VIA PM800 and PM880 IGP Chipsets

Delivering the Hi-Def™ Visual Experience

Technology Brief

VIA Technologies, Inc.
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Introduction

There is a rapid change under way in PC usage, as more people are turning to their PCs and notebooks for entertainment, such as watching movies, streaming video and for displaying on larger and ever higher quality television sets. With the focus increasingly on playing and managing digital media, the PC industry is being compelled to develop products that more closely meet user demands for a better, richer entertainment experience. In particular, the overall visual experience needs to be enhanced at all levels, for powerful new Media Center PCs and small form factor home entertainment systems alike, as well as for traditional mainstream desktop PCs and notebooks.

This means that not only must a PC be able to play DVDs, but it also must be able to process both Standard and High Definition digital TV signals, Internet video streams, and the wealth of video content available that is specifically for the PC, such as Microsoft® WMV HD or DIVx. Furthermore, the PC must be able to support the latest HDTV formats and displays.

To meet these demands, Integrated Graphics Processors (IGP) need to move beyond delivering excellent 2D and 3D graphics capabilities for everyday productivity applications and gaming for mainstream PCs, and add a third dimension that enables a stunning high definition visual experience, not only through CRT and LCD monitors but also via television sets right up to next generation HDTVs.

As the first IGP chipsets to introduce a feature set aimed specifically at delivering an unprecedented **Hi-Def**™ **Visual Experience** to the Intel® Pentium® 4 processor platform, the VIA PM800 and VIA PM880 chipsets rise to this challenge by enriching digital media consumption and offering support for the very highest definition digital TV standards to meet the requirements of the rapidly emerging markets for HDTV-ready Media Center PCs.

To enable this high definition support, the VIA PM800 and PM880 IGP chipsets comprise two principal hardware sectors: VIA's core logic technology and the S3 Graphics UniChrome IGP graphics core.

The **core logic** integrates all the key functions of a performance chipset North Bridge, including the memory controller, the front side bus, and the graphics interface, and paired with the leading VIA VT8237 South Bridge provides a comprehensive storage, connectivity and multimedia feature set.

The new **S3 Graphics UniChrome Pro IGP graphics core** ("UniChrome Pro") provides the graphics and display performance features required by today's and tomorrow's entertainment-oriented PC systems, comprising:

- A robust **2D/3D graphics engine** that takes graphics data and turns it into 2D or 3D images, and

- The **Chromotion CE Video Display Engine** that raises the bar for digital entertainment for all manner of PC systems.

Figure 1: VIA PM800/880 Integrated Graphics Chipsets
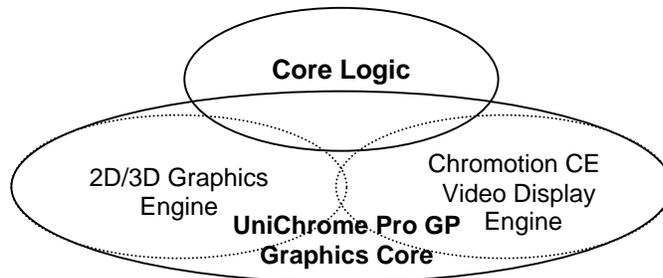
The Chromotion CE Video Display Engine with the UniChrome Pro core employs a multi-faceted approach to displaying digital content that includes features in every stage of processing, and interfaces to better control the final output. This unique platform approach to the requirements of the Media PC allows the CPU to perform other critical multimedia tasks, while also providing display support that is on par with the latest CE devices for easy interconnection and compatibility. The four major components of the Chromotion CE Video Display Engine, as shown below, are **Hardware Decoding**, the **Rendering** functions of Video De-blocking and Adaptive De-interlace, and **Output** options that include full HDTV support up to the latest 1080p resolutions.

Figure 2: Chromotion CE Video Display Engine
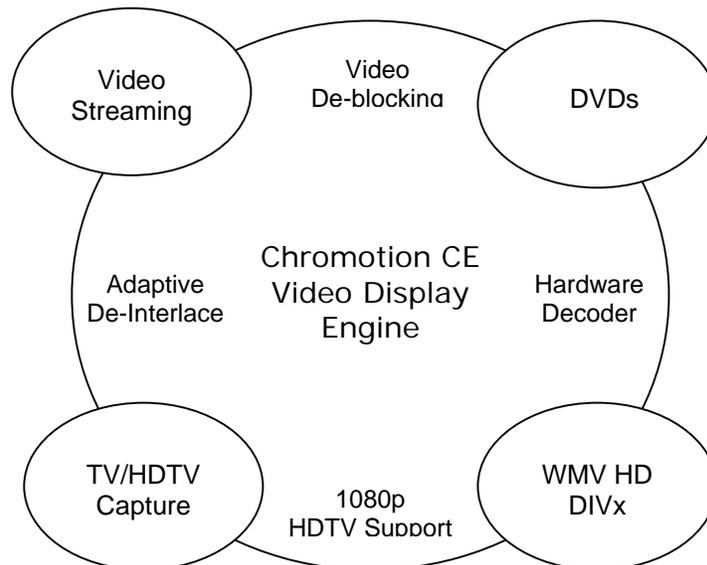
VIA PM800 and VIA PM880 Core Logic Overview

The VIA PM800 and PM880 chipsets build upon VIA's extensive experience in North Bridge design, and include a host of new intuitive memory technologies, providing exceptional system performance and a rich digital media experience. The combination of a high performance chipset architecture coupled with support for the latest and fastest memory technologies makes the PM800 and PM880 chipsets a powerful multimedia and productivity platform for the latest Intel Pentium 4 processors.

Advanced Memory Controller

The distinguishing feature between the VIA PM800 and PM880 chipsets is the memory controller. The PM800 uses the proven FastStream64™ single channel memory controller, while the PM880 uses the ultra-high performance DualStream64™ memory controller. Both controllers support up to 8GB of DDR266,333 or 400 memory.

FastStream64 (PM800)

VIA FastStream64 Technology uses an expanded array of prefetch buffers to reduce latency in the memory controller, extending performance at a lower transistor cost than dual channel implementations. Combined with support for the latest memory modules, the VIA PM800 provides lightning fast access to system memory.

DualStream64 (PM880)

The VIA PM880 features the intelligent DualStream64 dual memory controller that harnesses revolutionary new intuitive technologies that optimize system performance through an enhanced data prefetch protocol, improved memory branch prediction, utilizing a larger on-chip branch table, and tighter read/write turnaround for significantly improved clock timings.

High Performance CPU Interface

The VIA PM800/880 chipsets deliver high-speed 400/533/800MHz FSB connections to a complete range of Intel Pentium 4 processors with HyperThreading™ technology, including the latest processors supporting 800MHz front side bus speeds.

AGP 8X

The VIA PM800/880 chipsets also feature an optional high bandwidth AGP 8X port that enables easy upgrades to the latest in graphics card technology, providing a full 2.1GB/s data bandwidth for realistic 3D graphics environments and a new realm of PC gaming.

Ultra V-Link Chipset Interconnect

The VIA PM800/880 chipsets feature the new Ultra V-Link North/South Bridge interconnect, delivering aggregate data throughput speeds of up to 1066MB/s. The Ultra V-Link bus delivers the necessary bandwidth and low latency required by today's increasingly demanding digital media applications, and also provides headroom for I/O traffic generated from ever increasing processor and memory bus speeds.

Not only does Ultra V-Link speed up data transfer rates, it also addresses potential bottlenecks on the South Bridge that may be created by the growing use of high-speed USB2.0 and 1394 peripherals.

V-Map Modular Architecture

The VIA PM800/880 chipsets are part of VIA's unique Modular Architecture Platform (V-MAP) that reduces design times and shortens time-to-market for motherboard partners through pin-compatibility across VIA core logic solutions, and allows motherboard partners to cover multiple market segments with a single design.

