Computer RAM and things to know

If a few years ago we didn't have much to say about RAM because most systems were equipped with SDRAM with speeds from 66MHz to 133MHz, in a short time, there were quite a few strains. New types of memory such as DDR SDRAM, Rambus RDRAM, DDR-II SDRAM ... make users 'eyes' when choosing

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Over the years, users have witnessed the rapid change of the desktop system. The two main CPUs of Intel and AMD changed constantly not only in speed (from several hundred MHz to hundreds of GHz) but also communication (Intel: Socket 370/423/478/775, AMD: Slot A, Socket 462-A / 754/940/939 .) and of course they lead to the change of the motherboard and many other components. One of the components most affected is system memory (RAM). This article will help you better understand the concepts of computer RAM along with some other useful information. However, we will focus on DDR and DDR2 memory because currently, they are the dominant type in the market. SDRAM is too old and RDRAM is too expensive to be used in some early Pentium 4 computers.

1. BASIC LIST OF RAM

NAME

Many people are often confused about how to call the names of different types of RAM. If RDRAM has nothing to say, the SDRAM is getting bigger and bigger. The concept of RAM (Random Access Memory), everyone must know. DRAM or SDRAM is a broader concept (Synchronous Dynamic Random Access Memory). At first and even today when it comes to SDRAM people often think of old RAM at 100MHz or 133MHz; However, since DDR SDRAM (Double Data Rate SDRAM) was born, this concept is completely wrong. Refer to a few components quotes, you will see companies have contributed significantly to making users misunderstand the problem. SDRAM is the common name for a computer memory stream, which is divided into SDR (Single Data Rate) and DDR (Double Data Rate). So if you call correctly, we will have two main types of RAM: SDR SDRAM and DDR SDRAM. The structure of these two types of RAM is relatively similar, but DDR is capable of transmitting data at both the up and down points of the signal so the speed is twice as fast. In recent times, new RAM standards are based on DDR-II, DDR-II platform with higher speed thanks to design improvements.

SPEED (SPEED)

This is probably the concept that most users are interested in, but there are some questions about how to call, for DDR there are two ways to call at MHz or bandwidth. For example, when speaking DDR333 it means that the RAM by default operates at 333MHz, but calling PC2700 speaks about RAM bandwidth, which means that when running at 333MHz, it will reach 2700MB / s (in theory). Correspondingly, we will have the following table:

Usually in Vietnam, there are buses with buses 333 and 400, those with higher buses often appear in high-end types such as Kingston HyperX, Corsair, Mushkin LV but generally quite rare.

LATE (LATENCY)

CAS Latency is the concept that users ask the most. Previously, when buying RAM, buyers were often only interested in operating speeds like 100MHz or 133MHz, but recently, CAS concepts are gradually being noticed by users because it plays an important role in processing speed. overall system; Special in overclocking. So what is CAS?

CAS stands for 'Column Address Strobe'. A DRAM bar is treated as a matrix of memory cells (you can imagine an excel spreadsheet with many empty cells) and of course each memory cell will have coordinates (horizontal and vertical). So you can guess right away the concept of RAS (Row Adress Strobe) is the goods address, but because the operation principle of DRAM is to transfer data to the foot, RAS is usually not as important as CAS.

The latency concept represents the amount of time you have to wait before you get what you need. According to Merriam-Webster's dictionary, the latency means 'the period of time from commanding to receiving feedback'. So how will the CAS work? What does CAS Latency mean?

In order to understand this concept, we will take a quick look at how memory works, first the chipset will access the horizontal row (ROW) of the memory matrix through putting the address into the memory foot (RAM pin) then activate the RAS signal. We will have to wait for some RAS to CAS Delay before the column address is placed on the memory pin and the CAS signal emits. After the CAS signal is transmitted, we continue to wait a while longer (this is the CAS Latency), the data will be found. It also means that for CAS 2, the chipset has to wait for 2 clock cycles before getting the data and with CAS3, the waiting time will be 3 system clocks.

