Cyber 9397DVD™

(High Performance 3D Multimedia/DVD Flat Panel Controller)

Product Brief

Features

- *Single-Cycle 3D GUI engine with on-chip Setup Engine*
- *Single-Cycle SDRAM/SGRAM I/F 2/4/8MB (9397 support up to 4M)*
- *Independent refresh rate for dual display for dual image*
- *MPEG2/DVD Playback Hardware Assist*
- *APC™ enhanced DSTN shading algorithm*
- *Full AGP with Sideband*
- *Built-in TrueVideo® processor*
- *Dual video windows for Videoconferencing*
- *Motion video capture with Zoom Video Port*
- *Reduce EMI using Spectrum Spread Panel Clocking*
- *ClearTV™ for flicker-free TV Output*
- *230MHz built-in RAMDAC™ & frequency synthesizer*
- *High Resolution supports up to 1280x1024 SXGA panel*
- *Fully PC98 compliant*
- *316 BGA package, pin compatible with 9397*

Single-Cycle High Performance 3D GUI

- Advanced graphics drawing Single-Cycle 3D Rendering Engine with Z buffer provides premium 3D functions
- Hardware Triangle Setup Engine enhances 3D performance
- Optimized graphic engine for GUI operations
- Linear display memory addressing up to 4GB memory
- 265 Raster Operations (ROPs) up to 24/32-bit True Color
- Four-color hardware cursor & pop-up icon up to 128x128

MPEG2/DVD Hardware Playback

- THAMA™ architecture enables full DVD player support with AC3 Direct subpicture support
- Requires no extra frame-buffer
- Supposed freeze, fast-forward, slow motion, reverse
- Support Digital TV Encoder interface

Enhanced AGP Bus Interface

- 66/133MHz AGP with Sideband
- Backward Compatible to 33MHz/66MHz PCI
- DMA mastering with Scatter Gather
- Execute Model for Direct Textures, Video, and DVD

- Pipelined AGP access through Sideband

TrueVideo® Accelerator

- TrueVideo® provides horizontal and vertical interpolation with proprietary edge recovery scaling
- Dual apertures for simultaneous access to graphics and video display memory areas
- Field rendering for interlace support on NI display
- Accelerates DirectDraw™ and DirectVideo™ functions
- CCIR 656/CCIR 601 and YUV planar

Dual Video Windows for Videoconferencing

- Two independent scalers and CSCs for separate local and remote video window control
- Video data path selection from video port or PCI bus

Motion Video Capture Port

- VMI compliant hardware interface to MPEG1/2
- VBI (Intercast) interface
- ZV port accepting RGB or YUV (4:2:2/4:1:1) data format

DirectDraw™ and DirectVideo™ Support

- Color keys of source and destination for transparent blt
- Sprites, Double buffering, page flipping

Frame Buffer Interface

- Single-Cycle R/W memory interface
- Supports SDRAM/SGRAM 2/4/8MB

Simple Bus Interface Support

- PCI rev. 2.1 compliance
- PCI Bus Mastering support up to 66MHz
- Accelerated Graphics Port (AGP)

Mobile Power Management

- 8 GPIOs, suspend and standby modes
- Internal Clock Gating to reduce the power
- Support PCI Clock Run
- Support AGP Clock Busy/Stop (clock stops when system is not using the bus)

Dual/Simultaneous Display with Independent Refresh Rate

- Supports simultaneous display on Flat Panel and CRT or Flat Panel and TV
- Independent refresh rate fully utilizes Dual and simultaneous display

Flat Panel

- New APC enhanced DSTN shading algorithm
- Gamma correction for color enhancement
- Auto expansion and centering

- Supports straight or double pixel/clock interface up to 1280x1024x64K SXGA panels

CRT

- Supports high quality CRT display up to 1280x1024x64K
- VESA DDC2B compliance

ClearTV™ Display

- Interlaced display for NTSC or PAL resolutions
- Flicker removal filter for interlaced TV monitors
- Underscan/Overscan to TV display

Overview

The Cyber9397DVD™ is a 64-bit fully integrated LCD, CRT, and TV high performance 3D Multimedia Flat Panel Controller for PCI systems. The Cyber9397DVD™ features a hardware 3D GE with a Triangle Setup Engine, TrueVideo® processor, Motion Video Capture port, dual video windows for videoconferencing, ClearTV™ for flicker-free TV-Output support, independent refresh rate for superlative Dual/simultaneous display, and a 230MHz 24-bit RAMDAC 256x18 color lookup table, which dramatically improve GUI functions and overall system operation. The Cyber9397DVD™ also includes an integrated GUI accelerator, read cache, and command FIFO that optimizes memory bandwidth and maximizes graphics performance. The Cyber9397DVD™ supports a 32-bit PCI 2.1 compliant local bus interface with Bus Mastering capability and Accelerated Graphics Port (AGP) interface for high speed 3D image rendering.

