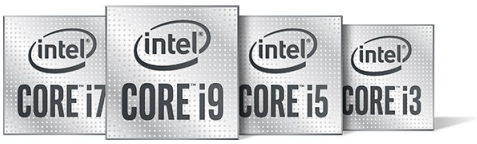
PLATFORM BRIEF

10th Gen Intel® Core™ Processors for Internet of Things
Intel® Xeon® W-1200E Series Processors for Internet of Things
Intel® Pentium® Gold Processors for Internet of Things
Intel® Celeron® Processors for Internet of Things

Boost Performance at the Edge

Power your IoT platforms with the choice and flexibility of 10th Generation Intel® Core™ processors



Tackling the unique challenges and objectives of an Internet of Things (IoT) or artificial intelligence (AI) solution requires hardware that offers choice and flexibility. From the edge to the data center, Intel provides tools to capture, analyze, and act on data gathered at the edge. Intel's IoT portfolio and vast ecosystem of partners can help you evolve your data infrastructure, accelerate development, and scale intelligent solutions to increase the value of your data and decrease your time to market.

Product overview

With up to 10 cores and 20 threads for improved throughput, LGA socket scalability, embedded use conditions, and long-term product availability, 10th Gen Intel Core processors provide a solid foundation for IoT platforms. For single-board scalability, 10th Gen Intel Core processors are validated to work with the Intel® W480E chipset, the Intel® Q470E chipset, and the Intel® H420E chipset. 10th Gen Intel Core processors support memory up to DDR4-2933 and TDP ranges between 35W and 65W. Complemented by other Intel® technologies, built-in hardware accelerators, AI capabilities, and a vast partner ecosystem, this platform brings enhanced performance, computer vision, and workload convergence to your IoT platforms.

Choice and flexibility for powering connected devices

To help you balance app performance and create scalable platforms at the edge, the 10th Gen Intel Core processors offer four, six, and eight-core options with LGA socket scalability. For the ultimate performance, the Intel® Core™ i9 processor and Intel® Xeon® W-1200E Series processors have up to 10 multithreaded cores for your high-performance edge needs. For edge devices that benefit from multithreaded applications and workload convergence, the Intel Xeon W-1200E Series processor is a powerful solution.

10th Gen Intel Core processors support multiple operating systems, including open source options, and the Intel Xeon W-1200E Series processors include support for Windows Server 2019.

Intel® Slim Bootloader, one of two bootloader options, powers on edge devices quickly[1], has integrated security, and includes a license that gives you the flexibility to design proprietary systems.

Better protection and performance for data throughput

To help protect against data corruption, which can lead to hardware failures and system crashes, 10th Gen Intel® Core™ i3 and Intel Xeon W-1200E Series processors include error-correcting code (ECC) capabilities. 10th Gen Intel Core processors and Intel Xeon W-1200E Series processors allow for large memory and PCIe I/O bandwidth capacities to help you move, store, and process data from edge to cloud and back again. The platform also includes:

- Hardware-assisted virtualization capabilities with Intel® Virtualization Technology (Intel® VT), letting you converge workloads and optimize performance by virtualizing CPU and memory.
- Intel® Virtualization Technology for Directed I/O (Intel® VT-d) enables virtualized throughput.
- For virtualized GPU and intelligent desktop virtualization (IDV), pair Intel® GVT-g and the Yocto Project for Linux-based systems.

Intelligence at the edge

With the Intel® Media SDK, Intel® Distribution of OpenVINO™ toolkit, and the Inference Engine high-density deep learning (HDDL) plugin, you get the tools you need to design and streamline AI workloads and capabilities. Hardware accelerators can boost computer vision performance, and you can dedicate compute blocks to inferencing or increased AI performance.

