Safe Harbor for Forward-Looking Statements

This presentation contains forward-looking statements under the Private Securities Litigation Reform Act of 1995 including those relating to our expectations regarding financial guidance for the second quarter of 2018, including revenue, operating costs and expenses, earnings per share and estimated, fixed, long-term projected tax rates, and full year 2018. 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.

The Company has provided financial results for the first quarter ended March 31, 2018 and its second quarter outlook under ASC 606 and ASC 605 in order to provide additional transparency. The Company believes that providing this additional disclosure in the short term will help its investors and analysts understand the impact of the change in revenue recognition standards, especially given the material difference in the timing of revenue recognition for its fixed-fee licensing arrangements as mentioned above. Note that the presentation under ASC 605 is not a substitute for the new ASC 606 revenue recognition rules under current GAAP.

This presentation contains non-GAAP financial measures, including operating costs and expenses, operating margin, operating income (loss), adjusted EBITDA 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

Corporate Facts
- NASDAQ: RMBS, Inc. in 1990; IPO 1997
- Headquartered in Sunnyvale, CA
- Operations throughout North America, Europe & Asia
- Q118 Revenue:
  - $46.4M (ASC 606)
  - $100.5M (ASC 605)
- 2017 Revenue: $393.1M (ASC 605)
- ~800 employees
- ~2,500 patents & applications

Markets Served
Data Center
- Acceleration + lower power
- System-level architectures
- Innovative products to support needs

Mobile Edge
- Secure endpoints = secure data
- Hardware root-of-trust
- Value and monetization for end-user services
Our Journey So Far

Key Milestones

1990
- Rambus founded
- Nintendo64 ships with RDRAM®

2000
- PCs ship with RDRAM®
- Sony PLAYSTATION 2 ships

2010
- Sony PLAYSTATION 3 ships
- Server DIMM Chipset Launch
- Acquired Cryptography Research Inc.

2017
- Acquired Bell ID and Ecebs
- Amplified with products from Semtech and Inphi

Revolutionizing the Memory Market ➤ Diversification Focused on Key Markets
Moving Data Faster, Safer, and Smarter
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
Growth Through Acquisition for Data Center Needs

Architecture License
Foundational IP

Cores
DDRx PHYs
SerDes PHYs

Chips
Buffer chips

Historic Business
High margin; predictable; fuels investment

High growth; differentiated margin
Growing Opportunity in Data Center

Source: IHS, Gartner, Semico Research, and Rambus estimates
Moving Data Faster, Safer, and Smarter
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
Growth in Services at the Mobile Edge

**Foundational Embedded Security**
- Architectural Licenses, Cryptographic IP Cores
- Historic Business

**Secure Device Management**
- CryptoManager Core in Customer Chips
- Hardware Root of Trust & Provisioning Infrastructure

**Trusted Transactions**

**Smart Transport**

**IoT Security**

**In-field secure services**
Growing Opportunity in Mobile Edge

Source: ABI Research, Strategy Analytics, Gartner and Rambus estimates
Security from Chip to Cloud to Crowd

Trust by Design
Secure Assets & Clusters
Device Configurations & Customer Demands
Applications & Services
Customer Data & Intelligence

Manufacturing
- Over 9 billion chips/year with DPA license
- CryptoManager Cores and Infrastructure with Qualcomm and others
- Over 1.5 billion chips configured Annually

In-field
- 100s of billions of payment and ticketing transactions secured
- Recently announced CryptoManager IoT Security Service

Moving Data Faster & More Securely
CryptoManager Platform Ecosystem

- **CryptoManager Platform**
  - Sell hosted service
  - License software + sell appliances
  - License cores + sell appliances
  - CM Root of Trust and Infrastructure

