PLATFORM BRIEF

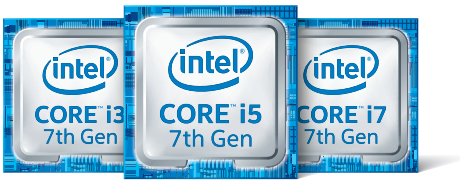
7th Generation Intel® Core™ Desktop Processor Family
with Intel® H110 and Intel® Q170 Chipsets

Internet of Things

7th Generation Intel® Core™ Processor-Based Platforms for Internet of Things (IoT) Solutions

(Intel® Core™ i7-7700, i7-7700T, i5-7500, i5-7500T, i3-7101E, and i3-7101TE 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. Manufactured on the latest 14 nm technology, these processors offer 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. The 7th generation Intel Core processor family also maintains a standardized thermal envelope for 65W and 35W desktop products, remaining consistent with the previous processor generation, and is an ideal low-power option for manufacturing flexibility.

Stunning Visual Performance

The 7th generation Intel Core processors utilize the latest in 4K UHD, 10-bit HEVC and VP9 encode/decode, and integrated HDCP 2.2. Video playback is also faster and smoother, thanks to hardware-robust DRM and industry standards-based HDR. Experience richer visuals with a wider color spectrum and HDMI 2.0a with LSPCON.[1] The new generation offers up to three independent audio streams and displays, 4K Ultra HD support, and workload consolidation for lower BOM costs and energy output.

Users will also enjoy efficient and fluid playback with 1.75x faster YouTube* video,[2,3] smoother multitasking, and support for additional formats of 4K UHD and 4K 360 content streams. 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 17 percent faster multithreaded CPU performance and up to 15 percent faster graphics[2,4]—all at the same or similar thermal design power (TDP) as the prior generation.[5] Develop more flexible designs with the same high-speed I/O as the previous generation and tap into fast memory performance and 64GB max capacity with 8GB density.

The 7th gen Intel® Core™ i7 and Intel® Core™ i5 processors come with Intel® Turbo Boost Technology 2.0[6] for that extra burst of performance and Intel® Hyper-Threading Technology (only on Intel Core i7 processors) 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

For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

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 a broad product line with multiple operating system (OS) choices that scale from low-power systems requiring greater productivity and graphics, to sleek, high performance computing systems.

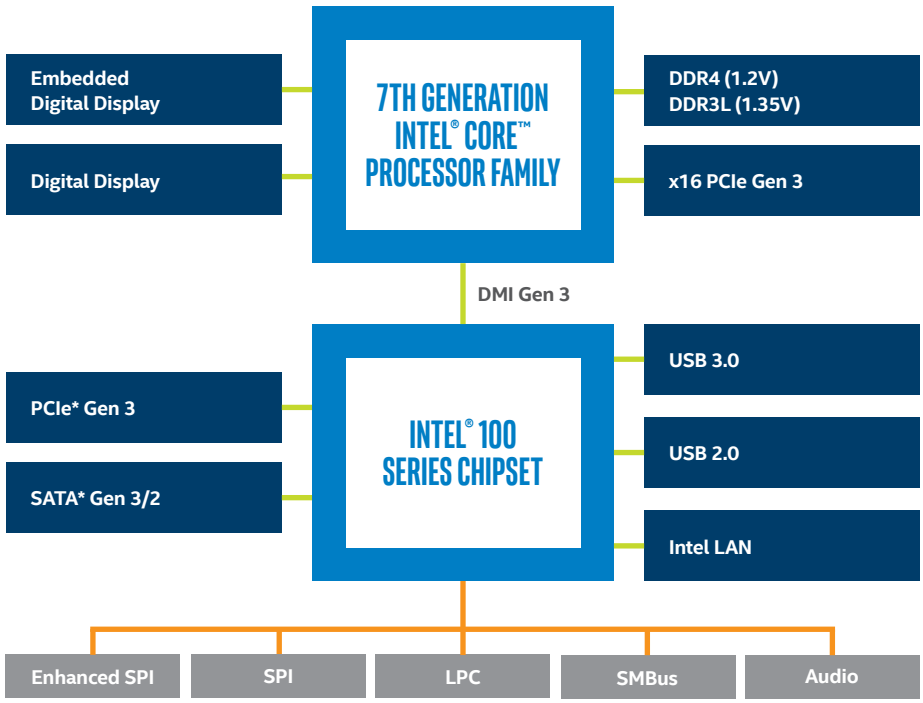
Operating system support ranges from small footprint real-time operating systems (RTOSs) to feature-rich OSs to optimize choice, flexibility, and OS investment protection.

The new 7th generation Intel Core processors enable more flexible designs with configurable I/O offering additional high-speed ports compared to the previous generation. More high-speed input/output (HSIO) means improved flexibility, increasing to 26 total HSIO ports,[7] including up to 20 PCIe 3.0 ports,[7] up to 10 USB 3.0 ports,[7] and up to six SATA* (6Gbps).

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,[8] now up to 4096 x 2304 pixels, and supports performance across three independent displays with audio.

Gen9 graphics: Supports the latest graphics APIs DirectX* 12 and OpenGL* 4.5 for improved 3D 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 3D graphics.

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 Technology[6] 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.

