



VIA ProSavageDDR P4M266 Chipset

High Performance Integrated DDR platform for the
Intel® Pentium® 4 processor

The VIA ProSavageDDR P4M266: High Performance Integrated DDR platform for the Intel® Pentium 4® processor.

With the launch of the VIA ProSavageDDR P4M266 chipset, VIA Technologies, Inc has achieved yet another industry first by introducing a core logic solution with integrated graphics for the Intel® Pentium® 4 Processor. Harnessing the industry-leading performance of DDR (Double Data Rate) SDRAM, the flexibility of VIA Modular Architecture Platform (V-MAP) design, and the rich graphics performance of the enhanced S3 Graphics ProSavage8™ 2D/3D engine, the VIA ProSavageDDR P4M266 reduces system cost while delivering unprecedented performance and stability.

The VIA ProSavageDDR P4M266 also boasts the latest South Bridge technology with first to market innovations like integrated 3Com® networking in the VT8233C and the introduction of Ultra ATA-133 in the VT8233A. Ultra ATA-133, offering 33% more bandwidth between hard drive and CPU, enables the VIA ProSavageDDR P4M266 to deliver more performance in data intensive applications like business productivity software than rival mainstream desktop platforms.

The VIA ProSavageDDR P4M266 is pin to pin compatible with the acclaimed VIA Apollo P4X266 and follows in the footsteps of the VIA Apollo Pro133, the first core logic chipset to support PC133 SDRAM; the VIA Apollo Pro266, the first core logic chipset to support DDR SDRAM on the Intel Socket 370 platform; and the VIA Apollo KT266, the first volume core logic chipset to support DDR SDRAM on the AMD Socket A platform.

Its launch further extends the leadership role that VIA has played in enabling rapid industry wide transitions to higher bandwidth memory technologies and integrated graphics solutions that enable OEMs and SIs to address a fuller spectrum of PC price points. It achieves this through the implementation of the following key technologies:

- **DDR200/266 SDRAM Support:** The VIA ProSavageDDR P4M266 offers up to 2.1GB/s of memory bandwidth with its support for up to 4GB DDR266 SDRAM. This provides memory intensive applications (such as content creation, media streaming, 3D gaming, etc.) the bandwidth they need to perform optimally. When paired with DDR266 SDRAM, the VIA ProSavage P4M266 also boasts lower memory latency than other Intel® Pentium® 4 processor chipset platforms, further increasing performance. The VIA ProSavageDDR P4M266 is also completely backwards compatible with PC100 and PC133 SDRAM, providing OEMs and System Integrators with additional options for building Intel® Pentium® 4 processor-based systems at aggressive Value PC price points.
- **S3 Graphics ProSavage8™ Integrated Graphics core:** The ProSavage8™ 2D/3D Accelerator with internal AGP 8X bandwidth and DVD Motion Compensation is optimized for use with the Microsoft Windows® XP operating system and drives integrated graphics for the Intel® platform to a new level. Shared Memory Architecture (SMA) enables the P4M266 to utilize the system memory for frame buffer and texture memory on data path doubled to 128-



bit capacity. Thus, the DDR memory subsystem, offering up to 2.1GB/s of memory bandwidth, increases the overall performance of the integrated graphics core by up to 50% over SMA chipsets based on PC133 SDRAM.

- **V-MAP:** Based on the unique VIA Modular Architecture Platform (V-MAP), the VIA ProSavageDDR P4M266 provides OEMs and SIs with unparalleled flexibility and scalability for existing and future PC designs. As a modular solution, both the North Bridge and South Bridge of the VIA ProSavageDDR P4M266 are completely pin compatible with current products, such as the VT8233C South Bridge with integrated 3Com® Ethernet, and the VIA Apollo P4X266 North Bridge. V-MAP maximizes flexibility when designing a platform around the VIA ProSavageDDR P4M266 chipset. This enables OEMs and SIs to save costs and speed up time to market by offering systems covering a full spectrum of system price points based on a single motherboard platform.
- **High-Speed V-Link Hub Architecture:** The VIA ProSavageDDR P4M266 makes use of VIA's 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.
- **400MHz Quad-pumped Front Side Bus Support:** The VIA ProSavageDDR P4M266 features a quad-pumped 400MHz Front Side Bus. Delivering up to 3.2GB/s of bandwidth, the 400MHz Front Side Bus fully complements the high performance DDR memory subsystem and V-Link Bus.
- **Optional External AGP Port:** Providing up to 1GB/s in graphics bandwidth with external AGP4X technology, this feature offers OEMs and System Integrators flexibility in building systems to different configurations and allows for future upgrades. Additionally, it does not sacrifice AGP 2X compatibility like less advanced chipsets, allowing competitively priced graphics products to be integrated into Intel® Pentium® 4 processor-based Value PC systems.

