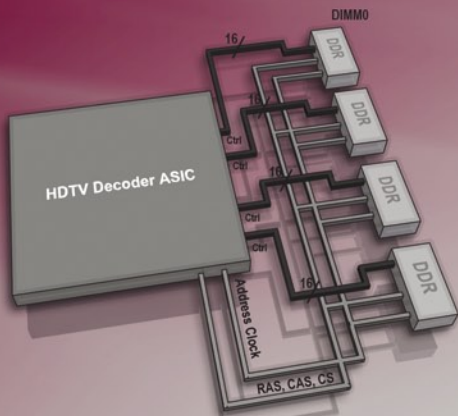


# Rambus®

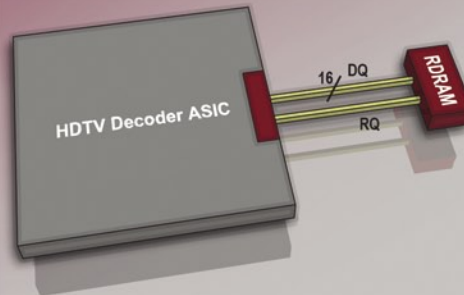
## RDRAM™

### Technology Summary

#### Comparison of Consumer HDTV Decoder Design



WITH DDR-SDRAM MEMORY 4 COMPONENTS  
AT 333MHZ 2.7 GBYTES/SEC BANDWIDTH



WITH RDRAM MEMORY 1 COMPONENT  
AT 1333MHZ 2.7 GBYTES/SEC BANDWIDTH

#### APPLICATIONS

Consumer Electronics  
Networking Equipment  
Servers  
PC Main Memory

#### BENEFITS

Exceptional bandwidth to cost ratio  
Reliable and proven technology  
Extensive support and infrastructure resources  
RDRAM devices available in volume  
RDRAM ASIC Cells available in many processes

## High Performance Memory Interface Solution

### The Challenge: Providing a Reliable High Performance Memory Interface

Pervasive computing, graphics, and networking applications continue to drive the need for high-speed memory interfaces. Many mainstream memory technologies fail to meet the needs of the powerful processors in today's high-volume systems, reducing the performance these systems deliver. System and chip designers today need a high performance memory technology already proven in high-volume markets.

### The Solution: RDRAM Memory Interface

The Rambus® RDRAM® memory interface provides an exceptional system bandwidth-to-cost ratio and meets the high-performance requirements for a broad range of consumer electronic, computing and networking applications. The RDRAM interface has been incorporated into chips and systems from industry leaders such as Cisco, Dell, Elpida, HP, Intel, NEC, Panasonic, Samsung, SiS, Sony, Texas Instruments, Toshiba and Vitesse.

### Exceptional Scalability, Flexibility and Performance

The RDRAM memory interface is designed to deliver outstanding scalability and flexibility, while enabling maximum system performance. Consumer systems can achieve 3.2GB/s of peak bandwidth with a 16-bit wide RDRAM memory interface and a single RDRAM device. High-capacity applications like servers can also scale the number of devices to allow up to 1GB of memory per channel.

#### RDRAM interface features:

- Very high bandwidth per pin, reducing overall component count, controller pin-count and system board cost
- Supported DRAM densities from 128-576 Mbit
- Speeds of 800, 1066, 1200, 1333, and 1600MHz
- Memory configurable into single or dual RIMM modules supporting bandwidths from 1.6 GBytes/sec to 12.8 GBytes/sec

The RDRAM interface achieves its exceptional performance through several innovative design techniques that include:

- Highly efficient protocol

- Low-voltage signaling
- Separate control and address buses
- Precise clocking to minimize skew between clock and data lines

The RDRAM memory interface has been implemented in high-volume chips and systems and incorporated into hundreds of millions of consumer electronic, computing and networking products worldwide. From video game consoles to desktop PCs to network routers and switches, RDRAM interfaces provide an optimal balance between performance, cost and capacity to meet a broad range of application design requirements.

#### Consumer Electronics

Designers of consumer electronics products have an extraordinary challenge. They must deliver generational leaps in system bandwidth and performance using a low-cost infrastructure that enables innovative new products at attractive price points. The Rambus RDRAM memory interface, now in its fourth generation, enables designers to meet this challenge by providing high-speed connections between chips that enable the highest bandwidth implemented in the smallest chip and board

## FEATURES

400 Mhz to 8 GHz data rate (per signaling pair)

Ultra low voltage DRSL signaling for low power and reduced EMR

Highest performance for low latency, low power applications

Ideal for short distance, low distortion interconnects

LVDS signaling support for HyperTransport, RapidIO, SPI-4, FB-DIMM, and other industry standards

Uses low-cost, high-volume industry standard packaging and PCBs

footprint. In fact, Rambus interfaces and expertise have played an important role in the success of numerous consumer electronics products, including video game consoles, HDTVs, set top boxes and video projectors.

### Networking

Growing data and voice traffic, as well as bandwidth-intensive applications, make increasing demands on enterprise networks and the Internet. As a result, network processing and storage systems require maximum performance today, and scalability to accommodate future demand. The RDRAM memory interface provides an ideal packet buffer solution for network processors in core and enterprise switches, routers, and storage devices.

The RDRAM interface is the only high-volume, memory interface solution that enables system manufacturers to deliver scalable memory bandwidth in the smallest form factor and lowest-cost implementation. Fewer I/O pins lead to dramatically reduced die sizes, PCB routing area, and overall system cost.

### Computing

RDRAM has proven its advantages to supercomputing and mainstream PC systems. The memory bandwidth of RDRAM devices, coupled with its highly efficient protocol, delivers the performance required by graphics and data intensive multi-media applications. The RDRAM interface is also implemented in printers, servers and workstations from leading OEMs.

### The RDRAM Advantage: Ready Availability of High-Volume Infrastructure

A major advantage of implementing the RDRAM memory interface into a system design is the established infrastructure of suppliers who can provide the three elements of most RDRAM-based memory systems:

- RDRAM memory is available from leading chip manufacturers including Elpida and Samsung.
- Rambus ASIC Cells (RACs) provide the physical layer for RDRAM devices and incorporate all of the required high-speed interface circuitry and logic. They are available in many of today's most popular processes from TSMC and other leading suppliers.

- RIMMTM modules ranging from 64 MBytes to 1 GByte are available from numerous suppliers and are interoperable, providing OEMs with the ability to utilize multiple memory configurations.

In addition, Rambus specifies and enables key infrastructure components such as clock generators, motherboard reference designs and module connectors, in order to simplify the implementation of RDRAM systems. Rambus also develops logical models for memory subsystems and testing/validation programs for system testing.

### The Benefits of "Plug-and-Play" Design

The RDRAM memory interface provides designers with the additional benefit of interoperability. From initial design through final specification, RDRAM memory has been developed to make it easy to customize the memory interface system, resulting in an optimal combination of performance, cost and capacity.

### Rambus Support Services Ensure Your Success

Rambus works closely with customers to solve their memory interface challenges, as well as support them on memory architecture, silicon integration and system-level design issues. As a result, companies that work with Rambus are able to build more competitive products that benefit from faster time-to-market, increased performance and lower system cost.

With over a decade of experience, Rambus engineering provides customers with unmatched expertise in physical interface circuit design and system design, as well as specific knowledge of dozens of applications.

### RDRAM: The Choice for Performance, Scalability and Flexibility

Delivering exceptional performance, scalability and flexibility, the Rambus RDRAM memory interface can make a significant contribution to achieving your design goals.

**Rambus**

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