



Comparisons among DDR SDRAM, DDR2 SDRAM and DDR3 SDRAM

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ABSTRACT: The name of SDRAM is stand for Synchronous Dynamic Random Access Memory which is dynamic memory and it's a classic SDRAM having synchronous interface which means that before control inputs is responded to, it will wait for a clock cycle. So we can say that it synchronised with the computer system bus. DDR is the next generation of SDRAM, stand for Double Data Rate SDRAM and in which we get higher bandwidth than the previous memory. The single data rate SDRAM, achieves or transfer the data on both the rising and falling edges of the clock cycle. So without changing the internal clock we are transferring the double data of DDR SDRAM. After that DDR2 SDRAM had come and DDR SDRAM is replaced by the DDR2. The first benefit of this is the capability to operate the data bus twice at a time which is fast as DDR SDRAM. It is done by the enhanced bus signal. Now the DDR3 has come, and DDR2 replaced by the DDR2 SDRAM because it reduces so many parameters like power , cost and also speed factor. The speed of transferring data is triple or can say much faster than the previous one. Fetching is increased. DDR3 is used two functions, namely ASR (Automatic Self-Refresh) and SRT (Self- Refresh Temperature).

KEYWORDS: DDR SDRAM, DDR2 SDRAM and DDR3 SDRAM.

I. INTRODUCTION

The DDR SDRAM interface gives maximum transfer rates, When it comparisons with single data rate SDRAM and these are possible by more strict control of the timing of the electrical data and clock signals. The Implementations are done by some scheme such as phase-locked loops and self-calibration to reach the required timing accuracy. The data can captured or transferring uses double edges (means transferring data on both the rising and falling edges of the clock signal) to lower the clock frequency. DDR2 SDRAM has one additional feature is double pumping means it allows high bus speed and works on low power by clock signal with done only by half speed of the data bus. DDR2 internal clock works on half than the DDR external clock rate. so that the DDR2 memory is running at the same external data bus clock rate because it have the capacity to achieve a data with high speed as compare to DDR. The drawback of this memory is that it has higher latency but bandwidth is same as DDR. DDR3 SDRAM is an abbreviated version for double data rate synchronous dynamic random access memory, which is using rate of third type. DDR3 has more speed as compare to other previous memories because it has high performance solution for computer or we can say for Central Processing Unit(CPU). It works with high performance means the areas like speed factor, power consumption, bandwidth for desktop, server computing and notebook. DDR3 is very much comfortable electrically with DDR2 and also DDR3 DIMMs contain 240 pins.

II. DDR SDRAM

The double data rate (DDR) synchronous Dynamic Access Memory is a type of memory integrated circuits which are used in computers. By JEDEC Board Ballot JCB-99-70, and it is enhanced by other Board Ballots and developed under the committee of cognizance JC-42.3, which comes under DRAM Parametric. It was released in 1996 and started in 2000. DDR SDRAM, also called DDR1 SDRAM was developed by the JEDEC, the DDR (Double Data Rate) SDRAM specification (JESD79).The DDR SDRAM has one advantage is provide the clock frequency down which reduces the signal integrity required for the circuit board used to connect the memory to the controller. The name "double data rate" means to the fact that a DDR SDRAM with a certain clock frequency achieves normally twice the



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bandwidth of a SDR SDRAM running at the same clock frequency, due to this double sampling. So DDR is replaced by the DDR2.

III DDR2 SDRAM

DDR2 SDRAM is a double data rate two .synchronous dynamic random-access memory. It is replaced by the original DDR SDRAM specification. It has since been replaced by DDR3 SDRAM. In 2003 April, DDR2 was introduced and with two clock rates: 266 MHz (for PC2-4200) and 200 MHz (for PC2-3200). At the end of 2004, DDR2 was started by DDR standard, so that it can compete with the older, as modules with lower latencies became available. Both are performed more badly than the original DDR specifications because of higher latency. So the total time to access them is longer. The Data in DDR2 SDRAM is captured at double pumping (means transfer of data on both edges the falling and rising edges).DDR2 is of higher bus speed and uses the internal clock with half speed of data bus so that it can be used at low power. For a total of four data transfer at clock cycle, two factors are required.

The data can be transferred at a rate of 64 bits per unit time so that the transfer rate of memory bus of the DDR2 SDRAM is clock rate \times 64 are number of bits transferred \times 2 for dual rate \times 2 for bus multiplier/ 8(number of bits/byte). So, DDR2 SDRAM can transfer data at a maximum rate of 3200 MB/s, if a bus with frequency 100 MHz is used. But DDR2 is replaced by the DDR3.

IV DDR3 SDRAM

For the computers the DDR3 SDRAM is an abbreviated version for double data rate synchronous dynamic random access memory, which is using rate of third type. This is a modern DRAM type, which is having a double data rate interface. The DDR3 is of higher-speed than DDR and DDR2 but an advance version is also available DDR4 synchronous dynamic random access memory (SDRAM) chips. With earlier type of Random Access Memory (RAM), DDR SDRAM is not suitable because of the timings, voltages of signal, and other factors.

The Double Data Rate (DDR3) is a specification of DRAM interface. The array, which store data for actual DRAM are similar to the DRAMs available earlier and with similar performance.^[24] The data transfer rate for DDR2 SDRAM is twice or double the rate (eight times higher to internal memory arrays).

The data is transferred at 64 bit wide, by using quadruple clock with two transfers per cycle; DDR3 module may transfer the data with data rate up to 64 times the speed of memory clock. The transfer rate for DDR3 SDRAM is given by 2 for dual rate \times 4 for bus clock multiplier \times 64 are number of bits transferred \times memory bus clock rate / 8 are number of bits/byte. So that DDR2 SDRAM can provide transfer rate of up to 6400 MB/s, with a 100 MHz clock frequency. In addition, the DDR3 standard allows DRAM chip capacities of up to 8 Gigabit.

As Compared to DDR2 memory DDR3 memory is used 30% less power. This factor or reduction comes from the difference in supply voltages: 1.8 V or 2.5 V for DDR2, and 1.5 V for DDR3.

V CONCLUSION

The conclusion is that the DDR3 SDRAM is much faster than the DDR and DDR2 because the maximum transfer rate (MB/s) of DDR3 for DDR3(800-1600) is 6400-12800 , for DDR2(400-1066) is 3200-8533 and for DDR(200-400) is 1600-3200. The bus speed is different for all memory. DDR having bus speed only 100-200 MHz, DDR2 having bus speed 200-400 MHz and for DDR3 bus speed is higher which is 400-800 MHz . And as compared to other memory DDR3 memory is used 30% less power and this power factor comes by the difference in supply voltages 2.5 for DDR, 1.8 for DDR2 and only 1.5 for DDR3 SDRAM. DDR3 have the ability to work on low power and provide Device Cooling or Improved thermal design. The cost of dual data rate 3 is higher than the dual data rate 2. The manufactured processes are improved with time but, dual data rate modules will be works at lower latencies than the JEDEC standards.

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