

## PLATFORM BRIEF

Intel® Core™ Processors with Intel® Q87  
and Intel® C226 Chipsets  
Intelligent Systems



# 4th Generation Intel® Core™ Processor-based Platforms for Intelligent Systems (i7-4770S, i7-4770TE, i5-4570S, i5-4570TE)

Ideal for Intelligent Systems—context-aware, securely managed embedded devices that connect seamlessly to networks, clouds and each other.



## Product Overview

Manufactured on industry-leading 22nm process technology with 3D Tri-Gate transistors, these 4th generation Intel® Core™ processors offer superior CPU, graphics and media performance. This, along with outstanding flexibility and enhanced security, makes them ideal for a wide range of intelligent systems, including retail transaction terminals, digital signage, digital security and surveillance, gaming, industrial automation, and medical equipment.

These 4th generation Intel Core processors offer numerous advancements over the 3rd generation Intel® Core™ processors. With the introduction of Intel® Advanced Vector Extensions (Intel® AVX) 2.0, these processors deliver improved integer/matrix-based calculation abilities, while upgrades to Intel® AES New Instructions<sup>1</sup> (Intel® AES-NI), allow security algorithms to benefit from hardware acceleration for data encryption and decryption.

Next-generation Intel® graphics engines significantly improve graphics and media performance. The platform supports up to three independent displays, enabling one system to drive multiple screens without the need for a discrete graphics card. Built-in visual features, including Intel® Clear Video HD technology and Intel® Quick Sync Video 2.0, deliver smoother visual quality, improved ability to decode and transcode simultaneous video streams, and outstanding HD media playback. Additionally,

the platform supports next-generation graphics APIs, such as Microsoft DirectX\* 11.1, OpenGL\* 4.0, and OpenCL\* 1.2.

When paired with the Intel® Q87 chipset, the platform supports dual-channel DDR3/DDR3L 1600 MHz memory at 1.5V and Intel® Rapid Start Technology<sup>2</sup> for increased system responsiveness and fast recovery from sleep states. It also supports faster connectivity and flexibility with integrated next-generation I/O technologies such as PCI Express\* Gen 2.0, SATA 6.0 Gbps, and USB 3.0 with Intel® Flex I/O. Error Correcting Code is enabled when select processors are paired with the Intel® C226 chipset, providing improved data integrity and system reliability through automatic data correction.

Intel® vPro™ technology,<sup>3</sup> enabled when processors are paired with the Intel Q87 chipset, delivers intelligent security, expanded management capabilities and improved power management. The technology supports operating system-absent manageability and down-the-wire security even when the system is powered off, the operating system is unresponsive, or software agents are disabled.

These processors offer quad- and dual-core capabilities with industry-leading performance and thermal design power (TDP) options of 35W to 65W. While incorporating advanced technology, they remain software-compatible with previous processors.

## Platform Highlights

(Features vary with SKU. Please see page 4 for details.)

**Intel® HD Graphics 4600:** Supports enhanced high-end media and graphics capabilities and performance.

**Intel® Quick Sync Video 2.0:** Significantly improves decode and transcode performance and frees up the CPU for other tasks.

**Intel® Advanced Vector Extensions 2.0:** Accelerates integer/matrix compute performance for signal and image processing applications.

**Intel® AES New Instructions<sup>1</sup> (Intel® AES-NI):** Improves security without slowing response times.

**Intel® Intelligent Power Technology:** Reduces idle power consumption through architectural improvements such as integrated power gates and automated low-power states.