The Cyber9397DVD™'s premium 3D rendering and texture mapping functions and triangle Setup Engine provide real-time interaction with solid 3D models in CAD/CAM, 3D modeling, and 3D games. The single-cycle R/W 64-bit memory data bus, supporting SDRAM/SGRAM memory with 83MHz/100MHz, provides faster data transfer rates to further improve system throughput.

To meet PC98 graphics adapter and multimedia requirements, the Cyber9397DVD™ provides: planar video format support for MPEG1/2, built-in TrueVideo® processor with on-chip hardware Color Space Conversion (CSC) for faster data conversion, TrueVideo® scaling with interpolation and edge recovery algorithm and overlay control with different graphics color depths, dual video playback overlay windows for videoconferencing and multimedia display.

The Cyber9397DVD™'s outstanding LCD interface provides a flexible environment to manipulate the LCD control. It supports all phases of panel interface up to 1280x1024x64K.

The Cyber9397DVD™'s Mobile Power Management provides a flexible power saving solution with extended power management capabilities. The 3.3V chip power supply dramatically reduces power consumption, which is an optimum solution for notebook design.

3D Functions

The Cyber9397DVD™'s 3D Single-Cycle GE supports advanced 3D functions, such as:

- Hardware Triangle Setup Engine
- Z Buffer

- Texture Mapping with MIP Map Perspective Correction
- Gouraud Shading
- Alpha Blending
- Fog Effect

Hardware Triangle Setup Engine

The Cyber9397DVD™ has an integrated triangle Setup Engine which sets up triangle edge parameters and delta values by triangle vertex input data. The Cyber9397DVD™ can optionally detect and reject backfacing polygons; this can potentially save software a significant amount of time, especially in a strip or mesh environment.

Z Buffer

The Z buffer determines the visible surface to provide the basis for the third dimension in 3D graphics.

Texture Mapping with Perspective Correction

Textures are by far the most effective mechanism for producing realistic pictures. A very large number of smooth and flat shaded polygons can be replaced by a few simple texture mapped polygons.

Gouraud Shading

Gouraud shading, or color interpolation, is a process by which color information is interpolated across the face of the polygon to determine the colors at each pixel.

Alpha Blending

The real world is composed of transparent, translucent, and opaque objects. Alpha blending is implemented by rendering polygons through a stipple mask whose on-off density is proportional to the transparency of the object. The resultant color of a pixel is a combination of the foreground and background color.

Accelerated 2D Graphics Functions

The Cyber9397DVD™'s graphics engine significantly boosts graphics performance through specialized hardware that accelerates the most frequently used GUI operations: BitBLT, image and text transfer, line draw, short stroke vector draw, rectangle fills, and polygon fills. Graphics functions are optimized further by hardware cursor operations, which reduce the CPU workload. The graphics engine also supports 256 Raster Operations (ROPs) for 8, 16, 24, and 32 bits per pixel graphic modes. These advanced functions combine to provide outstanding acceleration in graphic intensive environments such as Microsoft Windows™ .

MPEG2 H/W Assist for DVD Playback

MPEG2 Motion Compensation hardware is included in the Cyber 9397DVD™ and full motion video with AC3 decoding is now possible with currently available x86 CPU's. This allows low cost low power consumption implementation of MPEG2/DVD Playback.

APC Enhanced DSTN

To achieve better display quality than the conventional FRC algorithm, the Cyber 9397DVD™ offers the APC (Advanced Phase Compensation) DSTN algorithm to enable up

to True Color (256 shades per primary color) displays on conventional and fast response DSTN panels.

TrueVideo® Processor

The Cyber9397DVD™, with an integrated TrueVideo® processor and a Capture Engine, supports the dual aperture on the PCI bus which enables independent graphic and video data to be transported simultaneously without any software involvement. The video image is stored in off-screen memory and is retrieved by the Video Display Processing block for TrueVideo® processing. TrueVideo® processing is performed utilizing Trident's proprietary edge recovery algorithm for sharper line visibility, de-interlacing, multitap filtering, dithering, gamma correction, and scaling operations with bilinear interpolation in both horizontal and vertical directions. In addition, the on-chip hardware Color Space Conversion (CSC) accelerates conversion for 16-bit YUV pixels into linear True Color 24-bit RGB pixels on the fly. The additional X and Y minifiers are capable of shrinking the video images to any linear fractions, which saves bus bandwidth and memory space.

Dual Video Windows for Videoconferencing

The Cyber9397DVD™ can simultaneously display two live video windows through hardware. This is most effective in videoconferencing for displaying a local and a remote video stream.

In the Cyber9397DVD™, these two windows are fully scaleable and independent of each other. Either window can be overlaid on top of the other or with graphics. The local window video stream can come from a camera interface over the video port. This data is sent to the display memory for screen display and also sent to the CPU, using PCI Bus Mastering, for compression and transmission to the remote site. This data can also come directly from the PCI bus. The "remote" data stream comes from the PCI Bus Master and is stored in a separate section of display memory before going through its own dedicated CSC and scaler for display.

