PowerPC™

IBM

PowerNP NPe405 Embedded Processors

PowerPC based network processor family

Highlights

Combines leadership embedded performance with networking peripherals for a wide variety of networking applications

Low power consumption makes it ideal for power-conscious, thermal-sensitive applications

Functional configurability and code compatibility to all 405 family chips helps ensure ease of use and quicker time to market

Overview

IBM's PowerNP™ NPe405 family of embedded processors offer industry-leadership performance/price solutions for networking applications. The popular 405 CPU core is now available up to 266MHz to power the level of functionality needed to meet your specifications.

When your next-generation system is ready for a performance or functional boost, just plug and play. This is the inherent benefit of a scalable PowerPC™ architecture which is optimized for software reuse.

PowerPC 405 Embedded Core

- 200 or 266MHz CPU
- Memory Management Unit
- 16KB instruction and 8KB data caches
- Multiply-Accumulate (MAC) function, including fast multiply unit
- Timers
- JTAG and Trace debug logic

On-Chip Ethernet Support

- 10/100 ethernet MAC ports
  - NPe405H supports 4
  - NPe405L supports 2
- Each 10/100 MAC contains 2K Tx and 4K Rx FIFOs
- Medium Independent Interface (MII) to external physical layer PHY for single-drop applications
- Reduced MII (RMII) and Serial MII (SMII) to external PHY for multi-drop applications
- Dedicated DMA channel

32-Channel HDLC Controller

- Up to 32 separate Rx, Tx full-duplex channels
- Implements HDLC protocol and time division multiplexing
- Operates over 2 PCM Highway interfaces; up to 8Mbps for one, or 4Mbps each

- Can support a fully channelized E1 or T1 link

8 Port HDLC Controller (NPe405H only)

- Supports 8 single-channel point to point ports
- Each port operates at up to 2Mbps

PCI Controller (NPe405H only)

- 32-bit, PCI version 2.2 compatible
- Asynchronous operation from 1/8 PLB frequency up to 66MHz max
- Read prefetch and posted write buffers on both sides of the PCI controller
- Internal PCI arbiter, supports five external PCI masters
- Supports external arbitration
- Optional system boot from PCI
- Supports host-bridge or adapter mode
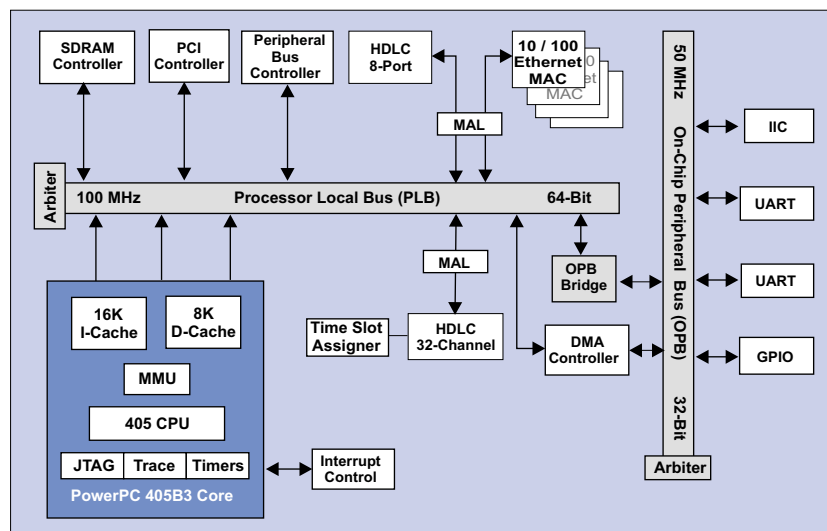
PowerNP NPe405H block diagram

PowerNP NPe405 Family Specifications

Technology	0.25μm (0.18μm L_{eff}) CMOS SA-12E	
Performance (est.)	282 Dhrystone 2.1 MIPS @ 200MHz	
	375 Dhrystone 2.1 MIPS @ 266MHz	
Frequency (CPU / SDRAM)	200/100	266/133
Typical Power Dissipation[1] (est.)	1.5W (NPe405H)	1.1W (NPe405L)
Signal I/Os	360 (NPe405H)	206 (NPe405L)
Temperature Range [1]	-40° C to 85° C	
Power Supply	2.5V (core), 3.3V (I/O) supports 5V I/Os	
Packaging	580-Ball Enhanced PBGA; 35mm x 35mm, 1mm pad pitch, 4-rows (NPe405H) 324-Ball Enhanced PBGA; 23mm x 23mm, 1mm pad pitch, 4-rows (NPe405L)	

1 See datasheet specifications for more detailed information.

SDRAM Controller
- Up to 4 chip selects, 4MB to 256MB per bank
- PC100 compliant (PC133 for 266MHz)
- Support dual- and quad-bank SDRAMs with 11x8 to 13x11 addressing
- Programmable address mapping and timing
- Separate 32-byte read and 128-byte write buffers
- Power management (self-refresh)
- 32-bit external data bus width
- ECC option

Peripheral Bus Controller
- Supports ROM, EPROM, SRAM, Flash, and peripherals
- Synchronous or asynchronous
- Programmable address mapping
- NPe405H supports:
  - 32-bit addr / 8-, 16-, and 32-bit data
  - Interface supports master and slave devices
  - 8 chip selects
- NPe405L supports:
  - 28-bit address / 8-, 16-bit data
  - Interface supports slave devices
  - 4 chip selects

DMA Controller
- 4 independent channels (internal or external)
- Supports: buffered memory to peripheral, peripheral to memory and memory to memory transfers
- 8-, 16-, 32-bit peripheral support
- Scatter/gather capability with command/data chaining
- 32 byte data buffer
- Peripherals supported include PCI memory, internal UARTs, and DMA peripherals on the external peripheral bus

Other On-Chip Peripherals
- 2 serial ports (16550), 9-pin and 4-pin
- Master and slave IIC controller, compliant with Phillips I²C spec
- Up to 32 general purpose I/Os
- Interrupt controller including up to 12 external interrupts

Development Support
IBM PowerPC embedded processors are supported by IBM and over 90 select third-party vendors in the PowerPC Embedded Tools™ program. This program offers early development support through a full range of embedded development tools, including compilers, debuggers, real-time operating systems, emulators, logic analyzers, and evaluation boards.