Product Brief

**Intel® Core™2 Duo Processors**

Embedded Computing

# Intel® Core™2 Duo Processors T9400, T7500, T7400, L7500, L7400 and U7500 for Embedded Computing

## Product Overview

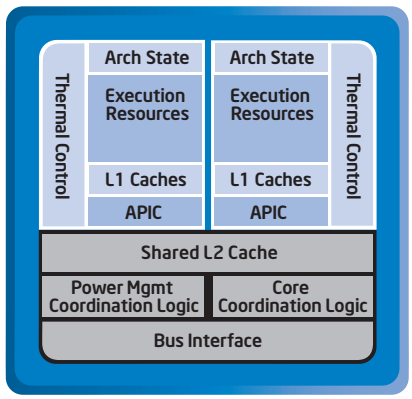
Intel® Core™2 Duo processors – members of Intel's growing product line of multi-core processors based on Intel® Core™ micro-architecture – now feature 45nm process technology (T9400Δ) to deliver more energy-efficient performance. Intel Core 2 Duo processor technology makes it possible to integrate two complete execution cores in one physical package, providing advancements in simultaneous computing for multi-threaded applications and multi-tasking environments. Intel's new hafnium-based 45nm Hi-k silicon process technology enables even more 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 2 Duo processors meet the needs of a wide range of performance-intensive, low-power embedded applications in smaller form factors such as interactive clients (i.e., point-of-sale 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® Core™ Microarchitecture

Energy-efficient performance helps equipment manufacturers optimally balance processing capabilities within power and space constraints.

- Intel® Wide Dynamic Execution allows each core to simultaneously complete up to four full instructions per clock cycle.
- Intel® Advanced Smart Cache significantly reduces memory latency to frequently used data through dynamic allocation of shared L2 cache.
- Intel® Smart Memory Access accelerates out-of-order execution, reduces time in-flight instructions must wait for data, and moves data from system memory into fast L2 cache prior to execution.
- Intel® Advanced Digital Media Boost accelerates execution of Streaming SIMD Extension (SSE) instructions to significantly improve performance of video, audio, and image processing for multimedia, encryption, financial, engineering, and scientific applications. 128-bit SSE instructions, issued at a throughput rate of one per clock cycle, effectively doubles speed of execution over previous-generation processors. 45nm versions include new Super Shuffle Engine to improve existing SSE instructions while enabling significant gains on the latest SSE4 instruction set. This provides additional performance improvements in SSE4-optimized applications, such as video editing and encoding in high-definition resolution.




Intel® Core™2 Duo processor, based on Intel® Core™ microarchitecture, includes two complete execution cores, shared L2 cache, and intelligent power management features which deliver significantly greater performance-per-watt over previous-generation dual-core Intel® processors.

## Intel® Core™ Microarchitecture (continued)

- Intel® Virtualization Technology[1] allows one hardware platform to function as multiple "virtual" platforms, improving manageability, limiting downtime and maintaining worker productivity. Provides greater isolation and security between different applications and operating systems for added protection.
- Intel® 64 Architecture[2] supports 64-bit instructions, providing flexibility for 64-bit and 32-bit applications and operating systems.
- Intel® Trusted Execution Technology (Intel® TXT) defends against software-based attacks and helps protect confidentiality and integrity of data stored or created on the system. Enables each application to run within its own space, protected from all other software on the system.
- Execute Disable Bit[3] marks memory regions as executable or non-executable when combined with a supporting operating system.
- Digital Thermal Sensor (DTS) enables efficient processor and platform thermal control. Thermal sensors located within the processor measure maximum temperature on the die at any given time.
- Embedded lifecycle support protects system investment by enabling extended product availability for embedded customers.
- Intel® Embedded and Communications Alliance (intel.com/go/eca) helps developers cost-effectively meet design challenges and shorten time-to-market through collaboration with a strong ecosystem of hardware and software vendors.

