

Manageability

Power
Optimized

Integration

Performance

EMBEDDED INTEL® 3rd GEN CORE™ PROCESSOR SOLUTIONS



Advantech Products With Intel 3rd Gen Core Processors

- Lower power draw, more speed and much better graphics performance
- Superior transfer speed via native USB 3.0 and PCIe 3.0
- Mobile versions and desktop/performance versions
- Base clocks speeds from 1.60GHz to 3.40GHz
- TurboBoost 2.0 technology in most available processors
- DDR3 memory up to 1,600MHz speed
- Thermal Design Power from 17 to 95 watts
- Mobile CPUs: Scalable TDP allows flexible form factors
- 1.8x HD-to-HD transcode, 60% 3D graphics speed boost
- Supports up to three independent displays
- ECC memory support available in BGA packages
- Active Management Technology 8.0 and IPMI support in most chips

The Ivy Bridge Platform: 3rd Gen of Intel® Core™ Processors

It seems like only yesterday that Intel introduced the first and then second generation of Core processors, and now the third generation is here. This document highlights the 3rd generation of Intel Core processors, discusses its new features and strengths, and highlights some of the first Advantech products to take advantage of Intel's latest and most powerful processor platform.



What is the 3rd Generation of Intel Core Processors?

It is the latest and most advanced processor family from Intel and includes a) "Ivy Bridge" CPUs with a new 22nm manufacturing process, b) a much more powerful GPU integrated into the CPUs, c) the new "Panther Point" chipset family that all support Intel HD graphics, d) the 82579LM "Lewisville" GbE (Gigabit Ethernet) chip, and e) a new WiFi chip. Do not expect dramatic increases in clock speed; Ivy Bridge is about increased efficiency, lower power consumption, and much better graphics performance.

How can I benefit from Ivy Bridge?

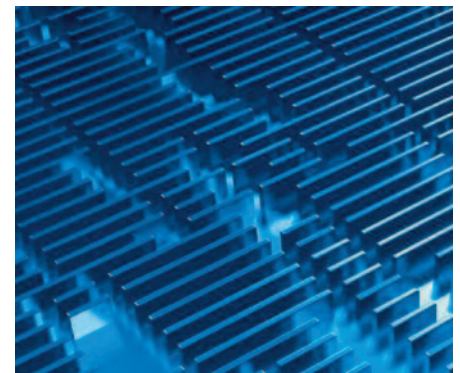
Compared to the 2nd generation predecessor family, equivalent 3rd generation Intel Core processors deliver up to 15% more CPU performance, up to 60% more 3D graphics performance (via more and faster execution units), and up to 1.8x transcode speed via Quick Sync Video. There is also support for Microsoft DirectX 11 (as opposed to 10.1 in Sandy Bridge), OpenGL 3.1 (instead of 3.0) and, new, OpenCL 1.1. Combined with native USB 3.0 and PCIe 3.0 (16 PCIe generation 3 lanes) support, embedded systems can now process much higher data loads and provide quicker, richer and more complex visuals on up to three simultaneous displays. There are new Intel technologies that address data security, system responsiveness, and manageability. And the 3rd Gen is cross-compatible (both socket and pin) with the 2nd Gen, so chips and/or chipsets can be upgraded without additional design cost.

Improved power management and scalability

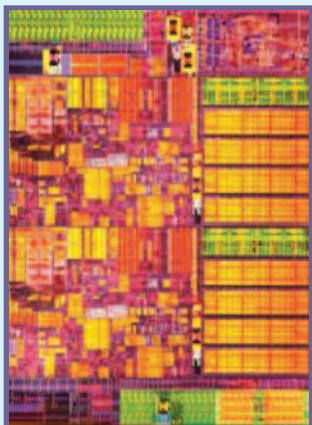
Of particular interest to embedded systems designers, mobile 3rd gen Core processors have software-configurable TDP for thermally sensitive projects (as low as 13 watts in an i7 processor). This provides form factor flexibility, better performance per watt for longer battery life (or a smaller battery). In Ivy Bridge, if additional cooling is available, TDP can be increased. If less is available, it can be throttled. The 3rd gen also supports low power DDR3L memory and a low power mode, as well as various design optimizations to provide maximum efficiency across the full range of operation.

Special embedded systems versions

Intel provides select 3rd Gen Core processors in embedded versions. This means 7-year long life support (including the WiFi chip), special OS validation, higher reliability to meet embedded use conditions, various form factors and packaging, ECC in BGA SKUs, and cross compatibility with Intel 6 Series Express chipsets.



