New GUI Accelerators Featured at Comdex

Trident Storms Already Crowded Market—Matrox to Follow

By Linley Gwennap

Comdex/Fall provided its usual range of big news, little news, and interesting tidbits. In the PC graphics area, two new players are poised to enter the market for GUI accelerators, the chips that improve performance for Windows and other graphics user interfaces (GUIs). Trident will reach the market first with its new Storm chips, but Matrox may ultimately have a more powerful solution than any on the market today. Cirrus introduced a GUI accelerator for notebooks, and a new version of WinMark, based on WinBench 3.1, also premiered at the show.

Trident Moves Up From VGA Chips

Trident Microsystems has grown into a $67 million company in just five years, based primarily on its success in building low-cost VGA and SuperVGA graphics chips; the company claims to have a 20% share in this market. Trident is not a familiar name because most of its sales are in Taiwan, although the company is based in Silicon Valley. At Comdex, it announced the Storm family, its first graphics accelerator chips. The Storm DG is a DRAM-based accelerator, while the Storm VG uses VRAM, but the chips are otherwise very similar.

The Storm chips provide a glueless connection to either ISA, MCA (Micro Channel), or 16-bit VL-Bus (i.e., 386SX). The full 32-bit VL-Bus is supported with four external TTL buffers. Both chips support a 32-bit interface to the video memory; the VG includes a separate bus for the VRAM serial ports. Both chips support up to 2M of video memory, allowing displays up to $800 \times 600 \times 24$, $1024 \times 768 \times 16$, or $1280 \times 1024 \times 8$, although the DG can support the latter mode only for interlaced displays. A single 8-bit bus connects to both the BIOS ROM and the RAMDAC. A complete graphics subsystem consists of just the Storm, video memory, ROM, RAMDAC, and a clock chip.

The Storm chips provide a full complement of accelerated features, including BitBLT, color expansion, pattern fill, line draw, and hardware cursor. (The DG does not include a hardware cursor.) They offer linear addressing to improve image transfers, and emulate a SuperVGA controller as well, eliminating the need for an external VGA chip. This allows emulation of VGA and other register-level standards, which is needed for DOS and other programs that require such compatibility.

Trident supplies drivers for the leading CAD and business applications under DOS, as well as for Microsoft Windows, OS/2, and X-Windows (under SCO UNIX). It expects to have a Windows NT driver early next year. The chips will sample in December, with full production expected in February. The chips are built in 0.8-micron CMOS and packaged in a 208-pin PQFP.

The company does not yet have WinMark figures for the new chips but expects their performance to be competitive with mid-range chips like S3's 801 and 805. The VG will be slightly faster than the DG due to its use of VRAM memory, particularly for higher-resolution displays with more colors. Volume pricing for the DG is $23, or $30 for the VG. This compares well to the S3 chips, which are priced at $29 and $35.

Matrox Cuts Cost of Workstation Graphics

Matrox is best known for its PC graphics cards based on S3 chips, but the company also supplies a chip set used by Sun in its mid-range GS accelerator for the SPARCstation 2. To join these two businesses, Matrox plans to integrate the GS chip set into a two-chip PC accelerator dubbed the MGA. Although the MGA has not been formally announced, Matrox disclosed some details about their new chip, which is expected to sample in 1Q93 with volume shipments in 2Q93.

By leveraging its workstation design, Matrox expects the MGA to outperform every GUI accelerator on the market today. Like the Storm chips, the MGA will offer a full range of accelerated graphics functions and will also have a linear frame buffer. Two features should give it a performance advantage over Storm and other chips. First, as shown in Figure 1, the MGA uses a 64-bit
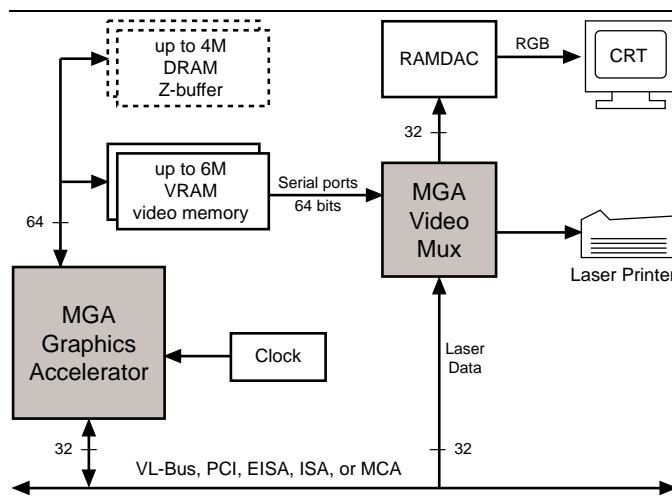