Input/output options for connecting peripherals

10th Gen Intel Core processors provide up to 40 PCIe 3.0 HSIO lanes (16 from the CPU and up to 24 from the PCH) for rapid data throughput. Support is included for up to eight SATA storage devices and up to 14 USB 3.2 ports, with up to eight ports providing data transfer speeds up to 10 Gbps. 10th Gen Intel Core processors include industry-standard Wi-Fi 5 (802.11ac) connectivity for data transfers via integrated Intel® Wi-Fi and discrete Intel® Wireless-AC connections.

Support for three simultaneous, independent displays

Edge devices with a 10th Gen Intel Core processor inside have three external device driver interface (DDI) ports, allowing you to connect to up to three different 4K displays. Each DDI port includes built-in high-bandwidth digital content protection to help you defend data in transit against breaches.

Improve power delivery and support additional, incremental throughput

10th Gen Intel Core processors support enhanced SPI (eSPI) interfaces, providing a small energy footprint (1.8 volts), smaller pin count, and high throughput between the chipset and embedded controllers or Super I/O (SIO).

Manageability at the edge

Intel® Active Management Technology (Intel® AMT), a feature of the Intel vPro® platform, enables IT to access, maintain, and manage edge devices that are off-site or difficult to physically access—even when the device, hardware, or operating system are powered off or malfunctioning.

Use case possibilities

Any sector using technology at the edge can find value powering their connected devices with 10th Gen Intel Core processors, Intel Xeon W-1200E Series processors, Intel® Pentium® Gold processors, and Intel® Celeron® processors. Here are a few examples:

- **Digital signage** that use the latest AI and analytics to provide real-time data about its audience, their traffic patterns, and which messages work best.
- **Self-service kiosks** that help improve a customer experience through computer vision and deep learning.
- **Intelligent shelving and point-of-sale (POS) devices** that collect and analyze inventory throughput.
- **Rugged devices** with consolidated programmable logic controllers (PLCs), human machine interfaces (HMIs), and other components.
- **Industrial PCs** connected to multiple HD cameras for near-real-time anomaly detection or asset and employee monitoring.
- **Workload convergence and workflow optimization** to enable more productivity in smart labs, including laboratory connectivity platforms for deep learning workloads.
- **Advanced, innovative medical imaging solutions**, like mobile imaging for inpatient or distributed healthcare workflows.

Partnerships that help you improve time to market

Intel is part of a large and expanding ecosystem that aims to inspire innovation at the edge. Intel and other IoT technology providers are collaborating to help you build and deploy connected devices.

Intel® IoT Solutions Alliance can help you deliver first-in-market IoT solutions. Discover how the alliance accelerates the design and deployment of intelligent devices and analytics.

Intel® Solutions Marketplace offers a searchable partner directory to help you connect with Intel partners that can help you with developing IoT products and solutions.

Intel® AI: In Production provides a catalog of equipment providers, system integrators, software providers, and solution aggregators/distributors to help you integrate scalable AI solutions in your IoT platforms.

Bring more power to your edge

The 10th Gen Intel Core processors add up to 20 percent more cores than previous-generation processors and can enhance multitasking and single-task application performance.

Up to **20%** more cores

Up to **31%** better performance on multitasking compute-intensive applications[2]

Up to **11%** improved performance on single-task compute-intensive applications[2]

See the last page for configuration details. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks. Refer to software.intel.com/articles/optimization-notice for more information regarding performance and optimization choices in Intel software products.

KEY FEATURES

PERFORMANCE

Power for every level of need: Provides up to 10 processor cores and 20 threads for enhanced performance with memory support up to DDR4-2933.

Interoperability and scalability at the edge: For versatile, scalable, and embedded use conditions with flexible connectivity options, 10th Gen Intel Core processors are validated to work with these PCHs: Intel® Q470E chipset, Intel® W480E chipset, and Intel® H420E chipset. For use cases that do not require scalability or embedded use conditions, 10th Gen Intel Core processors also support the Intel® H410 chipset.

Rich graphics and displays: Support for integrated graphics up to Intel® UHD Graphics 630 with Intel® Built-in Visuals.

