3DImàge9753™

High Performance GUI & Video Accelerator

Features

64 Bit High Performance GUI Accelerator

- 64 bit internal memory data bus
- 265 Raster Operations (ROPs) for 8 bit per pixel (PsuedoColor), 15/16 bits per pixel (HiColor), and 24/32 bits per pixel (TrueColor) graphic modes
- Enhanced graphics engine for BitBLT's, line drawings, short stroke vector draws, clipping, and text transfer
- Built-in hardware cursor and pattern register
- 24 bit packed true color acceleration

Extended Display Resolutions

- High resolution non-interlaced display through 1600x1200-64K, 1280x1024-64K, 1024x768-16M, 800x600-16M, or 640x480-16M colors
- Extended text modes (80 or 132 columns by 25, 30, 43, or 60 rows)

Highly Integrated Design

- Fully integrated 24-bit true-color DAC with color look-up table, 170MHz clock synthesizer, read cache, command FIFO, 100% IBM compatible VGA core, and GUI Accelerator
- 256x18 color look-up table with HiColor and true-color bypass mode support
- Two wire interface to EEPROM or VESA DDC

Performance Optimized PCI Bus

- Supports 33MHz or 66MHz PCI
- PCI Bus Master Support
- PCI Burst mode support
- PCI 2.1 compliant Bus Interface Unit supports zero wait state, 32-bit "glueless" connection to PCI bus
- Big-endian and little-endian data formats
- Zero wait state host write buffer and read cache

Software 3D Acceleration

- Direct 3D Acceleration
- Stretch BLT
- PCI bus mastering

"Deep Green PC" Power Management

- VESA Display Power Management Signaling (DPMS) compatible
- RAMDAC and clock synthesizer powerdown for greater energy savings

TrueVideo® Acceleration

- TrueVideo® Scaling Support. Horizontal/vertical interpolation with proprietary edge recovery scaling, and overlay control for 30 fps software MPEG/video CODEC acceleration
- Dual on-chip Color Space Converters (CSC)
- Direct interface to MPEG and video decoders through video capture port
- Accelerates DirectDraw functions with color keying, sprites, and double buffering for page flipping
- Dual aperture for simultaneous access to graphics and video display memory areas
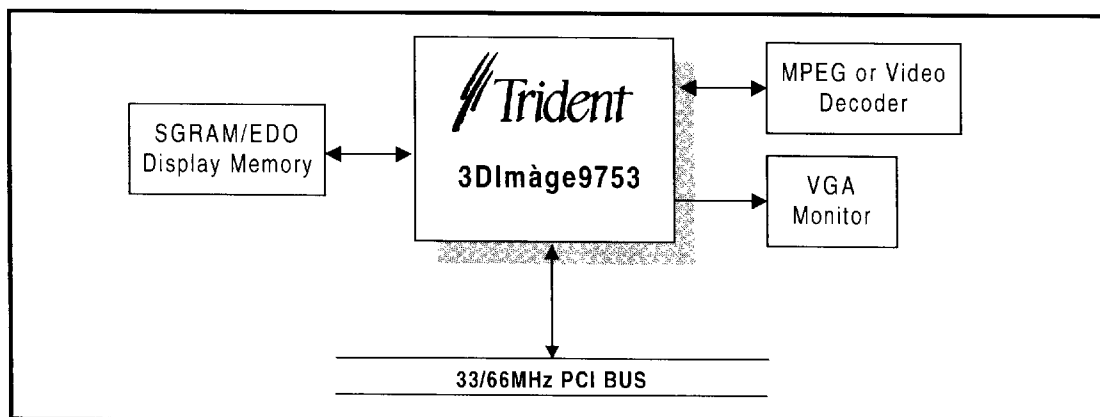- CCIR 656 and YUV planar

Videoconferencing: Dual Video Windows

- 2 independent scalers and CSC's for separate local and remote video window control
- Video data path selection from video port or PCI bus

Video Module Interface (VMI) and Vertical Blank Interval (VBI) Support

- VMI compliant direct hardware interface to MPEG/video decoders for live video inputs (TV, Camera, VCR, etc.)
- VBI (Intercast) interface can separate Vertical Blank Interleaved data for transmission to the CPU

Performance Display Memory Interface

- SGRAM/EDO DRAM types supported
- 64-bit memory interface (32-bit also supported)
- 1MB to 4MB display memory configuration with densities of 256Kx4, 256Kx8, 256Kx16, and 256Kx32
- Only two 256Kx16 DRAM's for 1024x768-256

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PCI Bus Master

- Full PCI Bus Master read/write supported

Packaging

- 208 pin PQFP; pin compatible with 3DImàge9750 performance 3D accelerator family