Figures 3 and 4 illustrate the rich array of features available with the VIA PM800 and PM880 chipset platforms.

Figure 3: VIA PM800 Block Diagram
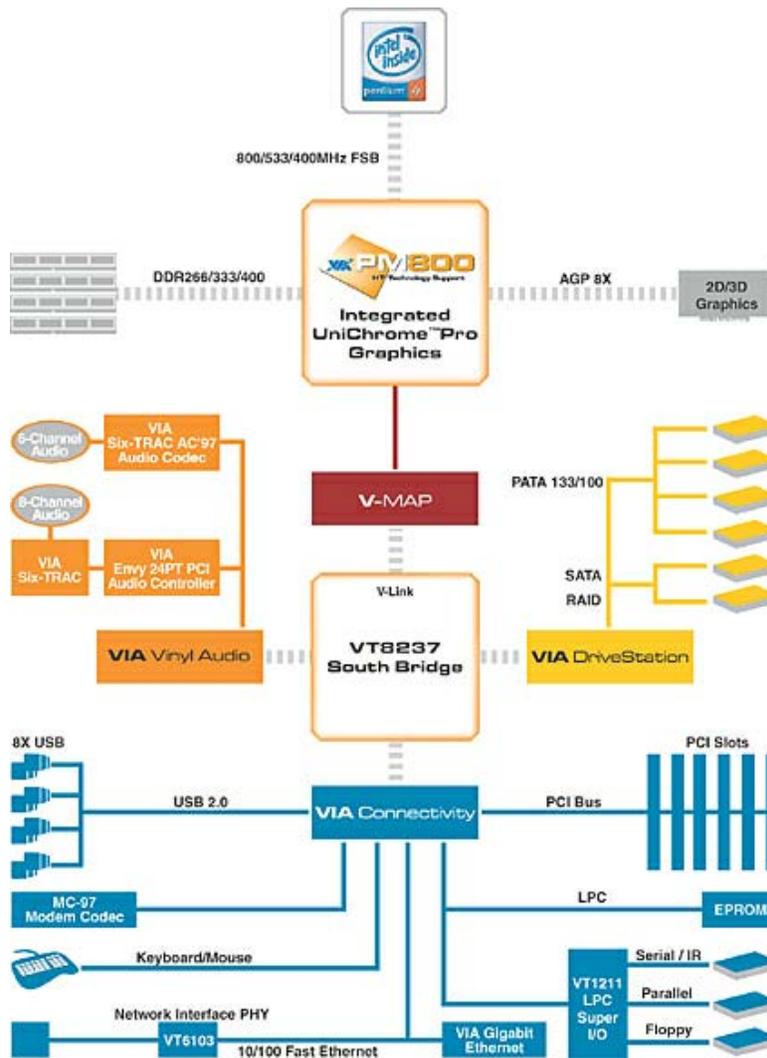
Figure 4: VIA PM880 Block Diagram
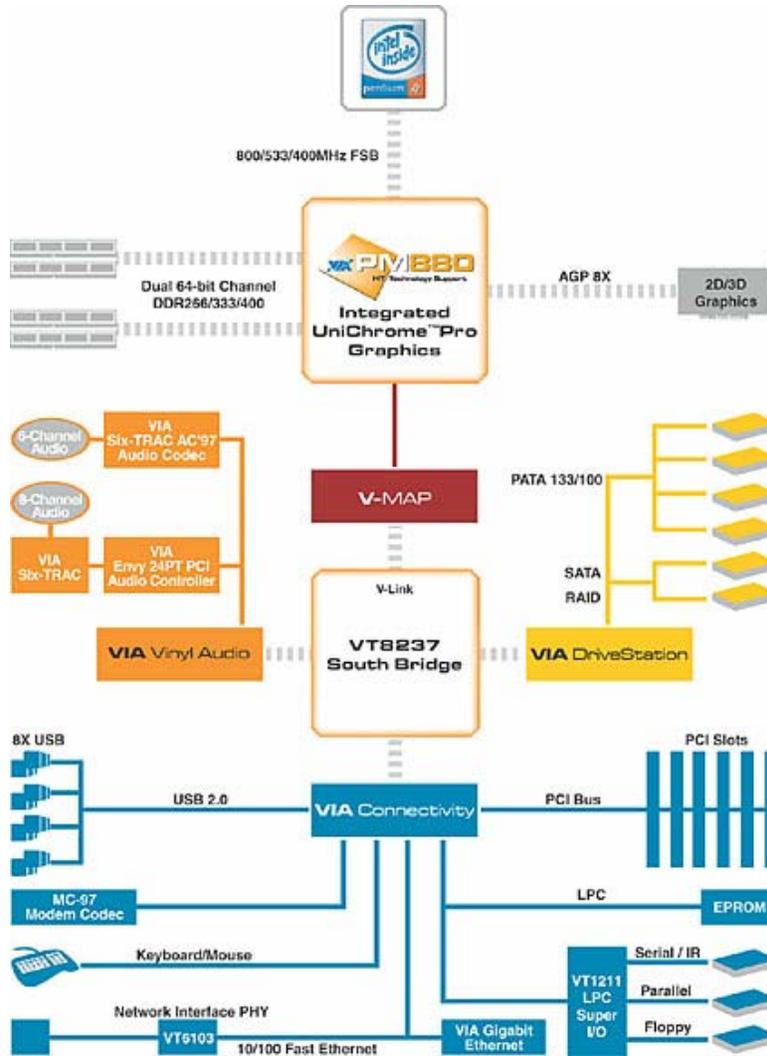
VIA VT8237 South Bridge

When coupled with the highly acclaimed VIA VT8237 South Bridge, the VIA PM800 and PM880 also deliver a host of advanced storage, connectivity and multimedia features, including the industry's first full-featured native Serial ATA/RAID controller and rich surround sound, to provide the most scalable and highest performance core logic chipset platform for mainstream Intel Pentium® 4 processor based PC systems.

The VIA VT8237 South Bridge has been designed to meet the increasing demands of today's software programs while providing all the necessary headroom for the data-intensive applications of tomorrow. It consists of four key components, as shown in Figure 5 and listed below.

Figure 5: VIA VT8237 South Bridge Architecture

VIA Drive Station Controller Suite

Featuring the VIA DriveStation™ Controller Suite, the VIA VT8237 South Bridge provides the most comprehensive high-performance integrated storage interface technologies available on the market today. In addition to enabling high-speed 150MB/s dual channel connections to Serial ATA Hard Drives while retaining support for up to four Parallel ATA-133 devices, it combines exceptionally fast disk data transfer rates and optimal data integrity with easy installation and manageability through V-RAID, the first native RAID controller integrated into a South Bridge supporting multiple RAID Level 0, RAID Level 1, RAID 0+1*, and JBOD configurations.

VIA Vinyl Multichannel Audio Suite

The VIA VT8237 South Bridge integrates the high-performance VIA Vinyl Multichannel Audio Suite for superlative 6-channel and 8-channel immersion audio support, and incorporates the VIA Vinyl AC'97 controller to enable six-channel audio and the transfer of the highest resolution audio possible over the AC'97 standard.

VIA Advanced Connectivity Suite

The VIA Advanced Connectivity Suite in the VIA VT8237 offers a host of high-bandwidth network and peripheral connectivity options, including support for the high-throughput VIA Velocity Gigabit companion controller, integrated 10/100Mb/s Fast Ethernet, and eight high-speed USB 2.0 ports, as well as support for TV-Out and IEEE 1394 companion controllers and a host of ultra high-bandwidth PCI-X expansion controllers for the server/workstation platforms.

