Product Brief

Intel® Celeron® Processor

Embedded Computing

Intel® Celeron® Processors E1500 and E3400 for Embedded Computing

Product Overview

The dual-core Intel® Celeron® processors E1500[Δ] and E3400[Δ] provide energy-efficient computing and exceptional value for embedded designs such as retail and transaction solutions (i.e., kiosks, point-of-service terminals and digital signage), gaming, industrial automation and control, and print imaging. Featuring Intel® Intelligent Power Capability, it optimizes energy usage in the two processor cores by turning on computing functions only when needed. This improves performance and energy efficiency by operating at lower frequencies while supporting smaller and quieter embedded systems.

The Intel Celeron processor E1500 is based on 65nm process technology; the Intel Celeron processor E3400 is based on 45nm process technology. Both processors feature Execute Disable Bit[1] for built-in security support, as well as Intel® 64 architecture,[2] enabling applications to access larger amounts of memory when used with appropriate 64-bit supporting hardware and software.

In addition, the Intel Celeron processor E3400 features Intel® Virtualization Technology,[3] (Intel® VT) providing embedded devices with a high level of isolation between partitions so that multiple applications can share the same platform without interruption and without compromise.

Both processors are validated with four different Intel® chipsets, offering flexibility with a selection of graphics, security, manageability and performance capabilities:

- **Intel® G45 Express chipset:** Next-generation Intel® Graphics Media Accelerator X4500HD (Intel® GMA X4500HD), features built-in support for full 1080p high-definition video playback, including Blu-ray* content. This powerful video engine delivers smooth HD playback without the need for add-in video cards or decoders. Intel® Clear Video Technology, a combination of video processing hardware and software technologies, provides crystal clear images without the imperfections and artifacts typically associated with video content. It allows embedded computing applications to connect to a wide range of digital display interfaces, including the High-Definition Multimedia Interface* (HDMI*) and DisplayPort.* HDMI supports all HD formats including 720p, 1080i, and 1080p. It consists of the Intel® 82G45 Graphics and Memory Controller Hub (GMCH) and Intel® I/O Controller Hub (ICH) 10.

- **Intel® G41 Express chipset:** An ideal price/performance solution for embedded computing applications, this chipset includes the Intel® GMA X4500, with built-in support for smooth HD video playback without the need for add-in video cards or decoders. Intel Clear Video Technology enhances the visual experience with a combination of video processing hardware and software technologies. The chipset also delivers optimized 3D graphics performance and support for Microsoft DirectX* 10, Shader Model* 4.0 and OpenGL* 2.0. It consists of the Intel® 82G41 GMCH and Intel® ICH7.

- **Intel® Q45 Express chipset:** Intel® GMA 4500 provides enhanced graphics and media capabilities for applications such as gaming, retail, kiosks and digital signage, while Intel® Trusted Execution Technology[4] (Intel® TXT) provides security functionality for digital security surveillance (DSS) applications. Intel® Active Management Technology[5] (Intel® AMT) version 5.0 provides improved manageability for point-of-service terminals or digital signs in a networked retail environment. It consists of the Intel® 82Q45 GMCH and Intel® ICH 10 DO.

- **Intel® 3210 Express chipset:** This chipset features a PCI Express* 2x8 or 1x16 I/O port, while an additional PCI Express port supports further expansion. The MCH supports dual-channel DDR2 MHz memory technology (up to 12.8 GB/s of peak memory bandwidth) and Error Correcting Code memory for a high level of data integrity, reliability and system uptime.

