A ONE-CHIP BOOST FOR DESKTOP GRAPHICS

System makers can build desktop computers that deliver the same color graphics as high-end work stations at a fraction of work-station prices, with a video-controller chip from Inmos Corp. The Colorado Springs, Colo., company's IMS G300 is a general-purpose controller that integrates all the control and data-conversion functions needed to implement a bit-mapped graphics subsystem. All a designer needs to build such a system without going over budget is the G300, a microprocessor to serve as a central-processing unit, a frame-buffer memory, and a few other circuits.

The G300 offers a single-chip solution for all of the real-time functions of a graphics subsystem, including interfaces to the CPU and video random-access-memory array, with a minimum of external circuitry. The analog outputs can be configured to drive a wide variety of display devices, ranging from a high-resolution graphics monitor to a standard RS 170A TV screen. Pricing had not yet been set as of late last month.

The controller integrates video timing, screen refreshing, and pixel-flow control with color expansion and digital-to-analog conversion in one 84-pin package. The internal architecture is 24 bits wide, ensuring a large enough address range and high enough resolution for most applications. Any CPU can be used, since the G300 is compatible with 8-, 16-, and 32-bit interfaces. It handles screens of any size and resolution, limited only by the bandwidth of the video dynamic RAMs.

Business computer users are beginning to demand both increased computing power and the kind of graphics that the G300 can help provide. They want a desktop tool that can perform heavy computation while interpreting and displaying the results in complex graphics, even three-dimensional graphics.

To get that kind of performance and still keep the desktop system competitively priced, however, designers cannot afford to use the highly specialized and expensive graphics architectures common to big work stations. One common method of producing high-quality graphics, for example, has been to use a coprocessor with a set of microcoded or hardware-implemented drawing instructions to take over the low-level graphics tasks, such as line and arc drawing. This is not a very flexible solution, since new chips or microcodes have to be developed when new and better algorithms come along.

Business users now demand graphics power that the G300 can help provide

What efficient graphics systems need is not more special instructions but large amounts of general-purpose processing power—a simple architecture where the response time is determined by the power of the processors used and the bandwidth for delivering drawing instructions to the frame buffer (bit map). This kind of architecture gives the host processor free access to the pathway to the graphics frame-buffer memory.

In such an environment, the potential for performance improvements is found mainly in the raw speed of the host processor and the efficiency with which it supports core graphics operations. To aid the design of systems with this type of free-access graphics architecture, what is needed is a simple, inexpensive way to handle all the tasks required to transform the data in the frame buffer into the pixels to be delivered to the display device. It is precisely these capabilities that Inmos has built into the G300.

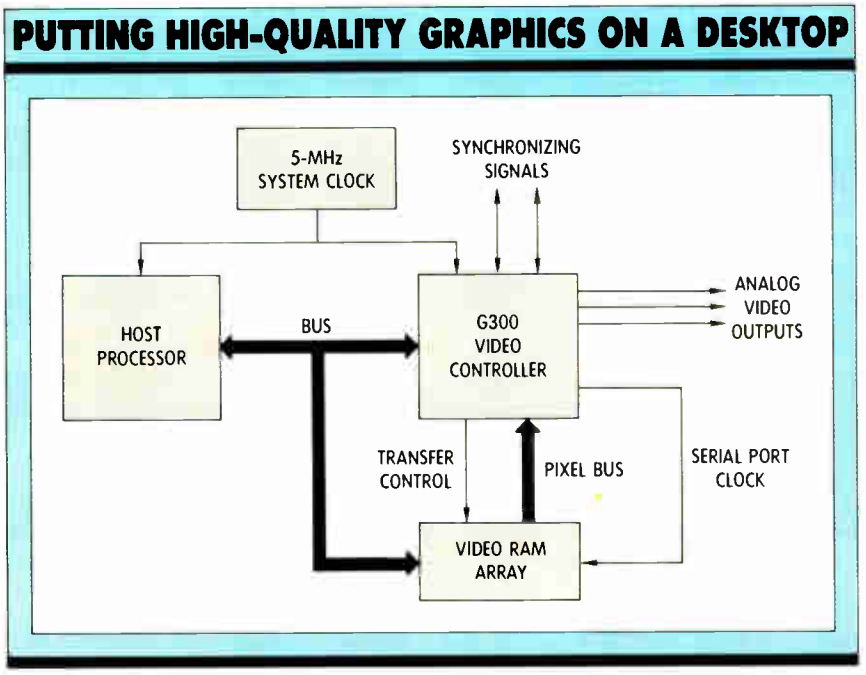
The chip is powerful enough to handle all of the operations required to turn data into pixels and move them from the frame buffer to the screen. It includes screen-refresh address generation—both interlaced and noninterlaced—video synchronization, and data conversion. It also boasts automatic line-increment capability, a color-lookup table, a triple video DAC, and a phase-locked loop.

The video-timing generator is a programmable state machine that accepts a simple description of the video system as a set of numerical parameters. The screen parameters include the width of the horizontal synchronization pulse, the duration of the setup, the number of pixels dislayed in both a full-scan line and a half-scan line, the width of the frame-synchronization equalizing pulse, the width of the frame-sync pulse, the number of blanked lines per frame, and the number of displayed lines per frame.

For sophisticated control of the screen refreshing, a small set of registers holds the description of the video system and the bit-map configuration. The screen-refresh mechanism uses direct memory access to read the data in the video RAM frame buffer, allowing a seamless mid-line update of the screen. This approach keeps the impact of the screen update function on the processor-to-frame-buffer bandwidth to a minimum.

In the color-lookup table, the color of each pixel is defined as the 8-bit address of a color that is described by more than 8 bits—possibly up to 24 bits for a very large range. The price incurred by using a color-lookup table is a reduction in the number of colors that can be displayed simultaneously. High-end graphics systems, which require many simultaneous colors, use 24-bit direct addressing, but require much more frame-buffer memory than an 8-bit indirect color-lookup table to do it. The table built into the G300 is a 256-location 24-bit table. *–Tom Manuel*

PUTTING HIGH-QUALITY GRAPHICS ON A DESKTOP



The Inmos G300 offers the real-time functions of a bit-mapped graphics subsystem.