*RAID Level 0+1 requires four Serial ATA drives; support for the two additional drives can only be implemented with two external Serial ATA ports enabled through a SATALite PHY.

S3 Graphics UniChrome™ Pro IGP Graphics Core

The S3 Graphics UniChrome Pro IGP Graphics Core (UniChrome Pro) as integrated in the VIA PM800 and PM880 chipsets is a direct result of the successful technical collaboration between S3 Graphics and VIA, combining S3 Graphics' expertise in developing leading edge, low power graphics solutions, with VIA' proven core logic technologies.

This all-new design comprises two main segments: the 2D/3D engine, and the Chromotion CE Video Display Engine, as shown in Figure 3 below.

Figure 6: UniChrome Pro Block Diagram
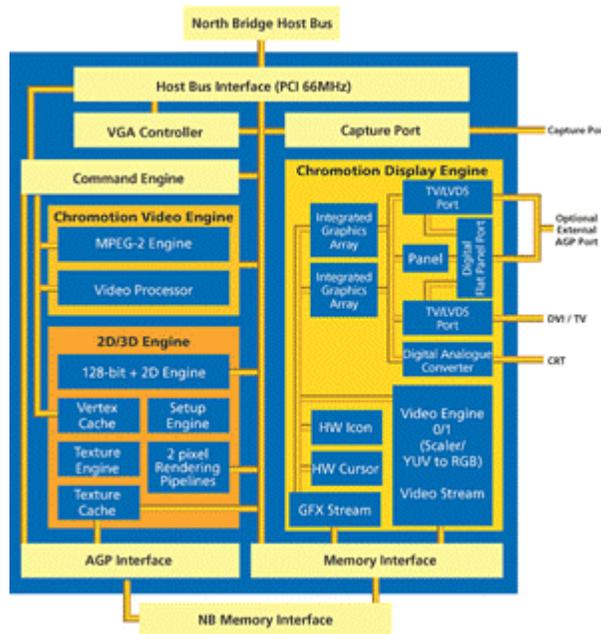
2D/3D Engine

With internal data flow equivalent to what is available to the latest AGP 8x graphics cards. A 200MHz Graphics engine has separate 128-bit data paths, one for frame buffer access, and the other for texture/command access.

2D Acceleration

A 128-bit 2D graphics engine supports acceleration of high quality graphics features that will allow applications to run with the best appearance possible without sacrificing system performance. The CC Winstone 2002 and Business Winstone 2002 benchmarks given in Appendix 1 illustrate the superlative 2D performance of the UniChrome Pro 2D engine.

3D Acceleration

With dual pixel rendering pipes, and a 128-bit 3D graphics engines the VIA PM800/800 chipsets support advanced 3D rendering. The 3D engine is capable of two textures per pass with a triangle rate up to 4.5 million triangles per second, a pixel rate up to 200 million pixels per second, and a texel bilinear fill rate up to 400 million texels per second.

The 3DMark2001SE and 3DMark2003 benchmarks given in Appendix 2 clearly demonstrate the superior performance of the UniChrome Pro 3D engine.

Additional Gaming Features

UniChrome Pro integrates high levels of gaming support with an available OpenGL driver, and support for Microsoft DirectX 7.0 and 8.0. Texture compression and edge anti-aliasing support ensure maximized graphics quality, while support for vertex fog, specular lighting, and bump mapping with bring gaming scenes to life.

S3ConfigD3D Direct3D Configuration Utility

The S3Config Direct3D configuration utility provides a way for the end-user to configure or toggle various Direct3D-related capabilities to compensate for differences in the requirements and behaviors of various Direct3D applications.

Figure 7: S3ConfigD3D Direct3D Configuration Utility

Refresh Rate Override

The S3 Graphics utility software for UniChrome Pro desktop systems will include S3RefreshLock, which will give the game enthusiast the ability to override refresh rate settings on Windows 2000/ Windows XP systems. S3RefreshLock will apply globally to both DirectX and OpenGL applications. The driver will initiate a restore of the system's current refresh rate when the user exits the application. Override control is accessible as a Display Properties Advanced Settings tab named S3RefreshLock. Selectable options include:

- Application controlled refresh rate (Default)
- Override with same as desktop refresh rate
- Override with highest capable refresh rate (Optimal)

Figure 8: S3RefreshLock Utility

Chromotion CE Video Display Engine

The Chromotion CE Video Display Engine as integrated in the UniChrome Pro graphics core is designed with one singular goal- to ensure the best possible viewing experience. Employing a multi-faceted approach, the Chromotion CE Video Display Engine provides a number of features that optimize the Decoding of data, the rendering of graphics data, and finally the visual output for standard PC monitors, Standard Television displays, or the latest HDTVs.

Decoding: Flawless DVD Playback

A great visual experience starts with the smooth delivery of content. Most video today is encoded using algorithms that reduce the file sizes for easier delivery. For a device such as the PC to play such content, it must be decoded in real time; however, if a system's processor is overloaded with multiple tasks, the system will drop video frames, resulting in a less than satisfactory viewing experience. As part of VIA's Distributed Performance platform strategy, UniChrome Pro comes equipped with a hardware MPEG-2 decoder to provide full 30 frames per second playback of video such as DVDs, while freeing the processor for other tasks. UniChrome Pro's MPEG-2 decoder is fully compatible with all popular DVD playback software including WinDVD, PowerDVD, and Windows Media Player.

In the process of DVD playback, video decoding demands nearly 80% of the total decoding power. UniChrome Pro's MPEG decoder engine incorporates MPEG-1 and MPEG-2 variable length decoding (VLD), de-Quantization, inverse scan, iDCT and hardware-assisted Motion Compensation. By off-loading these playback activities to the North Bridge hardware, the computational power of the processor can be allocated for audio decoding, subpicture decoding, decryption and navigation. The total requirement for processor utilization is thus greatly reduced.

UniChrome Pro's brand new Chromotion CE Video Display Engine is also designed with the Microsoft DirectX Video acceleration standard (DXVA) in mind, minimizing extra overhead and allowing maximum efficiency for DVD playback in current and future Microsoft operating systems.

DVD Performance

Power DVD 5.0 is a very useful tool for analyzing an IGP chipset's MPEG-2 video engine performance. A low CPU usage percentage indicates that the integrated MPEG-2 video engine is performing the complete hardware decoding process onboard. A higher CPU usage percentage indicates that the MPEG-2 decoding process is being handled partially or entirely by software and is relying heavily on CPU processing power. Figure 9 (overleaf) tests VIA's Distributed Performance approach to system design by measuring CPU usage during an MPEG-2 application.

Figure 9: Power DVD 5.0 – CPU Usage
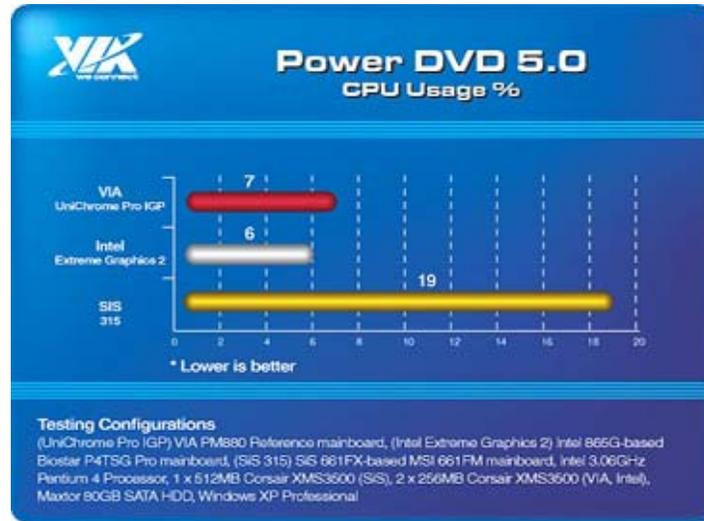
While playing the popular Microsoft DVD testing title, Annex 2.0, the VIA PM880 chipset-based test system featuring UniChrome Pro managed an impressive 7% CPU usage score. UniChrome Pro is the only integrated graphics chipset core to feature full onboard hardware MPEG-2 decoding components, including VLD (Variable Length Decode), iDCT, and Hardware Motion Compensation, thus allowing very low CPU utilization rates as well as maintaining low power, low heat system operation.

