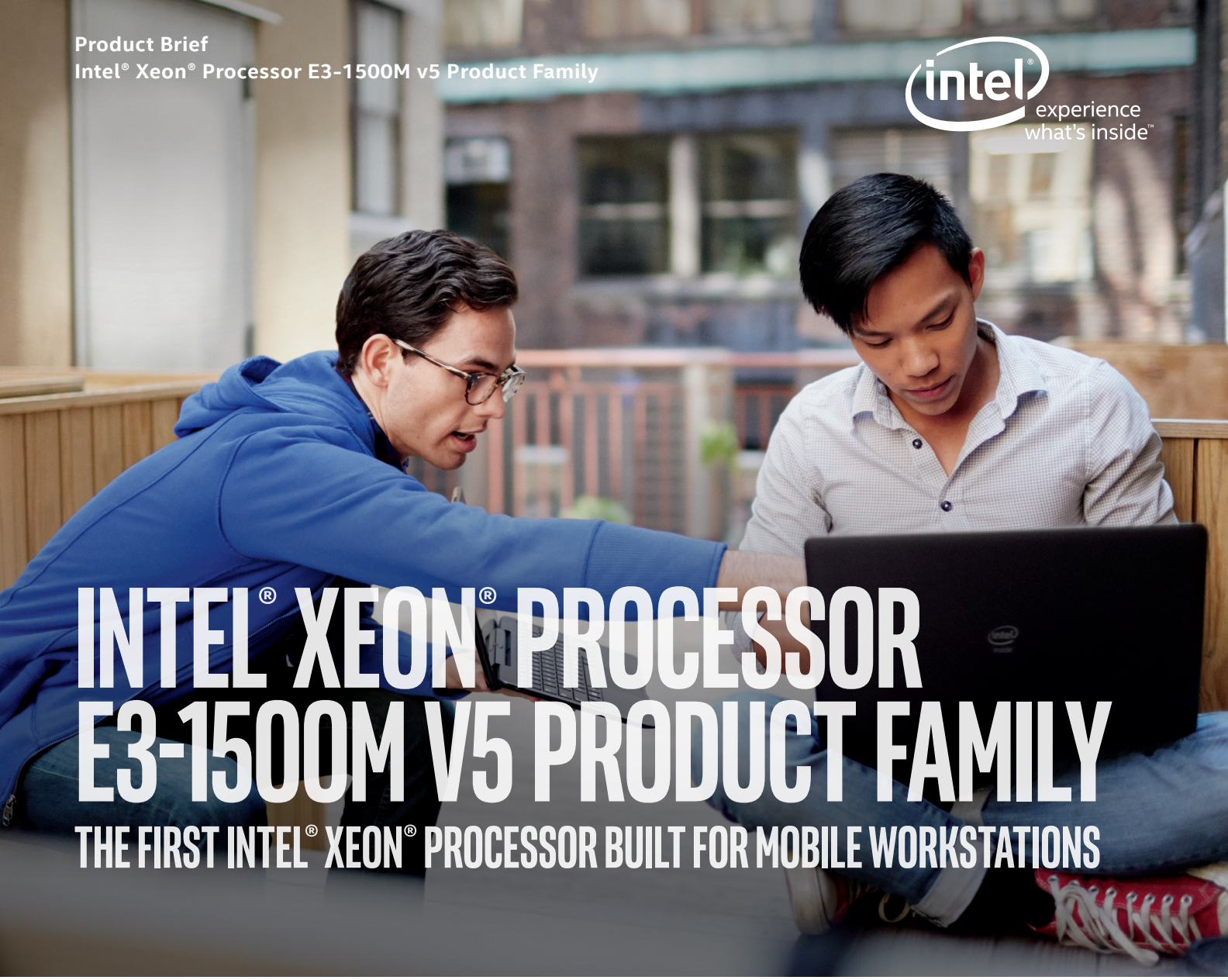


INTEL® XEON® PROCESSOR E3-1500M V5 PRODUCT FAMILY

THE FIRST INTEL® XEON® PROCESSOR BUILT FOR MOBILE WORKSTATIONS

POWERFUL. PRODUCTIVE. PORTABLE.

