Industry’s First
7.2 Gbps 512GB DDR5 Module

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A Promising Memory Solution for Next-Gen Servers
Spurred by the increasing market needs for big data and cloud services, global server suppliers and hyperscalers are looking to adopt high-speed and large-capacity memory modules. To fulfill this trend, the brand-new low-voltage operable DDR5 (double data rate 5th generation) memory can be an appropriate solution, with the highest speed of 7.2 Gbps and the largest capacity of 512 GB.

However, some critical obstacles, such as increased capacity and high-speed I/O requirements, unstable power noise occurrences, high power consumption, and increase in operating temperature, must be overcome. This poster will cover various technical pathfinding solutions for world’s first DDR5 512 GB module with an advanced DRAM process and I/O schemes, package technology, and module architecture regarding improvements in the following four aspects: performance, speed, capacity, and power.

This will unveil the industry’s first high-performance and large-capacity memory product with 8-stacked DDR5 DRAMs. Samsung believes that this product will pave the way for achieving both higher bandwidth and lower power consumption to inaugurate the era of terabyte DRAM modules for next-gen servers.
Advances in Performance, Bandwidth, Capacity, and Voltage

- Performance: 85%
- Speed: 7.2 Gb/s
- Capacity: 512GB
- Voltage: 1.1V

Manufactured 512GB module with 8-stacked DRAMs

8H TSV

1.0mm
The 4 Biggest Trends In Big Data And Analytics Right For 2021

Self-driving cars, lifelike robots, and autonomous delivery drones are the sexy, headline-grabbing face of the digital transformation that we see all around us today.

None of these would be possible, though, without data – the oil of the fourth industrial revolution – and the analytic technology we’ve built to allow us to interpret and understand it.

4th Industrial Revolution

Continuous Increase in the Number of Data Centers

Source: Cisco Global Cloud Index, 2015-2020; Synergy Research.
Higher Performance
By increased BL* and refresh granularity

* BL: Burst Length, FGR: Fine Granularity Refresh, SBR: Same Bank Refresh
Faster Transfer Speed
By newly adopted equalization schemes

- Decision feedback equalizer (DFE) with loop-unrolling
- Shortened data path with un-matched data and strobe (DQ-DQS)
- Equalizer scheme with per-pin VrefDQ calibration

DFE Circuit

Test Result
Larger Capacity

By the thinnest eight-stacked package

- Reduced gap between dies by ~40%
- Thin wafer handling techniques
- Error-free TSV interconnect technology
- Better cooling capability with lower airflow impedance

* Cubic feet per minute

Increased Air Flow in CFM* (+16%)
Lower Power
By reduced voltage and new process

- High-efficiency PMIC (1st for DRAM module)
- Reduced noise for low voltage operation
- High-K Metal Gate (HKMG) process (1st for EDP* DRAM)

* Electronic data processing
More Reliable Data

By enhanced error correction capability

- On-Die Error-Correction Code (ODECC)
- Improved \((10^{-6} \text{ times})\) bit error rate (BER)
- More reliable and secure data
Summary & Future Plan

• AI and cloud technologies drive demand for high-performance and large-capacity memory

• Samsung developed industry’s first 7.2 Gbps 512GB DDR5 module

• Ready for mass production of 512GB by the end of year 2021

• DDR5 to be the main stream of computing memory (DDR5 cross over expected in ’23–’24)

• New era of terabyte DRAM for next-gen servers at post-pandemic

• Samsung to provide total memory solutions for industry