You might wonder if CAS2 is 33% faster than CAS3, not so much because there are many factors affecting the overall memory performance, such as:

+ Information processing chain: activating RAS, waiting for the delay time of RAS-to-CAS Delay and CAS Latency.
+ Memory access in sequence: sometimes the chipset will read the data in the series of RAM (burst) so a lot of data will be transferred once and the CAS signal is activated only once at the beginning of the string.
+ The processor has a large buffer so it contains many access commands and data; therefore information is searched on the buffer before accessing RAM and the hit-rate data rate is quite high (about 95%).

In summary, switching from CAS 3 to CAS 2 will increase processing performance for all applications. Programs that depend on memory such as games or graphics applications will run faster. This means that the RAM stamped CAS2 certainly runs faster than the CAS3 RAM bars. If you plan to buy toys for an overclocking race or simply need the system to achieve optimal speed, choose RAM CAS2 but if it is just office work, CAS 3 still fully meets the requirements.

FRESH FREQUENCY FREQUENCY

Often when it comes to the concept of RAM Refresh Rate, people often think of a computer screen, but the DRAM (Dynamic Random Access Memory) memory also has this concept. As you know the DRAM module is made up of many electronic cells, each of these cells must be recharged thousands of times per second because otherwise the data contained in them will be lost. Some types of DRAM have the ability to make independent data independent of the processor that is often used in mobile devices to save power.

SDRAM ACCESS TIME

The introduction of sequential data reading (Burst Mode) has helped overcome many disadvantages and increased RAM performance, the cycle of the string is much shorter than the page cycle of the old type RAM. The cycle of the string is also considered as the clock cycle of SDRAM and therefore it is considered as the scale for determining the speed of RAM because it is the time required between data retrieval according to the sequence of RAM. . Numbers -12, -10, -8 . recorded on RAM chips indicate the minimum time interval between each data retrieval: label -12 determines the data access cycle of RAM is 12ns (nano-seconds means that the

maximum operating speed of RAM will be 83MHz. Often high-speed RAM will use low-cycle RAM chips but with low access cycles, it is unlikely that RAM will be able to operate at high speeds depending on many other factors. So sometimes you will encounter a low-speed RAM bar, but when you put on the "fire test" overclocking, it will get much higher speed than the default high-speed RAM types. If you want more information, you can visit: http://www.dewassoc.com/performance/memory/memory_speeds.htm.

2. CHOOSE RIGHT RAM

When buying or assembling a computer, choosing the right type of RAM is quite important but few people pay attention. Each system using Intel or AMD CPUs 'likes' a different type of RAM, and the choice of RAM depends on the chipset and the user's working needs. Usually Intel Pentium 4 and Athlon 64 CPUs require high-speed RAM (400MHz bus) or higher because the CPU's FSB is quite large to allow for wide data bandwidth. If the RAM does not meet the bandwidth level, it will cause a bottle-neck phenomenon, the application will work very slowly. If you don't consider overclocking (overclocking), usually when buying RAM for a computer, buy the following:

DDR SDRAM

As mentioned above, this is the most common and popular RAM for all desktops at the time you read this article.

A. FOR INTEL CPU

+ Intel Pentium 4-C / E / G / J Front Side Bus (FSB) 800MHz: These CPUs have a very large FSB so if used on the latest 865/875 or 915/925 motherboard, you will reach High speed when installing dual channel memory (Dual Channel DDR) properly. In principle Dual Channel DDR is quite similar to the RAID mode of the hard disk, with 100MB of data transferred to RAM, instead of entering a 100MB RAM, the chipset will transfer simultaneously into each 50MB RAM, so it will shorten the working time. the job is only half. And so two DDR bus 400 RAM modules will give theoretical bandwidth up to 800MHz, commensurate with the CPU bus. This shows that if you use the CPU with 800 bus, buying two identical DDR bus 400 is the ideal choice. Note that the two RAM modules must be the same in both the speed and type of memory chips used, especially when you are running on the i875P chipset because this chipset is quite 'fastidious', if not the same, it is possible to enable PAT. not enabled and reduces system performance.
+ 400MHz / 533MHz Intel Celeron / Pentium4 bus: Although the types of CPUs are quite high, but due to the old generation or cheap line, they are usually installed with 845 chipsets, until 845PE chipset, the RAM speed is high. The most officially supported is only 333MHz. So if you install DDR400 RAM it is not economical. So unless you use a motherboard with 845PE chipset, otherwise you should choose 266MHz bus types and save excess funds for an overall system upgrade later.