The all-new Intel® Xeon® processor E3-1500M v5 product family, based on Intel's newest wave of 14nm processors, delivers the responsive performance, high-speed I/O and enterprise-grade features that professional power-users demand. With support for Error-Correcting Code (ECC) memory, workstation application certifications, and Intel® vPro™ technology security and manageability, Intel® Xeon® processor-based mobile workstations enable the level of portable business computing that engineers, graphics professionals, and media creators need and IT requires.

Responsive Performance and High-Speed I/O

The Intel Xeon processor E3-1500M v5 product family leverages the power efficiency of a new microarchitecture for faster performance than previous-generation processors.[1] Intelligent power management with Intel® Turbo Boost Technology 2.0 dynamically controls performance and power—for cores and graphics—boosting performance when it is needed, and saving energy when it counts. The Intel Xeon processor E3-1500M v5 product family supports four cores and eight threads with Intel® Hyper-Threading Technology (Intel® HT Technology), enabling powerful, yet sleek, mobile workstations. Thunderbolt™ 3 Technology (with 40 Gbps bandwidth) will be available on a number of mobile workstation designs alongside ample high-speed I/O, including up to 16 PCIe Gen3 lanes.

Manageability and Stability

Intel® Active Management Technology simplifies PC management and maximizes uptime for increased productivity and lower IT costs. Additionally, Intel® Stable Image Platform Program (SIPP) guarantees no image-breaking hardware/firmware changes and the extended availability of the platform.

Certified Applications

Optimized for a range of independent software vendor (ISV) applications, the Intel Xeon processor E3-1500M v5 product family delivers previously out-of-reach, entry-level workstation performance and visuals to designers, engineers, and media creators.

Workstation-Class Graphics Optimized for Professional Software

Built-in Intel® HD Graphics P530 deliver the hardware-accelerated imagery and media performance that professionals need for vector and bit map visualizations, video transcoding, and ultra-high definition (UHD) display. New enhancements in the processor silicon enable professional software to leverage the added graphics performance for superior portable workstation experiences. The new Intel Xeon processor E3-1500M v5 product family is enabling an entirely new class of powerful, portable, and graphics-accelerated workstations. Learn more about Intel HD P530 graphics.

