



**Mobile Pentium® Processor  
with MMX™ Technology  
233/200 MHz  
Performance Brief**

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## INTRODUCTION

The Intel mobile Pentium® processor family provides outstanding performance for all mobile applications. Manufactured from Intel's latest state-of-the-art 0.25 micron process technology, the 233- and 200- MHz mobile Pentium processors with MMX™ technology enable new levels of multimedia and communications performance and are the highest performing mobile Pentium processors. The mobile Pentium processor family now consists of the following products:

- Pentium® processor with MMX™ technology at 233 MHz
- Pentium processor with MMX technology at 200 MHz
- Pentium processor with MMX technology at 166 MHz
- Pentium processor with MMX technology at 150 MHz
- Pentium processor with MMX technology at 133 MHz
- Pentium processor at 150 MHz
- Pentium processor at 133 MHz
- Pentium processor at 120 MHz
- Pentium processor at 100 MHz
- Pentium processor at 90 MHz
- Pentium processor at 75 MHz

Today's microprocessor performance can be best assessed using three different vectors: Integer Benchmarks, Multimedia Benchmarks, and Floating-Point Benchmarks. Integer Benchmarks simulate the activities of end users working in typical productivity applications such as word processing, spreadsheets, presentation applications and personal finance programs. Multimedia Benchmarks are designed specifically to simulate the activities of end users utilizing video, digital sound, PC imaging or Video Conferencing, and other similar media-rich applications. Floating-Point Benchmarks measure the performance of three dimensional visualization techniques such as games to support richer textures and enhanced lighting effects.

Representative integer benchmarks include: Processor Level Benchmarks- SPECint\* 95, CPUmark32\*, Norton\*SI32. System Level Benchmarks- SYSmark32\* for Windows\* 95, SYSmark32\* for Windows\* NT 4.0, SYSmarkNT\*

Representative multimedia benchmarks include: Intel Media Benchmark, Norton Multimedia Benchmark from Norton Utilities for Windows\* 95, Intel MMX™ Technology Applications

Representative floating-point benchmarks include: 3D geometry portion of the Intel Media Benchmark, 3D graphics portion of the Norton Multimedia Benchmark, 3D WinMark\* Suite of 3D WinBench\* 97

This report provides test results on the three vectors of performance on Intel's 233- and 200- MHz mobile Pentium processors with MMX technology performance normalized to the mobile Pentium processor with MMX technology at 166 MHz. We selected the following benchmarks to represent the three vectors of performance:

- 1) Integer: CPUmark32\* (Processor Level), SYSmark32\* on Windows\* 95/NT (System Level)
- 2) Multimedia: Intel Media Benchmark
- 3) Floating-Point: 3D Geometry portion of Intel Media Benchmark

Details of the system configurations used in all the benchmarks throughout this brief are



described in Appendix A.

## The Intel Pentium® Processor with MMX™ Technology

The Intel Pentium processor with MMX technology delivers excellent performance for all PC software. It is fully compatible with the huge base of PC software. Additionally, the Pentium processor with MMX technology enables new levels of multimedia and communication performance. It has immediate responsiveness for the latest, most demanding software with powerful realistic graphics and the ability to run full-screen, full-motion video.

## MOBILE PENTIUM® PROCESSOR WITH MMX™ TECHNOLOGY PRODUCT FEATURE HIGHLIGHTS

Such dramatic performance allows the mobile Pentium processor with MMX technology to run today's most demanding mobile applications. It has the performance to run full-screen, full-motion video, real-time animation, compute intensive 3D modeling graphic applications, and mobile multimedia presentations.

The mobile Pentium processor with MMX technology is fully compatible with an entire library of mobile applications based on operating systems such as MS-DOS\*, Windows 3.1, Windows 95, OS/2\*, UnixWare\*, SCO UNIX\*, Windows NT, OPENSTEP\*, and Sun Solaris\*. It has several features which allow high-performance notebooks to be designed, including the following:

- 133, 150, 166, 200, and 233 MHz
- New instructions that accelerate multimedia and communications performance
- 32 Kbyte Level One Cache
- Separate Code and Data Caches with MESI Protocol
- Pin Compatible with previous Pentium processors
- Improved Branch Prediction
- Superscalar Architecture
- More efficient instruction decoder
- Floating-Point Unit
- 64-bit External Data Bus
- Performance Monitoring and Execution Tracing
- High-Reliability Error Detection
- 2.45V core supply and 3.3V I/O buffer supply for 133/150/166 MHz processors
- 1.8V core supply and 2.5V I/O buffer supply for 200/233 MHz processors

## MICROPROCESSOR PERFORMANCE SUMMARY

### WINDOWS\* 95/WINDOWS\* NT PROCESSOR BENCHMARKS

The 32-bit integer Windows performance of the Pentium processor is illustrated by the commonly used Windows benchmarks. These benchmarks represent the high performance achieved by the Intel Pentium processor running 32-bit applications.

