This presentation contains forward-looking statements under the Private Securities Litigation Reform Act of 1995 including Rambus’ financial guidance for future periods, product and investment strategies, timing of expected product launches, demand for existing and newly-acquired technologies, the growth opportunities of the various markets we serve, the expected benefits of our merger, acquisition and divestiture activity, including the expected timing of transaction completions and the success of our integration efforts, and the effects of ASC 606 on reported revenue, amongst other things.

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, interest and other income (expense), net and diluted net income (loss) per share. 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

Who We Are

• Premier silicon IP and chip provider, making data faster and safer
• Developed foundational technology for all modern computing systems
• Improving performance, capacity and security for leading SoCs and systems

Rambus Offerings

- Architecture Licenses
- High-speed IO & DPA Countermeasures
- Chips
- Memory Interface Chips
- Silicon IP
- High-speed Interface and Security IP

Financial Performance

Revenue
Q319: $57.4M
2018: $231.2M
$401.1M (ASC 605)

Cash from Operations
Q319: $25.6M
2019 YTD: $93.1M
2018: $87.1M

NASDAQ: RMBS
30 Years Tech leadership & innovation
2600+ Patents and Applications
HQ: California WW Offices in India, EU, Asia
~850 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
Semiconductor Solutions Built on Leading-Edge IP

- **Architecture License**
  - Foundational IP

- **Silicon IP**
  - Security IP: Secure Cores and Provisioning
  - Interface IP: Memory and SerDes PHYs and Controllers

- **Chips**
  - Memory Interface Chips
Silicon IP: Security

Protecting semiconductors and their secrets from design and manufacturing through deployment and end-of-life.

Secure Silicon IP
- Root of Trust
- DPA Cores and Workstation
- Crypto Accelerators
- Anti-Counterfeiting

Secure Provisioning
- Key and Data Provisioning
- Device Key Management

End to End Security Solution

Crypto/DPA Cores & Test Equipment
- Encryption Cores
- Platform Security
- Key Injection Systems
- Device Lifecycle Manager

Root of Trust Core

Provisioning Appliances

Key Management Service (KMS)
### Complementary Portfolio Extends Market Reach and Depth

<table>
<thead>
<tr>
<th>Secure Silicon IP</th>
<th>Secure Software Protocols</th>
<th>Secure Provisioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securing Data at Rest</td>
<td>Securing Data in Motion</td>
<td></td>
</tr>
<tr>
<td>Rambus</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>verimatrix</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Key Markets
- **Data Center**
- **AI + ML**
- **Automotive**
- **Military**
- **Networking**
- **IoT**
- **Edge**
- **Data Center**
- **Edge**
- **Military**
- **Automotive**
- **Data Center**
- **AI + ML**
Silicon IP: High-speed Interfaces

High-speed memory and SerDes interfaces are pervasive in modern computing and critical to performance in data-intensive applications.

**Backplane Interconnects**
- 112G – LR
- 56G – LR
- 100/200/400GbE
- 128GFC

**Memory Interconnects**
- HBM2
- GDDR5/6
- DDR3/4
- LPDDR3/4

**Device Interconnects**
- USB3/4
- SATA
- SAS

**Chip-to-Chip Interconnects**
- PCIe 3/4/5
- 112G – MR, VSR
- 56G – MR
- 28G – MR

**Chiplet Interconnects**
- 112 – XSR
- 56 – XSR

**Memory PHY + Digital Controller**
- DDR4/3
  - 28nm & 14nm
- HBM2
  - 14nm
- GDDR6
- DDR5 & HBM3

**SerDes PHY + Digital Controller**
- 16G
  - 28nm & 14nm
- 28G
  - 14nm
- 56G
  - 10nm
- 112G
  - 7nm
## Complementary Physical and Digital IP Portfolios

<table>
<thead>
<tr>
<th></th>
<th>DDR4</th>
<th>GDDR6</th>
<th>HBM2</th>
<th>PCIe</th>
<th>MIPI</th>
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<tbody>
<tr>
<td>Rambus</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Northwest Logic</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Markets**

- Data Center
- Networking
- Edge
- Automotive
- AI + ML
- IoT

**Markets**

- Data Center
- Networking
- Automotive
- AI + ML
- IoT

- Data Center
- Networking
- Edge
- Automotive
- AI + ML
- IoT

- Data Center
- Networking
- Edge
- Automotive
- AI + ML
- IoT

- IoT
- Mobile
Memory Interface Chips

Memory buffers are the key to expanding capacity for data centers and high-performance computing.

