V850 family

Product Letter

V853

32-bit RISC Microcontrollers

Description

The single-chip V853 microcontroller is a member of NEC's 32-bit RISC V850 family. It integrates CPU, ROM, RAM and peripheral functions on chip. The internal bus is 32 bits wide, the external bus 16 bits wide. Controller memory options are listed in Table 1.
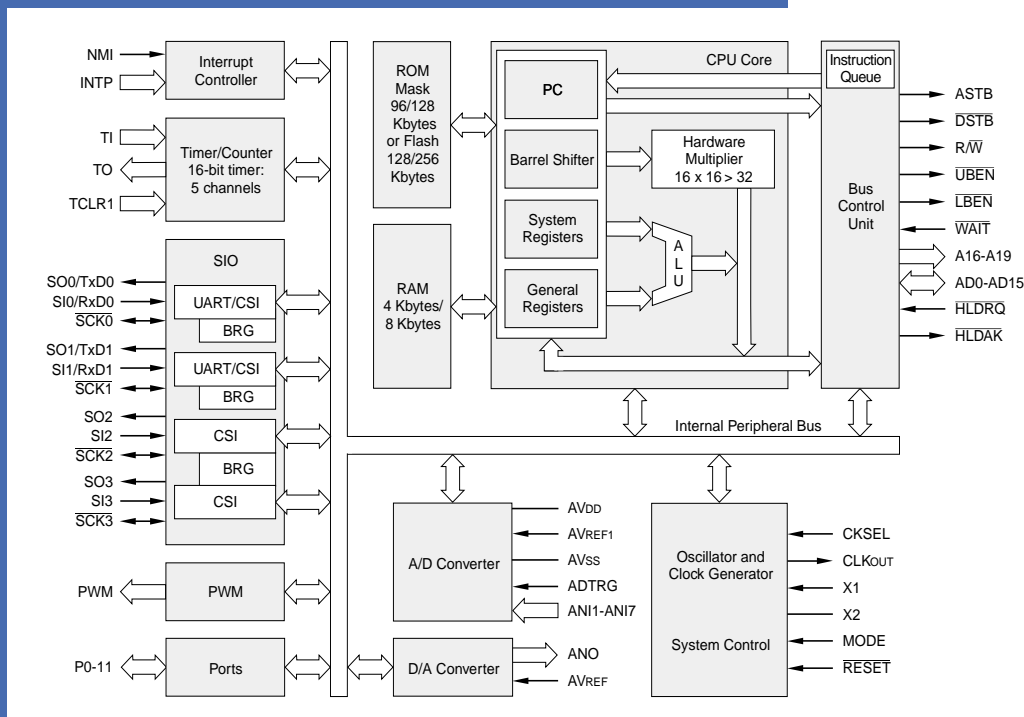
Applications

Like other V850 series controllers, the V853 device is used for real-time control applications, such as servo motor control in computer peripherals and machine tools, for engine management control, consumer electronics and multimedia. Flash memory, a variety of serial communication channels and AD/DA converters make it the perfect choice for compact communication terminals and complete control systems. Typical benefits of Flash memory are individually programmed devices in the final production process and field upgradability. With their low power consumption and power-saving modes, V853 devices are also ideal for portable applications.

Features

- Small 32-bit RISC CPU core
- 30 ns minimum instruction execution time (33 MHz max. clock)
- 16-Mbyte linear address space
- 1-Mbyte external address space
- 32 general-purpose registers
- 74 instructions optimized for embedded control
- DSP functionality with 16-bit multiplication and saturation logic in a single clock cycle

- Up to 8 Kbytes internal RAM
- Interrupt controller
- Real-time pulse unit/timers
- Serial interface with baud rate generator
- A/D and D/A converters
- PWM
- Clock generator
- Power save functions
- Mask ROM, Flash versions
- 100-pin LQFP package

Block Diagram

NEC

Functional Block Description

CPU

The internal CPU, based on Harvard architechture, is a very compact 32-bit RISC engine. Most instructions are executed in a single clock cycle under control of a 5-stage pipeline. It also includes a 16 x 16-bit hardware multiplier with 32-bit result and saturation logic. A 32-bit barrel shifter and bit manipulation instructions accelerate complex bit operations.

Bus Control Unit (BCU)

The BCU initiates the bus cycles based on the physical addresses generated by the CPU. When an instruction stored in external memory is executed and no bus cycle initiation is requested by the CPU, the BCU creates a prefetch address to prefetch an instruction code which is then inserted in the internal instruction queue.

RAM

The internal RAM, with a capacity of 4 or 8 Kbytes, is mapped from address FFFFE000H. The CPU can access any data in one clock cycle.

ROM

The internal ROM (96 or 128 Kbytes) or Flash ROM (128 or 256 Kbytes) is mapped from 00000000H. The CPU can access any instruction from the ROM/Flash ROM in one clock cycle.

PROM Programming

The Flash memory can be written and erased electrically.

Ports

The V853 has 67 input/output port pins that can be used alternatively as control pins.

Interrupt Controller

The interrupt controller handles the interrupt request issued by internal peripheral hardware and external sources. Up to 8 interrupt priority levels can be specified for each interrupt request.