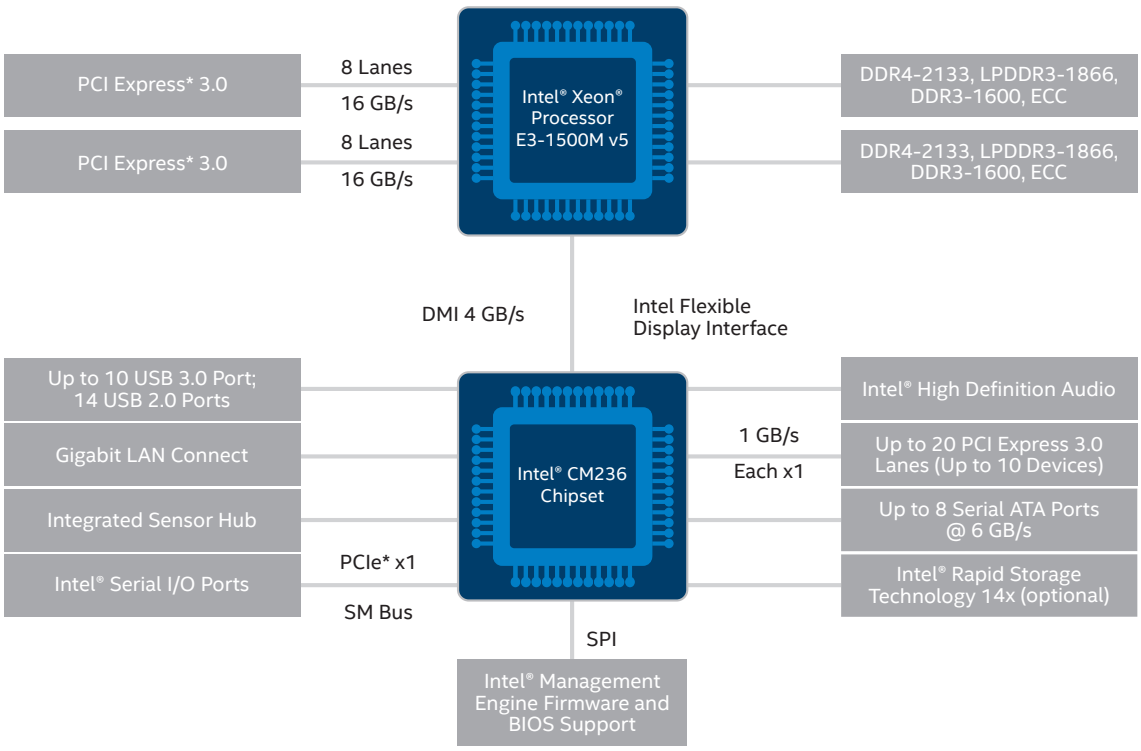
Security and Reliability

The Intel Xeon processor E3-1500M v5 product family has been designed to enable hardware-enhanced security, including Intel® Software Guard Extensions (Intel® SGX) that can provide an additional level of hardware-based protection by putting data into a secure container on the platform, and Intel® Memory Protection Extensions (Intel® MPX) that can help prevent buffer flow attacks. ECC memory support guards your system from potential crashes and changes in data with built-in protection that automatically detects and repairs errors that cause data corruption.

Experience the Best of Windows* 10 in a Powerful Mobile Workstation

The premium performance of Intel Xeon processor-powered mobile workstations unleashes massive potential in Windows* 10. With accelerated CPU and graphics performance, and enhanced security, manageability, and reliability features, your Windows 10 experience just gets better. Blazing-fast startup and app switching gets you to work faster, boosting productivity. Platforms integrating Intel® 3D cameras add new dimensions to your Windows 10 workstation experience. And increased efficiency of both the Intel Xeon processor E3-1500M v5 product family and Windows 10 lets you enjoy the freedom to work longer wherever you want.

Typical Intel® Xeon® Processor E3-1500M v5 Platform Configuration[a]

