



# PowerPC™ 440GR

Embedded Processor



**PowerPC™**

*With speeds of up to 667MHz, support for DDR memory, ethernet and NAND flash interfaces, low power dissipation and a small footprint, the PowerPC 440GR embedded processor is ideally suited to a wide range of high-performance applications, including networking and storage. The 440GR is an excellent choice for 405xx users requiring additional performance or looking to upgrade to DDR memory.*

## Benefits

- Delivers 333MHz to 667MHz performance for high-speed embedded designs
- Nand Flash Support
- Extensive connectivity via on-chip Ethernet, UARTs, IIC, SPI and PCI
- Offers low power dissipation and small form factor for high-density and power-conscious 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 32KB data cache and 32KB 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 digital signal processing (DSP) instructions, as well as non-blocking caches that can be managed in either write-through or write-back mode.

## High Speed Bus Architecture

Offering a peak bandwidth of 4.2GBps and separate read and write data buses — the PowerPC 440GR's Processor Local Bus (PLB) provides a high-bandwidth connection between the processor core and memory controller. Less demanding I/O devices are served by a 30-bit On-chip Peripheral Bus (OPB).

## Extensive Memory Support

An on-chip Double Data Rate (DDR) SDRAM controller provides a 32-bit memory interface with optional Error Checking and Correcting (ECC) and a 1.1 GBps peak data rate. It supports 4 memory banks of up to 256MB each, for a maximum capacity of 1GB. 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 512MB, an optional SmartMedia card interface.

These devices can be accessed much like diskette drives, with available boot capability.

## PCI Interface

The PowerPC 440GR offers a 32-bit PCI V2.2 interface and supports frequencies of up to 66MHz. Multiple read prefetch and write post buffers enhance throughput, while the ability to boot the processor from PCI bus memory increases functionality.

## Dual Ethernet Ports

For extensive connectivity options, the 440GR offers two integrated 10/100 Ethernet ports.

## Standard Peripherals

The PowerPC 440GR offers two serial ports, 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 440GR also supports up to four UARTs in a variety of configurations. A JTAG interface is provided for debugging purposes.

## Development tools support

PowerPC embedded processors are supported by AMCC and more than one hundred third-party vendors through the PowerPC Embedded Tools program. This program provides compilers, debuggers, real-time operating systems, emulators, logic analyzers, and a full range of tools to help manufacturers develop products more quickly. A PowerPC 440GR reference board kit is available to help expedite product evaluation and project development.

**Preliminary and Subject to Change.**

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### Features

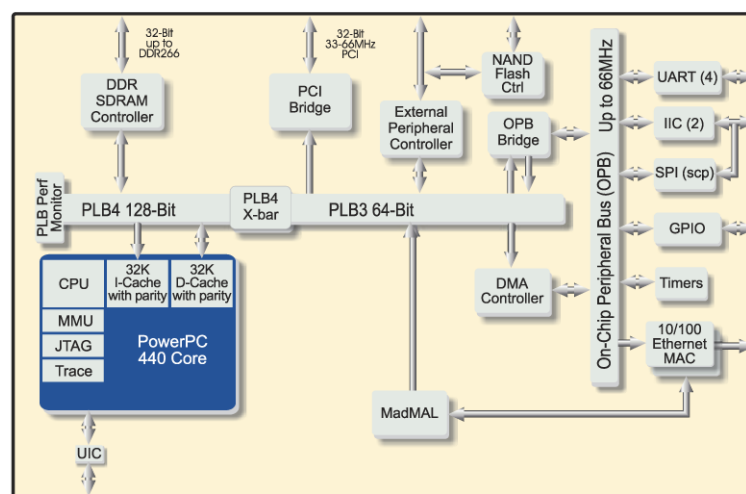
- 333 to 667MHz
- Nand Flash controller:
  - Supports 1 to 4 banks of Nand Flash memory devices;
  - Direct interfacing to discrete Nand Flash devices (up to 4 devices) and SmartMedia Card socket (22-pins);
  - 4MB-256MB devices sizes supported;
  - 512-byte +16-byte or 2KB +64-byte device page sizes supported;
  - DMA support allows direct, no processor-intervention block copy from Nand Flash out to SDRAM;
  - Boot-from-Nand supported
- On-chip Double Data Rate (DDR) SDRAM controller with 32-bit interface, 13-bit addressing, 1.1 GBps peak data rate and optional ECC
- Support for 4 banks DDR SDRAM memory of up to 256MB each, maximum capacity of 1GB
- Support for 64, 128, 256, and 512MB DDR devices, with CAS latencies of 2,2.5, or 3
- 32-bit PCI V2.2,3.3 V interface supporting frequencies of up to 66MHz
- (2)Ethernet 10/100 Mbps, full duplex MAC (1xMII or 2xRMII)with packet reject interface support; Memory Access Layer (MAL) provides DMA capability to both Ethernet channels
- Up to four serial port UARTs (1 x 8-pin, or 2 x 4-pin, or 4 x 2-pin, or 1x4-pin and 2 x 2-pin)
- Two IIC (with one integrated Boot Strap Controller)
- One SPI serial interface 4-channel DMA – available for internal and external use
- Programmable interrupt controller with 10 external inputs, 64 internal inputs
- Programmable timers
- General-purpose I/O (64)
- Support for JTAG board testing and RISCWatch™ debugger
- RoHS Compliant version available (lead-free)

For more information, visit our Web site at:

<http://www.amcc.com>

### Specifications

|                                  |   |
|----------------------------------|---|
| <b>Technology</b>                | <ul style="list-style-type: none"> <li>• 0.13 μm CMOS</li> </ul>  |
| <b>Performance (est.)</b>        | <ul style="list-style-type: none"> <li>• 666 Dhrystone 2.1 MIPS @333MHz</li> <li>• 1,334 Dhrystone 2.1 MIPS @667MHz</li> </ul>  |
| <b>Frequency</b>                 | <ul style="list-style-type: none"> <li>• CPU:333 to 667MHz</li> <li>• Memory<br/>32-bit width:800MBps (DDR200)to 1.1GBps (DDR266)</li> <li>• PCI: 33 to 66MHz</li> <li>• PCI-X: 50 to 133MHz</li> </ul> |
| <b>Typical Power Dissipation</b> | <ul style="list-style-type: none"> <li>• 3W @533MHz (preliminary estimate, application dependent)</li> </ul>  |
| <b>Case Temperature Range</b>    | <ul style="list-style-type: none"> <li>• -40° to 85°C</li> </ul>  |
| <b>Power Supply</b>              | <ul style="list-style-type: none"> <li>• 1.5V (logic),2.5V (SDRAM/Ethernet),3.3V (other I/O)</li> </ul>   |
| <b>Signal I/Os</b>               | <ul style="list-style-type: none"> <li>• 304</li> </ul>   |
| <b>Packaging</b>                 | <ul style="list-style-type: none"> <li>• 456-e-PBGA,35mm x 35mm (with 1.27mm pad pitch)</li> </ul>  |



# AMCC

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