Samsung DDR4 SDRAM

The new generation of high-performance, power-efficient memory that delivers greater reliability for enterprise applications

DDR4 SDRAM

Samsung MEMORY activated

SAMSUNG

An optimized memory for enterprise-level workloads

Meet diverse enterprise workload demands with higher bandwidth and reduced power consumption

Accelerated adoption of cloud computing, virtualization and high-performance computing (HPC) technologies has made higher-performing, higher-density memory a key factor for server operation. Highly virtualized environments enable companies to run numerous applications on a single server instead of multiple servers. A single server with more virtual machines (VMs) requires not only a higher processor speed, but also higher density in memory.

Requirements for memory become more diverse to support a wide range of enterprise server applications from less critical workloads to mission-critical workloads. Enterprise-level workloads, such as database or transaction processing run on high-end servers, need a large capacity of in-memory systems and higher reliability. Mid-range servers used for virtualization or consolidation require high bandwidth and scalability. Small form factor, less power and low cost are essential requirements for workloads on low-end servers used as web, collaboration and infrastructure systems.

Rising energy costs and the need to provide greater environmental sustainability are also placing demands on chipmakers and server vendors. A server running a virtualized environment can achieve a higher utilization which, in turn, increases the total power consumption of server. As a result, CPU and server companies are focusing intently on the development of next-generation green IT systems.

The memory that supports next-generation, green IT systems should meet the diverse demands of enterprise workloads with higher performance, increased density, improved reliability and low power consumption.

Samsung DDR4 SDRAM

Provide an optimized solution for enterprise applications

Samsung DDR4 is an optimized solution for highly virtualized environments, high-performance computing and networking. Semiconductor modules of Samsung DDR4 are designed with new system circuit architecture to deliver higher performance with low power requirements than previously available memory products.

The Samsung portfolio of DDR4-based modules using 20 nm-class process technology includes registered dual inline memory modules (RDIMMs) and load-reduced DIMMs (LRDIMMs). These memory modules are available with initial speeds up to 2400 Mbps, increasing to the Joint Electron Devices Engineering Council (JEDEC)-defined 3200 Mbps. The portfolio includes the following modules:

- 8 GB DDR4 RDIMMs
- 16 GB DDR4 RDIMMs
- 32 GB DDR4 RDIMMs and LRDIMMs
- 64 GB DDR4 LRDIMMs
- 128 GB DDR4 LRDIMMs

Doubled bandwidth, along with reduced voltage and dramatically lower power consumption, improves performance and optimizes the total cost of ownership (TCO). Samsung DDR4's enhanced reliability, availability and serviceability (RAS) features provide enhanced reliability and improved signal integrity (S/I).

