

## High Performance 3D Multimedia Flat Panel Controller

### Features

- Single-Cycle 3D GUI engine with on-chip Setup Engine
- Single-Cycle EDO DRAM/SDRAM/SGRAM I/F 1/2/4MB
- Fully PC97 compliance
- Built-in TrueVideo® processor
- Dual video windows for DualDisplay
- Motion video capture with Zoom Video Port
- ClearTV™ for flicker free TV-Output
- Independent refresh rate for simultaneous display
- 170 MHz built-in RAMDAC & frequency synthesizer
- Integrated PanelLink™ & External LVDS interface support
- High Resolution supports up to 1280x1024 SXGA panel
- 316 BGA package

### 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 (Cyber9397 only)
- Optimized graphic engine for GUI operations
- Linear display memory addressing up to 4GB memory
- 265 Raster Operations (ROPs) up to 24/32bit TrueColor
- Four-color hardware cursor & popup icon up to 128x128

### 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 bit
- Sprites, Double buffering, page flipping

### Frame Buffer Interface

- Single-Cycle R/W memory interface
- Supports EDO DRAM/SDRAM/SGRAM 1/2/4 MB

### Simple Bus Interface Support

- PCI rev. 2.1 compliance
- PCI bus mastering supports up to 66 MHz
- Accelerated Graphics Port (AGP) ready

### Mobile Power Management

- 8 GPIO, suspend and standby modes

### 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

- Integrated PanelLink™ interface / external LVDS support
- Gamma correction for color enhancement
- Auto expansion and centering
- Supports straight or double pixel/clock interface up to 1280x1024x64K SXGA panels

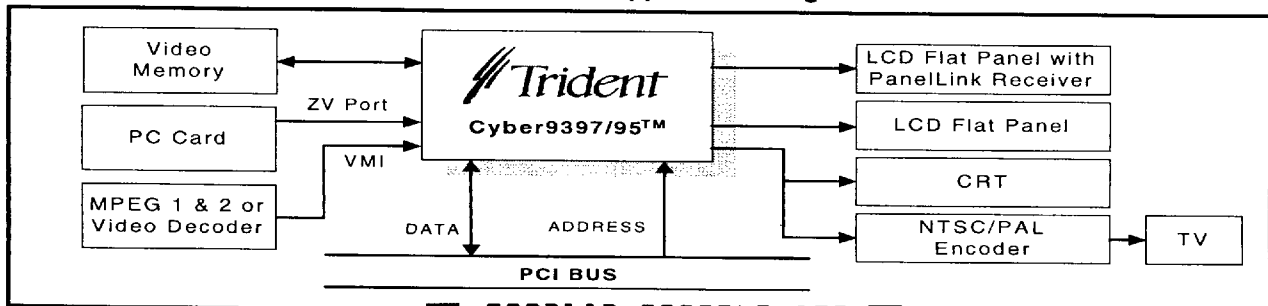
### CRT

- 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

Cyber9397/95™ Application Diagram



## Overview

The Cyber9397/95 is a 64 bit fully integrated LCD, CRT and TV high performance 3D Multimedia Flat Panel Controller for PCI systems. The Cyber9397/95 features hardware 3D GE with Triangle Setup Engine (Cyber9397 only), 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 170 MHz 24 bit RAMDAC composed of 256x18 color lookup table, dramatically improving GUI functions and significantly promoting overall system operation. The Cyber9397/95 also includes an integrated GUI accelerator, read cache, and command FIFO that optimizes memory bandwidth and maximizes graphics performance. The Cyber9397/95 supports 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 Cyber9397/95's premium 3D rendering and texture mapping functions, the triangle Setup Engine (Cyber9397 only), 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 EDO DRAM (45ns) or SDRAM /SGRAM memory with 83MHz/100MHz, provides faster data transfer rates to further improve system throughput.

To meet the PC97 graphics adapter and multimedia PC requirements, the Cyber9397/95 supports planar video format for MPEG1/2, the 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 color depths from graphics. Plus, the dual video playback overlay windows for video conferencing and multimedia display. The ClearTV™ technology of "flicker removal" and "scaling" functions removes the artifacts of VGA signals to TV monitor or VCR. The Motion Video Capture port including Zoom Video (ZV) port, Video Module Interface (VMI), and interacts protocol Vertical Blanking Interleave (VBI), and dual clock synthesizers allow the media chip perform at peak levels.

The Cyber9397/95's outstanding LCD interface provides a flexible environment to manipulate the LCD control. It supports all phases of panel interface up to 1280x1024x64k. The interface dramatically reduces the panel interface EMI noise by embedding in PanelLink™ technology and supporting external LVDS panel interface.

