



PowerPC 460GT

Embedded Processor

With speeds of up to 1.2GHz, support for serial RapidIO, PCI-Express, Gigabit Ethernet MACs, security, NAND Flash interfaces and low power dissipation, the PowerPC 460GT embedded processor is ideally suited to a wide range of high-performance applications, including networking and storage.



Benefits

- Delivers 667 MHz to 1.2GHz performance (CPU)
- 32-KB Instruction and Data Caches
- 256-KB L2 Cache with parity protection, may also be used as on-chip SRAM
- 64-KB On Chip Memory
- DDR2 memory support
- Two PCI-Express interfaces
- Serial RapidIO interface
- Four GE MACs, three with SGMII
- Security (optional)
- NAND Flash support
- Extensive connectivity by means of on-chip Ethernet, USB, UARTs, IIC, SPI and PCI
- Offers low power dissipation and small form factor for high-density and power-conscious applications

Applications

- Wireless infrastructure
- Enterprise network equipment
- Control plan applications

The PowerPC 440 Core

To enhance overall throughput, the PowerPC 440 superscalar core incorporates a 7-stage pipeline and executes up to two instructions per cycle. Its large 32-KB data cache and 32-KB instruction cache are 64-way set-associative. Versatile configurations enhance performance tuning while optional parity protection preserves data integrity. For additional system performance, the PowerPC 440 core includes dynamic branch prediction and 24 multiply accumulate instructions (MAC) that can be used for signal processing or other numerical tasks, as well as non-blocking caches that can be managed in either write-through or write-back mode.

High Performance Serial RapidIO (SRIO)

In addition to its powerful 440 core, the PowerPC 460GT includes support for high-performance Serial RapidIO. The SRIO High Speed Serial (HSS) port is shared with a second PCI-Express x4 port. Serial RapidIO manages errors at a high level and provides means to report and recover from transmission errors.

Turbo Security (Optional)

The PPC460GT delivers advanced security capabilities with the optional Turbo Security Engine. This security engine attaches directly to the PLB4 bus for the fastest possible throughput between the PPC460 processor, memory, and the security engine itself. The Turbo Security engine supports DES, 3DES, AES, ARC-4 encryption, MD-5, SHA-1 and SHA-256 hashing. The security engine includes a pseudo random number generator as well as header and trailer protocol processor. The header/trailer protocol processor eliminate any need for security processing by the PPC460 processor, freeing it to handle application-based operations, while improving overall security performance. The engine incorporates an on-chip true random number generator and a public key accelerator. The algorithms are compliant with FIPS-140-2 and ANSI X9.17 Annex C.

High-Bandwidth Bus Architecture

The PowerPC 460GT 128-bit processor local bus (PLB) provides a two-way crossbar, with a separate 128-bit read and 128-bit write data bus for each way. The four 128-bit data buses may operate concurrently, providing up to 12.8 GB/s of peak on-chip bandwidth at 200 MHz. The SDRAM controller attaches to both PLB slave segments to provide optimal access to memory from any other peripheral/core. Lower bandwidth I/O devices are supported by the on-chip peripheral bus (OPB).

Extensive Memory Support

An on-chip double data rate 2 (DDR2) SDRAM controller provides a 32/64-bit memory interface with optional error checking and correcting (ECC). It supports four memory banks of up to 4 GBs each, for a maximum capacity of 16 GBs. An integrated NAND Flash controller allows up to four banks of Flash memory devices to be connected to the processor's external peripheral bus. The Flash controller supports device densities up to 256 Mbytes. It can also interface to an optional SmartMedia card interface. These devices can be accessed much like diskette drives, with available boot capability.

On-Chip Memory

The PowerPC 460GT offers 64 KB of on-chip memory.