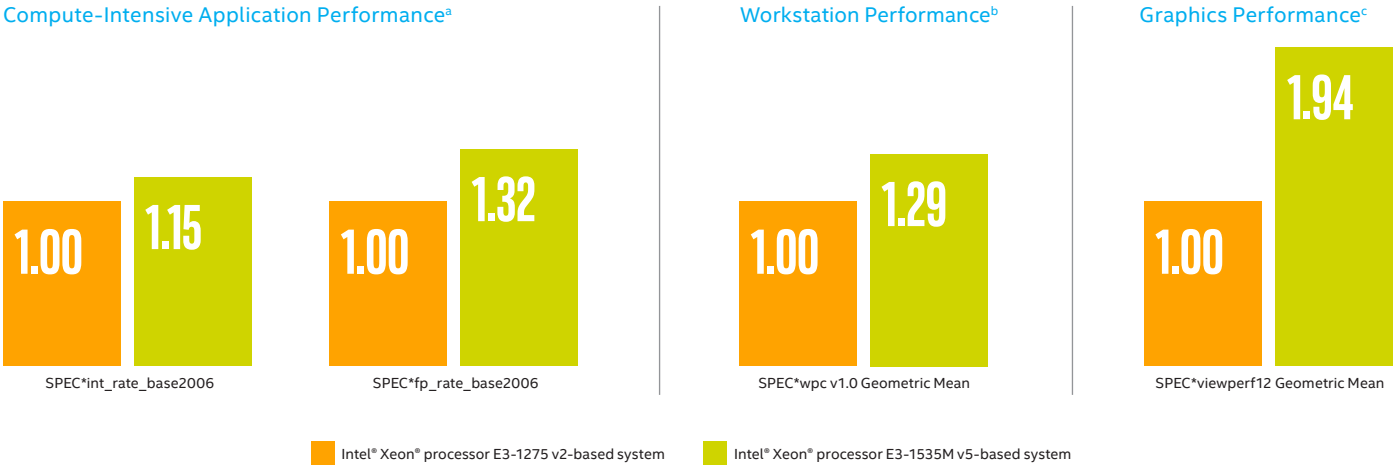


[a]Features may vary depending on processor and chipset SKUs.

Relative Processor Performance: Intel® Xeon® processor E3-1275 v2-based system compared to Intel® Xeon® processor E3-1535M v5-based system

Intel® Xeon® Processor E3-1500M v5 Product Family

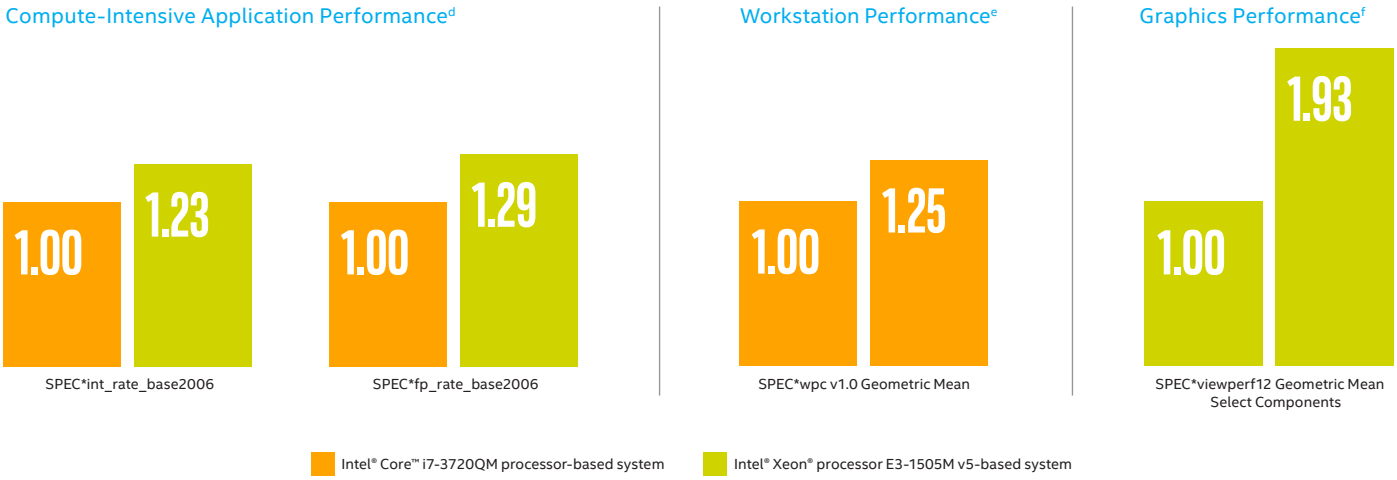
Generational Performance Gains



Relative Processor Performance: Intel® Core™ i7-3720QM processor-based system compared to Intel® Xeon® processor E3-1505M v5-based system

