LM</td>
</tr>
<tr>
<td>DRAM Memory</td>
<td>2100D, FSL</td>
</tr>
<tr>
<td>NAND Flash</td>
<td>2100D, AMS-W/L/W</td>
</tr>
<tr>
<td>PM IC</td>
<td>2100D, AMS-W/L/W</td>
</tr>
<tr>
<td>Motion coprocessor</td>
<td>2100D, AMS-W/L/W</td>
</tr>
<tr>
<td>Gyroscope</td>
<td>2100D-P, 2100D-D, AMS-W/L/M, FCL</td>
</tr>
<tr>
<td>3-axis accelerometer</td>
<td>2200evo</td>
</tr>
<tr>
<td>barometric sensor</td>
<td>2200evo</td>
</tr>
<tr>
<td>Charging IC</td>
<td>2100D-P, 2100D-D, AMS-W/L/M, FCL</td>
</tr>
<tr>
<td>Power Delivery IC</td>
<td>2100D-P</td>
</tr>
<tr>
<td>Wireless charging IC</td>
<td>2100D-P, 2100D-D, AMS-W/L/M</td>
</tr>
<tr>
<td>WiFi/BT module</td>
<td>AMS-W/LM / 2100HSI</td>
</tr>
<tr>
<td>NFC</td>
<td>880KFCQ, AMS-W/LM, ZD09SS1</td>
</tr>
<tr>
<td>LTE Modem</td>
<td>880KFCQ, AMS-W/LM</td>
</tr>
<tr>
<td>Low Band LTE PAD</td>
<td>2200evo, FSL</td>
</tr>
<tr>
<td>Mid Band PAD</td>
<td>2200evo, FSL</td>
</tr>
<tr>
<td>High Band PAD</td>
<td>2100D-P, 2100D-D, AMS-W/L/M</td>
</tr>
<tr>
<td>RF Transceiver</td>
<td>2100D-P, 2100D-D, AMS-W/L/M</td>
</tr>
<tr>
<td>RF Receiver</td>
<td>2100D-P, 2100D-D, AMS-W/L/M</td>
</tr>
<tr>
<td>Envelop Tracking IC</td>
<td>880KFCQ, AMS-W/LM</td>
</tr>
<tr>
<td>Antenna Switch</td>
<td>2100D-P, 2100D-D</td>
</tr>
<tr>
<td>PA</td>
<td>2100D-P, 2100D-D, AMS-W/L/M</td>
</tr>
<tr>
<td>PA Module</td>
<td>2200evo, 2100D-D</td>
</tr>
<tr>
<td>GSM/F9 module</td>
<td>2200evo, 2100D-D</td>
</tr>
<tr>
<td>Video/Audio</td>
<td>Besi system Utilized</td>
</tr>
<tr>
<td>Camera Back side</td>
<td>2200evo</td>
</tr>
<tr>
<td>Camera Front Side</td>
<td>2200evo</td>
</tr>
<tr>
<td>Face ID</td>
<td>2200evo</td>
</tr>
<tr>
<td>Image Sensor</td>
<td>2200evo</td>
</tr>
<tr>
<td>Dot Projectors</td>
<td>2200evo</td>
</tr>
<tr>
<td>2x4 microphones</td>
<td>2100D-S</td>
</tr>
<tr>
<td>Audio Codec</td>
<td>2100D-P, 2100D-D, AMS-W/L/M</td>
</tr>
<tr>
<td>Touch screen control</td>
<td>2100D-S</td>
</tr>
<tr>
<td>Touch Transmitter</td>
<td>FCL</td>
</tr>
<tr>
<td>OLED PMIC</td>
<td>2100D-P</td>
</tr>
</tbody>
</table>
We are creating ever more data

zettabytes information created, captured copied and consumed

Source: Statista May 2021

We use more and more computing power to accomplish daily tasks:

- Need faster computing
- Need faster data transfer between compute and memory
- Need bigger and faster memory

Data transfer governed by:

- Distance between compute and memory
- Number of lanes for data transfer
- Speed per lane

Assembly process critical to improve data transfer speeds
Computing: Usage of High Performance Computing Expanding to Many Other Commercial Applications

Data centers

Laptops/Gaming/Engineering

Mobile Phones

Autonomous Driving

Super Computers

AI/Vision/Recognition

Industry 4.0

Medical
Computing: Hybrid Bonding Offers Higher Level of Performance for Next Generation Computing Needs