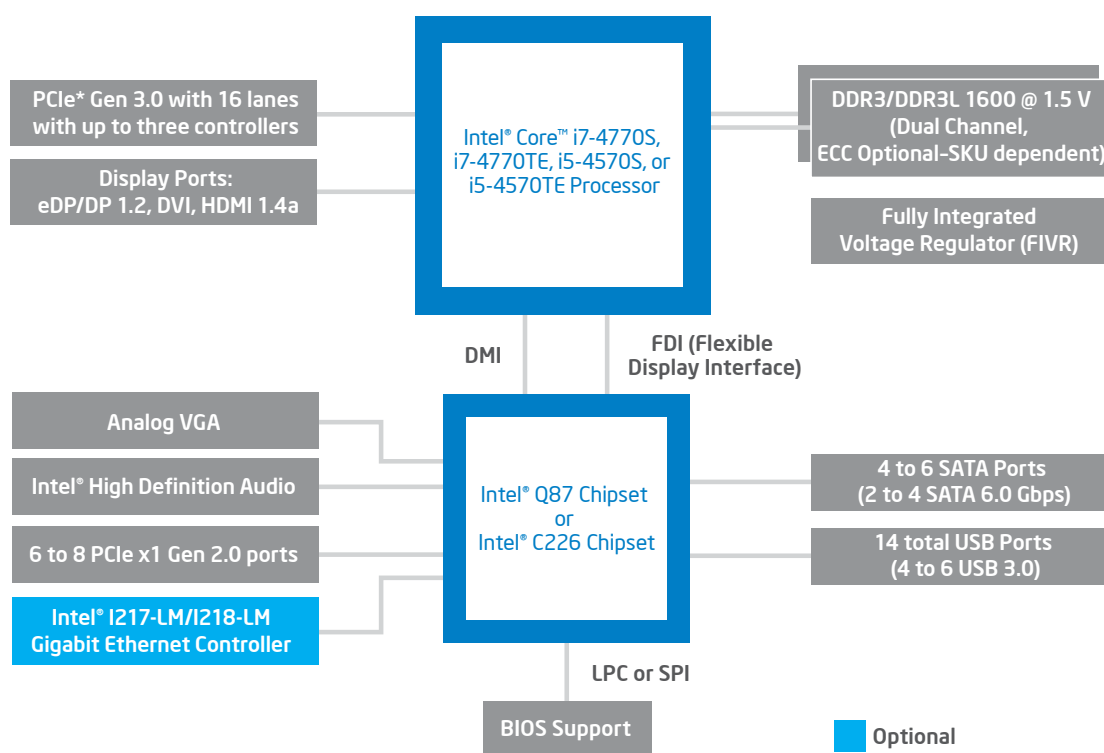
**Intel® Flex I/O:** Allows user to assign four to six SATA 6.0 Gbps ports, six to eight PCI Express\* Gen 2.0 ports, and four to six USB 3.0 ports, based on configuration needs.

**Error Correcting Code (ECC):** Delivers a high level of data integrity, reliability, and system uptime (select processor SKUs paired with Intel C226 chipset).

**Intel® Turbo Boost Technology<sup>4</sup> 2.0:** Runs applications faster by using available thermal headroom to run at a higher frequency.

**Intel® Hyper-Threading Technology<sup>5</sup>:** Simultaneous multi-threading helps boost performance for parallel, multi-threaded applications.

**Intel® vPro™ Technology<sup>3</sup> (with Intel Q87 chipset):** Delivers unprecedented hardware support for vital security and management functions with Intel® Active Management Technology,<sup>6</sup> Intel® Virtualization Technology,<sup>7</sup> and Intel® Trusted Execution Technology.<sup>8</sup>



## Software Overview

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

### OPERATING SYSTEM

Microsoft Windows\* 8  
 Microsoft Windows Embedded Standard 8  
 Microsoft Windows 7  
 Microsoft Windows Embedded Standard 7  
 Microsoft Windows XP SP3<sup>a</sup>  
 Microsoft Windows Embedded Standard 2009<sup>a</sup>  
 Microsoft Windows POS 2009<sup>a</sup>  
 Linux\* (Kernel 3.x)  
 Wind River VxWorks\* 6.9  
 SUSE SLE\* 11 SP1

### CONTACT

Intel provides drivers<sup>9</sup>  
 Intel provides drivers<sup>9</sup>  
 Intel provides drivers<sup>9</sup>  
 Intel provides drivers<sup>9</sup>  
 Intel provides drivers<sup>9</sup>  
 Intel provides drivers<sup>9</sup>  
 Intel provides drivers<sup>9</sup>  
 Wind River, Red Hat, Novell  
 Wind River  
 Novell

### BIOS

American Megatrends  
 Insyde Software  
 Phoenix Technologies  
 Byosoft

<sup>a</sup>Not all features are supported. Contact your local Intel representative for more information.

## Platform Features and Benefits

This 4th generation Intel® Core™ processor family offers numerous advancements over the 3rd generation Intel® Core™ processors.

