78K0S family

Product Letter

μPD78916x/7x

8-bit Microcontrollers

Description

The μPD78916x/7x are highly integrated single-chip microcontrollers in the NEC 78K0S family. They feature CPU, ROM, RAM and peripheral functions such as ADC on chip. Flash memory is available as well as the memory options listed in the ordering information table.

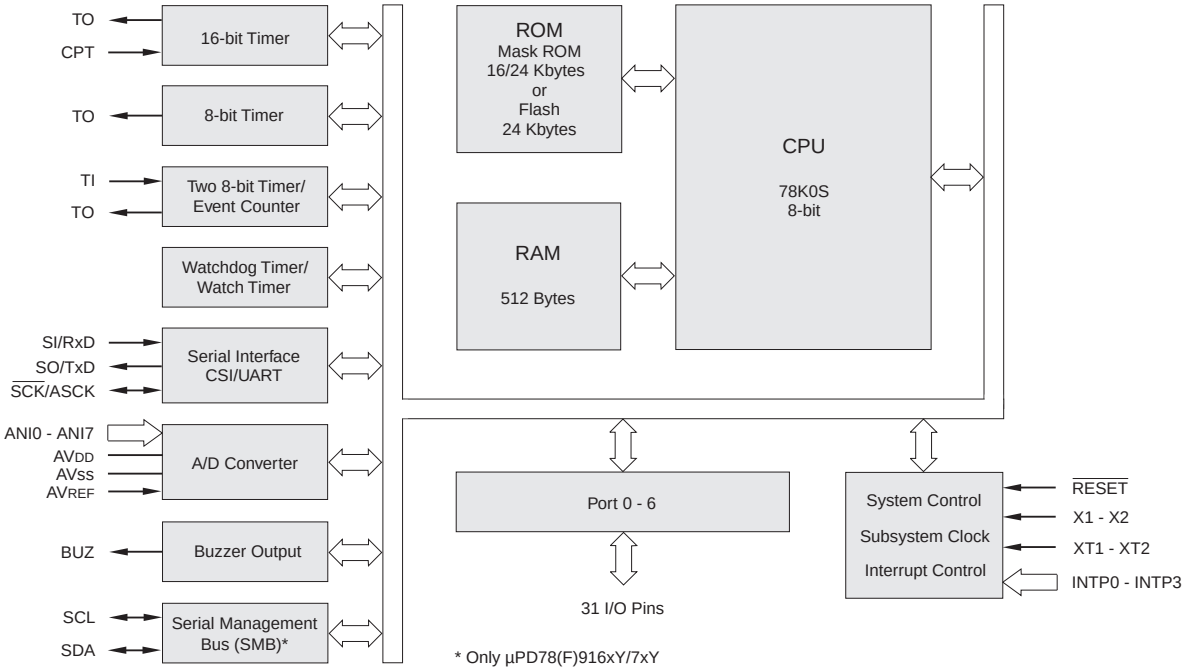
Applications

The μPD78916x/7x subfamily is ideally suited for the control of power windows, keyless entry systems, battery management units, side air bags, etc.

Features

- Mask ROM (16 and 24 KB) and Flash EPROM (24 KB) versions available
- 512 bytes internal High-Speed RAM
- System Management Bus (SMB) optional
- Minimum instruction execution time from 0.4 μs to 122 μs (5 MHz main system clock)
- Bit manipulation instructions
- 16-bit multiplication (8x8→16)
- Serial interface (UART, 3-wire serial I/O mode)
- 8-channel A/D converter with 8 bit (10 bit) resolution
- 8-bit/16-bit timer/counter
- Watchdog timer
- Clock prescaler
- 32.768 kHz subsystem clock with watch timer
- Buzzer output
- 31 I/O ports
- Interrupt controller
- Wide supply voltage range: 1.8 – 5.5 V
- Standby control (HALT, STOP mode)
- 44-pin plastic QFP (10 x 10 mm²), SMB-type also 48-pin QFP (7 x 7 mm²)

Block Diagram



Functional Block Description

CPU

The core of the 78K0S family is a powerful 8-bit CPU, which was directly derived from NEC's successful 78K0 CPU. By using 0.35 µm process technology for the µPD78916x/7x an excellent power/performance ratio has been achieved. The instruction set consists of 48 optimized commands. Eight 8-bit general registers can be concatenated into four 16-bit registers, enabling 16-bit operations. Bit manipulation operations are supported.