Overview

The 3DImàge9753 is a highly integrated SGRAM/EDO-based graphics accelerator and CRT controller. It provides a flexible, low cost, high performance solution for a diverse range of color depth, CRT resolution, and display memory configurations for 64-bit PCI-bus interfaces. The 3DImàge9753's highly innovative system design and full 64-bit acceleration graphics engine dramatically improves GUI functions and significantly enhances overall system operation. Advanced system features such as Color Space Converter, TrueVideo® Scaling, Dual Video Windows, Video Module Interface (VMI), Vertical Blanking Interval (VBI) data capture, Display Power Management Signaling (DPMS), 24-bit true color DAC, dual clock synthesizer, minimal DRAM configuration, and extended color text modes allow operation at peak performance levels. The 3DImàge9753 also supports standard BIOS for VESA modes, VESA palette snooping, and programmable DRAM timing. The 3DImàge9753's enhanced feature set and flexible system configuration can be tailored for a wide range of design applications, making it the ideal solution for PCs running Microsoft Windows 3.1, Windows 95, Windows NT, IBM OS/2 and similar operating systems.

Accelerated Functions

The 3DImàge9753's graphics engine significantly boosts graphics performance through specialized hardware that accelerates the most frequently used GUI operations. Functions directly supported in hardware include: BitBLT, image and text transfer, line draw, short stroke vector draw, rectangle fills, and polygon fills. Graphics functions are optimized further by faster hardware cursor operations, which offloads the CPU. The graphics engine also supports 256 Raster Operations (ROPs) for 8 and 16-bit per pixel (HiColor) as well as 24-bit true color graphic modes. These advanced functions combine to allow performance increases up to five times greater than Super VGA designs, providing outstanding acceleration in graphic intensive environments such as Microsoft Windows.

Highly Integrated Design

The 3DImàge9753's highly integrated design offers a "no-TTL" solution for simple, efficient, cost effective high performance graphics subsystem design for PCI bus systems. The integrated 24-bit True Color DAC, 170 MHz programmable clock synthesizer, read cache, and command FIFO reduce system cost while optimizing memory bandwidth for maximum graphics performance.

A complete graphics subsystem solution is effected simply by adding DRAM. The 3DImàge9753 also includes a fully integrated GUI/video accelerator with video capture capability. TTL support is not required for the bus or display memory interface, and a single line EEPROM interface allows easy graphic system configuration.

Flexible Memory Interface

Support for SGRAM and EDO (Extended Data Out) DRAM improves system performance by offering CPU access to the display memory at maximum bus bandwidth. The 3DImàge9753 offers a display memory configuration from 1MB to 4MB and supports a range of DRAM configurations from 256Kx4 to 256Kx32. A 64-bit memory bus interface and programmable DRAM timing provides a flexible interface that maximizes timing for increased performance. Additionally, a nominal DRAM interface requirement of two 256Kx16 DRAM's for 1024x768-256 color SVGA minimizes chip count, system cost, and board space for cost-effective design solutions. The display memory interface also supports symmetrical or asymmetrical configuration and Dual CAS/Dual WE DRAM configuration.

TrueVideo® Scaling Support

The 3DImàge9753 implements Trident's highest quality video scalar utilizing the patented TrueVideo® technology. When scaling real time video, the 3DImàge9753 performs horizontal and vertical interpolation (employing line buffers and programmable tap filters) as well as the proprietary Trident Edge Recovery Technology (TERT) on the video stream. The scaled values will have the highest quality with smoothed edges.

Windows 95 DirectDraw / DirectVideo Accelerator

According to Microsoft, the vision of DirectDraw is to enable world class games on a Windows 95 class PC. The application need only pay attention to some basic device dependencies that are quite standard across hardware implementations. DirectDraw is a memory manager for video memory. Using DirectDraw, an application should be able to manipulate display memory easily, taking full advantage of the BLTing capabilities of different types of video hardware without becoming dependent on a particular piece of hardware. The 3DImàge9753 implements several features which accelerate DirectDraw functions:

1. Color keys of source/destination for transparent BLT
2. Sprites for game acceleration
3. Double buffering and page flipping for anti-tearing
4. PCI bus mastering support

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5. YUV planar support

Color key allows for the selection of a destination pixel or group of pixels which will be overwritten during a BitBLT operation. Only the destination pixels which contain the specified color will be overwritten. Color key also allows for the selection of a source pixel or group of pixels which will not be written during a BitBLT operation if they contain the specified color. DirectDraw allows for off-screen patterns to be stored linearly. These patterns (or sprites) are defined by stride (width) and height. The freedom to allow software to define off-screen patterns arbitrarily will facilitate and accelerate applications using animation.

