Product Brief

Intel® X38 Express Chipset

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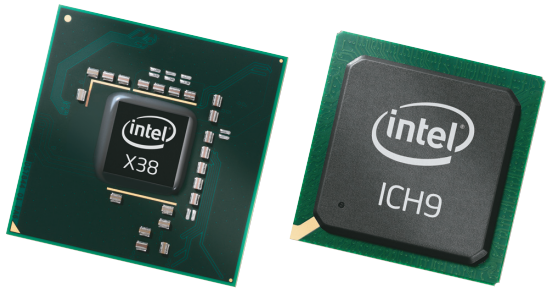
Performance Unleashed. Fast Redefined.

Desktop PC platforms based on the Intel® X38 Express Chipset, combined with either the Intel® Core™2 Duo, Intel® Core™2 Quad or Intel® Core™2 Extreme processors establish a new standard for performance and enable the fastest platforms. The Intel X38 Express Chipset was designed with headroom and an engineering passion to push the envelope for performance. The Intel X38 Express Chipset enables custom tuning to extract the maximum platform performance.



The Intel X38 Express Chipset

The Intel X38 Express Chipset adds a new chapter to the Intel® chipset legacy and establishes new levels of performance with headroom and capabilities designed specifically to deliver the fastest platforms. The X38 Express Chipset achieves this by supporting Intel® next-generation 45nm dual- and quad-core processors, enabling increased system bandwidth by supporting industry-leading technologies, such as 1333 MHz DDR3 memory, 1333 MHz system bus speed and PCI Express* 2.0, to keep up with the latest Intel Core 2 Duo and Intel Core 2 Quad processors. Intel® Fast Memory Access and Intel® Turbo Memory further improve performance, while removal of overspeed protection[1] and ability to easily tune the system for optimum performance enable extreme power users to achieve performance levels beyond its industry-leading baseline performance.

Intel® Viiv™ processor technology

Intel® Viiv™ processor technology[2] is a set of PC technologies designed for the enjoyment of digital entertainment in the home. The Intel X38 Express Chipset has support for Intel Viiv processor technology with either the ICH9R or ICH9DH SKUs.

Faster System Performance

With the growing imbalance between CPU and memory performance, it is critical to optimize the memory controller design to obtain the maximum possible performance from the memory subsystem. The redesigned Intel® X38 Express Chipset Memory Controller Hub (MCH) architecture significantly increases overall system performance through the optimization of available bandwidth with the new 1333 MHz system bus and reduction of memory access latency with Intel Fast Memory Access. These technology breakthroughs result in optimized system architecture with built-in intelligence, greatly improving system memory performance.

The updated MCH also includes support for Intel 45nm next-generation Intel® Core™2 processor family and wider internal data buses that support dual-channel DDR3 memory technology at 1333 MHz.

DDR3 Memory

The Intel X38 Express Chipset supports the new dual-channel DDR3 memory technology at 1333 MHz while also maintaining support for DDR2 memory. The key advantages of DDR3 are the higher bandwidth and the increase in performance at a lower power than DDR2. The DDR3 SDRAM devices operating at 1333 MHz offer peak data transfer rates of up to 21.2 GB/s (when operated in dual-channel interleaved mode). The Intel X38 Express Chipset operates at a lower memory voltage, resulting in approximately 20% lower power consumption and reduced heat dissipation, but delivers higher bandwidth, faster system performance, and higher performance per watt than its predecessors.[3]