Principal advantages

- Contact density increases by factor of 1,000x (1,000/mm\(^2\) to 1,000,000/mm\(^2\))
- More contacts per mm\(^2\) means greater and faster data transfer per mm\(^2\)
- Shorter distance between dies also increases data transfer speeds
- Better thermal performance
- Cost per contact lower

June 10, 2021
Computing: Chiplet Adoption Enables Cost Effective Means of Increasing Performance

For many years the most direct way to improve capacity and performance was to increase wafer size and design by using smaller devices with more transistors/mm²

5 nm node seems to be the turning point where chiplet technology becomes more cost effective to further increase performance

Current Technology Limitations

- Size limited by lithography constraints
- Usage of larger chips results in lower yields
- Wire length between sections can become too long

- Investment and design cost per/mm² increasing for advanced nodes

- Single Silicon Die
  1 Die Bonding Step

- Split into 5 smaller dies connected with 5 Bridges = 10 Die Bonding Steps!

Source: AMD

Source: Toshiba

Source: IMEC
## Automotive: Electronic/Electric Content Growing Over Time

<table>
<thead>
<tr>
<th><strong>First Automobile</strong></th>
<th><strong>Reliable Ignition</strong></th>
<th><strong>Electric Starter</strong></th>
<th><strong>Car Radio</strong></th>
<th><strong>Car Phone</strong></th>
<th><strong>All Transistor Car Radio</strong></th>
<th><strong>Anti-Lock Braking System</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Wheels</td>
<td>Double Coil</td>
<td>Small Unit</td>
<td>First connected cars!</td>
<td>Real connected car</td>
<td>90% Less energy</td>
<td>ABS First Digital Technology</td>
</tr>
<tr>
<td>0.75 HP</td>
<td>Magneto Induction</td>
<td>High Current</td>
<td>Bulky but reliable</td>
<td>Professional use</td>
<td>Immediate On</td>
<td>in a key system</td>
</tr>
<tr>
<td>Carl Benz</td>
<td>Ceramic Spark Plug</td>
<td></td>
<td>Costs 15% of new car</td>
<td>Took half the trunk</td>
<td></td>
<td>Fiat ABS (Palazzetti) Patent sold to Bosch</td>
</tr>
<tr>
<td>Robert Bosch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mercedes S first car</td>
</tr>
<tr>
<td>Gotlobb Honold</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Charles Kettering</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Henry Leland Delco</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Paul Galvin Motorola</td>
<td></td>
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<td></td>
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<tr>
<td>William Lear Elmer Wavering</td>
<td></td>
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</tr>
<tr>
<td>Paul Galvin</td>
<td></td>
<td></td>
<td></td>
<td>Bell Labs</td>
<td></td>
<td></td>
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<tr>
<td>Motorola</td>
<td></td>
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<td></td>
<td>Motorola</td>
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<tr>
<td>William Lear</td>
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<td>Philco</td>
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<tr>
<td>Elmer Wawering</td>
<td></td>
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<td></td>
<td>Chrysler</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1885</td>
<td>1902</td>
<td>1911</td>
<td>1930</td>
<td>1946</td>
<td>1955</td>
<td>1970's</td>
</tr>
</tbody>
</table>

Sources: Wikipedia, Bosch, Motorola, Mercedes G.C.Fors

- **1885**: Bertha Benz and 2 sons, First car trip Aug 1888, 180 km Mannheim Pforzheim
- **1902**: Carl Benz
- **1911**: Robert Bosch, Gotlobb Honold
- **1930**: Charles Kettering, Henry Leland, Delco
- **1946**: Paul Galvin, Motorola, William Lear, Elmer Wawering, Bell Labs Motorola
- **1955**: Philco, Chrysler
- **1970's**: Fiat ABS (Palazzetti), Patent sold to Bosch Mercedes S, first car

---

**June 10, 2021**
Automotive: Today’s Car is an Electric-Driven Supercomputer on Wheels

It senses surroundings

- Ultrasonic: 9
- Radar (LRR): 2
- Radar (SRR): 4
- Forward Camera: 2
- Surround Camera: 4
- Driver Camera: 1
- LiDAR: 4
- Infrared: 2
- Total Sensors: 28

L5 28 Sensors

It connects to outside world

C-V2X

It analyzes and understands

It makes decisions

Need supercomputer in car using state of the art technology

Tesla inks deal with Samsung to develop new nano chip for autonomous cars

Jan 27, 2021 5 NM

14 nm 6 B Transistors

Source: Nvidia, The Verge, Qualcomm

June 10, 2021
Automotive: Increased Electronic Content and Power Requirements Will Require New Assembly Solutions