CPUmark32\* is a 32-bit processor level benchmark provided by Ziff-Davis Labs designed to measure the processor performance potential running 32-bit applications.

SYSmark32\* for Windows 95 and SYSmark32 for Windows NT are system-level benchmarks designed to show the speed of a system (CPU, L2 cache, and memory) using different CPUs running 32-bit applications.

Figures 1, 2, and 3 illustrate the Intel mobile Pentium® Processors with MMX™ Technology performance when executing those popular 32-bit benchmarks.

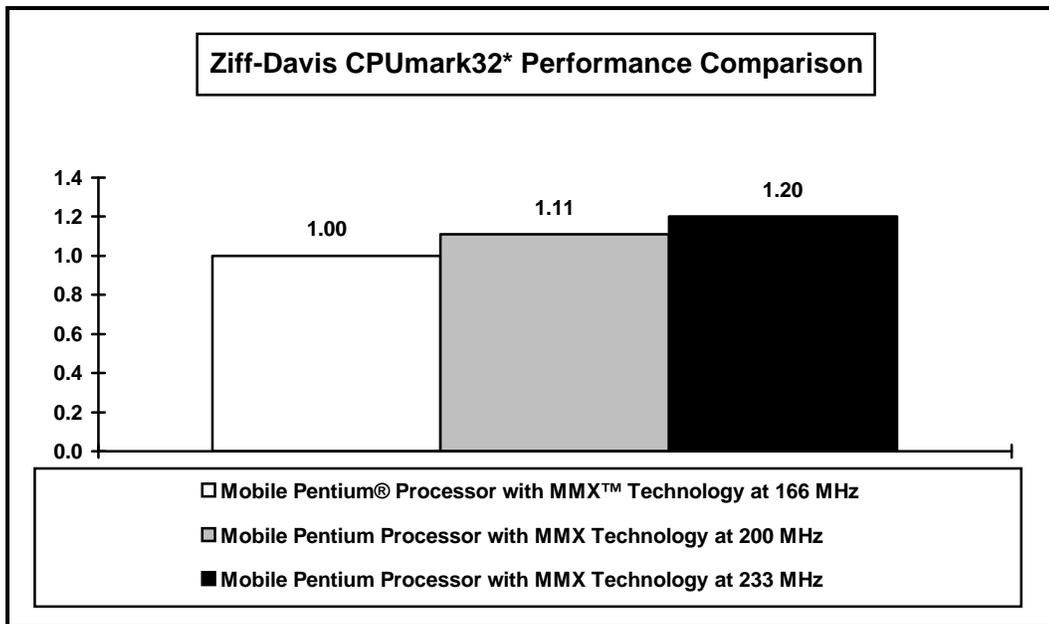


Figure 1. Mobile Pentium® Processor with MMX™ Technology Performance for Ziff-Davis CPUmark32\* Benchmark

