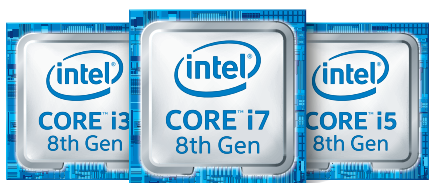(intel®)

Low Power and High Performance for Intelligence at the Edge

Bring performance and connectivity to the latest embedded designs where space and power are limited

Product overview

With a feature-packed, low-power design, 8th Gen Intel® Core™ U-series processors bring high performance and connectivity to the edge for IoT applications. Designed for long-life availability and embedded use conditions where space and power are limited, these processors enable a wide range of solutions at 15W TDP, configurable down to 12.5W—ideal for handheld, battery-powered, and fanless devices.

High-quality visual and audio experiences

Create high-quality visual experiences with integrated Gen 9.5 Intel® Graphics and high-definition media capabilities that meet rising expectations for performance. Deliver smooth 4K content streaming on multiple displays, enable simultaneous monitoring of video feeds, and much more. Designs can support up to three displays.

Take audio experiences to a new level with enhanced speech and audio quality from microphones, voice activation and wake from standby, and enhanced playback with Intel® Smart Sound Technology and our programmable quad-core audio DSP, designed for low power consumption.

Capabilities for AI and deep learning

Deploy AI capabilities at the edge to capture, process, and analyze data for near-real-time insights. With high processor and integrated graphics performance combined with the Intel® Distribution of OpenVINO™ toolkit, you can improve capabilities like facial recognition in retail devices, license plate recognition and people counting in smart city solutions, and fast and accurate anomaly detection on manufacturing lines.

Scalable SKU range to balance power and performance

Pair low power consumption with high performance. 8th Gen Intel Core U-series processors operate at 15W TDP, configurable up to 25W and down to 12.5W. Additional performance-enhancing products from Intel include Intel® Optane™ memory and Intel® Movidius™ vision processing units.

Robust connectivity for greater flexibility

With a broad range of connectivity options, including more high-speed input/output (HSIO), data can move quickly to wherever it needs to go. Add multiple peripherals—HD displays, cameras, storage, and more—with up to 16 PCIe* Gen 3 lanes and up to six USB 3.1 Gen 2 ports supporting data transfer of up to 10 Gbps. Connect to nearly any device with discrete Thunderbolt™ 3 technology and share

data quickly via high-speed wireless and wired connectivity with integrated Gigabit Wi-Fi and Bluetooth* 5.0 and Intel® Gigabit Ethernet. Overcome data transfer bottlenecks with support for the latest Intel Optane memory technology.

Advanced manageability and security

Intel® vPro™ technology-enabled features, such as Intel® Active Management Technology, provide out-of-band remote management for devices that are off premise or difficult to physically access.[1] Intel® Software Guard Extensions (Intel® SGX) offers hardware-based memory encryption that isolates specific application code and data in memory. This allows user-level code to allocate private regions of memory, called enclaves, which are designed to be protected from processes running at higher privilege levels.

Consolidate and future-proof designs

Connected systems are becoming more complex, especially in retail and industrial environments as digitization and automation expand. 8th Gen Intel Core U-series processors deliver the high performance and specialized technologies to help consolidate data and applications while leaving enough performance headroom to add new functionalities as needed, such as vision capabilities. And with high reliability and long availability, you can design solutions with the confidence of long-term support. All this helps OEMs, ODMs, system integrators, and ISVs reduce BOM and integration costs and software complexity.

8th Gen Intel® Core™ U-series processors
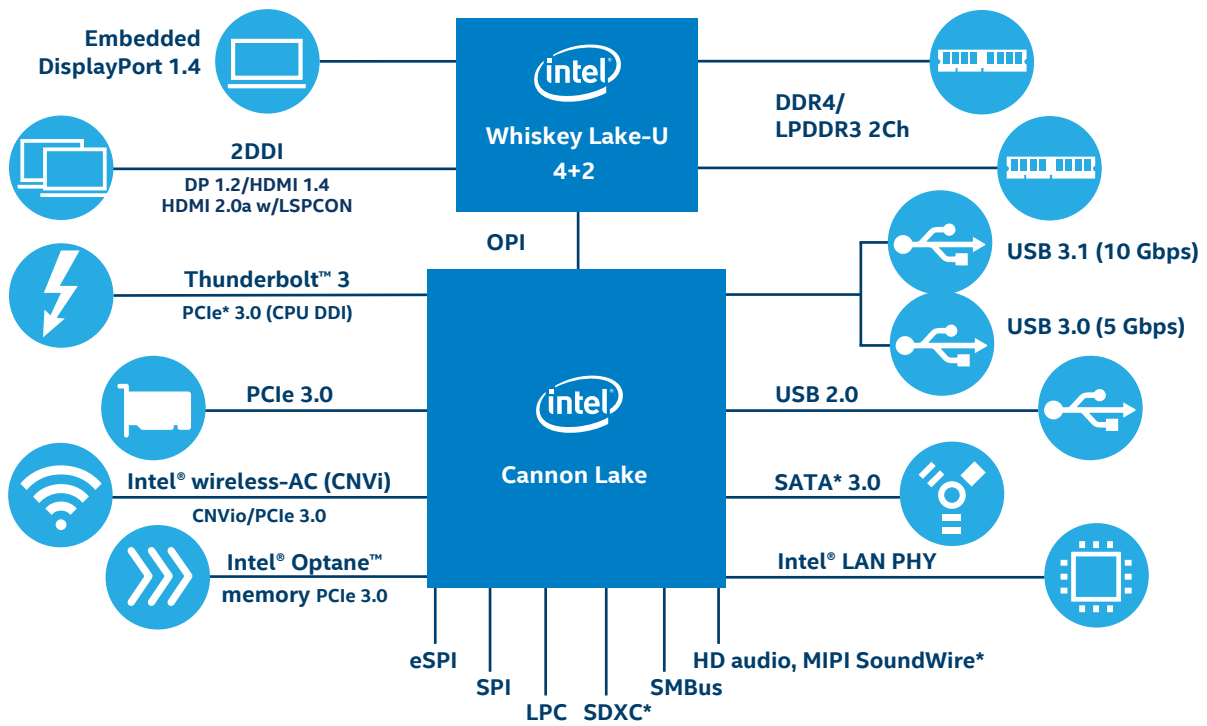
UP TO **58**% BETTER

