Rambus at Nasdaq 40th Investor Conference

Presenter: Rahul Mathur, CFO

June 13, 2019
Safe Harbor for Forward-Looking Statements; Other Disclosures

This presentation contains forward-looking statements under the Private Securities Litigation Reform Act of 1995 including those relating to Rambus’ expectations regarding product and service offerings, growth for 2019 and financial guidance for the second quarter of 2019, including revenue, operating costs and expenses, earnings per share and estimated, fixed, long-term projected tax rates. Such forward-looking statements are based on current expectations, estimates and projections, management’s beliefs and certain assumptions made by Rambus’ management. Actual results may differ materially. Our business is subject to a number of risks which are described more fully in our periodic reports filed with the Securities and Exchange Commission. Rambus undertakes no obligation to update forward-looking statements to reflect events or circumstances after the date hereof.

Effective January 1, 2018, the Company adopted Accounting Standards Update No. 2014-09, Revenue from Contracts with Customers in ASC 606. The adoption of ASC 606 materially impacted the timing of revenue recognition for the Company’s fixed-fee intellectual property licensing arrangements. The adoption of ASC 606 did not have a material impact on the Company’s other revenue streams, net cash provided by operating activities, or its underlying financial position.

This presentation contains non-GAAP financial measures, including operating costs and expenses, operating margin, operating income (loss) and net income (loss). In computing these non-GAAP financial measures, stock-based compensation expenses, acquisition-related transaction costs and retention bonus expense, amortization expenses, non-cash interest expense and certain other one-time adjustments were considered. The non-GAAP financial measures should not be considered a substitute for, or superior to, financial measures calculated in accordance with GAAP, and the financial results calculated in accordance with GAAP and reconciliations from these results should be carefully evaluated. Management believes the non-GAAP financial measures are appropriate for both its own assessment of, and to show investors, how the Company’s performance compares to other periods. Reconciliation from GAAP to non-GAAP results are made available and more fully described on our website as well as the back of this deck and in the earnings release.
Rambus at a Glance

**Market Megatrends**

- Renaissance of computer architectures, **memory critical and driving innovation**
- Internet giants moving **SoC design in-house**, enabling TAM expansion
- **Secure semiconductor HW, SW and supply chain essential** for global commerce

**Rambus Offerings**

- **Architecture Licenses**
- **IP Cores**
- **Chips**
- **Key Management**

- **High-speed IO & DPA Countermeasures**
- **Memory & SerDes PHYs; Secure Cores**
- **Memory Buffers**
- **Secure Supply Chain Provisioning**

**Financial Performance**

- **Revenue**
  - Q119: $48.4M
  - 2018: $231.2M, $401.1M (ASC 605)

- **Cash from Operations**
  - Q119: $28.8M
  - 2018: $87.1M

**NASDAQ:** RMBS

- **25+ Years**
- **2500+ Patents and Applications**
- **HQ:** California
- **~800 Employees Worldwide**

Data • Faster • Safer
All Growth Markets Are Impacted by These Megatrends

**Artificial Intelligence**
Accurate training requires enormous amounts of data - memory bandwidth is key

**Data Center**
Explosion of data from connected devices and real-time processing needs pushing demands on interconnects to move data faster

**Autonomous/ADAS Automotive**
Real-time decisions from multiple inputs increase demand on processing and trust in the data

**Edge Compute (5G)**
Near edge (base stations) drive performance and far edge (gateways and routers) demand power efficiency and trust

**Internet of Things**
Billions of connected endpoints make device-level security critical to enabling trust across the ecosystem

**Defense**
Trusted device authentication is critical to global supply chain
Semiconductor Industry Ecosystem Built on Leading-Edge IP

Markets
- AI/ML
- Data Center
- Automotive
- Communications
- IoT
- Government

Cloud Providers
- Google
- Amazon
- Facebook
- Microsoft
- Alibaba Group

System OEMs
- HP
- Dell
- HTC
- Ericsson

Chip Makers
- Micron
- Samsung
- SK hynix
- Qualcomm
- Intel

Foundry
- TSMC
- Samsung
- Global Foundries

Technology Suppliers
- IDT
- Montage Technology
- Rambus
- cadence
- Synopsys
- ARM