Increase In General Electronic Components

Electric Vehicles: Requires More Power/Devices

Autonomous Driving Incorporates High End Content

Charging Infrastructure: Requires More Power/Devices

Source: Amkor

Source: Infineon

Source: Continental, Nvidia Mobile Eye

June 10, 2021
Automotive: Semiconductor Content and Cost per Car Increasing

EV Adoption Will Further Increase Semi Content and Cost/Car

Growth in Automotive Semiconductors

Content and Cost/Car Increasing

Source: IHS Markit 10/2020

Source: IHS Markit and Deloitte Insights, July 2020
IV. GROWTH OPPORTUNITIES
Growth in Advanced Packaging Will Continue As Gateway to Realizing Improved Performance in Next Gen Applications

**Advancements in Miniaturization**

<table>
<thead>
<tr>
<th>TECHNOLOGY ROADMAPS AVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALLER DEVICES ARE FASTER AND REQUIRE LESS ENERGY PER SWITCHING ACTION</td>
</tr>
</tbody>
</table>

**New Computing Methods**

- Neuromorphic Computing
- Parallel Computing
- Standard Computing

**New Packaging Methods: Chiplets / 2.5 D Stacking**

- Multiple Smaller Stacked Dies
- Need more die attach process steps

**Real 3D Device Coupling With Die Stacking**

- Single large Die
- 3D Stacking with TCB
- DIRECT STACK WITH HYBRID
  - CACHE DIE
  - Hybrid Bond
  - CORE LOGIC DIE

Source: IMEC
Hybrid Bonding Now on Agenda of All Big Players

Source: TSMC, AMD presentations

Source: Intel Architecture Day 2020

Source: Samsung presentations

June 10, 2021
Hybrid Bonding Merges Front-end/Back-end Processes

**Requiring Much Smaller Dimensions**

- C4 (Flip-Chip) ~120/mm²
- μ-bump (3DIC) ~ 800/mm²
- Bump-less (SoIC) 12,000 → 1,200,000/mm²

Hybrid die to wafer bonding much like front end fab

**Requiring Much Higher Precision**

- Align Contacts Very Precisely In X and Y
- Typical 10% Max Deviation of contact size
- 1 um contact => 100 nm Accuracy

As well as angular control

**Requiring Higher Levels of Cleanliness Comparable to Front-End**

In TCB process, a small particle may have little effect

In hybrid process, a small particle may cause an open contact

Source: TSMC

June 10, 2021
And More Process Steps Resulting in Higher Assembly Capital Intensity

Hybrid Bonding Adoption Will Generate Additional Demand For Assembly Equipment

**LOGIC**

**Example: COWOS TYPE STRUCTURE**

Current Design
3 BONDING STEPS

With Hybrid Bonding
5 BONDING STEPS

**Example: FAN OUT TYPE STRUCTURE**

Current Design
2 BONDING STEPS

With Hybrid Bonding
4 BONDING STEPS

**MEMORY**

CASE 1 => HYBRID MAY REPLACE 1 TO 1 TCB

CASE 2 => HYBRID WILL ALLOW FOR MORE DIES IN SAME STACK HEIGHT LEADING TO MORE BONDING STEPS

Source: TSMC

Source: Xperi
Different Wafer Level Structures Will Also Drive Growth for High End Assembly Market. Hybrid Bonding Will Coexist with TCB/Flip-Chip

Many different form factors will require different bonding technology per package. BESI is active in all key die bonding process technologies:

- **Highest Level Hybrid D2W & D2D**
- **Next Generation TCB D2W**
- **High Accurate Bridge Placement**
- **Flip Chip**
Status Update: Besi/AMAT Development Cooperation

### SYSTEM IMPROVEMENTS
- REACHING 122nm ACCURACY
- OUTPUT UP TO 2000 UPH

### JOINT DEVELOPMENT COOPERATION
- AMAT AND BESI
- ANNOUNCED OCTOBER 2020

- Front and Back-End Process Expertise
- Dedicated Packaging Development Center
- Platform Design and Integration
- Assembly Equipment Process Expertise
- Market Leader in Hybrid Bonding Systems

### SUBSTANTIAL INVESTMENT IN CLEAN ROOM INFRASTRUCTURE, MEASUREMENT EQUIPMENT, AND PEOPLE

---

**June 10, 2021**
Besi’s Hybrid Die Bonding Progress

**Status Today**
- First production orders received
- Multiple customer engagements
- First hybrid die to wafer products introduced

