# Intel® Mobile Celeron™ Processor at 466 MHz, 433 MHz, 400 MHz, 366 MHz, 333 MHz, 300 MHz, and 266 MHz Performance Brief

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# 1. INTRODUCTION

The Intel® 466 MHz and 433 MHz Mobile Celeron™ processor are the newest members of the family of Intel processors that provide outstanding performance for all mobile applications at an exceptional value. Manufactured from Intel's 0.25 micron process technology, the 466 MHz, 433 MHz, 400 MHz, 366 MHz, 333 MHz, 300 MHz, and 266 MHz mobile Celeron processors, with their on-die 128-Kbyte L2 cache, enable higher levels of performance for new mobile PCs.

The mobile Celeron processor family now consists of the following five products:

- Mobile Celeron™ Processor at 466 MHz
- Mobile Celeron™ Processor at 433 MHz
- Mobile Celeron™ Processor at 400 MHz
- Mobile Celeron™ Processor at 366 MHz
- Mobile Celeron™ Processor at 333 MHz
- Mobile Celeron™ Processor at 300 MHz
- Mobile Celeron™ Processor at 266 MHz[+]

Today's microprocessor performance can be best assessed using the Spectrum of Performance:

- **Productivity 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.

- **3D/Floating-Point Benchmarks** measure the performance of three-dimensional visualization techniques such as those used in games to support richer textures and enhanced lighting effects.

- **Internet Technology Benchmarks** evaluate processor Internet performance on browser, 3D, and multimedia technologies.

Representative integer benchmarks include: Processor Level Benchmarks- SPECint*95; System Level Benchmarks- SYSmark*98, Winstone*99, and the processor component of WinBench*99 from Ziff-Davis*.

Representative multimedia benchmarks include: MultimediaMark* 99 from FutureMark* Corp., Intel MMX™ Technology Applications, as well as Intel Media Benchmark.

Representative floating-point benchmarks include: the FPU component of WinBench*99 from Ziff-Davis*, 3DMarkCPU from 3Dmark, WinBench*98 FPU, and SPECfp base*95.

Representative Internet benchmarks include: the productivity, 3D, and multimedia benchmarks listed above. Additionally, some Java Internet technology benchmarks are JMark*2.0 Processor Test for the processor level benchmark and SYSmark*J for the system level.

This report provides test results on the Spectrum of Performance for Intel's 466 MHz, 433 MHz, 400 MHz, 366 MHz, 333 MHz, 300 MHz, and 266 MHz processors with performance normalized to the mobile Celeron Processor at 266 MHz. We selected the following benchmarks to represent the Spectrum of Performance:

- Productivity: Processor level benchmark- SPECint*95, system level benchmark- Winstone*99 and SYSmark* 98
- Multimedia: MultimediaMark* 99
- 3D/Floating-Point: SPECfp_base*95 and WinBench*98 FPU

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**Endnotes**

+ The Mobile Celeron™ processor at 266 MHz includes processors at 1.6V $V_{cc}$ and processor at 1.5V $V_{cc}$.

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- Internet: JMark*2.0

Details of the system configurations used for all the benchmarks throughout this brief are described in Appendix A.

## 1.1 The Intel® Mobile Celeron™ Processor at 466 MHz, 433 MHz, 400 MHz, 366 MHz, 333 MHz, 300 MHz, and 266 MHz

Intel's 466 MHz, 433 MHz, 400 MHz, 366 MHz, 333 MHz, 300 MHz and 266 MHz Mobile Celeron™ processors deliver excellent performance for all IA architecture based PC software. They are fully compatible with the existing base of PC software written for the Pentium® II processor, Celeron™ processor, Pentium processor, Intel486™ processor, and Intel386™ processor. Additionally, this new generation of processors enables higher 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.