Ecosystem Example
Rambus Semiconductor Solutions Built on Leading-Edge IP

High growth; differentiated margin

Secure Supply Chain Provisioning

Chips

Buffer Chips

High margin; predictable; fuels investment

Provisioning

IP Cores

High-speed Interfaces and Embedded Security

Architecture License

Foundational Patents
Rambus Solutions Throughout the Data Center

Buffer Chips

Memory Interface IP

Secure Cores

SerDes Interface IP

Networking Line Card Example

CryptoManager Root of Trust

Custom RISC-V CPU
Secure Memory
Crypto Accelerators (AES, SHA, others...)

Register Clock Driver (RCD)
RCD
Data Buffer
Delivering More Data, Faster: High-speed IP Cores and Chips

High-speed memory and SerDes interfaces are critical for performance in data-intensive applications.

Memory buffers are the key to expanding capacity for data centers and high-performance computing.
Keeping Data Safe: Secure Silicon IP and Provisioning

Embedding secure roots of trust in silicon and siloing it from general processing is critical to creating trust across connected devices.
Rambus R&D Drives Datacenter Innovation in Foundational Areas

- Extending the performance of DRAM for future generations
- Next-generation hybrid memory subsystems for cost-effective performance
- Application-specific memory solutions for Artificial Intelligence and Machine Learning
Predictable Revenue Base

Large portion of our revenue is fixed & predictable

- Continue to leverage our high margin historic businesses to fuel growth in adjacent areas
- Revenue does not reflect billings related to fixed-fee licensing arrangements

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Q1’18</th>
<th>Q2’18</th>
<th>Q3’18</th>
<th>Q4’18</th>
<th>Q1’19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensing Billings</td>
<td>$75.9</td>
<td>$73.2</td>
<td>$75.4</td>
<td>$76.7</td>
<td>$75.4</td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$21.4</td>
<td>$30.0</td>
<td>$33.6</td>
<td>$45.4</td>
<td>$24.8</td>
</tr>
<tr>
<td>Delta</td>
<td>$54.6</td>
<td>$43.2</td>
<td>$41.8</td>
<td>$31.3</td>
<td>$50.6</td>
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</tbody>
</table>
## Non-GAAP Income Statement

<table>
<thead>
<tr>
<th>In Millions</th>
<th>ASC 606 Q1 2018</th>
<th>ASC 606 Q2 2018</th>
<th>ASC 606 Q3 2018</th>
<th>ASC 606 Q4 2018</th>
<th>ASC 606 Q1 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>$46.4</td>
<td>$56.5</td>
<td>$59.8</td>
<td>$68.5</td>
<td>$48.4</td>
</tr>
<tr>
<td><strong>Total Operating Expenses¹</strong></td>
<td>$68.7</td>
<td>$66.8</td>
<td>$67.6</td>
<td>$61.6</td>
<td>$67.3</td>
</tr>
<tr>
<td><strong>Operating Income (Loss)¹</strong></td>
<td>($22.3)</td>
<td>($10.3)</td>
<td>($7.9)</td>
<td>$6.9</td>
<td>($18.9)</td>
</tr>
<tr>
<td><strong>Cash from Operations</strong></td>
<td>$16.8</td>
<td>$3.6</td>
<td>$31.6</td>
<td>$35.1</td>
<td>$28.8</td>
</tr>
</tbody>
</table>

Driven by the structure and timing of key deals. Year over year growth from product revenue, royalties and incremental licensing agreements.

Managed expenses through refocus on core growth initiatives. Adoption of ASC 842 in Q1’19 increased operating expense with corresponding decrease in interest expense.

Operating results under ASC 606 do not reflect significant cash flow from fixed-fee licensing arrangements.

Consistent performance in line with expectations.