B. FOR AMD

If so far, AMD's CPU lines are not popular in Vietnam due to distribution and warranty mode, now that Silicom officially becomes an AMD distributor, users will be assured Use this processor line. On the other hand, there are more motherboards and accessories (radiator fans, socket sockets .) for AMD CPUs. However, there is a sad thing that before AMD products were loved due to the low cost and high performance, now the motto is no longer so because AMD's high-end CPUs are too high, even Releases better than Intel. However, AMD users should note that AMD processors (especially AthlonXP) will give the best performance when RAM runs synchronously with FSB (equal speed) and low CAS Latency (preferably 2). Choosing the right RAM is very important.
+ Duron / Athlon XP / Sempron 266MHz Bus: If you are using these CPUs, of course the most ideal option is DDR 266MHz. Usually because the bus is low, you can find many types of RAM with CAS2, please pay attention to this detail and choose it properly.
+ 333 / 400MHz AthlonXP bus: With these two CPUs, choosing RAM depends heavily on the mainboard

chipset you use. Usually with popular VIA chipsets with numbers of 333 or less such as KT333, KT266, KM266 . you should use 333MHz RAM speed.
Why not buy 400MHz RAM bus? The reason is simple, finding a RAM bus 266 or 333 with CAS is much simpler than finding a 400MHz CAS2 RAM bar. For chipsets like KT400, KT600 or especially nVIDIA nForce 2, you should buy DDR400 because in addition to supporting this speed, most AMD AthlonXP Barton CPUs can run well at 400MHz bus even though the default they are only 333MHz. However, be careful to choose carefully before buying because on the market today there are many types of DDR400 RAM with different origins. For details on choosing RAM, you can refer to the article 'Overclock - Gain, Loss and what to know' (Computer World A 9/2003). Note that the nForce2 supports Dual Channel DDR 400MHz.
+ Athlon 64: Almost all Athlon64 systems require a minimum of 400MHz bus RAM, new Socket939 systems support Dual Channel so you have to remember to buy accordingly.

DDR-II
Although it has been around for a long time, DDR-II does not seem to make a good impression on users, the main key for the manufacturer to raise the DDR-II bandwidth is by multiplying the memory chip in one half the frequency of I / O buffers and this means that the data buffer runs at twice the speed. Normally if the RAM is 100MHz, the data buffer will run at 100MHz, but with DDR, this speed is 200MHz. In DDR-II, the data buffer runs at 200MHz at 100MHz RAM, which allows them to process 4 bits of data in a clock because of the double speed so when applying the DDR principle, We will get the real data frequency up to 400MHz with only 100MHz RAM speed. In a simpler way:
With DDR1: 100MHz real pulse -> 100MHz data buffer -> 200MHz data rate (DDR).
With DDR2: 100MHz real pulse -> 200MHz data buffer -> 400MHz data rate (DDR).
So the CAS delay of DDR-II will be different from the current DDR-I and is usually set at 4 or 5. Currently in the domestic market there is not much choice of DDR memory- II due to low user demand but rare and expensive products. Also, if you want to use DDR-II for your desktop, you have no choice in the Vietnamese market other than motherboards with Intel 915 and 925 chipsets, which will lead to many upgrades. Other like Socket 775 CPU and PCI-Express graphics card. However, the speed of DDR-II at the present time has not proved competitive with traditional DDR, so it is not much interested by users. You can find some products from Samsung, Kingston or KingMax in many stores throughout the country if needed.