Intel® Xeon® Processor E3-1500M v5 Product Family

Platform Performance Gains



INTEL® XEON® PROCESSOR E3-1500M V5 PRODUCT FAMILY FEATURES AT A GLANCE

FEATURES[2]	BENEFITS
ECC Memory	Guards your system from potential crashes and changes in data with built-in protection that automatically detects and repairs errors that cause data corruption.
Intel® Pro Wireless Display (Intel® Pro WiDi)	Enables organizations to take advantage of WiDi in the workplace, with all the benefits of wirelessly connecting to projectors and displays through their enterprise networks, plus the security, flexibility, and configuration capabilities that IT requires.
Intel® Turbo Boost Technology 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.
Intel® Built-In Visuals	**Intel® Iris™ Pro Graphics[3] –** Intel's best graphics deliver the stunning graphics performance enthusiasts and content creators demand on the go or in the office with dedicated on-package cache memory. **Intel® HD Graphics –** Allows HD videos to play with exceptional clarity, and viewing and editing of even the smallest details of photos on the go or in the office. **Intel® Quick Sync Video –** Delivers excellent video conferencing capability, fast video conversion, online sharing, and fast video editing and authoring. **Intel® Clear Video HD –** Visual quality and color fidelity enhancements for HD playback and immersive web browsing. **Intel® Wireless Display Display (Intel® WiDi)[4] –** Lets you beam your apps and personal and online content such as movies, photos, and music to an HDTV with a simple wireless connection.
Integrated Memory Controller	Offers stunning memory read/write performance through efficient prefetching algorithms, lower latency, and higher memory bandwidth.
Intel® Smart Cache	Dynamically allocates shared cache to each processor core, based on workload, reducing latency and improving performance.
Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI)	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® Power Optimizer 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. Processor C-states (C8-C10) provide low idle power.
Configurable TDP Power	With Configurable TDP, the processor is now capable of modulating the maximum sustained power vs. performance. Configurable TDP thus provides design and performance flexibility to control system performance based on the cooling capability and usage scenarios. For example, a detachable Ultrabook™ device may need more performance when used in a full clamshell mode (vs. tablet mode), or when balanced performance is needed in a quiet conference room setting.
Intel® Secure Key (formerly Digital Random Number Generator [DRNG])	Security hardware-based random number generator that can be used for generating high-quality keys for cryptographic (encryption and decryption) protocols. Provides quality entropy that is highly sought after in the cryptography world for added security.
Intel® Transactional Synchronization Extensions New Instructions (TSX-NI)[6]	A set of instructions focused on enterprise-level multi-threaded 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 multi-user collaboration.
Intel® Advanced Vector Extensions (Intel® AVX) 2.0[7]	An extension of AVX 1.0 with new optimized instructions to deliver enhanced performance on floating-point-intensive apps. AVX 2.0 adds 256-bit integer instructions and new instructions for FMA (Fused Multiply Add). FMA delivers better performance on media and floating-point computations, including face recognition; professional imaging; high-performance computing; consumer video and imaging; compression; and encryption.
Collaborative Processor Performance Control (CPPC)	A technology based on the ACPI 5.0 specification that dynamically modulates performance vs. active application power. It reduces active power to deliver better battery life and allows deep low power states to be reached.