¹Please refer to reconciliations of non-GAAP financial measures included in this presentation and in our earnings release.
Financial Strength

<table>
<thead>
<tr>
<th></th>
<th>Q1 2018</th>
<th>Q2 2018</th>
<th>Q3 2018</th>
<th>Q4 2018</th>
<th>Q1 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cash &amp; Marketable Securities</td>
<td>$291.2</td>
<td>$298.3</td>
<td>$248.2</td>
<td>$277.8</td>
<td>$305.9</td>
</tr>
</tbody>
</table>

Issued $172.5M convert and extinguished $56.8M of debt in Q4 2017 and $81.2M of debt in Q3 2018

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assets</td>
<td>$1,539.7</td>
<td>$1,525.8</td>
<td>$1,344.0</td>
<td>$1,361.1</td>
<td>$1,321.4</td>
</tr>
</tbody>
</table>

Strong balance sheet with limited debt

$50M of cash used for share repurchases in Q1 2018

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<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stockholders’ Equity</td>
<td>$1,119.0</td>
<td>$1,105.5</td>
<td>$1,008.3</td>
<td>$1,012.1</td>
<td>$999.9</td>
</tr>
</tbody>
</table>

$674M and $629M contract assets in Q4 2018 and Q1 2019 respectively, related to ASC 606 adoption

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<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash from Operations</td>
<td>$16.8</td>
<td>$3.6</td>
<td>$31.6</td>
<td>$35.1</td>
<td>$28.8</td>
</tr>
</tbody>
</table>

Continued strong cash performance

¹Please refer to reconciliations of non-GAAP financial measures included in this presentation and in our earnings release
**Strong Cash From Operations**

Low Capital Expenditure, Consistent Return to Shareholders

- Predictable revenue stream provides consistent cash flow
- Returned $200M of cash to shareholders from 2015 through 2018 through Accelerated Share Repurchase programs

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow from Operations</th>
<th>Free Cash Flow</th>
<th>Return of Capital (Share Buyback)</th>
<th>Free Cash Flow/share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>(17)</td>
<td>(39)</td>
<td>(10)</td>
<td>(0.35)</td>
</tr>
<tr>
<td>2013</td>
<td>51</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>76</td>
<td>69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>77</td>
<td>71</td>
<td>100</td>
<td>0.39</td>
</tr>
<tr>
<td>2016</td>
<td>96</td>
<td>87</td>
<td>117</td>
<td>0.77</td>
</tr>
<tr>
<td>2017</td>
<td>108</td>
<td></td>
<td>117</td>
<td>0.98</td>
</tr>
<tr>
<td>2018</td>
<td>87</td>
<td>76</td>
<td>87</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Data • Faster • Safer
Rambus Investment Summary

• **Focus on core strength in semiconductor**
  Targeting high-growth data center and edge markets with steady growth in product revenue

• **Solid foundation of committed, long-term revenue**
  Continued profitable growth with high, predictable margin from reoccurring royalties and fees

• **Strong balance sheet to support strategic initiatives**
  Consistent generation of cash from operations
Thank you
Reconciliation of Non-GAAP Financial Measures

