VIA Apollo P4X266A

Evolution of the world's first DDR Pentium® 4 platform featuring Performance Driven Design

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In its never ending quest to drive the advancement of PC platform technology, VIA Technologies Inc. is constantly working to improve current chipset designs. The latest fruits of this drive towards evolution is the VIA Apollo P4X266A. Featuring the same performance enhancement technology as the successful Apollo KT266A, the Apollo P4X266A pushes the performance envelope even further, yet takes advantage of industry standard DDR266 memory.

Latest in a long line of "A" branded chipsets, the VIA Apollo P4X266A follows in the footsteps of previous successful designs. Starting with the VIA Apollo Pro133A, and continuing with the VIA Apollo KT133A and KT266A, the "A" line of performance chipsets have developed into a solid and well recognized force in the marketplace. "A" series chipsets demonstrate VIA's commitment to the continual evolution of platform design.

The VIA Apollo P4X266A further expands VIA's extensive line of Intel® Pentium® 4 chipsets. VIA now offers Pentium 4 platform solutions from top to bottom, with the VIA ProSavage P4M266 offering SMA graphics for the low end, the VIA Apollo P4X266 offering mainstream discrete performance, and the new VIA Apollo P4X266A covering the high end extreme performance segment.

? **Enhanced Processor Bus:** The VIA Apollo P4X266A features an enhanced processor bus interface that more efficiently takes advantage of the quad pumped bus of the Intel® Pentium® 4 processor. Now, up to 12 instructions can be queued in the processor bus interface, allowing the high speed 400MHz bus of current and Pentium® 4 processors to run at optimal efficiency. This also reduces latency between the processor and other peripherals and devices, which improves overall system operation. The VIA Apollo P4X266A also offers support for high bus speeds, allowing seamless upgradeability to possible future processors.