Server DIMM Chipsets: enabling performance and capacity

- DDR3 DB & RCD
- DDR4 DB & RCD
- NV DDR4 NVRCD
- DDR5 DB & RCD
Products Driving Growth

In Thousands

- Silicon IP growth driven by design win momentum and acquisitions
- Buffer Chip market share gains expected to continue through DDR4 ramp and DDR5 introduction
- Strong systematic growth in Buffer Chip and Silicon IP product revenue offsets structural declines in Patent Licensing
- Predictability of long-term licensing agreements with key industry partners provides strong cash flow and stability
## Key Financial Metrics

<table>
<thead>
<tr>
<th>In Millions</th>
<th>ASC 606 Q3 2018</th>
<th>ASC 606 Q4 2018</th>
<th>ASC 606 Q1 2019</th>
<th>ASC 606 Q2 2019</th>
<th>ASC 606 Q3 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$59.8</td>
<td>$68.5</td>
<td>$48.4</td>
<td>$58.3</td>
<td>$57.4</td>
</tr>
</tbody>
</table>

Driven by the structure and timing of key deals. Year over year growth from product revenue.

| Total Operating Expenses¹ | $67.6 | $61.6 | $67.3 | $64.1 | $67.1 |

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 Income (Loss)¹ | ($7.9) | $6.9  | ($18.9) | ($5.8) | ($9.7) |

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

| Cash from Operations     | $31.6  | $35.1 | $28.8  | $38.7  | $25.6  |

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>Q3 2018</th>
<th>Q4 2018</th>
<th>Q1 2019</th>
<th>Q2 2019</th>
<th>Q3 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cash &amp; Marketable Securities</td>
<td>$248.2</td>
<td>$277.8</td>
<td>$305.9</td>
<td>$337.7</td>
<td>$338.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Assets</td>
<td>$1,344.0</td>
<td>$1,361.1</td>
<td>$1,321.4</td>
<td>$1,312.2</td>
<td>$1,299.8</td>
</tr>
<tr>
<td>Stockholders’ Equity</td>
<td>$1,008.3</td>
<td>$1,012.1</td>
<td>$999.9</td>
<td>$973.2</td>
<td>$961.3</td>
</tr>
<tr>
<td>Cash from Operations</td>
<td>$31.6</td>
<td>$35.1</td>
<td>$28.8</td>
<td>$38.7</td>
<td>$25.6</td>
</tr>
</tbody>
</table>
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
Rambus Investment Summary

- Focusing on core strengths in semiconductor with unique expertise
- Strong patent portfolio of interface and security IP has continued relevance
- Predictable cash generation to re-invest in R&D and M&A in areas of focus
- Delivering to performance-intensive, high-growth market segments including data center, edge, AI and automotive
Thank you
## Reconciliation of Non-GAAP Financial Measures

### Net Income (Loss) in Millions

<table>
<thead>
<tr>
<th></th>
<th>Q3 2018 (ASC 606)</th>
<th>Q4 2018 (ASC 606)</th>
<th>Q1 2019 (ASC 606)</th>
<th>Q2 2019 (ASC 606)</th>
<th>Q3 2019 (ASC 606)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP Net Loss</td>
<td>($105)</td>
<td>($2)</td>
<td>($27)</td>
<td>($37)</td>
<td>($17)</td>
</tr>
<tr>
<td>Adjustments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock-based compensation</td>
<td>$6</td>
<td>$6</td>
<td>$7</td>
<td>$7</td>
<td>$7</td>
</tr>
<tr>
<td>Acquisition-related/divestiture costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
</tr>
<tr>
<td>Amortization</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$3</td>
</tr>
<tr>
<td>Restructuring charges and other charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
<td>$1</td>
</tr>
<tr>
<td>Net-cash interest expense</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
</tr>
<tr>
<td>Provision for (benefit from) income taxes</td>
<td>$90</td>
<td>($2)</td>
<td>$3</td>
<td>$4</td>
<td>($0)</td>
</tr>
<tr>
<td>Impairment (recovery) on assets held for sale</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$17</td>
<td>($2)</td>
</tr>
<tr>
<td>Escrow settlement refund</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Non-GAAP Net Income (Loss)</td>
<td>($1)</td>
<td>$9</td>
<td>($9)</td>
<td>$1</td>
<td>($3)</td>
</tr>
</tbody>
</table>