Clock Generator

The clock generator produces the CPU operating clock. The internal frequency can be selected as 5x or 1x of crystal frequency by using the internal PLL or 1/2x crystal frequency without PLL. An external clock can be used instead of the clock generator. A clock-out signal is available.

Real-time Pulse Unit (RPU)/Timers

The RPU includes a 5-channel 16-bit timer/counter unit.

Serial Interface

The serial interface includes two channels of CSI (Clocked Serial Interface) and two channels which can be operated in the UART (Asynchronous Serial Interface) or the CSI mode. The UART transfers data via the TxD and RxD pins. The baud rate is determined by the on-chip dedicated baud rate generator. The CSI transfers data via the SO, SI and SCK pins at a baud rate determined by the on-chip dedicated baud rate generator or an external clock.

A/D Converter

An 8-channel A/D converter with 10-bit resolution and a 2-channel 8-bit D/A converter are integrated.

PWM

A 2-channel PWM unit with different operating modes is available on chip.

Ordering Information

Devices

Part Number	Max. freq. (MHz)	ROM (Kbytes)	Flash (Kbytes)	RAM (Kbytes)
µPD703004AGC-25	25	96	-	4
µPD703004AGC-33	33	96	-	4
µPD703003AGC-25	25	128	-	4
µPD703003AGC-33	33	128	-	4
µPD70F3004AGC-25	25	-	128	4
µPD70F3004AGC-33	33	-	128	4
µPD70F30025AGC-25	25	-	256	8
µPD70F30025AGC-33	33	-	256	8
µPD7030025AGC-25	25	256	-	8
µPD7030025AGC-33	33	256	-	8

Documentation

Doc Number	Devices	Type
U13919EE2V0CD00	NEC Micro-Components	CD-ROM
U10243EJ6V0UM00	V850	Architecture Manual
U10913EJ5V0UM00	V853	User's Manual
U13188EJ2V1DS00	V853 Mask	Data Sheet
U13189EJ2V0DS00	V853 Flash	Data Sheet

Tools

Order Number	Devices	Description	Type
V850-IAR-Toolset	V850	ICE + C Compiler	Hardware & Software
IE-703003-MC-EM1	V853	Emulation Board	Hardware
CPDW95/NT-CDR-V800	V850	C/C++ Compiler (GHS)	Optional Software
FA100-GC	100-pin LQFP	Programming Adapter	Hardware
SC100SDN	V850	Emulation Probe Extension	Optional Hardware
StartWARE-GHS-V850/SA1	V850	Starter Kit	Hardware & Software
FlashMASTER	V850	Programmer	Hardware

For further information on NEC's V850 family or other NEC products visit our European website at **www.nec.de**

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NEC Offices

NEC Electronics (Europe) GmbH, Oberrather Str. 4, D-40472 Düsseldorf,
Tel. (02 11) 65 03 01, Fax (02 11) 65 03-3 27

NEC Electronics (Germany) GmbH, Kanzlerstr. 2, D-40472 Düsseldorf,
Tel. (02 11) 65 03 02, Fax (02 11) 65 03-4 90
- Podbielskistr. 164, D-30177 Hannover, Tel. (05 11) 3 34 02-0, Fax (05 11) 3 34 02-34
- Arabellastr. 17, D-81925 München, Tel. (0 89) 92 10 03-0, Fax (0 89) 91 31 82
- Industriestr. 3, D-70565 Stuttgart, Tel. (07 11) 9 90 10-0, Fax (07 11) 9 90 10-19

NEC Electronics (BNL) - Boschdijk 187a, NL-5612 HB Eindhoven,
Tel. (0 40) 2 44 58 45, Fax (0 40) 2 44 45 80

NEC Electronics (Scandinavia) - Täby Centrum, Entrance S (7th floor),
S-18322 Täby, Tel. (08) 6 38 08 20, Fax (08) 6 38 03 88

NEC Electronics (France) S.A., 9, rue Paul Dautier, B.P. 187,
F-78142 Vélizy-Villacoublay Cédex, Tél. (01) 30 67 58 00, Fax (01) 30 67 58 99

NEC Electronics (France) S.A., Representacion en Espana,
Juan Esplandiu 15, E-28007 Madrid, Tel. (01) 5 04 27 87, Fax (01) 5 04 28 60

NEC Electronics Italiana S.R.L., Via Fabio Filzi, 25A, I-20124 Milano,
Tel. (02) 66 75 41, Fax (02) 66 75 42 99
- Rome Office, Via Monte Cervialto, 131, I-00139 Roma,
  Tel. (06) 8 86 22 91/2, Fax (06) 8 86 22 39

NEC Electronics (UK) Ltd., Cygnus House, Sunrise Parkway, Milton Keynes,
GB-MK14 6NP, Tel. (0 19 08) 69 11 33, Fax (0 19 08) 67 02 90
- Scotland Office, Block 3, Carfin Industrial Estate, Motherwell GB-ML1 4UL,
  Tel. (0 16 98) 73 22 21, Fax (0 16 98) 83 38 68

With compliments