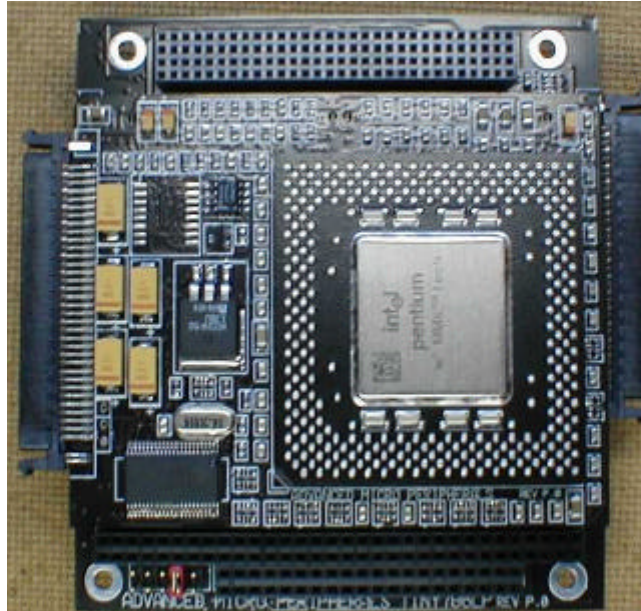


Tiny786LP PC/104 Low Power Pentium Computer



General Description

The **Tiny786LP** is a highly integrated, cost-effective and ACPI compliant low power Pentium-class computer on a standard 3.6in x 3.8in PC/104 footprint. The Tiny786LP series are 100% compatible with MSDOS, Windows 3.x, Windows95/98/NT/CE, Linux and a wide range of RTOS such as PharLap, QNX, pSOS, etc. In addition to standard peripheral controllers for disks, Keyboard and Mouse, and serial ports, the Tiny786LP features **Fast Ethernet** Controller capable of operating at 10M and 100Mbits/sec. The high performance **AGP Display** Controller provides hardware assists for **DVD** and software **MPEG** playback to CRT and Flat Panels. The built-in FlashDisk option provides total Hard Disk emulation using M-Systems Disk-on-Chip (DOC). The Tiny786LP provides extensive power management support in compliance with the ACPI specifications.

Features

- 100% PC-AT compatible
- Pentium-class processors to 500MHz
- 100MHz bus speed
- 16 - 128 MBytes DRAM
- 4 - 144 MBytes DOC FlashDisk
- 10/100MBit Ethernet
- 8MBytes AGP Display Controller
- EIDE and USB ports
- Low Power ACPI compliant
- PC/104+ and PC/104 Expansion
- Available in Extended Temperature
- Standard 3.6in x 3.8in PC/104 form factor

Applications

- Medical Instrumentation
- Mobile Entertainment Systems
- Point-of-sale and Kiosk Applications
- Portable Test Equipment
- Rugged Harsh Environment Applications
- Industrial Automation
- Thin Server/Client Applications
- Embedded Internet/Intranet Appliance
- Windows95/98/CE/2000 support