### Operating Income (Loss) in Millions

<table>
<thead>
<tr>
<th></th>
<th>Q3 2018 (ASC 606)</th>
<th>Q4 2018 (ASC 606)</th>
<th>Q1 2019 (ASC 606)</th>
<th>Q2 2019 (ASC 606)</th>
<th>Q3 2019 (ASC 606)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP Operating Loss</td>
<td>($19)</td>
<td>($4)</td>
<td>($31)</td>
<td>($37)</td>
<td>($23)</td>
</tr>
<tr>
<td>Adjustments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock-based compensation</td>
<td>$6</td>
<td>$6</td>
<td>$7</td>
<td>$7</td>
<td>$7</td>
</tr>
<tr>
<td>Acquisition-related/divestiture costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
</tr>
<tr>
<td>Amortization</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$3</td>
</tr>
<tr>
<td>Restructuring and other charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
<td>$1</td>
</tr>
<tr>
<td>Impairment (recovery) on assets held for sale</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$17</td>
<td>($2)</td>
</tr>
<tr>
<td>Escrow settlement refund</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>($0)</td>
<td>$0</td>
</tr>
<tr>
<td>Non-GAAP Operating Income (Loss)</td>
<td>($8)</td>
<td>$7</td>
<td>($19)</td>
<td>($6)</td>
<td>($10)</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$3</td>
<td>$3</td>
<td>$3</td>
<td>$3</td>
<td>$4</td>
</tr>
<tr>
<td>Adjusted EBITDA</td>
<td>($5)</td>
<td>$10</td>
<td>($16)</td>
<td>($3)</td>
<td>($5)</td>
</tr>
</tbody>
</table>

Certain amounts may be off $1.0M due to rounding.
## GAAP to Non-GAAP Income Statement

<table>
<thead>
<tr>
<th>In $ Millions</th>
<th>GAAP Actual Q3'19</th>
<th>Non-GAAP Actual Q3'19</th>
<th>Delta to GAAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$57.4</td>
<td>$57.4</td>
<td>$ -</td>
</tr>
<tr>
<td>Cost of revenue</td>
<td>12.6</td>
<td>9.6</td>
<td>(3.0)</td>
</tr>
<tr>
<td>Research and development</td>
<td>41.5</td>
<td>38.1</td>
<td>(3.4)</td>
</tr>
<tr>
<td>Sales, general and administrative</td>
<td>26.7</td>
<td>19.5</td>
<td>(7.2)</td>
</tr>
<tr>
<td>Recovery on assets held for sale</td>
<td>(1.9)</td>
<td>0.0</td>
<td>1.9</td>
</tr>
<tr>
<td>Restructuring charges and other</td>
<td>1.4</td>
<td>0.0</td>
<td>(1.4)</td>
</tr>
<tr>
<td>Total operating cost and expenses</td>
<td>80.3</td>
<td>67.1</td>
<td>(13.1)</td>
</tr>
<tr>
<td>Operating loss</td>
<td>(22.9)</td>
<td>(9.7)</td>
<td>13.1</td>
</tr>
<tr>
<td>Interest and other income (expense), net</td>
<td>4.2</td>
<td>6.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Loss before income taxes</td>
<td>(18.6)</td>
<td>(3.8)</td>
<td>14.9</td>
</tr>
<tr>
<td>Benefit from income taxes</td>
<td>(1.3)</td>
<td>(0.9)</td>
<td>0.4</td>
</tr>
<tr>
<td>Net loss</td>
<td>($17.3)</td>
<td>($2.9)</td>
<td>$14.5</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>In $ Millions</th>
<th>Actual Q3'19</th>
<th>Actual Q2'19</th>
<th>Variance QoQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision for (benefit from) income taxes (GAAP)</td>
<td>(1.3)</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Adjustment to GAAP provision for (benefit from) income taxes</td>
<td>0.4</td>
<td>(4.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Non-GAAP provision for (benefit from) income tax</strong></td>
<td><strong>(0.9)</strong></td>
<td><strong>0.1</strong></td>
<td><strong>(1.0)</strong></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Actual Q3'19</th>
<th>Actual Q2'19</th>
<th>Variance QoQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP effective tax rate</td>
<td>7%</td>
<td>(13)%</td>
<td></td>
</tr>
<tr>
<td>Adjustment to GAAP effective tax rate</td>
<td>17%</td>
<td>37%</td>
<td></td>
</tr>
<tr>
<td><strong>Non-GAAP effective tax rate</strong></td>
<td><strong>24%</strong></td>
<td><strong>24%</strong></td>
<td><strong>0%</strong></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 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 and Licensing Billings

