Product Brief

Intel® Core™2 Duo Processors

Embedded Computing

Intel® Core™2 Duo Processors E8400, E7400, E6400 and E4300 for Embedded Computing

Product Overview

Intel® Core™2 Duo processors are members of Intel's growing product line of multi-core processors based on Intel® Core™ microarchitecture. This innovative process technology makes it possible to integrate two complete execution cores in one physical package, providing advancements in simultaneous computing for multi-threaded applications and multi-tasking environments.

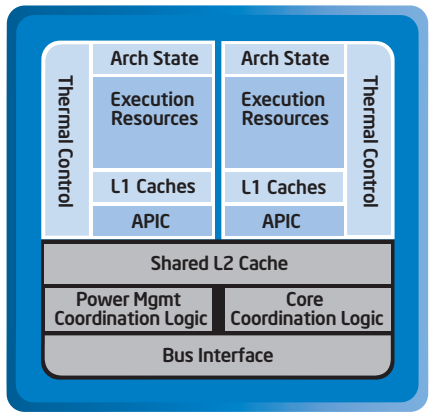
Processors meet the needs of a wide range of performance-intensive, low-power embedded applications in smaller form factors such as retail and transaction terminals (i.e., point-of-service terminals and ATMs), gaming platforms, industrial control and automation, digital security surveillance and medical imaging. While incorporating advanced processor technology, they remain software-compatible with previous IA-32 processors.

Intel's hafnium-based 45nm Hi-k silicon process technology (E8400[Δ] E7400[Δ]) enables excellent processor performance by doubling transistor density and increasing cache size by up to 50 percent. The result is improved speed and efficiency relative to previous-generation dual-core Intel® processors.

Intel® Core™ Microarchitecture

Intel Core microarchitecture provides enhanced energy-efficient performance to help equipment manufacturers optimally balance processing capabilities within power and space constraints.

- Intel® Wide Dynamic Execution executes four instructions per clock cycle to improve execution speed and efficiency. Each core can complete up to four full instructions simultaneously using an efficient 14-stage pipeline.
- Intel® Advanced Smart Cache improves system performance by significantly reducing memory latency to frequently used data through dynamic allocation of shared L2 cache to each of the processor cores.



Intel® Core™2 Duo processors, based on Intel® Core™ microarchitecture, include two complete execution cores, shared L2 cache, and intelligent power management features.

- Intel® Smart Memory Access optimizes use of available data bandwidth from the memory subsystem to accelerate out-of-order execution. The prediction mechanism reduces the time in-flight instructions must wait for data, while pre-fetch algorithms move data from system memory into fast L2 cache in advance of execution. 45nm process technology further improves these features with more efficient methods of loading and storing data in main memory. These functions keep the pipeline full, improving instruction throughput and performance.
- Intel® Advanced Digital Media Boost accelerates execution of SSE/2/3 instructions to significantly improve multimedia performance. 128-bit SSE instructions are issued at a throughput rate of one per-clock cycle, effectively doubling the speed of execution on a per-clock basis over previous-generation processors. 45nm process technology delivers a new super shuffle engine, which improves existing SSE instructions while enabling significant gains on the latest SSE4 instruction set. As a result, SSE4-optimized applications such as video editing and encoding in high-definition resolution will see additional performance improvements.

- **Intel® Intelligent Power Capability** manages runtime power consumption of execution cores by turning on computing functions only when needed. Reduces overall power consumption, enabling quieter, more power-efficient system designs.

Product Highlights

- **Intel® Virtualization Technology**[1,3] (E8400[Δ], E7400[Δ], and E6400[Δ]) allows one hardware platform to function as multiple "virtual" platforms. It offers improved manageability, limiting downtime and maintaining worker productivity by isolating computing activities into separate partitions. It also provides greater isolation and security between different applications and operating systems for added protection against corruption.
- **Intel® Trusted Execution Technology**[2,3] (E8400[Δ]) for safer computing is a versatile set of hardware extensions to Intel® platforms, enabling security capabilities such as measured launch and protected execution. Hardware-based mechanisms help protect against software-based attacks to safeguard the confidentiality and integrity of data stored or created on embedded devices.
- **Intel® 64 Architecture**[4] supports 64-bit instructions, providing flexibility for 64-bit and 32-bit applications and operating systems. Access to larger physical memory space reduces load on the system and allows faster access to data from RAM instead of the hard drive.
- **Execute Disable Bit**[5] allows memory to be marked as executable or non-executable when combined with a supporting operating system. If code attempts to run in non-executable memory, the processor raises an error to the operating system. This prevents some classes of viruses or worms that exploit buffer overrun vulnerabilities and helps improve system security.
- **Digital Thermal Sensor (DTS)** measures maximum temperature on the die at any given time.
- **Embedded Lifecycle Support** protects system investment by enabling extended product availability for embedded customers.
- **A strong ecosystem of hardware and software vendors,** including members of the Intel® Embedded and Communications Alliance (intel.com/go/eca), helps developers cost-effectively meet design challenges and shorten time-to-market.