This white paper describes the features of the VIA ProSavageDDR P4M266 chipset as well as the combination of performance and cost efficiency that enables next generation computing for mainstream and value desktops, workstations, and servers based on the Intel® Pentium® 4 processor.

Intel® Pentium® 4: Slow Uptake In The Corporate Market

The Intel® Pentium® 4 processor has been positioned as the next mainstream PC platform for every segment of the marketplace. Migration from the existing standard, the Intel® Pentium® III, has been slow though, particularly in cost sensitive segments like the corporate and education markets. This reasons for this have been the high cost and perceived unreliability of RDRAM memory and the absence of integrated graphics platforms, making an Intel Pentium 4 processor system an expensive option for risk averse customers operating large networks.



Integrated graphics chipsets enable OEMs and System Integrators to save cost by eliminating the requirement for an external graphics card. This makes them popular platforms for large corporate, government and education networks where the main functions are running are business productivity and data intensive applications where high quality 3D performance is not a priority. The Intel® Pentium® III combined with an integrated chipset like the Intel 815 or VIA ProSavage PM133 has become the de facto standard for this significant section of the PC marketplace.

Integrated Graphics for the Intel® Pentium® 4

The VIA ProSavageDDR P4M266 with the S3 Graphics ProSavage8™ core integrated into the North Bridge enables a mainstream upgrade to the Intel® Pentium® 4 processor platform by offering a combination of performance and value unmatched by existing chipset platforms.

The VIA ProSavage range based on PC133 SDRAM has proved popular with OEMs and SIs for the following reasons:

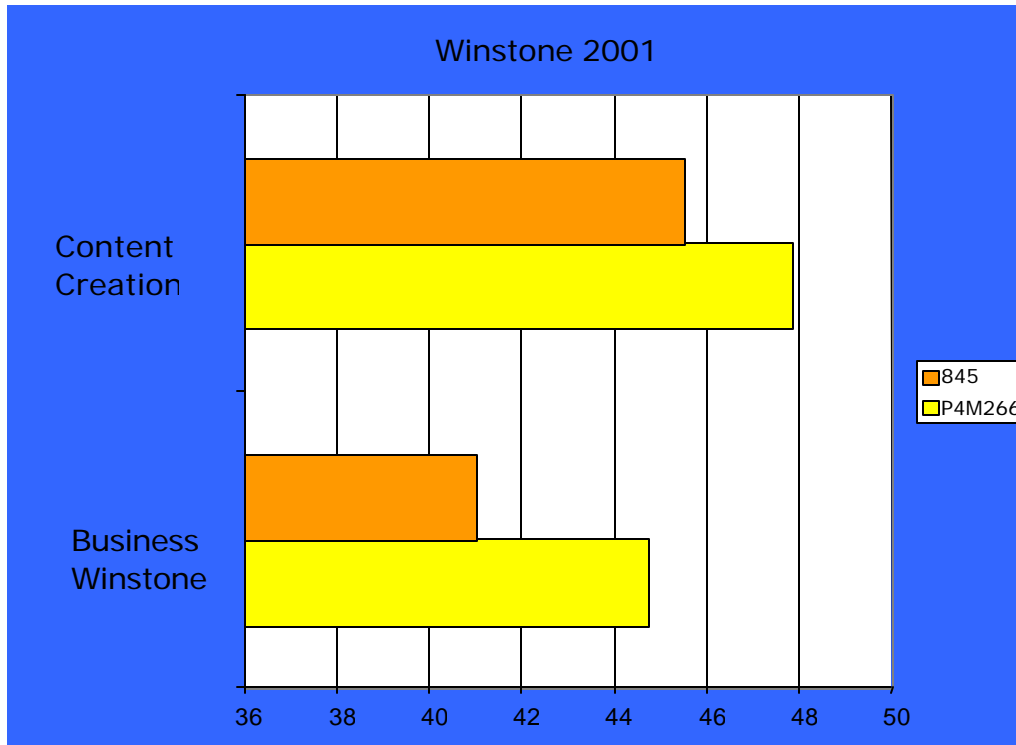
Integration reduces system cost: Integrated graphics allow OEMs and System Integrators to eliminate an external graphics card from the cost of a VIA ProSavage based system while maintaining competitive 2D and 3D performance.