multithreaded integer compute-intensive application performance[2,3]

UP TO **33**% BETTER

multithreaded floating point compute-intensive application performance[2,3]

UP TO **50**% BETTER

video transcoding performance[2,4]

on 8th Gen Intel® Core™ i7-8665UE vs. two-year-old 7th Gen Intel® Core™ i7-7600U

KEY FEATURES

INTEL® BUILT-IN VISUALS

Accelerated 4K hardware media codecs: Enhances high-density streaming applications and optimized 4K hardware video acceleration with HEVC (10-bit), VP8, VP9, and MPEG2 encoding/decoding and VC-1 decoding.

4K Ultra HD support: Provides stunning display resolutions and supports performance across multiple displays.

Integrated Gen 9.5 Intel Graphics with up to 24 execution units: Supports the latest graphics APIs DirectX* 12 and OpenGL* 4.5 for improved 3D rendering performance at low power.

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

PERFORMANCE

Intel® turbo Boost Technology[5] 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[6]: Delivers two processing threads per physical core. Highly threaded applications can get more work done in parallel, completing tasks sooner.

Programmable quad-core audio DSP: Provides enhanced speech and audio quality from microphones, voice activation and wake from standby, and enhanced playback with Intel® Smart Sound Technology and a programmable quad-core audio DSP.

Intel Distribution of OpenVINO toolkit: Helps speed computer vision workloads; streamline deep learning deployments; and enable easy, heterogeneous execution across multiple types of Intel® platforms, from device to cloud.

CONNECTIVITY

HSIO: Offers up to 16 PCIe* Gen 3 lanes and up to 6 USB 3.1 Gen 2 ports, supporting data transfer of up to 10 Gbps.

Thunderbolt 3 technology: Connects to nearly any device via discrete Thunderbolt 3 USB-C connector.

Integrated Gigabit Wi-Fi/Bluetooth* 5.0: Shares data quickly via high-speed wireless connectivity.

Intel® Gigabit Ethernet: Quickly transfers data via high-speed wired connectivity.

TECHNOLOGIES

Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI)[7]: Access a fast, secure AES engine for a variety of encryption apps, including whole-disk encryption, file-storage encryption, conditional access of HD content, internet security, and VoIP. Consumers benefit from protected internet and email content, plus fast, responsive disk encryption.

Intel® Platform Trust Technology: Helps enhance the firmware trusted platform module (TPM).

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[8]; secures data while in use in a Windows* or Linux* environment.

Intel® Boot Guard: Helps securely boot machines.

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 Active Management Technology (Intel AMT)[1]: 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)[9]: Protects 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[10]: 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.

SOFTWARE OVERVIEW

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

CATEGORY		OPERATING SYSTEM/BOOTLOADER (TARGETED FOR SUPPORT)	IMPLEMENTATION	DISTRIBUTION AND SUPPORT
Operating systems	Microsoft	Windows® 10 IoT Enterprise RS5[1] (64b)	Intel	Intel, Microsoft
	Linux*	Ubuntu*, SUSE*, Red Hat* Enterprise[1,3] (64b)	Canonical Ltd., Attachmate Group, Red Hat, and open source	
		Yocto Project* BSP tool-based embedded Linux distribution[1] (64b)	Intel	Intel, Yocto Project community
	Google	Android* (64b) P and R	Intel	ISV partners
	RTOS	Wind River VxWorks* 7 (64b)	Wind River	
Boot loaders		UEFI/BIOS and Intel® FSP	Intel	Intel, IBVs
		coreboot* and Intel FSP	Intel	Intel, coreboot community
		Intel® Slim Bootloader and Intel FSP	Intel	Intel, ESPs

1. Legacy boot not supported for Windows® 10, Linux*, and Android*. Customers should work with their BIOS vendors for enabling/validating legacy BIOS features.
2. Linux* supported by Intel via the upstreaming of Intel Linux drivers to the Linux Open Source Community. Adoption into individual Linux distributions is dependent upon the OS vendors.