INTEL® XEON® PROCESSOR E3-1500M V5 PRODUCT FAMILY FEATURES AT A GLANCE

FEATURES[2]	BENEFITS
Intel® Software Guard Extensions (Intel® SGX)	A processor enhancement designed to help protect application integrity and confidentiality of secrets and withstand software and certain hardware attacks.
Intel® Memory Protection Extensions (Intel® MPX)	Provides hardware accelerated mechanism for memory testing (heap and stack) buffer boundaries in order to identify buffer overflow attacks.
Intel® BIOS Guard	An augmentation of existing chipset-based BIOS flash protection capabilities targeted to address the increasing malware threat to BIOS flash storage. It helps protect the BIOS flash from modification without platform manufacturer authorization, helps defend the platform against low-level DOS (denial of service) attacks, and restores BIOS to a known good state after an attack.
Intel® Protection Technology with BIOS Guard	Hardware-based boot integrity protection that 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. Configurable boot types include: Measured Boot – Measures the initial boot block into the platform storage device such as trusted platform module (TPM) or Intel® Platform Trust Technology (PTT). Verified Boot – Cryptographically verifies the platform initial boot block using the boot policy key.
Intel® OS Guard	A hardware-based security feature that protects the operating system kernel. OS Guard helps prevent 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. OS Guard is not application-specific and protects the kernel from any application.
Intel® Platform Trust Technology	A trusted element of the platform execution that provides enhanced security by verifying the boot portion of the boot sequence.
Intel® Active Management Technology (Intel® AMT)	Using built-in platform capabilities and popular third-party management and security applications, Intel® AMT allows IT to discover, heal, and protect computing assets on wired and wireless networks.
Intel® Rapid Storage Technology (Intel® RST)	Offers excellent levels of performance, responsiveness, and expandability. Take advantage of the enhanced performance and lower power consumption available with Intel® RST with one or more SATA or PCIe storage drives. With additional SATA drives, Intel RST provides quicker access to digital photo, video, and data files with RAID 0, 5, and 10, and greater data protection against a storage disk drive failure with RAID 1, 5, and 10. Dynamic Storage Accelerator unleashes the maximum performance of Solid State Drives (SSD) when multitasking.
Intel® Speed Shift Technology	Delivers dramatically quicker responsiveness with single-threaded, transient (short duration) workloads, such as web browsing, by allowing the processor to more quickly select its best operating frequency and voltage for optimal performance and power efficiency.
Intel® Smart Response Technology	Spend less time waiting, with fast access to the files and applications you use the most.
Intel® Identity Protection Technology	Help protect your One Time Password (OTP) credentials and PKI certificates and add a layer of encrypted second factor authentication for online transactions. Log into your system or make secure credit card purchases on your system using near-field communication (NFC).
Thunderbolt™ 3 Technology	Delivers blazing-fast I/O up to 40 Gb/s; supports 2x 4K video displays.

INTEL® XEON® PROCESSOR E3-1500M V5 PRODUCT FAMILY AND CM236 PCH[8]

Intel Xeon processor E3-1500M v5 product family has a separate Platform Control Hub. The following summarizes the available configuration for CM236.[2]

Independent Displays Supported	3
Intel® Rapid Storage Technology	Yes
Intel® Smart Response Technology and RAID	Yes
Intel® Protection Technology with BIOS Guard	Yes
Intel® High Definition Audio	Yes
USB 3.0 Ports[9]	Up to 10
USB 2.0 Ports[9]	14
PCIe 3.0 Express Lanes[9]	Up to 20
SATA 3.0 Ports[9]	Up to 8

To learn more about Intel Xeon processor-based mobile workstations, please visit www.intel.com/mobileworkstation

Performance test specifications for information on page 4.

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 information go to http://www.intel.com/performance

[a] Compute-Intensive Application Performance: Estimated based on measurements on internal reference platform for the Intel® Xeon® processor E3-1535M v5 using SPEC* CPU2006

[b] Workstation Performance: Geometric mean of all components of SPEC*wpc v1.0

[c] Graphics Performance: Geometric mean of all components of SPEC*viewperf 12

System Configuration - **Intel® Xeon® processor E3-1535M v5-based system:** Intel® Reference Platform, Intel Xeon processor E3-1535M v5 45W TDP, 4C8T, Turbo up to 3.8GHz/2.9GHz, Memory: 2x4GB DDR4-2133, Storage: Intel® SSD, Display Resolution:1920x1080. Graphics driver: 15.40.4281 , OS: Windows* 10 Professional build 10240 x64; **Intel® Xeon® processor E3-1275 v2-based system:** Carlow based platform, BIOS ACRVMBY1.86C.0096.P0009/09/2012, Intel Xeon processor E3-1275 v2 77W TDP, 4C8T, 3.5GHz turbo up to 3.9GHz, 8MB Cache, Intel® HD Graphics P4000; Memory: 8GB (2x4GB) DDR3-1600 ECC UDIMM; Storage: WD2000FYYZ; Display resolution: 1920x1080. Graphics Driver: 8.15.10.2712; OS: Microsoft Windows 7 SP1 64 Bit. HT Enabled, Turbo on.