ProSavage Graphics Performance: With AGP 4X, 32MB of frame buffer and DVD motion compensation the ProSavage4™ provides rich 2D/3D graphics performance and has an unblemished record of reliability.

ProSavage Driver Set: S3 Graphics ProSavageDDR chipsets have a mature and comprehensive unified driver set, minimizing compatibility issues and reducing deployment risk for corporate customers.

The VIA ProSavageDDR P4M266 retains these three key advantages of VIA ProSavage integrated chipsets while offering a significant increase in graphics performance through the benefits of DDR266 SDRAM memory in a Shared Memory Architecture Design. The new S3 Graphics ProSavage8™ integrated into the VIA ProSavageDDR P4M266 shares the same architecture and feature set as the ProSavage4™ but boasts internal data paths expanded to 128-bit from 64-bit giving an effective AGP 8X bandwidth capacity and increasing performance by 40-50% over PC133 SDRAM based SMA chipsets.

The performance benefits this technology delivers in real world applications are evident in a Winstone 2001 comparison (see graphic below) with an Intel Pentium 4 system based on the Intel 845 chipset equipped with an external nVIDIA GeForce 2 graphics card. The VIA ProSavageDDR P4M266 system offers better performance at a lower system cost, even in graphics intensive applications like Adobe® Photoshop® and Macromedia® Dreamweaver®, as tested by Content Creation Winstone.



1.5GHz Intel Pentium® 4 processor; i845 MB; 256MB PC133 SDRAM; Asus Geforce2 AGP card; 30GB IBM 307030 ATA 100 HDD; Windows 98 SE
 1.5GHz Intel Pentium 4 processor VIA P4M266 Reference Board. 256MB PC2100 DDR SDRAM 30GB IBM 307030 ATA 100 HDD; Windows 98 SE

Now that the price of DDR266 SDRAM has fallen to levels almost equivalent to PC133 SDRAM the performance benefits of the VIA ProSavageDDR P4M266 come without a cost penalty.

256MB DDR DIMM	\$29.69
256MB PC133 DIMM	\$27.89

Source www.crucial.com 29/10/01

Combined with the significant cost saving from the integrated graphics engine, there is now a compelling value proposition for mainstream domestic and corporate migration to the Intel® Pentium® 4 platform.

VIA ProSavageDDR P4M266 Product Overview

The VIA ProSavageDDR P4M266 consists of two separate chips: The 664-pin VT8751 Integrated North Bridge, and the 376-pin VT8233 or VT8233C V-Link South Bridge. Both use standard PGA packaging to reduce the cost of production and allow the use of standard heatsink solutions. The basic architecture of the chipset is shown in the illustration below.

VIA ProSavage P4M266 North Bridge

The North Bridge of the VIA ProSavageDDR P4M266 (model number VT8751) provides support for the quad-pumped 400MHz (8X100MHz) Front Side Bus for the Intel® Pentium® 4 processor. Deep pipelining and buffering keep the high-speed system bus supplied with a constant stream of data, maximizing the performance of