? **Performance Driven Design:** Using the highly efficient memory controller of the renowned VIA Apollo KT266A, the VIA Apollo P4X266A offers exceptionally high memory performance. This is accomplished through improved timings and deepened queues. Supporting up to 4GB of DDR200 or DDR266 memory, the VIA Apollo P4X266A provides lightning fast access to system memory. Moreover, the VIA Apollo P4X266A offers a highly developed AGP4X interface, ensuring the highest possible graphics performance with a myriad of AGP4X graphics accelerators.
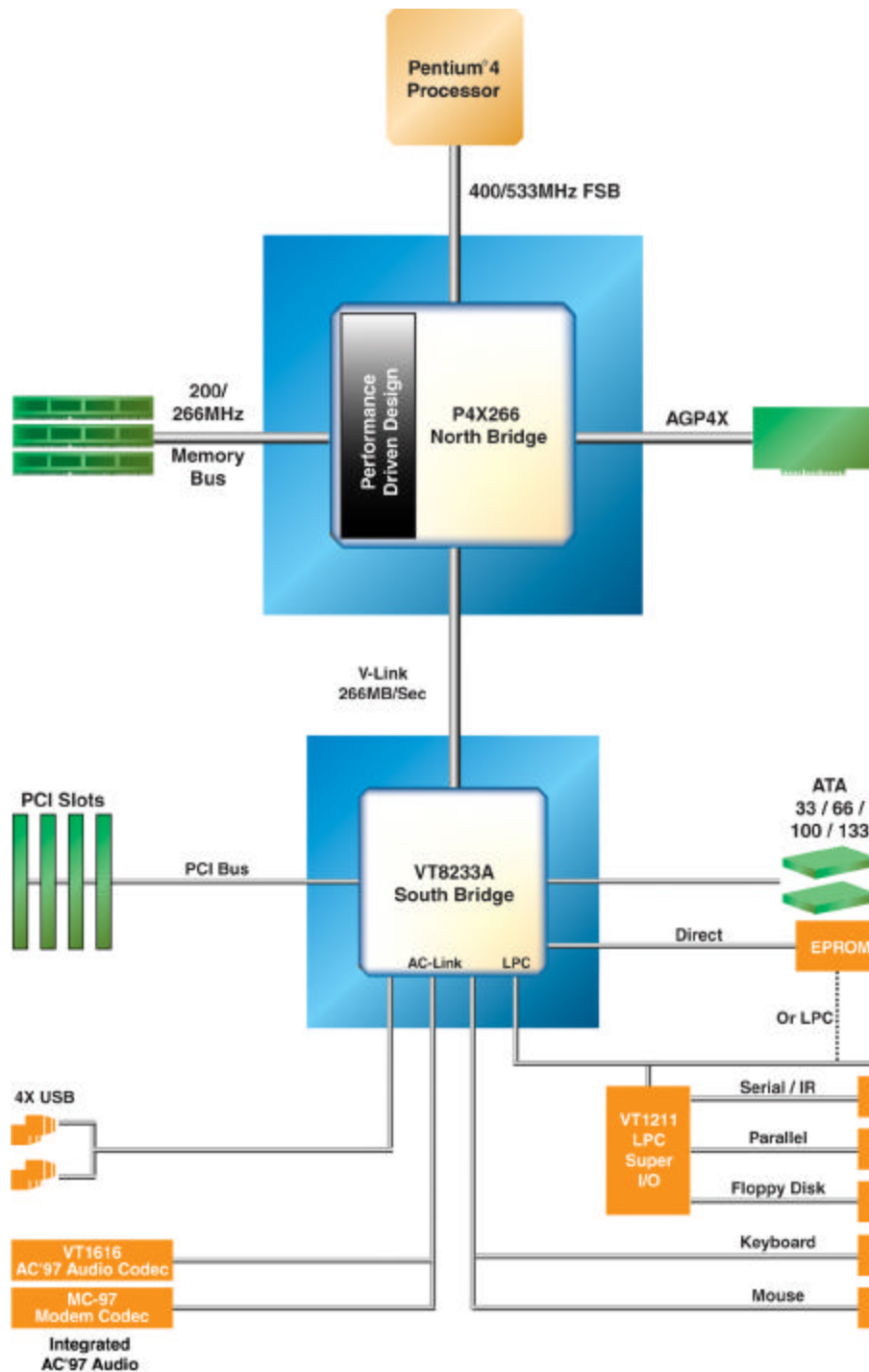
? **V-MAP:** The VIA Apollo P4X266A is part of the family of VIA Modular Architecture Platforms (V-MAP). As a modular solution, the North and South Bridge of VIA Apollo P4X266A are completely pin compatible with current and future products. The VT8753A North Bridge of P4X266A is pin compatible with the VT8753 of P4X266, and the VT8751 of P4M266. Additionally, VT8753A can interface with three separate pin-compatible South Bridges: The VT8233 offering VIA Ethernet MAC, the VT8233C featuring 3Com Ethernet MAC, and the VT8233A supporting the new ATA/133 drive standard. With this wide range of pin-compatible products, up to six distinct chipsets are possible for Intel? Pentium? 4 processors while using the same motherboard design.

? **High-Speed V-Link Hub Architecture:** The VIA Apollo P4X266A takes advantage of VIA's high performance V-Link Hub Architecture, which provides a dedicated 266MB/s bus between the North and South Bridge. Less advanced chipsets use the 132MB/s PCI bus as a link, which must be shared with all PCI peripherals. V-Link greatly improves data transfer rates when high-speed interconnect technologies such as USB2.0, IEEE1394, and ATA/133 are implemented in a single system.

This white paper describes the features of the VIA Apollo P4X266A chipset that enable next generation computing for high-performance desktops, workstations, and servers based on Intel? Pentium? 4 processors.

