



AcceleRAM™ LowFB Technology

***for the
Chrome 20 Series
(S25 and XM27/25)***

***A
S3 Graphics
White Paper***

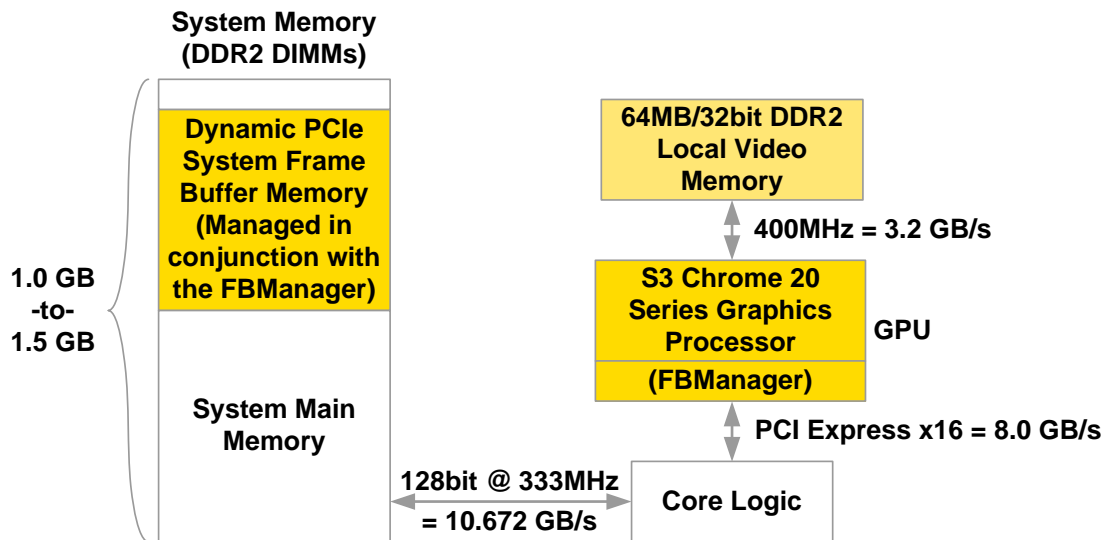


Introduction

AcceleRAM LowFB (Low Frame Buffer) Technology is available with selected S3 Graphics' Chrome 20 Series processors. AcceleRAM is available for the Chrome S25 desktop graphics processor and for the Chrome XM27 and Chrome XM25 graphics processors for mobile systems.

AcceleRAM is a combination of hardware and software that enables a small size frame buffer architecture. In an AcceleRAM configuration, a part of the larger system main memory (DDR2 DIMMs), called PCIe memory, is used by the Chrome 20 Series processor as part of the overall video memory, which includes a relatively small amount of dedicated local video memory. This technology enables S3 Graphics to offer graphics solutions for the complete top-to-bottom range of mainstream and entry level graphics platforms and to lead in the performance/features/price market segment.

The consumer benefits, as this effective technology now allows entry level consumers the capability of getting the rich feature set found in a discrete graphics processor at a lower price point, while maintaining or surpassing the performance level of competitive solutions in this market segment.



Note:

Size and width of the small Local Video Memory can be 64MB/32bit (3.2 GB/s) to 128MB/64bit (6.4 GB/s) @ 400 MHz DDR2. It can also be 64MB/64bit (8.0 GB/s) to 128MB/128bit (16.0 GB/s) @ 500 MHz DDR3. This is all dependent upon performance requirements.

The DDR2 @ 400 MHz (3.2 GB/s) local video memory is for a typical case in the low frame buffer market segment.

The 128bit @ 333 MHz (10.672 GB/s) system main memory is for a typical case in the mainstream market segment.

Figure 1. AcceleRAM LowFB Configuration Example

Windows Vista Memory Requirements

With the introduction of Microsoft® Windows® Vista™ operating system, the system main memory (DIMM) requirement has increased. Prior to June 1, 2007, Windows Vista will require 512MB of system main memory, which means that most, if not all, systems that want to have the Premium logo, will probably ship with 1.0GB of system main memory. After June 1, 2007, Windows Vista will require, 1.0GB of system main memory, which would mean that most, if not all, systems that want to have the Premium logo, will probably ship with 1.5GB of system main memory. Windows Vista also requires a minimum of 128MB of dedicated video memory on the graphics card. This is the current Microsoft Windows Vista Premium requirement. This would dramatically increase the overall system cost and necessitate the need for a GPU with great low-frame buffer technology.