PCI Express and PCI Interfaces

The 460GT offers two independent PCI-Express interfaces compliant with PCI-Express base specification 1.1. One interface has four lanes and supports x4 or x1 configurations. The other interface has one lane. Both interfaces can be configured as root or end point ports. In addition, the 460GT offers a 32-bit PCI V2.2 interface and supports frequencies of up to 66 MHz. Multiple read prefetch and write post buffers enhance throughput, while the ability to boot the processor from PCI bus memory increases functionality.

Four Ethernets, Including Two with QoS and TCP/IP Acceleration Hardware

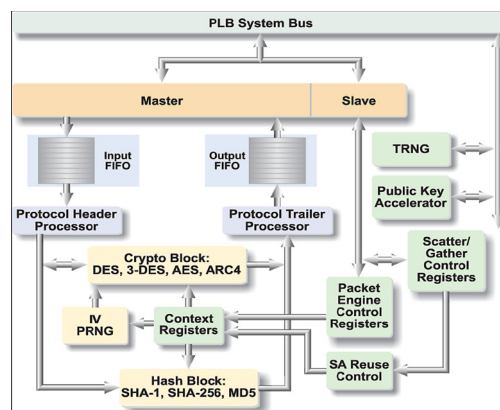
For extensive connectivity options, the 460GT offers two integrated 10/100/1000 Ethernet ports with TCP/IP Acceleration Hardware, QoS and Jumbo Frame support. Two additional 10/100/1000 Ethernet ports are also provided for a total of four. GMII/MII, RGMII, SGMII, RMII and SMII interfaces.

External Bus Interface

To accommodate connectivity with other devices, the PowerPC 460GT offers a 32-bit bus supporting up to six ROM, RAM or slave peripheral I/O devices and speeds up to 100 MHz. The 4-Channel DMA is also supported.

Standard Peripherals

The PowerPC 460GT offers support for up to 64 general-purpose I/O (GPIO) and two IIC controllers. A serial peripheral interface (SPI), also referred to as a serial communications port (SCP), allows full-duplex, synchronous data exchanges with other serial devices. The 460GT also supports up to four UARTs in a variety of configurations. A JTAG interface is provided for debugging purposes.



Turbo Security Engine Block Diagram



PowerPC 460GT

PowerPC Partners Ecosystem

AMCC's embedded PowerPC processors are supported by an extensive ecosystem of products and services from a wide range of leading suppliers. AMCC's PowerPC Partners program includes industry standard providers of:

- Embedded operating systems
- Hardware and software development tools
- Embedded software products and services
- Board-level products
- System design services
- Technical training.

For full details of the products and services available through the PowerPC Partners program, or to browse support available for a specific processor, visit: <http://www.amcc.com/Embedded/Partners>

AMCC also provides an evaluation kit for this PowerPC processor, including an optimized evaluation board as well as sample applications and other software.