<table>
<thead>
<tr>
<th>Net Income (Loss) in Millions</th>
<th>Q1 2018 (ASC 606)</th>
<th>Q2 2018 (ASC 606)</th>
<th>Q3 2018 (ASC 606)</th>
<th>Q4 2018 (ASC 606)</th>
<th>Q1 2019 (ASC 606)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP Net Loss</td>
<td>($36)</td>
<td>($15)</td>
<td>($105)</td>
<td>($2)</td>
<td>($27)</td>
</tr>
<tr>
<td>Adjustments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock-based compensation</td>
<td>$8</td>
<td>$2</td>
<td>$6</td>
<td>$6</td>
<td>$7</td>
</tr>
<tr>
<td>Acquisition-related transaction costs &amp; retention bonus</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Amortization</td>
<td>$11</td>
<td>$9</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
</tr>
<tr>
<td>Restructuring charges</td>
<td>$3</td>
<td>($1)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Non-cash interest expense</td>
<td>$3</td>
<td>$3</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
</tr>
<tr>
<td>Provision for (benefit from) income taxes</td>
<td>($0)</td>
<td>($0)</td>
<td>$90</td>
<td>($2)</td>
<td>$3</td>
</tr>
<tr>
<td>Non-GAAP Net Income (Loss)</td>
<td>($11)</td>
<td>($3)</td>
<td>($1)</td>
<td>$9</td>
<td>($9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating Income (Loss) in Millions</th>
<th>Q1 2018 (ASC 606)</th>
<th>Q2 2018 (ASC 606)</th>
<th>Q3 2018 (ASC 606)</th>
<th>Q4 2018 (ASC 606)</th>
<th>Q1 2019 (ASC 606)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP Operating Loss</td>
<td>($44)</td>
<td>($20)</td>
<td>($19)</td>
<td>($4)</td>
<td>($31)</td>
</tr>
<tr>
<td>Adjustments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock-based compensation</td>
<td>$8</td>
<td>$2</td>
<td>$6</td>
<td>$6</td>
<td>$7</td>
</tr>
<tr>
<td>Acquisition-related transaction costs &amp; retention bonus</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Amortization</td>
<td>$11</td>
<td>$9</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
</tr>
<tr>
<td>Restructuring charges</td>
<td>$3</td>
<td>($1)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Non-GAAP Operating Income (Loss)</td>
<td>($22)</td>
<td>($10)</td>
<td>($8)</td>
<td>$7</td>
<td>($19)</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$3</td>
<td>$3</td>
<td>$3</td>
<td>$3</td>
<td>$3</td>
</tr>
<tr>
<td>Adjusted EBITDA</td>
<td>($19)</td>
<td>($7)</td>
<td>($5)</td>
<td>$10</td>
<td>($16)</td>
</tr>
</tbody>
</table>

Certain amounts may be off $1.0M due to rounding.
## GAAP & Non-GAAP P&L

<table>
<thead>
<tr>
<th>ASC 606</th>
<th>GAAP Actual Q1'19</th>
<th>Pro Forma Actual Q1'19</th>
<th>Delta to GAAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>48.4</td>
<td>48.4</td>
<td>-</td>
</tr>
<tr>
<td>Cost of revenue</td>
<td>11.2</td>
<td>7.3</td>
<td>(3.9)</td>
</tr>
<tr>
<td>Research and development</td>
<td>40.6</td>
<td>37.4</td>
<td>(3.2)</td>
</tr>
<tr>
<td>Sales, general and administrative</td>
<td>27.6</td>
<td>22.6</td>
<td>(5.0)</td>
</tr>
<tr>
<td>Restructuring charges</td>
<td>0.3</td>
<td>0.0</td>
<td>(0.3)</td>
</tr>
<tr>
<td>Total operating costs and expenses</td>
<td>79.8</td>
<td>67.3</td>
<td>(12.5)</td>
</tr>
<tr>
<td>Operating loss</td>
<td>(31.4)</td>
<td>(18.9)</td>
<td>12.5</td>
</tr>
<tr>
<td>Interest and other income (expense), net</td>
<td>5.1</td>
<td>6.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Loss before income taxes</td>
<td>(26.3)</td>
<td>(12.1)</td>
<td>14.2</td>
</tr>
<tr>
<td>Income tax provision</td>
<td>0.3</td>
<td>2.9</td>
<td>2.6</td>
</tr>
<tr>
<td>Net loss</td>
<td>(26.6)</td>
<td>(9.2)</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Certain amounts may be off $0.1M due to rounding.
Non-GAAP Provision for (Benefit from) Income Taxes

<table>
<thead>
<tr>
<th>ASC 606</th>
<th>Actual Q1'19</th>
<th>Actual Q4'18</th>
<th>Variance QoQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>In $ Millions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision for income taxes (GAAP)</td>
<td>0.3</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Adjustment to GAAP provision for income taxes</td>
<td>(3.2)</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Non-GAAP provision for (benefit from) income taxes</td>
<td>(2.9)</td>
<td>3.0</td>
<td>(5.9)</td>
</tr>
</tbody>
</table>