Intel® Core™2 Duo Processor Platform Features

Intel® Core™2 Duo Processors E8400[Δ] and E7400[Δ]	▪ Based on Intel® 45nm process technology ▪ E8400 increases L2 cache up to 6 MB, a three-fold increase over E6400 ▪ Validated with Intel® G45 Express chipset, Intel® Q45 Express chipset, Intel® Q35 Express chipset, and Intel® 3210 chipset to address key requirements of many embedded computing designs, including: – Quality graphics, low-power consumption and noise reduction – Enhanced manageability, data protection and security
Intel® Core™2 Duo Processors E6400[Δ] and E4300[Δ]	▪ Based on Intel® 65nm process technology ▪ Validated with Intel® Q45 Express chipset, Intel® Q35 Express chipset, Intel® 3210 chipset, and Intel® 3010 chipset to address key requirements of many embedded computing designs, including: – Quality graphics, low-power consumption and noise reduction – Enhanced manageability, data protection and security ▪ Validated with Intel® Q965 Express chipset – Optimized memory engine for exceptional system performance – Specialized technologies for enhanced graphics, sound and manageability

Software Overview

A number of independent operating system and BIOS vendors provide support for these platforms:

Operating System	Contact
Microsoft Windows* XP	Intel provides drivers[6]
Microsoft Windows* XP embedded	Intel provides drivers[6]
Microsoft Windows* WEPOS	Intel provides drivers[6]
Microsoft Windows* Server 2003	Intel provides drivers[6]
Red Hat Enterprise Linux* 5	Red Hat
Novell SUSE Linux* Enterprise 10	Novell
Wind River Linux*	Wind River
Wind River VxWorks* 6.6	Wind River

BIOS
American Megatrends
Insyde Software
Phoenix Technologies

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Product Number	Core Speed	Front-Side Bus Speed	L2 Cache	Thermal Design Power	VID	Tj Max	Package
45nm process technology							
Intel® Core™2 Duo Processor E8400[Δ] EU80570PJ0806M	3.0 GHz	1333 MHz	6 MB Unified	65 watts	0.85 V-1.3625 V	Tc Max = 5° C to 72.4° C	LGA 775
Intel® Core™2 Duo Processor E7400[Δ] AT80571PH0723M	2.80 GHz	1066 MHz	3 MB Unified	65 watts	0.85 V-1.3625 V	Tc Max = 5° C to 72.4° C	LGA 775
65nm process technology							
Intel® Core™2 Duo Processor E6400[Δ] HH80557PH0462M	2.13 GHz	1066 MHz	2 MB Unified	65 watts	0.85 V-1.3625 V	Tc Max = 5° C to 61.4° C	LGA 775
Intel® Core™2 Duo Processor E4300[Δ] HH80557PG0332M	1.80 GHz	800 MHz	2 MB Unified	65 watts	0.85 V-1.3625 V	Tc Max = 5° C to 61.4° C	LGA 775

Intel in Embedded and Communications: intel.com/embedded

[Δ] Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See http://www.intel.com/products/processor_number for details.

[1] 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.

[2] No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer system with Intel® Virtualization Technology, an Intel TXT-enabled processor, chipset, BIOS, Authenticated Code Modules and an Intel TXT-compatible measured launched environment (MLE). The MLE could consist of a virtual machine monitor, an OS or an application. In addition, Intel TXT requires the system to contain a TPM v1.2, as defined by the Trusted Computing Group and specific software for some uses. For more information, see www.intel.com/technology/security.

[3] Not all specified units of this processor support Intel® VT or Intel® TXT. See the Processor Spec Finder at http://processorfinder.intel.com or contact your Intel representative for more information.

[4] 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. Performance will vary depending on your hardware and software configurations. Consult with your system vendor for more information.

[5] 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.

[6] Drivers available at: downloadcenter.intel.com (enter chipset name).

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