3. ECONOMIC
Surely, you also notice that the choice at the present time is almost exclusively limited to the type of DDR RAM because DDR-II and RDRAM are almost uncommon. The majority of DDR types that are being sold in computer component stores are capable of operating smoothly on all systems. However, to get good RAM, high performance and still want to 'play around', it will take a bit of effort. The most popular is DDR400 or PC3200 with dozens of different types and the price varies from a few dollars to a few dozen dollars! For convenience, we will be divided into two categories: 'popular' and 'advanced'. Ordinary RAMs don't usually have steel casing, but only with RAM, some of the line of brand names like Corsair or Kingston have a very polite plastic box and specify Value RAM. Value RAM series in general the quality is not uniform and depends quite a lot on the type of chipset that the manufacturer uses, each batch of quality goods is very different, so buying good or bad products is mostly thanks to luck. . For example, Kingston Value RAM PC3200 has a cascade of CAS 2.5, with a cascade of CAS 3; Adata PC3200 with plastic cover at the time of production is underestimated, but later on, it has been praised and strongly purchased, resulting in scarcity. So what is the secret? Often when buying low-level RAM, you can easily see the symbols written on RAM chips and good-quality RAM that often use memory chips of famous brands such as Winbond, Samsung, and Hynix. Hyundai, Kingston, Kingmax . pay attention to the type of RAM with 8 chips if possible. In addition, you can check the Access Time parameter through the code written on the RAM chip, for example with a normal Elixir bar with code N2DS25680BT-5T, then -5 is the parameter you need to find, from which to deduce The speed of this RAM is about 400MHz or more. The last

factor that you test is the quality of the circuitry and the sophistication of the printed circuit, try bending the RAM bar to check the durability, some of the RAM with stamping layers is not tight and makes a sound. when bending slightly curved, it is easier to damage than others.

With high-end RAM lines, the selection will be much more difficult because both the box and the RAM itself are very well protected (refer to the picture below). It is not possible to remove the cover to see inside, you can only identify the quality of RAM through the product code and production date, generally the products of the high-end line have good quality. It is suitable for most users even when you want to overclock, except that only a few people who are 'monsters' with full 'genuine' tools for overlocking have higher requirements. The high-speed RAM types of the outstanding high-end series in the Vietnamese market at the present time may include:

+ Kingston HyperX: With speeds from 400MHz to 500MHz and distributed through genuine dealers, users can safely use it, but HyperX's CAS coefficient is quite high, so it is not favored by AMD users. Some previously produced HyperX series using the Winbond BH-5 chipset were constantly sought by overlockers.

+ Adata Vitesta: Speed ??from 500MHz to 600MHz, the price is quite cheap, in testing a random Atada Vitesta bar can run CAS 2.5 (manufacturer's default is 3) at 500MHz bus (dual channel mode) Dual Channel) stable.

+ Mushkin Level 2 Black Cover: Speed ??from 400MHz to 466MHz. Currently, this type of RAM is highly appreciated by computer gamers for its high speed uplift and low CAS, especially the latest line using Samsung memory chip TCCD for much better results and even even beyond the previous BH-5 line. The TCCD memory chip is also used for both RAM series with a default bus of 600MHz (PC4800).

+ Corsair: After a long time of absence, Corsair is now regaining its status with the latest high-end C2PT RAM XMS product line (revision 4.1) using TCCD chipset, in the VOZ forum tests, most RAM types using TCCD chipsets can pass the 550MHz bus easily even with a CAS factor of only 2.5. In addition, the company also provides RAM line with CAS 2 with Data Indicator lights flashing according to pretty good operation. However, you should note that in many users' opinion, the Corsair high-end RAM products are not very uniform in quality.

+ Gskill: This is a new name for domestic users, but the launch of the company with the line of DDR600 RAM (TCCD memory chip) is really impressive. Despite this, the number of goods is not much and the purchase is very difficult.
In addition, manufacturers like OCZ or Geil also have many high-end products that you can find to buy but are often quite rare because there is no official distributor in the country.