## 2. MOBILE CELERON™ PROCESSOR FEATURE HIGHLIGHTS

The Mobile Celeron™ processor allows exceptional value notebooks to be designed for today's mobile applications by providing the following features:

- 466 MHz, 433 MHz, 400 MHz, 366 MHz, 333 MHz, 300 MHz, 266 MHz, and low voltage 266 MHz Core CPU
- Integrated 16 Kbytes of Data and 16Kbytes of Instruction Level-One Cache
- Integrated on-die 128 Kbytes Level-Two Cache
- Low Power GTL+ Processor System Bus Interface operating at 66 MHz
- Integrated Floating-Point Unit
- 64-bit External Data Bus
- Supports the Intel Architecture MMX™ Technology
- Supports the Intel Architecture with Dynamic Execution
- Quick Start Mode for low power , fast exit (low latency) clock "throttling"
- Deep Sleep mode for extremely low power dissipation
- Integrated Thermal Diode
- High-Reliability Error Detection

## 3. MICROPROCESSOR PERFORMANCE SUMMARY

## 3.1 Spectrum of Performance

### 3.1.1 Productivity Benchmarks

The 32-bit Integer Windows performance of the Intel Mobile Celeron™ processor is illustrated by the following benchmarks:

Processor Level Benchmark: SPECint*95

The SPECint*95 benchmark test provides a comparison point for the performance of the microprocessor, memory architecture and compiler of a computer system on compute-intensive, 32-bit applications. SPEC benchmark test results for Intel microprocessors are determined using particular, well-configured systems. These results may or may not reflect the relative performance of the Intel microprocessor in systems with different hardware or software designs or configurations (including compilers). Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing.

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<u>System Level Benchmark: Winstone* 99 and SYSmark*98</u>

Winstone* 99 is a system-level, application-based benchmark developed by Ziff-Davis*. Winstone* 99 measures a PC's overall performance when running Windows-based 32-bit applications on Windows* 98 or Windows* NT 4.0. It runs real 32-bit business suites through a series of scripted activities and uses the time a PC takes to complete those activities to produce its performance scores.

Winstone* 99 incorporates the following popular office software suites: Corel* WordPerfect* Suite 8, Lotus SmartSuite*, and Microsoft Office* 97. To mirror the typical usage patterns of today's PC users, the benchmark keeps multiple applications open within each suite, and switches tasks between these applications and the Netscape Navigator Internet browser. (source: Ziff-Davis* )

SYSmark* 98 for Windows* 98 and Windows* NT 4.0 is a suite of application software and associated benchmark scripts developed by Business Applications Performance Corporation (BAPCO), a non-profit consortium of PC OEMs, software vendors, semiconductor manufacturers, and industry publications. SYSmark 98 is a tool that measures system performance on popular business-oriented applications in the Microsoft* Windows operating environment. The scripts were developed to reflect usage patterns of PC users in a business-oriented environment.

SYSmark* 98 includes 32-bit benchmark scripts for office productivity and content creation. Applications for office productivity are: Corel* CorelDRAW* 8, Microsoft Excel* 97, Dragon Systems* Naturally Speaking* 2.02, Netscape* Communicator* 4.05, Caere* OmniPage Pro* 8.0, Corel Paradox* 8.0, Microsoft PowerPoint* 97, Microsoft Word* 97. Applications for content creation are: MetaCreations* Bryce* 2, Avid* Elastic Reality* 3.1, Macromedia* Extreme3D * 2, Adobe* Photoshop* 4.0.1, Adobe Premiere* 4.2, Xing Technology* XingMPEG* Encoder* 2.1