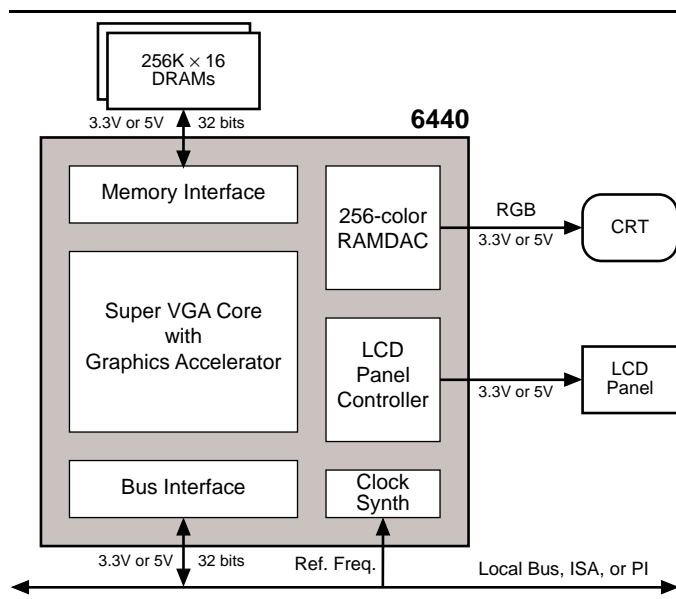Figure 1. Matrox MGA chip set block diagram.

Figure 2. Cirrus 6440 block diagram.

path to memory. With twice the bandwidth of most other chips, performance on BitBLT and image transfers will nearly double. The VRAM serial ports connect to the MGA video multiplexer, reducing the pin count of the graphics accelerator.

VRAM block writes provide the second unique performance enhancement. Most VRAMs allow a single data value to be written into multiple locations in a single cycle. The MGA will take advantage of this feature on area fills, pattern fills, and character drawing, increasing performance by up to 16× in these areas. Other vendors have not used this technique because their graphics engines are derived from DRAM-based designs that cannot implement block writes. Top chips such as Weitek's Power 9000, S3's 928, and ATI's 68800 have neither block write capability nor 64-bit data paths to VRAM.

Not satisfied with high performance, Matrox also plans features to improve the appearance of the display. Like ATI's 68800 chips, the MGA will use font anti-aliasing to improve the appearance of text on the screen, and it will provide a "StretchBLT" function to allow video images to be quickly expanded in hardware. Weitek, S3, and other leading graphics vendors do not offer these capabilities. (First Toronto wins the World Series, and now two Canadian companies take the lead in offering new graphics features!)

To further improve video and animation, the MGA has a double-buffering mode, allowing one frame to be displayed while the next is being assembled in video memory, preventing visible artifacts between the frames. In this mode, color depth is cut in half to create room for the second buffer, but full color depth can be restored if the playback is frozen on any given frame.

The chip set includes another unusual feature: a laser printer acceleration port. Although this has little to do with video, the video multiplexer chip contains circuitry that allows the CPU to communicate directly to the laser engine through a port present on most laser printers. Matrox can provide software that performs page image generation on the host CPU, which can be up to five times faster than the processor in printers such as the Laserjet II and III, resulting in a significant increase in print speed.

With up to 6M of VRAM, the MGA will support displays up to 1600 × 1200 with 8-bit color or 1024 × 768 with full 24-bit color, although smaller configurations will be more practical for most users. The main chip contains a 3D graphics engine as well, and it can support an additional 4M of DRAM as an optional Z-buffer for high-end applications. It also includes an on-chip VGA controller to reduce system chip count. The MGA connects directly to ISA, MCA, EISA, VL-Bus, or PCI with a 32-bit interface.

