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Winner

ET6000™

ET6000 Graphics and Multimedia Engine Data Sheet

GRAPHICS BY
TSENG
L A B S

ET6000™ Features

- A single 208- SVGA graphics controller with a powerful graphics accelerator.

- Integrated 135Mhz VGA-compatible 24-bit LUT-DAC and dual frequency clock generator

- Full control of power-down for internal clocks and palette RAM.

- Displays resolutions up to 1280x1024.

- Displays colors up to 16.8 million.

- Greater than 100Hz vertical refresh.

- Support for revolutionary Mulitbank™ DRAM (MDRAM).

- PCI2.1 Compatible I/O bus interface.

- VESA DDCI and DDC2b monitor detection.

- State-of-the-art 128-bit GUI accelerator.

- Full functioned graphics acceleration engine supporting:

  Aligned and non aligned operations.

  Transparent BLT.

  Rectangular BitBLT.

  Trapezoidal BitBLT.

  Stretch BitBLT.

  Area fill

  Color/text (Font) expansion.

  All 256 raster operations (ROP's).

  Vector line drawing.

  Hardware assisted clipping.

  Hardware cursor with 64 possible foreground/background colors.

- Accelerator architecture optimized for 8/15-16/24/32 -bit packed pixel RGB modes.

- Accelerator queuing allows parallel processing by ET6000 and host CPU.

- 32-bit linear addressing and data bus interface.

- 8-Bit high speed feature connector integrated.

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- Multimedia Video Feature:

  Internal pixel interpolation engine for horizontal and vertical expansion of video.

  Internal YUV 4:2:2 to RGB 8/15-16/24 converter.   Display controller may display either YUV or RGB   data stored in the graphics memory buffer.

  n Hardware graphics and video windows may be simultaneously displayed, allowing mixed numerous YUV and RGB windows.

  Up to four simultaneous scaled video windows. Internal Windows clipping control for video window.

  Color keying.

  Gamma boost/correction to enhance video luminance.

  IMA and DDbus interfaces multimedia devices to ET6000.

  IMA devices add no additional loading to the PCI bus.

  Enhanced pcIMA bus offers bi-directional access to graphics frame buffer.

Choosing the Best RAM

Tseng Labs has integrated a revolutionary new memory interface to the MoSys Multibank DRAM (MDRAM) into the ET6000. MDRAM is an enhanced memory that uses existing DRAM in multiple small, internal banks, augmented by a very fast controller interface. Tseng Labs has integrated a sophisticated memory controller that allows the ET6000 to perform different memory functions (precharge, row access, column access) simultaneously to different banks. As a result, MDRAM has much lower memory latency than other new memory architectures. MDRAM can also run at very high frequencies, delivering much higher peak bandwidth than other memory alternatives. It is this peak bandwidth, together with low latency, that enables ET6000 solutions to deliver higher available bandwidth today's demanding multimedia applications. In addition, finer memory granularity allows MDRAM frame buffer sizes to be tailored to the requirements of individual designs. Since available bandwidths not tied to memory size, this granularity benefit offers considerable cost savings with no impact to performance. Together with Multibank DRAM, the ET6000 provides the professional performance and bandwidth necessary
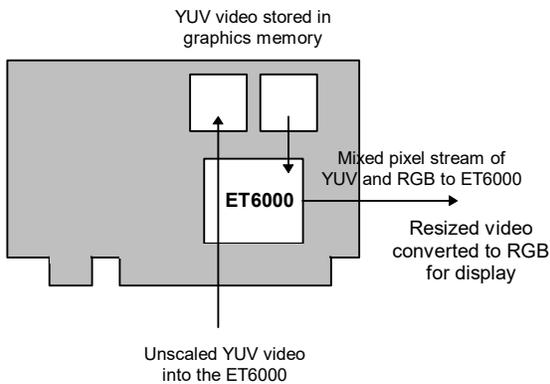
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for game, multimedia, and 3-D applications of today and tomorrow.

Multimedia Video Today: Integration and IMA

The ET6000 integrates the most popular features needed to deliver multimedia video to the user. The internal scaling engine can be used to enhance applications containing Direct Video™, and DCI compliant video like Intel Indeo™, Cinepak™, Xing MPEG Player™, True Motion™ from Horizons Technology and other Windows compatible playback algorithms. The internal video scaling engine provides high quality display similar to Tseng Labs' VIPeR™ video accelerator .