3. ADJUSTING BIOS FOR FITNESS

A. SPEED

To optimize RAM performance, you only have to use the computer's BIOS, press Del when booting to enter the BIOS. Usually the RAM parameters are divided into two parts, the ratio of RAM will be in CPU Voltage / Frequency (some manufacturers will put them into separate groups such as Soft Menu (Abit), Genie Bios (DFI). . In this section, each company has a different arrangement but it is based on a common principle that the speed of RAM is proportional to the FSB of the CPU according to a certain coefficient. The direct RAM level helps users not take time to calculate and Abit chooses to use the ratio, you will have to multiply and divide to get speed results but this will help you gain more knowledge and better understanding The speed of RAM is calculated according to the ratio of CPU / DRAM, for example when the CPU has an external bus of 200MHz (at bus CPUs of 800MHz) and this ratio is 1: 1 then RAM will run at 200MHz bus (400MHz DDR) .When the ratio is 5: 4, the external bus is 200MHz, the RAM speed will be (200/5) * 4 = 160MHz (320MHz DDR).

Other RAM parameters, such as CAS Latency, RAS-to-CAS Delay ., are included by all manufacturers in a generic group called Advance Chipset Configuration. You may feel dizzy, but the most important parameter is the DRAM Timing section, which consists of four main parameters, namely CAS Latency, Act to Precharge Delay, Ras-to-CAS Delay and DRAM Ras Precharge. If you have RAM parameters like 2-2-2-5 or 2-3-3-7, then that is the four parameters that are arranged in the same order. Meaning of the remaining parameters you can refer to the instruction manual of each motherboard.

B. CRAZY:
Also in the above images, you can see there is an indicator of the supply voltage for RAM (DRAM Voltage). Usually DDR uses a voltage of 2.5v and DDR-II of 1.8v. Some types of high-speed DDR RAM may require up to 2.8v or 2.85v, for these types you must refer to the accompanying documentation to get the information. However, you need to follow a safety rule: Do not pull the voltage up to more than 2.9v if there is no effective heat dissipation solution because RAM may be burnt or inflated after a period of use. For cheap motherboards, you won't be able to adjust the voltage of the RAM, you can only change the speed. In this case you can use some specialized toys like DDR Booster of OCZ. According to user statistics, Samsung's RAM chips are able to withstand the highest power and overclock to the appropriate speed, and the chips of Winbond can run at high speed even with electricity. a bit more default or slightly. The RAM's voltage even affects the timing so if the RAM you bought doesn't work at low timing (eg 2), you can try pushing the voltage slightly.

After having all the hardware solutions, the most important thing of choosing RAM is high performance and stability, you will need specialized software to check the speed as well as the ability to operate long. Long of RAM whether running at default speed or overclocking. The two most valuable programs that are appreciated by many users are Sisoft Sandra 2005 (http://www.sisoftware.co.uk/) and Passmark Burn-in Test (http://www.passmark.com). These two programs are able to check the RAM bandwidth together with the maximum test of the 'internal force' of RAM to detect errors if any. If your RAM achieves a test time of 8 to 10 hours and the speed is acceptable, you are in luck, otherwise check all the devices or contact the seller to change the other .

In short, it is important to choose the right RAM for your computer configuration and your work requirements. Buying RAM from well-known brands will certainly guarantee you quality as well as warranty. Although most types of RAM on the market at the present time have a 3-year warranty period, it would be troublesome if RAM fails and you have to run back and forth to contact the seller; not to mention the flickering RAM bar that can give your important data no farewell in a snap. In general, if it is a computer for the office, you absolutely can buy common types of RAM to save costs, of course, to check carefully. If you are 'people who play' overlock well or often play high-speed games or simply want to make your computer look 'more', then you can go through the high-end product line but please Remember to check your wallet first! Their prices are definitely not cheap at all. For more information and answers, you can visit the Vietnam Overclocker Zone forum at the address www.vozforums.com.