The pricing of the chip has not yet been established, but because Matrox expects it to be used primarily in Pentium-based systems, the price may be high, perhaps exceeding the $70 price tag on Weitek's Power 9000. The company is still examining the PC chip market, however, and may decide that a lower price will be attractive to the large number of 486 users who could appreciate the features and performance of the MGA. If Matrox can deliver the chip as planned, it will be a potent competitor for next-generation efforts from ATI and others.

Cirrus Accelerates Notebooks, Desktops

Cirrus Logic, the leader in providing graphics controller chips for portable systems, announced the GD6440, aimed at high-end notebooks. Like most other Cirrus controllers, the 6440 is a fully-integrated solution with a RAMDAC and clock synthesizer on-board, and it can drive both a CRT and LCD display at the same time (see Figure 2). It connects directly to a wide variety of monochrome, color STN, and color TFT flat-panel displays. It is a mixed-voltage part, operating at either 3.3V or 5V internally, and it can connect to 5V devices even when the core is running at 3.3V. At 5V, the pixel clock runs at up to 65 MHz, but it is limited to 40 MHz when running at 3.3V.

The new chip includes a 32-bit local-bus interface along with direct connections to the 16-bit PI (peripheral interface) and ISA buses. The local-bus interface and 3.3V operation make the 6440 very attractive for systems using Intel's new 486SL processor. To prevent the video memory from becoming a bottleneck, the chip includes a 32-bit memory bus as well. 1M of DRAM allows 16-bit color at VGA resolution (640 × 480) and 8-bit color at resolutions up to 1024 × 768.

The 6440 is Cirrus' first chip to bring some graphics acceleration features to portable systems. It includes

Price and Availability

The Storm DG and Storm VG can be ordered as the TGUI9420 and TGUI9430, respectively. The DG is priced at $23, while the VG is priced at $30, both in a 208-pin PQFP in quantities of 1000. Contact Trident Microsystems at 205 Ravendale Drive, Mountain View, CA 94043; 415/691-9211, fax 415/691-9260.

The Matrox MGA chip set has not been formally announced, so no pricing information is available. Samples are expected sometime in 1Q93. For more information, contact Matrox Electronic Systems at 1055 St. Regis Blvd, Dorval, Quebec, Canada H9P 2T4; 800/361-4903 or 514-685-2630; fax 514/685-2853.

Cirrus' CL-GD6440, in a 208-pin PQFP, is expected to sample in December with volume production in March. The price is $40 in quantities of 5000. The CL-GD5420, 5422, 5424, and 5426 are all in production and all use a 160-pin PQFP. The 5420 is priced at $13, the 5422 at $19, the 5424 at $20, and the 5426 at $27, all in quantities of 1000. Contact Cirrus Logic at 3100 W. Warren Avenue, Fremont, CA 94538; 510/623-8300, fax 510/226-2180.

The WD90C33 is now sampling with volume production expected next March. Pricing is $29 in a 208-pin MQFP in quantities of 1000. Contact Western Digital at 8105 Irvine Center Drive, Irvine, CA 92718; 714/932-4900, fax 714/932-6498.

IIT's VP and VC chips are now in production. The VP uses a 144-pin PGA or PQFP, while the VC uses a 208-pin PGA or PQFP. The chips are sold in sets that include certain software drivers; the minimum set is one VC and one VP, which costs $200. For more information, contact Integrated Information Technology at 2445 Mission College Blvd, Santa Clara, CA 95054; 408/727-1885, fax 408/980-0432.

The 68800AX is expected to sample next January with volume production expected by March. It uses a 208-pin PQFP that is compatible with the original 68800 and is priced at $75 in quantities of 1000. Contact ATI Technologies at 3761 Victoria Park Ave, Scarborough, Ontario, Canada M1W 3S2; 416/756-0718, fax 416/756-0720.

For price and availability for the S3 chips, the Avance GUI Ultra and the Weitek Power 9000, see ***061202.PDF***. For price and availability for the IIT AGX chips and ATI 68800, see ***061301.PDF***.

color expansion and linear addressing to improve graphics performance. The new chip does not include a BitBLT engine, but Cirrus believes that the typical notebook user would see little benefit from this feature. Future systems with larger displays and more colors may require BitBLT support. Other graphics functions such as line drawing, raster operations, and clipping are not accelerated.