**Capacity/Support Expanded**
- Expanded R&D teams in Europe and Singapore
- Added clean room facility Malaysia (Q1)
- Completed clean room facility Austria (Q1)
- Engineers and software developers hired for US and Taiwan support

Source: AMD/TSMC at Compudex 2021 TAIWAN
Hybrid Die Bonding Market Update

June 2020 estimate

Total # of installed back-end machines for hybrid bonding

Market tracking towards high case developed in June 2020

- High level of customer engagement
- Significant interest expressed by both logic and memory players
- Collaboration with AMAT enhances market position
- 2020 market estimate confirmed with potential upside
- AMD recently announced first hybrid bonded 3D chiplet-based processor

Forecast highly dependent on timing of:

- Successful design and development per IDM
- Customer roadmaps
- Successful performance in mass production environment

June 10, 2021
Photonics combines optical elements and silicon

- Lasers, receivers and modulators integrated within silicon chip
  - Initially utilized for short distance communication in data centres
  - Applications expanded including lidar and light based computing
  - Advanced packaging required to provide high precision placement and speed.
Expansion of Flip Chip in Mobile Market is Another Revenue Opportunity

- **Substantial number of applications shifting to flip chip**
  - High end <20nm applications
  - High end gaming and crypto currency mining applications
  - New mobile applications
  - Also mid-range applications FC-QFN

**FC entering SIP market for RF parts in 5G applications**

VLSI expects ~2x of FC market 2020-2025

### Area

<table>
<thead>
<tr>
<th>New</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>GPU, Bitcoin/Gaming</td>
</tr>
<tr>
<td>Servers</td>
<td>Expanding FC-BGA</td>
</tr>
<tr>
<td>Edge/IOT</td>
<td>CSP, FC-QFN, PMIC</td>
</tr>
<tr>
<td>Mobile 1</td>
<td>AP, BB</td>
</tr>
<tr>
<td>Mobile 2</td>
<td>Filters, RF SIP, PMIC</td>
</tr>
<tr>
<td>Mobile 3</td>
<td>DDR Memory</td>
</tr>
<tr>
<td>Mobile 4</td>
<td>GPU M1</td>
</tr>
</tbody>
</table>

**Examples**

- **Expansion**
  - PC: GPU, Bitcoin/Gaming
  - Servers: Expanding FC-BGA
  - Edge/IOT: CSP, FC-QFN, PMIC

**New**

- Mobile 1: AP, BB
- Mobile 2: Filters, RF SIP, PMIC
- Mobile 3: DDR Memory
- Mobile 4: GPU M1

**M1, Source, System Plus Consulting**

**FC, QFN**

**June 10, 2021**
MicroLED Update

MicroLED still in development phase

- Qualified process and mass production complexity underestimated
- First application probably smaller form factor like AR/VR glasses and watches
- Besi focused primarily on monolithic microLEDs
- Developing specifications for pre-production system

Example: Idea on Smart Glasses Vuzix

Microsoft Patent Application

Example: Idea on Smart Glasses Vuzix
COVID has accelerated move to digital society and increased technology adoption

Importance of advanced processes like hybrid bonding and chip to wafer has increased substantially

Customer roadmaps have been accelerated

Will increase capital intensity of advanced packaging

Has potential to significantly increase Besi’s addressable market

Hybrid bonding has become a reality over past year with significant market potential

Specifications more like front-end

Will coexist and help drive growth in other advanced packaging processes
V. EQUIPMENT PORTFOLIO UPDATE
Industry Leading Die Attach Equipment Portfolio

Multi-Module Attach
- 2200 evo
- 2200 evo plus
- 2200 evo hS
- 2200 evo advanced
- 2200 evo hf Q4’21

Die Attach
- 2100 hS
- 2100 hS i
- 2100 sD advanced i
- 2100 hS ix Q4’21
- 2009 SSI
- 2100 SSI
- 2100 DS

Flip-chip
- 8800 CHAMEO advanced / PLP
- 8800 FC CHAMEO Ultra Q3’21
- 8800 FC Quantum adv / sigma
- 8800 FC Quantum hs
- 2100 FC hS

Hybrid Bonding
- 8800 CHAMEO ultra plus New

Thermo Compression
- 8800 TC advanced
- 8800 TC NEXT Q4’21

Direct Lid Attach
- DLA
- TGB 2.0 Q3’21

June 10, 2021
Best in Class Packaging and Plating Equipment Portfolio

Substrate Molding
- AMS-LM
  - Substrate strip format
  - Exposed die

Leadframe Molding
- AMS-i
  - MEMS
  - Sensors
- AMS-X
  - HD Leadframe
  - Power Devices

