

Rabbit[®] 4000

MODEL | 4000 |

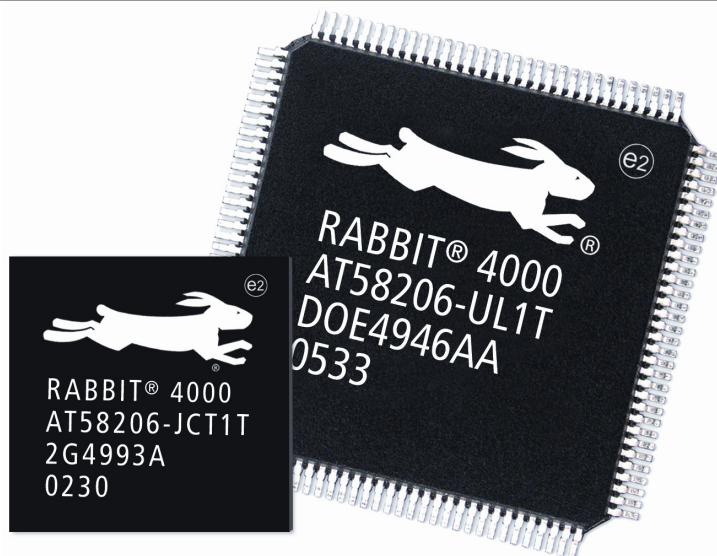
Microprocessor

Key Features

- Up to 60 MHz
- Integrated 10Base-T Ethernet
- Eight independent DMA channels
- Supports 8 or 16 – bit Flash and SRAM memories
- Seven Hardware Breakpoints
- 10x Speed Improvement in AES encryption
- New instructions to support 32-bit values and math operations
- On-Board slave port allows the Rabbit to be configured as an intelligent peripheral device
- Control of clock speed by software allows dynamic trading of power vs. speed
- 40+digital I/O lines
- Battery-backable time/date clock
- Two Watchdog timers
- RoHS Compliant

Design Advantages

- High performance 8-bit architecture with integrated peripherals permits efficient and cost effective hardware design.
- 10Base-T Ethernet is built right into the Rabbit 4000, leading to smaller footprint for smaller applications.
- Enhanced Instruction Set brings new power and speed to 8-bit systems with numerous one-byte opcodes and 16 and 32-bit logical, arithmetic, and data transfer instructions.
- Exceptional performance based on highly optimized math libraries
- Dynamic C development software for real-time development and debugging of Rabbit-based systems using C or Assembly language.



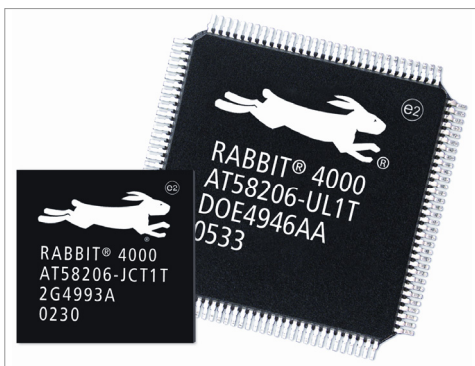
Rabbit 4000 – High Performance Microprocessor

The new Rabbit 4000 is a high-performance, low-EMI microprocessor designed specifically for embedded control, communications, and Ethernet connectivity. The Rabbit 4000 outperforms most 16-bit processors without losing the efficiency of an 8-bit architecture. Extensive integrated features, glueless architecture and 10Base-T Ethernet facilitate rapid hardware design, while a new C-friendly instruction set promotes efficient development of even the most complex applications.

The Rabbit 4000 is fast, running at up to 60 MHz, with compact code and direct software support for 16-bit memory devices. Rabbit 4000 operates at 1.8 V Core 3.3 V I/O or 1.8 V for both Core and I/O. The Rabbit 4000 boasts 6 serial ports with IrDA, 40+ digital I/O, quadrature decoder, PWM outputs, and pulse capture and measurement capabilities. It also features a battery-backable real-time clock, glueless memory and I/O interfacing, and ultra-low power modes. 3 levels of interrupt priority allow fast response to real-time events. Its compact instruction set and high clock speeds give the Rabbit 4000 exceptionally fast math, logic, and I/O performance.