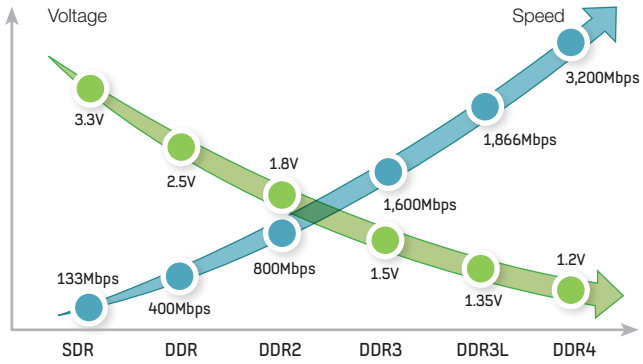

Figure 1. High speed and low voltage of DDR4 SDRAM

Lower power memory consumption with higher capacity and performance

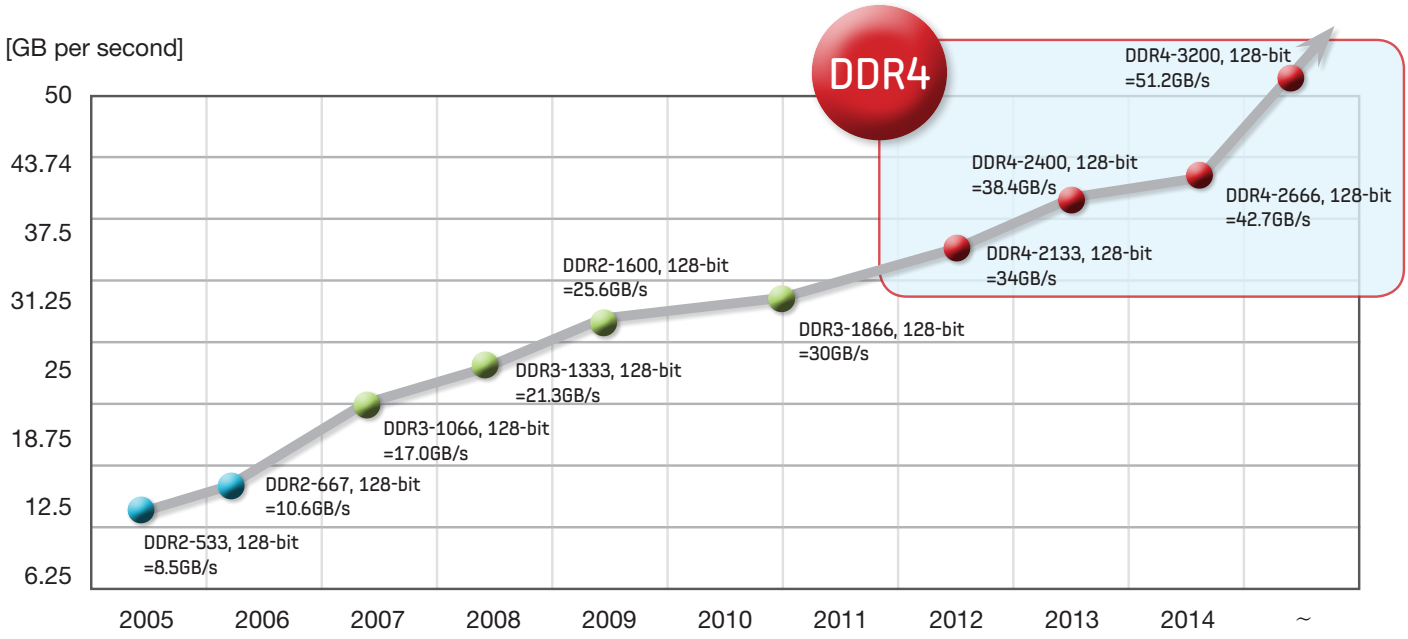

Figure 2. DDR4 higher performance compared with DDR3L and DDR2

Increase performance for higher bandwidth

Samsung DDR4 delivers higher performance at a higher speed than DDR2 and DDR3. DDR4 can achieve more than 2 Gbps per pin beyond 30 Gbps bandwidth. Compared to DDR3L (low power DDR3), Samsung DDR4 shows overall performance improvement in every DIMM and approximately 30 percent better performance at 1 DIMM per channel.

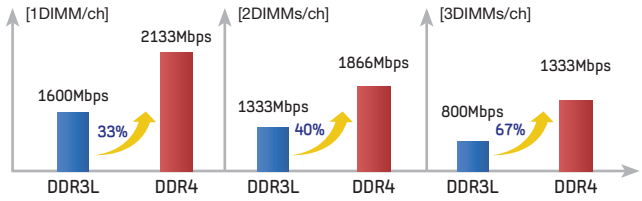

Figure 3. DDR4 provides an optimized server solution for high capacity and performance compared to DDR3L.
***Note:** The test result is based on RDIMM, chipset POR.*

Reduce power usage for greener, lower-cost computing

A major decrease in voltage and the improved input/output (I/O) power efficiency of DDR4 synchronous dynamic RAM (SDRAM) translates into significant cost savings. According to Samsung internal testing, DDR4 operates at 1.2 V, a voltage that is 11 percent lower than the 1.35 V consumed by DDR3L. DDR4 consumes 37 percent less power than DDR3L when running an identical process at the same speed. DDR4 adopts a Pseudo Open Drain (POD) interface to reduce I/O power consumption and increase power savings by 50 percent compared to DDR3L under 4 Gb-based 16 GB 2 DIMMs per channel (DPC) conditions.