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The toys are indispensable
You can see that it is clear that the speed of RAM and the potential use is higher.Initially we have DDR200 / 2.5v, now we have DDR500 / 2,8v (even 2.85v for certain types) or DDR2-667 / 1.8v. These two factors have contributed to increasing the temperature of RAM, which is why high-end RAM usually has steel on the outside; In addition to protection reasons, it also contributes to heat dissipation. However, if you buy regular RAM but have good speed and high overclocking capability, you can refer to RAM solutions for RAM of third

manufacturers such as the heat sink for RAM of CoolerMaster (see picture).

If you feel financially limited, you can build your own pieces of heat dissipation as shown with a large CPU heat sink and a hacksaw. If you are skillful, you will have beautiful products no less than brand name. Some manufacturers choose a simpler solution by making heat-dissipating panels of brand name with materials such as heat-conductive or copper-red alloys but in fact they are not very effective.

One more toy that is currently popular among overclockers is DDR Booster of OCZ but it is quite dangerous and you should only use it if you have experience with computers. DDR Booster is not a RAM bar although it looks a bit like when you first look at it. However, it is very close to RAM thanks to the ability to interfere with the power supply system for RAM, so with DDR Booster, you can adjust the power consumption for RAM correctly thanks to the supplied meter. .

The use is very simple, you just need to plug in the empty RAM slot and then turn the potentiometer while monitoring the clock so that if the temperature is too high, RAM can burn. Maybe DDR Booster is quite scary but the effect it brings is no one can blame. In the past, you needed soldering and electronic leveling in a class that had a need to adjust RAM power manually, with DDR Booster, the need to simply plug and twist. Can you imagine the normal normal RAM bars sold full out of the store that can run at nearly double or at least the same level of good RAM? The answer is yes, of course with DDR Booster and reasonable thermal solutions.

Steps to upgrade memory

When you find your computer running slowly, you might think about upgrading your graphics card, processor or motherboard (mainboard). But did you know that in many situations, upgrading RAM memory significantly increases computer performance and costs are cheap?

DETERMINING QUANTITY

Memory capacity depends on the operating system and application. Windows XP requires at least 64MB of RAM but 128MB is recommended. Windows Me requires a minimum of 32MB, while Windows 98 requires only 16MB. If you install an Office XP suite on Windows XP, you need at least 128MB of RAM. To run applications like Word, Excel and Power Point at the same time, you need at least 152MB. In general, you should have 256MB of RAM when using the WinXP system. If you want to play games, graphic design, film processing, you should have 512MB RAM; As much as possible, it depends on the support of the motherboard.

DETERMINING MEMORY TYPE

There are 3 popular memory technologies, SDRAM, DDR-SDRAM and RDRAM, so you need to determine the memory type based on the motherboard's documentation.

SDRAM: Popular in Pentium, Pentium II, and Pentium III systems, SDRAM has 3 types: PC66, PC100 and PC133; corresponding to working frequency of 66MHz, 100MHz and 133MHz.

DDR SDRAM: Common in Pentium IV or AMD systems. Like SDRAM, DDR SDRAM also comes in a variety of different speeds such as PC2100, PC2700, PC3200, PC3500 and PC3700 (respectively, 266MHz, 333MHz, 400MHz, 433MHz, and 466MHz)

RDRAM: Memory technology Best, RDRAM is used for high-end Xeon and Pentium IV systems. Because prices are expensive, they are not as popular as the two types of RAM above.

COMPATIBILITY

Don't rush to choose fast-speed RAM because it's not suitable for your computer, but choose a memory type with the same parameters as the current memory on the system. Buying a 466MHz DDR-SDRAM PC3700 while the motherboard only supports 266MHz RAM, it is not as efficient as buying 266MHz DDR SDRAM PC2100.

