Rambus at a Glance

Pioneer of industry-leading chips and silicon IP making data faster and safer

- **Improving data bandwidth, capacity and security**: 30+ Years Tech leadership & innovation
- **HQ in California with offices WW in India, EU and Asia**: ~600 Employees Worldwide
- **Continued Innovation feeds licensing and product roadmap**: 3000+ Patents and Applications
- **YoY Revenue Growth from Products, Contract and Other***: ▲41%
- **2020 Cash from Operations**: $185.5M
- **Strong balance sheet and cash generation fuel strategic initiatives**: Data Center 75%+
- **Share of product* revenue from Data Center & Edge**: 75%+

*Excludes discontinued businesses
*Includes Product and Contract & Other

Data • Faster • Safer
MORE AND MORE DATA
Data usage growing at 35% CAGR to 175ZB by 2025, driving overall server unit growth up 8% per year

ACCELERATING SHIFT TO CLOUD
Cloud driving Data Center growth, with equipment spend at top 5 hyperscalers doubling to $100B by 2024

GROWING AI/ML ADOPTION
Over 25% of server shipments in 2025 will be AI-specific with $10B in AI silicon

Rapid Data Center Growth Driving Technology Demand

PROCESSING AT THE EDGE
Edge workloads increasing by 34% per year leading to $5B in Edge silicon by 2024

SECURITY THREATS ON THE RISE
Total number of DDoS attacks projected to double from 7.9M in 2018 to 15.4M in 2023

MEMORY AND I/O
Bandwidth limiting factor for system performance

INCREASING CONNECTIVITY
In 2021, there were 27B connected smart devices capturing and sending data, up 10B over 5 years

HARDWARE SECURITY IS MISSION CRITICAL TO PROTECT VALUABLE DATA

Source: IDC, 650 Group, Cisco, MarketsandMarkets
Amplified Market Opportunity

Increasing need for bandwidth and security

**FORECASTED ANNUAL GROWTH***

- **Market**: $↑4.5%$: Data Center
  - Exponential rise in data usage driving secular growth

- **System**: $↑8%$: Server Units
  - Rising AI/ML workloads driving server growth

- **Chip**: $↑26%$: Server DRAM Bits
  - Need for more data driving memory bandwidth and bit growth

*Source: Arizton, IDC, Gartner
Semiconductor Industry Ecosystem Built on Leading-Edge IP

Markets
- Data Center
- 5G/Edge
- IoT
- Automotive
- Government

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

System OEMs
- HP
- Dell
- Quantas Computer
- BOSCH
- ERISSON

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

Foundry
- TSMC
- Samsung
- Global Foundries

Technology Suppliers
- Renesas
- MOTTAGE Technology
- Rambus
- Cadence
- Synopsys
- ARM

Ecosystem Example
New Memory Architectures Driving TAM Expansion

Transition to DDR5

Memory Subsystem Expansion with Serial Links (e.g., CXL)

Data Center Disaggregation

Increasing bandwidth, capacity, efficiency and security
Rambus Memory Interface Chip Growth

- Robust server memory demand projected 2021 and 2022
- Strong qualification footprint and share gains on new DDR4 platforms
- Leading qualification position on DDR5 platforms
- Active ecosystem engagement on new memory architectures

2018-2020
72% CAGR
Rambus Product Revenue (~Chips)

DDR4

DDR5

I2C

I3C
Rambus Delivers Fast and Secure Connections for Data Center

- Memory and SerDes IP: Accelerate data for AI
- Memory Interface Chips: Improve memory subsystem speed and capacity
- Secure Silicon IP: Protect valuable data

- Faster Data Rates
- Greater Capacity
- Higher Security
- Easy Integration
- Reliable Supplier
Product Leadership Driving Topline Growth

2018-2020

41% CAGR
Chip and Silicon IP combined revenue

Industry’s first DDR5 memory interface chips

Integrated PCIe5, HBM2E and GDDR6 memory PHY + Controller subsystems

Broadest portfolio of secure root of trust, protocol engine, and crypto accelerator cores

Experts in interface solutions critical for performance and utilization in emerging data center architectures
**Financial Highlights**

### Chip & Silicon IP Revenue* ($M)

<table>
<thead>
<tr>
<th>Year</th>
<th>Chip &amp; Silicon IP</th>
<th>Discontinued Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>101</td>
<td>31</td>
</tr>
<tr>
<td>2019</td>
<td>133</td>
<td>19</td>
</tr>
<tr>
<td>2020</td>
<td>162</td>
<td></td>
</tr>
</tbody>
</table>