- **Connected Devices**
  - CM SDK and Infra
  - OEM
  - Chip Maker

- **Platform as a Service (PaaS) Provider**

- **IoT Security Service**
Growing Revenue Base

Large portion of our revenue is fixed & predictable

- Year-over-year revenue growth under ASC 605
- Continue to leverage our high margin historic businesses to fuel growth in adjacent areas
<table>
<thead>
<tr>
<th>In Millions</th>
<th>ASC 606 Q1 2018</th>
<th>ASC 605 Q1 2017</th>
<th>ASC 605 Q2 2017</th>
<th>ASC 605 Q3 2017</th>
<th>ASC 605 Q4 2017</th>
<th>ASC 605 Q1 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$46.4</td>
<td>$97.4</td>
<td>$94.7</td>
<td>$99.1</td>
<td>$101.9</td>
<td>$100.5</td>
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<tr>
<td>Total Operating Expenses¹</td>
<td>$68.7</td>
<td>$66.8</td>
<td>$69.3</td>
<td>$64.6</td>
<td>$68.4</td>
<td>$68.7</td>
</tr>
<tr>
<td>Operating Income (Loss)¹</td>
<td>($22.3)</td>
<td>$30.6</td>
<td>$25.4</td>
<td>$34.5</td>
<td>$33.5</td>
<td>$31.7</td>
</tr>
<tr>
<td>Operating Margin¹</td>
<td>(48)%</td>
<td>31%</td>
<td>27%</td>
<td>35%</td>
<td>33%</td>
<td>32%</td>
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<tr>
<td>Diluted Earnings (Loss)Per Share¹</td>
<td>($0.10)</td>
<td>$0.17</td>
<td>$0.14</td>
<td>$0.19</td>
<td>$0.19</td>
<td>$0.21</td>
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1Please refer to reconciliations of non-GAAP financial measures included in this presentation and in our earnings release.
# Financial Strength

<table>
<thead>
<tr>
<th>In Millions</th>
<th>Q1 2017</th>
<th>Q2 2017</th>
<th>Q3 2017</th>
<th>Q4 2017</th>
<th>Q1 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cash &amp; Marketable Securities</td>
<td>$187.6</td>
<td>$167.9</td>
<td>$183.6</td>
<td>$329.4</td>
<td>$291.2</td>
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<tr>
<td>Issued $172.5M convert and extinguished $56.8M of debt in Q4 17</td>
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<tr>
<td>Total Assets</td>
<td>$826.2</td>
<td>$803.3</td>
<td>$824.1</td>
<td>$884.6</td>
<td>$1,554.2</td>
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<tr>
<td>Strong balance sheet with limited debt</td>
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<tr>
<td>$50M of cash used for share repurchases in Q2 17 and Q1 18</td>
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<tr>
<td>Stockholders’ Equity</td>
<td>$601.6</td>
<td>$570.2</td>
<td>$589.5</td>
<td>$564.9</td>
<td>$1,128.5</td>
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<tr>
<td>$818M contract asset booked in Q1 18 related to ASC 606 adoption</td>
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<tr>
<td>Adjusted EBITDA¹</td>
<td>$34.0</td>
<td>$28.7</td>
<td>$37.8</td>
<td>$36.8</td>
<td>$34.7</td>
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<tr>
<td>$117.4M Cash from Operations in 2017</td>
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</tbody>
</table>

¹Please refer to reconciliations of non-GAAP financial measures included in this presentation and in our earnings release
Investment Summary

- Focused on key technology areas in the Data Center & Mobile Edge
- Accelerating our growth through strategic acquisitions & execution of key programs
- Large portion of our cash flows are predictable and committed long-term
- Strong balance sheet to support strategic initiatives
Thank You
## Reconciliation of Non-GAAP Financial Measures