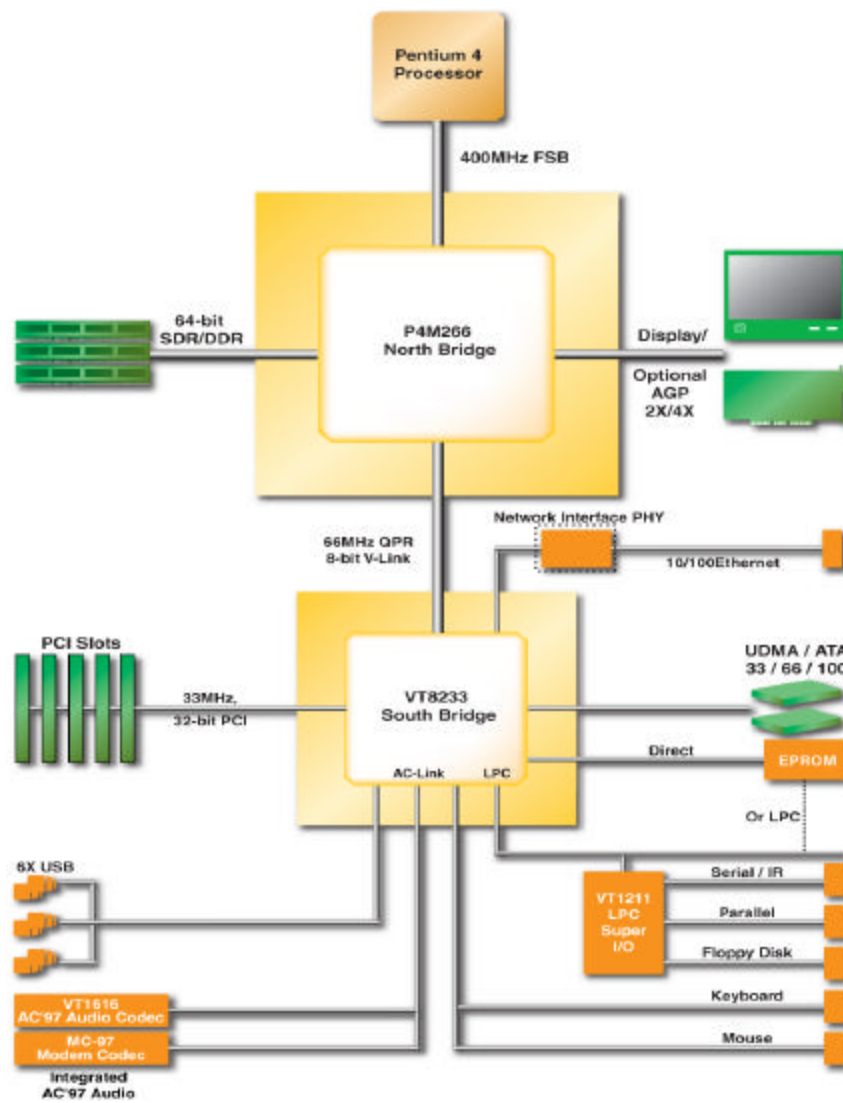


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the processor. This system bus runs in pseudo-synchronous operation with the memory and AGP controllers, providing the low latency of a synchronous design without sacrificing the flexibility of an asynchronous implementation.

The VT8751 integrates the ProSavage8™ graphics core into the North Bridge offering competitive 2D/3D performance while retaining an optional external AGP 4X port for configuration flexibility. The VT8751 also does not sacrifice support for older AGP2X models, providing OEMs and SIs with additional configuration options.

The VT8751 North Bridge of the VIA ProSavageDDR P4M266 has a flexible memory controller that supports up to 4GB of DDR200/DDR266 SDRAM. Virtual Channel Memory and Error Correcting Code (ECC) memory are also supported, as is PC100 and PC133 SDRAM. With such flexible memory support, the VIA ProSavageDDR P4M266 gives OEMs and SIs maximum scalability to allow the construction of a full spectrum of high-performance and low-cost systems from mainstream consumer and commercial desktops to high-end workstations.



VIA ProSavageDDR P4M266 South Bridge

The VIA ProSavageDDR P4M266 is capable of interfacing to any VIA V-Link South Bridge, including the VT8233, VT8233C and VT8233A, as well as future South Bridge designs. The VT8233 and VT8233C are highly integrated network-ready South Bridges that feature two high-speed ATA-100 IDE controllers (4 IDE devices total), six USB ports, 6 PCI slots, Low Pin Count (LPC) interface, and an I/O Advanced Programmable Interrupt Controller (APIC). Advanced Configuration and Power Interface (ACPI) and Advanced Power Management (APM) are also integrated into all VT8233 family products. The VT8233C adds an integrated 3Com® Ethernet MAC controller, providing high quality and ultra reliable 10/100 Mbps network support.