### Pro Forma Operating Expenses ($M)

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D</th>
<th>SG&amp;A</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>89</td>
<td>146</td>
<td>235</td>
</tr>
<tr>
<td>2019</td>
<td>80</td>
<td>144</td>
<td>224</td>
</tr>
<tr>
<td>2020</td>
<td>69</td>
<td>123</td>
<td>192</td>
</tr>
</tbody>
</table>

### Cash from Operations ($M) & FCF per Share ($)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash from Ops</th>
<th>FCF per Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>86</td>
<td>0.68</td>
</tr>
<tr>
<td>2019</td>
<td>129</td>
<td>1.02</td>
</tr>
<tr>
<td>2020</td>
<td>186</td>
<td>1.26</td>
</tr>
</tbody>
</table>

### Cash Equivalents & Return of Capital ($M)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Equivalents</th>
<th>Return of Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>278</td>
<td>50</td>
</tr>
<tr>
<td>2019</td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>503</td>
<td>50</td>
</tr>
</tbody>
</table>

*Includes Product and Contract & Other Revenue
Rambus Investment Summary

Amplified market opportunity in data center as memory importance increases

Pioneer of industry-leading chips and silicon IP enabling critical performance improvements for data center and cloud

Continued innovation feeds patent portfolio and product roadmap expansion

Superior product execution and strong operational discipline drive solid financial results and profitable growth

Strong cash generation enables strategic initiatives and return of capital to shareholders
Detailed Financials
## Continued Strong Cash Generation

<table>
<thead>
<tr>
<th>In Millions</th>
<th>ASC 606 Q1 2020</th>
<th>ASC 606 Q2 2020</th>
<th>ASC 606 Q3 2020</th>
<th>ASC 606 Q4 2020</th>
<th>ASC 606 Q1 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$65.8</td>
<td>$61.7</td>
<td>$56.9</td>
<td>$61.9</td>
<td>$70.4</td>
</tr>
<tr>
<td>Total Operating Costs and Expenses&lt;sup&gt;1&lt;/sup&gt;</td>
<td>$63.5</td>
<td>$59.5</td>
<td>$56.7</td>
<td>$55.8</td>
<td>$58.2</td>
</tr>
<tr>
<td>Operating Income&lt;sup&gt;1&lt;/sup&gt;</td>
<td>$2.3</td>
<td>$2.2</td>
<td>$0.2</td>
<td>$6.1</td>
<td>$12.1</td>
</tr>
<tr>
<td>Cash from Operations</td>
<td>$37.3</td>
<td>$62.0</td>
<td>$44.1</td>
<td>$42.1</td>
<td>$39.5</td>
</tr>
</tbody>
</table>

Driven by higher Chip revenue quarter over quarter

Disciplined expense management through refocus on core growth initiatives

Operating results under ASC 606 do not reflect significant cash flows from fixed-fee licensing arrangements signed prior to the standard becoming effective

Sustained, predictable cash generation

<sup>1</sup>Please refer to reconciliations of non-GAAP financial measures included in this presentation and in our earnings release.
## Solid Balance Sheet Supports Strategic Initiatives

<table>
<thead>
<tr>
<th>In Millions</th>
<th>Q1 2020</th>
<th>Q2 2020</th>
<th>Q3 2020</th>
<th>Q4 2020</th>
<th>Q1 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cash &amp; Marketable Securities</td>
<td>$435.4</td>
<td>$486.1</td>
<td>$520.2</td>
<td>$502.6</td>
<td>$529.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driven by continued strong cash from operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Assets</td>
<td>$1,325.4</td>
<td>$1,324.1</td>
<td>$1,316.6</td>
<td>$1,251.4</td>
<td>$1,235.8</td>
</tr>
<tr>
<td>Stockholders’ Equity</td>
<td>$971.6</td>
<td>$972.7</td>
<td>$965.8</td>
<td>$912.7</td>
<td>$909.4</td>
</tr>
<tr>
<td>$345M and $376M contract assets in Q1 2021 and Q4 2020 respectively, related to ASC 606 adoption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash from Operations</td>
<td>$37.3</td>
<td>$62.0</td>
<td>$44.1</td>
<td>$42.1</td>
<td>$39.5</td>
</tr>
<tr>
<td>Sustained, predictable cash generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Reconciliation of Non-GAAP Financial Measures