[d] Compute-Intensive Application Performance: Estimated based on measurements on internal reference platform for the Intel® Xeon® processor E3-1505M v5

[e] Workstation Performance: Geometric mean of all components of SPEC*wpc v1.0

[f] Graphics Performance: Geometric mean of select sub-components of SPEC*viewperf 12

System Configuration - **Intel® Xeon® processor E3-1505M v5-based system:** Intel Reference Platform, Intel Xeon processor E3-1505M v5 45W TDP, 4C8T, Turbo up to 3.7GHz/2.8GHz, Memory: 2x4GB DDR4-2133, Storage: Intel SSD, Display Resolution:1920x1080. Graphics driver: 15.40.4281 , OS: Windows* 10 Professional build 10240 x64; I**ntel® Core™ i7-3720QM processor-based system:** Lenovo ThinkPad* W530, Intel Core i7-3720QM processor 45W TDP, 4C8T, Turbo up to 3.4GHz/2.6GHz, Memory: 2x4GB DDR3-1600, Storage: Intel SSD, Display Resolution: 1920x1080. Graphics driver: 10.18.10.4252, OS: Windows 10 Professional build 10240 x64

---

[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 visithttp://www.intel.com/performance.

Performance comparison based on measurement of Intel® Xeon® processor E3-1500M v5 vs. Intel® Core™ i7-4910MQ processor using SYSmark* 2014. System configuration info processor: Intel® reference platform running Intel Xeon processor E3-1500M v5 PL1=45W TDP, PL1=45W TDP, 4C8T, Turbo up to 3.7GHz, Memory: 2x4GB DDR4-2133,

Storage: Intel® SSD, Display Resolution:1920x1200. System configuration for 4th Gen processor: Intel® reference platform running Intel Core i7-4910MQ processor; PL1 =47W, 4C8T, Turbo up to 3.9GHz, Memory: 2x4GB DDR3L-1600, Storage: Intel SSD, Display Resolution:1920x1200.

[2] Not all features available on all systems.

[3] Available on select models of Intel® processors. For more information on which processors support the capability, see http://ark.intel.com.

[4] Requires an Intel® Wireless Display–enabled PC, tablet, or smartphone, a compatible adapter, and a TV. 1080p and Blu-ray* or other protected content playback only available on select Intel® processors with built-in visuals enabled. 4K support requires an Intel® Core™ processor or Intel® Xeon® processor, Intel® graphics driver 15.36.13.4062 or later, Intel® Wireless 7260/7265 and wireless driver 17.13.1 or later, Windows 8.1 with August Update, and a 2015 model year LG WebOS* 2.0 series TV (UF and EG series). System must be connect to AP at 5GHz for resolutions >1080p. 4K support not available on Intel® Pro WiDi. Consult your PC manufacturer. For more information, see www.intel.com/go/widi.

[5] Available on select processor models only. Warning: Altering memory frequency and/or voltage may (i) reduce system stability and use life of the system, memory and processor; (ii) cause the processor and other system components to fail; (iii) cause reductions in system performance; (iv) cause additional heat or other damage; and (v) affect system data integrity. Intel assumes no responsibility that the memory, included if used with altered clock frequencies and/or voltages, will be fit for any particular purpose. Check with memory manufacturer for warranty and additional details.

[6] Available on select processor models enabled for Intel® vPro™ Technology. For details, see http://ark.intel.com.

[7] Intel® Advanced Vector Extensions (Intel® AVX)* are designed to achieve higher throughput to certain integer and floating point operations. Due to varying processor power characteristics, utilizing AVX instructions may cause a) some parts to operate at less than the rated frequency and b) some parts with Intel® Turbo Boost Technology 2.0 to not achieve any or maximum turbo frequencies. Performance varies depending on hardware, software, and system configuration and you should consult your system manufacturer for more information.

[8] Feature support dependent on PCH configuration selected. See the Intel® Xeon® processor line PCH table in this document for details.

[9] 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.

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 intel.com.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request. Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order. Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or by visiting Intel's Web site at www.intel.com.

* Other names and brands may be claimed as the property of others.

0116/DGS/OCG/XX/PDF 333207-002US