The company does not yet have first silicon on the 6440 but optimistically hopes to sample in December, with volume production by next March. The chip is expected to cost about $40 in volume. This should position the 6440 well against high-end notebook chips from Western Digital and Chips & Technologies.

Cirrus also showed its desktop graphics chips. All four members of the 542x series, announced last August, are now shipping in volume. The four pin-compatible chips all integrate the DAC and clock synthesizer to reduce system cost, and they provide glueless interfaces to ISA and MCA. All support only DRAM for video memory and are fully compatible with standard VGA.

The baseline 5420 supports 1M of video memory through a 32-bit bus. The on-board DAC supports pixel clock rates up to 75 MHz. The chip performs color expansion to speed text displays and area fills, and it provides a hardware cursor. The 5422 adds a video overlay and can clock the DAC at up to 80 MHz. The 5424 includes a local-bus interface. The top-of-the-line 5426 clocks at up to 85 MHz, adds a BitBLT engine, and can support up to 2M of video memory, increasing the range of display options. The 5424 and 5426 require external latches to support the 32-bit VL-Bus.

Like the 6440, the 542x family does not include the full range of graphics features found in more expensive competitive chips. At about $13 for the 5420 and $19 for the 5422, these chips are competitive with VGA and SuperVGA chips. The 5426, at $27, is competitive in price and performance with low-cost accelerators from Weitek, Oak and LSI's Headland division. The higher integration of the Cirrus chips lowers the cost of the graphics subsystem and reduces the board space needed.

Western Digital Upgrades 90C31

Western Digital is now shipping samples of its WD90C33, a software-compatible upgrade to the popular WD90C31 *(see **061301.PDF**)*. The new chip adds a 32-bit system bus interface with glueless support for VL-Bus, ISA, and MCA. The DRAM interface is also expanded to 32 bits, doubling the video memory bandwidth. The C33 supports up to 2M of DRAM, twice that of the previous version, allowing 24-bit color at VGA resolution. Because of the DRAM bottleneck in updating large displays, the C33 supports only 8-bit color at 1024 × 768 and 1280 × 1024, and the latter mode is allowed only for interlaced monitors.

Western Digital also improved the internal graphics engine. In addition to the hardware cursor and BitBLT support of the C31, the new chip accelerates line drawing, area fills, and clipping operations. Like its predecessor, the C33 provides full VGA emulation.

The C33 is expected to reach volume shipments around March of next year. Volume pricing is $29, slightly more than the C31. The new chip will be used in

Western Digital's Paradise line of graphics add-in boards. Other board and system vendors who use the C31—such as Diamond, Zeos, and Tandy—are expected to pick up the C33 as well, but no announcements have been made.

IIT Steps Forward With AGX, Vision Chips

Integrated Information Technology (IIT) said it is currently shipping its AGX-14 ISA-based accelerator, and that the VL-Bus AGX-15 *(see **061301.PDF**)* is now sampling, with volume shipments expected in January. The company has also achieved volume production of its much-delayed Vision Controller (VC) chip (see µPR 10/30/91, p. 1), originally expected to hit the streets around the beginning of this year.

The VC works with IIT's Vision Processor (VP) to provide a complete programmable JPEG/MPEG/P×64 encoder and decoder. The VP includes a set of ALUs, multiply, and shift units that accelerate the discrete cosine transform (DCT) function used in the aforementioned video coding standards. The VC uses the MIPS-X core, licensed from Stanford, to control the higher-level encoding and decoding. Because the programming for the VC is kept in external memory, it can be set up for any of these algorithms or their derivatives, and can even be changed on the fly. A complete personal video-conferencing solution can be built on a single ISA-bus card using a VC, VP, memory, and some interface logic.

IIT indicated that problems with the MIPS-X core caused much of the delay, as the original design did not meet robust commercial standards. Now that it has solved these problems, the company is looking ahead to its next-generation video product. The new chip, called the VCP, will further increase the integration level by combining the VC and two VPs onto a single die. This integration will not only reduce the cost and board space for personal video but is also expected to increase the internal clock rate to 50 MHz, a 50% boost from the current products. The VCP is expected in 4Q93.

