CHOICES — IDT WINCHIP C6-200 MHz

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Our Free Enterprise Economic Model encourages competition. Intel is challenged by the engineering skill of AMD and Cyrix. Now Centaur Technology, a division of Integrated Device Technology, joins in the competitive market of providing us with CPU choices.

ABOUT THE COMPANY

IDT WinChip C6 is manufactured and marketed by Integrated Device Technologies (http://www.idt.com) of Santa Clara, California and is designed by Centaur Technology (http://www.winchip.com) of Austin, Texas. IDT is a leading supplier of SRAM, Zero Bus Turnaround SRAM, First-In First-Out Memory (FIFO), Asynchronous Transfer Mode devices (ATM) and MIPS RISC microprocessors used in Cisco routers, SGI workstations and the Web TV Internet access box. IDT has been in business 17 years and had fiscal '97 sales of $533,000,000. Centaur Technology was established in 1995.

WinChip C6 is made in a 296-pin grid array (i.e., PGA), ceramic, Socket 7 compliant package, compatible with the Pentium pin-out and has a selectable operating voltage of 3.3 or 3.52 volts. WinChip C6 can be used in either older single voltage (rail) Pentium mother-boards as an upgrade CPU, which are now barred from using CPUs with 2.8/3.3 dual voltage requirement at speeds of 166 MHz or greater, or dual-rail models (voltages are selectable with jumpers on the mainboard). A current version of Award 4.5x, AMI, Phoenix or SystemSoft BIOS supporting WinChip C6 is recommended for robust operation. Award is currently the most optimized. WinChip C6 is currently sampling at 150 MHz CPU / 75 bus, 180 MHz / 60 MHz bus, and 200 MHz / 66 MHz bus versions. Higher speeds and specialty derivatives are planned.

Scientific Method of Investigation and Reporting

The Scientific Method of Investigation and Reporting forms an outline for reaching a conclusion that others may reach through reproducing the investigative steps that lead to the conclusion. In this method, the hypothesis is a question of what is to be proven. Defining the test procedure and environment provides the outline so that results can be reproduced. A conclusion is deduced from the refined data collected through the test procedure.

My Hypothesis, or what is to be proven testing WinChip C6?
To validate compatibility for IDT's first generation x 86 microprocessor.

> Is WinChip C6 a Socket 7 plug-in replacement -- thus compatible with the Pentium pin-out -- to Intel, AMD, and Cyrix Socket 7 compliant packages?

Ziff-   Is WinChip C6 compatible with common business applications supplied in the Davis Winstone® 97 Version 1.0 (WS97) application-based benchmark of overall PC performance under Windows?

Is WinChip C6 competitive with AMD, Cyrix, and Intel?

Is WinChip C6 operable at a selectable operating voltage of 3.3 or 3.52 volts?

Is there a change in WinChip C6 performance when the mainboard and chipset are changed?

Are the data reproducible?

Test Environment

Testing was done with the gracious help of the FIC Technical Support Group in Fremont, CA; whose help filled in my knowledge gaps during the forty hours of testing.

Ensuring repeatable results was my goal for testing. The results in Table 1 reflect CPU Winstone 7 performance in the Holco Shuttle HOT-565 v1.51 mainboard. Each test was run at least twice to detect any data spread. The tests were initiated with the WinChip C6 as the starting CPU and ended with same to evaluate any change after testing all CPU's.

Table 2 results reflect change due to the monitor refresh rate increasing from 60 Hz to 75 Hz as tested at Centaur. One test was performed with a Connon 850 MB CFS850A harddrive reflecting a lower performance.

Table 3 reflects the performance when going to a different mainboard design with a different chipset. The FIC PA-2007 was also posted on Tom's Hardware Guide site (http://www.tomshardware.com/IDTC6.html). The spread in results between Tom's and myself are accountable in the difference in subsystem components, presented to show a reasonable correlation between our two independent results. "I tested the C6 in the FIC PA-2007 board, which still is one of the fastest Socket 7 boards available," says Tom at the above listed site.

Table 4 shows another FIC mainboard, VA-502, for comparisons.

Table 5 varies Vcc for the WinChip C6 from 3.3V to 3.5V.

SYSTEM CONFIGURATION AS TESTED

WinChip C6 Vs. x86 alternatives as tested in:
1) Holco Shuttle 565 motherboard- A.K.A.:   Spacewalker
2) Intel 440 TX chipset
3) Award 4.51 PG BIOS with Centaur support
4) 512 Kbyte L1 cache
5) 32 Megabytes EDO DRAM, 60 ns
6) Diamond Stealth 3D 2000 (VIRGE) with 2 MB EDO DRAM

7) Diamond driver revision 4.03.00.3211, 1024 x 768 x 256, 75 Hz
Refresh, Non-Interlaced
8) Western Digital WDC 21600 Caviar 1.6 G IDE
9) Samsung 24 x CD-ROM
10) ESS 768 PnP Sound
11) 1.44 MB Floppy
12) Windows 95 B w/ license

TEST DATA

The result in terms of Winstone 97 performance for an $865 PC with average memory, graphic and disk subsystems for that price point. System configuration as tested:

Winstone 97 Performance -- Socket 7 Compliant Processors: Baseline data provided by IDT/Centaur Test Lab