BIOS Operation

The system BIOS does not need to do anything special, as there is a small amount of local video memory dedicated to the Chrome 20 Series processor to boot the system normally. Therefore, no new, special system BIOS is required, nor are any modifications or configurations to the existing system BIOS required to support S3 Graphics' AcceleRAM LowFB. It will work as is on any system. After booting into Windows, the Frame Buffer Manager (FBManager), which is part of the optimized hardware and software, will then intelligently and efficiently determine what type of data will be stored in the small amount of dedicated local video memory and what type of data will be stored in the larger shared system main memory, called PCIe memory which is now part of the overall video memory.

Driver Operation

In a traditional non-AcceleRAM configuration, the dedicated local video memory is used to store various 3D graphics data, such as the multiple display data, Z-buffer information, frequently used textures and mip maps, etc. Storing this data usually requires a large amount of dedicated local video memory which translates into higher costs for the consumer. The graphics display driver also uses part of system main memory to store data, such as large and seldom used textures and mip maps, etc., that will be used at a later time by the discrete graphics processor for a specific 3D application. The graphics display driver is responsible for managing the transfer of this stored data from system main memory to the dedicated local video memory whenever the data is needed by the discrete graphics processor for the specific 3D application.

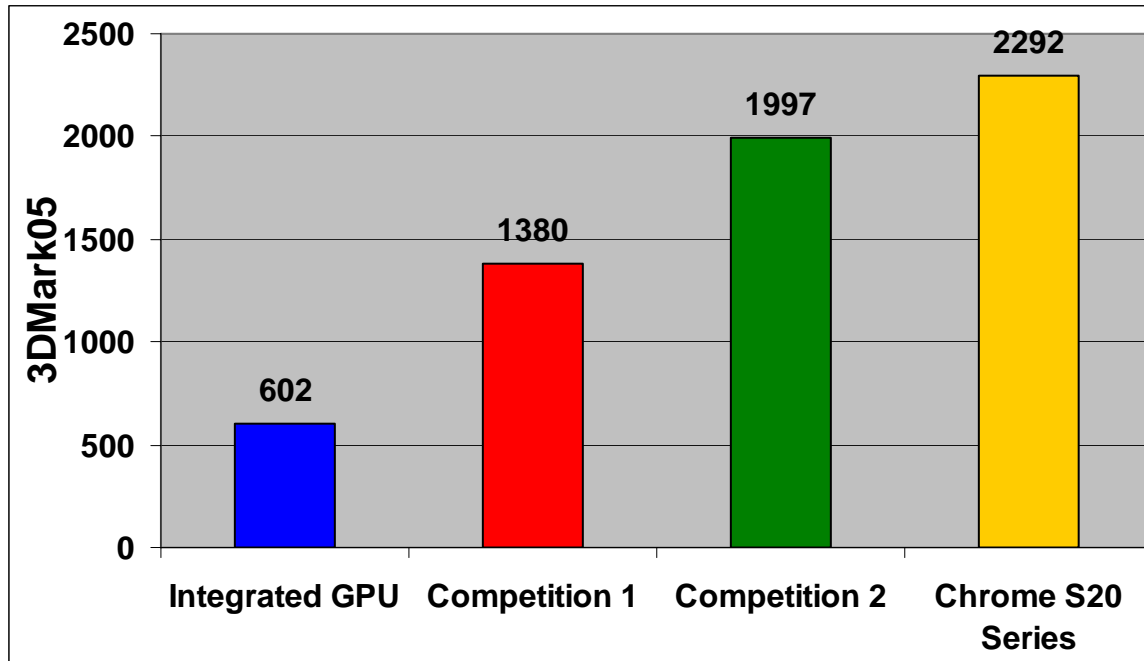
In an AcceleRAM LowFB configuration, the PCIe memory portion of the larger system main memory is now used as part of the overall video memory. The overall video memory also includes the small amount of dedicated local video memory for the Chrome 20 Series processor. A large, dedicated local video memory is not needed anymore. The amount of PCIe memory available from the larger system main memory impacts the performance of the graphics subsystem and the demand of the PCIe memory actually fluctuates from time to time depending upon the mode, application, and type of data required. The FBManager will intelligently and dynamically determine how much PCIe memory is required, beyond the Windows Vista requirement, for optimum performance.

The Chrome 20 Series (S25 and XM27/25) FBManager also intelligently and efficiently manages the transfer of data from PCIe memory to the Chrome 20 Series processor (S25 and XM27/25) for immediate and direct operation and/or to the small dedicated local video memory for future operation to achieve optimum performance. The Chrome 20 Series processor does not have to wait for data to be transferred from PCIe memory into its small dedicated local video memory to be able to operate on it, as that could decrease performance. It can operate directly on some of the data as it is being transferred from PCIe memory by the FBManager. The FBManager dynamically determines the appropriate size of the PCIe memory, what type of data is stored there, what type of data is stored in the small dedicated local video memory, and what type of data is required by the Chrome 20 Series processor for a given 3D application and mode to obtain the optimum performance. Once the 3D application is closed, the FBManager frees up the PCIe memory which is now made available to the system again.