<table>
<thead>
<tr>
<th>In Thousands</th>
<th>ASC 606</th>
<th>ASC 606</th>
<th>ASC 605</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1'18</td>
<td>Q2'18</td>
<td>Q3'18</td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$21,374</td>
<td>$30,049</td>
<td>$33,599</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>$7,313</td>
<td>$8,087</td>
<td>$11,753</td>
</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>$17,739</td>
<td>$18,322</td>
<td>$14,402</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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In Thousands</th>
<th>Q1'18</th>
<th>Q2'18</th>
<th>Q3'18</th>
<th>Q4'18</th>
<th>FY 2018</th>
<th>Q1'19</th>
<th>Q2'19</th>
<th>Q3'19</th>
<th>YTD 2019</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>$27,050</td>
<td>$19,448</td>
<td>$71,351</td>
</tr>
<tr>
<td>Licensing Billings¹</td>
<td>$75,924</td>
<td>$73,210</td>
<td>$75,374</td>
<td>$76,717</td>
<td>$301,225</td>
<td>$75,460</td>
<td>$64,948</td>
<td>$63,058</td>
<td>$203,466</td>
</tr>
<tr>
<td>Delta</td>
<td>$54,550</td>
<td>$43,161</td>
<td>$41,775</td>
<td>$31,287</td>
<td>$170,773</td>
<td>$50,607</td>
<td>$37,898</td>
<td>$43,610</td>
<td>$132,115</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In Thousands</th>
<th>ASC 606 Interest Income²</th>
<th>ASC 606 Interest Income²</th>
<th>ASC 606 Interest Income²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1'18</td>
<td>Q2'18</td>
<td>Q3'18</td>
</tr>
<tr>
<td>ASC 606 Interest Income²</td>
<td>$7,514</td>
<td>$7,041</td>
<td>$6,532</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.

² Interest income associated with the significant financing component of licensing agreements as a result of the adoption of ASC 606.
From chip-to-cloud-to-crowd, Rambus secure silicon IP helps protect the world’s most valuable resource: data. Securing electronic systems at their hardware foundation, our embedded security solutions span areas including root of trust, tamper resistance, content protection, anti-counterfeiting and trusted provisioning.

**Improved Profitability**
- Improved time-to-market and reduced inventory waste
- Dynamic SKU and feature management lowers inventory costs
- Reduce revenue lost to unauthorized access and counterfeits

**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

**Managed Value Chain**
- Actively monitor production status, availability, and inventory levels
- Validate process information through secure logs
- Deploy in distributed, high-volume manufacturing
Silicon IP: Security

Secure Silicon IP

• CryptoManager Root of Trust
• DPA cores, accelerators, workstation
• Crypto accelerators
• CryptoFirewall accelerators

Provisioning

• CryptoManager Provisioning
• CryptoManager Device Key Management
CryptoManager Root of Trust

Family of fully-programmable secure co-processors
- Protects private data (keys and chip identity) with security anchored in hardware
- Adapts to an evolving threat landscape
- Supports new secure features and applications

Secure processing is separated from general processing for greater protection

Purpose-built for security with defense in depth against attacks
Provisioning and Device Key Management

Silicon and device provisioning and enablement of downstream cloud-based services with a complete silicon-to-cloud security solution.
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
High-Speed SerDes Solutions

SerDes PHY and digital controller solutions

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

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

PCIe digital controllers

- Northwest Logic
  - a Rambus Company

Lead Customers
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
## Memory Interface Solutions

### Memory PHY and digital controller solutions

<table>
<thead>
<tr>
<th>Technology</th>
<th>Speed (Mbps)</th>
<th>Channels</th>
<th>Ranks</th>
<th>Process</th>
<th>Features</th>
</tr>
</thead>
</table>
| DDR4/3     | 3200        | x16 to x72-bits | 1-4 | 28nm & 14nm | - 3200 Mbps  
- x16 to x72-bits  
- 1-4 Ranks  
- DFI 4.0 |
| HBM2       | 2000        | 1024-bit | 2.5D design architecture | 14nm | - 2000 Mbps  
- 1024-bit  
- 2.5D design architecture |
| GDDR6      | 12-18       | 2x 16-bit channels |  |  | - 12-18 Gbps  
- 2x 16-bit channels |
| DDR5 & HBM3| 2000        | 1024-bit | 2.5D design architecture | 14nm | - 2000 Mbps  
- 1024-bit  
- 2.5D design architecture |

### 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

### Roadmap

- LabStation Platform

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**NW Logic**

*a Rambus Company*
Memory Interface Chips
Built for speed, power efficiency and reliability, the DDRn memory interface chips for RDIMM, LRDIMM and NVDIMM server modules deliver top-of-the-line performance and the 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
Memory Interface Chips

**Enabling performance and capacity in server DIMMs**

**DDR3 DB & RCD**
- JEDEC Compliant
- Speeds up to 2133 Mbps
- Multiple OEM qualifications

**DDR4 DB & RCD**
- JEDEC Compliant
- Speeds up to 3200 Mbps
- Multiple OEM qualifications

**NV DDR4 NVRCD**
- JEDEC Compliant
- Speeds up to 3200 Mbps
- Ongoing qualifications

**DDR5 DB & RCD**
- Consistent with JEDEC direction

**Available in Production**

**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
Thank you