Figures 1, 2, and 3 illustrate the performance of the Intel® Mobile Celeron™ processor when executing integer part of the benchmarks for CPU and system level performance comparison.
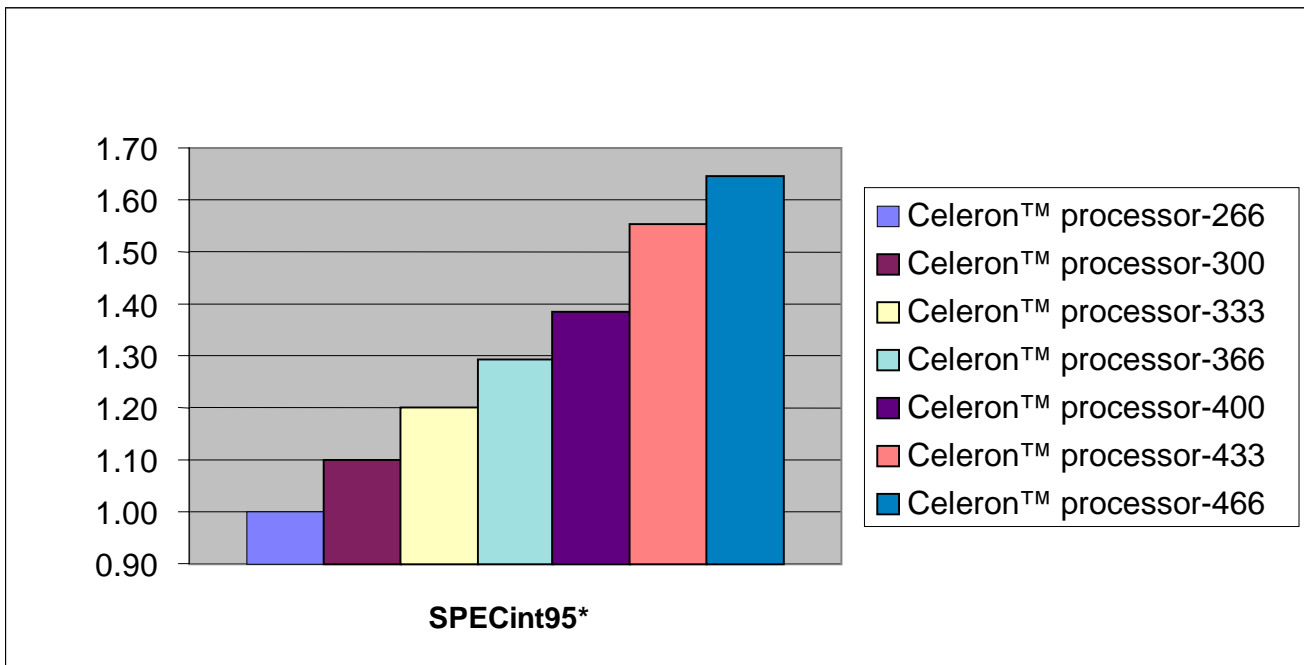


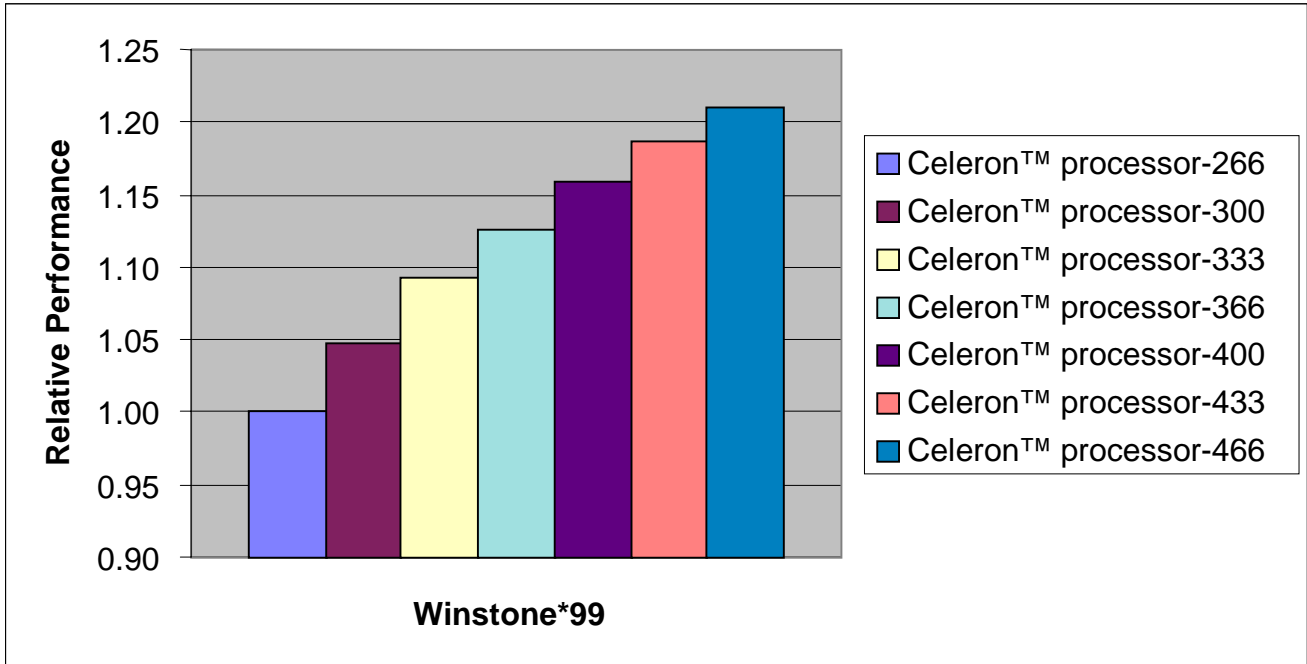**Figure 1. Mobile Celeron™ Processor Relative Performance for SPECint*95**