IIT also plans to integrate video and graphics by modifying future AGX graphics chips to include a direct port from the video subsystem. This port will allow decoded motion video from the VC/VP to be displayed in a window on the screen. The AGX would automatically synchronize the video with the display refresh and overlay the video on top of the graphics generated by the CPU, removing the need for an external video buffer.

New WinBench Enforces Rules

A new version of WinBench, version 3.1, premiered at the show. WinBench is used to compute WinMarks, and many vendors complained that the previous version (2.5) was easily "broken" to produce higher numbers. Indeed, some vendors displayed systems running at 40, 50, even 60 WinMarks using the old measurements. Yet when these systems were used for typical Windows oper-

ations, it was clear that they were not as incredibly fast as their scores would indicate.

Version 3.1 is designed to eliminate the most common methods of breaking the old WinBench. For example, the old version measured line drawing speed by redrawing the same line over and over. Some drivers detected that the line was already on the screen and then skipped successive iterations. The new version also adds two text tests; the previous version used no text. The two new tests are weighted at 10% each, replacing the old memory-to-screen pattern copy and pattern invert.

Unfortunately, many vendors have not yet tested their chips with the new WinBench, and others had only preliminary results. Because of this transition, this article includes no WinMark numbers; we will print a full comparison using the new WinBench numbers as soon as they are available from the various vendors. As a result of the added tests and the tighter restrictions, the new WinMarks will be lower than previous scores. For example, one vendor who was quoting over 20 WinMarks using version 2.5 could demonstrate just 11 WinMarks with version 3.1. It remains to be seen whether all vendors will suffer such a serious blow to their WinMarketing.

Other News, Rumors, Announcements

ATI recently announced the 68800AX, an upgrade to its original 68800 chip *(see **061301.PDF**)* that adds PCI support, taking advantage of Intel's new PCI system-logic chip set *(see **061602.PDF**)*. It also increases the VRAM interface to 64 bits using a similar configuration to the Matrox MGA, but it requires that the video multiplexer function be integrated into the DAC. The AX version will be available in 1Q93 for $75, just $5 more than the current 68800.

Weitek also announced a PCI version of its Power 9000, with availability expected in 1Q93. At Comdex, leading companies such as Cardinal Technologies, Diamond Computer, Micronics, and Orchid displayed products using the current Power 9000. Interestingly, Cardinal also plans a product using S3's 928 chip, positioning it at a lower performance and price point than its Power 9000 board. S3 had hoped that the 928 would match the Weitek chip's performance, but apparently that is not the case.

S3 is also having some problems delivering their chips. The 928, which was supposed to be in production at this point, is still ramping up and will not reach full volume until the end of December. The mid-range 801 and 805 parts are in production but are on allocation. An S3 spokesperson said this was a "happy problem" of demand exceeding expectations, and that S3 will produce more new parts this month than the highest monthly production of the widely used 911 chip.

Avance finally showed its GUI Ultra chip, and

claimed that volume production would begin soon. Tseng Labs demonstrated a new ET4000 upgrade, the W32, which brings graphics acceleration to Tseng's popular VGA controller line. The Tseng chip is supposed to be in production by January, but several vendors have been unable to get even evaluation units and thus have no firm product plans for the chip. Problems like these explain why many board makers use two or more graphics chip suppliers.

So far, the market for GUI accelerators continues to gain players and no one yet appears ready to drop out. Companies such as Trident, Matrox, and Cirrus are building on their strengths in other graphics areas (VGA chips, workstations, notebooks) to enter the desktop accelerator market. Although the new Trident chips offer little to differentiate themselves, the Matrox MGA could set new standards in performance and features for high-end systems. The Cirrus chips bring a new level of integration to the low end of the accelerator market, putting pressure on other low-cost chips.

Of the previous entrants, market leader S3 has stumbled but should recover if it can begin delivering its new products in volume. The ATI and Weitek chips are racking up design wins in the high end and are the first to offer PCI support, but neither company has had as much success in the mid-range. Avance and IIT have delivered on their promises, but it remains to be seen whether the market is interested in them. ♦