The Cyber9397/95's Mobile Power Management provides a flexible power saving solution, extends power management capabilities. The 3.3V chip power supply dramatically reduces the power consumption which is optimum solution for notebook design.

## 3D Functions

The Cyber9397/95's 3D Single-Cycle GE supports advanced 3D functions, such as

- Hardware Triangle Setup Engine (Cyber9397 only)
- Z Buffer
- Texture Mapping with MIP Map Perspective Correction
- Gouraud Shading
- Alpha Blending
- Fog effect

### Hardware Triangle Setup Engine (Cyber9397 Only)

The Cyber9397 Integrated a triangle Setup Engine which will set up triangles edge parameters and delta values by input data of triangle vertex. The Cyber9397 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 provides 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.

For a more detailed description, please refer to 3Drender Graphics Systems Programming Interface User's Guide, published by Intel in 1994.

## Accelerated Functions

The Cyber9397/95's graphic engine significantly boosts graphics performance through specialized hardware that accelerates the most frequently used GUI operations including: 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™.

### **TrueVideo® Processor**

The Cyber9397/95, 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 our proprietary edge recovery algorithm for sharper line visibility, de-interlacing, multitap horizontal 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 bandwidths and memory space.

### **Dual Video Windows for Videoconferencing**

The Cyber9397/95 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 Cyber9397/95, 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 displaying on the screen and also sent to the CPU using PCI bus master 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 (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 Cyber9397/95 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 Cyber9397/95 has a built-in video capture port and hardware interface logic to directly connect 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 Cyber9397/95. 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 Cyber9397/95 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 Cyber9397/95 provides Zoom Video (ZV) port aperture which direct connect between a PC card and Cyber9397/95. It allows the PC card write video data (YUV) directly to Cyber9397/95 to be overlaid video window with graphic data on frame buffer without increasing the data transfer loading on PCI bus.

### **Frame Buffer Interface**

The Cyber9397/95 provides flexible memory configuration to meet the demand of high-end to mid-end notebook design. The display memory features Single-Cycle memory R/W timing for Extended-Data-Out (EDO) DRAM with 1MB/2MB/4MB and Synchronous Graphic RAM (SGRAM)/ Synchronous DRAM (SDRAM) with 2MB/4MB that offer a high performance data throughput, especially for 3D high bandwidth data transfer requirement. The programmable DRAM timing provides flexibility that maximizes performance. The display queue has been increased to reduce the frequency of the memory bus requests, optimizing the memory bus efficiency for the graphic 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, DPMS standards for up to 8 GPIO for DDC, I<sup>2</sup>C.

■ 9002182 000349 673 ■



Additionally, zero-wait state host write buffer, read cache, and memory mapped I/O increase operating speeds and contribute to peak performance levels. The Cyber9397/95'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 is ready in the Cyber9397/95 for future 3D high bandwidth data transfer access.

### Mobile Power Management

The Cyber9397/95 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 extend 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.

### Dual/Simultaneous Display With Independent Refresh Rate

The Cyber9397/95 features versatile display support in the following areas: flat panels, CRTs, TVs and application display software drivers. The Cyber9397/95's DualDisplay in 24 bit TrueColor 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 Cyber9397/95 supports straight or double pixel/clk panels up to 1280x1024x64K color without external glue logic. To enhance the image on high resolution displays, texts and graphics are expanded to fill the whole panel. In addition, the auto-centering function relocates the display image to the center of the screen for the same purpose.

The Cyber9397/95 provides various direct data connection to flat panel interface. The integrated Panellink™ transmitter interface provides a low voltage, high speed, low EMI, serial, DC-balanced differential data transmission solution. Plus, the interface can also support external Low Voltage Differential Signaling (LVDS) interface.

### • CRT

The Cyber9397/95 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 Cyber9397/95 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.

Contact your local Trident representative for:

- Technical Reference Manuals
- Software Programmer's Guides
- Evaluation Kits (Includes documentation plus evaluation board and software)

USA	Taiwan	Hong Kong
Trident Microsystems, Inc. 189 North Bernardo Avenue Mountain View, CA 94043-5203  Phone: 415-691-9211 Fax: 415-691-9260 BBS: 415-691-1016 <a href="http://www.trid.com">http://www.trid.com</a>	Trident Microsystems (Far East), Ltd. 18F, No. 202, Sec 2 Yen Ping North Road Taipei, Taiwan R.O.C.  Phone: 886-2-550-6616 Fax: 886-2-550-3902	Trident Microsystems (Far East), Ltd. Unit 1, 19F, Tower II, Enterprise Square 9 Sheung Yuet Road, Kowloon Bay Kowloon, Hong Kong  Phone: 852-2-756-9666 Fax: 852-2-796-9849

Specifications subject to change without notice.  
Document Revision A. Printed in USA 08/96



9002182 0000350 395

Preliminary