Wafer & Panel Molding
- FSL
  - Wafer molding
  - Panel molding

Trim and Form
- FCL-X/P
  - Leadframe trim & form
  - Sorting

Plating
- Leadframe
- Solar
- Next Gen HD plating with integrated litho
- Film & Foil
- Battery
- Chemical Deflash
- Wettable Flank

Singulation
- FSL
  - Substrate strip singulation
  - Sorting

June 10, 2021
# Key Development Programs Currently

<table>
<thead>
<tr>
<th>Category</th>
<th>Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advanced Interconnect</strong></td>
<td>• Hybrid bonding production launch for leading foundry and IDM customers</td>
</tr>
<tr>
<td></td>
<td>• TC(^{\text{Next}}) platform: sub-micron accuracy in chip on chip placement with advanced TCB process control</td>
</tr>
<tr>
<td><strong>Camera Modules and Sensors</strong></td>
<td>• ‘Clean’ evo system to reduce particulate contamination in advanced image sensor assembly</td>
</tr>
<tr>
<td><strong>Automotive and Power</strong></td>
<td>• Fully integrated 6 side die inspection for high speed/quality die bonding</td>
</tr>
<tr>
<td></td>
<td>• 2100 SSI soft solder die attach product launch</td>
</tr>
<tr>
<td></td>
<td>• Singulation and plating equipment for full saw wettable flank QFN</td>
</tr>
<tr>
<td><strong>Base Technology</strong></td>
<td>• Increasing die accuracy toward nanoscale placement</td>
</tr>
<tr>
<td></td>
<td>• Design-to-cost: base platform standardization and cost reduction</td>
</tr>
<tr>
<td></td>
<td>• Sustainability: Reduce energy consumption, extend equipment life via field upgrade capability and enhanced reliability</td>
</tr>
</tbody>
</table>
2200 evo: Industry Leading Multi-Module Attach Platform

**Key competitive advantages**
- Multi-die, multi-wafer
- High Accuracy and high speed
  - 3 µm accuracy available
- Highly configurable
- Broad range of applications: (400+)
- Rapid R&D to production

**Target Markets**
- **Mobile:** Camera modules, OIS, other sensors
- **Automotive:** Lidar, VCSEL, MEMS, Photodiodes, Radar transceivers
- **Power:** Power IGBT, SiC, Sinter bonding
- **HPC:** 2.5 D Interposers > 70 mm die
- **Computing:** Cloud Storage, SiPh PD and VCSEL

**Continuously Upgraded for New Applications**

- **Gen 4 Platform:** 
  - Performance upgrade and lower cost design

- **2200 evo**
  - High bond force for large die, power devices

- **evo ‘Clean’**
  - Front-end cleanliness levels for advanced camera modules

**New Developments 2021**

- > 6,000 Units Shipped
- 6,000 Units Shipped

June 10, 2021
2100 Epoxy Die Attach: Industry Leading Platform
Highest Speed and Accuracy for Single Die Placement

> 3,300 Units Shipped

New Developments 2021
Focus: Automotive power, advanced quality control and 5G performance

3D Dispensing
- Sinter bonding for power

6 Side Die Inspection
- Automotive quality

Multi-Device Matching
- 5G SiP Performance

Key competitive advantages
- Industry leading accuracy and speed
- Precise bond line thickness control
- New version with advanced self diagnostics and machine learning
- Ultra-thin die ejector for memory
- Confocal inspection for real time material height compensation

Target Markets
- Mobile: Sensors, PMIC, analog
- 5G: PA & RF front end modules
- Automotive: MEMS and Sensors, MCU
- Storage: NAND (SD Cards, iNAND)
- Industrial: Analog, power, MCU
2009 and 2100 Soft Solder Systems: Industry Leading Platforms for Automotive and Industrial Applications

Key competitive advantages
- Leading soft solder process:
  - Lowest cost of ownership
  - Lowest gas consumption
  - Low oxygen level
  - Wide leadframe handling
  - > 10 mm die size for high power
  - Plasma pre treatment
  - Fully automotive qualified

Next Generation Soft Solder

New Developments 2021
Common platform with 2100 epoxy system to extend capabilities and reduce cost

Wide Leadframe
- Large leadframe power SiP

Advanced N2 Chamber
- Lowest gas consumption

Process Control
- Patented bond process

Target Markets
- **Automotive:** High Rel Power packages, SiC
- **Industrial:** All power devices, IGBT, IPM