Intel® Turbo Boost Max Technology 3.0[3]: Increases the processor frequency as needed by leveraging thermal and power headroom when operating below specified limits.

Intel® Hyper-Threading Technology[4]: Provides two processing threads per physical core to support multithreaded applications.

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

Intel® Distribution of OpenVINO™ toolkit: Helps accelerate computer vision workloads and streamline deep learning deployments.

Intel® Rapid Storage Technology (Intel® RST)[5]: Accelerate PCIe data transfer speeds and protect against data loss.

ENVIRONMENT

Support for IoT device life cycles: Provides long-term product availability.

Outdoor environment use cases: Support for ambient temperatures between 0°C and thermal specification limit, with TDP ranges between 35W and 65W for 10th Gen Intel Core processors and TDP ranges between 35W and 95W for Intel Xeon W-1200E Series processors.

TECHNOLOGIES

Manageability: Includes Intel vPro® platform capabilities, including Intel® Active Management Technology (Intel® AMT).

Machine learning and computer vision: Integrates with the Inference Engine high-density deep learning (HDDL) plugin and Intel® Movidius™ vision processing units (VPUs), as well as the Intel® Media SDK and Intel® Distribution of OpenVINO™ toolkit.

Intel® Virtualization Technology[6]: Helps make virtualizing various compute tasks—like processing power, throughput, and memory—more accessible to IT.

Intel® Security Essentials: Builds security and trust into Intel hardware.

SOFTWARE

Operating systems: Support for Windows 10 IoT for Enterprise, Windows Server 2019, and Yocto Project for Linux-based systems.

Bootloader options: Use Intel® Slim Bootloader or UEFI BIOS, paired with Intel® Firmware Support Package (Intel® FSP).

Intel® System Studio: Provides tools to help accelerate app development, boost app performance and power efficiency, and improve the reliability of connected devices.

CONNECTIVITY

Industry-standard Wi-Fi 5 (802.11ac) with integrated or discrete components: Quickly transfer data via high-speed wireless or high-speed wired connectivity.

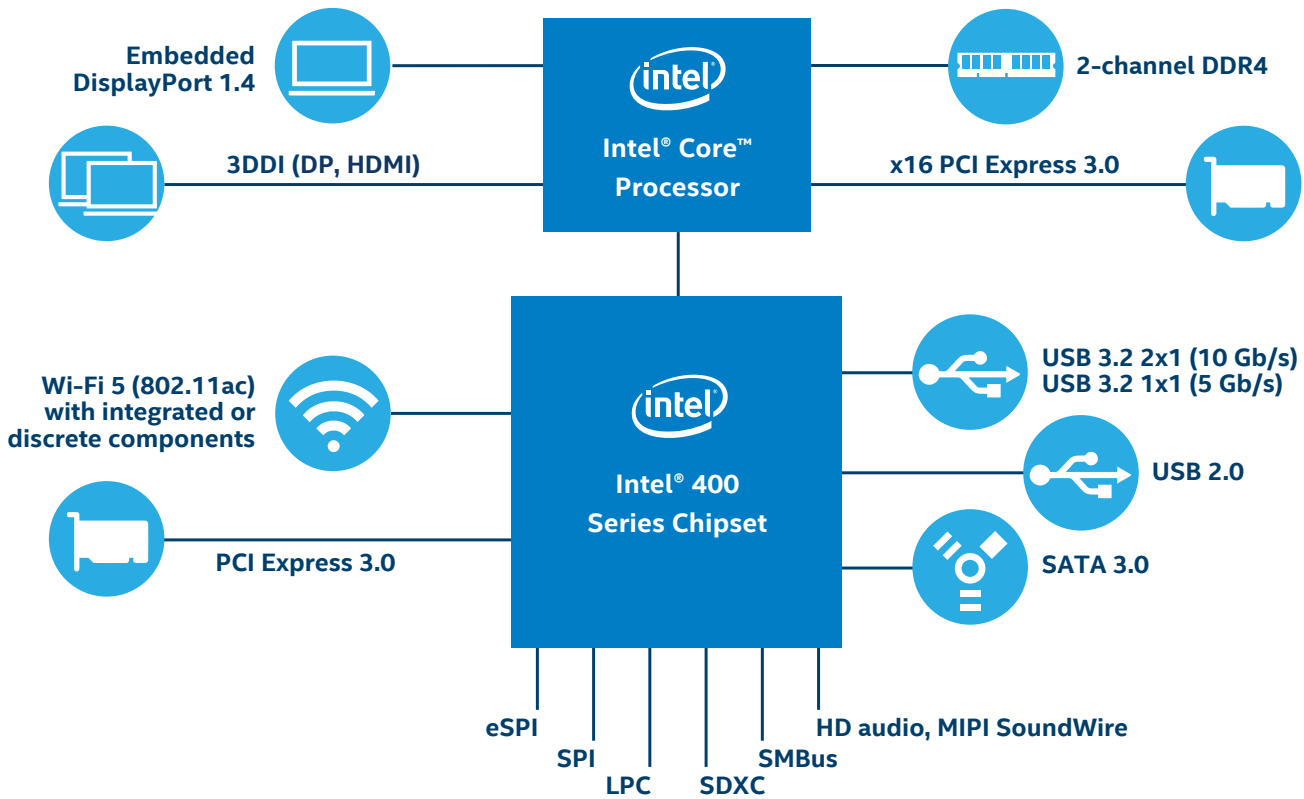
HSIO: Platform provides up to 40 PCIe 3.0 HSIO lanes with integrated USB 3.2 Gen 2 ports, supporting data transfers up to 10 Gbps.