#### Net Income (Loss) in Millions

<table>
<thead>
<tr>
<th></th>
<th>Q1 2020 (ASC 606)</th>
<th>Q2 2020 (ASC 606)</th>
<th>Q3 2020 (ASC 606)</th>
<th>Q4 2020 (ASC 606)</th>
<th>Q1 2021 (ASC 606)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP Net Loss</td>
<td>($7)</td>
<td>($9)</td>
<td>($13)</td>
<td>($12)</td>
<td>($3)</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>$7</td>
<td>$7</td>
<td>$6</td>
<td>$7</td>
</tr>
<tr>
<td>Acquisition-related/divestiture costs</td>
<td>$2</td>
<td>$2</td>
<td>$1</td>
<td>$1</td>
<td>$1</td>
</tr>
<tr>
<td>Amortization of acquired intangible assets</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
</tr>
<tr>
<td>Restructuring and other charges</td>
<td>$1</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
<td>$0</td>
</tr>
<tr>
<td>Non-cash interest expense</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
</tr>
<tr>
<td>Facility restoration costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Change in fair value of earn-out liability</td>
<td>($2)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Depreciation expense on unused EDA software licenses</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$2</td>
<td>$0</td>
</tr>
<tr>
<td>Expense on abandoned operating leases</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Restatement and shareholder activist costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
<td>$0</td>
</tr>
<tr>
<td>Provision for (benefit from) income taxes</td>
<td>($1)</td>
<td>($1)</td>
<td>$0</td>
<td>($0)</td>
<td>($4)</td>
</tr>
<tr>
<td>Non-GAAP Net Income</td>
<td>$6</td>
<td>$5</td>
<td>$2</td>
<td>$6</td>
<td>$11</td>
</tr>
</tbody>
</table>

#### Operating Income (Loss) in Millions

<table>
<thead>
<tr>
<th></th>
<th>Q1 2020 (ASC 606)</th>
<th>Q2 2020 (ASC 606)</th>
<th>Q3 2020 (ASC 606)</th>
<th>Q4 2020 (ASC 606)</th>
<th>Q1 2021 (ASC 606)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAAP Operating Loss</td>
<td>($9)</td>
<td>($11)</td>
<td>($13)</td>
<td>($11)</td>
<td>($3)</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>$7</td>
<td>$7</td>
<td>$6</td>
<td>$7</td>
</tr>
<tr>
<td>Acquisition-related/divestiture costs</td>
<td>$2</td>
<td>$2</td>
<td>$1</td>
<td>$1</td>
<td>$1</td>
</tr>
<tr>
<td>Amortization of acquired intangible assets</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
</tr>
<tr>
<td>Restructuring and other charges</td>
<td>$1</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
<td>$0</td>
</tr>
<tr>
<td>Facility restoration costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Depreciation expense on unused EDA software licenses</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$2</td>
<td>$0</td>
</tr>
<tr>
<td>Expense on abandoned operating leases</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$1</td>
</tr>
<tr>
<td>Change in fair value of earn-out liability</td>
<td>($2)</td>
<td>$0</td>
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<td>$0</td>
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<td>Restatement and shareholder activist costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$3</td>
<td>$0</td>
</tr>
<tr>
<td>Provision for (benefit from) income taxes</td>
<td>($1)</td>
<td>($1)</td>
<td>$0</td>
<td>($0)</td>
<td>($4)</td>
</tr>
<tr>
<td>Non-GAAP Operating Income</td>
<td>$2</td>
<td>$2</td>
<td>$0</td>
<td>$6</td>
<td>$12</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$5</td>
<td>$5</td>
<td>$5</td>
<td>$7</td>
<td>$5</td>
</tr>
<tr>
<td>Adjusted EBITDA</td>
<td>$7</td>
<td>$7</td>
<td>$5</td>
<td>$13</td>
<td>$17</td>
</tr>
</tbody>
</table>

Certain amounts may be off $1.0M due to rounding.
## Revenue and Licensing Billings

<table>
<thead>
<tr>
<th>In Thousands</th>
<th>ASC 606</th>
<th>ASC 606</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1'20</td>
<td>Q2'20</td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$21,482</td>
<td>$18,744</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>$30,728</td>
<td>$31,725</td>
</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>$13,567</td>
<td>$11,248</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$65,777</td>
<td>$61,717</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In Thousands</th>
<th>ASC 606</th>
<th>ASC 606</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1'20</td>
<td>Q2'20</td>
</tr>
<tr>
<td>Royalty Revenue</td>
<td>$21,482</td>
<td>$18,744</td>
</tr>
<tr>
<td>Licensing Billings¹</td>
<td>$67,072</td>
<td>$60,687</td>
</tr>
<tr>
<td><strong>Delta</strong></td>
<td>$45,590</td>
<td>$41,943</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In Thousands</th>
<th>ASC 606</th>
<th>ASC 606</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1'20</td>
<td>Q2'20</td>
</tr>
<tr>
<td>ASC 606 Interest Income²</td>
<td>$4,437</td>
<td>$3,788</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.
## GAAP to Non-GAAP Income Statement