## Intel® Core™2 Duo Processor Platform Features

| | |
|---|---|
| Intel® Core™2 Duo Processor T9400[Δ] | ▪ Based on Intel® 45nm technology<br>▪ Validated with Mobile Intel® GM45 Express chipset<br>– Excellent processor and graphics performance, storage speed and reliability<br>– Up to 8 GB 667/800 MHz DDR2 or 800/1067 MHz DDR3 SODIMM system memory<br>– Graphics core performance up to 533 MHz<br>▪ Validated with power-optimized Intel® 5100 Memory Controller Hub chipset with Intel® 82801IR I/O Controller Hub 9R<br>– 30 lanes of PCI Express* for I/O connectivity<br>– Supports dual-channel DDR2 registered ECC memory (533 MHz and 667 MHz) to help safeguard data and improve reliability<br>– Performance-per-watt advantage for single-processor bladed form factor applications |
| Intel® Core™2 Duo Processors T7500[Δ]/L7500[Δ]/U7500[Δ] | ▪ Based on Intel® 65nm process technology<br>▪ Validated with Mobile Intel® GME965 Express chipset<br>– Excellent storage speed, reliability and remote asset management capabilities<br>– Integrated 32-bit 3D graphics engine, and up to 4 GB of 533/667 MHz DDR2 SODIMM system memory<br>– Graphics core performance up to 500 MHz<br>▪ L7500 offers low-power, value-sensitive solution<br>▪ U7500 provides ultra low-power solution with excellent graphics performance |
| Intel® Core™2 Duo Processors T7400[Δ]/L7400[Δ]/U7500[Δ] | ▪ Based on Intel® 65nm process technology<br>▪ Validated with Mobile Intel® 945GME Express chipset<br>– Superb graphics, I/O bandwidth, storage speed, reliability and remote asset management capabilities<br>– Integrated 32-bit 3D graphics engine<br>– Up to 4 GB of 400/533/667 MHz DDR2 SODIMM system memory<br>▪ T7400 and L7400 also validated with Intel® E7520 chipset, addressing the needs of high-performance, low-power platforms within small form factor designs<br>▪ L7400 and U7500 also validated with Intel® 3100 chipset, an integrated chipset offering low-power platform solutions for thermally sensitive and performance-intensive embedded, communications and storage applications |

## Intel® Core™2 Duo Processors for Embedded Computing

| Product Number | Core Speed | Front-Side Bus Speed | L2 Cache | Thermal Design Power | VID | Tj Max | Package |
|---|---|---|---|---|---|---|---|
| 45-nm technology | | | | | | | |
| Intel® Core™2 Duo Processor T9400[Δ] | | | | | | | |
| AV80576GH0616M | 2.53 GHz | 1066 MHz | 6 MB Unified | 35 watts | 0.75 V-1.3 V | 105° C | 479 µFC-BGA |
| AW80576GH0616M | 2.53 GHz | 1066 MHz | 6 MB Unified | 35 watts | 0.75 V-1.3 V | 105° C | 478 µFC-PGA |
| 65-nm technology | | | | | | | |
| Intel® Core™2 Duo Processor T7500[Δ] | | | | | | | |
| LE80537GG0494M | 2.20 GHz | 800 MHz | 4 MB Unified | 35 watts | 0.75 V-1.35 V | 100° C | 479 µFC-BGA |
| LF80537GG0494M | 2.20 GHz | 800 MHz | 4 MB Unified | 35 watts | 0.75 V-1.35 V | 100° C | 478 µFC-PGA |
| Intel® Core™2 Duo Processor T7400[Δ] | | | | | | | |
| LE80537GF0484M | 2.16 GHz | 667 MHz | 4 MB Unified | 34 watts | 0.75 V-1.3 V | 100° C | 479 µFC-BGA |
| LF80537GF0484M | 2.16 GHz | 667 MHz | 4 MB Unified | 34 watts | 0.75 V-1.3 V | 100° C | 478 µFC-PGA |
| Intel® Core™2 Duo Processor L7500[Δ] | | | | | | | |
| LE80537LG0254M | 1.60 GHz | 800 MHz | 4 MB Unified | 17 watts | 0.75 V-1.3 V | 100° C | 478 µFC-BGA |
| Intel® Core™2 Duo Processor L7400[Δ] | | | | | | | |
| LE80537LF0214M | 1.50 GHz | 667 MHz | 4 MB Unified | 17 watts | 0.75 V-1.1 V | 100° C | 479 µFC-BGA |
| Intel® Core™2 Duo Processor U7500[Δ] | | | | | | | |
| LE80537UE0042M | 1.06 GHz | 533 MHz | 2 MB Unified | 10 watts | 0.75 V-0.975 V | 100° C | 479 µFC-BGA |

## Intel Access

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|---|---|
| Intel in Embedded and Communications: | intel.com/go/embedded |
| Developer's Site: | intel.com/design/ |
| General Information Hotline: | (800) 628-8686 or (916) 356-3104 5 a.m. to 5 p.m. PST |
| Intel® Literature Center: | (800) 548-4725 7 a.m. to 7 p.m. CST (U.S. and Canada)<br>International locations please contact your local sales office. |

[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] 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.

[3] 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.



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