

# 2300E

## Embedded GPU

### Product Overview

S3 Graphics' **2300E Embedded GPU** is a small form factor (23mm x 23mm), high performance 3D graphics and video processor that provides PCI Express™ compatible hardware acceleration for Microsoft® DirectX™ 9.0c and for OpenGL 1.5 shaders. Combining HDTV Hi-Def™ display capabilities with an advanced High Definition Programmable Video Engine, the **2300E** creates images of stunning quality and supplies incredible 3D graphics performance with tremendous system level flexibility. A wide range of features targeted for embedded applications demonstrates a perfect balance of longevity, portability, performance, power, and value.

- ⇒ Long Term Supply Guarantee
- ⇒ Low Power – Fanless Operation
- ⇒ Reference Design Kit Available
- ⇒ AcceleRAM™ Support
- ⇒ Microsoft® DirectX™ 9.0c
- ⇒ DVI™ Dual-Link with HDCP™
- ⇒ HD Video and HDTV Support

#### Long Term Supply and Support

S3 Graphics guarantees longevity of supply and support for the **2300E**. In addition, the memory support available with the **2300E** allows longevity when procuring COTS (commercial off the shelf) memory devices.

#### Flexible Memory Architecture

The memory architecture allows support for modern (G)DDR2 memory up to speeds of 400 MHz, with a total local frame buffer size of up to 256MB with a 64/32-bit memory bus interface. The memory bus is flexible enough to support the most common memory types for design longevity.

#### AcceleRAM™ Technology

The **2300E** can provide an optimal feature/price alternative solution to embedded integrated graphics chipsets by allowing dynamic sharing of system main memory as part of the local video memory. This feature is enabled via the high speed PCI Express link, allowing a smaller capacity/bitwidth local video memory to reduce overall system cost.

#### PCI Express

The **2300E** employs a native PCI Express high speed serial link implementation. It supports 16x, 8x, 4x, and 1x lane configurations.

#### Fanless Operation

Advanced technologies for fanless implementations make the **2300E** especially suited for low power environments. Low Power configurations enable specific power management modes, including dynamic clock gating, clock scaling, and PCI Express power management schemes for additional power saving capabilities.

#### High Definition Programmable Video Engine

The advanced HD programmable video engine is fully compatible with Microsoft DirectX-VA media acceleration. Its powerful programmable video enhancements can be applied to almost all video codecs, including Windows Media Video 9-HD™ (WMV9-HD) and MPEG-2 HD. Post-processing filters enhance video from poor, low bit rate source materials.

#### HDTV Hi-Def Experience

The integrated HDTV Hi-Def encoder technology supports all 18 DTV ATSC and DVB standards, including 1080p. In HDTV Hi-Def mode, the **2300E** brings the theater experience into the home for home entertainment systems and set-top box (STB) media.

#### Advanced Display Technology

This advanced technology allows the capability of supporting all the leading edge display technologies; such as CRTs, single/dual DVI monitors in single/dual link mode with or without HDCP, single/dual channel LVDS panels, TVs, and HDTVs. Displays are supported for various combinations in independent DuoView™ modes and in DuoRotate™ modes.

#### DirectX 9.0c Shader Model 2.0+

**2300E** incorporates a programmable hardware architecture that supports Microsoft's DirectX 9.0c Vertex and Pixel Shaders (Shader Model 2.0+). This API allows visual and graphical applications to leverage the shader units of the **2300E** to create stunning visual effects using texture blending and filtering along with complex lighting and material effects for a great user experience.



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### Technical Specification

#### Memory Interface

- 32/64-bit memory bus
- 256/128/64 MB local video memory w/ (G)DDR2
- Peak memory bandwidth up to 6.4 GB/s @ 400MHz
- Dynamic CKE controlled power management
- Support for "termination free" low cost board designs

#### AcceleRAM Technology

- Utilize system main memory as part of the local video memory using the high speed PCI Express link
- Dynamic memory allocation based on system memory size
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#### PCI Express

- Dynamic lane (16x/8x/4x/1x) switching support for flexible speed configuration and power management options
- Compliant with PCIe Mobile Graphics Low-Power Addendum
- Independent DMA bus master to and from host memory

#### Highly Integrated Power Saving Features

- S3PowerWise™ Architecture technology with aggressive dynamic system and sub-system power minimization techniques
- Dynamic clock gating for major functional blocks
- Pulse width modulation for panel lighting control
- Fanless operation

#### Vertex Shader 2.0+ and Pixel Shader 2.0+

- 128-bit (4xFP32) vertex precision and 96-bit (4xFP24) pixel precision per clock
- Shadow Volume acceleration with two-sided stencil
- Non-power of 2 textures
- High accuracy floating point render targets for cinematic quality image rendering
- High quality advanced 16x anisotropic filtering
- High quality rotated grid full screen anti-aliasing with 4x super-sampling up to 1600x1200
- Volume and cube maps for photo-realistic reflections
- High Performance Fast Tri-Linear filtering

#### Full Precision Pixel Pipeline

- Full floating point precision ALU for single clock execution per pipeline for PS 2.0+ operations
- Unified superwide pipeline for seamless 2D/3D/Video context switching
- Optimized advanced shading dependency read pipelines
- Programmable render target blending
- Programmable depth shader

#### Small Form Factor

- Small footprint 23mm x 23mm package (0.92mm pitch)
- BGA package (532 balls)

#### High Definition Programmable Video Engine

- IDCT hardware and MPEG-2 HD Motion compensation
- Per pixel adaptive de-interlacing
- Windows Media Video 9 HD (WMV9-HD) hardware acceleration
- 4x4 programmable kernel filter video scaling
- Microsoft Video Mixing Renderer (VMR) support

#### Advanced Display Features

- Integrated Single/Dual-link DVI™ Transmitter
- HDCP™ support (requires external keystore serial EEPROM)
- Independent display support (DuoView)
- Dual channel LVDS transmitter for LCD panels up to 2048x1536
- High quality bi-linear LCD PanelSharp Expansion

#### High Performance 400MHz 10-bit CRT DAC

- 1+ billion colors (Giga-Palette)
- 2048x1536 QXGA (3.1M) display resolution capable
- Excellent INL/DNL characteristics (+/- 1 LSB)
- High precision Gamma control

#### Duo-Rotate™

- Hardware acceleration for display rotation (90°, 180°, 270°)
- Displays can be independently rotated
- Rotation acceleration for 3D, 2D, & media playback

#### Integrated Hi-Def HDTV & Standard TV Encoder

- Comprehensive support for all 18 DTV ATSC and DVB standards, including 1080p
- Component (YPbPr) output
- 4:4:4 conversion with 10 bit DAC resolution
- All NTSC/PAL standard TV output formats (S-video & composite)
- Flicker filter with programmable coefficients
- Vertical over/under-scan compensation
- Non-linear scaling: for panorama 16:9 viewing on HDTV
- Full range RGB to YUV color space conversion with Hue, Saturation, Brightness, and Contrast adjustment
- Smooth vertical over-scan compensation with programmable contraction factors

#### High Speed Video Input Port: CCIR-656, VIP port

- High speed digital video input port
- Compatibility with the latest video decoder devices

#### High Speed Digital Audio Port: I<sup>2</sup>S Bus

- High speed digital audio port
- Enables Microsoft MCE-compliant synchronized audio and video host-based capture and compression
- Compatible with A/V decoders from major vendors