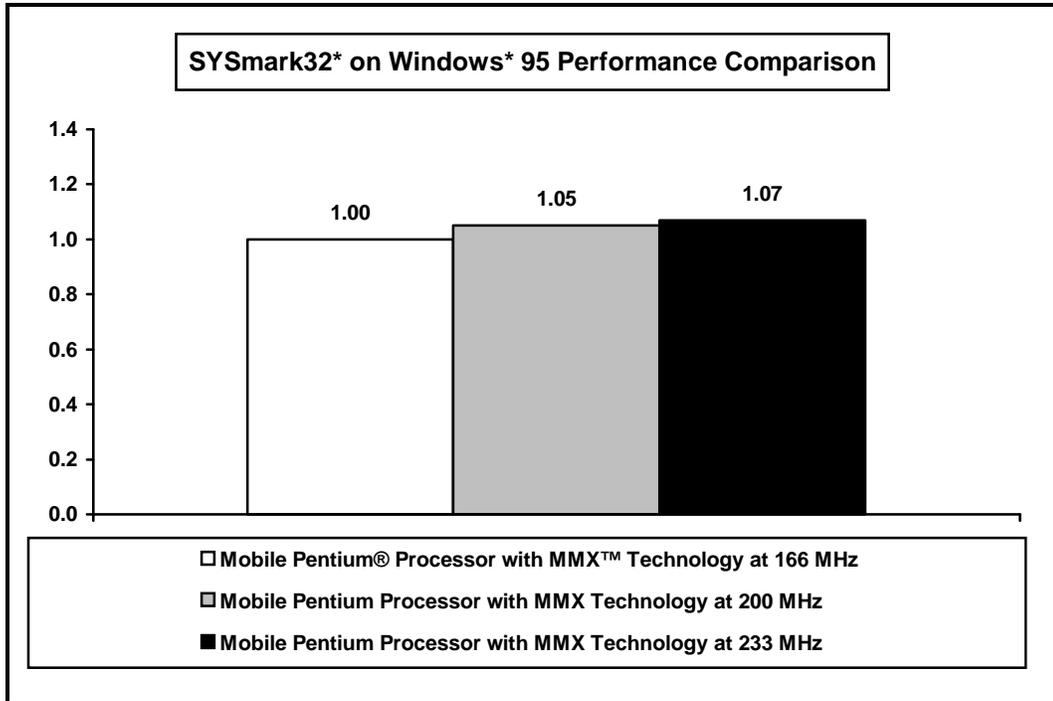


Figure 2. Mobile Pentium® Processor with MMX™ Technology Performance for SYSmark32\* on Windows\* 95 Benchmark

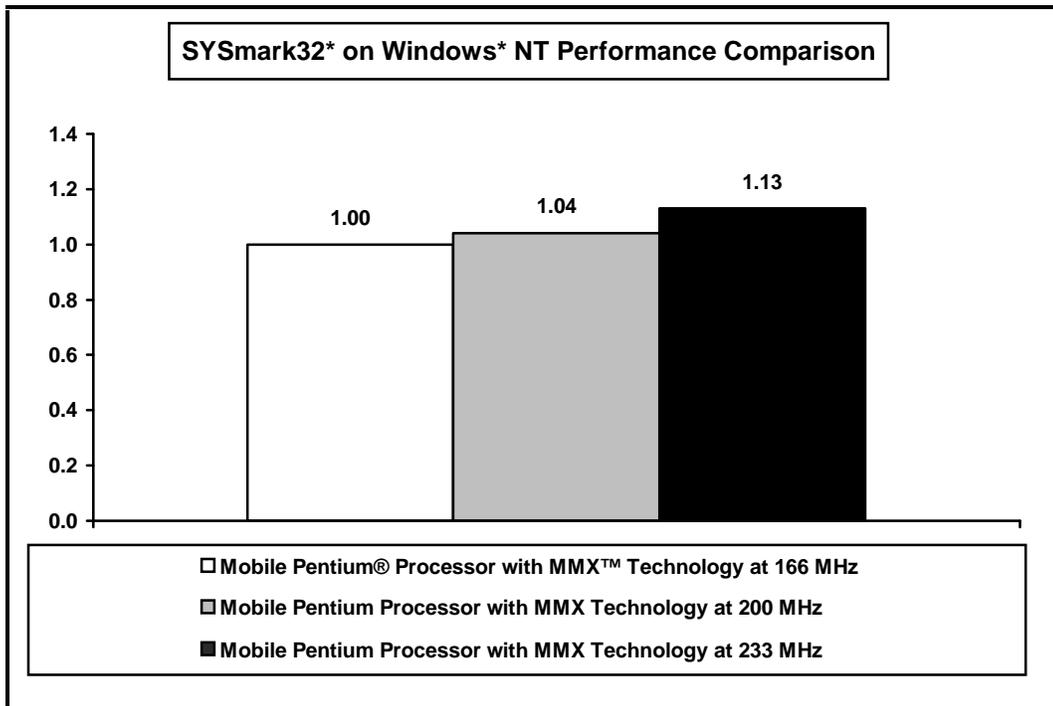


Figure 3. Mobile Pentium® Processor with MMX™ Technology Performance for SYSmark32\* on Windows\* NT Benchmark



## Intel Media Benchmark

Multimedia applications are proliferating rapidly. Intel developed the Intel Media Benchmark because an adequate industry standard multimedia benchmark does not currently exist to measure multimedia performance. The Intel Media Benchmark measures the performance of processors running algorithms found in multimedia uses. It incorporates audio and video playback, image processing, wave sample rate conversion, and 3D geometry.