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Figure 2. Mobile Celeron™ Processor Relative Performance for Winstone* 99
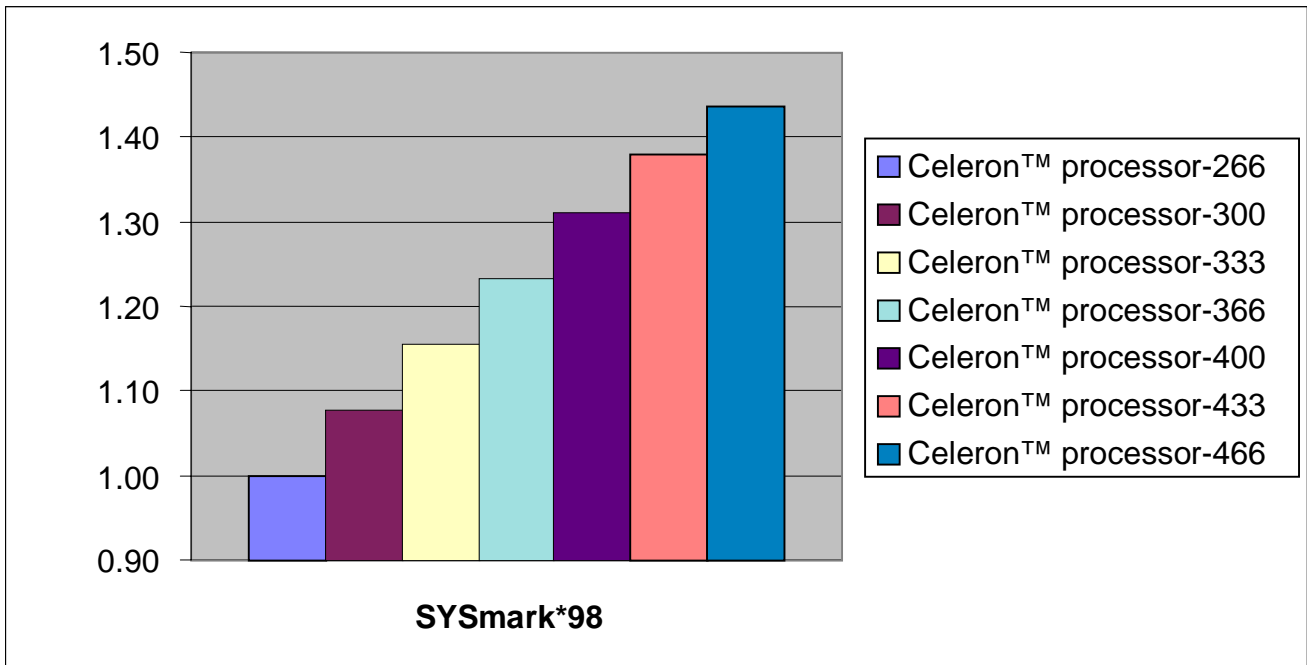