INSTALLATION

First, you have to open the case and remember to wear an antistatic or grounding ring to avoid damaging electronic components. Look on the motherboard, find the RAM slots (probably the longest). Press the 2-pin latch on the empty RAM slot to both sides and place the RAM in the correct position, press the two heads evenly (so as not to damage or scratch the electronic circuit) until you see 2 pins plugged into two into RAM. Installing RDRAM is similar but need to install RDRAM bars in pairs and place CRIMM in the empty slot to close the circuit. For SDRAM type, you will have to push the tilt.

RUNNING

Please observe the number of memory capacity when the system starts. If it is different, you should check the location of the RAM sticks. If necessary, press Pause / Break to pause the start screen.

When you see the system reporting sufficient RAM and starting normally on Windows, you continue to test some applications and check if they work properly; because of incompatible RAM can cause crashes or freezes.

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VIDEO RAM (VRAM)

VRAM is developed based on FPM technology (fast page mode), there are two communication ports instead of one port as usual: a port for making functions Fresh screen) The other port outputs images to the screen. Thanks to this design, VRAM works more effectively than DRAM in video applications. However, due to less video chip consumption than the main memory chip, the price is still high. Therefore, in some low-cost video card systems, people can use conventional DRAM to reduce costs.

GRAPHIC DDR (GDDR)

GDDR (DDR graphics) is developed based on DDR SDRAM technology dedicated to graphics. After the GDDR-2 version based on DDR-II, ATI and NVIDIA worked closely with memory manufacturers to offer GDDR-3 with lower working voltage than GDDR-2, working from 500MHz to 800MHz with the aim of reducing power consumption, increasing memory chip density and simplifying heat dissipation solutions.

WINDOW RAM (WRAM)

WRAM is another form of two-port memory, used in specialized graphics processing systems. Slightly different from VRAM, WRAM has a smaller display port and supports Extended Data Out (EDO).

SYNCHRONOUS GRAPHIC RAM (SGRAM)

SGRAM is SDRAM type designed specifically for video with special read / write functions. SGRAM allows to access and edit data by block instead of each unit, thus reducing the number of memory read / write times and increasing the performance of the graphics controller.

BASE RAMBUS AND CONCURRENT RAMBUS

Before becoming the main memory technology, Rambus technology was used as video memory. Rambus memory technology is used as the current main memory called Direct Rambus. The two original Rambus forms are Base Rambus and Concurrent Rambus used for workstation video applications and video game systems like Nintendo 64.

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Memory improvements

ENHANCED SDRAM (ESDRAM)

To increase speed and efficiency, the standard memory modules can be integrated buffer SRAM (Static RAM) directly on the chip. ESDRAM is SDRAM with SRAM buffer to be able to work with 200MHz frequency. Similar to the external caching principle, DRAM also uses an SRAM buffer to store frequently used data, to shorten DRAM access time. The advantage of SRAM on chip is to create wider bus between SRAM and DRAM, enhance bandwidth and DRAM speed effectively.

FAST CYCLE RAM (FCRAM)

FCRAM is co-developed by Toshiba and Fujitsu to serve servers, high-end printers and telecommunication switching systems. Memory is divided into multiple arrays and having a queue design should increase random access speed and reduce power consumption.

SYNCLINK DRAM (SLDRAM)

Currently outdated but SLDRAM has been developed by DRAM manufacturing community to compete with Rambus in the late 1990s.

VIRTUAL CHANNEL MEMORY (VCM)

developed by NEC, VCM allows 'blocks'. 'Different memory interface is independent of the memory controller and has its own buffer. This allows each system task to be a separate block, not shared or shared with other running tasks.

FLASH MEMORY

Flash memory is a form of memory that can be recorded, not lost, steady state, has the combined function of RAM and hard drive. Flash memory stores data bits in the form of electrical signals in memory cells (like DRAM) but is capable of remembering even when disconnecting power (like a hard disk). Thanks to its low voltage, stable, high speed performance, flash memory is suitable for many mobile applications such as digital cameras, digital camcorders, mobile phones, printers, PDAs, pagers, digital recorder, MP3 player, GPS system.

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