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 enhanced IDE controllers on the VT8233 and VT8233C support all Ultra-DMA 33/66/100 devices including as CD-ROMS, DVD-ROMs, and hard disk drives. ATA-100 is the fastest IDE standard currently available on the market, and allows each separate IDE controller on the VT8233 and VT8233C to burst up to 100MB/s, for a total of 200MB/s of bandwidth. Each controller also supports up to two devices, for a total of four ATA-100 capable drives. In addition, with the introduction of the VT8233A South Bridge in Q4 2001, VIA will be first to support the new Ultra ATA-133 interface standard offering 33% more bandwidth per controller between hard drive and CPU, offering even more performance for data intensive applications like business productivity software.

The three USB hubs offering a combined 36 Mbps of bandwidth on the VT8233 family 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.

VIA V-Link Architecture

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.

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 has embraced DDR, and currently offers the widest range of DDR chipsets for the Intel® Pentium® III, AMD Athlon™ XP, and Intel® Pentium® 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

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(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.

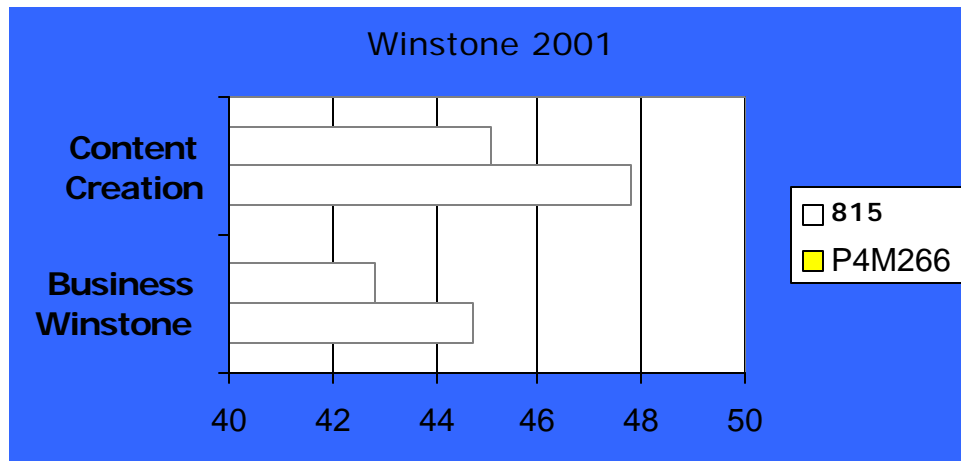
All grades of DDR SDRAM operate at 2.5 volts, as opposed to 3.3V for PC100 and PC133. This lowered voltage allows DDR to penetrate power sensitive applications, such as notebooks and 1U servers. Lowered power consumption translates directly to lowered heat dissipation, again increasing the effectiveness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

DDR SDRAM leverages the existing PC133 manufacturing infrastructure, allowing manufacturers to produce DDR266 memory 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 ProSavageDDR P4M266 Chipset Performance