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

HSIO: Increases flexibility from 18 to 26 total HSIO ports,[7] from up to eight PCIe* 2.0 to 20 PCIe 3.0 ports,[7] and from up to six USB 3.0 to 10 USB 3.0 ports.[7]

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 the 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 an 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 as a guest (nested virtualization) to access a shadow VMCS memory area using the normal VMRead/VMWrite instructions. This reduces overhead for a more natural and responsive user experience, allowing users to take control of their personal and professional data and apps while being protected by game-changing security.

KEY FEATURES

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

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.

PCI Express* 3.0 Interface: Offers up to 8 GT/s for fast access to peripheral devices and networking with up to 16 lanes.[7] PCI Express ports can be configured as x1, x2, x4, x8, and x16 depending on motherboard designs.

Intel® Ready Mode Technology: Improves OS boot time and wakes up from deep sleep state more quickly than previous generations for better system responsiveness.

INTEL® VPRO™ TECHNOLOGY

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 or 2.0 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: 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.

Intel® Transactional Synchronization Extensions (Intel® TSX): Focuses on enterprise-level multithreaded performance scaling, making parallel operations more efficient via improved control of software threads and locks. This offers performance benefits for enterprise-level big data analytics/business intelligence and visualization apps, which involve multiuser collaboration. (Available on the Intel® Core™ i7 and Intel® Core™ i5 processors with Intel® vPro™ technology and unlocked processors.)

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 and BIOS vendors provide support for these platforms.

OS VENDOR	OPERATING SYSTEM (TARGETED FOR SUPPORT)	DISTRIBUTION	SUPPORT	BIOS
Microsoft	Windows* 10 Enterprise (64b)	Microsoft	Intel/Microsoft	American Megatrends Inc. Insyde Software Phoenix Technologies BYOSOFT
	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™ PROCESSORS FOR INTERNET OF THINGS SOLUTIONS

	CORE FREQUENCY (GHz)							
PROCESSOR NUMBER	CORES/ THREADS	BASE FREQUENCY	1 CORE TURBO (MAX)	INTEL® SMART CACHE	THERMAL DESIGN POWER	PACKAGE	INTEL® AES-NI	INTEL® AVX
Intel® Core™ i7-7700 processor	4C/8T	3.6 GHz	4.2 GHz	8 MB	65W	LGA1151	Yes	Intel® AVX2
Intel® Core™ i7-7700T processor	4C/8T	2.9 GHz	3.8 GHz	8 MB	35W	LGA1151	Yes	Intel® AVX2
Intel® Core™ i5-7500 processor	4C/4T	3.4 GHz	3.8 GHz	6 MB	65W	LGA1151	Yes	Intel® AVX2
Intel® Core™ i5-7500T processor	4C/4T	2.7 GHz	3.3 GHz	6 MB	35W	LGA1151	Yes	Intel® AVX2
Intel® Core™ i3-7101E processor	2C/4T	3.9 GHz	3.9 GHz	3 MB	65W	LGA1151	Yes	Intel® AVX2
Intel® Core™ i3-7100TE processor	2C/4T	3.4 GHz	3.4 GHz	4 MB	35W	LGA1151	Yes	Intel® AVX2

			INTEL® VPRO™ TECHNOLOGY			
PROCESSOR NUMBER	INTEL® TURBO BOOST TECHNOLOGY 2.0	INTEL® HYPER-THREADING TECHNOLOGY	INTEL® VIRTUALIZATION TECHNOLOGY	INTEL® ACTIVE MANAGEMENT TECHNOLOGY 11.6	INTEL® TRUSTED EXECUTION TECHNOLOGY	ERROR-CORRECTING CODE
Intel® Core™ i7-7700/i7-7700T processor	Yes	Yes	Yes	Yes	Yes	No
Intel® Core™ i5-7500/i5-7500T processor	Yes	No	Yes	Yes	Yes	No
Intel® Core™ i3-7101E/i3-7101TE processor	No	Yes	Yes	No	No	Yes

INTEL® CHIPSETS FOR INTERNET OF THINGS SOLUTIONS

PRODUCT	PRODUCT CODE	PACKAGE	FEATURES
Intel® Q170 Chipset	GL82Q170 PCH	FCBGA13	Up to six SATA* ports (6 Gbps); 14 total USB ports (up to 10 USB 3.0); up to 20 PCI Express* x1 gen 3.0 ports; 1x16, 2x8 or 1x8+2x4 PCI Express graphics support; memory channels/DIMM per channel = 2/2; support Intel® vPro™ technology
Intel® H110 Chipset	GL820H110 PCH	FCBGA13	Up to four SATA ports (6 Gbps); 10 total USB ports (up to 4 USB 3.0); up to six PCI Express* x1 gen 2.0 ports; 1 x 16 PCI Express graphics support; memory channels/DIMM per channel = 2/1

Learn more: intel.com/content/www/us/en/embedded/products/kaby-lake-s/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. Only the MCA (MegaChips of America) version of the LSPCON enables HDCP 2.2 and HDMI 2.0a, which enables HDR.
2. 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.
3. Measured by Intel on systems with Intel® Core™ Processor i7-7700 and Intel® Core™ Processor i7-6700 using 3DMark11*. See system configurations below.
4. Measured by Intel on systems with Intel® Core™ Processor i7-7700 and Intel® Core™ Processor i7-6700 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. 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.
8. On eDP/DP at 24bpp and 60Hz.

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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