

7th Generation Intel® Core™ Processors Based on the Mobile U-Processor for IoT Solutions

(Intel® Core™ i7-7600U, i5-7300U, i3-7100U, and Celeron® 3965U processors)

Harness the Performance, Features, and Edge-to-Cloud Scalability to Build Tomorrow's IoT Solutions Today



Product Overview

Intel is proud to announce its 7th generation Intel® Core™ processor family featuring ultra-low-power, 64-bit, multicore processors built on the latest 14 nm technology. Designed for small form-factor applications, this multichip package (MCP) integrates a low-power CPU and platform controller hub (PCH) onto a common package that enables rich visual experiences with the latest 4K Ultra HD graphics improvements, amazing CPU performance, and great power efficiency, with the same range of power options and latest advanced features to boost edge-to-cloud Internet of Things (IoT) designs.

These processors run at 15W thermal design power (TDP) and are ideal for small, energy-efficient, form-factor designs, including digital signage, point-of-sale terminals, and medical tablets.

A third power state, known as “active idle” or S0ix, is an extremely low-power active state that wakes up almost instantly. While incorporating advanced technology like S0ix, 7th generation Intel Core processors remain compatible with previous-generation processors.

Stunning Visual Performance

The 7th generation Intel Core processors utilize the Gen9 graphics engine, which improves graphic performance by up to 7 percent.^{1,2} The improvements are demonstrated through faster 3D graphics performance and rendering applications at low power. Video playback is also faster and smoother thanks to the latest in 4K Ultra HD, 10-bit HEVC and VP9 encode/decode, and integrated HDCP 2.2. The new generation offers up to three independent audio streams and displays, Ultra HD 4K support, and workload consolidation for lower BOM costs and energy output.

Users will also enjoy enhanced high-density streaming applications and optimized 4K videoconferencing with accelerated 4K hardware media codecs, HEVC (10-bit), VP8, VP9, and VDENC encoding, decoding, and transcoding. Together, the stunning visual performance enhancements add up to more immersive computing experiences.

Power-Efficient Performance

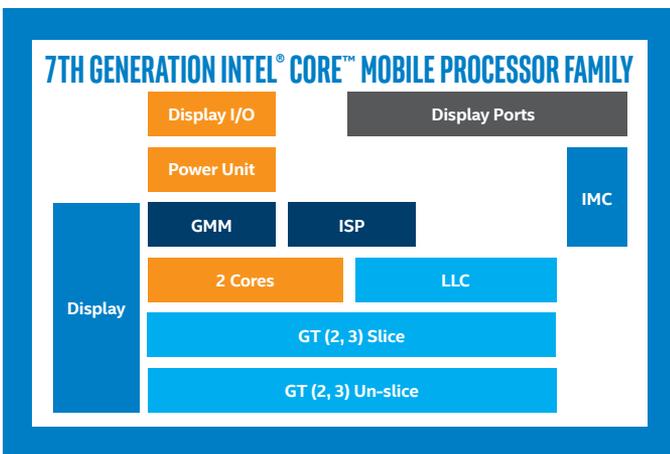
The new 7th gen Intel Core processors make a powerful difference on the efficiency front as well. The improved technology promises up to 6 percent faster multithreaded CPU^{1,3} and up to 7 percent faster graphics^{1,4}—all at the same or similar TDP as the prior generation.⁵

The 7th gen Intel® Core™ i5 and Intel® Core™ i7 processors come with Intel® Turbo Boost Technology 2.0 for that extra burst of performance, and Intel® Hyper-Threading Technology so each processor core can work on two tasks simultaneously. Other important features include Intel® Advanced Vector Extensions 2 (Intel® AVX2), which provides optimized instructions to drive enhanced performance on floating point-intensive apps, and Intel® Ready Mode Technology for PCIe* storage for improved data reliability and greater levels of performance, responsiveness, and expandability.

Broad Design Range

In addition to stunning visuals and efficient performance, the 7th generation Intel Core processor offers broad product coverage, from Intel® Celeron® to Intel Core i7 processors. It also provides multiple operating system (OS) choices that scale from dynamic new tablets to low-power systems requiring greater productivity and graphics—perfect for low-power retail and medical devices.