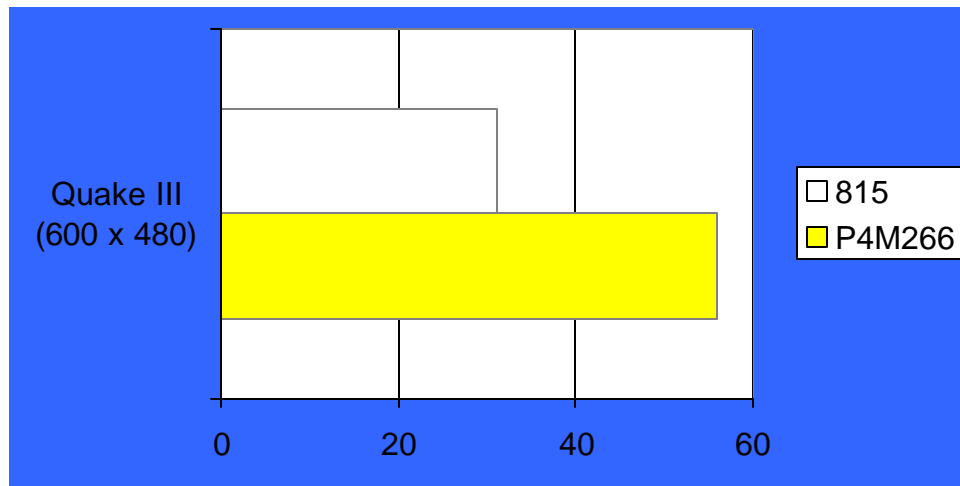
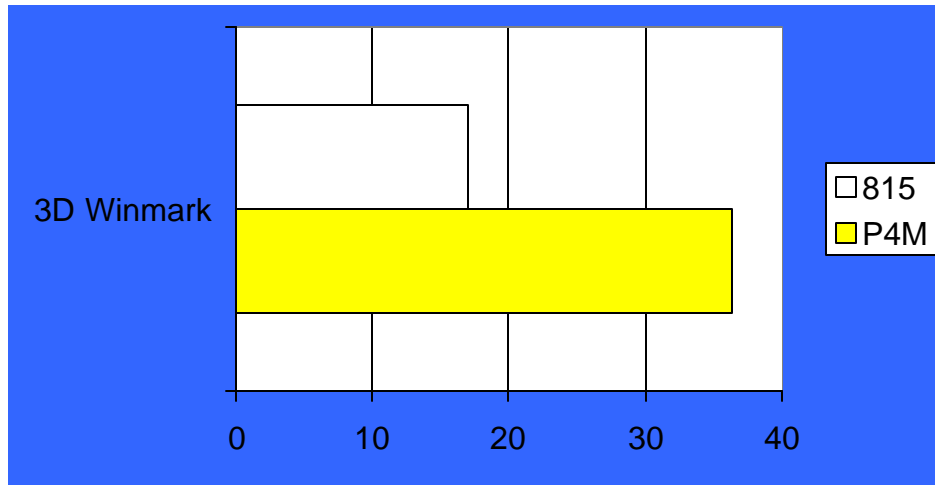
Through its use of high-performance DDR266 memory, high-speed V-Link bus, deep buffering and pipelining, and optimised timings, the VIA ProSavageDDR P4M266 offers superior performance across a range of industry standard applications. Offering a huge performance boost over the existing Intel® Pentium® III + Intel® 815 corporate desktop standard, the VIA ProSavageDDR P4M266 provides the Intel Pentium 4 processor platform with the bandwidth it needs for performance hungry functions like multi-tasking.

The Winstone 2001 comparison below demonstrates a performance increase of up to 5% over the Intel® Pentium® III + 815 standard corporate desktop on the most commonly used applications. With the integrated ProSavage8™ graphics bringing the cost of a VIA ProSavageDDR P4M266 based system to similar levels as the Intel® Pentium® III based options, there is now a strong value case for corporate migration to the Intel® Pentium® 4 platform.



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3D Winmark 2001 and Quake III Arena, the industry standards when gauging the 3D performance of a platform reveal the VIA ProSavageDDR P4M266 represents a major step forward in mainstream integrated graphics performance. The high bandwidth and low latency of DDR266 memory increase the performance of the integrated ProSavage8™ graphics core by 40% over existing integrated graphics chipsets giving the VIA ProSavageDDR P4M266 a 100% performance boost over the Intel® 815 platform.



Conclusion

As the first integrated graphics chipset for the Intel® Pentium® 4 processor platform, the VIA ProSavageDDR P4M266 delivers unparalleled performance and features at an affordable price, and provides the headroom and security that corporate buyers require for a 3 year product lifecycle. As part of the industry's largest range of SMA and DDR SDRAM based chipsets the VIA ProSavageDDR P4M266 represents proven technology, and a low risk, scalable platform for development of high performance Intel® Pentium® 4 systems.



Appendix

The reference systems were based on the following configurations:

Chipset	VIA ProSavageDDR P4M266	Intel® 815
Processor	Intel® Pentium® 4 1.5GHz	Intel® Pentium® III 1.0GHz
Memory	256MB DDR266	256MB PC133
Graphics	Integrated S3 Graphics Savage 4	Integrated Intel® i752
HDD	IBM 307030 30GB ATA-100	IBM 307030 30GB ATA-100
Operating System	Windows 98 SE	Windows 98 SE

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