VIA Apollo P4X266A Product Overview

The VIA Apollo P4X266A consists of two separate chips: The 664-pin VT8753A DDR North Bridge, and choice of 376-pin V-MAP compatible South Bridges, such as VT8233, VT8233C, or VT8233A. All chips use standard PGA packaging to reduce the cost of production and allow the use of standard heatsink solutions. The P4X266A is a drop-in replacement for the previous VT8753, allowing cost effective and seamless upgrading of current motherboard designs. The following diagram outlines some of the basic features of the VIA Apollo P4X266A chipset.

Pentium 4 Processor

400/533MHz FSB

Performance Driven Design

200/266MHz
Memory Bus

P4X266 North Bridge

AGP4X

V-Link 266MB/Sec

PCI Slots

PCI Bus

VT8233A South Bridge

ATA 33 / 66 / 100 / 133

Direct

EPROM

Or LPC

AC-Link   LPC

4X USB

Serial / IR

VT1211 LPC Super I/O

Parallel

Floppy Disk

VT1616 AC'97 Audio Codec

Keyboard

MC-97 Modem Codec

Mouse

Integrated AC'97 Audio

VIA Apollo P4X266A North Bridge

The North Bridge of VIA Apollo P4X266A (model number VT8753A) is the second VIA product to feature Performance Driven Design. As such, it includes new features and technology that assure the world's highest SDRAM performance for the Intel Pentium 4 processor. Up to 12 instructions can be queued on the front side bus, hiding latency and increasing effective

bandwidth. This contributes significantly to the VIA Apollo P4X266A's high memory performance.

The VT8753A retains the advanced features of previous DDR V-MAP chipsets, such as flexible DRAM support. Up to 4GB of DDR200 or DDR266 is supported, including ECC and Registered modules. The VT8753A is also backwards compatible with PC100 and PC133, enabling platforms built upon the VIA Apollo P4X266A to reach very competitive price points. The VIA Apollo P4X266A provides OEMs and System Integrators with maximum flexibility and scalability to build a full spectrum of high-performance and cost effective systems from mainstream consumer and commercial desktops to high-end workstations and servers.

The VT8753A also supports the latest generation of AGP4X graphics cards, providing up to 1GB/s of graphics bandwidth. For true workstation capability, support for AGP Pro is included, supplying additional voltage to high-end CAD/CAM graphics cards. Despite these advanced features, the VT8753A does not sacrifice support for older AGP2X models, enabling extremely low graphics price points.

VIA Apollo P4X266A South Bridge Options
The VIA Apollo VT8753A is capable of interfacing, through its modular V-MAP design, to any VIA V-Link South Bridge, including the VT8233, VT8233C and VT8233A. The VT8233 and VT8233C are highly integrated network-ready South Bridges that feature two high-speed ATA-100 IDE controllers (four IDE devices total), six USB ports, six PCI slots, Low Pin Count (LPC) interface, and an I/O Advanced Programmable Interrupt Controller (APIC). The VT8233A is a low-cost, high performance South Bridge featuring support for the new ATA/133 drive interface standard. This raises the maximum transfer rate of today's fastest IDE drives a further 33%, allowing bursts of up to 133MB/s.The VT8233 also removes some little-used components in order to offer a much better value, and comes without an integrated Ethernet MAC. Also, two USB controllers for four total ports are offered, along with the standard features of VT8233/C.

All VIA V-Link South Bridges feature high quality, 6 channel AC/97 2.2 sound support, as well as an MC/97 software modem interface. These features, along with 10/100 Ethernet and HomePNA support, can be harnessed through the use of an ACR (advanced communication riser) slot, or can be integrated directly onto the system board.