Rendering: Delivering Digital Content

After decoding, the digital content must be optimized for different display types. A legacy of TV is that much of our video content is encoded in an interlaced format, while PC monitors display video in a progressive format; therefore, in order to play digital video content on a standard TV set, it must be converted (in real time) from an interlaced to a progressive format. UniChrome Pro utilizes the intelligent Adaptive De-interlace Technique (ADT) to analyze each pixel and determine how best to display it on progressive format monitors for the best possible effect. Moreover, UniChrome Pro features Hardware Video De-blocking that helps reduce the appearance of pixel 'blocks' in real time when displaying highly compressed video streams.

Adaptive De-Interlace Technique

The UniChrome Pro Chromotion CE Video Display Engine is specially equipped with a unique Adaptive De-interlace Technique for getting the most from interlaced imagery. Video content encoded specifically for playback on a television screen must be manipulated by the graphics subsystem to insure high quality video playback on a computer monitor. Television uses Interlacing while the computer monitor is a progressive display device. Thus, non-interlaced data must be generated prior to display. De-Interlacing is a technique that converts interlaced video to a format that is suitable for a progressive scan monitor.

The most common methods of de-interlacing are Bob and Weave.

Bob is a process that stretches each field to a frame size, does a vertical adjustment, and then displays sixty frames from sixty fields. This is an effective De-Interlacing method for areas of video that represent motion. Unfortunately this is not a good solution for areas of video with no motion.

Figure 10: Video Playback utilizing Bob De-Interlacing

Figure 11: Video Playback utilizing Weave De-Interlacing

Weave is a different technique which is preferred for video source images with little or no motion. The weave method simply interleaves two sequential fields of video and displays thirty frames per second.

Weave is not suitable for areas of video with motion.

Figure 12: Video Playback utilizing UniChrome Pro's Advanced De-interlacing Technique

ADT: UniChrome Pro utilizes the Advanced De-Interlacing Technique (ADT) that combines Bob and Weave on a per pixel basis.

The UniChrome Pro ADT examines every pixel of each field and decides whether to Bob, or to Weave with the past field, or to Weave with the future field. Since the decision-making process combines both temporal and spatial elements of the picture on a per pixel basis, UniChrome Pro generates a high quality, very film-like video output.

Hardware Video De-blocking Filter

By default, each frame of a video stream undergoes some level of post-processing after it is decoded. The level of post-processing depends on the level of processor performance. This post-processing smoothes the video frame by de-blocking the image to smooth artifacts that are inherent to the digital compression process, and by de-ringing the image to correct for certain motion artifacts. The amount of post-processing directly affects your platform's processor usage.

The UniChrome Pro Chromotion CE Video Display Engine integrates a **Hardware Video De-blocking Filter** that can be used to help reduce the appearance of block-like artifacts that appear in highly compressed video streams. This feature can be used during capture for real-time processing, during conversion or during playback to enhance existing media files.

The Hardware Video De-blocking Filter can also smooth edges and remove the blocky artifacts present in movies that use the highly compressed MJPEG or MPEG formats. The Video De-blocking Filter can be extremely useful for improving movies created by digital cameras that can take highly compressed, small video clips. Zooming in or resizing these videos make the blocky patterns more evident. The Video De-blocking Filter will greatly improve the quality of any movie that shows blocky compression artifacts.

Figure 13: Image Improvement with Hardware Video De-blocking

Normal View   **With Hardware Video De-blocking**

Outputs: Delivering the Hi-Def Visual Experience

The Chromotion CE Video Display Engine provides an extensive range of video outputs that will enable a user to connect virtually any display to the PC.

For viewing on standard PC monitors, UniChrome Pro provides support for displaying content on CRT monitors up to 1920x1440 or LCD panel resolutions up to 1600x1200. To support displays on other types of devices, especially for multimedia applications, UniChrome Pro enables TV-Out and DVI connections to standard televisions, projectors, and HDTV screens.

Figure 14: Chromotion CE Display Output Utility
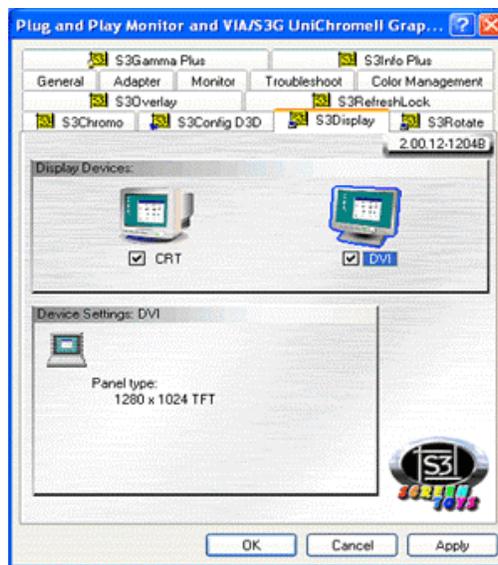
HDTV Support

Little has changed in television since its introduction. The major change in the NTSC television standards last came when we moved from black and white screens to color. However, the recent FCC mandate for broadcasters to change from NTSC analog to ATSC digital broadcasting was a major step, and grant the PC industry a large advantage, for when enacted, the display format will no longer be limited to 525-line interlaced lines that are subject to screen flickering, ghost-shadows, and blurring.

While PC Graphics had traditionally been forced to stay firmly attached to computer monitors in studies and bedrooms, this is all about to change. A system equipped with UniChrome Pro and its Hi-Def output opens up a world of opportunities – enabling the use of crisp and clear high resolutions up to 1920x1080 on your living room big screen HDTV enabled television set.

Digital television does not require pixel data to be encoded. Digital signals also produce a higher quality TV picture, displaying sharp and vivid images using up to 1080 lines instead of 525 lines.

Figure 15: UniChrome Pro Hi-Def Native HDTV Support

A number of HDTV formats are in active use, all of which are supported by the Chromotion CE Video Display Engine. Currently the majority of major television networks broadcast in the 720p and 1080i formats. The premier quality format 1080p, however, is starting to see wider use for high quality movies.

Table 1: HDTV Formats Supported by UniChrome Pro

	Format	Vertical Scan Lines	Horizontal Pixels	Aspect Ratio	Scan Mode	Frame Rate (fps)
HDTV	1080p	1080	1920	16:9	Progressive	24
	1080p	1080	1920	16:9	Progressive	30
	1080i	1080	1920	16:9	Interlaced	30
	720p	720	1280	16:9	Progressive	24
	720p	720	1280	16:9	Progressive	30
	720p	720	1280	16:9	Progressive	60
DTV	483p	483	720	16:9	Progressive	60

Scanning: Interlaced vs. Progressive

Interlacing was first introduced in the early days of television to reduce the amount of information sent for each image. By transferring the odd-numbed lines, followed by the even-numbered lines (as shown in the left of Figure 15), the amount was halved.

With interlace, each scan line is refreshed half as often as it would be if it were a progressive display. Therefore, to avoid line flicker on sharp edges due to a too-low refresh rate, the line-to-line changes are limited, essentially by vertically low-pass filtering the image. A progressive display has no limit on the line-to-line changes, so is capable of providing a higher resolution image (vertically) without flicker.