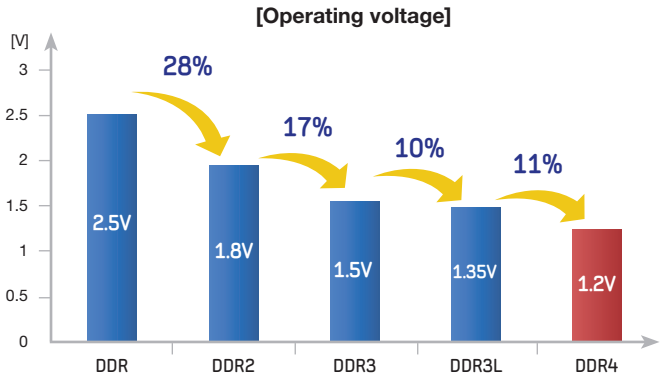

Figure 4. Reduced operating voltage requirements of DDR4 compared to DDR3L

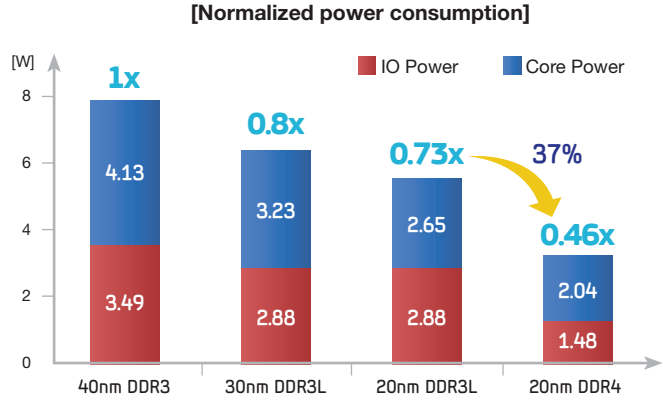

Figure 5. Reduced normalized power consumption requirements of DDR4 compared to DDR3L

Samsung MEMORY
activated

SAMSUNG

100 percent detection of random 1- to 2-bit errors

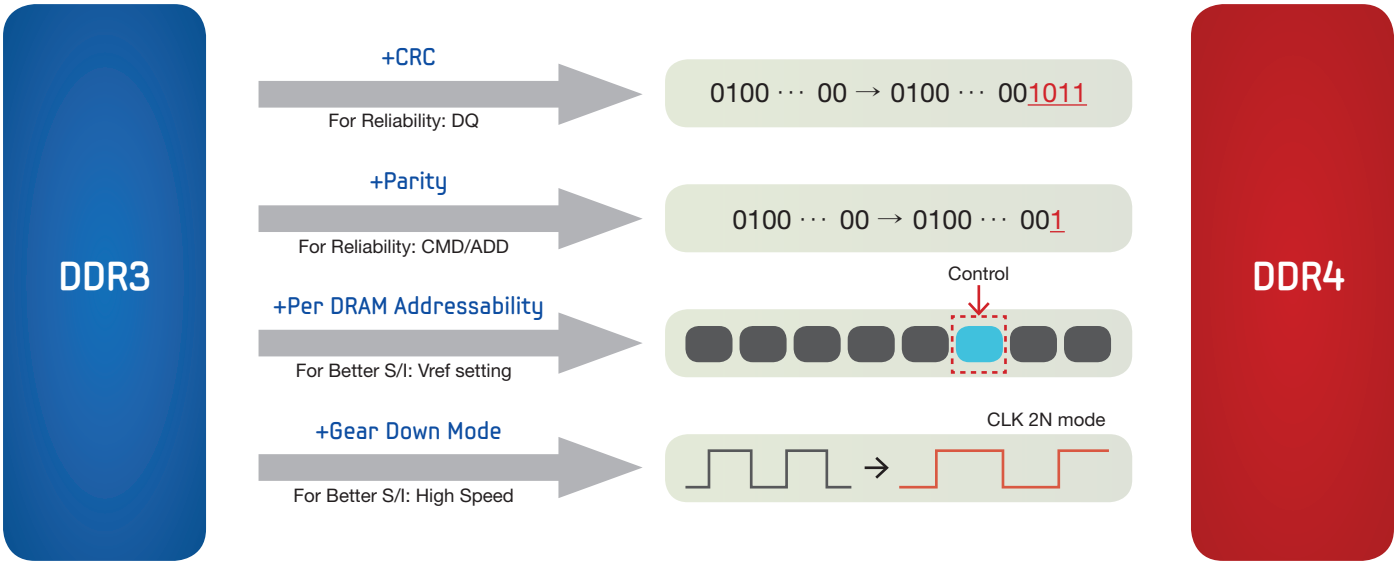

Figure 6. RAS feature comparison of DDR3 and DDR4 SDRAM

Provide greater reliability, availability and serviceability (RAS)

Samsung DDR4 represents a significant advancement in the following RAS features resulting in enhanced reliability and improved S/I for mission-critical enterprise applications.