The three USB hubs on the VT8233/C, and two on VT8233A provide additional flexibility by allowing the user to add up to six USB devices to the system, such as keyboards, mice, drives, digital cameras, scanners, speakers, modems, joysticks, and MP3 players.
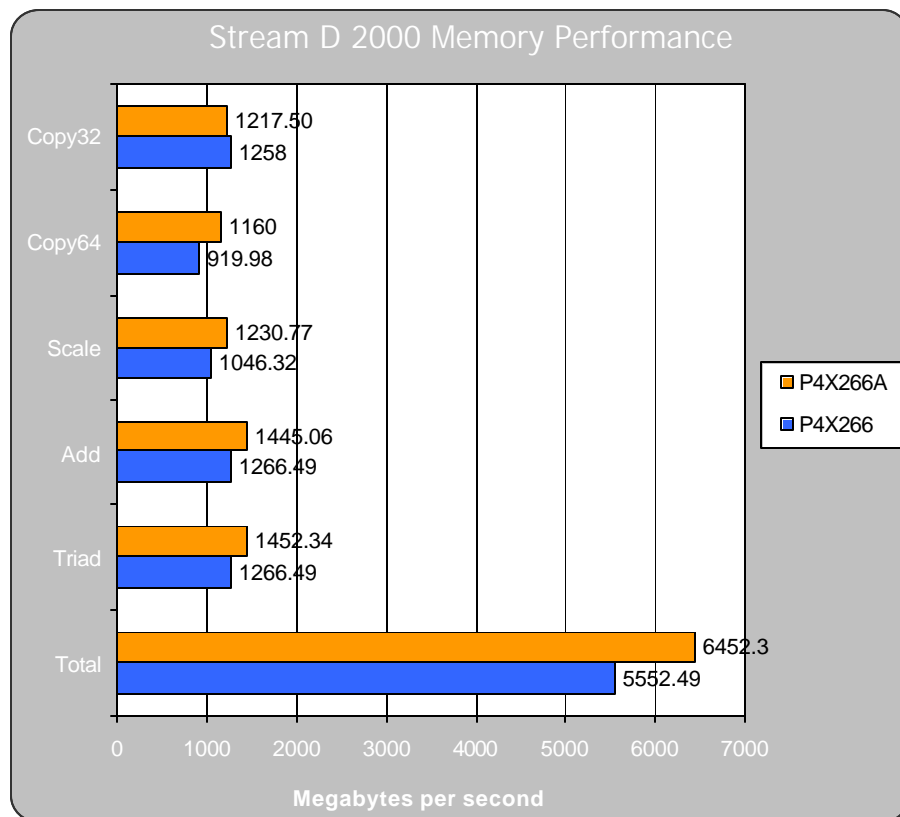
<u>VIA V-Link Hub Architecture</u>

VIA has developed V-Link technology to remove the PCI bus as the bottleneck in inter-chip communication. In less advanced chipsets, the PCI bus is responsible for connecting both the north and South Bridge, as well as providing a bus for most add-in peripherals. VIA V-Link technology provides a dedicated 66MHz quad-pumped bus between the North and South Bridge, freeing up the PCI bus to deal strictly with peripheral devices.

VIA Apollo P4X266A Chipset Performance

Offering fully optimized bus and memory interfaces with Performance Driven Design, the VIA Apollo P4X266A provides impressive performance in today's and tomorrow's memory bandwidth limited applications. Performance Driven Design offers tangible benefits in terms of overall system responsiveness, and memory performance improved 10% or more.

Stream D 2000 Memory Performance

Test	P4X266A	P4X266
Copy32	1217.50	1258
Copy64	1160	919.98
Scale	1230.77	1046.32
Add	1445.06	1266.49
Triad	1452.34	1266.49
Total	6452.3	5552.49

Megabytes per second

In StreamD, the VIA Apollo P4X266A featuring performance driven design out-performs its predecessor, the VIA Apollo P4X266, by 15% overall, and as much as 20% in some tests.

DDR SDRAM Overview

DDR-SDRAM technology is the result of an industry-wide collaboration to develop the next generation memory standard. It is designed to provide a high performance, high value upgrade path from previous PC133 technology. As the driving force behind PC133, VIA Technologies, Inc. has embraced DDR, and currently offers the widest range of DDR chipsets for the AMD Athlon™ and Intel® Pentium® III and 4 processor platforms.