The most probable anticipated use of the microprocessor in video applications will be to provide software decompression of video data. One algorithm, which is increasing in popularity, is the industry standard MPEG1\* algorithm, such as that used by the popular Xing Technology decompression and the Berkeley\* MPEG1 shareware software. The video playback component of the Intel Media Benchmark implements the MPEG1 decompression algorithm (ISO11172-2). This benchmark focuses on the contribution of the processor in implementing a video player.

The audio component is based on the MPEG1 audio decompression definition (ISO11172-3). This component of the Intel Media Benchmark decompresses and plays a stereo audio clip. The audio component also includes sample rate conversion, special effects and stereo mixing.

The image processing component applies digital filters to true-color (24-bit) bitmap images. These filters include a box filter which is used to implement filters such as Gaussian blur and embossing, an image blending function used to combine two images into one, and a color space conversion function used to change an image's luminance.

The 3D component of the Intel Media Benchmark is based on Direct3D\* and a geometry routine from the OpenGL\* 3D Triangle benchmark. These tests are used to measure the geometry portion of a 3D workload. As such, rasterization performance is not measured. It is Intel's belief that in the next two to three years rasterization will be encompassed by the graphic accelerator card. Thus the performance of rasterization will not be CPU-bound and is therefore not measured with regard to the processor performance. However, it is anticipated that 3D geometry will remain the duty of the processor.

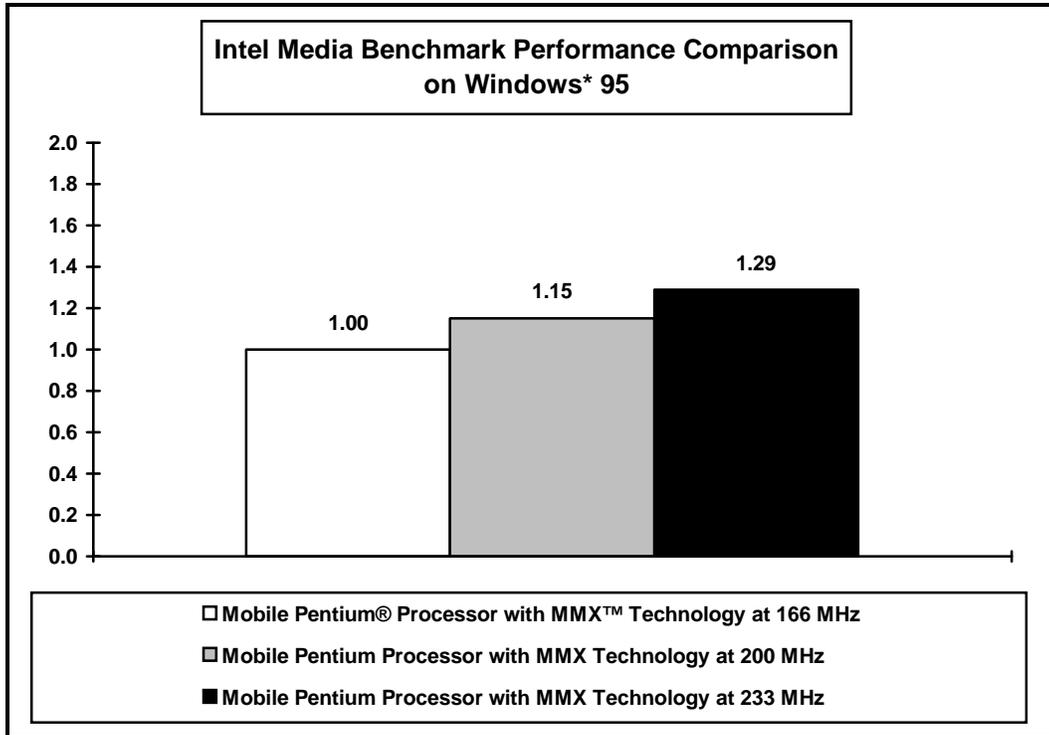


Figure 4. Mobile Pentium® Processor with MMX™ Technology Performance for the Intel Media Benchmark