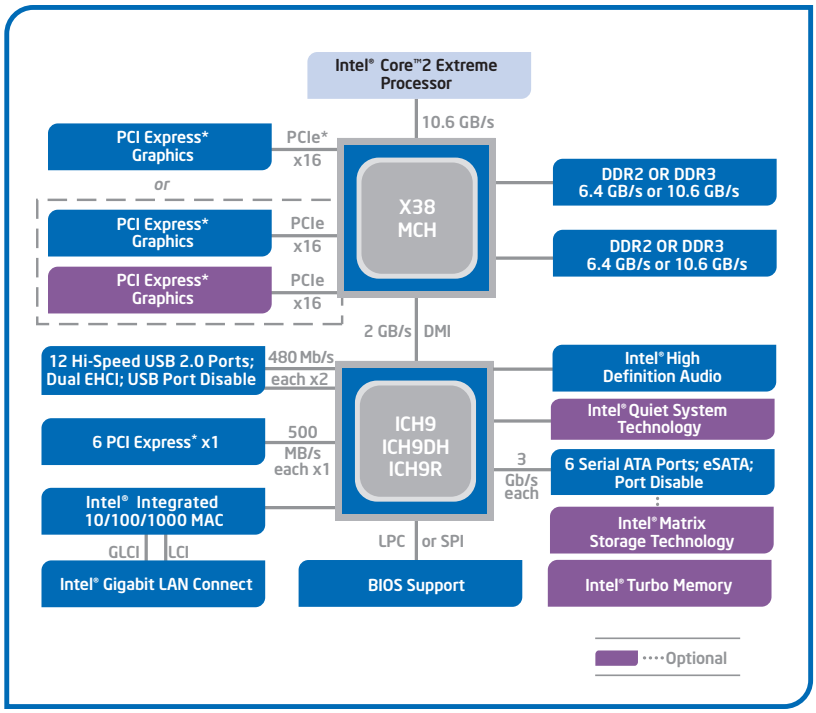
PCI Express* 2.0

The Intel X38 Express Chipset supports PCI Express 2.0 Dual X16 graphics, delivering up to 16 GB/s bandwidth per port, double the bandwidth of PCI Express 1.0. PCI Express 2.0 enables greater flexibility and reliability in design because it is backward compatible with PCI Express 1.0 and can dynamically manage power and performance through software controls. The greatly improved 32 GB/s of graphics bandwidth capability enables much higher levels of performance on graphics-intensive applications such as high-end gaming and video rendering.

Intel® I/O Controller Hub (Intel® ICH9/R/DH)

The Intel® ICH9 I/O controller hub of the Intel® X38 Express Chipset integrates several capabilities to provide flexibility for connecting I/O devices.

- **Intel® Matrix Storage Technology[4] (when configured with ICH9R I/O controller):** Native support of external SATA* ports (eSATA), combined with Intel Matrix Storage Technology (Intel® MST), provides the flexibility to add an external drive for increased data storage with up to 6 times faster performance than USB* 2.0 or Firewire* 400.[5] Support for eSATA enables the full SATA interface speed of up to 3 Gb/s outside the chassis. The Advanced Host Controller Interface (AHCI) provides easier expandability with support for eSATA devices and native hot plug, while boosting boot and multi-tasking performance with Native Command Queuing (NCQ). In addition, support for Command Based Port Multipliers, and RAID levels 0, 1, 5, and 10 enable greater reliability for personal data, or maximum storage performance for intensive applications.
- **Intel® Rapid Recover Technology:** With the ability to instantly boot off a clone, Intel Rapid Recover Technology (part of Intel Matrix Storage Technology) provides a fast, easy-to-use method for the end user to recover their data and return their system to an operational status.
- **Intel® Turbo Memory:** The Intel X38 Express Chipset also supports Intel Turbo Memory (when configured with ICH9R I/O controller), an innovative flash memory-based overall system performance and boot time accelerator. This feature is easily implemented using a PCI-Express x1 module and can be used with any SATA hard drive to improve system responsiveness. Intel Turbo memory enables faster application loading and concurrent performance enhancements when used in conjunction with Intel Matrix Storage Technology.[4]
- **Intel® Quiet System Technology (Intel® QST):** Integrated into all the different SKUs of the Intel ICH9, Intel QST can help reduce system noise and heat through more intelligent fan speed control algorithms.