AcceleRAM™ Advantages

Performance

As the following graph illustrates, a Chrome S20 Series GPU128MB/64-bit DDR2 configuration offers a performance advantage over its competitors. The performance comparison below reflects tests done using competitor's off-the-shelf add-in boards available in the marketplace and which represent the entry level competition in this market segment. Comparisons were run in the exact same system.



System Configuration: Core2-Dual 1.86GHz, on i946GZ, with 1.0GB of system memory. All video cards are configured at their default clocks with 128MB/64bit of local video memory.


Figure 2 . Chrome S20 DDR2 vs. Competitors' 3DMark05 Performance

This performance advantage is provided at a lower cost and with no sacrifice in features. This is one example, but other configurations also offer higher performance gains over the competition in their appropriate market segment, and do so at a lower cost.

Window Experience Index with AcceleRAM

All of the Chrome 20 Series configurations are Microsoft Windows Vista Premium ready. They all easily exceed the 1.6 GB/sec Microsoft Windows Vista Premium WinSAT memory bandwidth requirement.

The Chrome 20 Series also gives a Microsoft Windows Vista Windows Experience Index (WEI) rating of 3.0 at a minimum in competitive system configurations as shown below.

Processor	Intel(R) Pentium(R) 4 CPU 3.20GHz	4.3	 Determined by lowest subscore
Memory (RAM)	1.00 GB	4.5	
Graphics	S3 Graphics Chrome 20 Series (Microsoft Corporation - WDDM)	3.7	
Gaming graphics	383 MB Total available graphics memory	4.3	
Primary hard disk	38GB Free (49GB Total)	5.4	

System Configuration: P4 3.2GHz, on ASUS P4N32-SLI Deluxe, with 1.0GB of system memory, and 128MB/64bit of local video memory.

Figure 3. Vista Windows Experience Index for Chrome 20 Series

Full Featured Functionality

When using an AcceleRAM LowFB configuration, no features need be sacrificed. The exact same features that are on S3 Graphics' Chrome S20 Series graphics processor non-AcceleRAM configurations are also available on all Chrome 20 Series AcceleRAM LowFB configurations. This is quite different than competitors' solutions, as users have to sacrifice features and performance for entry level priced, low video memory market segments.

Some competitors' graphics cards do not support Microsoft DirectX™ Video Acceleration, which would increase CPU utilization while playing back some video files. Some integrated GPUs cannot support some graphics intensive games as shown by the following Figures.

The following comparisons were done using a system configuration of:

- ❖ For Chrome 20 Series – P4 3.4GHz, on VIA P4M900, with 512MB of system memory, and 128MB/64bit of local video memory.
- ❖ For integrated GPU - P4 3.4GHz, on i945G, with 1.0GB of system memory.

**Figure 4. Doom3
with Chrome20 Series GPU**



**Figure 5. Doom3 with
Competitor's Integrated GPU**



The screen shot in Figure 4 was taken using a Chrome20 Series GPU while Figure 5 was taken using a leading edge integrated GPU. These screen shots are from the popular PC game Doom3. They clearly show that the integrated GPU cannot draw the correct lava flows in the game.

**Figure 6. Hero5 with
Chrome 20 Series GPU**



**Figure 7. Hero5 with
Competitor's Integrated GPU**



These screenshots are from the popular PC game Hero5, and clearly show that the integrated GPU cannot draw the correct water flows and some other objects in the game. Figure 6 is a screenshot taken using the Chrome20 Series GPU while Figure 7 is taken using a leading edge integrated GPU.

Lower Cost

In its target entry level market segment, S3 Graphics' AcceleRAM LowFB configuration provides a much lower cost solution than that of a traditional high cost add-in card (non-AcceleRAM configuration) discrete graphics processor. There is no need for the added high cost of the large traditional dedicated local video memory. A greater cost benefit accrues, as S3 Graphics' AcceleRAM LowFB configurations offer a full feature set with higher performance for less than the competitors in this market segment.

With the AcceleRAM LowFB configuration, S3 Graphics offers the entry level consumer a feature rich, Microsoft Windows Vista Premium Ready solution at a relatively low cost with optimum performance.

Conclusion

In conclusion, with the AcceleRAM LowFB Technology available with the Chrome S25 and Chrome XM27/25 processors, S3 Graphics provides a great balance between performance, feature set, and cost for the entry level market segment. Implementing AcceleRAM LowFB allows system vendors to provide a perfect middle ground between the low performance and minimal feature set of low cost UMA graphics and the high cost of discrete graphics solutions.