Supplemental Reconciliation of GAAP to Non-GAAP Effective Tax Rate (1)

<table>
<thead>
<tr>
<th></th>
<th>Actual Q1'19</th>
<th>Actual Q4'18</th>
<th>Variance QoQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP effective tax rate</td>
<td>(1)%</td>
<td>(894)%</td>
<td></td>
</tr>
<tr>
<td>Adjustment to GAAP effective tax rate</td>
<td>25%</td>
<td>918%</td>
<td></td>
</tr>
<tr>
<td>Non-GAAP effective tax rate</td>
<td>24%</td>
<td>24%</td>
<td>0.0</td>
</tr>
</tbody>
</table>

(1) For purposes of internal forecasting, planning and analyzing future periods that assume net income from operations, the Company estimates a fixed, long-term projected tax rate of approximately 24 percent for both 2018 and 2019, which consists of estimated U.S. federal and state tax rates, and excludes tax rates associated with certain items such as withholding tax, tax credits, deferred tax asset valuation allowance and the release of any deferred tax asset valuation allowance. Accordingly, the Company has applied these tax rates to its non-GAAP financial results for all periods in the relevant year to assist the Company's planning. Certain amounts may be off by $0.1M due to rounding.
# Revenue Breakdown

## In Millions

<table>
<thead>
<tr>
<th></th>
<th>ASC 606</th>
<th>ASC 606</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rambus</td>
<td>Q1'18</td>
<td>Q2'18</td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$21.4</td>
<td>$30.0</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>$7.3</td>
<td>$8.1</td>
</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>$17.7</td>
<td>$18.3</td>
</tr>
<tr>
<td>Total</td>
<td>$46.4</td>
<td>$56.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>ASC 606</th>
<th>ASC 606</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID</td>
<td>Q1'18</td>
<td>Q2'18</td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$19.5</td>
<td>$18.3</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>$6.3</td>
<td>$7.6</td>
</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>$8.2</td>
<td>$9.1</td>
</tr>
<tr>
<td>Total</td>
<td>$34.0</td>
<td>$35.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>ASC 606</th>
<th>ASC 606</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSD</td>
<td>Q1'18</td>
<td>Q2'18</td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$1.5</td>
<td>$11.8</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>$0.1</td>
<td>$0.4</td>
</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>$8.5</td>
<td>$9.3</td>
</tr>
<tr>
<td>Total</td>
<td>$10.0</td>
<td>$21.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>ASC 606</th>
<th>ASC 606</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLD</td>
<td>Q1'18</td>
<td>Q2'18</td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$0.4</td>
<td>$0.0</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>$0.9</td>
<td>$0.0</td>
</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>$1.1</td>
<td>$0.0</td>
</tr>
<tr>
<td>Total</td>
<td>$2.4</td>
<td>$0.0</td>
</tr>
</tbody>
</table>

Certain amounts may be off $0.1M due to rounding.
# Revenue and Licensing Billings

In Thousands

<table>
<thead>
<tr>
<th>Rambus</th>
<th>ASC 606 Q1'18</th>
<th>ASC 606 Q2'18</th>
<th>ASC 606 Q3'18</th>
<th>ASC 606 Q4'18</th>
<th>ASC 606 FY 2018</th>
<th>ASC 605 Q1'19</th>
<th>ASC 605 Q2'18</th>
<th>ASC 605 Q3'18</th>
<th>ASC 605 Q4'18</th>
<th>ASC 605 FY 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royalty Revenue</td>
<td>$21,374</td>
<td>$30,049</td>
<td>$33,599</td>
<td>$45,430</td>
<td>$130,452</td>
<td>$24,853</td>
<td>$77,174</td>
<td>$73,626</td>
<td>$75,704</td>
<td>$76,717</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>$7,313</td>
<td>$8,087</td>
<td>$11,753</td>
<td>$11,537</td>
<td>$38,690</td>
<td>$8,964</td>
<td>$7,556</td>
<td>$8,221</td>
<td>$11,753</td>
<td>$11,867</td>
</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>$17,739</td>
<td>$18,322</td>
<td>$14,402</td>
<td>$11,596</td>
<td>$62,059</td>
<td>$14,567</td>
<td>$15,729</td>
<td>$16,973</td>
<td>$12,383</td>
<td>$13,398</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$46,426</strong></td>
<td><strong>$56,458</strong></td>
<td><strong>$59,754</strong></td>
<td><strong>$68,563</strong></td>
<td><strong>$231,201</strong></td>
<td><strong>$48,384</strong></td>
<td><strong>$100,459</strong></td>
<td><strong>$98,820</strong></td>
<td><strong>$99,840</strong></td>
<td><strong>$101,982</strong></td>
</tr>
</tbody>
</table>

