BA22-AP

32-bit Basic Application Processor

Implements a 32-bit processor for demanding embedded applications that use off-chip instruction and data memories and that may need to run a real-time operating system (RTOS) or a full operating system such as Linux or Android. Part of the royalty-free BA22 family, this processor core is extremely competitive in terms of high performance and low power consumption, and has best-in-class code density.

The core has Instruction and Data Memory Management Units (MMUs) and Caches, optional dedicated buses for tightly coupled on-chip Instruction and Data memories, and an AMBA® AHB™ or Wishbone system bus interface. Optional floating point, divider and multiply–accumulate units benefit DSP applications. The core includes up to 32 general purpose registers (GPRs), a tick-timer (TTimer), a programmable interrupt controller (PIC), an advanced power management unit (PMU), and an optional debug unit (DBGU). Additional microcontroller peripherals may be ordered for pre-integration and delivery with the core, individually or in a complete platform. IP Integration Services are also available to help integrate any BA22 processor configuration with memory controllers, image compression, or other CAST IP cores.

The processor's BA2 instruction set is relatively simple and extremely compact. Programing is facilitated with the included C/C++ tool chain; Eclipse IDE; architectural simulator; and ported C libraries, RTOSs, and OSs.
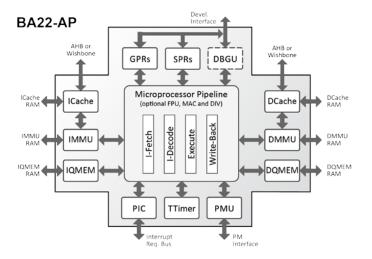
The BA22-AP synthesizes to 35k gates in a 90nm technology, can be clocked with more than 400MHz in a 65nm technology, and provides as many as 2.53 DMIPS/MHz. The core is delivered, with a complete software development environment under Eclipse IDE, and its users get access to already ported real operating systems (Linux, Android, eCOS and uClinux) and libraries.

The BA22 family of processors has been designed for easy reuse and integration, has been rigorously verified, and is production proven. Contact CAST Sales for details.

Applications

- Internet, networking and telecom
- Home entertainment consumer electronics
- Portable and wireless
- Automotive

Block Diagram

Processor Description

The BA22 family uses a 32-bit processor architecture designed for high performance with great silicon and power efficiency.

The highly configurable design may include caches and memory management units, enhanced arithmetic processing capabilities such as a divider and floating point unit, a sophisticated power management unit, and an interactive, JTAG-based debug capability.

The BA22-AP is one pre-configured version of the BA22, targeted for running embedded system applications and competitive with the 32-bit processor cores from other leading vendors.

BA22 processors are also designed for quick, efficient software development. The BA2 instruction set they use provides the highest code density in its class, without compromises on performance, ease of use, or scalability. It features:

- A linear, 32-bit or 64-bit logical address space
- An instruction length of 16, 24, 36, 48, or 64 bits, which reduces memory requirements by as much as 40%.
- Simple memory addressing modes
- Configurable general purpose registers (12 to 32 GPRs)
- Efficient memory transfer instructions

The BA22 has already proven itself in multiple production designs.

Implementation Results

BA22-AP reference designs have been evaluated in a variety of technologies. The following are ASIC pre-layout results reported from synthesis with a silicon vendor design kit under typical conditions, with all core I/Os assumed to be routed on-chip. Implementation numbers are for the core implemented with .4-way associative caches, 4-way associative MMUs and without an FPU.

Technology	Freq (MHz)	Area (um^2)	Logic Eq. Gates
TSMC 90nm (wl30, typ)	50	172,701	34,965
	150	179,021	36,245
	200	187,194	37,900

The provided figures do not represent the higher speed or smaller area for the core. Area, power and speed depend on configuration, optimizations, process, and libraries. Furthermore power consumption depends on power management, software and memories configuration. For accurate characterization on your application please contact CAST.

Support and Services

The core as delivered is warranted against defects for 90 days from purchase. Thirty days of phone and email technical support are included, starting with the first interaction. Additional maintenance and support options are available.

IP Integration Services are also available to help minimize time to market for BA22-based systems.

Deliverables

The core is available for ASICs in synthesizable HDL, and includes everything required for successful implementation:

- Verilog RTL source code
- Verilog Testbench
- Silicon-proven Reference SoC/ASIC Design
- Software development tools for Cygwin on Windows and Linux, with Eclipse IDE interface
- Operating systems and board support package

A reference design board running Linux and FPGA versions of the core are also available; contact CAST Sales for information.

Related Products

The BA2x™ Processor Family includes a set of royalty-free, pre-configured products intended for different applications:

- **BA25** 32-bit Application Processor, for demanding systems running applications on general-purpose operating systems such as Linux and Android.
- **BA22-CE** 32-bit Cache-Enabled Embedded Processor, for deeply embedded systems using off-chip instruction and data memories and possibly running an RTOS; 5-stage pipeline, caches but no MMU.
- **BA22-DE** 32-bit Deeply Embedded Processor, for deeply embedded applications that use on-chip instruction and data memories.
- **BA21** 32-bit Low-Power Deeply Embedded Processor, implements a 32-bit low-power processor that delivers better performance than most processors of its size.

Platforms

- **BA2x-AXI-PP** Pre-integrated peripherals platform for the AMBA3 AXI bus.
- **BA2x-AHB-PP** Pre-integrated peripherals platform for the AMBA2 AHB/APB buses.

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SEMICONDUCTOR
The BA22 core is sourced from
Technology Partner Beyond Semiconductor