The Rabbit 4000 has several powerful

design features that practically eliminate EMI problems (typically <10 dB μ V/m @ 3 m), which is essential for OEMs that need to pass CE and regulatory RF emissions tests. The amplitude of EM radiation is reduced by up to 25 dB μ V by the internal spectrum spreader, gated clocks to prevent unnecessary clocking of unused registers, and separate power pins for the processor core and I/O. An auxiliary I/O bus can be used by designers to enable separate buses for I/O and memory or to limit memory bus loading to reduce EMI and ground bounce problems when interfacing external peripherals to the processor. The auxiliary I/O bus accomplishes this by mirroring the Rabbit's data bus on Port A and uses Port B to provide the processor's 8 least



Rabbit 4000 Shown

significant address lines for interfacing with external peripherals. The high-performance instruction set offers both greater efficiency and execution speed of compiler-generated C code. Instructions include numerous single-byte opcodes that execute in two clock cycles, 16 and 32-bit loads and stores, 16 and 32-bit logical and arithmetic operations, 16 x 16 multiply (executes in 12 clocks), long jumps and returns for accessing a full 16 megabytes of memory, and one byte prefixes to turn memory access instructions into internal and external I/O instructions.

The Rabbit 4000 requires no external memory driver or interface-logic. Its 24-bit address bus, 8 or 16-bit data bus, 3 chip select lines, 2 output-enable lines, and 2 write-enable lines can be directly interfaced with up to 6 Flash/SRAM devices. A built-in slave port allows the Rabbit 4000 to be used as master or slave in multi-processor systems, permitting separate tasks to be assigned to dedicated processors. An 8-line data port and 5 control signals simplify the exchange of data between devices. A remote cold boot enables startup and programming via a serial or the slave port.

The Rabbit 4000 features five 8-bit parallel ports, yielding a total of 40 digital I/O. Six CMOS-compatible serial ports are available. All 6 are configurable as

asynchronous (also as IrDA), while 4 are configurable as clocked serial (SPI) and 2 as SDLC/HDLC. The Rabbit 4000 also offers alternate I/O functions. Two input capture channels each have a 16-bit counter, clocked by the output of an internal timer. These channels can be used for a variety of functions, such as pulse width measurement or serial baud-rate detection. Two quadrature decoder channels each have 2 inputs, as well as a 10-bit up-down counter. Each channel provides a direct interface to an optical encoder unit. Four independent PWM outputs, each based on a 10-bit pulse frame, are driven by the output of a programmable internal timer. The PWM outputs can be filtered to create a D/A converter or used to drive devices such as motors or solenoids.

Programming the Rabbit 4000

The Rabbit 4000 is programmed using the industry-proven Dynamic C® software development system — an integrated C compiler, editor, loader, and debugger created specifically for Rabbit-based systems. Developing software with Dynamic C is easy. Users can write, compile, and test both C and Assembly code without leaving the Dynamic C development environment, and no costly in-circuit emulators are required. Full TCP/IP stack with source code is provided royalty free in Dynamic C and with our Development Kits. TCP/IP support includes PPP and SNMP, socket-level TCP and UDP, FTP, TFTP, HTTP (w/ SSI and CGI),

Rabbit 4000 Specifications and Features

Packaging	128-pin LQFP	128-ball TFBGA
Package Size	16 x 16 x 1.5 mm	10 x 10 x 1.2 mm
Operating Voltage	1.8 V Core (3.3 V I/O) or 1.8 V Core and I/O	
Ethernet	Integrated 10Base-T Ethernet controller	
DMA	8 independent channels with two external DMA request inputs	
Operating Temp.	-55°C to +85°C	
Maximum Clock Speed	60 MHz	
Digital I/O	40+ (arranged in five 8-bit ports)	
Serial Ports	6 CMOS-compatible	
Baud Rate	Clock speed/8 max asynchronous	
Address Bus	24-bit	
Data Bus	8/16-bit	
Timers	Ten 8-bit, one 10-bit with two match registers, one 16-bit timer	
Real-Time Clock	Yes, battery backable	
RTC Oscillator Circuitry	External	
Watchdog Timer/Supervisor	Yes	
Clock Modes	1x, 2x, /2, /3, /4, /6, /8	
Power Down Modes	Sleepy (32 kHz) Ultra-Sleepy (16, 8, 2 kHz)	
Auxiliary I/O Bus	8 data, 8 address lines	