ET6000 Component Diagram.

YUV video stored in
graphics memory

Mixed pixel stream of
YUV and RGB to ET6000

ET6000

Resized video
converted to RGB
for display

Unscaled YUV video
into the ET6000

For designs that require display and capture of live broadcast video or inclusion of a decompression processor, the ET6000 provides the IMA multimedia architecture. IMA is a low pin-count media bus that allows separate multimedia devices to receive data from the PCI bus, and pass the result to the graphics memory. The ET6000 can display either YUV or RGB directly to the monitor.

Multimedia System Block Diagram with MPEG and Broadcast TV Tuner.

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Performance

The ET6000 with MDRAM is significantly faster than conventional DRAM, EDO DRAM, and VRAM GUI accelerators. Windows PATCOPY operations are performed at fast than 400 megabytes per second under maximum screen refresh rates. GUI benchmark performance is only one part of the total solution, however. The ET6000 also provides more memory to screen bandwidth (commonly referred to as DOS performance) than previous Tseng Labs controllers, which have dominated this field. Excellent performance over the system bus means games run fast, multimedia applications run fast, and advanced PCI bus hardware never has to wait for the graphics controller. The ET6000 delivers enough power today to exceed the demands of the multimedia application of tomorrow.
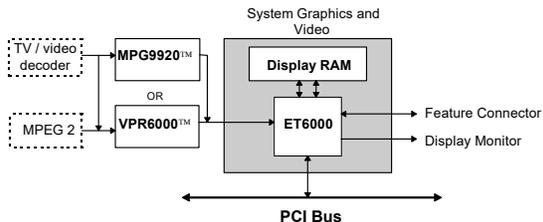
Design Support Services

The ET6000 is supported by Tseng Labs with everything an OEM needs to bring a product to market quickly, including video BIOS, drivers, mode setting/change software, prototype manuals, user and engineering diagnostics, and even sample circuit board layout for qualified OEMs.

Tseng Labs stands behind its customers with a staff of application hardware and software support engineers. Through years of experience, Tseng Labs has learned how to help customers bring the right products to market, in a timely fashion.

Device drivers for numerous popular software packages are provided to OEMs. Here are some of the software applications that support the extended capabilities of Tseng Labs graphics chips:

- Microsoft Windows95

- Microsoft Windows and Windows for Workgroups 3.xx

- Microsoft Windows NT 3.x

- IBM OS/2 2.x and WARP

- Autodesk AutoCAD and Autoshade *(Display List Support)*

- Autodesk 3-D Studio and Animator

- Bentley Systems Microstation PC

- VESA VBE compatible software

For a complete list of software that supports the ET6000, contact your Tseng Labs Sales Representative.

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MDRAM					
	MDRAM Amount				
SVGA Modes	**0.75**	**1.00**	**1.125**	**1.50**	**2.00**
1280x1024, 256 colors				✔	✔
1024x768, 65536 colors*				✔	✔
1024x768, 256 colors*	✔	✔	✔	✔	✔
800x600, 16.8 million colors				✔	✔
800x600, 65536 colors		✔	✔	✔	✔
800x600, 256 colors	✔	✔	✔	✔	✔
640x480, 16.8 million colors		✔	✔	✔	✔
640x480, 65536 colors	✔	✔	✔	✔	✔
640x480, 256 colors	✔	✔	✔	✔	✔

∗ SVGA modes can be displayed without off-screen memory. Accelerated operation or other advanced features including video windows may require some additional off-screen memory. Please consult the data on the back of this sheet for more information about memory requirements.