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| | |
|----------------------------------|---|
| Processors | Pentium and Super Socket7 CPUs at up to 500MHz Host Bus speeds up to 100MHz 3.3V and Low Power 2.5V Host Bus Operation |
| Memory | DRAM 16 -128MBytes SDRAM FlashROM 512KBytes (for BIOS) EEPROM 1KBytes (for CMOS Backup and System Configuration) |
| Standard Peripherals | |
| Serial Ports | 1 RS232 port with FIFO at 230.4KBaud 1 RS232/422 port with FIFO at 230.4KBaud |
| Disk/CD-ROM | Supports Ultra-DMA Hard Disk, CDROM/DVD drive |
| KeyB/Mouse | Supports PC Keyboard and PS2 Mouse |
| Extended Peripherals | |
| Graphics | High performance AGP Controller for CRT and Flat Panel Up to 8MBytes Display buffer 640x480 up to 1280x1024 CRT resolution 800x600 up to 1024x768 LCD resolution Double-headed Display Capability (picture on CRT can be different from Flat Panel) |
| FlashDisk Supports | 4 to 144MBytes Disk-on-Chip FlashDisk |
| Network | 10/100MBit PCI Ethernet Controller |
| USB | 1 on-board USB port PCI bus-mastering USB Hub Controller Fully compliant with OpenHCI standard |
| Watchdog | Software programmable Watchdog timer |
| Enhanced Power Management | ACPI compliant Dynamic Clock Stop Power On Suspend Suspend to DRAM Suspend to Disk |
| Internal Power Supply | 3 High Efficiency DC/DC for CPU Core, Host Bus, Memory |
| Expansion | PC/104 Standard 16-bit stackable PC/104 bus PC/104 Plus 32-bit stackable embedded PCI bus 132MBytes/sec data bandwidth |
| Physical | Size 3.6in x 3.8in PC/104 format Temperature 0 to 60degC operating (-40 to 85degC option) -40 to 95degC storage |
| Rel. Humidity | 5% to 95% non-condensing (optional conformal coating) |
| Power | Less than 7W with 166MHz CPU+16MBytes DRAM Single +5V DC regulated power |
| MTBF | Greater than 150,000 Hours MIL-HDBK-217 at 25degC |



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This section provides additional details on the Multimedia enhancements of the Tiny786LP Computer.

Tiny786LP Graphics and Video capabilities

· General Graphic Capabilities

- 64-bit Single Cycle 2D/3D Graphics Engine
- Supports 2 to 8 Mbytes of Frame Buffer located in System Memory
- Real Time DVD MPEG-2 Playback
- Video Processor
- Extended Screen Resolutions up to 1600x1200
- Extended Text Modes 80 or 132 columns by 25/30/43/60 rows
- DirectX 6 and OpenGL ICD API
- 1/16 sub-pixel positioning

Rendering Engine

- High performance single pass execution
- Diffused and specula lighting
- Gouraud and flat shading
- Anti-aliasing including edge, scene, and super-sampling
- OpenGL compliant blending for fog and depth-cueing
- 16-bit Z-buffer
- 8/16/32 bit per pixel colour formats

Texturing Engine- Multiple buffering and page flipping

Setup Engine

- 32-bit IEEE floating point input data
- High Performance rCADE3D™ Accelerator
- 32 entry command queue, 32 entry data queue
- 4Kbyte texture cache with over 90% hit rates
- Pipelined Setup/Texturing/Rendering Engines
- DirectDraw™ acceleration
- Slope and vertex calculations
- Back facing triangle culling

- D3D compressed texture formats DXT1 and DXT2
- Anisotropic texture filtering
- 1/2/4/8-bits per pixel compact palletized textures
- 16/32-bits per pixel quality non-palletized textures
- Pallet formats in ARGB 565, 1555, or 444
- Tri-linear, bi-linear, and point-sampled filtering
- Mip-mapping with multiple (Level-of-Detail) LOD calculation and perspective correction
- Colour keying for translucency



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2D GUI Engine

- 8/15/16/24/32-bits per pixel colour formats
- 256 Raster Operations (ROPs)
- Accelerated drawing: BitBLTs, lines, polygons, fills, patterns, clipping, bit masking
- Panning, scrolling, clipping, colour expansion, sprites
- 32x32 and 64x64 Hardware Cursor
- DOS graphics and text modes

· DVD

- Hardware-Assisted MPEG-2 Architecture for DVD playback
- Simultaneous motion compensation and front-end processing (decryption and decode)
- Supports full DVD 1.0, VCD 2.0 and CD-Karaoke
- Microsoft DirectShow 2.x native support, backward compatible to MCI
- No additional frame buffer requirements
- Dynamic frame and field de-interlace filtering for high quality playback on VGA monitors
- Tamper-proof software CSS implementation
- Freeze, Fast-Forward, Slow Motion, Reverse
- Pan-and-Scan support for 16:9 sequence