The double buffering (for page flipping) feature can be best explained by assuming there are two graphic storage areas, A and B. Via the memory bus, graphic stream A or B is sent to the display queue in the controller. When the graphic engine is updating graphics area A, the CRTC is displaying area B without being affected by new data being overwritten. When the graphics engine finishes, it will start to update area B and the CRTC will display area A. This eliminates a tearing effect which occurs when the next frame in an animation sequence is being written into the same memory of the previous frame, which is currently being displayed on the CRT.

DirectVideo is a Win95 API function which calls DirectDraw functions for displaying real time motion video in a window. DirectVideo acceleration is achieved by using the on-chip color space converter, TrueVideo® scaler, and overlay control.

Direct3D Acceleration

Designing a low cost system, which also supports Direct3D applications, requires the proper balancing of the CPU power and that of the graphics accelerator. The 3DImàge9753 has advanced features which accelerate 3D software applications by using today's mainstream CPU's, such as the Pentium 166 MHz and the 200 MHz MMX. The processor performs 3D geometry transformation, Z-buffering, lighting and texture mapping within a 320x240 resolution using Direct3D ramp format, while the 3DImàge9753's frame stretch feature is used to scale the image into a 640x480 or higher resolution. Employing Trident's TrueVideo® horizontal and vertical scaling with edge smoothing results in a high quality 3D image. The 3DImàge9753's PCI bus mastering feature further improves performance by BLTing the rendered image from the system memory to the frame buffer.

Direct Interface to MPEG and Video Decoders (VMI)

The 3DImàge9753 has a built in video capture port which supports direct connection to many MPEG and Video decoders such as the C-Cube CL450/480, SGS 3400/3500, Philips 7110/7111/7112, and the Brooktree

BT819/817/829. The Video Module Interface (VMI) allows for MPEG compressed data to be transferred to the MPEG decoder through the 3DImàge9753. The decompressed MPEG data is then transferred back to the graphics controller through the VMI port for real-time display in a window. Input data format can be either YUV 4:2:2, YUV 4:1:1, or YUV 12 (planar) and is placed in the video memory before conversion to RGB to conserve memory usage. Once the data is in display memory it can be displayed in a window though the on-chip color space converter and scalar or read back to system memory for storage in a file. The incoming video path to the display memory can be through the hardware video port or through the PCI bus.

Dual Hardware Video Windows for Videoconferencing

The 3DImàge9753 can simultaneously display two live video windows. This is most effective in Videoconferencing for displaying a local and a remote video stream. The local video stream allows the individual (or group) to position themselves correctly in front of the camera while the remote windows allows for displaying the video stream from the second party on the call.

In the 3DImàge9753, these two windows are fully scaleable and independent of each other. Either window can be overlaid on top of the other or overlaid with graphics. The local window video stream can come from a camera interface over the Video Port. This data is sent to the video 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 stored in separate section of video memory before going through the CSC and scaler for display on the CRT.

Vertical Blank Interval (VBI)

A new industry standard is emerging for the transmission of non video data over the TV broadcast signal during the dead time called vertical blanking. The 3DImàge9753 has the ability to take the entire video stream over the video port, sending the video stream to the display memory for display within a window, while stripping the VBI data from the video stream and sending this data to the CPU for processing.

Enhanced Display Capability

Display enhancements dramatically improve CRT resolution, providing sharp high color images. These enhancements include support of non-interlaced 1600x1200-256, 1280x1024-64K, 1024x768-16M, 1024x768-16M, 800x600-16M, or 640x480-16M color. Extended text modes of 80/132 columns by 25/30/43/60

rows provide an extended graphics area, frequently used in many spreadsheet and database applications. The 3DImàge9753 also allows panning and zooming to support virtual desktop. In addition, extended graphics and text modes are supported by software applications drivers that provide a "ready-to-go" solution, minimizing the need for additional driver development.

"Green PC" Power Management

The 3DImàge9753 supports VESA Display Power Management Signaling (DPMS), which decreases energy consumption when the device is in a temporary idle state. VESA DPMS power-down states (ready, standby, suspend, and off) specify HSYNC, VSYNC, clock, and DAC operation through DPMS utility software supplied by Trident.

Compatibility

The 3DImàge9753 is fully compliant with the PCI Rev. 2.1 specifications and also supports VESA DDC and VAFC. The 3DImàge9753 is 100% IBM VGA compatible at the BIOS, register, and hardware level, allowing full compatibility with virtually any VGA application software and monitor. Additionally, the 3DImàge9753 features a 208-pin package with optimized pin assignment for efficient PCB layout. During startup, pin scan testing and signature analyses are performed to verify interface connections and to ensure correct system functionality.

Contact your local Trident representative for:
- Technical Reference Manuals
- Software Programmer's Guides
- Evaluation Kits (Documentation plus evaluation board and software)

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