Figure 3. Mobile Celeron™ Processor Relative Performance for SYSmark* 98

## 3.1.2    Multimedia Benchmarks

The MultimediaMark* 99 is a system level benchmark from FutureMark* Corp. that measures audio, video, and imaging performance. MultimediaMark* 99 is a benchmark that focuses on testing multimedia performance of modern PC in a "real world" environment.
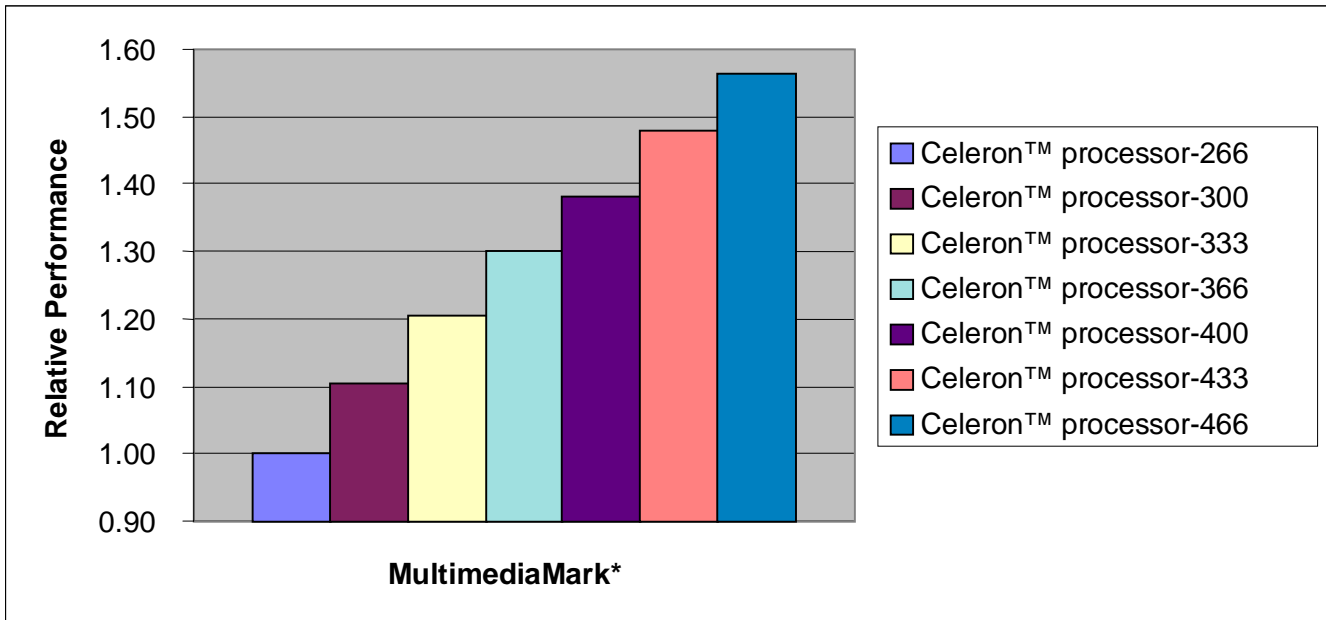


**Figure 4. Mobile Celeron™ Processor Relative Performance for MultimediaMark* 99**

Figures 4 illustrates the relative performance comparison of the Intel® mobile Celeron™ processors when executing the MultimediaMark* 99 benchmark.

## 3.1.3    3D/Floating-Point Benchmarks

The floating-point performance of the Intel® Mobile Celeron™ processor is illustrated by the following benchmarks:

SPECfp*95

The SPECfp*95 benchmark test provides a comparison point for the performance of the microprocessor, memory architecture, and compiler of a computer system on compute-intensive, 32-bit applications. SPEC benchmark test results for Intel microprocessors are determined using particular, well-configured systems. These results may or may not reflect the relative performance of Intel microprocessor in systems with different hardware or software designs or configurations (including compilers). Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing.

WinBench*98 FPU

Business WinBench*98 is a subsystem-level benchmark that measures the performance of a PC's graphics, disk, processor, video, and CD-ROM subsystems in a Windows*-based environment. WinBench 98's tests are all 32-bit and can only run on Windows*95, Windows*98, and Windows*NT systems.

We used the FPU WinMark* components of this benchmark for comparing floating-point performance in this report.