### FEATURES

### BENEFITS

#### Key Embedded Support

Extended life cycle product support	▪ Protects system investment by enabling extended product availability for embedded customers.
Ecosystem support	▪ Along with a strong ecosystem of hardware and software vendors, including members of the Intel® Intelligent Systems Alliance ( <a href="https://intel.com/go/intelligentsystems-alliance">intel.com/go/intelligentsystems-alliance</a> ), Intel helps to cost-effectively meet development challenges and speed time-to-market.

#### Built-In Visuals

Intel® HD Graphics 4600	<ul style="list-style-type: none"> <li>▪ Delivers enhanced visual experiences, including excellent 3D performance, the addition of HDMI 4K support, and enhanced color and deep color support for a broad range of intelligent systems.</li> <li>▪ Provides repartitioned display architecture, allowing three independent displays and hybrid multi-monitor configurations.</li> <li>▪ Integrated processor graphics help minimize power consumption while maximizing performance for decoding, encoding, and transcoding workloads with hardware acceleration of video codecs.</li> </ul>
Intel® Quick Sync Video 2.0	▪ Improved ability to decode and transcode simultaneous video streams for intelligent systems, including medical imaging and video surveillance functions.
Intel® Clear Video HD Technology	▪ Provides visual quality and color fidelity enhancements for spectacular HD media playback for applications such as digital signs and gaming platforms.

#### Security

Intel® AES New Instructions (Intel® AES-NI) <sup>1</sup> and Intel® Secure Key <sup>10</sup>	<ul style="list-style-type: none"> <li>▪ Helps protect media, data and assets from loss.</li> <li>▪ Intel AES-NI accelerates data encryption/decryption and improves performance.</li> </ul>
Intel® OS Guard	▪ Helps detect and prevent malware.
Intel® Platform Protection Technology with BIOS Guard	▪ Protects Flash from modification without platform manufacturer authorization.

#### Performance

Intel® Advanced Vector Extensions 2.0	▪ Supports faster performance on digital signal and image processing workloads of compute-intensive applications such as radar detection, hurricane command centers, ruggedized navigation systems and remote medical image processing.
Intel® Turbo Boost Technology <sup>4</sup> 2.0	▪ Boosts performance for specific workloads by increasing processor frequency.
Intel® Hyper-Threading Technology <sup>5</sup>	▪ Enables simultaneous multi-threading within each processor core, up to two threads per core; reduces computational latency, making optimal use of every clock cycle.
Error Correcting Code (ECC) memory (optional on select processor SKUs paired with Intel® C226 chipset)	▪ Detects multiple-bit memory errors; locates and corrects single-bit errors to keep the system up and running.
Intel® Smart Cache Technology	▪ Large on-die shared Last-Level Cache reduces latency to data, improving performance and power efficiency.

#### Power Efficiency

Intel® Intelligent Power Technology	▪ Automated energy efficiency to reduce power consumption.
Automated low-power states	▪ Adjusts system power consumption based on real-time processor loads.
Intel® Rapid Start Technology <sup>2</sup>	▪ Improves OS boot time and wakes up from deep sleep state more quickly than previous generations for better system responsiveness.
Fully Integrated Voltage Regulator	▪ Simplifies power delivery by integrating legacy power delivery onto processor package/die.

#### Intel® vPro™ Technology<sup>3</sup> (platforms paired with Intel® Q87 chipset)

Intel® Active Management Technology 9.0 <sup>6</sup>	▪ 9.0 version of Intel's remote management and maintenance capabilities enables vendors to roll back firmware image; remote host capabilities help ease provisioning of end devices.
Intel® Virtualization Technology <sup>7</sup>	▪ Speeds transfer of platform control and movement of data between the virtual machine monitor (VMM) and other platform agents (including guest OSs and I/O devices). By lowering the workload on the VMM, this technology addresses many embedded system design challenges, like migrating legacy software, increasing real-time performance, and making applications more secure.
Intel® Trusted Execution Technology <sup>8</sup>	▪ Protects 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® Core™ Processors for Intelligent Systems

PROCESSOR NUMBER <sup>A</sup>	CORES/ THREADS	CORE FREQUENCY (GHz)			THERMAL DESIGN POWER	PACKAGE	INTEL® AES-NI	INTEL® AVX
		BASE FREQUENCY	1 CORE TURBO (MAX)	INTEL® SMART CACHE				
Intel® Core™ i7-4770S Processor	4/8	3.1	3.9	8 MB	65 W	LGA1150	Yes	Yes
Intel® Core™ i7-4770TE Processor	4/8	2.3	3.3	8 MB	45 W	LGA1150	Yes	Yes
Intel® Core™ i5-4570S Processor	4/4	2.9	3.6	6 MB	65 W	LGA1150	Yes	Yes
Intel® Core™ i5-4570TE Processor	2/4	2.7	3.3	4 MB	35 W	LGA1150	Yes	Yes