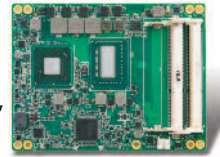
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3rd GEN CORE™
PROCESSOR SOLUTIONS



Intel® 3rd Gen Core™ Low Power Solutions

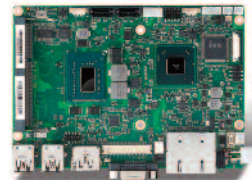
SOM-5892 COM-Express Basic

The SOM-5892 is a COM-Express Basic CPU module that can be configured with a wide variety of standard, low voltage, and ultra low voltage mobile 3rd Gen Core i3, i5 and i7 processors with integrated Intel HD graphics and the new Mobile Intel QM77 chipset. Despite its small size (3.74 x 4.92 inches), the SOM-5892 supports seven PCIe x1, a PCIe x16, two 300 MB/s and two 600 MB/s SATA channels, eight USB 2.0, four USB 3.0, 8-bit GPIO, HD audio, Watchdog Timer and up to 16GB of DDR3 or DDR3L RAM in two SODIMM slots. The module can support up to three independent displays via VGA, LVDS, DVI, HDMI and DisplayPort. A COM-Express development board is available as well.



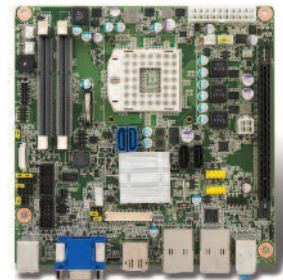
MIO-5290

Advantech created the stackable architecture MI/O Extension Single Board Computer as a SBC design with flexible multiple I/O support (hence the name MI/O) and unified extended interface connector. The new MIO-5290 uses the QM77 chipset, supports either 1600MHz DDR3 or low power 1333MHz DDR3L, USB 3.0, SATA III (600 MB/s), AMT 8.0, and can drive three independent displays (VGA, DP, 48-bit LVDS, HDMI). The MIO-5290 is available with 3rd Gen Core i3 and i7 CPUs.



AIMB-273

The Mini ITX AIMB-273 industrial motherboard is designed for embedded projects with power draw limitations that still need good performance and powerful graphics. Available with a new mobile Intel 3rd Gen Core i7-3610QE processor and QM77 chipset (as well as 2nd Gen i3/i5/i7 processors), these compact boards have integrated GFX Gen 7 graphics, offer AMT 8.0, triple simultaneous display capability (HDMI/DP/LVDS/VGA), a superfast PCIe 3.0 x16 slot and a mini-PCIe slot, 2 SATA II 300 and SATA III 600 channels each, 4 USB 2.0 and 4 USB 3.0, 2 RS-232, dual gigabit Ethernet, Watchdog Timer, optional TPM 1.2, and embedded software APIs.



These new boards and modules not only provide access to Intel's 3rd Gen Core processors, but also offer comprehensive embedded software API and utilities support with Watchdog Timers, GPIO, SMBUS, hardware monitor, brightness control and Advantech iManager in the MIO-5290 and SOM-5892. The systems also support Advantech eSOS, Flash Lock, Embedded Security ID and BIOS Flash.

Some of the Intel® 3rd Generation Core™ Processors used in Advantech embedded systems products

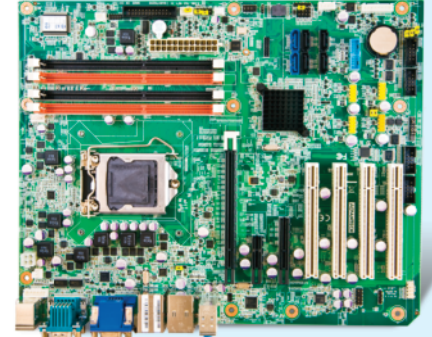
Processor	Cores	Threads	nm	TDP	Cache	Base Speed	Turbo speed	Chipset	vPro	EEC
Core i7-3770	4	8	22	95	8MB	3.40GHz	3.90GHz	Q77	yes	yes
Core i5-3550S	4	4	22	65	6MB	3.00GHz	3.70GHz	Q77	yes	yes
Core i3-3220	2	2	22	55	3MB	3.30GHz	NA	Q77	no	?
Core i7-3615QE	4	8	22	45	6MB	2.30GHz	3.30GHz	QM77	yes	yes
Core i7-3612QE	4	8	22	35	6MB	2.10GHz	3.10GHz	QM77	yes	yes
Core i7-3610QE	4	8	22	45	6MB	2.30GHz	3.30GHz	QM77	yes	yes
Core i7-3555LE	2	4	22	25	4MB	2.50GHz	3.10GHz	QM77	yes	yes
Core i7-3517UE	2	4	22	17	4MB	1.70GHz	3.00GHz	QM77	yes	yes
Core i5-3610ME	2	?	22	35	3MB	2.70GHz	3.30GHz	QM77	yes	no
Core i3-3120ME	2	4	22	35	3MB	2.40GHz	NA	QM77	no	no
Core i3-3217UE	2	4	22	17	3MB	1.60GHz	NA	QM77	no	yes