The Business applications and the categories in which the benchmark groups them are:
· Business Browsers: Netscape Navigator*
· Business Publishing: Corel DRAW!* 7, Microsoft PowerPoint*98
· Business Spreadsheet/Database: Microsoft Access*98, Microsoft Excel*98, Lotus 1-2-3* 98, Corel Quattro Pro*7
· Business Word Processing: Microsoft Word* 98, Corel WordPerfect* 7 (source Ziff-Davis*)

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Figure 5 and 6 illustrate the relative performance comparison of the Intel Mobile Celeron processors when executing SPECfp*95 and WinBench98 FPU* benchmarks.
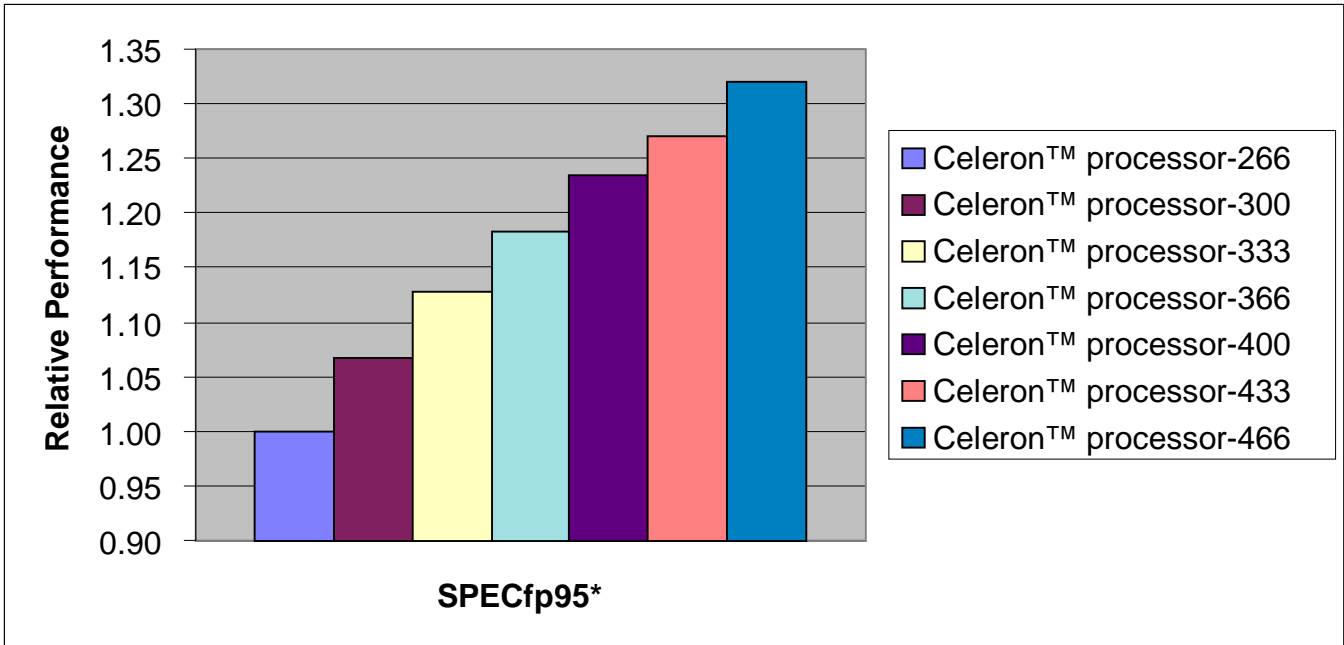