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

8TH GEN INTEL® CORE™ PROCESSORS (U-SERIES) FOR IOT SOLUTIONS

PROCESSOR NUMBER	CORES	THREADS	CACHE	BASE FREQUENCY	MAX 1 CORE TURBO	MAX TDP	ECC	INTEL® vPRO™ TECHNOLOGY
8th Gen Intel® Core™ U-Series Processors (Mobile-U)								
Intel® Core™ i7-8665UE Processor	4	8	8 MB	1.7 GHz	4.4 GHz	15W	No	Yes
Intel® Core™ i5-8365UE Processor	4	8	6 MB	1.6 GHz	4.1 GHz	15W	No	Yes
Intel® Core™ i3-8145UE Processor	2	4	4 MB	2.2 GHz	3.9 GHz	15W	No	No
Intel® Celeron™ 4305UE Processor	2	2	2 MB	2.0 GHz	2.0 GHz	15W	No	No
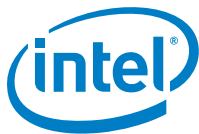
(intel®)

Learn more: intel.com/content/www/us/en/design/products-and-solutions/processors-and-chipsets/whiskey-lake/overview.html

1. Available on select 8th Gen Intel® Core™ processor SKUs (Intel® Core™ i7-8665 processors and Intel® Core™ i5-8365 processors). This feature may not be available on all computing systems. Please check with the system vendor to determine if your system delivers this feature, or reference the system specifications (motherboard, processor, chipset, power supply, HDD, graphics controller, memory, BIOS, drivers, virtual machine monitor (VMM), platform software, and/or operating system) for feature compatibility. Functionality, performance, and other benefits of this feature may vary depending on system configuration.

2. Intel® Core™ i7-8665UE processor, PL1= 15W TDP, 4C8T; turbo up to 4.4 GHz, Intel® UHD Graphics 620, Intel® Reference Platform; memory: 2x4GB DDR4-2400; storage: 512 GB Intel® 545s SSD; OS: Microsoft Windows® 10 Pro RS5 Build Version 1809.

   Intel® Core™ i7-7600U Processor, PL1=15W TDP, 2C4T; turbo up to 3.9 GHz, Intel® HD Graphics 620; motherboard: Intel Reference Platform; memory: 2x8 GB DDR4-2133; storage: 512 GB Intel 545s SSD; OS: Microsoft Windows® 10 Pro RS5 Build Version 1809.

3. As measured by SPECint_rate_base2006 N copy on Intel® Core™ i7-8665UE vs. Intel® Core™ i7-7600U. SPEC* CPU2000/2006 is a benchmark from the SPEC consortium that measures device performance and throughput using compute intensive application subtests. SPECint*_base2000/2006 measures how fast a device completes a single integer compute task. SPECint*_rate_base2000/2006 measures throughput, or how many integer compute tasks a device can accomplish in a given amount of time. OS support: Desktop Windows*, UNIX*/Linux*, and Mac* OS.

4. As measured by HDXPRT 4 Convert Videos workload on Intel® Core™ i7-8665UE vs. Intel® Core™ i7-7600U. HDXPRT 4 is published by Principled Technologies (PT), an open source community and host of the BenchmarkXPRT* development forum. HDXPRT tests Windows* Media Editing using real-world scenarios: Edit Photos, Convert Videos, and Edit Music. Mainstream applications used in the scenarios include Adobe Photoshop* Elements, Apple iTunes*, and CyberLink MediaEspresso*. Each scenario produces individual metrics that roll up to an overall score. For Windows, HDXPRT 4 supports Win64.

5. 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 intel.com/turboboost.

6. Available on select Intel® Core™ processors. Requires an Intel® HT Technology-enabled system. Consult your PC manufacturer. Performance will vary depending on the specific hardware and software used. For more information, including details on which processors support HT Technology, visit intel.com/info/hyperthreading.

7. Intel® AES-NI requires a computer system with an AES-NI-enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. For more information, see software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni/.

8. No computer system can be absolutely secure. Intel® technologies may require enabled hardware, specific software, or services activation. Check with your system manufacturer or retailer.

9. No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer with Intel® Virtualization Technology, and Intel TXT-enabled processor, chipset, BIOS, Authenticated Code Modules and an Intel TXT-compatible measured-launched environment (MLE). Intel TXT also requires the system to contain a TPM v1.s. For more information, visit intel.com/technology/security.

10. Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, and virtual machine monitor (VMM). Functionality, performance, or other benefits will vary depending on hardware and software configurations. Software applications may not be compatible with all operating systems. Consult your PC manufacturer. For more information, visit intel.com/go/virtualization.

Performance results are based on testing as of May 24, 2019, and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure.

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 about performance and benchmark results, visit intel.com/benchmarks.

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