June 10, 2021
New Product Introduction

**Key competitive advantages**
- Patented Van Gogh bond head and vision system
- < 200 nanometer accuracy
- High speed: over 2000 UPH
- High production yield achieved
- Front-end clean room standard
- Full front-end automation including tool changes

**New Developments 2021**
Shipping production systems in H2-2021

- **Van Gogh Bond Head**
  - Nanometer accuracy

- **Auto Product Change**
  - Front-end fab integration

- **Advanced Cleanliness**
  - Best-in-class yield

**Target Markets**

- **Computing**: Chiplet integration for HPC Heterogeneous integration
- **Memory**: High density 3D NAND
- **5G**: Future RF SiP modules

Source: Techserach
## Industry Leading Flip-Chip Die Attach Product Portfolio

<table>
<thead>
<tr>
<th>Advanced Flip-Chip and Fan-out 8800 CHAMEO</th>
<th>High Speed Flip-chip 8800 QUANTUM</th>
<th>2100 FC hS Lowest COO</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Advanced Flip-Chip and Fan-out 8800 CHAMEO" /></td>
<td><img src="image2" alt="High Speed Flip-chip 8800 QUANTUM" /></td>
<td><img src="image3" alt="2100 FC hS Lowest COO" /></td>
</tr>
<tr>
<td><strong>New</strong> advanced bondhead with V-axis Multi-die handling</td>
<td><strong>New</strong> Quatro bondhead system capable to pick and place 4 die per head</td>
<td>Lowest COO for smaller devices Advanced process control</td>
</tr>
<tr>
<td>Accuracy &lt; 3 µm → 750 nm Throughput 10,000 UPH 40 mm die size</td>
<td>Accuracy &lt; 4 µm → 3 µm Throughput 20,000 UPH → 25,000 30 mm die size</td>
<td>Accuracy &lt; 8 µm Throughput 13,000 UPH Die size 0.3 -20mm</td>
</tr>
<tr>
<td>fcBGA, 2.5D chip-to-wafer Fan-out WLP</td>
<td>fcCSP, 5G SiP, Memory</td>
<td>FCoLf / QFN / Led / SiP</td>
</tr>
</tbody>
</table>

June 10, 2021
Thermo Compression Bonding (TCB): Next Generation System Targeting Chip to Wafer Applications for HPC Market

**Next Generation TCB**

**New Developments 2021**

- Fine pitch process
- 5 µm pitch C2W demonstrated
- Sub-micron accuracy for chiplets
- Ultra low gas consumption

**Key competitive advantages**

- Both chip-to-substrate and chip-to-wafer capabilities
- Flexible material handling
- Submicron accuracy
- Bond collapse detection
- Up to 70mmx70mm die size
- Ultra-low gas usage

**Target Markets**

- **Computing:** HPC, Heterogeneous Integration Si interposer attach
- **Memory:** HBM stacking
- **Consumer:** AR/VR, uLED

June 10, 2021
Molding: AMS LM Substrate Molding: Leading Exposed Die System for 5G and Complex 3D Molding Applications

350+ Systems Shipped

Key competitive advantages
- Best in class COO
- Lowest power usage and weight
- Standard for thin die molding
- Exposed die molding (90% share)
- Dynamic clamp force control
- Board thickness compensation
- Double sided molding (5G FEM)

New Developments 2021
Focus on 5G System in Package Applications

- Low ESD <50V/Inch
- Low transfer pressure
- Particle reduction
- Safe for MEMS and RF
- Safe for MEMS and XTALs

Target Markets
- **5G**: Advanced RF front-end modules
- **Wearables**: SiPs with intricate 3D designs
- **Automotive**: Power products
- **Memory**: Stacked Die and FC DRAM 5

Intricate mold profile for wearable product

June 10, 2021
FML Wafer Level Molding For Exposed Die Applications Including Hybrid Bonding

**Key competitive advantages**

- Exposed die wafer molding
- No die swim
- Narrow gap filling < 50 μm
- Dynamic clamp force control
- Mold planarity below 5 μm
- High precision wafer placement
- 150 ton capability

---

**New Developments 2021**

**Auto leveling**

Precise thickness across wafer

**TSV Wafer molding**

Exposed die molding to encapsulate hybrid bonded die

---

**Target Markets**

- **Computing:** Chiplet integration for HPC Heterogeneous integration
- **Mobile:** 3D Wafer level fan-out

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June 10, 2021
AMS X: Next Generation Leadframe Molding Focused on Automotive and Other Quality Critical Applications