### Net Income (Loss) in Millions

<table>
<thead>
<tr>
<th></th>
<th>Q1 2018 (ASC 606)</th>
<th>Q1 2017 (ASC 605)</th>
<th>Q2 2017 (ASC 605)</th>
<th>Q3 2017 (ASC 605)</th>
<th>Q4 2017 (ASC 605)</th>
<th>Q1 2018 (ASC 605)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP Net Income (Loss)</td>
<td>($39)</td>
<td>$3</td>
<td>$3</td>
<td>$8</td>
<td>($32)</td>
<td>$6</td>
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<tr>
<td>Adjustments:</td>
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<tr>
<td>Stock-based compensation</td>
<td>$8</td>
<td>$7</td>
<td>$7</td>
<td>$7</td>
<td>$7</td>
<td>$8</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>
<td>$0</td>
</tr>
<tr>
<td>Amortization</td>
<td>$11</td>
<td>$10</td>
<td>$10</td>
<td>$11</td>
<td>$11</td>
<td>$11</td>
</tr>
<tr>
<td>Restructuring charges</td>
<td>$3</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
</tr>
<tr>
<td>Non-cash interest expense / Loss on extinguishment of debt</td>
<td>$3</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$3</td>
<td>$3</td>
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<tr>
<td>Provision for (benefit from) income taxes</td>
<td>$4</td>
<td>($3)</td>
<td>($6)</td>
<td>($6)</td>
<td>$32</td>
<td>($6)</td>
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<tr>
<td>Non-GAAP Net Income (Loss)</td>
<td>($11)</td>
<td>$19</td>
<td>$16</td>
<td>$22</td>
<td>$21</td>
<td>$24</td>
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</table>

### Operating Income (Loss) in Millions

<table>
<thead>
<tr>
<th></th>
<th>Q1 2018 (ASC 606)</th>
<th>Q1 2017 (ASC 605)</th>
<th>Q2 2017 (ASC 605)</th>
<th>Q3 2017 (ASC 605)</th>
<th>Q4 2017 (ASC 605)</th>
<th>Q1 2018 (ASC 605)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP Operating Income (Loss)</td>
<td>($44)</td>
<td>$13</td>
<td>$8</td>
<td>$17</td>
<td>$16</td>
<td>$11</td>
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<tr>
<td>Adjustments:</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Stock-based compensation</td>
<td>$8</td>
<td>$7</td>
<td>$7</td>
<td>$7</td>
<td>$7</td>
<td>$8</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>
<td>$0</td>
</tr>
<tr>
<td>Amortization</td>
<td>$11</td>
<td>$10</td>
<td>$10</td>
<td>$11</td>
<td>$11</td>
<td>$11</td>
</tr>
<tr>
<td>Restructuring charges</td>
<td>$3</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
</tr>
<tr>
<td>Non-GAAP Operating Income (Loss)</td>
<td>($22)</td>
<td>$31</td>
<td>$25</td>
<td>$35</td>
<td>$34</td>
<td>$32</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$3</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>$34</td>
<td>$29</td>
<td>$38</td>
<td>$37</td>
<td>$35</td>
</tr>
</tbody>
</table>

Certain amounts may be off $1M due to rounding.
## GAAP & Non-GAAP P&L

### ASC 606

<table>
<thead>
<tr>
<th>In Millions</th>
<th>GAAP Actual Q1'18</th>
<th>Non-GAAP Q1'18</th>
<th>Delta to GAAP</th>
<th>Delta to Non-GAAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$46.4</td>
<td>$46.4</td>
<td>$0.0</td>
<td></td>
</tr>
<tr>
<td>Cost of revenue</td>
<td>$16.5</td>
<td>$7.7</td>
<td>($8.8)</td>
<td></td>
</tr>
<tr>
<td>Research and development</td>
<td>$40.1</td>
<td>$36.9</td>
<td>($3.2)</td>
<td></td>
</tr>
<tr>
<td>Sales, general and administrative</td>
<td>$30.2</td>
<td>$24.1</td>
<td>($6.1)</td>
<td></td>
</tr>
<tr>
<td>Restructuring charges</td>
<td>$3.2</td>
<td>$3.2</td>
<td>$0.0</td>
<td></td>
</tr>
<tr>
<td>Total operating costs and expenses</td>
<td>$90.0</td>
<td>$68.7</td>
<td>($21.3)</td>
<td></td>
</tr>
<tr>
<td>Operating Income (Loss)</td>
<td>($43.6)</td>
<td>($22.3)</td>
<td>$21.3</td>
<td></td>
</tr>
<tr>
<td>Interest and other income (expense), net</td>
<td>$4.7</td>
<td>$7.4</td>
<td>$2.7</td>
<td></td>
</tr>
<tr>
<td>Income (Loss) before income taxes</td>
<td>($38.9)</td>
<td>($14.9)</td>
<td>$24.0</td>
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<tr>
<td>Income tax Benefit</td>
<td>0.0</td>
<td>($3.6)</td>
<td>($3.6)</td>
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<tr>
<td>Net Income (Loss)</td>
<td>($38.9)</td>
<td>($11.3)</td>
<td>$27.6</td>
<td></td>
</tr>
</tbody>
</table>

