ZFx86 Clocking

This application note describes some of the alternative ZFx86 clocking opportunities and their performance and power ramifications. The ZFx86 Data Book contains details about how to clock the ZFx86 chip.

Clocking Versus Performance

The most common notion is that higher clock frequencies lead to better processor performance. This is not necessarily always true. The most important issue is to properly balance the system to achieve the maximum performance for a given application.

The chart below shows that as a weighted average the performance of the ZFx86 is considerably higher when the DRAM bus is clocked at its maximum rate. As shown below a SYSCLK of 66MHz multiplied by one (resulting in a 66MHz CPU clock) outperforms a SYSCLK of 33MHz multiplied by three (resulting in a 100MHz CPU clock). It is not efficient to clock the processor extremely fast if the data flow from the DRAM does not keep up.
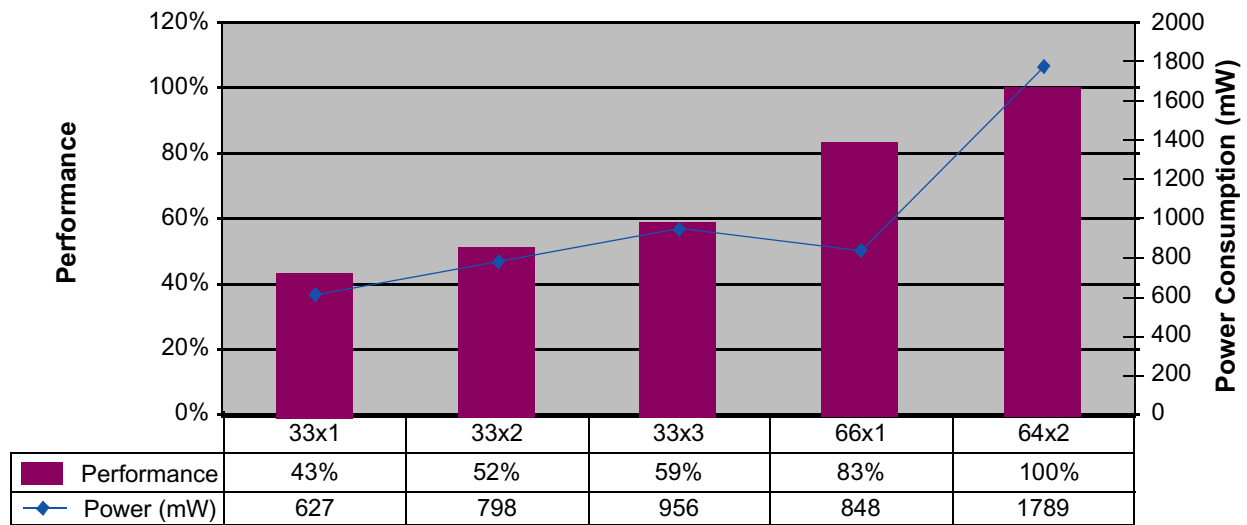

	33x1	33x2	33x3	66x1	64x2
Performance	43%	52%	59%	83%	100%
Power (mW)	627	798	956	848	1789

Figure 1. ZFx86 Performance Versus Clock

In addition, the core power consumption using a 33x3 processor clock is higher than the better performing 66x1 clocking. However, under certain circumstances such as an FPU or CPU bound operation with totally cached data, a better solution for the application might be 33X3 instead of 66x1. The table below indicates which item is enhanced by the given clocking choices.

