



# RAGE™ 128

## Next Generation 3D and Multimedia Accelerator

### overview

The ATI RAGE 128 is a fully integrated, 128-bit graphics and multimedia accelerator that offers leading-edge performance in all three vectors of visual computing: 3D, 2D, and video.

#### STUNNING PERFORMANCE

RAGE 128 couples an advanced 128-bit engine with ATI's new SuperScalar Rendering technology (SSR) to provide stunningly fast 2D and 3D performance. ATI's unique Twin-Cache Architecture (TCA) incorporates texture and pixel cache to increase the effective memory bandwidth for extra performance. The new Single-Pass Multi Texturing (SMT) capability enables advanced 3D effects like texturing, lighting and shading at full performance. The chip also incorporates ATI's new Concurrent Command Engine (CCE), which takes full advantage of AGP data flow techniques for unprecedented Pentium II performance.

#### THE IDEAL MULTIMEDIA PLATFORM

RAGE 128 uses integrated DVD/MPEG-2 decoding, including iDCT and motion compensation for top quality DVD with lowest CPU usage. The hardware subpicture decoder with interpolating scaler and alpha compositor provide optimal DVD subpicture quality. RAGE 128 includes an enhanced, 16-bit video port with support for both ATI Multimedia Channel (AMC) and VIP 1.1, along with support for all common HDTV formats. The RAGE 128 can be directly connected to popular video upgrades like TV output, video capture and HDTV decoder chips.



#### ADVANCED 3D FEATURES

RAGE 128 is optimized for both DX6 and OpenGL acceleration. It provides full support of Direct3D texture lighting and second-generation texture compositing. Special effects such as complete alpha blending, vertex and table-based fog, video textures, texture lighting, reflections, shadows, spotlights, bump mapping, LOD biasing, and texture morphing are available. AGP configurations can use system memory for additional textures. Hidden surface removal uses 16, 24, or 32-bit Z-buffering.

#### NEW DIRECTX 6.0 FEATURES

The RAGE 128 is ideally matched with DirectX 6.0, supporting new DirectX features such as multitexturing, stencil planes, bump mapping, vertex buffers, and direct walk of Direct3D/OpenGL vertex list.

#### 32MB FRAME BUFFER

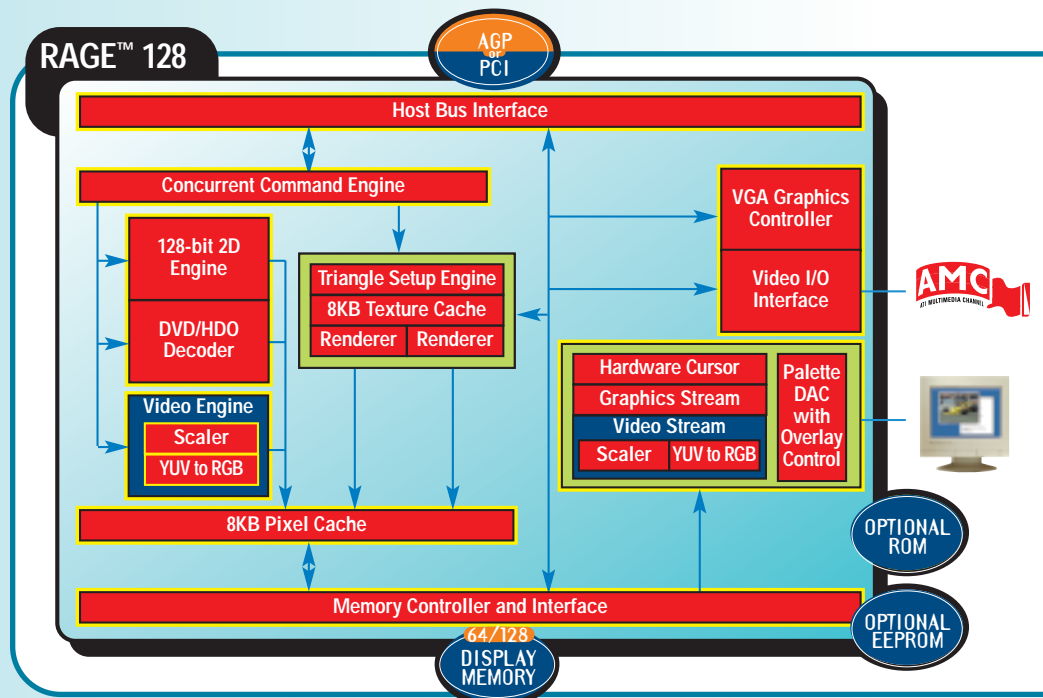
RAGE 128 includes Double Data Rate (DDR) SGRAM at up to 125 MHz on a 64-bit interface, and single data rate (SDR) memory at up to 143 MHz on a 128-bit interface, for bandwidths of up to 2.0 GB/sec.