OS support ranges from small footprint real-time operating systems (RTOSs) to feature-rich OSs to optimize choice, flexibility, and OS investment protection to take advantage of the 15W TDP, and a ball grid array (BGA) package that enables space-constrained or purpose-built designs.



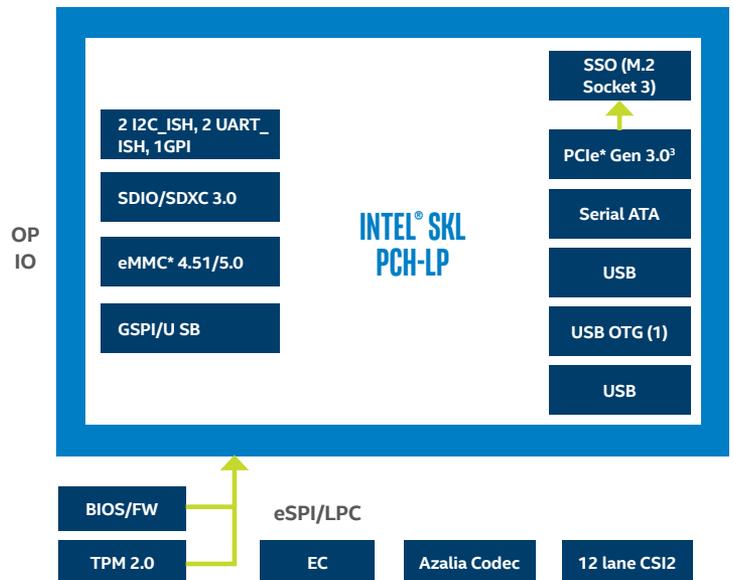
The new 7th generation Intel Core processors enable more flexible designs with configurable I/O offering the same high-speed ports as the previous generation, including:

- Storage options such as Gen 3 PCIe, eMMC* 5.0, SDXC 3.0
- PCIe lanes that operate at Gen 3 speeds
- Improved audio capabilities
- An integrated sensor hub
- Greater flexibility with I2C, SSIC
- Support for imaging capabilities with CSI2

Advanced Security and Manageability

New 7th generation Intel Core processors help protect IoT systems and data at rest and in flight through hardware- and software-based security hardening. Keep increasingly connected devices more secure and enhance the firmware trusted platform module (TPM) with Intel® Platform Trust Technology (Intel® PTT), Intel® Software Guard Extensions (Intel® SGX) to help protect data while in use, Intel® Memory Protection Extensions (Intel® MPX) to help protect memory from buffer-overload attacks, and Intel® Boot Guard to securely boot machines.

Intel® vPro™ technology allows you to remotely configure, diagnose, isolate, and repair an infected PC—even if it is turned off. In addition to helping secure the IT environment, hardware-based KVM Remote Control enables you to address issues remotely by seeing what users see.



KEY FEATURES

INTEL® BUILT-IN VISUALS

NEW Accelerated 4K hardware media codecs: Enhances high-density streaming applications and optimized 4K videoconferencing with HEVC (10-bit), VP8, VP9, and VDENC encoding, decoding, and transcoding.

NEW 4K Ultra HD support: Provides stunning display resolutions,⁷ now up to 4096 x 2304 pixels, and supports performance across three independent displays with audio.

NEW Integrated HDCP 2.2 Support: Provides integrated content protection capabilities.

Gen9 graphics with embedded DRAM: Supports the latest graphics APIs DirectX* 12 and OpenGL* 4.5 for improved 3-D rendering performance at low power.

Intel® HD Graphics: Plays HD video with exceptional clarity; permits viewing and editing of even the smallest image details.

Intel® Quick Sync Video: Delivers excellent videoconferencing capability, fast video conversion, and fast video editing and authoring.

Multiplane overlay: Enables faster, smoother, higher-quality video playback and improved 3-D graphics.

Intel® Clear Video HD technology: Provides visual quality and color fidelity enhancements for spectacular HD media playback.

Intel® Iris™ Graphics (GT3e): Offers a broad range of 3-D rendering capability options that fit low-, medium-, and high-performance applications.

PERFORMANCE

Intel® Advanced Vector Extensions 2 (Intel® AVX2): Provides optimized instructions to deliver enhanced performance on floating point-intensive apps, adding 256-bit integer instructions and new instructions for fused multiply add (FMA), which delivers better performance on media and floating-point computations.