Test run	33x3	64x2	66x1	33x2
WinBench 99/Business Disk WinMark 99 (KB/Sec)	499	866	707	448
WinBench 99/Business Graphics WinMark 99	7.6	10.8	9.54	N/A
WinBench 99/CPUmark 99	2.02	3.6	2.79	1.8
WinBench 99/Disk Playback/Bus:Overall (KB/Sec)	499	866	707	448
WinBench 99/Disk Playback/HE:AVS/Express 3.4 (KB/Sec)	2940	4920	4570	3790
WinBench 99/Disk Playback/HE:FrontPage 98 (KB/Sec)	2910	5470	4430	2670
WinBench 99/Disk Playback/HE:MicroStation SE (KB/Sec)	2190	3950	3050	1910
WinBench 99/Disk Playback/HE:Overall (KB/Sec)	2660	4640	3960	2610
WinBench 99/Disk Playback/HE:Photoshop 4.0 (KB/Sec)	4230	6620	6330	5170
WinBench 99/Disk Playback/HE:Premiere 4.2 (KB/Sec)	1960	3450	3010	1860
WinBench 99/Disk Playback/HE:Sound Forge 4.0 (KB/Sec)	3380	5740	5170	3350
WinBench 99/Disk Playback/HE:Visual C++ 5.0 (KB/Sec)	2210	3940	3210	2040
WinBench 99/FPU WinMark	89.3	120	63.4	60.6
WinBench 99/GDI Playback/HE/AVS/Express 3.4	4.22	6.21	4.9	N/A
WinBench 99/GDI Playback/HE/FrontPage 98	4.8	7.89	6.52	N/A
WinBench 99/GDI Playback/HE/MicroStation SE	0.322	0.57	0.455	N/A
WinBench 99/GDI Playback/HE/Photoshop 4.0	2.46	4.24	3.64	N/A
WinBench 99/GDI Playback/HE/Premiere 4.2	2.4	4.25	3.66	N/A
WinBench 99/GDI Playback/HE/Sound Forge 4.0	4.54	8	6.96	N/A
WinBench 99/GDI Playback/HE/Visual C++ 5.0	9.16	16.3	13.9	N/A
WinBench 99/High-End Disk WinMark 99 (KB/Sec)	2660	4640	3960	2610
WinBench 99/High-End Graphics WinMark 99	14.9	25.9	21.1	N/A

System Information and Testing Environment

All testing perfomed on a ZF Micro Devices' Integrated Development System running Phoenix BIOS. The benchmarking data collected while running Windows 98 and WinBench 99 version 1.1 from Ziff Davis. A system information summary required by Ziff Davis is shown below:

Basic Info/Project	Test
Basic Info/Tester Name	ZFx862
Basic Info/Tester Organization	ZF Micro Devices, Inc.
System Info/APM AC Power	Yes
System Info/APM Enabled	Yes
System Info/CD-ROM Name (Make/Model)	PIONEER DVD-ROM DVD-115
System Info/CD-ROM Windows Cache RAM (KB)	1238 KB
System Info/CD-ROM Windows Cache Type	CDFS Cache
System Info/CPU Active Processors	1
System Info/CPU Family	4
System Info/CPU Features	0x00000001
System Info/CPU Floating Point	Yes
System Info/CPU L1 Cache (KB)	8
System Info/CPU Name	Cyrix Cx486DX4(TM)
System Info/CPU Supports 3DNow!	No
System Info/CPU Supports MMX	No
System Info/CPU Supports Streaming SIMD	No
System Info/Disk Controller (Make/Model)	National ZFx86 Bus Master PCI to Dual IDE Controller
System Info/Disk Name (Make/Model)	FUJITSU MPF3102AH
System Info/Disk Settings 32 bit protect-mode disk drivers disabled	No
System Info/Disk Settings CDFS Prefetch	228
System Info/Disk Settings CDFS Prefetch Tail	128
System Info/Disk Settings Long name preservation for old programs disabled	No
System Info/Disk Settings Name Cache	2729
System Info/Disk Settings New file sharing and locking semantics disabled	No
System Info/Disk Settings Path Cache	64
System Info/Disk Settings Protect-mode hard disk interrupt handling disabled	No
System Info/Disk Settings Read Ahead Threshold	65536
System Info/Disk Settings Synchronous buffer commits disabled	No
System Info/Disk Settings Write-behind caching for all drives dis.	No
System Info/Disk Windows Cache RAM (KB)	All Available RAM

Basic Info/Project	Test
System Info/Disk Windows Cache Type	System Cache: write caching enabled
System Info/Display Adapter Chip	Mach64: RagePro
System Info/Display Adapter DAC	Internal
System Info/Display Adapter Driver Acceleration	0x 0
System Info/Display Adapter Memory (KB)	8192 KB
System Info/Display Adapter Name (Make/Model)	ATI 3D Rage Pro (atir3)
System Info/Display Mode	1024 x 768 16 bits/pixel
System Info/Display Orientation	Landscape
System Info/QueryPerformanceFrequency	1E+06
System Info/System BIOS Version	PhoenixBIOS 4.0 Rel 6.0 (A11)
System Info/System RAM (MB)	64
System Info/Version	2000 Build 20
System Info/Windows Computer Name	ZFx862
System Info/Windows Version	Windows 4 A , Build 2222