1. IDT WinChip C6 MMX 200 MHz   43.5

2. Pentium Classic 200 MHz   43.2

3. Pentium with MMX 200 MHz   38.9

4. AMD K6 MMX 200 MHz   44.8

5. Cyrix 6x86 MX 200 MHz   46.1

6. IBM 6x86 MX 200 MHz   46.1

TABLE 1.				Holco Shuttle HOT-565 v.1.51 MainBoard @ 60 Hz Refresh				
Line No.	Manufacturer	Clock Freq.	Test No.			Winstone 97 Value		
				Baseline	Test Value	WP/SS	Publishing	Database
1	AMD	200	1	44.8	40.9	3.97	4.33	4.1
2	AMD	200	2	44.8	40.9	3.95	4.46	4.0
3	Cyrix	166	1	46.1	41.8	4	4.45	4.3
4	Cyrix	166	2	46.1	41.4	4	4.38	4.2
5	IDT*	200	1	43.5	40.3	3.86	4.24	4.
6	IDT*	200	2	43.5	40.3	3.88	4.29	4.1
7	IDT*	200	3	43.5	40.1	3.89	4.14	4.2

8	IDT*	180	1		39.2	3.7	4.21	4.2
9	Intel	200	1	38.9	40.1	3.83	4.32	4.1
10	Intel	200	2	38.9	40.2	3.86	4.39	4.0
11	Intel	200	3	38.9	40	3.84	4.36	4.0

*Vcc=3.52V
Harddisk defragmentation between tests was not performed.

TABLE 2.	Holco Shuttle HOT-565 v.1.51 MainBoard @ 75 Hz Refresh						
Line No.	Vendor	CPU CLK (MHz)	Test No.	Winstone 97	WP/SS	Publishing	DB
1	AMD	200	1	45.0/36.1•	4.43	4.74	4.38
2	Cyrix	166	1	45.3	4.43	4.76	4.52
3	IDT**	200	1	43.4	4.23	4.53	4.45
4	IDT**	200	2	43.5	4.22	4.57	4.47
5	IDT**+	200	1	43.2	4.22	4.53	4.36
6	Intel	200	1	42.8	4.16	4.6	4.23

** Vcc=3.52 V
+60 Hz Refresh
•Test value with a connor 850 MB CFS 850A harddrive.

TABLE 3.	FICPA-2007 Baby at Pentium Mainboard@75Hz Refresh									
Line No.	Vendor	CPU CLK (MHz)	Test No.	Winstone 97			%	WP/SS	Publishing	DB
1	AMD	200	1	45.7	52.3	6.6	14	4.48	4.81	4.53
2	Cyrix	166	1	47	53.9	6.9	14	4.58	4.92	4.78
3	IDT**	200	1	43.4	49.6	6.2	14	4.21	4.57	4.45
4	IDT**	200	2	43.3				4.2	4.62	4.37
5	IDT**	180	1	41.4				4.01	4.35	4.26

| 6 | Intel | 200 | 1 | 42.8 | 50.2 | 7.4 | 17 | 4.13 | 4.59 | 4.33 |

This column represents data abstracted from Business Winstone 97 Windows 95 Chart, page 3 at http://www.tomshardware.com/IDTC6.htm and subtracted from my data to form a difference and the percentum difference is posted the following column. An average of about 14% difference is accounted for in the different subsystem components used by Tom and me.

TABLE 4.	FICVA-502 Baby At Pentium Mainboard @ 75 Hz Refresh						
Line No.	Vendor	CPU CLK (MHz)	Test No.	Winstone	WP/SS	Pub.	DB
1	AMD	200	1	43.9	4.31	4.64	4.32
2	Cyrix	166	1	45.6	4.42	4.82	4.63
3	IDT**	200	1	43.2	4.21	4.53	4.40
4	IDT**	200	2	43	4.19	4.49	4.4
5	IDT**	200	3	43.4	4.21	4.52	4.49
6	Intel	200	1	42.8	4.15	4.54	4.33

TABLE 5.	Holco Shuttle HOT 565 v.1.51 Mainboard@ 75 Hz Refresh							
Line No.	Vendor	CPU CLK (MHz)	Vcc V	Test No.	Winstone	WP/SS	Pub.	DB
1	IDT	200	3.3	1	42.6	4.19	4.44	4.26
2	IDT	200	3.3	2	43.5	4.24	4.52	4.43
3	IDT	200	3.52	1	42.8	4.15	4.53	4.34
4	IDT	200	3.52	2	42.6	4.17	4.4	4.35

Varing Vcc from 3.3V to 3.52V

CONCLUSION
ECONOMIC ANALYSIS

From the standpoint of cost effectiveness, WinChip C6 was specifically architected for a small die to serve the sub $1,000 PC product category. Explanation of the architectural elements of WinChip C6 can be found at http://www.winchip.com.

The result, in terms of Winstone 97 performance for an $865 PC with average memory, graphic and disk subsystems for that price point, is that IDT's WinChip C6 is a competitive alternative to AMD, Cyrix, and Intel with additional cost for these choices being in the range of $100 to over $150 per comparable system.

The Centaur WinChip C6 design team should be congratulated and receive some award for reducing the die size of the WinChip C6 MMX 200 MHz to 80mm^2 (84% difference over AMD K6 MMX 200 MHz at 162mm, 117% difference over Cyrix 6x86 MX 200 MHz 191 mm^2, and 60% difference over Intel Pentium with MMX 200 MHz at 141 mm^2) and providing a competitive quality processor at a lower price.

SUMMARY

The results of TABLE 1 compare to base line testing done at Centaur. The variance in my test results may be due to slightly different performance of subsystem components in my test system and that of Centaur's. With correlation to Tom's hardware page, I feel the WinChip C6 is competitive with AMD, Cyrix, and Intel per the Business Suite of tests in Ziff Davis Winstone 97 Business Suite.