1 Licensing billings is an operational metric that reflects amounts invoiced to our patent and technology licensing customers during the period, as adjusted for certain differences.
The Data Center

Data • Faster

- **Cores**
  - SerDes PHYs
    - Move data from chip to chip
  - Memory PHYs
    - Move data between chips and memory

- **Chips**
  - Server DIMM Chipsets
    - Enables more capacity at high performance
Optimized for power and area, our line-up of SerDes Interface solutions deliver maximum performance and flexibility for today’s most challenging systems.

**Fully Standards-Compatible**
- Compliant with the latest industry-standard specifications
- Support for multi-modal functionality

**Enhanced Design Flexibility**
- Support for multiple packaging options
- Enhanced margin and yield

**Reduced Power**
- Improved power efficiency
- Lower signaling and stand-by power

**Improved Performance**
- Increased data rates
- Improved bandwidth
- Higher capacity
Rambus High-Speed SerDes PHY Solutions

Complete Solutions: SerDes PMA+ PCS, MAC (Partners)

16G
28nm & 14nm
- PCIe 4/3/2
- CEI 11/6
- XFI/XAUI
- SATA
- SAS

28G
14nm
- CEI-28/25/11
- 100/10GbE
- FC28
- XFI/XAUI

56G
10nm
- CEI-56G MR
- CEI-56G LR
- CEI-28/25/11
- 400/100GbE
- PAM-4/NRZ

112G
7nm
- CEI-112G LR
- CEI-56/28/25
- 800/400/200/100GbE
- PAM-4/NRZ

LEAD CUSTOMERS

Integrated tools for easy bring-up and characterization

- Easy-to-use PC Interface
- Interface to 3rd party software
- Pre-defined test scripts
- PHY control settings
- External instrument control
- System characteristics and analysis

LabStation Platform

Validated solutions with partners

- PLDA
- avery design systems
- CoMIRA SOLUTIONS

ROAD MAP:
- CEI-112G XSR
With their reduced power consumption and industry-leading data rates, our line-up of enhanced memory interface solutions support a broad range of industry standards with improved margin and flexibility.

**Fully Standards-Competible**
- Compliant with the latest JEDEC and industry-standard specifications
- Support for multi-modal functionality

**Enhanced Design Flexibility**
- Support for multitude packaging options
- Enhanced margin and yield

**Reduced Power**
- Improved power efficiency
- Lower signaling and stand-by power

**Improved Performance**
- Increased data rates
- Improved bandwidth
- Higher capacity
Rambus Memory PHY Solutions

Memory PHY Solutions for Networking and Data Center

**DDR4/3**  
28nm & 14nm  
- 3200Mbps  
- x16 – x72-bits  
- 1-4 Ranks  
- DFI 4.0

**HBM2**  
14nm  
- 2000Mbps  
- 1024-bit  
- 2.5D design architecture

**GDDR6**  
- 12-16 Gbps  
- 2x 16-bit channels

**DDR5 & HBM3**  
- 2000Mbps  
- 1024-bit  
- 2.5D design architecture

**ROADMAP**

- Easy-to-use PC Interface  
- Interface to 3rd party software  
- Pre-defined test scripts  
- PHY control settings  
- External instrument control  
- System characteristics and analysis

**LabStation Platform**

**Validated solutions with partners**
Built for speed, power efficiency and reliability, the DDRn chipsets for RDIMM, LRDIMM and NVDIMM server modules delivers the top-of-the-line performance and capacity needed to meet the growing demands on enterprise and data center systems.