### ASC 605

<table>
<thead>
<tr>
<th>In Millions</th>
<th>GAAP Actual Q1'18</th>
<th>Non-GAAP Q1'18</th>
<th>Delta to GAAP</th>
<th>Delta to Non-GAAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$100.5</td>
<td>$100.5</td>
<td>$0.0</td>
<td></td>
</tr>
<tr>
<td>Cost of revenue</td>
<td>$16.5</td>
<td>$7.7</td>
<td>($8.8)</td>
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</tr>
<tr>
<td>Research and development</td>
<td>$40.1</td>
<td>$36.9</td>
<td>($3.2)</td>
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<tr>
<td>Sales, general and administrative</td>
<td>$30.2</td>
<td>$24.1</td>
<td>($6.1)</td>
<td></td>
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<tr>
<td>Restructuring charges</td>
<td>$3.2</td>
<td>$3.2</td>
<td>$0.0</td>
<td></td>
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<tr>
<td>Total operating costs and expenses</td>
<td>$90.0</td>
<td>$68.7</td>
<td>($21.3)</td>
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<tr>
<td>Operating Income</td>
<td>$10.5</td>
<td>$31.7</td>
<td>$21.3</td>
<td></td>
</tr>
<tr>
<td>Interest and other income (expense), net</td>
<td>($2.8)</td>
<td>($0.1)</td>
<td>$2.7</td>
<td></td>
</tr>
<tr>
<td>Income before income taxes</td>
<td>$7.6</td>
<td>$31.6</td>
<td>$24.0</td>
<td></td>
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<tr>
<td>Income tax provision</td>
<td>$1.5</td>
<td>$7.6</td>
<td>$6.1</td>
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<tr>
<td>Net Income</td>
<td>$6.1</td>
<td>$24.0</td>
<td>$17.9</td>
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</tr>
</tbody>
</table>