New Product Introduction

Key competitive advantages
- Lowest power usage and weight
- Dynamic clamp force control
- Supports large leadframe (125 mm x 300 mm)
- High density leadframes
- Excellent resin bleed
- Integrated trim and form
- Automotive quality
- Single product handling (power)

New Developments 2021

- Unique clamping mechanism
- Common module
- Reduced power consumption
- Scaleable automation
- High quality and yield
- Lowest operating cost

Target Markets
- Automotive: High Rel Power packages, SiC
- Industrial: All power devices, IGBT, IPM

June 10, 2021
FCL-X/P High Precision Trim and Form for Industrial and Automotive Markets

Key competitive advantages
- Handles most complex HD leadframes
- Fast configuration
- Full product traceability
- Fully modular
- Many off load configurations
- Complete vision inspection
- Laser marking module
- Selective punching

Key competitive advantages
- Handles most complex HD leadframes
- Fast configuration
- Full product traceability
- Fully modular
- Many off load configurations
- Complete vision inspection
- Laser marking module
- Selective punching

Target Markets
- Industrial: Power/IGBT
- Automotive: All leadframe based packages

New Developments 2021
- IGBT single unit handling
- Deflashing module
- Reject punching

1,500+ Units Shipped

June 10, 2021
Besi’s Plating and Wet Processing Systems are Industry Standard for Leadframe Plating

820 Systems Shipped

Key competitive advantages
- Leading share of leadframe plating market
- Very efficient chemical usage
- High precision plating
- Low power consumption
- High UPH/m²

New Developments 2021

Wettable Flank QFN
- Plating of QFN leads after full cut saw
- Improved reliability for automotive
- Full cut process can process thinner packages

Flux Cleaning - Clip Attach
- Leadframe cleaning for power applications
- Improved yield and quality for automotive

Chemical Deflash Line
- Removes residual resin from leadframe pads
- New high UPH machine for top OSAT

Next Gen Solar Plating
- Cu plating line for next generation solar cells
- HJT, Topcon, large wafer sizes
- Reduced cost compared to Ag printing

Leadframe plating line

Source: Semiconductor Packaging News
Development Summary

Enhancing Capabilities of Existing Portfolio for Future Growth

- Focus on new mobile features and functionality for evo. Next gen facial recognition, 3D imaging and sensors
- Focus on power devices and automotive electrification for die attach and packaging
- Innovation in high speed flip chip to maintain leadership in mainstream computing and communications applications
- Development of advanced SiP molding for 5G RFFE, wearables, and IOT
- Design-to-cost: base platform standardization and cost reduction

Industry Leading New Product Development

- Leader in new interconnect technology transition including:
  - Hybrid bonding for heterogeneous integration
  - Next gen TCB and flip chip
  - Increasing accuracy toward nanoscale placement
VI. 2021 STRATEGIC INITIATIVES
Summary Strategic Initiatives 2021

1. Extend Besi’s technology leadership
2. Engage with industry leaders in highest growth markets
3. Expand production capacity to meet €1B+ revenue model
4. Meet customer delivery schedules, Expand supply chain to support future growth
5. Align organization with customer capex expansion
6. Execute on cost reduction and efficiency improvement plans
Revenue Growth Initiatives

- "Pick the winners"
- Hybrid bonding engagement with leading foundry, logic and memory IDMs
- Expand technical service in US, Taiwan and Korea
- New 5G and AI applications
- Wire bonding to flip chip conversion
- Increased penetration of Korean and Chinese android markets
- Expand Chinese market presence
- Expand automotive market share

June 10, 2021
Strategic Operating Initiatives 2021

Production
- Scale production capacity to €250 million/quarter
- >20% floor space expansion in MY and CHN
- Increase temporary Asian production personnel
- Expand clean room for hybrid production MY

Supply Chain
- Active management to satisfy customer demand
- Efficiency improvements in procurement and logistics

Service/Support
- Increase remote working model including remote service and support

Besi field service engineers are equipped with Hololens AR glasses to enable remote equipment buy-off and service

June 10, 2021
VII. SUPPLY CHAIN & ESG
Two Principal Supply Chains:
- Southeast Asia and China
- Europe utilized for specific high-end parts
- ~1,600 total suppliers
- ~50 key suppliers
- Virtually all dual-sourced

Final system assembly/test in-house, production outsourced:
- Base units (90% pre-assembled)
- Modules
- Parts
- Services

Competitive Advantages:
- Long-term relationships
- Flexible supply chain/delivery contracts
- Strategic supply chain under CTO
- Successful scalability demonstrated through cycles and COVID
Besi’s Supply ChainScaled Rapidly to Meet 77% Year Over Year Order Growth* Despite Challenging Environment