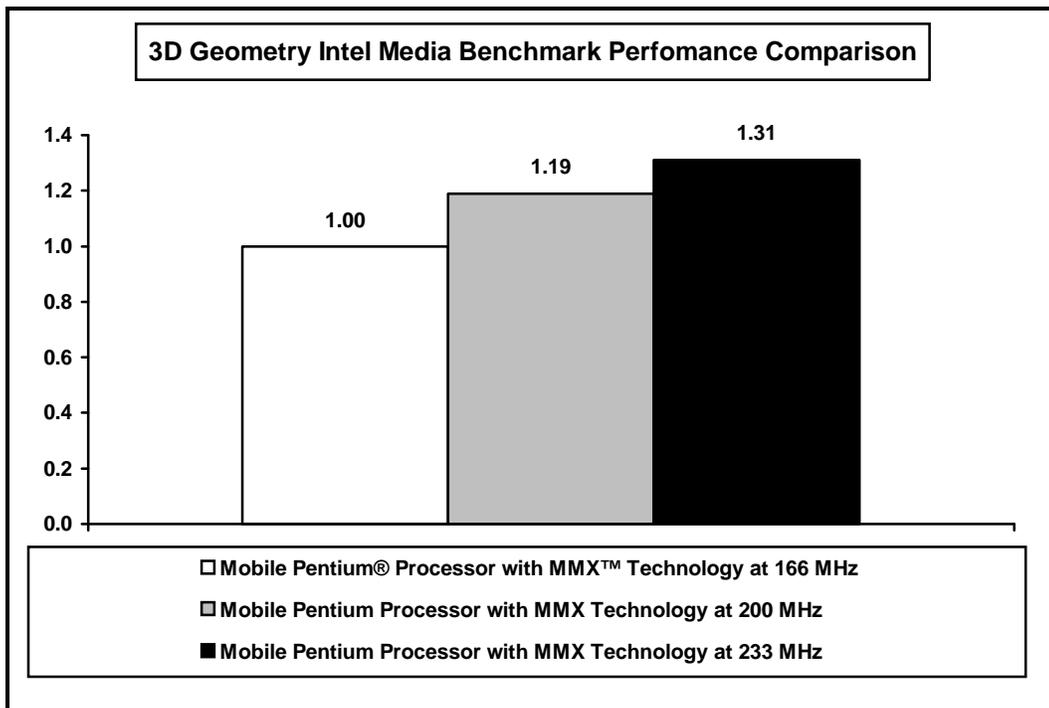


Figure 5. Mobile Pentium® Processor with MMX™ Technology Performance for 3D Geometry portion of Intel Media Benchmark



## SUMMARY

Table 1 summarizes the microprocessor benchmark relative performance results for the mobile Pentium processors discussed in this performance brief.

**Table 1. Mobile Pentium® Processor with MMX™ Technology Benchmark Results**

Benchmarks	Mobile Pentium® Processor with MMX™ Technology 166 MHz	Mobile Pentium Processor with MMX Technology 200 MHz	Mobile Pentium Processor with MMX Technology 233 MHz
CPUMark32*	1.0	1.11	1.20
SYSmark32* on Windows* 95	1.0	1.05	1.07
SYSmark32* on Windows* NT	1.0	1.04	1.13
Intel Media Benchmark	1.0	1.15	1.29
3 D Geometry portion of Intel Media Benchmark	1.0	1.19	1.31



## APPENDIX A — TEST CONFIGURATIONS

### System Configuration for Mobile Pentium® Processors with MMX™ Technology at 166/200/233 MHz

Processor	Pentium® Processor with MMX™ Technology - 166, 200, 233 MHz
Board	Intel 82430TX PCIset based mobile motherboard
Primary Cache	16-Kbyte (Instruction) 16-Kbyte (Data)
Secondary Cache	512 Kbyte SRAM (WB Burst)
Memory Size/Speed	64 Mbyte SDRAM/60ns
Motherboard Chip Set	Intel 82430TX
BIOS	Amibios v8.0
Hard Disk	Toshiba Mk1301 1.2Gig
Operating System	Windows95*/Windows* NT
Video Controller/Bus	Chips & Technology* 65554/PCI
Graphics	640 x 480 Resolution, 256 Colors