Available in two different speed grades, DDR enables memory performance to be scaled to fit the performance and cost requirements of a given platform. DDR200 (also known as PC1600) runs at a 100MHz clock speed, and transfers data on both the rising and falling edges of the clock for an effective 200MHz clock rate. DDR266 (or PC2100) uses the same clock doubling technology, but runs at a 133MHz core speed, for an effective 266MHz clock rate.

With this clock doubling technology, DDR200 is able to transfer up to 1.6GB/s, and DDR266 a staggering 2.1GB/s. Also, due to its evolutionary, parallel technology, the latency of DDR is quite low compared to competing serial memory technologies.

All grades of DDR operate at 2.5 volts, as opposed to 3.3V for PC100 and PC133. This lowered voltage allows DDR to penetrate power sensitive applications, such as notebooks and 1U servers. Lowered power consumption translates directly to lowered heat dissipation, again increasing DDR's effectiveness in mobile and server applications.

An additional speed grade, DDR333, is being finalized now by the DDR governing body JEDEC. DDR333 offers an increase in memory clock speed to 166MHz, for an effective 333MHz transfer rate. However, supporting this memory technology at the current time carries significant risk, as currently shipping modules may not necessarily comply fully with the DDR333 spec. Thus, VIA Technologies Inc. cannot ensure proper compatibility between DDR333 modules, and will support the technology when the specification has been finalized.

DDR leverages the existing PC133 manufacturing infrastructure, allowing manufacturers to produce DDR266 for roughly the same cost as PC133. This price parity with SDRAM will rapidly drive the adoption of DDR as memory bandwidth limitations become more constricting.

VIA & DDR SDRAM

Starting with PC133 SDRAM, VIA Technologies, Inc has worked very closely with the world's leading DRAM manufacturers, motherboard makers, and OEMS and System Integrators to enable rapid industry wide transitions to

higher bandwidth memory technologies that deliver enhanced system performance at an affordable cost. As one of the leading proponents of DDR SDRAM, VIA has developed the most comprehensive range of chipsets supporting this high-bandwidth memory technology covering all processor platforms, including:

- ? **VIA Apollo Pro266:** The first DDR SDRAM chipset to be launched onto the global market, the VIA Apollo Pro266 supports a full range of Socket 370 Intel? Pentium? III, Intel? Celeron? , and VIA C3? processors. It also supports dual Intel? Pentium? III processors for high performance, low power workstation and server applications.
- ? **VIA Apollo KT266:** The VIA Apollo KT266 was the first DDR SDRAM chipset solution to go into volume production for the AMD Athlon? processor.
- ? **VIA Apollo KT266A:** The first chipset to feature Performance Driven Design, the VIA Apollo KT266A offers maximum speed for AMD Athlon? and Duron? processors.
- ? **VIA Apollo P4X266:** The first DDR SDRAM chipset for the Intel® Pentium® 4 processor, the VIA Apollo P4X266 continues VIA's leadership in developing high performance, modular, scalable DDR chipsets for every market segment.

Conclusion

The VIA Apollo P4X266A is an evolutionary approach that yields a high-performance, high-value platform. The VIA Apollo P4X266A improves processor bus and memory controller efficiency, without sacrificing pin compatibility with previous designs. Thus, motherboard manufacturers can easily integrate the VIA Apollo P4X266A into current motherboards without expensive re-design work. Pin compatibility with a number of existing South Bridges, as well as the new low cost, high performance VT8233A, further enhances the evolutionary value of the VIA Apollo P4X266A.

Created under the mantra of Performance Driven Design, the VIA Apollo P4X266A provides the responsiveness users expect from a high performance platform while still taking advantage of existing memory standards. DDR266 has become the ubiquitous memory technology of modern high performance chipsets, and the VIA Apollo P4X266A exploits DDR266 more effectively than any other chipset on the market. As part of the V-MAP family of DDR chipsets, the VIA Apollo P4X266A also offers the modularity and reliability OEMs and System Integrators demand from an advanced platform.

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