Intel® 3rd Gen Core™ High Performance Solutions

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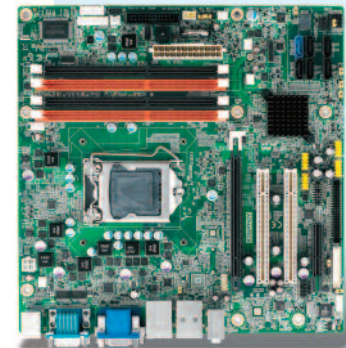
AIMB-782 ATX

The AIMB-782 is an ATX (12 x 9.6 inches) industrial motherboard for complex applications that require high data transfer speeds and maximum expansion capabilities. It comes with the new "Panther Point" Q77 chipset and the choice of several Intel 3rd Gen Core i3, i5 and i7 3xxx processors. There are four 240-pin DIMM slots for up to 32GB of 1066/1333/1600 MHz DDR3 memory, dual display support (DVI-D and VGA), dual Gigabit Ethernet, SATA RAID support (0, 1, 5, 10), and a total of seven expansion slots (4 PCI, 1 PCIe x1, 1 PCIe x4, and 1 PCIe x16). There are 2 SATA 600 MB/s and 4 SATA 300 MB/s channels, 14 USB (10 x USB 2.0 and 4 x USB 3.0), Intel HD audio, AMT 8.0, optional TPM 1.2, embedded software APIs, and extensive legacy support (RS-232/422/485, parallel, PS/2).



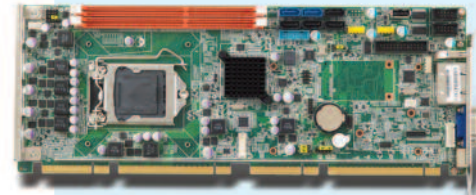
AIMB-582 MicroATX

The AIMB-582 MicroATX (9.6 x 9.6 inches) industrial motherboard comes with the new Q77 chipset and is available with a variety of powerful dual or quad core Intel 3rd Gen Core i3, i5, and i7 processors with Turbo speeds up to 3.4GHz, as well as Xeon and Pentium processors. Four standard DIMM sockets accommodate up to 32GB of DDR3 RAM with speeds of up to 1600MHz. The board supports dual/triple displays of DVI, LVDS/eDP, CRT, Display Port, dual Gigabit Ethernet and provides a total of four expansion slots (2 standard PCI, and one Gen 2 PCIe x4 and one Gen 3 PCIe x16 each). The board includes 2 SATA 600, 4 SATA 300, SATA RAID support, 12 USB ports (four of which are USB 3.0), HD audio, AMT 8.0, GPIO, optional TPM 1.2 as well as legacy support (serial, parallel, PS/2), making the AIMB-582 board a perfect choice for projects such as video surveillance systems and other high-end industrial applications.



PCE-5127 System Host Board

The PCE-5127 is a high-performance system host board that's perfect for graphics-oriented systems (via the PCE-5000 series backplanes). Available with the new Q77 chipset and an Ivy Bridge Intel Core i5 or i7 processor, the PCE-5127 SHB supports up to 16GB of DDR3 1600 memory in two full DIMM slots. There is dual display (DVI-D and VGA) support, four SATA 2.0 and two SATA 3.0 SATA, 9 USB 2.0 and 3 USB 3.0, as well as legacy interface support, optional TPM 1.2 module, iAMT 8.0, and IPMI management.



Intel® 3rd Gen Core™ Signage Solutions

ARK-DS262

The very compact (200 x 120 x 30 mm) ARK-DS262 is an Intel OPS (Open Pluggable Specification) digital signage platform that helps standardize the design and development of digital signage solutions. With its Panther Point QM77 chipset and 2.5/3.10GHz 3rd Gen Core i7-3555LE processor, the ARK-DS262 provides the processing and graphics performance as well as I/O interface flexibility required for a wide variety of signage projects.