<table>
<thead>
<tr>
<th>In $ Millions</th>
<th>GAAP Actual Q1'21</th>
<th>Non-GAAP Actual Q1'21</th>
<th>Delta to GAAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$70.4</td>
<td>$70.4</td>
<td>$-</td>
</tr>
<tr>
<td>Cost of revenue</td>
<td>17.4</td>
<td>12.9</td>
<td>(4.4)</td>
</tr>
<tr>
<td>Research and development</td>
<td>32.4</td>
<td>28.8</td>
<td>(3.5)</td>
</tr>
<tr>
<td>Sales, general and administrative</td>
<td>23.8</td>
<td>16.5</td>
<td>(7.3)</td>
</tr>
<tr>
<td>Restructuring charges</td>
<td>0.4</td>
<td>0.0</td>
<td>(0.4)</td>
</tr>
<tr>
<td><strong>Total operating cost and expenses</strong></td>
<td>73.9</td>
<td>58.2</td>
<td>(15.6)</td>
</tr>
<tr>
<td>Operating income (loss)</td>
<td>(3.5)</td>
<td>12.1</td>
<td>15.6</td>
</tr>
<tr>
<td>Interest and other income (expense), net</td>
<td>0.4</td>
<td>2.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Income (loss) before income taxes</td>
<td>(3.1)</td>
<td>14.4</td>
<td>17.5</td>
</tr>
<tr>
<td>Provision for (benefit from) income taxes</td>
<td>(0.5)</td>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td><strong>Net income (loss)</strong></td>
<td>($2.6)</td>
<td>$10.9</td>
<td>$13.5</td>
</tr>
</tbody>
</table>

Certain amounts may be off $0.1M due to rounding.
Product Overview
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
Innovating to Meet Market Needs

Growing Patent Portfolio

- 3000+

Industry Recognition of Rambus Patents

- Fundamental R&D feeds product development
- Relevant portfolio regularly cited by major industry players
- Supports predictable licensing base and sustained cash generation

Source: Innography, patent citations
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 4800 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

<table>
<thead>
<tr>
<th>DDR5</th>
<th>DDR4</th>
<th>NV</th>
<th>DDR3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB &amp; RCD</td>
<td>DB &amp; RCD</td>
<td>DDR4 NVRCD</td>
<td>DB &amp; RCD</td>
</tr>
<tr>
<td>• Per JEDEC Direction</td>
<td>• JEDEC Compliant</td>
<td>• JEDEC Compliant</td>
<td>• JEDEC Compliant</td>
</tr>
<tr>
<td>• Speeds of 4800 Mbps</td>
<td>• Speeds up to 3200 Mbps</td>
<td>• Speeds up to 3200 Mbps</td>
<td>• Speeds up to 2133 Mbps</td>
</tr>
<tr>
<td>• Ongoing qualifications</td>
<td>• Multiple OEM qualifications</td>
<td>• Multiple OEM qualifications</td>
<td>• Multiple OEM qualifications</td>
</tr>
</tbody>
</table>

Available in production

Smart tools for easy integration and reduced time to market

LabStation Platform and Buffer BIOS Integration Tool

Validated solutions with partners

---

LABSTATION PLATFORM 
and Buffer BIOS Integration Tool

SAMSUNG  SK hynix  Micron
DDR DIMMs Boost Capacity and Bandwidth

DIMM Memory Interface chips reduce the number of loads to enable higher system capacity and performance.

 DDR5 Registered DIMM (RDIMM)

 DDR5 Load Reduced DIMM (LRDIMM)

Memory Interface Chips = RCD + DB
Silicon IP
Across a broad spectrum of applications spanning automotive, artificial intelligence (AI), Internet of Things (IoT), network edge, and data center, there is a common need to move more data faster. Rambus memory and SerDes IP deliver the performance needed by the most demanding applications to move the data at blinding fast speeds.

