1. Introduction

The MX86250 is a new generation of fully integrated graphics and video accelerator. On a single chip, it integrates a 64-bit graphics CoProcessor, a true-color video processor, 135 MHz RAMDAC and dual programmable clock synthesizer. The MX86250 not only delivers extreme high performance in conventional GUI acceleration, it also provides very rich functionality for motion video applications. The MX86250 true color video processor allows full screen full motion playback of AVI and MPEG video from software based Codec's such as MPEG, Cinepak and Indeo. For even higher quality MPEG video playback, the MX86250 Media port supports the VMI connector linking to an external MPEG-1 decoder chip. The Media port also provides for playback and capture of live video input from TV tuner or video camera.

One key design goal of the MX86250 is to achieve the highest possible memory bandwidth in the display memory subsystem using main stream and cost effective EDO DRAM chips. By applying the RISC design technique of super pipelining", the MX86250 graphics CoProcessor can execute one bitblt operation in every clock cycle. When running at 50 Mhz and above, using -50 or faster EDO DRAM (20ns page mode cycle time), the bandwidth can reach 400 MB/sec and above. This extremely high bandwidth gives top-notch Windows GUI performance and fast frame rate in motion video playback.

For mainstream software Codec delivered video playback, the MX86250 provides video acceleration by a second generation" video processor consisting of YUV to RGB converter, scaler, and two dimensional bilinear filter. The scaler can zoom the video windows at arbitrary ratios. The bilinear filter provides both horizontal and vertical interpolation which is absent from 1st generation video chips.

For Windows 95 Games, the MX86250 supports DirectDraw with a rich set of features such as fast transparent Blts, double buffering and page flipping so that Windows 95 based games can achieve high speed sprite animation.

1.1 Features

High Performance 64 bit Graphics CoProcessor

- Uniformly accelerated graphics operations in all pixel formats : 256 color, High color and True color
- Optimized graphics engine for BitBLTs, rectangle fill, pattern fill, , line draw, color expansion, text transfer, and clipping
- Raster Operations (ROPs) with 3 operand BitBLT ALU.
- One chip 8x8x24 pattern memory achieves highest thrughput in the most common BitBLT in Windows -- the Pattern BLT
- Deep on-chip Source and Destination FIFOs for sustained burst cycles in BitBLTs
- Double buffered CoProcessor registers allows concurrent processing with CPU
- Built in Hardware cursor

Extremely high bandwidth

- *Achieves single clock* cycle DRAM access in Graphics Processor, Video Processor and Display Processor
- Provides 400 MB/sec memory bandwidth using -50 EDO DRAM chips
- Even higher performance can be achieved by using -35 EDO DRAM for 533 MB/sec bandwidth which is comparable to synchronous DRAM

Fully Integrated for Lower system cost

- Integrated 24 bit True Color RAMDAC supports 135 Mhz pixel rate and 256x18 look-up table with High Color and True color bypass mode support
- Integrated dual clock synthesizers
- Glueless PCI local bus interface
- Two wire interface to EEPROM, VESA DDC interface or I^2C channel

Flexible Display Memory configuration

- or 4 MB display memory.
- 256K x 4, 256K x 8, and 256K x 16 dual CAS or dual WE DRAM.
- Fast-page and Hyper-page EDO

Motion Video Codec Acceleration

- YUV/YCrCb conversion of industry standard YUV 4.2.2 or 2.1.1 formats
- Non-integer zoom in both X and Y direction
- Interpolation with Bi-linear filters in both Horizontal and Vertical dimensions
- Color Key supports video overlay, Chroma key supports transparency effect or blue screen video
- Edge Blending for smooth looking Blue screen video
- Video window is double buffered for smooth video playback.
- Independent video window mode allowing true-color video, independent of graphics color depth.

Windows 95 Game acceleration

- Designed to accelerate Windows 95 DirecDraw for game acceleration
- Fast Transparent BitBLT for sprite animation
- Linear access to offscreen DirectDraw surface storing multiple sprites
- Double buffer to support page flipping which is synchronized to vertical retrace

Media Port Interface to MPEG decoder chips or Video Capture frontend

- Glueless interface to VMI (Video Module Interface) connector to allow plug-in daughtercard of hardware MPEG-1 support
- Glueless interface to Phillips 7110 for live video input
- Dual aperture for simultaneous access to display memory from Graphics and Video
- Built in FIFO and flexible decimator

High speed PCI local bus

- Support zero wait state PCI burst cycles for maximum CPU write bandwidth
- Support version 2.1 PCI disconnect and retry cycles to free CPU from status polling overhead
- level command and data FIFO

Unified Memory Architecture (UMA) support

- Support VESA UMA (VUMA) standard
- Programmable wait states in DRAM access cycles to work with slower main memory DRAM chips
- DRAM interface buffers have programmable drive strength for optimal power versus performance tradeoff

Extended Display Resolution support

- 1600x1200, 64K color (int)
- 1280x1024, 64K color @ 75 Hz
- 1024x768, 16M color @ 60 Hz

"Green PC" power management

- Support VESA DPMS (Display Power Management) standard
- Built in advanced power management techniques such as internal DAC power down mode and clock idle modes

Multiple peripheral interfaces

- VESA Display Data Channel (DDC-2B) protocol support
- Two wire EEPROM interface
- I^2C channel
- VESA standard and advanced Feature Connector (VAFC) Support
- General purpose I/O pins

Complete Hardware compatibility

- Windows 95 Plug and Play compliant
- VGA Hardware, register, and BIOS compatible
- PCI revision 2.1 compatible

Low-Power 0.5 um CMOS technology

208 pin PQFP package