Figure 16: Scanning: Interlaced vs. Progressive

Interlace Scanning   **Progressive Scanning**
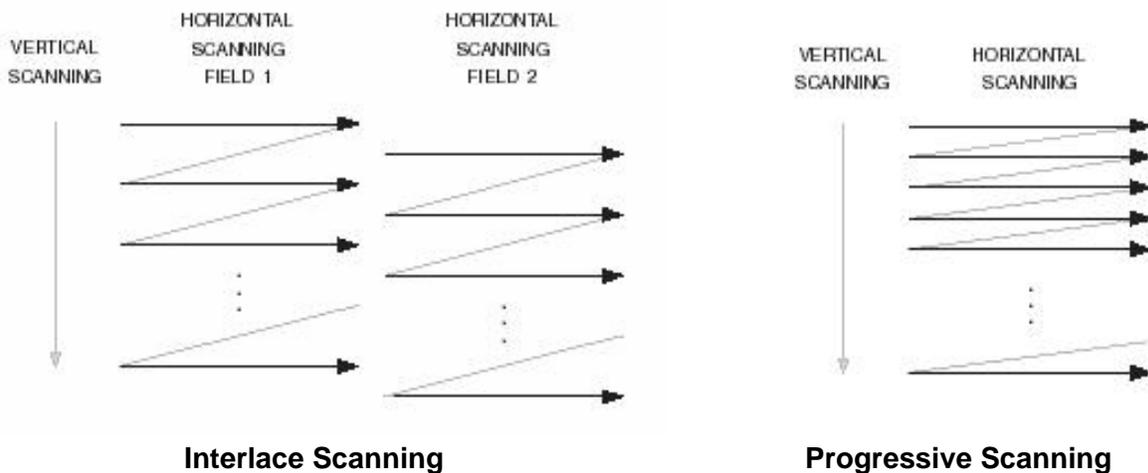
"Super" HDTV 1080p Format

In combination with a 1080p HDTV compatible TV-Out or DVI encoder chip, the PM800 and PM880 chipsets enable the full Hi-Def experience with support for the 1080p HDTV format. First generation interlace High Definition TV (HDTV) was called 1080i interlace, which should actually be characterized as 1920x540x60 format. However, this format is quickly being superseded by a new "Super" HDTV format – 1080p – which displays progressive scan images. Because progressive scan formats do not drop alternate lines in a given frame, they are capable of providing a higher quality image. Of the two recognized commercial technology formats for high definition television (1080i and 1080p), 1080p yields the best quality images with minimal artifacts.

Figure 17 simulates the differences between images in 1080i and 1080p formats. Both images depict an object moving from one frame to another against a stationary background. The upper row of images demonstrates an image using 1080 lines scanned progressing at 30fps. The lower row of images shows the lower quality

provided by a 1080i image, which scans only 540 lines in 60 fps. Only half of the 1080 lines of information are being updated in any given frame:

Figure 17: Screenshots: Interlaced and Progressive Format Comparison
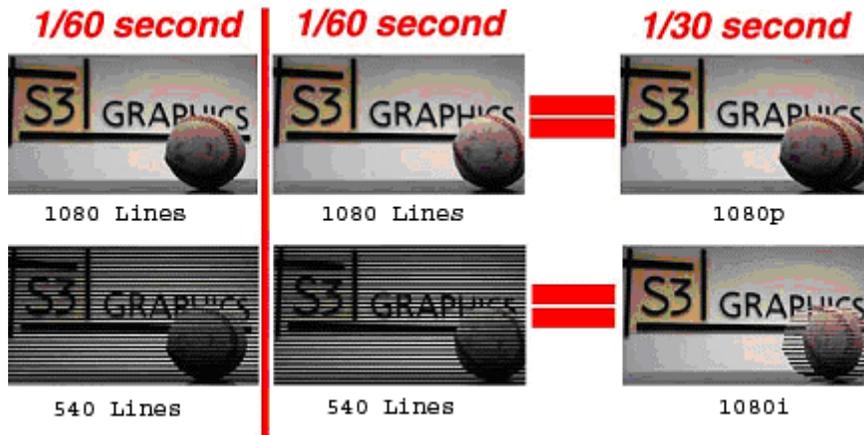
Figure 17 clearly shows that for watching content such as movies, 1080p is the undisputed display leader, and is supported by the latest generation of HDTV displays. Formats such as Microsoft's WMV HD is driving 1080p resolution support for PC content, with a number of recent DVD releases being supplied with a second disk encoded in WMV HD specifically for PC viewing, a further sign of the increasing trend of using the PC platform for entertainment.

As many movies are originally recorded in a 1080p format, watching movies in this format is literally as good a viewing experience can get.

Advanced Support for Standard Televisions

For connecting to standard televisions, UniChrome Pro supports single or dual channel LVDS encoders that enable S-Video or Component outputs, while a dedicated interface is provided for TV encoders to standard NTSC or PAL format television displays. The Chromotion CE Video Display Engine further offers a comprehensive set of features and utilities to fine-tune the viewing experience.

TV Flicker Filter

Flicker filter is a hardware filtering logic that interpolates vertical lines to reduce the effects of picture flicker associated with interlaced TV displays. Because the filtering process sacrifices image sharpness in order to reduce the picture flicker, the amount of flicker filtering is software-controlled to be optimized for the image. In general, the higher the level of filtering applied, the smoother the resultant image.

TV Display Scaling (Overscan/Underscan)

UniChrome Pro provides a unique method of display scaling, allowing an optimal image display based on the application needs. The images of normal TV programs and movies actually extend past the edges of the TV screen. Overscan modes create the same effect and are best for viewing movies or video clips. When no vertical or horizontal contraction is applied, i.e., when the maximum "size" has been selected through the TV adjustment control buttons, the TV display operates in overscan mode. This mode is best for viewing movies.

Horizontal and vertical contraction can be used to scale down the image. Underscanned modes scale down the image so that it can be viewed in its entirety on the TV screen.

TV Position and Color Adjustment Control

The TV Adjustments page of the S3Display utility allows the user to adjust the most common TV image controls. These include flicker filtering, brightness, contrast, color, and tint, as well as size and positioning. Which controls are available will depend on the hardware configuration and the TV encoder used. By default, all the controls on this page have a pseudo "real time" effect. Buttons, when pressed, will immediately affect the TV output. While a slider is being dragged, there will be no visible change in TV output; when the user lets go of the slider, the TV image will change according to the slider's new setting.

Figure 18: S3Display TV Adjustment Utility
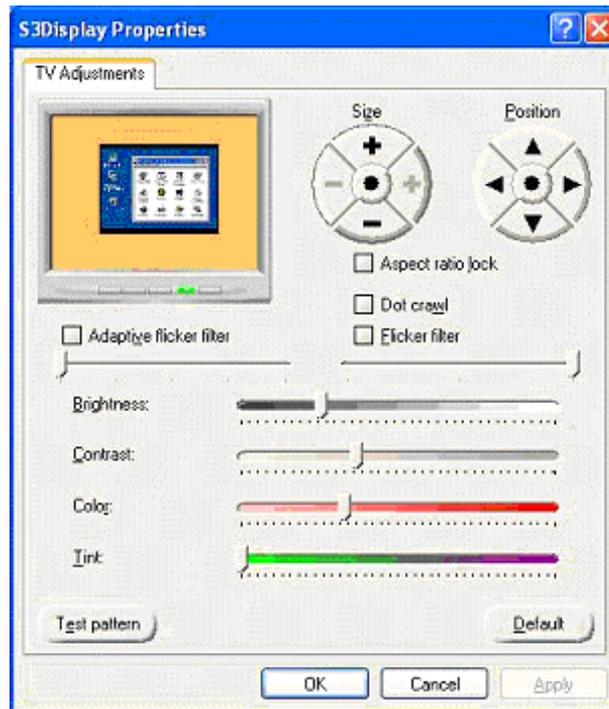
DuoView

DuoView is a unique combination of hardware and software support that allows the easy display of images on two monitors. Enabling support in Microsoft Windows® 98, Windows ME, and Windows XP operating systems, UniChrome Pro allows independent resolution and color depth for a secondary display, with full media capabilities on both displays.