SOFTWARE OVERVIEW

10th Gen Intel Core processors, Intel Xeon W-1200E Series processors, Intel Pentium Gold processors, and Intel Celeron processors support these operating systems, bootloaders, and SDKs.[7]

CATEGORY	OPERATING SYSTEMS, BOOT LOADERS, AND SDKs	IMPLEMENTATION	DISTRIBUTION AND SUPPORT
Operating Systems[7]	Windows 10 IoT Enterprise RS5 (64-bit)[8]	Intel	Intel, Microsoft
	Windows Server 2019[8,9]	Intel	Intel, Microsoft
	Ubuntu, SUSE, Redhat Enterprise, Wind River Linux[8,10]	Canonical Ltd., Attachmate Group, Red Hat, and Wind River	Canonical Ltd., Attachmate Group, Red Hat, and Wind River
	Yocto Project BSP tool-based embedded Linux distribution (64-bit)	Intel	Intel, Yocto Project community
	Wind River VxWorks 7	Wind River	Wind River
Boot Loaders	UEFI BIOS and Intel® FSP	Intel	Intel, IBVs
	Intel® Slim Bootloader and Intel FSP	Intel	Intel, SBL community
SDK	Intel® Media SDK	Intel	Intel
	Intel® Distribution of OpenVINO™ Toolkit	Intel	Intel
	Intel® System Studio	Intel	Intel
	Intel® Audio FDK	Intel	Intel
	Intel® AMT SDK	Intel	Intel

10th Gen Intel® Core™ Processors



10th Gen Intel® Core™ and Intel® Xeon® W-1200E Series Processors for IoT Solutions