Features	Benefits
Dual-Core Processing	▪ Two independent processor cores in one physical package run at the same frequency; up to 1 MB of shared cache and 800 MHz front-side bus.
Intel® Wide Dynamic Execution	▪ Improves execution speed and efficiency, delivering more instructions per clock cycle. Each core can complete up to four full instructions simultaneously.
Intel® Virtualization Technology[3] (E3400 only)	▪ Speeds transfer of platform control and the movement of data between the virtual machine monitor (VMM) and other platform agents (including guest OSs and I/O devices). By lowering the workload on the VMM, this technology addresses many embedded system design challenges, like migrating legacy software, increasing real-time performance, and making applications more secure.
Intel® Smart Memory Access	▪ Optimizes use of data bandwidth from the memory subsystem to accelerate out-of-order execution, keeping the pipeline full while improving instruction throughput and performance. Newly designed prediction mechanism reduces the time-in-flight instructions must wait for data. Pre-fetch algorithms move data from system memory into fast cache in advance of execution.
Enhanced Intel SpeedStep® Technology[6]	▪ Advanced means of enabling very high performance while meeting the power-conservation needs of embedded computing solutions.
Intel® Advanced Smart Cache	▪ Shared cache is dynamically allocated to each processor core based on workload. This efficient, dual-core-optimized implementation increases the probability that each core can access data from fast cache, significantly reducing latency to frequently used data and improving performance.
Intel® Advanced Digital Media Boost	▪ Accelerates execution of Streaming SIMD Extension (SSE) instructions to significantly improve media boost performance on a broad range of applications, including video, audio, image processing, multimedia and encryption. 128-bit SSE instructions are issued at a throughput rate of one/clock cycle, effectively doubling their speed of execution over previous-generation processors.
Intel® 64 Architecture[2]	▪ Enables access to larger amounts of memory and provides flexibility for 32-bit and 64-bit applications. With appropriate supporting hardware and software, platforms supporting Intel 64-bit computing can use extended virtual and physical memory.
Execute Disable Bit[1]	▪ Enhances virus protection when deployed with a supported operating system. Allows memory to be marked as executable or non-executable, allowing the processor to raise an error to the operating system, thereby preventing malicious code from infecting the system.
Digital Thermal Sensor	▪ Enables efficient processor and platform thermal control. Thermal sensors located within the processor measure maximum temperature on the die at any given time. System fans spin only as fast as needed to cool the system, and slower spinning fans generate less noise.
Embedded Lifecycle	▪ Protects system investment by enabling extended product availability for embedded customers.
Ecosystem Support	▪ Along with a strong ecosystem of hardware and software vendors, including members of the Intel® Embedded and Communications Alliance (intel.com/go/eca), Intel helps developers cost-effectively meet design challenges and speed time-to-market.

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Product Number	Core Speed	FSB Speed	L2 Cache	Thermal Design Power	VID[7]	Tcase (Max[8])	Package
Intel® Celeron® Processor E1500[Δ]							
HH80557PG049D	2.2 GHz	800 MHz	512 KB	65 watts	1.000V – 1.3375V	60.4° C	LGA-775
Intel® Celeron® Processor E3400[Δ]							
AT80571RG0641ML	2.6 GHz	800 MHz	1 MB	65 watts	0.85V – 1.3625V	74.1° C	LGA-775

Intel in Embedded and Communications: intel.com/go/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] 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.

[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] 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.

[4] 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 http://www.intel.com/technology/security.

[5] Intel® Active Management Technology requires the computer system to have an Intel® AMT-enabled chipset, network hardware and software, as well as connection with a power source and a corporate network connection. Setup requires configuration by the purchaser and may require scripting with the management console or further integration into existing security frameworks to enable certain functionality. It may also require modifications of implementation of new business processes. With regard to notebooks, Intel AMT may not be available or certain capabilities may be limited over a host OS-based VPN or when connecting wirelessly, on battery power, sleeping, hibernating or powered off. For more information, see www.intel.com/technology/platform-technology/intel-amt/

[6] See the Processor Spec Finder at http://processorfinder.intel.com or contact your Intel representative for more information.

[7] Variable VID voltage. The processor ships with different voltage settings. For detailed product specifications, please refer to http://developer.intel.com/design/celerondualcore/documentation.htm

[8] Tcase specification is based on Intel thermal profile. See processor data sheet for details.

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