RAGE 128 GL for OpenGL Workstations and high-end entertainment PCs

RAGE 128 VR ideal for stunning 2D & 3D performance on Mainstream PCs

First chip to support new DDR SGRAM and popular SDRAM memories

Optional support for TV-out and Video Capture, enabling "Broadcast PC" systems



# RAGE™ 128

## Next Generation 3D and Multimedia Accelerator

### GENERAL FEATURES

- Comprehensive AGP support, including 2X mode operation, Sideband Addressing, AGP Texturing (Direct Memory Execution), and support for AGP reads and writes
- 3.3V PCI version 2.1 (5V tolerant) with full bus mastering and scatter / gather support
- Fully PC 98 and PC 99 compliant
- Full ACPI and OnNow power management including PCI Power Management registers
- Bi-endian support for compliance on a variety of processor platforms
- DDC1 and DDC2B+ for plug and play monitors
- ATI's unique Twin Cache Architecture incorporates texture and pixel cache to maximize effective memory bandwidth
- CCE high speed pull architecture software interface optimized for Pentium II systems:
  - Bus mastering of 2D & 3D display lists
  - Direct walk of Direct3D/OpenGL vertex list
  - Ultra-thin driver layer
  - Maximizes concurrency between RAGE 128 and host
- Triple 8-bit palette DAC with gamma correction for true WYSIWYG color. Pixel rates of 200MHz
- Supports a variety of memory configurations for bandwidths of up to 2.0 GB/sec:
  - Single Data Rate (SDR) SGRAM or SDRAM at up to 125MHz on a 128-bit interface (2.0 GB/s)

- Double Data Rate (DDR) SGRAM at up to 125 MHz on a 64-bit interface (2.0 GB/s)
  - SDR SGRAM or SDRAM at up to 143MHz on a 64-bit interface (1.2 GB/s)
- Flexible graphics memory configurations: 2MB up to 32MB
- Supports block write feature of SGRAM
- Memory upgrade via industry standard SGRAM SO-DIMM, for reduced board area and higher memory speeds
- Multiple package options:
  - Small footprint, high integration 256 BGA ideal for motherboard designs
  - 312 BGA with 128-bit memory interface for high performance add-in boards
- Integrated hardware diagnostic tests performed automatically upon initialization
- High quality components through at-speed testing, built-in Scan, Iddq, CRC, chip diagnostics, and NAND tree
- Single chip solution in 0.25m, 2.5V CMOS technology, with multiple package options
- Comprehensive HDKs, SDKs and utilities augmented by full engineering support
- Complete local language support (contact ATI for current list).

- Monochrome Expansion, Panning/Scrolling, Scissoring, full ROP support and h/w cursor (up to 64x64x2)
- Game acceleration including support for Microsoft's DirectDraw: Double Buffering, Virtual Sprites, Transparent Blit, and Masked Blit
- Acceleration in 8/16/24/32 bpp modes.

### 3D ACCELERATION

- Enhanced 4 million triangle/s floating point set-up engine including pre-setup processor for backface culling
- Up to 3.5 million anti-aliased lines/s for CAD applications
- 8KB on-chip texture cache dramatically improves large triangle performance
- SuperScalar Rendering engine provides top 3D performance
- Complete 3D primitive support: points, lines, triangles, lists, strips and quadrilaterals and BLTs with Z compare
- Comprehensive enhanced 3D feature set:
  - Full screen or window double buffering for smooth animation
  - Hidden surface removal using 16, 24, or 32-bit Z-buffering
  - 8-bit stencil buffer
  - Line and Edge anti-aliasing
  - 4 bits of sub-pixel and sub-textel accuracy
  - Gouraud and specular shaded polygons