HBM2E Memory Subsystem
- Fully-integrate and silicon-proven PHY and controller
- Running at industry’s fastest data rate up to 4.0 Gbps
- Ideal for AI/ML training, graphics and networking applications

GDDR6 Memory Subsystem
- Fully-integrate and silicon-proven PHY and controller
- Running at industry’s fastest data rate up to 18.0 Gbps
- Ideal for AI/ML interference, automotive, graphics and networking applications

PCie 5
- Co-validated PHY and controller
- PHY supports Compute Express Link (CXL)
- Multiple configurations to support broad range of applications
Memory Interface Solutions

Memory PHY and digital controller solutions

**HBM2E**
7nm & 14/11nm
- 3.6 Gbps
- 1024-bit
- 2.5D design architecture

**GDDR6**
7nm
- 12-18 Gbps
- 2x 16-bit channels

**DDR4/3**
12nm & 28nm
- 3200 Mbps
- x16 to x72-bits
- 1-4 Ranks
- DFI 4.0

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

Verification tools
Complete HBM2E Interface

Applications

• AI/ML
• Graphics
• Networking

Features

• JEDEC standard compliant
• 7nm process node
• 461 GB/s maximum bandwidth
• Speed bins to 3.6 Gbps with operation to 4.0 Gbps
• Support for stacks of 2, 4, 8 or 12 DRAM

World’s fastest HBM2E Operating at 4.0 Gbps
Complete GDDR6 Interface

Applications:
- AI/ML
- Automotive
- Graphics
- Networking

Features:
- JEDEC standard compliant
- 7nm process node
- 72 GB/s maximum bandwidth
- Speed Bins: 12, 14, 16, 18 Gbps
- Supported DRAM: 8, 12, 16 Gbit
- ASIC Interface: DFI style
- Supports clam shell mode
- All training and calibration modes support

GDDR6 Memory Interface Subsystem
(Controller + PHY)
High-Speed SerDes Solutions

SerDes PHY and digital controller solutions

- **PCIe 5**
  - 7nm
  - PCIe 5
  - CXL (PHY)
  - PCIe 4/3/2

- **32G**
  - 12nm & 22nm
  - CEI-28/25/11
  - 40/10GbE
  - JESD204B/C
  - CPRI

- **28G**
  - 12nm
  - CEI-28/25/11
  - 40/10GbE
  - FC28
  - XFI/XAUI

- **16G**
  - 12nm & 28nm
  - PCIe 4/3/2
  - CEI 11/6
  - XFI/XAUI
  - SATA
  - SAS

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

Verification tools

![avery design systems logo]
Complete PCIe 5.0 Interface

Co-validated PCIe 5 PHY and Controller

- Eases SoC integration effort
- Reduces design risk
- Speeds time to market

Features

- Backward compatible to PCIe 4/3/2
- PHY supports Compute Express Link (CXL)
- X1, X2, X4, X8 and X16 lane configuration support
- Supports >36dB of channel insertion loss
- Available in 7nm
Rambus secure silicon IP helps protect data at rest and in motion across a broad range of applications and throughout a device’s lifecycle. Securing electronic systems at their hardware foundation, our embedded security solutions span areas including root of trust, tamper resistance, content protection and trusted provisioning.

**Root of Trust Cores**
- Portfolio of solutions from fully-programmable secure co-processors to highly-compact state machines
- Provides hardware-based foundation for security
- Optimized for broad range of applications including AI/ML, automotive, IoT and defense

**800G MACSec Engine**
- Protects data in motion with robust Layer 2 security anchored in hardware
- Operates at full line-rate up to 800 Gbps supporting real-time applications
- Offers easy integration into networking SoCs and ASICs

**Provisioning and Key Management**
- Provision cryptographic information securely in untrusted environments
- Protect against cloning, reverse engineering, and counterfeiting
- Manufacturers can leverage securely provisioned keys and identities to enable supply chain integrity.
Silicon IP: Security

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

Secure Cores
- Root of Trust
- Protocol Engines
- Crypto Cores
- Anti-Counterfeiting

Secure Protocols

Secure Provisioning
- Key and Data Injection
- Device Key Management

End-to-End Security Solution
Root of Trust

Portfolio of solutions from fully-programmable secure co-processors to highly compact state machines
- Provides hardware-based foundation for security
- Offers wide range of cryptographic functions and anti-tamper protections
800G MACsec Protocol Engine

- Protects data in motion with robust Layer 2 security anchored in hardware
- Operates at full line-rate up to 800 Gbps supporting real-time applications
- Offers easy integration into networking SoCs and ASICs
Thank you