Intel® X38 Express Chipset Block Diagram

Intel® X38 Express Chipset Features at a Glance

Feature	Benefit
1333/1066/800 MHz System Bus	▪ Supports the Intel® Core™2 Duo and Intel® Core™2 Quad processors with Intel® Virtualization Technology[6]; Dual-Core Intel® Pentium® processor, and Intel® Celeron® processor.
PCI Express* 2.0 Interface	▪ PCI Express 2.0 delivers up to 16 GB/s bandwidth per port, double that of PCIe* 1.0. It provides leading-edge graphics performance with dual X16 graphic card configuration.
Intel® Fast Memory Access	▪ Updated Memory Controller Hub (MCH) backbone architecture that improves system performance by optimizing the use of available memory bandwidth and reducing the latency of the memory accesses.
Dual-Channel DDR3 Memory Support	▪ Delivers up to 21.2 GB/s (DDR3 1333 dual 10.6 Gb/s) of bandwidth and 8 GB memory addressability for faster system responsiveness and support of 64-bit computing.
Dual-Channel DDR2 Memory Support	▪ Delivers up to 12.8 GB/s (DDR2 800 dual 6.4 Gb/s) of bandwidth and 8 GB memory addressability for faster system responsiveness and support of 64-bit computing.
Intel® Flex Memory Technology	▪ Facilitates easier upgrades by allowing different memory sizes to be populated and remain in dual-channel mode.
Intel® High Definition Audio[7]	▪ Integrated audio support enables premium digital sound and delivers advanced features such as multiple audio streams and jack re-tasking.
Intel® Matrix Storage Technology[4]	▪ With a second hard drive added, provides quicker access to digital photo, video and data files with RAID 0, 5, and 10, and greater data protection against a hard disk drive failure with RAID 1, 5, and 10. Support for external SATA* (eSATA) enables the full SATA interface speed outside the chassis, up to 3 Gb/s.
Intel® Rapid Recover Technology	▪ Intel's latest data protection technology provides a recovery point that is used to quickly recover a system should a hard drive fail or if there is massive data corruption. The clone can also be mounted as a read-only volume to allow a user to recover individual files.
Intel® Turbo Memory	▪ Intel's innovative NAND cache designed to improve the responsiveness of applications, application load times, and system boot performance.
Serial ATA* (SATA) 3 Gbp/s	▪ High-speed storage interface supports faster transfer rate for improved data access.
eSATA*/Port Multiplier	▪ SATA interface designed for use with external SATA devices. Provides a link for 3 Gb/s data speeds to eliminate bottlenecks found with current external storage solutions. Intel also supports natively port multipliers. Combining port multipliers, eSATA, and Intel® Matrix Storage Technology provides great flexibility and expandability for external storage solutions.
SATA* Port Disable	▪ Enables individual SATA ports to be enabled or disabled as needed. This feature provides added protection of data by preventing malicious removal or insertion of data through SATA ports. Especially targeted for eSATA ports available on the outside of the system.
USB* Port Disable	▪ Enables individual USB ports to be enabled or disabled as needed. This feature provides added protection of data by preventing malicious removal or insertion of data through USB ports.

For more information, visit the Intel Web site: www.intel.com/products/desktop/chipsets

[1] Warning: altering clock frequency and/or voltage may (i) reduce system stability and useful like of the system and processor; (ii) cause the processor and other system components to fail; (iii) cause reductions in system performance; (iv) cause additional damage; and (v) affect system data integrity. Intel has not tested, and does not warranty, the operation of the processor beyond its specifications.

[2] Home networking capability and many Intel® Viiv™ technology-based usage models will require additional hardware devices, software, or services. Functionality of Intel Viiv technology verified devices will vary; check product details for desired features. System and component performance and functionality will vary depending on your specific hardware and software configurations. See www.intel.com/go/viiv_info for more information.

[3] Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit Intel Performance Benchmark Limitations http://www.intel.com/performance/resources/benchmark_limitations.htm.

[4] Intel® Matrix Storage Technology requires the computer have an MST-enabled Intel chipset, RAID controller in the BIOS enabled and the Intel Matrix Storage Technology software driver installed. Please consult your system vendor for more information.

[5] Performance based on interface speed and data transfer rate specifications for eSATA, USB 2.0 and Firewire 400.

[6] Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM), and, for some uses, certain platform software enabled for it. Functionality, performance or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.

[7] Intel® High Definition Audio requires a system with an appropriate Intel chipset and a motherboard with an appropriate codec and the necessary drivers installed. System sound quality will vary depending on actual implementation, controller, codec, drivers and speakers. For more information about Intel® HD audio, refer to http://www.intel.com

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