DDR3 modules provided only one RAS feature, error-correcting code (ECC) capability. Compared to DDR3, DDR4 provides more robust RAS features, such as CRC, Parity, Per DRAM Addressability and Gear Down Mode.

1.Cyclic redundancy check (CRC) for improved data reliability

CRC is an error-detecting code that detects accidental changes to raw data of DRAM's DQ. It confirms 100 percent detection of random 1- to 2-bit errors by enabling error detection capability for data transfer.

2. On-chip parity detection for the integrity of Command/Address

Parity for Command/Address (CMD/ADD) provides a method of verifying the integrity of command and address transfers over a link.

3. Per DRAM Addressability for enhanced signal integrity

DDR4 can control module components and enhance signal integrity by controlling the ODT of Vref level.

4. Gear Down Mode for improved signal integrity

DDR4 Gear Down Mode allows a high speed of DQ to be maintained while decreasing the high speed of CMD/ADD.

Fault-tolerant, higher RAS systems supported by DDR4 SDRAM can remain available for longer periods of time without failure.

Manage a range of enterprise workloads with greater reliability, doubled bandwidth and reduced power usage

Designed with advanced system circuit architecture, Samsung DDR4 supports a wide range of server memory needs by delivering higher performance and reduced power usage with increased reliability. With advanced features of Samsung DDR4, companies can achieve greater performance at a lower TCO.

DDR3 and DDR4 specifications and features comparison

Feature		DDR3	DDR4
Component density, speed		512 Mb - 4 Gb 0.8 - 2.1 Gbps	4 Gb - 8 Gb 1.6 - 3.2 Gbps
Module density		1, 2, 4, 8, 16, 32 and 64 GB	8, 16, 32, 64 and 128 GB
Interface	Voltage (VDD, VDDQ, VPP)	1.5 V,1.5 V, NA (1.35 V, 1.35 V, NA)	1.2 V, 1.2 V, 2.5 V
	Vref	External Vref (VDD, 2)	Internal Vref (need training)
	Data I/O	Center Tab Termination (CTT) (34 ohm)	POD (34 ohm)
	CMD, ADDR I/O	CTT	CTT
	Strobe	Bi-dir, diff	Bi-dir, diff
Core architecture	Number of banks	8 banks	16 banks (4-bank group)
	Page size (X4, 8, 16)	1 KB,1 KB, 2 KB	512 B, 1 KB, 2 KB
	Number of prefetch	8 bits	8 bits
	Added functions	RESET, ZQ, Dynamic ODT	RESET, ZQ, Dynamic ODT CRC, Data Bus Inversion (DBI), Multi preamble
Physical	Package type, balls (X4, 8, X16)	78, 96 BGA	78, 96 BGA
	DIMM type	R, LR, U, SoDIMM	R, LR, ECC U/SoDIMM
	DIMM pins	240 (R, LR, U), 204 (So)	284 (R,LR, ECC U), 256 (ECC So)

Legal and additional information

About Samsung Electronics Co., Ltd.

Samsung Electronics Co., Ltd. is a global leader in technology, opening new possibilities for people everywhere. Through relentless innovation and discovery, we are transforming the worlds of televisions, smartphones, personal computers, printers, cameras, home appliances, LTE systems, medical devices, semiconductors and LED solutions. We employ 236,000 people across 79 countries with annual sales of US$187.8 billion. To discover more, please visit www.samsung.com.

For more information

For more information about Samsung DDR4 SDRAM, visit www.samsung.com/semiconductor.

Samsung Electronics Co., Ltd.
416, Maetan 3-dong,
Yeongtong-gu
Suwon-si, Gyeonggi-do 443-772,
Korea

www.samsung.com

2013-06