



## TGUI9440™ GUI Accelerator

### Features

#### Complete Hardware Compatibility

- Third pin-to-pin compatible member of the TGUI94XX family
- PCI rev 2 and VL Bus 2.0 compliant
- Supports VESA® DDC and VAFC standards
- 100% IBM® VGA compatible on BIOS, register, and hardware level
- 208-pin PQFP package

#### Accelerated Graphics Functions

- Optimized graphic functions for: BitBLTs, line drawing, short stroke vectors, rectangle fills, and text transfer
- 256 Raster Operations (ROPs) for 8-bits per pixel (PseudoColor) and 15-/16-bits per pixel (HiColor) graphic modes
- Accelerated color expansion modes
- Internal hardware cursor (64x64x2 or 32x32x2)

#### Extended Display Resolution

- High resolution non-interlaced display through 1280x1024-256, 1024x768-256, 1024x768-64K, 800x600-64K colors, or 640x480-16M colors
- Extended text modes (80 or 132 columns by 25, 30, 43, or 60 rows)

#### Advanced Multimedia Support

- VESA Advanced Feature Connector (VAFC) Port for high bandwidth video overlay on graphics
- Palette snooping

#### Improved Manufacturability

- Pin scan testing
- Signature analysis

#### Highly Integrated Design

- Fully integrated 24-bit TrueColor DAC with color look-up table, 108 MHz programmable clock synthesizer, 100% IBM compatible VGA core, and GUI accelerator
- 256x18 color look-up table with HiColor and TrueColor bypass mode support, dual loop memory, and video clock
- Two wire interface to EEPROM or VESA DDC

#### Simple Bus Interface Support

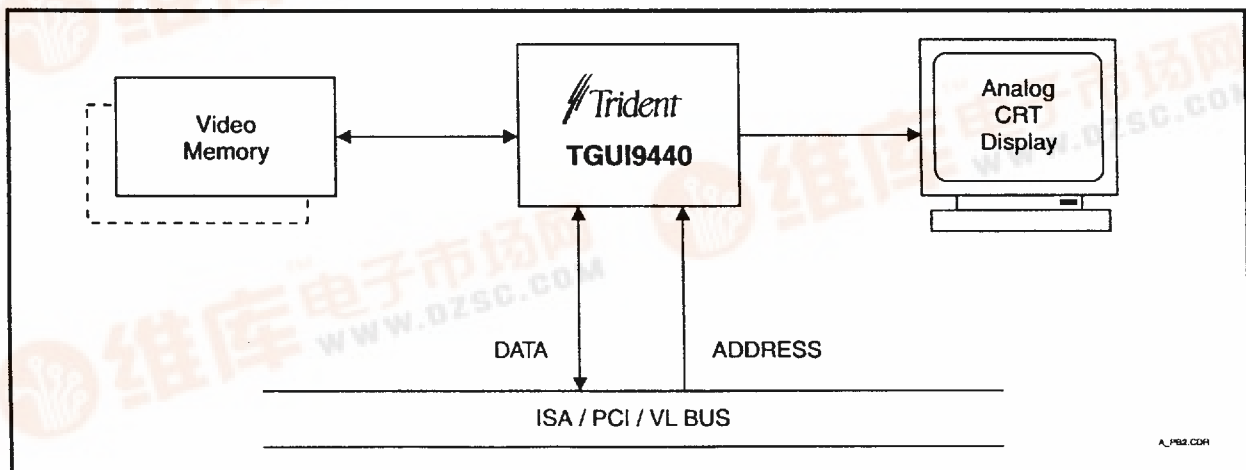
- Flexible Bus Interface Unit supports 16-bit ISA Bus interface and 32-bit “glueless” connection to VESA Local Bus (VL Bus) or PCI Bus with no additional TTL
- Linear display memory addressing
- Zero-wait state host write buffer and read cache
- PCI Burst mode support

#### “Deep Green PC” Power Management

- VESA Display Power Management Signaling (DPMS) compatible
- RAMDAC power-down and clock idle interface
- Support for graphics system shutdown

#### Flexible Display Memory Interface

- 1/2 MB, 1 MB, or 2 MB display memory configuration with memory densities of 256Kx4, 256Kx8, and 256Kx16
- Requires only one 256Kx16 DRAM for 1024x768-16 color SVGA solution
- 32-bit memory bus interface with programmable DRAM timing
- Supports DRAM or EDO DRAM