· Video Processor

- On-chip Colour Space Converter (CSC)
- Anti-tearing via two frame buffer based capture surfaces
- Minifier for video stream compression and filtering
- Horizontal/vertical interpolation with edge recovery
- Dual frame buffer apertures for independent memory access for graphics and video
- Vertical Blank Interval for Intercast™
- Overlay differing video and graphic colour depths
- Two scalers and Colour Space Converters (CSC) for independent windows

· Digital Flat Panel (DFP) Interface

- 85MHz DFP interface supports wide range of Flat Panels
- Both STN and TFT technologies at up to 1024x768 panels
- Allows external TMDS transmitter for advanced panel interfaces



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Tiny786LP Graphics Controller Overview

The Tiny786LP on-board Graphics Controller is a highly integrated display control device that incorporates a 64-bit 3D/2D graphic engine and video accelerator with advanced DVD video and optional TV output capability. It provides a flexible and high performance solution for graphics and video playback acceleration for various colour depth and resolution modes.

Capability Overview

The Tiny786LP on-board Graphics Controller is a fully integrated CRT and TV 64-bit 2D/3D Accelerator. The high performance graphics engine offers high speed 3D image processing in full compliance and compatibility with IBM® VGA and VESA™ extended VGA.

As an integrated controller, it provides unprecedented cost and performance advantages by eliminating the need for an external frame buffer while at the same time gaining local access to a larger amount of memory.

The Tiny786LP Graphics Controller supports all key 3D rendering operations, including: Gouraud shading for smooth object surfaces, texture mapping for realistic object textures, 16-bit hardware Z-buffering for fast 3D depth calculations, and Alpha Blending for transparency effects.

The Tiny786LP features a tightly-coupled full AGP implementation internally maintaining compatibility with existing software and programming models and at the same providing unprecedent 2D/3D garphics bandwidth and performance.

To meet the requirements of a PC98 graphics adapter in a multimedia PC, the Tiny786LP Graphics Controller supports planar video format for MPEG-1, MPEG-2, and DVD-video playback. The dual video playback facility is capable of overlaying windows for videoconferencing and multimedia displays on CRT, TV and Flat Panel Display.

The Tiny786LP provides advanced features such as colour space conversion, dual video windows, dual-view display, a 24-bit True Colour DAC, and dual clock synthesizers to achieve peak performance levels.

The Tiny786LP on-board Graphics Controller is capable of supporting two simultaneous displays:

CRT (analogue monitor) and Flat Panel (digital monitor), each with a different “window” or desktop.

Graphics Display System Capabilities

The Tiny786LP Graphics Controller’s main system features include:

- High Performance single cycle GUI
- Highly Integrated RAMDAC™ and Triple Clock Synthesizer
- Full Feature High Performance 3D Graphics Engine
- High speed internal AGP Bus Mastering data bus supporting DVD video playback & 3D
- Hardware implementation of motion compensation
- Dual Video Windows for Videoconferencing



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- TrueVideo Processor
- DirectDraw and DirectVideo Hardware Support
- Versatile Motion Video Capture/Overlay/Playback Support
- Flexible Frame Buffer Memory Interface
- Advanced Power Management Features
- PC98 Hardware Support

High Performance 64-bit 2D GUI

The 64-bit graphics engine of the Tiny786LP Graphics Controller significantly improves graphics performance through specialized hardware that accelerates the most frequently used GUI operations and matches the high-speed requirements of CPUs.

Functions directly supported in hardware include: BitBLTs, image and text transfer, line draw, short stroke vector draw, rectangle fills, and clipping. The graphics engine supports 256 Raster Operations (ROPs) for up to 32-bit packed pixel graphic modes. The ROP3 Processor in the Tiny786LP Graphics Controller is able to perform Boolean functions which allow many additional operations, including transparency, pattern masking, colour expansion alignment, and pattern enhancement.