### 2D ACCELERATION

- Highly optimized 128-bit engine
- Hardware acceleration of Bitblt, Line Draw, Polygon / Rectangle Fill, Bit Masking,

### 2D display modes/refresh rates

	128-BIT SGRAM/SDRAM OR 64-BIT DDR SGRAM					
	256 COLORS		65k COLORS		16.7M COLORS	
	2MB	4MB	2MB	4MB	2MB	4MB
640x480	200	200	200	200	200	200
800x600	200	200	200	200	200	200
1024x768	200	200	200	—	200	200
1152x864	150	150	150	—	150	150
1280x1024	100	—	100	—	100	100
1600x1200	90	—	90	—	—	85
1920x1200	—	—	—	—	—	76

\*Based on 250 MHz DAC

### 3D display modes

FRAME BUFFER MB	SCREEN RESOLUTION PIXELSxPIXELS	COLOR DEPTH BITS/PIXEL	FRONT BUFFER MB	BACK BUFFER MB	Z BUFFER MB	Z BUFFER DEPTH BITS	LOCAL TEXTURE MEMORY W Z (MB)   W/O Z (MB)	PRIMARY USE OF CONFIGURATION
4	640x480	32	1.17	1.17	0.59	16	1.07   1.66	Mainstream Systems
4	800x600	16	0.92	0.92	0.92	16	1.25   2.17	
8	800x600	32	1.83	1.83	1.83	32	2.51   4.34	Performance Systems
8	1024x768	16	1.50	1.50	3.00	32	2.00   5.00	
8	1024x768	32	3.00	3.00	1.50	16	0.50   2.00	
8	1280x1024	16	2.50	2.50	2.50	16	0.50   3.00	Power Users / Volume CAD
16	1280x1024	32	5.00	5.00	5.00	32	1.00   6.00	
16	1600x1200	16	3.66	3.66	7.32	32	1.35   8.68	PC Workstations
32	1600x1200	32	7.32	7.32	7.32	32	10.0   17.35	
32	1920x1200	32	8.79	8.79	8.79	32	5.63   14.42	

Note: These are the primary display modes supported. Others are also available. \*AGP configurations can use system memory for additional textures

## software support

SOFTWARE SUPPORT	DOS	WIN 3.X	WIN 95	WIN 98	NT 3.51	NT 4.0	NT 5.0	MAC OS	OS/2
<b>2D SOFTWARE SUPPORT <sup>1</sup></b>									
Accelerated driver support	VESA <sup>2</sup>	•	•	•	•	•	•	•	•
<b>VIDEO SOFTWARE SUPPORT</b>									
Microsoft DirectDraw			•	•		•	•		
Microsoft ActiveMovie/ DirectShow			•	•			•		
MPEG-1 software playback			•	•		•	•		
DVD/MPEG-2 software playback			•	•			•		
QuickTime acceleration								•	
<b>3D SOFTWARE SUPPORT</b>									
Microsoft Direct3D			•	•			•		
QuickDraw 3D RAVE								•	
OpenGL ICD			3	3		•	•		
AGP			•	•		4	•		

<sup>1</sup> Additional 3rd parties (including SCO and UNIXWARE). <sup>2</sup> Direct BIOS support. <sup>3</sup> Available 2H98; <sup>4</sup> NT 4.0 Service Pack 3 supports AGP devices, but does not provide support for AGP Texturing

- Perspective correct mip-mapped texturing with chroma-key support
- Single tick bilinear and trilinear texture filtering
- Full support of Direct3D texture lighting
- Second generation texture compositing
- Special effects such as complete alpha blending, vertex and table-based fog, video textures, texture lighting, reflections, shadows, spotlights, bump mapping, LOD biasing and texture morphing
- Dithering support in 16bpp for near 24bpp quality in less memory

- Extensive 3D mode support:
  - Draw in RGBA32, RGBA16, & RGB16
  - Texture map modes: RGBA32, RGBA16, RGB16, RGB8, ARGB4444, YUV444
  - Compressed texture modes: YUV422, CLUT4 (C14), CLUT8 (C18)