Industry-leading Performance

• Fully-compliant with the latest JEDEC standards
• Operational speeds up to 3200 Mbps

Enhanced Margin

• Wide margin I/O design with advanced programmability
• Exceed JEDEC reliability standards for ESD and EOS

Optimized Power

• Advanced power management
• Frequency-based, low-power optimization

Superior Debug and Serviceability

• Integrated tools for bring-up and debug
• Works out-of-the-box with no BIOS changes required
Rambus Server DIMM Chipset Solutions

Server DIMM Chipsets: enabling performance and capacity

**DDR3**
- JEDEC Compliant
- Speeds up to 2133
- Multiple OEM qualifications

**DDR4**
- JEDEC Compliant
- Speeds up to 3200
- Multiple OEM qualifications

**NV**
- JEDEC Compliant
- Speeds up to 3200
- Ongoing qualifications

**DDR5**
- Consistent with JEDEC direction

**Smart tools for easy integration and reduced time to market**

LabStation Platform and Buffer BIOS Integration Tool

**Validated solutions with partners**

AVAILABE IN PRODUCTION 
AVAILABE IN PRODUCTION 
AVAILABE IN PRODUCTION 
UNDER DEVELOPMENT

29
The Mobile Edge

Data • Safer

Embedded Security
- Secure Cores
  - Embedded device protection
- CryptoManager Platform
  - Secure provisioning and key management

Secure Services
- CryptoManager Trusted Services
  - IoT Security Service

Secure Software
- Mobile Payments
  - Secure payments and trusted transactions
- Smart Ticketing
  - Simplified travel with mobile ticketing
Secure Silicon IP

DPA Countermeasures
Cores, Software, and Workstation
- Cores and services
- Accelerate integration & TTM

Anti-Counterfeiting
CryptoFirewall Cores
- Consumable authentication
- Major printer OEMs

Hardware Root of Trust
CryptoManager Root of Trust
- Siloed, layered security co-processor
- Designed with security as the #1 priority, not speed
From security cores to high-performance secure device provisioning, the CryptoManager Security platform is a family of hardware security cores and provisioning infrastructure that creates a trusted path from the SoC manufacturing supply chain to downstream service providers with a complete silicon-to-cloud security solution.

**Improved Profitability**
- Improved time-to-market and reduced inventory waste
- Dynamic SKU and feature management lowers inventory costs
- Reduced operating costs through unified manufacturing and provisioning systems

**Superior Security**
- Provide a robust hardware root-of-trust
- Secure valuable secret keys, identity credentials, intellectual property, and other sensitive data
- Protect against cloning, counterfeiting, and reverse engineering

**Control the Value Chain**
- Actively monitor production status, availability, and inventory levels
- Validate process information through secure logs
- Proven in today’s high-volume manufacturing facilities
Root of Trust: Implementing Trust by Design in Silicon

**Design Freedom**
- Root of trust designed from the bottom up for security
- Control all implementation starting with open RISC-V Instruction Set Architecture

**Siloed**
- Separate general and secure processing
- Optimize independently for performance and security

**Layered Security**
- Strongest security enforced in hardware at inner layer
- Outer layers are more flexible, but less trusted
CryptoManager Root of Trust

Secure Functionality:
- Secure Boot
- Remote Attestation
- Authentication
- Runtime Integrity
CryptoManager Embedded Security Infrastructure

**Offline Root Server**
System Root-of-Trust, manages high value keys, kept in secure facility, authorizes all provisioning activity

**CryptoManager Service**
Control center used for monitoring and managing all provisioning activity, typically located in chip maker data center

**CryptoManager Appliances**
Tamper proof HSM-enabled devices that connect directly to testers in the manufacturing facility
Payments & Tokenization

Comprehensive solutions for banks, financial institutions and retailers alike. From Host Card Emulation (HCE) and OEM Pays, to retail scan and go with real-time loyalty redemption, to tokenization of real-time payments (RTP) and Automated Clearing House (ACH) transactions, to blockchain, Rambus software and services, secure a wide range of applications for customers worldwide.