DuoView integrates a single display adapter capable of outputting to two monitors. Each output device can be configured through the S3Graphics Screen Goodies toolkit for its own independent refresh rate, resolution, and color depth. The Single Adapter Multi-Monitor DuoView implementation in UniChrome Pro allows different images to be displayed with independent timings, so a secondary monitor won't be limited to a laptop's 60Hz refresh rate.

With more screen space for manipulating and viewing information, users can increase their productivity and streamline time-consuming tasks without having to buy another system, especially for laptop users who can more than double their screen area with an independent monitor. Applications for the second display include Instant Messaging, recording information on a spreadsheet or sending e-mail, while performing computational tasks on the primary display.

Figure 19: Single View Mode
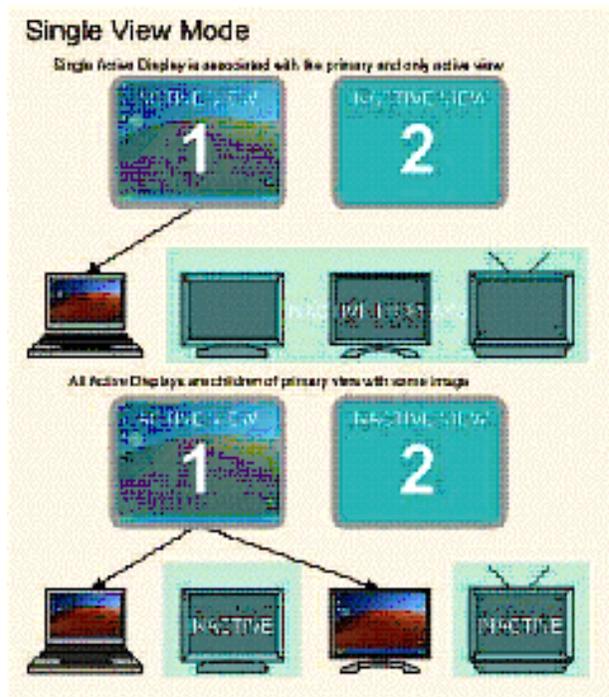
When the operating system is in SingleView, there is a single view of the desktop image displayed, regardless of the number of monitors enabled. This single view of the desktop is sometimes referred to as the Primary View. There may be one or more display output devices (monitors) associated with this single Primary. These monitors are said to be "child devices" of the Primary View.

When in SingleView, the Primary View owns all of the child devices, and the (inactive) Secondary View owns none.

Figure 20: Dual View Mode
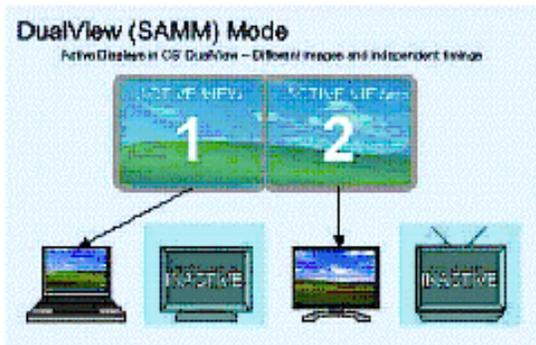
When the user elects to extend the desktop to a second display, DualView (SAMM) mode is enabled. The Windows desktop image is divided into two parts or views. The Primary View always contains the portion that includes the screen origin, coordinate (0,0). The Secondary View contains the remainder (i.e. the right-hand side) of the desktop.

Precedence order for establishing the display device associated with the Primary View usually follows the order: LCD, DVI, CRT.

Hardware DuoRotate

UniChrome Pro provides hardware acceleration for 90°, 180°, + 270° of display rotation. This means no limitations for 3D, 2D or Video in rotated modes even in dual monitor setups! Previous display rotation has been accomplished through inefficient software methods that may drastically reduce 3D performance and may even completely drop video. UniChrome Pro provides hardware support for the display rotation feature allowing full performance while in rotation mode. This feature is useful for portrait view applications such as desktop publishing, digital photography, tablet PC applications as well as web browsing.

Hardware DuoRotate operates with 2D, 3D, Video, live camera input, DuoView™ and multiple monitors. Rotating the display does not affect the Windows mode table selection. DuoRotate's full hardware acceleration and scaling supports DVD and WMV9 playback in all rotated modes as well as no rotation.

Figure 21: Hardware DuoRotate Modes
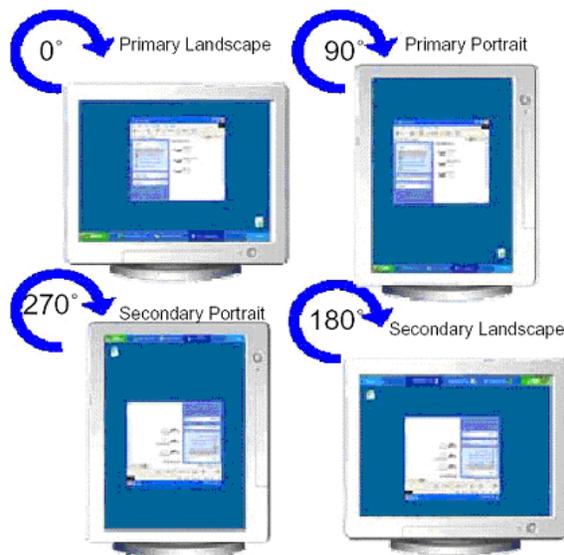
Figure 22: The Usage Benefits of Portrait Mode
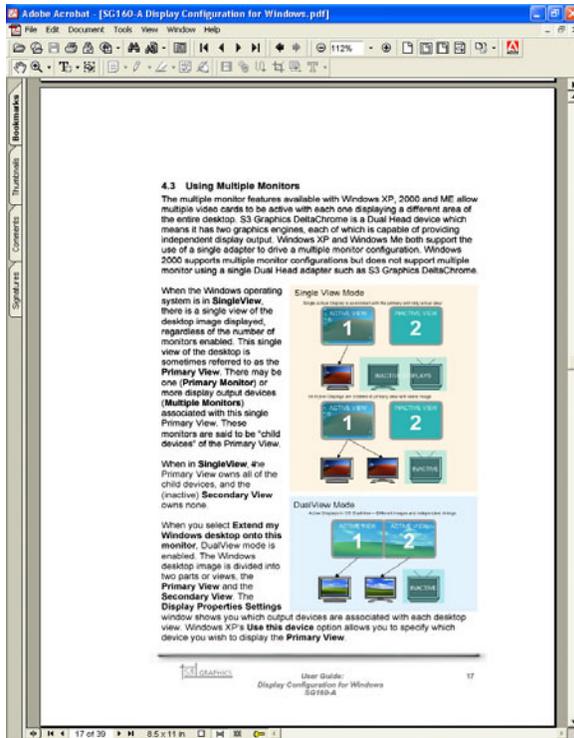
**Desktop Publishing in portrait mode
eliminates the need for page scrolling**

**Portrait mode enhances your
Web-browsing experience**

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S3Gamma Plus

The S3Gamma Plus utility provides a way for the end user to adjust the gamma, brightness, and contrast of the display adapter's output signal to compensate for differences in the brightness of various CRTs or LCD displays.