ARK-DS762

Designed for advanced digital media player and signage projects, the ARK-DS762 combines high processing and graphics performance (Intel 3rd Gen Core up to 45 watts TDP) with rich I/O (including USB 3.0) and extra flexibility via optional expansion modules. The ARK-DS762 can support three independent displays (HDMI, DVI and VGA).



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Improved GPU Performance

Intel's "Ivy Bridge" 3rd Generation Core processor platform is to a large extent about improvements in graphics speed and features. This has been a bit of a weak point in earlier Intel chips with integrated graphics, and often made discrete graphics necessary. Ivy Bridge goes a long way to fixing that.

Ivy Bridge GPUs can have 16 instead of just 12 execution units, and each execution unit is almost twice as powerful. There are numerous architectural performance improvements and graphics-specific cache. There is Microsoft DirectX 11 (as opposed to 10.1 in Sandy Bridge), OpenGL 3.1 (instead of 3.0) and, new, OpenCL 1.1 support that offers GPGPU (general processing on the GPU) capabilities.

According to Intel, for media and graphics-intensive designs this all adds up to 60% more 3D graphics performance, and up to 1.8x HD-to-HD transcode speed in Quick Sync Video. Ivy Bridge's overall better graphics experience, extended standards support, and ability of driving up to three independent displays mean that integrated graphics are now able to handle most jobs.

For more information:

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Ivy Bridge Q&A

Do Intel 3rd Gen Core CPUs have a new processor architecture?

No. The CPU part of the "Ivy Bridge" 3rd Gen Core processors still uses the "Sandy Bridge" 2nd Gen architecture but employs a new manufacturing process, and there is a new GPU microprocessor architecture. Like Sandy Bridge, Ivy Bridge is a 2-chip platform with CPU and PCH (Platform Controller Hub) that integrates the processing cores, graphics memory controller, PCIe controller, and shared LLC (last level cache). However, the move from 32 to 22nm means higher performance and lower power (at the same speed, the 22nm transistors need only about 75-80% of the voltage). There is also a more optimized implementation of hyper threading that no longer wastes buffer space in single threaded operations.

What is Intel's 3-D Tri-Gate transistor technology?

Tri-gate transistors essentially take transistor design from 2D into 3D. They have conducting channels on three sides of a vertical fin (or even multiple fins) as opposed to the single surface of a planar transistor, making for a much larger surface area for electrons to travel. The geometry also makes for minimal leakage and very quick switching, all contributing to lower power consumption at the same performance (or more performance at the same consumption). According to Intel, the move from 2D to 3D transistors will perpetuate Moore's Law for years to come. Initial direct benefits of tri-gate transistors are a 50+% reduction in power per transistor. What's also interesting is that the performance gain of Tri-Gate transistors becomes larger at lower voltage compared to 32nm planar transistors (18% faster at 1.0 Volts; 37% faster at 0.7 Volts). This means that Tri-Gate designs can run at lower voltage while providing the same performance, and the performance and efficiency gains are especially impressive in low power chips.

How do the new 7 Series chipsets differ, and are they backward compatible?

7 Series "Panther Point" chipsets are released together with the Ivy Bridge processors and they are socket and pin compatible with the earlier 6 Series "Cougar Point" chipsets. The major advance here is native USB 3.0 support with four USB 3.0 ports. The new chipsets also use PCIe 3.0, meaning there will be far fewer throughput bottlenecks. The high-end Q77 chipset supports both vPro and SIPP (Stable Image Platform Program).

What are the speed advantages of USB 3.0 and PCIe 3.0?

With a maximum transmission speed of up to 5 Gbit/s USB 3.0 — which is backward compatible with USB 2.0 — is more than 10 times as fast as USB 2.0 (480 Mbit/s), reducing both data transfer time and power consumption.

PCI Express 3.0, which is backwards compatible with existing PCIe implementations, has twice the bandwidth per lane than PCI Express 2.0 (1GB/s vs 500MB/s). A third gen PCIe x16 slot, as implemented on the AIMB-782 ATX board, has a capacity of 16GB/s per direction.

What is DDR3L memory?

PGA mobile versions of the 3rd Gen Core processors support DDR3L memory that operates at a default voltage of 1.35V as opposed to the standard DDR3 1.5V. This means additional power savings, but note that DDR3L memory currently maxes out at 1333MHz as opposed to the DDR3 1600MHz support by the 3rd Gen chips.