TGUI9440 Application Diagram

## Overview

The TGUI9440 Graphic User Interface (GUI) Accelerator is a highly integrated, DRAM-based, graphic CRT controller for 32-bit VL Bus, PCI Bus, and ISA Bus interfaces. It provides a flexible, low cost, high performance solution for a diverse range of color depth, CRT resolution, and display memory configurations. The TGUI9440's highly innovative system design and full acceleration graphics engine dramatically improves GUI functions and significantly enhances overall system operation. Pin-to-pin compatibility with Trident's TGUI9400CXi and TGUI9420DGi GUI Accelerators provides OEM board manufacturers an easy upgrade path for future product development. Plus, advanced system features such as VAFC DAC interface, Display Power Management Signaling (DPMS), 24-bit TrueColor DAC, dual clock synthesizer, minimal DRAM configuration, and extended color and text modes allow operation at peak performance levels. The TGUI9440 also supports standard BIOS for VESA modes, VESA palette snooping, and programmable DRAM timing. Additionally, its highly integrated design allows easy hardware connection for efficient development of high performance, integrated video subsystems. The 208-pin package and "glue-less" interface makes the TGUI9440 well suited for motherboard applications and high-level add-on-cards. The TGUI9440's enhanced feature set and flexible system configuration can be tailored for a wide range of design applications, making it an ideal solution for mid-range PCs running Microsoft Windows™, Windows NT™, IBM OS/2™, and similar operating systems.

## Accelerated Graphics Functions

The TGUI9440'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. Graphic functions are optimized further by faster hardware cursor operation (64x64x2 or 32x32x2 pixel image), which offloads the CPU for other data manipulation jobs. The graphics engine also supports 256 Raster Operations (ROPs) for 8, and 16-bit per pixel (HiColor) graphic modes. These advanced functions combine to allow performance increases up to five times greater than Super VGA designs, providing outstanding graphics acceleration in graphic intensive environments such as Microsoft Windows.

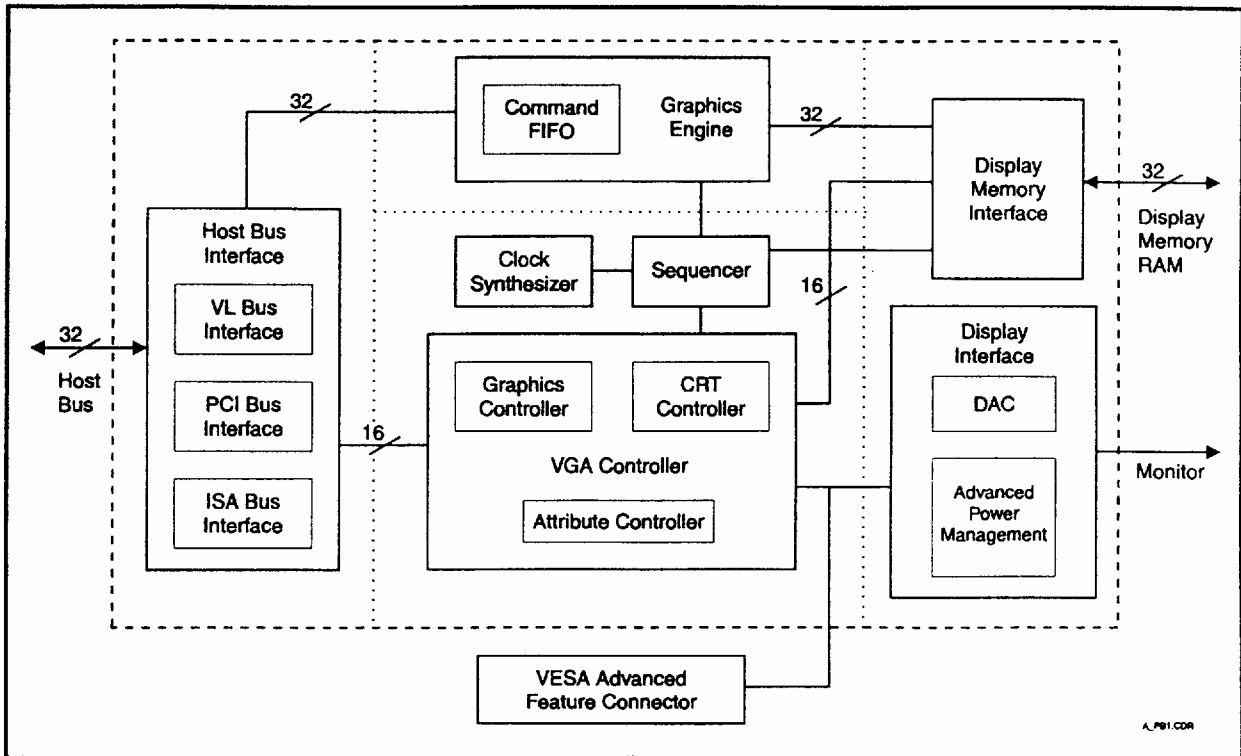
## Enhanced Display Capability

Display enhancements dramatically improve CRT resolution, providing sharp, high color, images. These enhancements include support of 1280x1024-256, 1024x768-256, 1024x768-32K, 800x600-64k, or 640x480-16M colors for "full spectrum" color. Extended text modes of 8/132 columns by 25/30/43/60 rows provide an extended graphics area frequently used in many spreadsheet and database applications. VESA Display Data Channel (DDC) also allows panning and zooming to support virtual desktops. In addition, extended graphics and text modes are supported by software application drivers that provide a "ready-to-go" solution minimizing the need for additional driver development. The TGUI9440 supports the following applications:

Microsoft Windows	Ventura Publisher™
Wordstar™	Microsoft NT
Autoshade™	CADKEY™
OS/2	Lotus™
FrameMaker™	AutoCAD™
P-CAD™	Quattro-Pro™
Microsoft Word™	VersaCAD™
Symphony™	WordPerfect™
SCO X-Windows™	

## Highly Integrated Design

The TGUI9440's highly integrated design offers "no-TTL" solution for simple, efficient, cost-effective high performance graphic subsystem designs for the IBM PC and compatible systems. The integrated 24-bit TrueColor DAC, 108 MHz programmable clock synthesizer, read cache, and command FIFO reduces system cost while optimizing memory bandwidth for maximum graphics performance. When combined with the integrated data bus transceivers, the integrated clock synthesizer and DAC provide a complete video subsystem solution simply by adding only DRAM. The TGUI9440 also includes a fully integrated GUI accelerator, 256x18 color look-up table HiColor and TrueColor bypass mode support, dual loop memory, and video clock. No TTL support is needed for system bus or display memory interface, and a single line EEPROM interface allows easy graphics system configuration.


**TGUI9440 Block Diagram**

### Optimized System Features

Compared with other devices in its class, the TGUI9440 offers many advanced features that optimize overall system operation. Linear display memory addressing, zero-wait state host write buffer, and read cache increase operating speeds and contribute to peak performance levels. Also, pin scan testing and signature analysis perform system level test operations upon startup to verify interface connections to ensure correct system functionality. Graphics system throughput is further enhanced by a command FIFO, allowing maximum bus transfer speed for applications such as Windows or AutoCAD that directly access video memory.

### Advanced Multimedia Support with VAFC DAC

A built-in VESA Advanced Feature Connector (VAFC) Port interfaces with the internal DAC to support high speed and high bandwidth video overlay on graphics or graphics output to video. This feature reduces the footprint for video subsystem design and

provides a very economical solution for combining video and graphics in the same system. The TGUI9440 also supports palette snooping, ideal for multimedia applications.

### Complete System Bus Support

A flexible Bus Interface Unit (BIU) provides a low cost, single chip solution for IBM PC or compatibles on VL, PCI, and ISA Bus systems. The TGUI9440's BIU supports a 16-bit ISA Bus interface and 32-bit VESA Local Bus (VL Bus) or PCI Bus interfaces. Combined with "glue-less" connections, the BIU allows an efficient design path for quick and easy integration to future generation PCs. The TGUI9440 supports VL 2.0 Bus speeds up to 50 MHz, PCI 2.0 Bus speeds up to 33 MHz, and ISA Bus speeds up to 12 MHz.



### “Green PC” Power Management

The TGUI9440 supports VESA Display Power Management Signaling (DPMS), which decreases monitor power consumption after a predetermined timeout period. “Deep Green PC” goes beyond the conventional VESA DPMS specification. VESA DPMS power-down states (ready, standby, suspend, and off) specify HSYNC and VSYNC signals to control the monitor power-down state. All power management functions are regulated using DMCLK, VMCLK, and RAMDAC control registers.

BIOS extensions can automatically turn off the RAMDAC and reduce clocks when DPMS power-down states are activated since the display no longer needs analog RGB signals. In addition, all registers in the TGUI9440 offer read/write access allowing the complete shutdown of the graphics subsystem.

### Flexible Display Memory Interface

The TGUI9440 offers display memory configurations from 1/2 MB to 2 MB and supports a range of DRAM configurations from 256Kx4 to 512Kx16. A 32-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 one 256Kx16 DRAM for 1024x768-16 color SVGA minimizes chip count, system cost, and board space for cost-effective design solution. The display memory interface also supports symmetrical or asymmetrical configuration and Dual CAS/Dual WE DRAM configuration. Plus, a conventional “Fast Page” mode or “Fast Page mode with Extended Data Out” DRAM feature improves system performance by offering CPU access to the display memory at maximum bus bandwidth.

### Pin Compatible

The TGUI9440 extends the range of the TGUI9420DGi, and TGUI9400CXi product family by offering a low-cost, pin-compatible upgrade path with increasing performance levels. It is fully compliant with the PCI Rev. 2 and the VL Bus 2.0 specifications and also supports VESA DDC, VAFC, and simplified DRAM interface interconnection. The TGUI9440 is 100% IBM VGA compatible on BIOS, register, and hardware level, allowing full compatibility with virtually any VGA application software. Additionally, the TGUI9440 features a 208-pin PQFP package with optimized pin assignment for efficient PCB layout.

Contact your local Trident representative for:

- Technical Reference Manuals
- Evaluation Kits: Includes documentation plus evaluation board and software
- Reference Design Kits: Includes full documentation and software license for drivers to immediately enter production



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