Figure 23: S3Gamma Plus Adjustment Utility
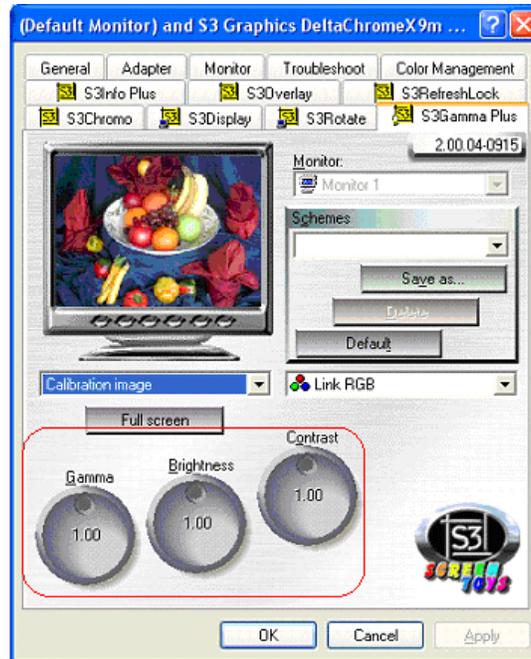
Media Center Features

UniChrome Pro includes a number of specialized features specifically for Media Center designs. One primary feature is the inclusion of two TV-capture ports, which allows video encoder data to be streamed directly into the North Bridge freeing up bandwidth on other buses such as PCI, and lowering overall CPU utilization.

The video engines in UniChrome Pro also provide specific consideration for the key requirements of Microsoft's Video Mixing Renderer (VMR) versions 7 and 9 to provide optimized compatibility with DXVA.

Conclusion: A New Class of IGP Chipset

Boasting highly intuitive core logic technologies and the revolutionary S3 Graphics UniChrome Pro IGP graphics core featuring the innovative Chromotion CE Video Display Engine, the VIA PM800 and PM880 have stepped up to the plate to deliver a remarkable all-round feature set that pushes the technology envelope for all the latest display functionality.

Optimized to deliver a superb Hi-Def visual experience when playing digital video content, the VIA PM800 and PM880 IGP chipsets represent a new class of multimedia-focused IGP chipset that clearly meets and exceeds the requirements of mainstream PC and notebooks users, while helping to usher in the era of HDTV-ready Media Center PCs and small form factor/low profile PC devices by providing leading edge performance in all spheres.

In combination with the VIA VT8237, the VIA PM800 and PM880 support the very latest standards in video and audio reproduction, as well as a host of advanced connectivity and storage features to best facilitate the playing, manipulation and management of digital media content.

For single or dual channel systems, the VIA PM800 and PM880 offer the best all-round chipset platform for Intel Pentium 4 PC system users looking for the richest entertainment experience.

Appendix 1: 2D Performance Benchmarks

CC Winstone 2002

CC Winstone 2002 measures the overall multimedia prowess of a PC system by running a series of popular image processing, audio editing, and web authoring applications including Photoshop, Premiere, Macromedia Director, Dreamweaver, SoundForge, Netscape Navigator, and Windows Media Encoder.

UniChrome Pro's 2D/3D engine handled the CC Winstone 2002 multimedia tests superbly, slightly outscoring the Intel solution and beating the SIS 315 solution by 8%.

Figure 24: CC Winstone 2002 Benchmark
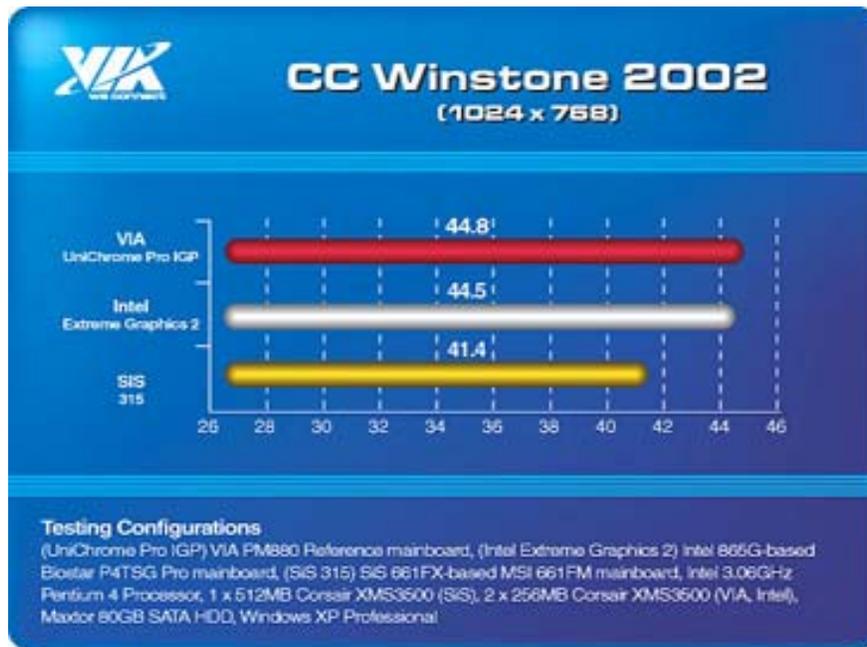
Business Winstone 2002

Business Winstone 2002 is a system-level, application-based benchmark that measures a PC's overall performance when running today's top-selling Windows Office applications such as Word, Excel, PowerPoint, FrontPage, Access and Outlook. It runs these Microsoft applications through a series of scripted activities and uses the time a PC takes to complete those activities to produce its performance scores.

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UniChrome Pro with its robust 2D engine again slightly outperformed the Intel Extreme Graphics2 solutions and extended a 12% lead over the SIS 315 solution (see Figure 25).

Figure 25: Business Winstone 2002 Benchmark
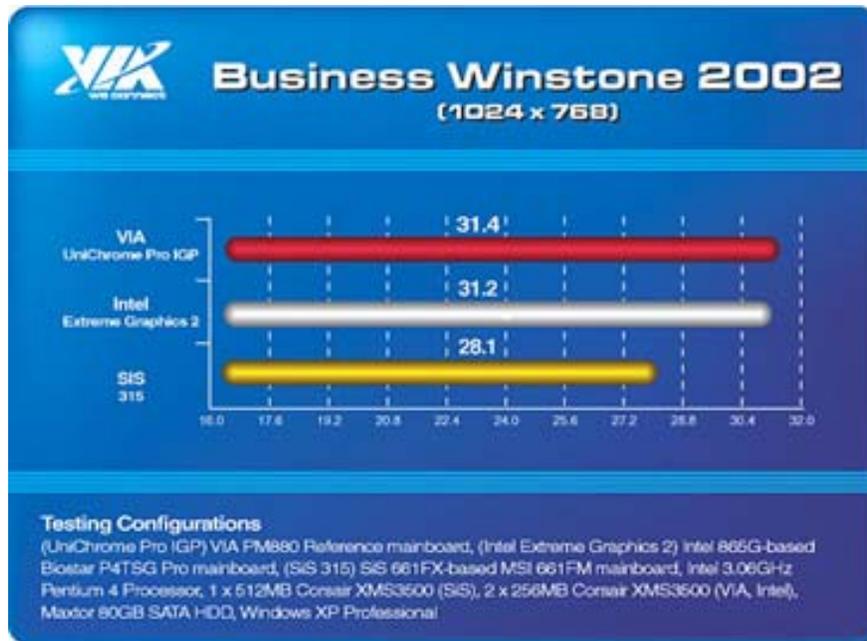
Appendix 2: 3D Performance Benchmarks

3DMark 2001SE

3DMark 2001SE is still considered by many in the hardware benchmarking community as the last word on 3D graphics performance. 3DMark2001SE is optimized for rendering Microsoft's DirectX 7/8 3D graphics and audio multimedia extensions so is particularly useful for testing integrated graphics chipset cores such as UniChrome Pro and other cores featuring hardware DirectX 7 support.