Certain amounts may be off $0.1M due to rounding.
## Revenue Breakdown

**In Millions**

<table>
<thead>
<tr>
<th></th>
<th>ASC 606</th>
<th>ASC 605</th>
<th>ASC 605</th>
<th>ASC 605</th>
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<th>ASC 605</th>
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<th>ASC 605</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Rambus</strong></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Royalty Revenue</td>
<td>$21.4</td>
<td>$69.0</td>
<td>$70.0</td>
<td>$72.8</td>
<td>$77.9</td>
<td>$289.6</td>
<td>$77.2</td>
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</tr>
<tr>
<td>Product Revenue</td>
<td>$7.3</td>
<td>$10.9</td>
<td>$8.4</td>
<td>$8.7</td>
<td>$8.5</td>
<td>$36.5</td>
<td>$7.6</td>
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<tr>
<td>Contract and Other Revenue</td>
<td>$17.7</td>
<td>$17.6</td>
<td>$16.3</td>
<td>$17.7</td>
<td>$15.5</td>
<td>$67.0</td>
<td>$15.7</td>
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<tr>
<td><strong>Total</strong></td>
<td>$46.4</td>
<td>$97.4</td>
<td>$94.7</td>
<td>$99.1</td>
<td>$101.9</td>
<td>$393.1</td>
<td>$100.5</td>
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<tr>
<td>Royalty Revenue</td>
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<td>$54.9</td>
<td>$56.6</td>
<td>$61.0</td>
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<tr>
<td>Product Revenue</td>
<td>$6.3</td>
<td>$4.8</td>
<td>$5.3</td>
<td>$5.1</td>
<td>$5.2</td>
<td>$20.3</td>
<td>$6.3</td>
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<tr>
<td>Contract and Other Revenue</td>
<td>$8.2</td>
<td>$9.3</td>
<td>$7.2</td>
<td>$7.1</td>
<td>$7.8</td>
<td>$31.3</td>
<td>$7.4</td>
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<tr>
<td><strong>Total</strong></td>
<td>$34.0</td>
<td>$70.6</td>
<td>$67.4</td>
<td>$68.8</td>
<td>$73.9</td>
<td>$280.7</td>
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<tr>
<td>Royalty Revenue</td>
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<td>$14.4</td>
<td>$15.5</td>
<td>$16.2</td>
<td>$58.5</td>
<td>$12.3</td>
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<tr>
<td>Product Revenue</td>
<td>$0.1</td>
<td>$3.5</td>
<td>$0.6</td>
<td>$0.9</td>
<td>$0.6</td>
<td>$5.6</td>
<td>$0.3</td>
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</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>$8.5</td>
<td>$7.4</td>
<td>$8.4</td>
<td>$9.9</td>
<td>$7.0</td>
<td>$32.6</td>
<td>$7.2</td>
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<tr>
<td><strong>Total</strong></td>
<td>$10.0</td>
<td>$23.2</td>
<td>$23.4</td>
<td>$26.3</td>
<td>$23.8</td>
<td>$96.7</td>
<td>$19.9</td>
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<tr>
<td><strong>RLD</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$0.4</td>
<td>$0.1</td>
<td>$0.6</td>
<td>$0.6</td>
<td>$0.7</td>
<td>$1.9</td>
<td>$0.5</td>
<td></td>
<td></td>
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<tr>
<td>Product Revenue</td>
<td>$0.9</td>
<td>$2.6</td>
<td>$2.5</td>
<td>$2.7</td>
<td>$2.8</td>
<td>$10.6</td>
<td>$0.9</td>
<td></td>
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<tr>
<td>Contract and Other Revenue</td>
<td>$1.1</td>
<td>$0.9</td>
<td>$0.8</td>
<td>$0.8</td>
<td>$0.7</td>
<td>$3.2</td>
<td>$1.1</td>
<td></td>
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<tr>
<td><strong>Total</strong></td>
<td>$2.4</td>
<td>$3.6</td>
<td>$4.0</td>
<td>$4.0</td>
<td>$4.2</td>
<td>$15.7</td>
<td>$2.5</td>
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</tr>
</tbody>
</table>
Revenue and Licensing Billings

In Thousands

<table>
<thead>
<tr>
<th>Rambus</th>
<th>ASC 606 Q1'18</th>
<th>ASC 605 Q1'17</th>
<th>ASC 605 Q2'17</th>
<th>ASC 605 Q3'17</th>
<th>ASC 605 Q4'17</th>
<th>ASC 605 FY 2017</th>
<th>ASC 605 Q1'18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royalty Revenue</td>
<td>$21,374</td>
<td>$68,956</td>
<td>$69,990</td>
<td>$72,787</td>
<td>$77,861</td>
<td>$289,594</td>
<td>$77,174</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>$7,313</td>
<td>$10,904</td>
<td>$8,401</td>
<td>$8,661</td>
<td>$8,543</td>
<td>$36,509</td>
<td>$7,556</td>
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<tr>
<td>Contract and Other Revenue</td>
<td>$17,739</td>
<td>$17,491</td>
<td>$16,329</td>
<td>$17,686</td>
<td>$15,487</td>
<td>$66,993</td>
<td>$15,729</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$46,426</strong></td>
<td><strong>$97,351</strong></td>
<td><strong>$94,720</strong></td>
<td><strong>$99,134</strong></td>
<td><strong>$101,891</strong></td>
<td><strong>$393,096</strong></td>
<td><strong>$100,459</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rambus</th>
<th>ASC 605 Q1'18</th>
<th>ASC 605 Q2'17</th>
<th>ASC 605 Q3'17</th>
<th>ASC 605 Q4'17</th>
<th>ASC 605 FY 2017</th>
<th>ASC 605 Q1'18</th>
</tr>
</thead>
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<td>$21,374</td>
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<td>$69,990</td>
<td>$72,787</td>
<td>$77,861</td>
<td>$289,594</td>
</tr>
<tr>
<td>Licensing Billings¹</td>
<td>$75,924</td>
<td>$68,556</td>
<td>$72,890</td>
<td>$71,537</td>
<td>$76,611</td>
<td>$289,594</td>
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<tr>
<td><strong>Variance</strong></td>
<td><strong>$54,550</strong></td>
<td><strong>($400)</strong></td>
<td><strong>$2,900</strong></td>
<td><strong>($1,250)</strong></td>
<td><strong>($1,250)</strong></td>
<td><strong>-</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.
Product Overview
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)

