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RAM GUY TECH NOTE

A DDR2 PRIMER

DDR2 is a new memory technology that will quickly replace the now common-place DDR. DDR2 is a standard defined by JEDEC (Joint Electron Device Engineering Council). The new memory modules built on this technology will provide greater speeds, lower latencies, and many other advantageous features. In this tech note, we will look at the major differences between DDR and DDR2, details on the most compelling new features, and what you need to know when designing a system based on DDR2 memory.

Major Differences Between DDR and DDR2

Prefetch length: DDR2 implements a 4-bit prefetch instead of the 2-bit prefetch of the original DDR standard.

Package type: DDR2 utilizes a FBGA (Fine Ball Grid Array) while DDR uses a TSOP-II (Thin Small-Outline Package). The FBGA uses a find pitch ball arrangement on the underside of the package, where the TSOP has leads protruding from the sides of the package. Because the contact point of the FBGA is on the bottom of the package, the package can be made smaller than the TSOP.

Operating Speeds: The operating frequencies specificed in the JEDEC specification for DDR2 begin where the original DDR left off. The
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	DDR	DDR2
Data Bus	64 bits wide	64 bits wide
Data Rate	200/266/333/400 Mbps	400/533/667 Mbps
Bus Frequency	100/133/166/200 MHz	200/266/333 MHz
DRAM Frequency	100/133/166/200 MHz	100/133/166 MHz
Package Type	TSOP-II	FGBA
Densities	256 MB, 512 MB, 1 GB	256 MB, 512 MB, 1 GB
Voltage	2.5 volts	1.8 volts
Prefetch Size	2 bit	4 bit
Burst Length	2/4/8	4/8
CAS Latency	1.5, 2, 2.5	3+, 4, 5
Write Latency	1T	Read Latency-1
Packaging	TSOP (II), TBGA	FBGA

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New Features

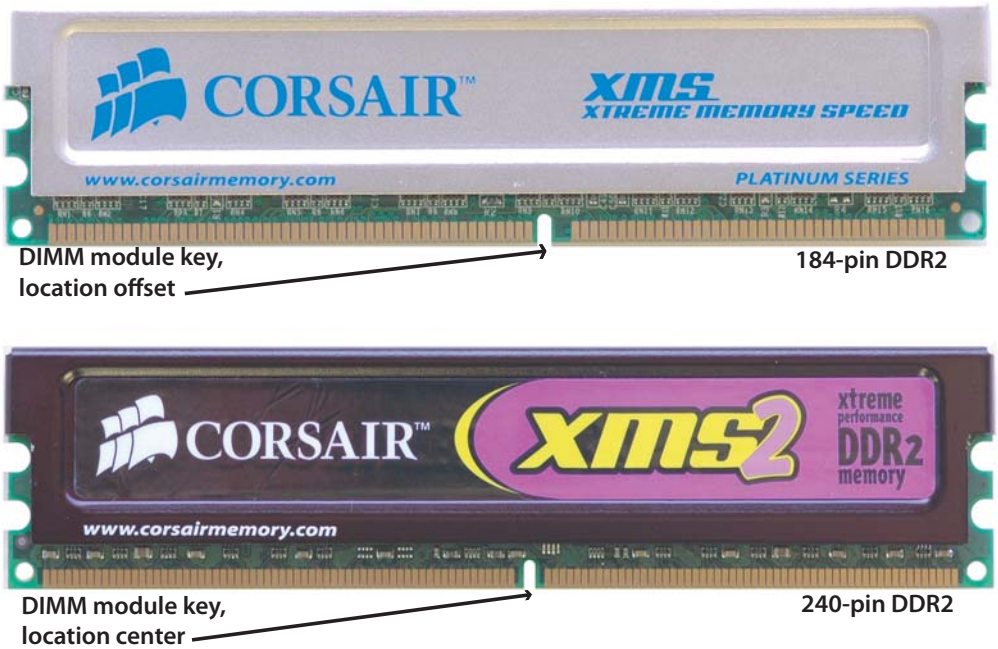
•On-Die Termination: In DDR, excess signal noise is eliminated using terminating resistors that are built into the motherboard. In DDR2, resisters are still used to eliminate the excess noise, however these resisters are built into each of the memory chips on the module which keeps them closer to the source of the noise. This is intended to reduce interference within the chip. Each resister is deactivated when the corresponding chip is activated, also saving on power.

•Posted CAS and additive latency: These two technologies work together to prevent data collisions within the memory as well as better utilizing the data bus by transferring more read/write within each clock cycle.

•Off-chip driver calibration (OCD): This calibration provides the option of tightening the variance of the pull-up and pull-down output driver at 18 ohms nominal. This increases the signal integrity and the system timing margin.

Considerations When Building a High-Performance System

When building a new system, it is important to note first, that DDR2 is NOT backwards compatible with DDR1 motherboards. In fact, because of the increase in number of pins (DDR2 modules have 240 pins, while DDR1 modules only have 184 pins) and the shifted location of the key, a DDR2 module will not fit in a slot found on a DDR1 motherboard. The figure below shows this difference. Additionally, DDR2 systems require a different power supply than the older DDR systems. While DDR systems require a standard 12 volt power supply, DDR2 require EPS 12 volt power supplies. Lastly, one final consideration when building a system is the addition of PCI Express to some DDR2 motherboards. Some of DDR2 motherboards use PCI Express to communicate with the graphics processor. In this case, one would need a graphics processor that supports this communication standard instead of the older AGP standard.



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