UniChrome Pro with its 3D graphics processor excelled in 3DMark2001SE, garnering a 15% performance advantage over the Intel Extreme Graphics2 based system and a 14% lead over the SIS 315-based system, showing a distinct advantage over the competition when rendering Microsoft's DirectX 7/8 3D graphics and multimedia extensions.

Figure 26: 3DMark 2001SE Benchmark
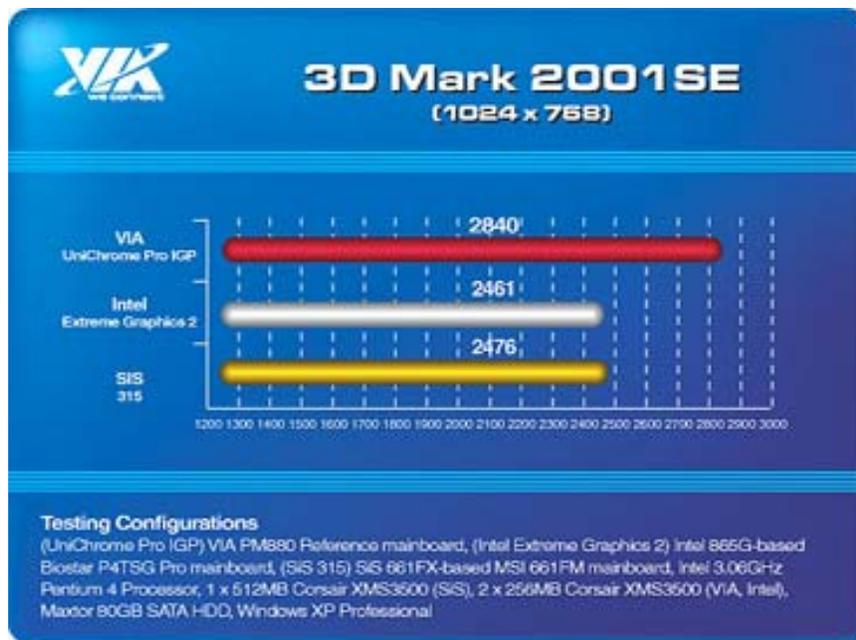
3DMark 2003

3DMark 2003 is the latest update of the highly popular 3DMark 2001SE. 3DMark2003 adds Microsoft's DirectX 9.0 multimedia extensions to fully exploit the latest generation high-detail 3D games.

Extending the 3D performance advantage trend that started with the 3DMark 2001SE results, UniChrome Pro pulls away to a 28% lead over the Intel Extreme Graphics2 solution and a 16% lead over the SIS 315 graphics solution.

Figure 27: 3DMark 2003 Benchmark
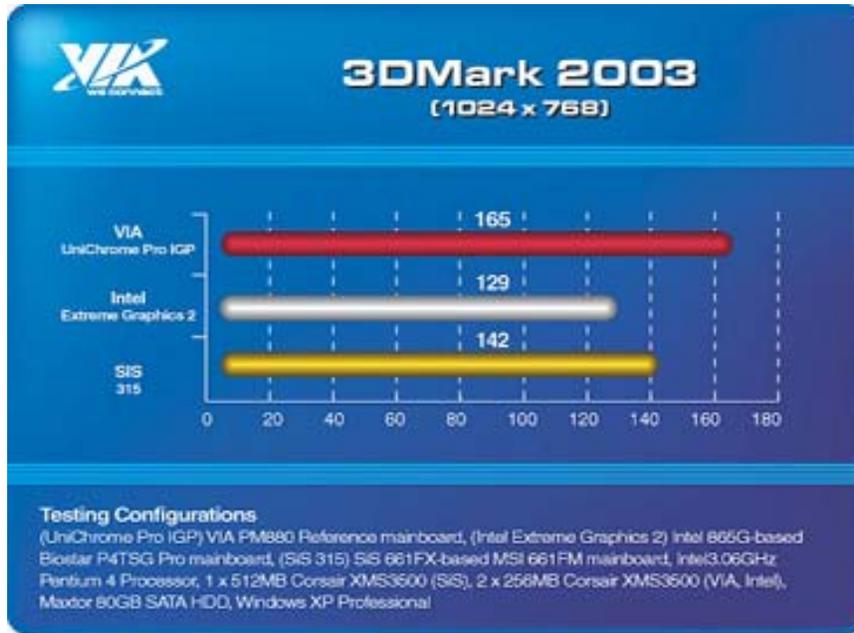
Appendix 3: VIA IGP Chipset Comparison Table

Feature	PM800	PM880	P4M266A
Processor	Intel Pentium 4	Intel Pentium 4	Intel Pentium 4
Front Side Bus	800MHz	800MHz	533MHz
Memory Controller	Faststream64 Single Channel	DualStream64 Dual Channel	Single Channel
Memory Support	DDR400	DDR400	DDR266
Max. Memory	8GB	8GB	4GB
AGP Support	AGP 8x	AGP 8x	AGP 4x
North/South Bridge Link	Ultra V-Link 1 GB / Sec	Ultra V-Link 1 GB / Sec	V-Link 266 MB / Sec
Graphics Core	UniChrome Pro	UniChrome Pro	ProSavage8
Video Acceleration	Yes	Yes	Yes
Dual Monitor Support	Yes	Yes	Yes
Video De-blocking	Yes	Yes	No
Adaptive De-interlace	Yes	Yes	No
Hardware Display Rotation	Yes	Yes	No
Video Capture Ports	Yes	Yes	No
CRT RGB Interface	350MHz	350MHz	250MHz

Appendix 4: IGP Chipsets Comparison Table

Feature	VIA/S3 UniChrome Pro	Intel Extreme Graphics 2	SIS 315	ATi 9100
MEMORY				
Memory Interface	64/128 bit DDR 400	64/128 bit DDR 400	64 bit DDR 400	64/128 bit DDR 400
Shared Memory	16MB – 64MB	16MB – 65MB	32MB – 64MB	16MB – 128MB
2D GRAPHICS				
2D Engine	128 bit	256 bit	128 bit	128 bit
3D GRAPHICS				
Pixel Pipelines	2	1	2	2
3D Engine	128 bit	256 bit	256 bit	128 bit
3D Engine Clock Speed	200MHz	266MHz	200MHz	300MHz
Hardware DirectX Support	DX7	DX7	DX7	DX7/8
Software DirectX Support	DX7/8/9	DX7/8/9	DX7/8/9	DX7/8/9
VIDEO				
MPEG 2 Hardware Engine	Full Implementation	Partial Implementation	No	Partial Implementation
Variable Length Decode (VLD)	Yes	No	No	No
iDCT	Yes	No	No	Yes
Hardware Motion Compensation	Yes	Yes	No	Yes
MPEG-4 Hardware Accelerator	Partial Implementation	No	No	No
Variable Length Decode (VLD)	No	No	No	No
iDCT	Yes	No	No	No
Hardware Motion Compensation	Yes	No	No	No
Video Capture	Yes	No	No	No
Adaptive De-interlacing	Yes	No	No	Yes
DISPLAY				
Dual Display	Yes	Yes	No	Yes
Display Rotation	Yes	No	No	No
Display Type Support	LVDS, DVI, TV-out, CRT	LVDS, DVI, TV-out, CRT	LVDS, DVI, TV-out, CRT	LVDS, DVI, TV-out, CRT