## MOTION VIDEO ACCELERATION

- Smooth video scaling and enhanced YUV to RGB color space conversion for full-screen / full-speed video playback
- Front and back end scalers plus capture port scaler support multi-stream video for video conferencing and other applications
- 4-tap filtered upscaling in both horizontal and vertical directions and filtered downscaling give top quality playback

- Enhanced line buffer allows vertical filtering of native MPEG-2 size (720x480) and HDTV images
- Integrated DVD / MPEG-2 decode including iDCT and motion compensation for top quality DVD with lowest CPU usage
- Hardware subpicture decoder with interpolating scaler and alpha compositor provide optimal DVD subpicture quality
- Special filter circuitry eliminates video artifacts caused by displaying interlaced video on non-interlaced displays
- Bi-directional bus mastering engine with full YUV planar mode support for superior MPEG-2 and video conferencing
- Hardware mirroring for flipping video images in video conferencing systems
- Supports graphics and video keying for effective overlay of video and graphics

- Ability to genlock to any video signal eliminates synchronization problems
- YUV to RGB color space converter with support for both packed and planar YUV:
  - YUV422, YUV410, YUV420
  - RGB32, RGB16/15

## VIDEO PORT

- Support for both VIP 1.1 and AMC (ATI Multimedia Channel) allowing direct connection to popular video upgrades such as:
  - Hardware MPEG-2 / DVD player
  - Digital Broadcast Satellite receiver
- Enhanced 16-bit video port allows support for all proposed HDTV formats
- Dual video ports allow simultaneous input of two streams.

# other ATI components

## IMPACTV2

High Quality NTSC/PAL Encoder with Macrovision support

## RAGE IIC

Integrated 3D, Video, and 2D Accelerator with optional AGP support

## RAGE PRO TURBO

3D, Video, and 2D Accelerator with AGP 2X support

## RAGE LT PRO

3D, Video, and 2D Accelerator with AGP 2X and Digital Flat Panel support

## ATI-264VT4

Low cost Video and 2D Accelerator

## OPTIONAL COMPANION CHIPS

- ImpacTV2:
  - NTSC/PAL encoder
  - Meets or exceeds all PC 98 and PC 99 requirements for TV out
  - Incorporates support for the Macrovision 7.01 analog copy protection standard
  - Programmable flicker filter uses up to 6 taps for optimum image quality
- Supports external NTSC/PAL/SECAM decoder including support for InterCast and Closed Caption decoding
- May be designed as a population option, allowing maximum flexibility.

## SOFTWARE FEATURES

- Register-compatible with VGA standards, BIOS-compatible with VESA Super VGA
- Full Open Firmware (IEEE 1275) support
- Supports corporate manageability requirements such as DMI
- 'Instantly Available' support
- Fully implements Write Combining for maximum performance on processors that support this feature, such as Pentium Pro and Pentium II
- Full-featured, yet simple Windows utilities:
  - ATI DeskTop supports panning and scrolling across a virtual workspace
  - Calibration utility for WYSIWYG color
- SGI level III OpenGL licensee
- Drivers meet Microsoft's rigorous WHQL criteria and are suitable for systems with the "Designed for Windows NT and Windows 98" logo

## THE RAGE 128 FAMILY

The ATI RAGE 128 is available in two variants to give customers maximum flexibility. Both variants share the same powerful architecture, and support all generic RAGE 128 features, including a 128-bit engine, complete 3D setup, and comprehensive AGP 2X support.

### RAGE 128 GL

The high performance RAGE 128 implementation, incorporating a 128-bit memory interface with support for SGRAM at speeds of up to 125 MHz. Available in a 312-pin BGA package, this part is the time to market solution for high-end systems.

### RAGE 128 VR

The mainstream RAGE 128 implementation, incorporating a 64-bit memory interface with support for single data rate (SDR) SGRAM at up to 143 MHz and double data rate (DDR) SGRAM at up to 125MHz. Available in a small footprint 256-pin BGA package, this part is ideal for motherboard implementations, and will allow equivalent performance to the RAGE 128 GL when coupled with DDR SGRAM. This device is pin compatible with a variant of the RAGE PRO TURBO, allowing a single motherboard to address both mainstream and performance segments.

## PART NUMBERS

RAGE 128 GL 215R4GASAx  
RAGE 128 VR 215R4BASAx



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