<table>
<thead>
<tr>
<th>Speed</th>
<th>Technology</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>16G</td>
<td>28nm &amp; 14nm</td>
<td>PCIe 4/3/2, CEI 11/6, XFI/XAUI, SATA, SAS</td>
</tr>
<tr>
<td>28G</td>
<td>14nm</td>
<td>CEI-28/25/11/6, 100/50/25Gbe, 10G-KR, FC28, XFI/XAUI</td>
</tr>
<tr>
<td>56G</td>
<td>10nm</td>
<td>CEI-56G MR, CEI-56G LR, CEI-28/25/11, 400Gbe, PAM-4/NRZ</td>
</tr>
<tr>
<td>112G</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 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

#### Lead Customers

- **Si**
- **Si**

#### Validated solutions with partners

- PLDA Design Systems
- avery Solutions
- CoMIRA Solutions
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-Compatible**
- 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

<table>
<thead>
<tr>
<th>DDR4/3</th>
<th>HBM2</th>
<th>GDDR6</th>
<th>DDR5 &amp; HBM3</th>
</tr>
</thead>
<tbody>
<tr>
<td>28nm &amp; 14nm</td>
<td>14nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 3200Mbps</td>
<td>• 2000Mbps</td>
<td>• 12-16 Gbps</td>
<td>• 1-4 Ranks</td>
</tr>
<tr>
<td>• x16 – x72-bits</td>
<td>• 1024-bit</td>
<td>• 2x 16-bit channels</td>
<td>• DFI 4.0</td>
</tr>
</tbody>
</table>

## ROADMAP

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

## Validated solutions with partners

- **Northwest Logic**
- **ARM**
- **mobiveil**

---

**Si**

**In Development**
Server DIMM Chipsets

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
Introducing DDR5 Server DIMM Chips

PRESS RELEASE

Rambus Announces Industry’s First Functional Silicon of Server DIMM Buffer Chipset Targeted for Next-generation DDR5 Memory Technology

Provides data center architects early path to next-generation memory speeds

SUNNYVALE, Calif. – Sept. 20, 2017 – Rambus Inc. (NASDAQ: RMBS) today announced functional silicon of a double data rate (DDR) server DIMM (dual inline memory module) buffer chip prototype for the next generation DDR5 memory technology. This represents a key milestone for Rambus and the industry’s first silicon-proven memory buffer chip prototype capable of achieving the speeds required for the upcoming DDR5 standard.
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

- SAMSUNG
- SK hynix
- Micron

Data • Faster • Safer
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
Embedded Security Cores

DPA Resistance

DPA Resistant Cores
- Cores and services
- Accelerate integration & TTM

Anti-Counterfeiting

CryptoFirewall Cores
- Consumable authentication
- Major printer OEMs

Content Protection

CryptoMedia Cores
- Integrated into Set top boxes
- Broadcast and OTT
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
Security First: 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

Custom RISC-V CPU

Secure Memory

Crypto Accelerators
(AES, SHA, others...)