Unprecedented disruptions to global supply chain networks

- Current delays related to basic components such as motors, PCBs and cameras, certain subassemblies and transportation/logistics

Launched strategic initiatives to meet delivery schedules

- Early identification of shortages
- Active engagement by top management with assistance from major customers
- Increased inventory levels including advance purchases of critical parts and China sourcing of fabricated parts
- Fast-track engineering for alternative solutions
- Flexible production allocation depending on local COVID situation
- Established truck route between Malaysia and China

Meeting customer shipment commitments

- Expect supply chain disruptions to normalize by year end

* LTM Q1-2021 vs. LTM Q1-2020
ESG Infrastructure Established: Three Pillars, 12 Topics, 75 Initiatives. Goals Defined For 2022-2030

* Priorities for 2021
ESG Targets Set to Significantly Reduce Besi’s Environmental Footprint

<table>
<thead>
<tr>
<th>Year</th>
<th>Direct Emissions</th>
<th>Energy Consumption</th>
<th>Energy Consumption</th>
<th>Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tCO2e/million €</td>
<td>GWh</td>
<td>kWh/million €</td>
<td>tonne</td>
</tr>
<tr>
<td>2020</td>
<td>8,482</td>
<td>13.5</td>
<td>382</td>
<td>881</td>
</tr>
<tr>
<td>2022</td>
<td>7,536</td>
<td>12.6</td>
<td>417</td>
<td>147</td>
</tr>
<tr>
<td>2030</td>
<td>3,090</td>
<td>11.8</td>
<td>374</td>
<td>133</td>
</tr>
</tbody>
</table>

- **Direct Emissions**
  - Scope 1: 8,482, 7,536, 3,090
  - Scope 2: 19.6, 21.2, 8.7
  - Relative to revenue: 0.0, 5.0, 10.0

- **Indirect Emissions** (Scope 3)
  - Non-hazardous: 621,443, 663,548, 552,957
  - Hazardous: 1,435, 1,863, 1,552
  - Total: 622,878, 665,411, 554,509
  - Relative to revenue: 622,878, 665,411, 554,509

- **Energy Consumption**
  - Renewable energy: 31.2, 35.5, 33.2
  - Non-renewable: 13.5, 12.6, 11.8
  - Relative to revenue: 13.5, 12.6, 11.8

- **Waste**
  - Non-hazardous: 881, 413, 374
  - Hazardous: 147, 413, 374
  - Total: 1,028, 826, 748
  - Relative to revenue: 1,028, 826, 748

* Targets for 2022 and 2030 based on 2019 revenue. **Only outbound freight included in Scope 3
Targeting 65% of Energy Needs from Renewable Sources

Currently 23% of global energy needs from renewable sources
• Europe 92%
• Focused on solar power and clean energy purchases
VIII. Q&A
Assembly market ever more critical in semiconductor value chain

Long term secular trends drive advanced packaging growth

Disciplined strategic focus has created an industry leader

Market presence has grown via key IDM, supply chains and partners

Tech leadership and scalability result in superior financial returns

Commitment to sustainable growth and fighting climate change

Attractive capital allocation policy
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-Jun-21</td>
<td>Analyst meeting, audio webcast</td>
</tr>
<tr>
<td>17-Jun-21</td>
<td>Goldman Sachs Inaugural Digital Economy conference, virtual</td>
</tr>
<tr>
<td>17-Jun-21</td>
<td>ING Benelux conference Frankfurt, virtual</td>
</tr>
<tr>
<td>24-Jun-21</td>
<td>ABN AMRO/ODDO BHF – When Benelux meets London conference, virtual</td>
</tr>
<tr>
<td>27-Jul-21</td>
<td>2021 Second Quarter Results</td>
</tr>
<tr>
<td>24-Aug-21</td>
<td>Annual Needham Virtual SemiCap and EDA conference, virtual</td>
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<tr>
<td>2-Sep-21</td>
<td>DB European TMT conference, virtual</td>
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<tr>
<td>7-Sep-21</td>
<td>ING Benelux conference London, virtual</td>
</tr>
<tr>
<td>14-Sep-21</td>
<td>KeplerCheuvreux/Rabobank Autumn conference, virtual</td>
</tr>
<tr>
<td>26-Oct-21</td>
<td>2021 Third Quarter Results</td>
</tr>
<tr>
<td>17/19-Nov-21</td>
<td>Morgan Stanley TMT conference Barcelona, virtual</td>
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</table>