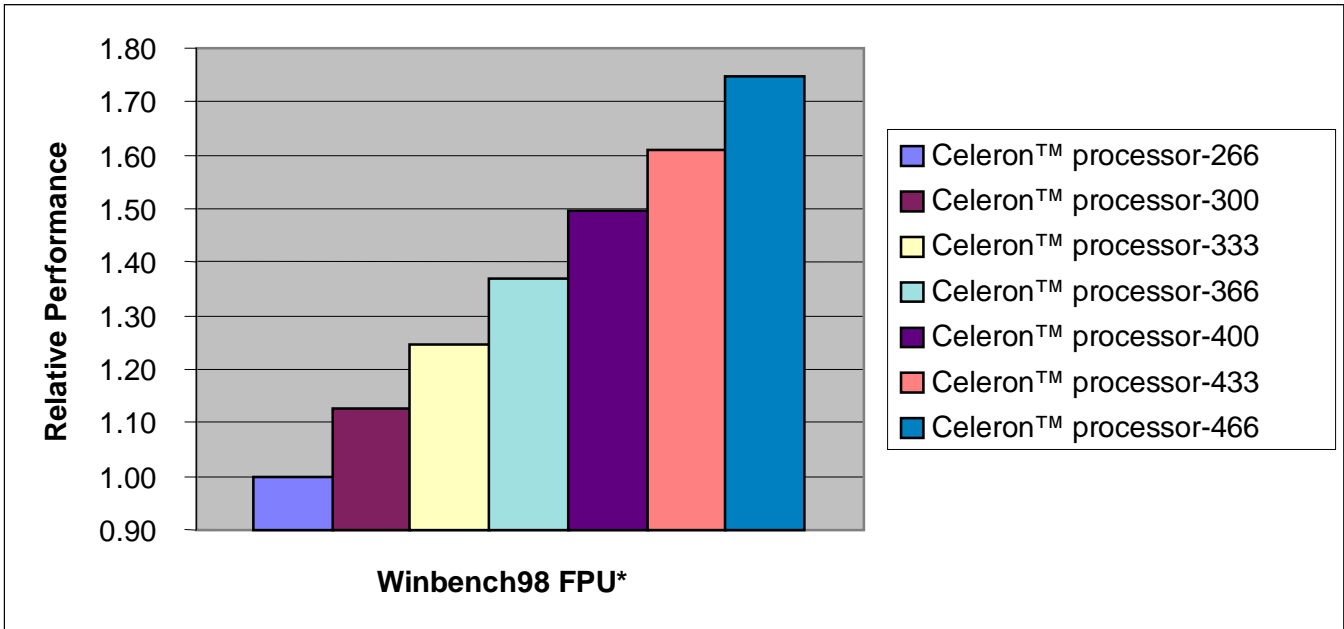**Figure 5. Mobile Celeron™ Processor Relative Performance for SPECfp*95**



**Figure 6. Mobile Celeron™ Processor Relative Performance for Winbench98 FPU***

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### 3.1.4    Internet Technology Benchmarks

Jmark* 2.0 is a benchmark developed by Ziff-Davis to measure processor Java performance. The Jmark 2.0 Processor Test stresses the Java Virtual Machine (JVM) on a non-graphical workload. Figures 7 illustrates the relative performance comparison of the Intel® mobile Celeron™ processors when executing Jmark*2.0 benchmark.
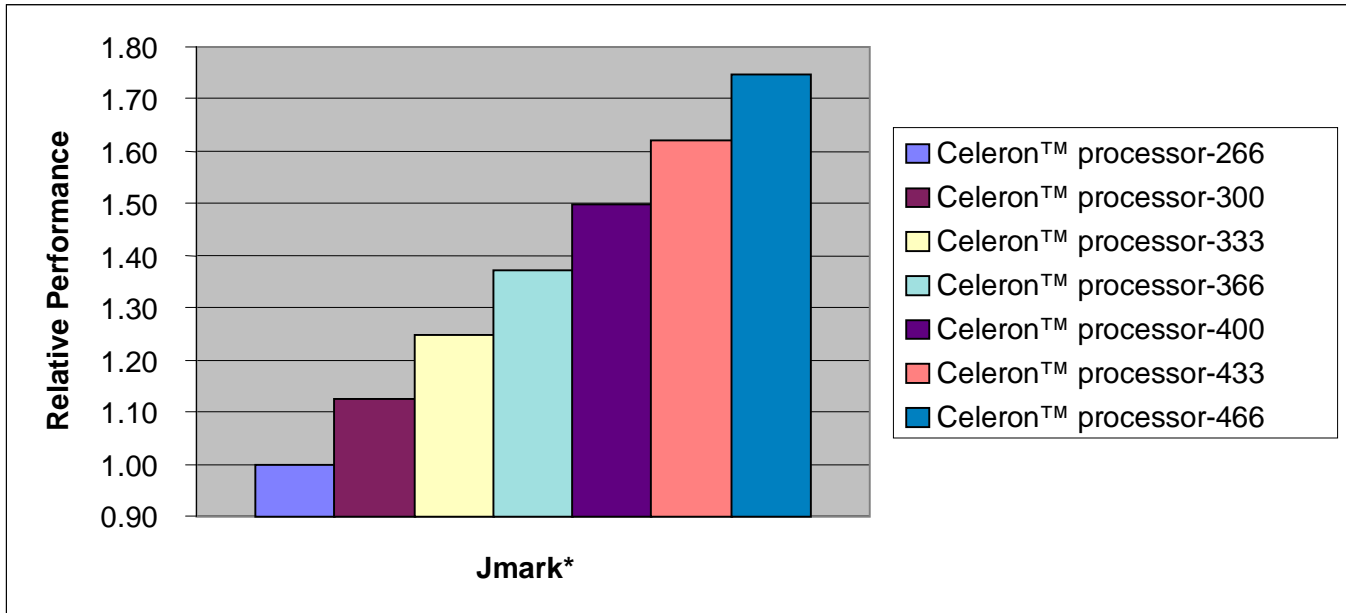