PROCESSOR NUMBER	VALIDATED INTEL® CHIPSET	CORES	THREADS	CACHE (MB)	BASE FREQUENCY (GHz)	MAX TURBO FREQUENCY	MAX TDP	ECC	INTEL VPRO® PLATFORM
Intel® Xeon® W-1200E Series Processors									
Intel® Xeon® W-1290E Processor	W480E	10	20	20	3.5	4.8	95W	Yes	Yes
Intel® Xeon® W-1290TE Processor	W480E	10	20	20	1.8	4.5	35W	Yes	Yes
Intel® Xeon® W-1270E Processor	W480E	8	16	16	3.4	4.8	80W	Yes	Yes
Intel® Xeon® W-1270TE Processor	W480E	8	16	16	2.0	4.4	35W	Yes	Yes
Intel® Xeon® W-1250E Processor	W480E	6	12	12	3.5	4.7	80W	Yes	Yes
Intel® Xeon® W-1250TE Processor	W480E	6	12	12	2.4	3.8	35W	Yes	Yes
Intel® Core™ i9 Processors									
Intel® Core™ i9-10900E Processor	W480E	10	20	20	2.8	4.7	65W	No	Yes
	Q470E								
	H420E								No
	H410								
Intel® Core™ i9-10900TE Processor	W480E	10	20	20	1.8	4.5	35W	No	Yes
	Q470E								
	H420E								No
	H410								
Intel® Core™ i7 Processors									
Intel® Core™ i7-10700E Processor	W480E	8	16	16	2.9	4.5	65W	No	Yes
	Q470E								
	H420E								No
	H410								
Intel® Core™ i7-10700TE Processor	W480E	8	16	16	2.0	4.4	35W	No	Yes
	Q470E								
	H420E								No
	H410								
Intel® Core™ i5 Processors									
Intel® Core™ i5-10500E Processor	W480E	6	12	12	3.1	4.2	65W	No	Yes
	Q470E								
	H420E								No
	H410								
Intel® Core™ i5-10500TE Processor	W480E	6	12	12	2.3	3.7	35W	No	Yes
	Q470E								
	H420E								No
	H410								
Intel® Core™ i3 Processors									
Intel® Core™ i3-10100E Processor	W480E	4	8	6	3.2	3.8	65W	Yes	No
	Q470E							No	
	H420E							No	
	H410							No	
Intel® Core™ i3-10100TE Processor	W480E	4	8	6	2.3	3.6	35W	Yes	No
	Q470E							No	
	H420E							No	
	H410							No	

Intel® Pentium® Gold Processors and Intel® Celeron Processors for IoT Solutions

PROCESSOR NUMBER	VALIDATED INTEL® CHIPSET	CORES	THREADS	CACHE (MB)	BASE FREQUENCY (GHz)	MAX TURBO FREQUENCY	MAX TDP	ECC	INTEL VPRO® PLATFORM
Intel® Pentium® Gold Processors									
Intel® Pentium® Gold G6400E Processor	Q470E H420E H410	2	4	4	3.8	3.8	58W	No	No
Intel® Pentium® Gold G6400TE Processor	Q470E H420E H410	2	4	4	3.2	3.2	35W	No	No
Intel® Celeron® Processors									
Intel® Celeron® G5900E Processor	Q470E H420E H410	2	2	2	3.2	3.2	58W	No	No
Intel® Celeron® G5900TE Processor	Q470E H420E H410	2	2	2	3.0	3.0	35W	No	No

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

1. Based on Intel estimates, from measurements on Intel internal reference platforms.
2. Based on Intel estimates as of April 21, 2020, from measurements on Intel internal reference platforms.
3. Requires a system with Intel® Turbo Boost Technology. Intel® Turbo Boost Technology and Intel® Turbo Boost Max Technology 3.0 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.
4. 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 https://www.intel.com/content/www/us/en/architecture-and-technology/hyper-threading/hyper-threading-technology.html.
5. Windows support only.
6. 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.
7. Not all features are supported in all operating systems.
8. Legacy boot not supported for Windows 10, Linux. Customers should work with their BIOS vendors for enabling/validating legacy BIOS features.
9. Windows Server 2019 applies only to Intel® Xeon® W-1200E Series processors.
10. 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.

Notices and disclaimers

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.

Optimization notice: Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.

Performance results are based on the date the systems are tested and may not reflect all publicly available security updates. See configuration disclosure for details. No product or component can be absolutely secure.

Intel® technologies' features and benefits depend on system configuration and may require enabled hardware, software, or service activation. Performance varies depending on system configuration. Your costs and results may vary.

Results have been estimated or simulated.

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