Intel® Turbo Boost Technology⁶ 2.0: Dynamically increases the processor's frequency, as needed, by taking advantage of thermal and power headroom when operating below specified limits.

Intel® Hyper-Threading Technology: Delivers two processing threads per physical core. Highly threaded applications can get more work done in parallel, completing tasks sooner.

Fast memory performance: Offers new DDR4 memory support, including new support for DDR4 1.2V up to 2133, 64GB max capacity with 8GB density.

Intel® Ready Mode Technology: Provides quick access to your PC with applications that are up-to-date and constantly connected.

HSIO: Increases flexibility with up to 16 total HSIO ports,⁸ up to 12 PCIe* 3.0 ports,⁸ and up to six USB 3.0 ports.⁸

Intel® Smart Cache: Dynamically allocates shared cache to each processor core, based on workload, reducing latency and improving performance.

POWER EFFICIENCY

Integrated memory controller: Supports DDR4 and offers stunning memory read/write performance through efficient prefetching algorithms, lower latency, and higher-memory bandwidth when compared to previous generations.

Intel® Power Optimization and processor C-states: Increases periods of silicon sleep state across the platform ingredients—including the CPU, chipset, and third-party system components—to reduce power.

Intel® Intelligent Power Technology: Reduces power consumption through automated energy efficiency.

Automated low-power states: Adjusts system power consumption based on real-time processor loads.

S0ix: System S0 power management states enable the CPU of a connected standby system to enter the deepest C10 state by turning the supply off and turning the external VR to 0V; display is off and device and applications are suspended.

KEY FEATURES

SECURITY

Intel® Identity Protection Technology (Intel® IPT) with multifactor authentication (MFA): Provides enhanced security by verifying the boot portion of the boot sequence, protects your one-time password (OTP) credentials and PKI certificates, and adds a layer of encrypted second-factor authentication for online transactions.

Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI): Helps provide security for a variety of encryption apps, including whole-disk encryption, file-storage encryption, conditional access of HD content, Internet use, and VoIP. Consumers benefit from more protected Internet and email content, plus fast, responsive disk encryption.

Intel® OS Guard: Helps protect the OS kernel and aids in preventing use of malicious data or attack code located in areas of memory marked as user-mode pages from taking over or compromising the OS kernel. Intel OS Guard is not application-specific and protects the kernel from any application.

Intel® Platform Trust Technology with BIOS Guard: Safeguards credential storage and key management, while helping reduce BOM cost and board space.

Intel® Software Guard Extensions (Intel® SGX): Allows application developers to protect sensitive data from unauthorized access or modification by rogue software running at higher privilege levels; secures data while in use in a Windows* or Linux* environment.

Intel® Data Protection Technology (Intel® DPT) with Intel® Boot Guard: Helps prevent unauthorized software and malware takeover of boot blocks critical to a system's function, thus providing added level of platform security based on hardware.

Intel® Memory Protection Extensions (Intel® MPX): Identifies errant pointer usage which, if left undetected, puts an application at risk of data corruption or malicious attack via buffer overruns and overflows. By adding extensions to the underlying architecture, Intel MPX achieves improved performance over software based solutions.

Intel® Secure Key: Generates high-quality keys for cryptographic (encryption and decryption) protocols, and provides quality entropy that is highly sought after for added security.

BIOS Guard: Augments existing chipset-based BIOS flash protection capabilities targeted to address the increasing malware threat to BIOS flash storage; protects from modification without platform manufacturer authorization, helps defend the platform against low-level denial-of-service (DOS) attacks, and restores BIOS to a known good state after an attack.

VMCS shadowing: Allows a Virtual Machine Manager (VMM) running in a guest (nested virtualization) to access a shadow VMCS memory area using the normal VMRead/VMWrite instructions, reducing overhead for a more natural and responsive user experience and allowing users to take control of their personal and professional data and apps while being protected by game-changing security.

Boot integrity: Enables hardware-based boot integrity of the Initial Boot Block (IBB) module before launch; helps prevent repurposing of the platform to run unauthorized software and boot block-level malware.