Additionally, the graphics engine features linear display memory addressing (up to 4GB memory space), accelerated colour expansion modes for graphics text procession, and memory-mapped I/O registers on the graphics engine for faster access time.

Graphic functions are optimized by a 64-bit internal data bus and a four-colour hardware cursor/pop-up icon, operating up to a 128x128x2 pixel image, which offloads the CPU.

The hardware cursor mechanism can also be used to display patterns stored in the system memory. This pop-up icon is very useful to display user friendly information instantly through simple hot key operations. This advanced function combination allows significant performance increases over standard Super VGA designs and provides outstanding graphics acceleration on GUIs, such as Microsoft Windows 95/98/2000 .

Full Feature High Performance 3D Engine

The Tiny786LP Graphics Controller is equipped with an advanced Graphics Drawing, Single Cycle 3D Graphics Engine that performs premium 3D functions at a high level of more than 1M triangles per second. The 3D engine supports Microsoft Direct3D.

The 3D Engine is set up to off-load the CPU from major 3D tasks including slope calculation, sub-pixel positioning, and Tri-striping. By balancing the 3D pipeline and reducing parameter passing, the Tiny786LP Graphics Controller provides very high levels of performance. The 3D engine is integrated with a triangle set-up engine that sets up triangles according to vertex input data and accomplishes various functions for 3D rendering.

Gouraud shading provides smooth shading for colours across surfaces, perspective correction and texture mapping to correct texture data based on the perspective, bi-linear texture filtering for interpolating, alpha blending .

Other features include Z-buffering (16-bit/24-bit), video texturing to overlay 2D video play-back onto 3D images, fogging to simulate weather effects, palletized texture mapping (1-, 4-, or 8-bit) for memory and bandwidth reduction, and anti-aliasing to reduce or eliminate jaggies that may have resulted from alias rendering.

The 3D engine also works with the APM system, conserving power while 3D operations are suspended.



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MPEG and DVD Playback

The Tiny786LP computer features an integrated display controller with a DVD video hardware block for motion compensation. This greatly enhances the ability to play DVD video in MPEG-2 format from disk or across Ethernet at high bandwidths with exceptionally good video quality.

Versatile Frame Buffer Interface

The Tiny786LP Graphics Controller features a versatile frame buffer interface aperture into main system memory.

Optimum performance is achieved with the single cycle memory bus interface using programmable SDRAM timing.

The internal display queue of the controller has been designed to reduce the frequency of memory bus requests, thereby optimizing memory bus efficiency for the graphic controller. In the execute mode, the Tiny786LP Graphics Controller is able to use both the dedicated graphics portion and the general portion of system memory for graphics operations. As a result, DVD and 3D rendering performance and quality are greatly enhanced.

Hi-Resolution and Hi-Refresh Display Support

Tiny786LP Graphics Controller display enhancements dramatically improve CRT resolution. These enhancements include support of non-interlaced 1280x1024x64K, 1024x768x16M, 800x600x16M, and 640x480x16M colours for “full spectrum” colour. Extended text modes of 80 or 132 columns by 25, 30, 43, or 60 rows provide an extended graphics area public information display, instrument panel and kiosk display applications. Extended graphics and text modes are supported by software drivers that provide a “ready-to-go” solution, minimizing the need for additional driver development.

A virtual screen can be created with the Tiny786LP Graphics Controller. When this function is enabled, a selected portion of a large image can be shown on a smaller display. The image can also be moved or scrolled and panned across the whole screen, either up or down.

Digital Flat Panel (DFP) Interface

The Tiny786LP DFP interface is designed to support industry standard TFT and DSTN panels directly or through an optional external plug-in TMDS transmitter module. Digital Flat Panels from all the major manufacturers are supported at display resolutions up to 1024 x768 pixels.

Complete Hardware Compatibility

The Tiny786LP Graphics Controller is 100% VGA compatible at both the BIOS and Driver level, allowing full compatibility with virtually any VGA application software.

The Tiny786LP Graphics Controller provides hardware support to DirectDraw™, offering high-speed game and multimedia graphics on Windows 95/98/2000/CE.