Ports

The µPD78916x/7x devices provide 8 CMOS input pins, 17 CMOS input/output pins and 6 N-channel open-drain input/output pins (withstand voltage 12 V). All CMOS ports feature internal pull-up resistors, which can be enabled via software if the port is used as input.

Serial Interface

All devices have a serial interface, which can be switched between an asynchronous serial interface (UART) mode and a 3-wire clocked serial interface mode. For the UART mode, a dedicated baud rate generator is incorporated, allowing data transfer in wide range of different baud rates. In addition to this, the baud rate can be defined by scaling the input clock. The UART also features full-duplex operation. In the 3-wire serial I/O mode, the clock or data phase can be chosen. Devices containing a "Y" in the order code feature the system management bus (SMB), which can be set to I^2C bus standard or high-speed mode.

Timer/Event Counter

The µPD78916x/7x devices have two 8-bit timers / event counters, and one 8-bit timer counter. All 8-bit timers can output PWM and square waves. Additionally, one 16-bit timer counter is implemented. This timer is equipped with a capture register and buzzer output. The watchdog timer has interval timer functions and may generate non-maskable or maskable interrupts. It is used to detect inadvertent programme loops.

Multiplier

The multiplication of two 8-bit values to a 16-bit result is supported by compact, built-in instructions.

Clock Generator

The clock generator provides the operating frequency to be supplied to the CPU core and integrated peripheral hardware. It requires an external crystal or ceramic resonator (1 to 5 MHz). From this oscillation the system clock generates the internal operating frequency, controlled by the processor clock control register (PCC). Optionally the operating frequency can be prescaled. In STOP mode, the operation of the main system is suspended totally, resulting in ultra-low power consumption.

A/D Converter

An 8-channel A/D converter with a resolution of 10 bit (8 bit) is incorporated into this microcontroller. The minimum conversion time is less than 15 µs (at 5 MHz clock speed).

Ordering Information

Devices

Part Number	Mask ROM (Kbytes)	Flash (Kbytes)	A/D Converter	System Management Bus*
μPD789166GB	16	–	8 x 8-bit	No
μPD789167GB	24	–	8 x 8-bit	No
μPD789176GB	16	–	8 x 10-bit	No
μPD789177GB	24	–	8 x 10-bit	No
μPD78F9177GB	–	24	8 x 10-bit	No
μPD789166YGB	16	–	8 x 8-bit	Yes
μPD789167YGB	24	–	8 x 8-bit	Yes
μPD789176YGB	16	–	8 x 10-bit	Yes
μPD789177YGB	24	–	8 x 10-bit	Yes
μPD78F9177YGB	–	24	8 x 10-bit	Yes

* Can be used in I^2C bus standard or high-speed mode

Documentation

Doc Number	Devices	Type
U13919EE1V0CD00	NEC Microcontrollers	CD-ROM
U11047EJ3V0UM00	78K0S	Instruction Manual
U14186EJ1V0UM00	μPD78(F)916x/7x	User's Manual
U13349EJ1V0UM00*	μPD78(F)916xY/7xY	User's Manual
U14017EJ1V0PM00*	μPD78916x/7x	Product Information
U13216EJ1V0PM00*	μPD78916xY/7xY	Product Information
U14022EJ1V0PM00*	μPD78F9177	Product Information
U13210EJ1V0PM00*	μPD78F9177Y	Product Information

* Preliminary document

Tools

Order Number	Devices	Description	Type
78K0S-PCI-SET*	78K0S	Toolset* with PCI interface card	HW + SW
78K0S-PCMCIA-SET*	78K0S	Toolset* with PCI interface card	HW + SW
IE-789177-NS-EM1	μPD78(F)916x/7x	Emulation Board	Hardware
NP-44GB-TQ	44 GB Style Packages	Emulation Probe	Hardware
NQPACK044SA	44 GB Style Packages	Board Socket	Hardware
YQPACK044SA	44 GB Style Packages	Probe Adapter	Hardware
HQPACK044SA	44 GB Style Packages	Chip Adapter	Hardware
DSWIN-I3HD-789	78K0S	Simulator	Software
FLASHMASTER	μPD78Fxxxx	Flash Programmer	Hardware
FA-44GB-8ES	μPD78F177(Y)GB	Programming Adapter	Hardware

* Includes In-Circuit Emulator, Power Supply, PC-Interface, C-Compiler/Assembler and Debugger

For further information on NEC's 78K0S family or other NEC products please visit our European website at **www.nec.de**

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, Tel. (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

© Published by NEC Electronics (Europe) GmbH, Printed in Germany, September 1999
Document No. U14477EE1V0PL00

With compliments