### INTEL® vPRO™ TECHNOLOGY<sup>B</sup>

PROCESSOR NUMBER <sup>A</sup>	INTEL® TURBO BOOST TECHNOLOGY 2.0	INTEL® HYPER- THREADING TECHNOLOGY	INTEL® VIRTUALIZATION TECHNOLOGY	INTEL® ACTIVE MANAGEMENT TECHNOLOGY 9.0	INTEL® TRUSTED EXECUTION TECHNOLOGY	ERROR CORRECTING CODE
Intel® Core™ i7-4770S Processor	Yes	Yes	Yes	Yes	Yes	No
Intel® Core™ i7-4770TE Processor	Yes	Yes	Yes	Yes	Yes	No
Intel® Core™ i5-4570S Processor	Yes	No	Yes	Yes	Yes	No
Intel® Core™ i5-4570TE Processor	Yes	Yes	Yes	Yes	Yes	Optional <sup>B</sup>

<sup>A</sup>When paired with the Intel® Q87 chipset.

<sup>B</sup>When paired with the Intel® C226 chipset.

## Intel® Chipsets for Intelligent Systems

PRODUCT	PRODUCT CODE	PACKAGE	FEATURES
Intel® DH82Q87 Platform Controller Hub	DH82Q87	FCBGA 708	4 to 6 SATA ports (2 to 4 SATA 6.0 Gbps); 14 total USB ports (4 to 6 USB 3.0); 6 to 8 PCI Express* x1 Gen 2.0 ports; supports Intel® vPro™ Technology
Intel® DH82C226 Platform Controller Hub	DH82C226	FCBGA 708	Supports ECC and Intel® Active Management Technology 9.0; 4 to 6 SATA 6.0 Gbps ports; 14 total USB ports (4 to 6 USB 3.0); 6 to 8 PCI Express* x1 Gen 2.0 ports

## Intel in Intelligent Systems: [intel.com/intelligentsystems](http://intel.com/intelligentsystems)

<sup>A</sup> Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families: Go to: [http://www.intel.com/products/processor\\_number](http://www.intel.com/products/processor_number).

<sup>1</sup> 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 <http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni>.

<sup>2</sup> Requires a select Intel® processor, Intel® software and BIOS update, and Intel® Solid-State Drive (SSD). Depending on system configuration, your results may vary. Contact your system manufacturer for more information.

<sup>3</sup> Intel® vPro™ Technology is sophisticated and requires setup and activation. Availability of features and results will depend upon the setup and configuration of your hardware, software and IT environment. To learn more visit: <http://www.intel.com/technology/vpro>.

<sup>4</sup> 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 PC manufacturer. Performance varies depending on hardware, software, and system configuration. For more information, visit <http://www.intel.com/go/turbo>.

<sup>5</sup> 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 <http://www.intel.com/info/hyperthreading>.

<sup>6</sup> Requires activation and a system with a corporate network connection, an Intel® AMT-enabled chipset, network hardware and software. For notebooks, Intel AMT may be unavailable or limited over a host OS-based VPN, when connecting wirelessly, on battery power, sleeping, hibernating or powered off. Results dependent upon hardware, setup and configuration. For more information, visit <http://www.intel.com/technology/platform-technology/intel-amt>.

<sup>7</sup> 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 <http://www.intel.com/go/virtualization>.

<sup>8</sup> No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer with Intel® Virtualization Technology, an 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 <http://www.intel.com/technology/security>.

<sup>9</sup> Drivers available at: [downloadcenter.intel.com](http://downloadcenter.intel.com) (enter chipset name).

<sup>10</sup> No system can provide absolute security. Requires an Intel® Secure Key-enabled PC with a 3rd gen or 4th gen Intel® Core™ vPro™ processor and software optimized to support Intel Secure Key. Consult your system manufacturer for more information.

Performance results are based on certain tests measured on specific computer systems. Any difference in system hardware, software or configurations will affect actual performance. For more information go to <http://www.intel.com/performance>.

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