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High Performance Peripheral support on the Tiny786LP

A wealth of high performance I/O ports for peripheral support

· *UltraDMA-33 Master Mode PCI EIDE Controller*

- Dual channel master mode PCI supporting two Enhanced IDE devices
- Transfer rate up to 33MB/sec for PIO mode 4, and UltraDMA-33 interface
- Thirty-two levels (doublewords) of prefetch and write buffers
- Dual DMA engine for concurrent dual channel operation
- Bus master programming interface for SFF-8038i rev.1.0 and Windows-95 compliant
- Full scatter gather capability
- Support ATAPI compliant devices including DVD devices
- Support PCI native and ATA compatibility modes
- Complete software driver support

The Tiny786LP features a Master mode enhanced IDE controller port which can operate at the 33MB/sec UltraDMA Mode and provide very high performance data transport/storage solution for Multimedia applications. ATAPI and IDE devices such as disk drives, CDROMs, DVD drives can be attached to the IDE port.

· *Serial, Parallel, Floppy Disk Ports*

- Supports 2 serial ports

The Tiny786LP supports 2 standard serial ports - Com1, Com2.

Com1 is configured as RS232 and Com2 is user configurable for RS232/422/485 interfacing.

The serial ports are capable of operating at speeds in excess of 230KBits/sec.

- Multi-mode Parallel port

The parallel port supports Standard, ECP and EPP modes.

- Floppy disk controller functions

The high performance Floppy Disk Controller with internal 16 bytes of FIFO supports data rates up to 1Mbps and Perpendicular recording.

· *Universal Serial Bus Controller*

- USB v.1.1 and Intel Universal HCI v.1.1 compatible
- Eighteen level (doublewords) data FIFO with full scatter and gather capability
- Root hub and 1 function port
- Integrated physical layer transceivers with over-current detection status on USB inputs

A single fully compliant USB port is provided as standard on the Tiny786LP.



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Sophisticated PC98-Compatible Mobile Power Management

- Supports both ACPI and legacy (APM) power management
- ACPI v1.0 Compliant
- APM v1.2 Compliant
- CPU clock throttling and clock stop control for complete ACPI C0 to C3 state support
- Power Management Enable (PME) control, and PCI/CPU clock generator stop control
- Power-on suspends with flexible CPU/PCI bus reset options
- Normal, doze, sleep, suspend and conserve modes
- Support for System Wake-up by Ethernet or Modem

The Tiny786LP provides extensive support for ACPI and APM especially for battery powered applications. This intelligent management of power resource ensures the system power is utilised most efficiently.

Tiny786LP Fast Ethernet

The Tiny786LP features a Fast Ethernet Controller that provides 32-bit performance and PCI bus master capability. The Fast Ethernet interface is fully compliant with IEEE 802.3u 100Base-T specifications and IEEE 802.3x Full Duplex Flow Control.

The Fast Ethernet interface on the Tiny786LP supports both legacy 10MBit/sec network and the emerging 100Mbits/sec when operating in half-duplex mode. Data speed of 200MBit/sec is supported in full-duplex mode of operation.

Ordering Information

Tiny786LP-CPU speed-CPU type/SDRAM size-Fast LAN

CPU speed and CPU type combinations

| | |
|------|----------------------------|
| 166L | = 166MHz Low Power Pentium |
| 266L | = 266MHz Low Power Pentium |
| 266A | = 266MHz Low Power K6-2E |
| 350 | = 350MHz AMD-K6-II |
| 400 | = 400MHz AMD-K6-II |
| 450 | = 450MHz AMD-K6-II |
| 500 | = 500MHz AMD-K6-II |

Example:

Tiny786LP-266L/64-L

means 266MHz LowPower Pentium with 64MBytes SDRAM and Fast LAN.

Tiny786LP-266A/32-L

means 266MHz LowPower K6-2E with 32MBytes SDRAM and Fast LAN.