Features

- CPU Speed (frequency): 667 MHz to 1.2GHz
- Performance: 2.0 DMIPS/MHz (2,400 DMIPS @ 1.2 GHz peak)
- 32-KB-I/32-KB-D L1 caches, and 256-KB L2/SRAM with parity protection
- 64KB On Chip Memory
- On-chip double data rate 2 (DDR2) SDRAM controller with 32/64-bit interface and optional ECC
 - Support for four banks of DDR SDRAM memory of up to 4 GB each, maximum capacity of 16 GBs with CAS latencies of 2, 3, 4, 5, 6, and 7
- Two PCI-Express interfaces, one with four lanes and one with one lane; 2.5-Gbit/s full duplex per lane; compliant with PCI-Express base specification 1.1; configurable as root or end point
- 32-bit PCI V2.2, 3.3-V interface supporting frequencies of up to 66 MHz
- Serial RapidIO (SRIO) support
- Turbo Security Engine: Optional on-chip IPSec/SSL security acceleration engine
- Kasumi Engine (optional)
- NAND Flash controller. Supports one to four banks of NAND Flash memory devices; direct interfacing to discrete NAND Flash devices (up to four devices) and Smart-Media Card socket (22-pins); 4-Mbyte - 256-Mbyte devices sizes supported; 512-byte +16-byte or 2-KB +64-byte device page sizes supported; DMA support allows direct, no processor-intervention block copy from NAND Flash out to SDRAM; boot-from-NAND supported
- 4-channel DMA - available for internal and external use
 - Support for memory-to-memory, peripheral-to-memory, and memory-to-peripheral transfers
 - Scatter/gather capability
- 1-channel high performance DMA for internal use
- (4) Ethernet 10/100/1000-Mbit/s, full duplex Macs with support for:
 - IPv4 and IPv6 Internet protocols
 - Quality of Service (QoS) throughput
 - Jumbo Frames
 - GMII/MII, RGMII, SGMII, RMII and MII interfaces
 - CRC32 error detection and checking
- TCP/IP and iSCSI Acceleration Hardware support
- Up to 100 MHz, 27-bit address bus, 32-bit data bus external bus control (EBC) interface
 - Support for up to 6 ROM, RAM, or slave peripheral I/O devices
- Up to four UARTs (1x 8-pin, or 2x 4-pin, or 4x 2-pin, or 1x4-pin and 2x 2-pin)
- Two IIC (with one integrated boot strap controller)
- One SPI serial interface
- Programmable interrupt controller with 16 external inputs, 48 internal inputs
- Programmable timers
- General-purpose I/O (64)
- Support for JTAG board testing, JTAG debuggers, and 4xx instruction trace interface
- RoHS compliant (lead-free) version available

For more information, please visit <http://www.amcc.com>.

Specifications

Technology

- 90nm CMOS

Performance (estimated)

- 1,334 Dhrystone 2.1 MIPS @ 667 MHz
- 2,400 Dhrystone 2.1 MIPS @ 1.2GHz

Frequency

- CPU: 667 MHz to 1.2GHz
- Memory: 32/64-bit width: (DDR2)
- PCI: 32-bit, 33 MHz to 66 MHz
- PCI Express
 - One 4-lane @ 2.5 Gbit/s per lane/direction
 - One 1-lane @ 2.5 Gbit/s per lane/direction
- Serial RapidIO port (x4 lane)
 - One port @ 1.5 or 3.0Gb/s

Typical Power Dissipation

- <6 W @ 1 GHz (estimated)
- Core/FPU <2.5 W @ 677 MHz

Case Temperature Range

- -40 ° to +85 ° C

Power Supply

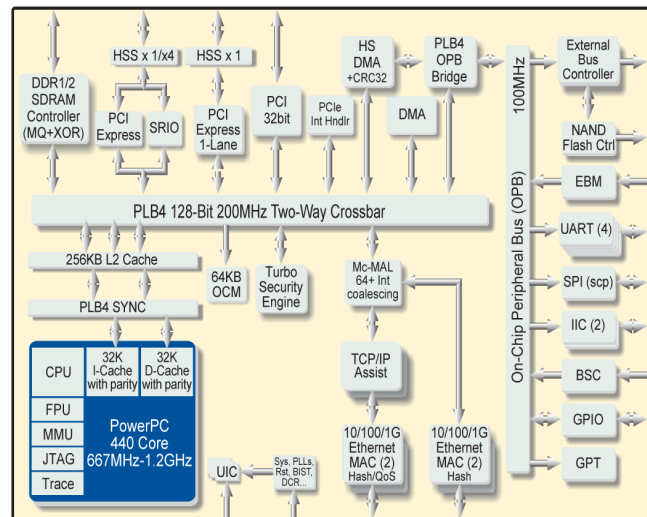
- 1.225 V (logic), 1.8 V (DDR2), 2.5 V (DDR1, Ethernet, USB), 3.3 V (PCI, other I/O)

Signal I/Os

- 435

Packaging

- 728-TE-EPBGA, 35 mm x 35 mm (1-mm ball pitch)



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POWERPC460GT_PB_v1.01_11_06_2007