General Processing

Secure Processing
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
Flexible cloud-to-silicon secure provisioning platform to host, operate and manage on device security services, lifecycle management and applications services for OEMs, service providers and operators.

**Device Lifecycle Management**
- Cloud-to-silicon security ecosystem
- Secure provisioning, authentication, and device protection

**Seamless Secure Connectivity**
- Proven platform used to provision billions of chipsets
- Establish independent trust between devices and services

**Flexible Platform Integration**
- Provisioning infrastructure offered both as a cloud service and as a standalone product
- Secure services implemented via a hardware or software root-of-trust
CryptoManager IoT Security Services Ecosystem

- **CryptoManager Trusted Services**
  - Sell Security-as-a-Service
    - IoT Security Service
  - Provide software
    - IoT Security Service SDK
  - OEM
    - Chip Maker
  - Connected Devices
    - Platform as a Service (PaaS) Provider
      - Service Provider

- **Data • Faster • Safer**
  - 40
Leveraging a Rambus or 3rd-party root of trust, our IoT Security Service enables seamless secure connectivity and security lifecycle management of IoT devices.
Mobile Payments

Certified and award-winning management software to enable secure integration with mobile OEM pay and independent mobile wallets for banks and retailers.

**Improved Time-to-market**
- Reduce implementation time with a unified platform to connect to payment schemes and OEM Pay
- Compatible with existing EMV schemes and contactless infrastructure

**Enhanced User Experience**
- Retain branding and drive digital engagement with mobile wallet
- Support loyalty programs, gift cards and more for a unified purchasing experience

**Superior Security**
- Maintain user privacy without sharing data with schemes
- Utilizes HCE with tokenization to minimize unauthorized use of cardholder data

**Reduced Cost**
- Eliminate tokenization fees from payment schemes
- Save on transaction fees as the issuing and acquiring bank
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

**New Account**
- Create account with retailer
- Load CC info
- Enable account-based retail
- Create integrated online-to-in store experience

**In-Aisle Purchase**
- Chose an item, photo/scan to add to virtual cart
- Place item in cart or collect on check-out
- Gather customer purchasing data, shopping trends

**In-store Advertising**
- Receive in-store coupons and recommendations based on cart items or geo-beacons
- Order-ahead goods or services
- Increase upsell and cross-sell opportunities

**Mobile Check Out**
- Check out on mobile device and skip the lines
- Automatically accrue loyalty points
- Reduce CC transaction fees with integrated retail CC payments
- Reduce staff requirements for check-out lines
- Free up more in-store sq. footage for product

**Complete Shopping**
- Print or show mobile receipt
- Collect items
- Go home happy
- Better user experience drives customer loyalty and brand equity

Data • Faster • Safer
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
Going Ticketless With Frictionless Travel

**New Account**
- Create account
- Add CC info

**Ticketless Travel**
- Go to train & get on – no ticket required
- Receive updated schedules automatically

**In-transit Services**
- Receive location-based coupons
- Pay In-app

**Easy Payment**
- Get off train and go – fare automatically debited
- Lowest fare automatically selected

**Travel Assistance**
- Auto-updated with travel times of frequently traveled routes
- Receive loyalty/frequent rider discounts

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**Traveler**
- Enable account-based ticketing to capture metadata for every user
- Enable mobile GPS, tap on/off or geo beacons track fare
- Reduce/eliminate ticketing machines and monetize new rental space

---

**Operator**
- Increase revenue from ancillary services
- Optimize routes and dispatch fleet based on traveler traffic
- Better user experience drives customer loyalty and frequency of travel
Emerging Solutions
Data • Smarter

Emerging Solutions
From concept to reality
Innovation • Research • Development
Advanced Research

Exploring avenues to surpass the slowing of Moore's Law and meet the needs of next-generation data centers through cryogenic and hybrid memory research.
Expanding to Prototypes with Microsoft Research

- DRAM Partner
- FAB Partner
- Cryogenic Research Partner
- Development
- Modeling

Rambus Cryogenic Research Station
Thank you