Product Brief

Intel® Core™2 Quad Processor

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New version now available based on Intel's 45nm technology

Overview

The Intel® Core™2 Quad processor is the latest in cutting-edge processor technology for the desktop PC. Based on the new Intel® Core™ microarchitecture, the Intel Core 2 Quad processor delivers four complete execution cores within a single processor, delivering unprecedented performance and responsiveness in multi-threaded and multi-tasking business and home environments.

The unprecedented performance of the Intel Core 2 Quad processor is made possible by each of the four complete execution cores delivering the full power of Intel Core microarchitecture. More instructions can be carried out per clock cycle, shorter and wider pipelines execute commands more quickly, and improved bus lanes move data throughout the system faster. This quad-core processor represents Intel's continued leadership and drive of multi-core processing and more parallel computing.

The latest versions, built on Intel's 45nm manufacturing technology, take these benefits to a whole new level. This new technology uses hafnium-infused Hi-k transistors, enabling even more processor performance by doubling the transistor density, improving efficiency and speed relative to the previous generation, and increasing cache size by up to 50 percent. These new Intel Core 2 Quad processors deliver even more performance without using more energy.

Doing More with Intel® Quad-Core

The Intel Core 2 Quad processor is at the center of today's most interactive and content-rich software experiences. The evolving set of threaded multimedia applications, including digital content creation, will shine as users are able to complete tasks faster. Game play can achieve even greater visualization and realism as tasks such as artificial intelligence (AI), physics, and rendering can be distributed across each of the four complete execution cores and run in parallel.

Features and Benefits of the Intel® Core™2 Quad Processor

Features	Benefits
Quad-Core Processor	Provides four complete execution cores in a single processor with up to 12 MB of L2 cache and up to a 1333 MHz Front Side Bus. Four dedicated, physical threads help operating systems and applications deliver additional performance, so end users can experience better multi-tasking and multi-threaded performance across many types of applications and work loads.
Intel® Wide Dynamic Execution	Improves execution speed and efficiency, delivering more instructions per clock cycle. Each of the four cores can complete up to four full instructions simultaneously.
Intel® Smart Memory Access	Optimizes the use of the data bandwidth from the memory subsystem to accelerate out-of-order execution. A newly designed prediction mechanism reduces the time in-flight instructions have to wait for data. New pre-fetch algorithms move data from system memory into fast L2 cache in advance of execution. These functions keep the pipeline full, improving instruction throughput and performance. 45nm versions further improve this feature, with more efficient methods of loading and storing data in main memory.
Intel® Advanced Smart Cache[1]	Provides shared level 2 cache across each pair of cores that can be dynamically allocated to each processor core, within the pair, based on workload. This efficient implementation increases the probability that each core within the pair can access data from fast L2 cache, significantly reducing latency to frequently used data and improving performance.
Intel® Advanced Digital Media Boost	Accelerates the execution of Streaming SIMD Extension (SSE) instructions to significantly improve the performance on a broad range of applications, including video, audio, and image processing, and multimedia, encryption, financial, engineering, and scientific applications. The 128-bit SSE instructions are now issued at a throughput rate of one per clock cycle effectively doubling their speed of execution on a per clock basis over previous generation processors. 45nm versions include a new Super Shuffle Engine, which improves existing SSE instructions while enabling significant gains on the latest SSE4 instruction set. SSE4-optimized applications, such as video editing and encoding in high-definition resolution, will see additional performance improvements.
Intel® Virtualization Technology (Intel® VT)[2]	Allows one hardware platform to function as multiple "virtual" platforms. Intel® VT improves manageability, limiting downtime and maintaining worker productivity by isolating computing activities into separate partitions.
Intel® 64[3] Architecture	Allows the processor to access larger amounts of memory. With appropriate 64-bit hardware and software, platforms based on an Intel processor supporting Intel® 64 architecture can allow the use of extended virtual and physical memory.
Execute Disable Bit[4]	Provides extended virus defense when deployed with a supported operating system. Memory can be marked as executable or non-executable, allowing the processor to raise an error to the operating system if malicious code attempts to run in non-executable memory. This can prevent the code from infecting the system.
Digital Thermal Sensor (DTS)	Provides for more efficient processor and platform thermal control improving system acoustics. The DTS continuously measures the temperature at each processing core. The ability to continuously measure and detect variations in processor temperature enables system fans to spin only as fast as needed to cool the system. The combination of these technologies can result in significantly lower noise emissions from the PC.
Intel Designed Thermal Solution for Boxed Processors	Includes a 4-pin connector for fan speed control to help minimize the acoustic noise levels generated from running the fan at higher speeds for thermal performance[5]. Fan speed control technology is based on actual CPU temperature and power usage.

[1] For the Intel® Core™2 Quad processor, shared L2 cache refers to 12, 8, or 6MB of L2 cache per core pair.

[2] Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain platform software enabled for it. Functionality, performance or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.

[3] 64-bit computing on Intel architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Consult with your system vendor for more information.

[4] Enabling Execute Disable Bit functionality requires a PC with a processor with Execute Disable Bit capability and a supporting operating system. Check with your PC manufacturer on whether your system delivers Execute Disable Bit functionality.

[5] The acoustic benefits of the 4-pin header are reliant on a properly designed motherboard. Contact your board manufacturer for compatibility.

[6] Intel® 975X, P965, X38, and P35 Express Chipsets support Intel® Core™2 Quad processors. Other 3rd party chipsets may support Intel Core 2 Quad processors. Contact your board manufacturer for compatibility.

Multi-tasking environments can be expanded like never before. Users can stream high-definition content while playing a high-framerate game, or run multiple complex data bases while developing professional content and running virus protection software in the background. The Intel Core 2 Quad processor is a powerful new tool for today, with the ability to grow and expand tomorrow.

Comparison Table

	Q9000 series	Q6000 series
Manufacturing Process	45nm	65nm
L2 Shared Cache[1]	12 MB / 6 MB	8 MB
System Bus	1333 MHz	1066 MHz
SSE Instructions	SSE4, SSE3, SSE2, and SSE	SSE3, SSE2, and SSE
Intel® Express Chipset[6]	Intel® 3 Series Express Chipsets	Intel® 3 Series and G965, P965, and 975X Express Chipsets