**Figure 7. Mobile Celeron™ Processor Relative Performance for JMark*2.0**

## 4.    SUMMARY

Table 1 summarizes the microprocessor benchmark relative performance results for the Mobile Celeron™ processors discussed in this performance brief.

**Table 1.  Mobile Celeron™ Processor Benchmark Results**

| Processor | Winstone* 99 | SYSmark* 98 | MultimediaMark * 99 | Winbench98 FPU** | SPECint* 95 | SPECfp* 95 | Jmark* 2.0 |
|---|---|---|---|---|---|---|---|
| Mobile Celeron™ Processor at 266 MHz | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Mobile Celeron ™ Processor at 300 MHz | 1.05 | 1.08 | 1.10 | 1.13 | 1.10 | 1.07 | 1.12 |
| Mobile Celeron ™ Processor at 333 MHz | 1.09 | 1.16 | 1.21 | 1.24 | 1.20 | 1.13 | 1.25 |
| Mobile Celeron™ Processor at 366 MHz | 1.13 | 1.23 | 1.30 | 1.37 | 1.29 | 1.18 | 1.37 |
| Mobile Celeron™ Processor at 400 MHz | 1.16 | 1.31 | 1.38 | 1.50 | 1.38 | 1.23 | 1.50 |
| Mobile Celeron™ Processor at 433 MHz | 1.19 | 1.38 | 1.48 | 1.61 | 1.55 | 1.27 | 1.62 |
| Mobile Celeron™ Processor at 466 MHz | 1.21 | 1.44 | 1.56 | 1.75 | 1.65 | 1.32 | 1.75 |

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# Appendix A — System Configuration

Table A-1 shows the system and its configuration used for evaluating the benchmark performances discussed in this brief.

**Table A-1.  System Configuration**

| Processor | Mobile Celeron™ Processor at 266/300/333/366/400/433/466 MHz |
|---|---|
| OEM's System | Gateway* Solo* 2500 with Celeron™ processor with Intel 440BX Chip Set |
| Primary Cache | 16-Kbyte (Instruction) 16-Kbyte (Data) |
| Secondary Cache | On-die 128 Kbytes for Mobile Celeron ™ Processor at 266/300 MHz |
| System Memory Size/Speed | 64 Mbytes SDRAM |
| Motherboard Chip Set | Intel® 82440BX |
| Hard Disk | 2.1 GB |
| Media | 20X CD-ROM |
| Operating System | Windows* 98 for Winstone* 99, MutlimediaMark* and Winbench98 FPU*, Windows* NT 4.0 (OSR3) for SPECint95*  and SPECfp95* |
| Sound | NeoMagic* Magicwave* 3DX |
| Video Controller | MagicGraph 128XD* graphics controller |

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