MDRAM size is dependent on the number of 32kilobyte (256 kilobit) banks included in a single package. The following chart discusses four possible MDRAM configurations:

MDRAM Configurations		
.50 megabytes	524,288 bytes	16 banks
.75 megabytes	786,432 bytes	24 banks
1.0 megabytes	1,048,576 bytes	32 banks
1.125 megabytes	1,179,648 bytes	36 banks
1.25 Megabytes	1,310,720 bytes	40 banks

VRAM or DRAM		
	VRAM or DRAM Amount	
SVGA Modes	**1.0**	**2.0**	**4.0**
1280x1024, 65536 colors			✔
1280x1024, 256 colors		✔	✔
1024x768, 16.8 million colors			✔
1024x768, 65536 colors		✔	✔
1024x768, 256 colors	✔	✔	✔
800x600, 16.8 million colors		✔	✔
800x600, 65536 colors	✔	✔	✔
800x600, 256 colors	✔	✔	✔
640x480, 16.8 million colors	✔	✔	✔
640x480, 65536 colors	✔	✔	✔
640x480, 256 colors	✔	✔	✔

ET6000 Memory Bandwidth

Memory Bandwidth		
Memory Configuration	**Peak Bandwidth(MB/sec)**	**Net Bandwidth(MB/sec)**
Two MDRAM Channels	720	580
One MDRAM Channel	360	295
2 Megabytes DRAM	240	180
1 Megabyte Dram	120	99

MDRAM in Channel Design

AMOUNT OF DRAM IN SINGLE CHANNEL DESIGN								
Horizontal	Vertical	Bytes/Pixel	Total Display RAM Req. (bytes)	Base MDRAM # Banks	1 Video Window # Banks	2 Video Windows # Banks	3 Video Windows # Banks	Notes
640	480	1 256 color	307,200	10 327,680	18 589,824	26 851,968	34 1,114,112	24 banks 786,432
800	600	1 256 color	480,000	15 491,520	23 753,664	31 1,015,808	39 1,277,952	32 banks 1,048,576
640	480	2 65k color	614,400	19 622,592	27 884,736	35 1,146,880	43 1,409,024	36 banks 1,179,648
1024	768	1 256 color	786,432	24 786,432	32 1,048,576	40 1,310,720	48 1,572,864	
640	480	3 16.8m color	921,600	29 950,272	37 1,212,416	45 1,474,560	53 1,736,704	Requires more than one
800	600	2 65k color	960,000	30 983,040	38 1,245,184	46 1,507,328	54 1,769,472	MDRAM chip per channel
1280	1024	1 256 color	1,310,720	40 1,310,720	48 1,572,864	56 1,835,008	64 2,097,152	
800	600	3 16.8m color	1,440,000	44 1,441,792	52 1,703,936	60 1,966,080	68 2,228,224	
1024	768	2 65k color	1,572,864	48 1,572,864	56 1,835,008	64 2,097,152	72 2,359,296	
1024	768	3 16.8m color	2,359,296	72 2,359,296	80 2,621,440	88 2,883,584	96 3,145,728	
1280	1024	2 65k color	2,621,440	80 2,621,440	88 2,883,584	96 3,145,728	104 3,407,872	

AMOUNT OF MDRAM PER CHANNEL IN TWO CHANNEL DESIGN								
Horizontal	Vertical	Bytes/Pixel	Total Display RAM Req. (bytes)	Base MDRAM # Banks	1 Video Window # Banks	2 Video Windows # Banks	3 Video Windows # Banks	Notes
640	480	1 256 color	307,200	5 163,840	9 294,912	13 425,984	17 557,056	24 banks 786,432
800	600	1 256 color	480,000	7.50 245,760	11.50 376,832	15.50 507,904	19.50 638,976	
640	480	2 65k color	614,400	9.50 311,296	13.50 442,368	17.50 573,440	21.50 704,512	
1024	768	1 256 color	786,432	12 393,216	16 524,288	20 655,360	24 786,432	
640	480	3 16.8m color	921,600	14.50 475,136	18.50 606,208	22.50 737,280	26.50 868,352	32 banks 1,048,576
800	600	2 65k color	960,000	15 491,520	17 557,056	23 753,664	27 884,736	
1280	1024	1 256 color	1,310,720	20 655,360	24 786,432	28 917,504	32 1,048,576	36 banks 1,179,648
800	600	3 16.8m color	1,440,000	22 720,896	26 851,968	30 983,040	34 1,114,112	
1024	768	2 65k color	1,572,864	24 786,432	28 917,504	32 1,048,576	36 1,179,648	
1024	768	3 16.8m color	2,359,296	36 1,179,648	40 1,310,720	44 1,441,792	48 1,572,864	Requires more than one
1280	1024	2 65k color	2,621,440	40 1,310,720	44 1,44,792	48 1,572,864	52 1,703,936	MDRAM chip per channel

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