DirectDraw™ /DirectVideo™ Support

The Cyber9397DVD™ implements the following features which accelerate DirectDraw ™ and DirectVideo™ functions:

- Color keys of source and destination for transparent blt
- Sprites for game acceleration
- Double buffering and page flipping for anti-tearing
- PCI Bus Mastering
- YUV planar

Motion Video Capture Port

- **Video Module Interface (VMI)**

The Cyber9397DVD™ has a built-in video capture port and hardware interface logic to connect directly to many MPEG1/2 and video decoders. The Video Module Interface (VMI) allows for MPEG compressed data to be transferred to the MPEG decoder through the Cyber9397DVD™. The decompressed MPEG data is then transferred back to the graphics controller through the VMI port for real-time display in a window.

- **Vertical Blank Interval (VBI)**

A new industry standard is being set for transmission of non-video data over the TV broadcast signal during the dead time called vertical blanking. The Cyber9397DVD™ has the ability to take the entire video stream over the video port, sending the visible video stream to the display memory for display in a window, stripping the VBI data from the stream, and then sending this data to the CPU for processing using PCI Bus Mastering.

- **Zoom Video (ZV) Port**

The Cyber9397DVD™ provides Zoom Video (ZV) port aperture, which connects directly to a PC card. It allows the PC card to write video data (YUV) directly to the Cyber9397DVD™ to be overlaid with graphic data from the frame buffer without increasing the data transfer loading on the PCI bus.

Frame Buffer Interface

The Cyber9397DVD™ provides flexible memory configuration to meet the demand of high-end to mid-end notebook design. Programmable DRAM timing provides this flexibility that maximizes performance The display memory features Single-Cycle memory R/W timing for 2/4/8MB of SGRAM or SDRAM that offers a high performance data throughput, especially for high bandwidth 3D data transfers. The display queue has been increased to reduce the frequency of the memory bus requests, optimizing the memory bus efficiency for the graphics controller.

Simple Bus Interface Support

A simple Bus Interface Unit (BIU) provides a low cost, single chip solution for IBM™ PC or compatibles on PCI 2.1 bus systems, driving both the system bus and display memory interface without external glue logic. A two-wire communications interface allows direct support of VESA DDC and DPMS standards for up to 8 GPIOs for DDC and I2C. Additionally, zero-wait state host write buffer, read cache, and memory mapped I/O increase operating speeds and contribute to peak performance levels. The Cyber9397DVD™'s PCI Mastering feature further improves the 3D performance by BLTing the rendered image from system memory to frame buffer. The Accelerated Graphics Port (AGP) Interface in the Cyber9397DVD™ is ready for future 3D high bandwidth data transfer access.

Enhanced AGP Bus Interface

The Cyber9397DVD™ supports 66/133MHz AGP with sideband support to facilitate high speed, high quality texture fetching from system memory.

Mobile Power Management

The Cyber9397DVD™ provides the 3.3V low power consumption power input with 5V tolerance. The on-chip 3D engine, LUT/DAC, video clock (VCLK) and memory clock (MCLK), and external crystal input can be powered down through register controls or pins. Power-down states includes ready, standby, suspend, and hibernation. Each power state can be activated by hardware pins, hardware timers, or software control bits. Self-refresh DRAM and slow-refresh DRAM are also supported in this design.

The Cyber9397DVD™ features low cost and low power consumption hardware MPEG2 motion compensation with DVD playback. Full motion video with AC3 decoding is now possible with currently available x86 CPUs using the Cyber9397DVD™.

Dual/Simultaneous Display With Independent Refresh Rate

The Cyber9397DVD™ features versatile display support in the following areas: flat panels, CRTs, TVs, and application display software drivers. The Cyber9397DVD™'s DualDisplay in 24-bit True Color with mixed video and graphics simultaneously displays on flat panel and CRT, or flat panel and TV with independent refresh rate to fully utilize the individual device's display quality. This feature provides an optimal solution for users requiring either different images on different displays or the same data with two individual video windows on both displays.

- **Flat Panel**

The Cyber9397DVD™ supports straight or double pixel/clock panels up to 1280x1024x64K color without external glue logic. To enhance imaging on high resolution displays, texts and graphics are expanded to fill the whole panel and the auto-centering function relocates the displayed image to the center of the screen.

The Cyber9397DVD™ provides various direct data connections to flat panel interfaces and also supports the external Low Voltage Differential Signaling (LVDS) interface.

- **CRT**

The Cyber9397DVD™ display enhancements dramatically improve CRT resolution, providing sharp images. These enhancements include support up to 1280x1024x64K or 1024x768x16M. In addition, extended graphics and text modes are supported by software drivers that provide a "ready-to-go" solution, minimizing the need for additional driver development.

- **ClearTV™ Support**

The Cyber9397DVD™ incorporates ClearTV™ technology of "flicker removal" and "horizontal/vertical scaling" logic for the best video quality when displayed on an interlaced TV monitor with 640x480 (NTSC) or 800x600 (PAL) resolutions and 320x240 (NTSC/PAL) for DOS games. The underscan function enables VGA data to be filled inside the edges of the visible area of a TV screen while overscan allows VGA data to be filled beyond the edges of the visible area of a TV screen.