Improved Time-to-market
- Reduce implementation time with proven solutions for mobile, direct debit and credit, and retail payments
- Vertically integrated to provide a comprehensive solution

Enhanced User Experience
- Retain branding and drive digital engagement with bank and retail mobile wallets
- Increase customer adoption with support for major mobile payment platform

Superior Security
- Utilizes tokenization to reduce risk of card and account-based fraud
- Provides layered security with cryptograms, domain controls and tokenization

Reduced Cost
- Integrates with existing infrastructure and processes
- Supports closed-loop payments to reduce transaction fees
Enabling Mobile Payments for NFC Devices
Token Service Provider

- Leverages Host Card Emulation (HCE) and tokenization to enable secure mobile payments
- Single interface to connect with multiple schemes and OEM Pay platforms
- Maintained up-to-date with latest TSP specifications
## Scan and Go with In-aisle Check Out

<table>
<thead>
<tr>
<th>New Account</th>
<th>In-Aisle Purchase</th>
<th>In-store Advertising</th>
<th>Mobile Check Out</th>
<th>Complete Shopping</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Create account with retailer</td>
<td>• Chose an item, photo/scan to add to virtual cart</td>
<td>• Receive in-store coupons and recommendations based on cart items or geo-beacons</td>
<td>• Check out on mobile device and skip the lines</td>
<td>• Print or show mobile receipt</td>
</tr>
<tr>
<td>• Load CC info</td>
<td>• Place item in cart or collect on check-out</td>
<td>• Order-ahead goods or services</td>
<td>• Automatically accrue loyalty points</td>
<td>• Collect items</td>
</tr>
<tr>
<td>• Enable account-based retail</td>
<td>• Gather customer purchasing data, shopping trends</td>
<td>• Increase upsell and cross-sell opportunities</td>
<td>• Reduce CC transaction fees with integrated retail CC payments</td>
<td>• Go home happy</td>
</tr>
<tr>
<td>• Create integrated online-to-in store experience</td>
<td></td>
<td></td>
<td>• Reduce staff requirements for check-out lines</td>
<td></td>
</tr>
</tbody>
</table>
Vaultify Trade

A Tokenization platform for the secure transaction and storage of digital assets on blockchain

• Combines multi-signature with bank-grade tokenization to enhance security, confidentiality and privacy of private keys
• First solution to enable banks, exchanges and investment companies to leverage tokens to securely buy, sell, trade and store crypto assets
• Integrates with existing mobile banking, trading and wallet apps for easy access to crypto assets
Improving Security of the Blockchain

1. Encrypted tokens are stored on end-user devices, while private keys to encrypt assets remain safely stored in secure “warm” online vault.

2. Banks support fraud prevention rules.

3. Warm online vault signs transactions, while recovery keys remain safe in “cold” storage even if exchange is hacked.

4. Tokenization mitigates fraud risk to protect crypto assets.
Smart Ticketing

Suitable for multi-modal transport solutions including rail, bus, ferry and taxi, our end-to-end smart ticketing solutions can be implemented in any transport scenario.

**Ease of Integration**
- Comprehensive solutions from back office, to mobile device, to smart card
- Compatible with existing smart systems and suppliers

**Improved Profitability**
- Enhanced business intelligence through account-based ticketing and data analytics
- Easy management of transaction data to ensure correct reimbursements

**Superior Security**
- Reduced risk of fraud with smart technology versus paper tickets
Comprehensive Smart Ticketing Solutions

- End-to-end smart ticketing solutions from back-office processing and traveler analytics, to online purchasing and remote download of tickets
- Leverages secure NFC and mobile technology to replace paper tickets
- Integrated systems for operators to manage passenger journey transactions and analytics to optimize transport systems
Rambus Ticketing

First to bring Smart Mobile Ticketing to Rail in UK
Enabling passengers on Scotland’s national railway to use their smartphone to purchase tickets and simply tap to travel