# V850/SA1™ 32-BIT RISC MICROCONTROLLER

The low-power, high-performance, and cost-effective V850/SA1 microcontroller features the advanced 32-bit RISC engine of NEC's V850™ family. Fabricated using NEC's 0.35-micron process technology, the device offers 256K on-chip flash memory and delivers 19 Dhrystone MIPS performance at 3 volts. An integrated subclock allows 90 µW power consumption at 32 kHz. The V850/SA1 micro-controller's fully static architecture is highly optimized for power-conscious applications that require embedded real-time control. Versions of the V850 core are available for ASIC development.

SPECIFICATIONS

— Clock frequency
  – DC to 17 MHz
  – 32-kHz subclock
— Performance consumption
  – 45 mW at 13.5 MHz
  – 90 µW at 32 kHz (subclock)
— Single-cycle MAC instruction
— Performance
  – 19 Dhrystone MIPS
  – 600 MIPS/W

— Two-cycle multiply-and-accumulate (MAC) operation
— 2.7–3.6-volt operation
— 0.35-µm CMOS process technology
— Package
  – 100-pin plastic QFP (14 mm x 14 mm)
  – 121-pin FPBGA (12 mm x 12 mm)

BLOCK DIAGRAM

96YL-1132C (11/98)
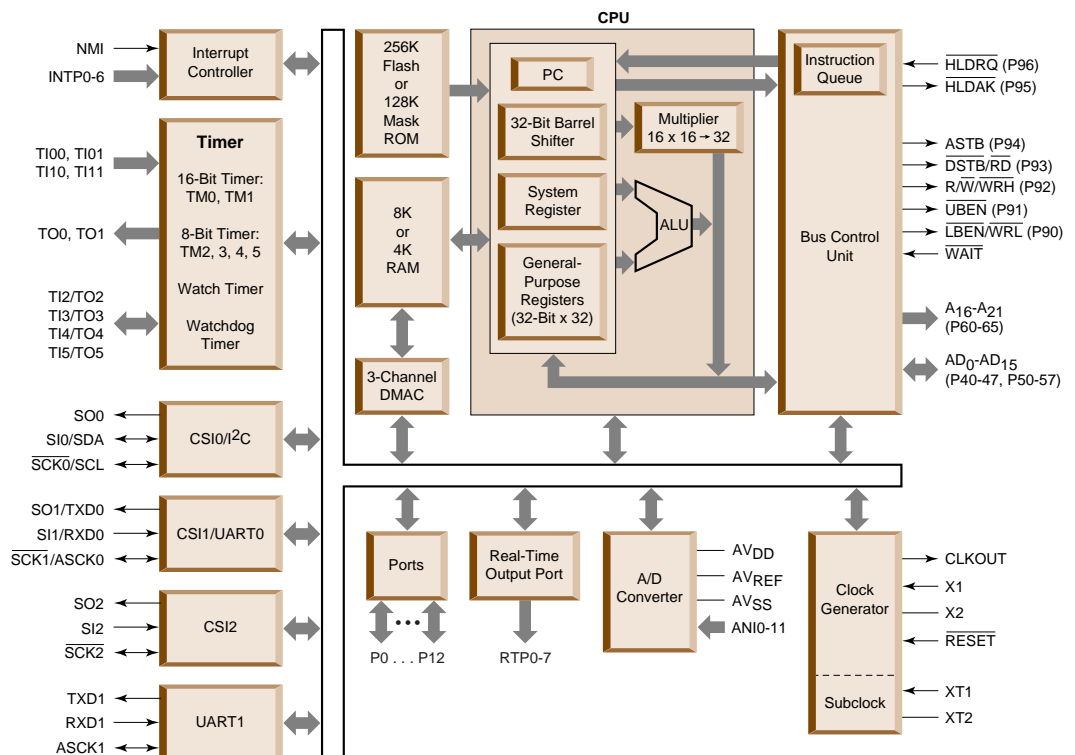
CPU
— Highly integrated microcontroller
  – 32-bit arithmetic logic unit (ALU)
  – 32 general-purpose 32-bit registers
  – 32-bit barrel shifter
— Single-cycle 16 x 16-bit → 32-bit hardware multiplier
— Powerful RISC instruction set
  – 74 16- and 32-bit RISC instructions
  – Two-cycle MAC function for DSP applications
  – Saturated arithmetic instructions (over/under-flow detection function)
  – Single-cycle 32-bit shift instructions
  – Bit manipulation instructions
  – Load and store instructions with 8-/16-/32-bit data

MEMORY
— 256KB single-cycle internal flash memory or 128KB mask ROM
— 4KB RAM for mask ROM internal version
— 8KB RAM for flash memory internal version
— 4MB linear address space external expansion
— Idle state insertion for slow memory

EXTERNAL BUS INTERFACE
— Multiplexed 22-bit address/16-bit data bus
— Multiprocessor capability
— Programmable and external wait functions

INTERRUPTS
— 32 software traps
— 29 maskable interrupts plus one NMI
— Eight programmable priority levels on maskable interrupts

PERIPHERALS
— 13 input ports and 72 I/O ports
— Real-time pulse unit
  – Two 16-bit timer registers
  – Two 16-bit capture/compare registers
  – Four 8-bit timer registers with four 8-bit compare registers
  – Three watchdog timer control registers
  – One watchdog timer
— Real-time output port with one 8-bit channel or two 4-bit channels
— Serial interface
  – One-channel clocked serial interface /universal asynchronous receiver transmitter (CSI/UART)
  – One-channel CSI/I^{2}C™
  – One-channel CSI
  – One-channel UART
— Analog-to-digital (A/D) interface
  – 12-channel A/D converter with 10-bit resolution
  – 5.6-µs conversion time
— Three-channel DMA
  – Internal RAM to peripherals
  – Peripherals to internal RAM
— Clock generator
  – Direct clock (no PLL)
  – 32-kHz subclock

OTHER
— Power saving features
  – Halt/idle/stop modes
  – Clock output stop function
  – Fully static operation

Part Number	Internal ROM	Package
µPD70F3015GC-17-8EU	128K masked ROM	100-pin plastic LQFP (fine pitch) 14mm x 14mm
µPD70F3015YGC-17-8EU	128K masked ROM	100-pin plastic LQFP (fine pitch) 14mm x 14mm
µPD70F3017GC-17-8EU	256K flash memory	100-pin plastic LQFP (fine pitch) 14mm x 14mm
µPD70F3017YGC-17-8EU	256K flash memory	100-pin plastic LQFP (fine pitch) 14mm x 14mm
µPD70F3017S2-17-YJC	256K flash memory	121-pin FPBGA 12mm x 12mm
µPD70F3017YS2-17-YJC	256K flash memory	121-pin FPBGA 12mm x 12mm

NEC

For literature, call **1-800-366-9782** 7 a.m. to 6 p.m. Pacific time
or fax your request to **1-800-729-9288**
or visit our Web site at **www.nec.com**