Sun Creator3D Graphics

To design Sun Creator3D graphics, Sun engineers built on lessons learned with other architectures, enabling them to locate acceleration technologies in the system where they would most benefit graphics performance. This approach resulted in a highly-integrated, modular architecture that tightly couples the CPU, the system interconnect, the frame buffer and graphics accelerator.

Sun Creator3D graphics provides a wealth of features which make it ideal for a range of applications including imaging, video, multimedia, as well as 2D and 3D graphics applications. Sun Creator3D graphics systems provide fast 8- and 24-bit window system and imaging performance, but add key graphics features like double-buffering and Z-buffer support for accelerating 3D solids and animation applications. Sun Creator3D graphics dramatically accelerates high-end 3D functionality like double buffering, triangle and quad rendering, and lighting and shading.

Sun Creator3D graphics provides 96 bit planes, including full 24-bit double-buffer planes required for smooth animation. A 28-bit Z-buffer enables hardware assisted hidden surface removal for dynamic rendering of 3D objects. Sun Creator3D graphics features include:

- High-performance, low-cost, 24-bit true color standard
- Transparent acceleration for X11 and XIL graphics libraries
- Partial acceleration for the OpenGL 3D API
- Simultaneous 8-bit and 24-bit visual support
- Multiple hardware colormaps
- Adjustable gamma correction
- 4-bit pseudocolor overlay support (non-destructive)
- High resolution (1280 x 1024 @ 76Hz non-interlaced)
- Stereo-ready (960 x 680 @ 112 Hz non-interlaced)
- DDC2B monitor serial communication with EDID support
- 8-bit SOV-compliant pseudocolor overlay
- Transparent acceleration for 3D APIs (OpenGL and Java 3D)
- 3D solids, dynamic shading, rotation, and Z-buffered acceleration
- Full double-buffered 24-bit true color, 8-bit overlay, 28-bit Z-buffer, 4-bit stencil
- 24-bit single-buffered high resolution support (1920x1200) with Sun 24-inch monitor

Sun Creator3D Graphics Theory of Operation

With Sun Creator3D graphics processing is balanced across the entire system to take advantage of all available resources. Table 4-1 lists the parts of the system that are responsible for accelerating different graphics operations.

Functionality	Responsible System Component
Window System and 2D Graphics	Creator3D Graphics Module
Imaging and Video	UltraSPARC (VIS Instruction Set), Creator3D Graphics Module
3D Graphics Pipeline	UltraSPARC (Floating Point Unit), Creator3D Graphics Module

Table 4-1   Components responsible for accelerating graphics in Creator systems

The Sun Creator3D graphics module (Figure 4-1) contains three key components — a *Frame Buffer Controller ASIC*, *3D-RAM*, and a *RAMDAC*.
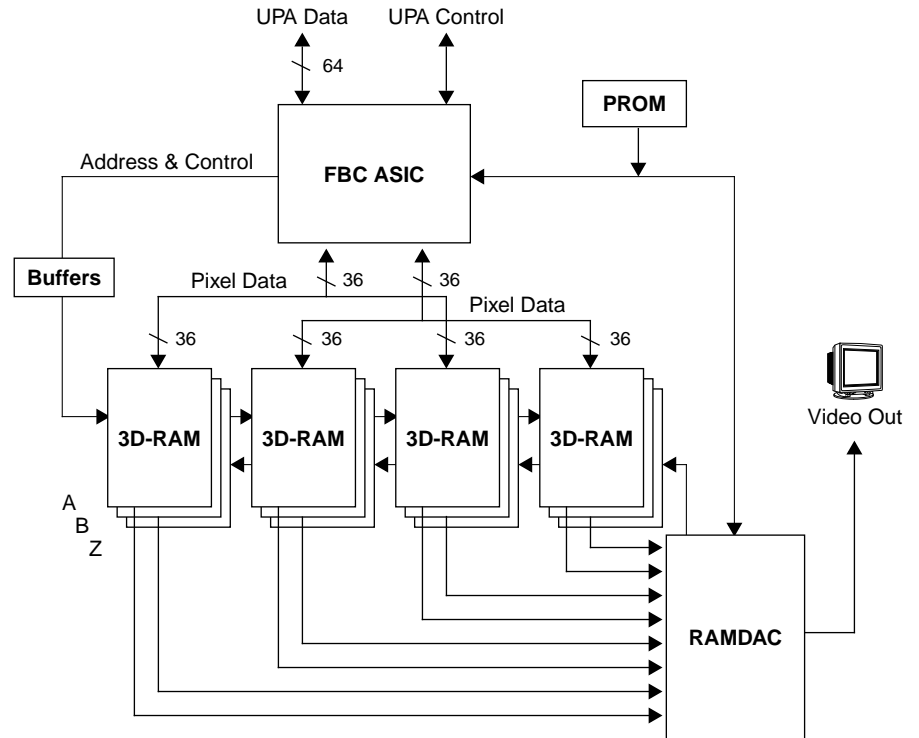

Figure 4-1   The Sun Creator3D graphics accelerator

- *Frame Buffer Controller ASIC*

  The Frame Buffer Controller ASIC (FBC2) provides an interface to the UPA64S memory interconnect in Sun Blade 1000 systems and provides acceleration of graphics rendering. Key graphics primitives such as Bresenham lines, polygons fills, and text scrolling are implemented in ASIC technology to provide substantially higher window system performance.

- *3D-RAM*

  3D-RAM provides a solution to one of the traditional bottlenecks in 3D graphics hardware — namely the rate at which pixels can be drawn into a frame buffer for Z-buffered rendering. Historically, the performance of hidden surface removal algorithms has been limited by the pixel fill rate of 2D projections of 3D primitives.

  Working together, Sun Microsystems and Mitsubishi Electronics created breakthrough technology for implementing fast, inexpensive 3D frame buffers. 3D-RAM integrates DRAM and an SRAM cache on a single chip along with an on-chip arithmetic logic unit. The result is a 10 Mbit part that handles 3D graphics ten times faster than conventional VRAM, at a lower system cost.

- *RAMDAC*

  Finally, a highly-flexible, dual-mode RAMDAC provides high-performance 8-bit and 24-bit color space management. The RAMDACs employed by Sun Creator3D graphics systems integrate functionality that was previously spread throughout the system in other designs. This approach provides a higher level of integration and produces a considerable cost savings.

Sun Elite3D m6 Graphics

Sun Elite3D m6 graphics-equipped systems accelerate applications that manipulate large numbers of complex 3D solids for use in MCAD, geotechnical, animation, or related fields. Sun Elite3D m6 graphics dramatically improves performance in double-buffering, triangle and quad rendering, and lighting and shading without sacrificing fast 8- and 24-bit window system, imaging, or video performance.

Sun Elite3D m6 graphics-equipped systems provide 88-bit planes, including full 24-bit double-buffer planes as required for smooth animation. A 28-bit Z-buffer is included to provide hardware assistance for hidden surface removal and dynamic rendering of 3D objects.