INTEL® VPRO™ TECHNOLOGY (ONLY INTEL® CORE™ I5 AND INTEL® CORE™ I7 PROCESSORS)

Intel® Active Management Technology (Intel® AMT): Remotely monitors, maintains, updates, upgrades, and repairs PCs through hardware and firmware technology for remote out-of-band management.

Intel® Trusted Execution Technology (Intel® TXT): Helps protect embedded devices and virtual environments against rootkit and other system-level attacks. Using an industry-standard TPM 1.2 to store keys and other protected data, this portion of Intel® vPro™ technology boots the BIOS, operating system, and software into a "trusted" execution state, verifying the integrity of the virtual machine and protecting the platform from unauthorized access.

Intel® Virtualization Technology (Intel® VT): Allows one hardware platform to function as multiple "virtual" platforms; offers improved manageability by limiting downtime and maintaining productivity by isolating computing activities into separate partitions.

SUSTAINABILITY

Green technology: Manufactured with lead-free and halogen-free component packages.

Conflict-free: Products do not contain conflict minerals (tin, tantalum, tungsten, and/or gold) that directly or indirectly finance or benefit armed groups in the Democratic Republic of the Congo (DRC) or adjoining countries.

SOFTWARE OVERVIEW

The following independent operating system vendors provide support for these platforms.

OS VENDOR	OPERATING SYSTEM (TARGETED FOR SUPPORT)	DISTRIBUTION	SUPPORT
Microsoft	Windows* 10 Enterprise (64b)	Microsoft	Intel/Microsoft
	Windows* 10 IoT Enterprise (64b)	Microsoft	Intel/Microsoft
Linux*	Fedora* 24 or later (mid-2016; 64b)	Open Source	
	Ubuntu*, SUSE*, Red Hat Enterprise (64b)	Canonical Ltd., Attachmate Group, Red Hat, and Open Source	
	Yocto* v2.2 "Morty" (Kernel 4.8) tool-based Embedded Linux* (64b) Distribution	Yocto Project* Community	Commercial Linux support from Wind River
Google	Chromium* (Chrome*) (64b)	The Chromium Projects*	Open Source Community Google
RTOS	Wind River VxWorks* 7 (64b)	Wind River Systems	

Not all features are supported. Contact your local Intel representative for more information.

7TH GENERATION INTEL® CORE™ & INTEL® CELERON® PROCESSORS
(U-PROCESSOR LINE) FOR IOT SOLUTIONS

PROCESSOR NUMBER	CORE FREQUENCY (GHz)			INTEL® SMART CACHE	THERMAL DESIGN POWER	PACKAGE	INTEL® AES-NI	INTEL® AVX
	CORES/ THREADS	BASE FREQUENCY	1 CORE TURBO (MAX)					
Intel® Core™ i7-7600U processor	2C/4T	2.8 GHz	3.9 GHz	4 MB	15 W	BGA1356	Yes	Intel® AVX2
Intel® Core™ i5-7300U processor	2C/4T	2.6 GHz	3.5 GHz	3 MB	15 W	BGA1356	Yes	Intel® AVX2
Intel® Core™ i3-7100U processor	2C/4T	2.4 GHz	2.4 GHz	3 MB	15 W	BGA1356	Yes	Intel® AVX2
Intel® Celeron® 3965U processor	2C/2T	2.2 GHz	2.2 GHz	2 MB	15 W	BGA1356	Yes	SSE4.1, SSE4.2

INTEL® VPRO™ TECHNOLOGY

PROCESSOR NUMBER	INTEL® TURBO BOOST TECHNOLOGY 2.0	INTEL® HYPER-THREADING TECHNOLOGY	INTEL® VPRO™ TECHNOLOGY			
			INTEL® VIRTUALIZATION TECHNOLOGY	INTEL® ACTIVE MANAGEMENT TECHNOLOGY 11.6	INTEL® TRUSTED EXECUTION TECHNOLOGY	ERROR- CORRECTING CODE
Intel® Core™ i7- 7600U processor	Yes	Yes	Yes	Yes	Yes	No
Intel® Core™ i5- 7300U processor	Yes	Yes	Yes	Yes	Yes	No
Intel® Core™ i3- 7100U processor	No	Yes	Yes	No	No	No
Intel® Celeron® 3965U processor	No	No	Yes	No	No	No

INTEL® CHIPSETS FOR IOT SOLUTIONS

PROCESSOR NUMBER	INTEGRATED CHIPSET FEATURES
Intel® Core™ i7-7600U/i5-7300U/i3-7100U processor/Intel® Celeron® 3965U processor	Up to three SATA* (6 Gbps); up to 10 USB ports (6 USB 3.0); up to six PCIe* gen 3.0 devices across 12 lanes; 6 I2C; 3 UART

Learn more at intel.com/content/www/us/en/embedded/products/kaby-lake-u/overview.html.



Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at www.intel.com.

"Conflict-free" refers to products, suppliers, supply chains, smelters, and refiners that, based on our due diligence, do not contain or source tantalum, tin, tungsten or gold (referred to as "conflict minerals" by the U.S. Securities and Exchange Commission) that directly or indirectly finance or benefit armed groups in the Democratic Republic of the Congo or adjoining countries.

"Conflict minerals", as defined by the U.S. Securities and Exchange Commission (SEC), is a broad term that means tin, tantalum, tungsten, and gold, regardless of whether these minerals finance conflict in the Democratic Republic of the Congo (DRC) or adjoining countries. Source: Enough Project.

1. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit www.intel.com/benchmarks.
2. Measured by Intel on systems with Intel® Core™ i7-7600U processor and Intel® Core™ i7-6600U processor using 3DMark11. See system configurations below.
3. Measured by Intel on systems with Intel® Core™ i7-7600U processor and Intel® Core™ i7-6600U processor using SPECfp2006 (4-copy). See system configurations below.
4. Measured by Intel on systems with Intel® Core™ i7-7600U processor and Intel® Core™ i7-6600U processor using 3DMark11. See system configurations below.
5. Based on industry-standard cooling solutions. Actual TDP may vary.
6. Requires a system with Intel® Turbo Boost Technology. Intel® Turbo Boost Technology and Intel® Turbo Boost Technology 2.0 are only available on select Intel® processors. Consult your system manufacturer. Performance varies depending on hardware, software, and system configuration. For more information, visit <https://www-ssl.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-technology.html>.
7. On eDP/DP at 24bpp and 60Hz.
8. Actual number of ports available may vary by processor number and system configuration. Please refer to the specifications corresponding to the processor number of interest or consult your system vendor for more information.

SYSTEM CONFIGURATIONS

Battery life and performance measurements on Intel Reference Platform unless otherwise noted.

Intel Reference Platform is an example new system. Products available from systems manufacturers will not be identical in design, and performance will vary.

System power management policy: DC balanced for battery life measurements, AC balanced for performance measurements and AC High Performance on 7th and 6th Generation systems. Wireless: On and connected.

7th Generation system configuration:

Intel® Core™ i7-7820EQ, PL1 = 45w TDP, 4C/8T, Turbo up to 3.7GHz/3.0 GHz, Memory: 2x16GB DDR4-2400, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 21.20.16.4458, OS: Windows® 10, CentOS 7.2

Intel® Core™ i7-7700, PL1 = 65w TDP, 4C/8T, Turbo up to 4.2GHz/3.6 GHz, Memory: 2x16GB DDR4-2400, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 21.20.16.4458, Windows® 10, CentOS 7.2

Intel® Core™ i7-7600U, PL1 = 15w TDP, 2C/4T, Turbo up to 3.9GHz/2.8 GHz, Memory: 2x4GB DDR4-2133, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 21.20.16.4495, Windows® 10

6th Generation system configuration:

Intel® Core™ i7-6820EQ, PL1 = 45w TDP, 4C/8T, Turbo up to 3.5GHz/2.8GHz, Memory: 2x8GB DDR4-2133, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 10.18.15.4256, Windows® 10, CentOS 7.2

Intel® Core™ i7-6700, PL1 = 65w TDP, 4C/8T, Turbo up to 4.0GHz/3.4GHz, Memory: 2x8GB DDR4-2133, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 10.18.15.4225, Windows® 10, CentOS 7.2

Intel® Core™ i7-6600U, PL1 = 15w TDP, 2C/4T, Turbo up to 3.4GHz/2.6Hz, Memory: 2x4GB DDR4-2133, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 21.20.16.4495, Windows® 10

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