

# 78K0S CAN family

## Product Letter

# $\mu$ PD789850

## 8-bit Microcontrollers

### Description

The  $\mu$ PD789850 is a highly integrated single-chip microcontroller in NEC's successful 78K0S family. It features CPU, ROM, RAM and peripheral functions such as DCAN controller, 8-bit A/D-converter and full-duplex UART on chip. Due to the special requirements for automotive applications, this device is specified for improved reliability ("A-grade"). It is available with both mask ROM and flash memory.

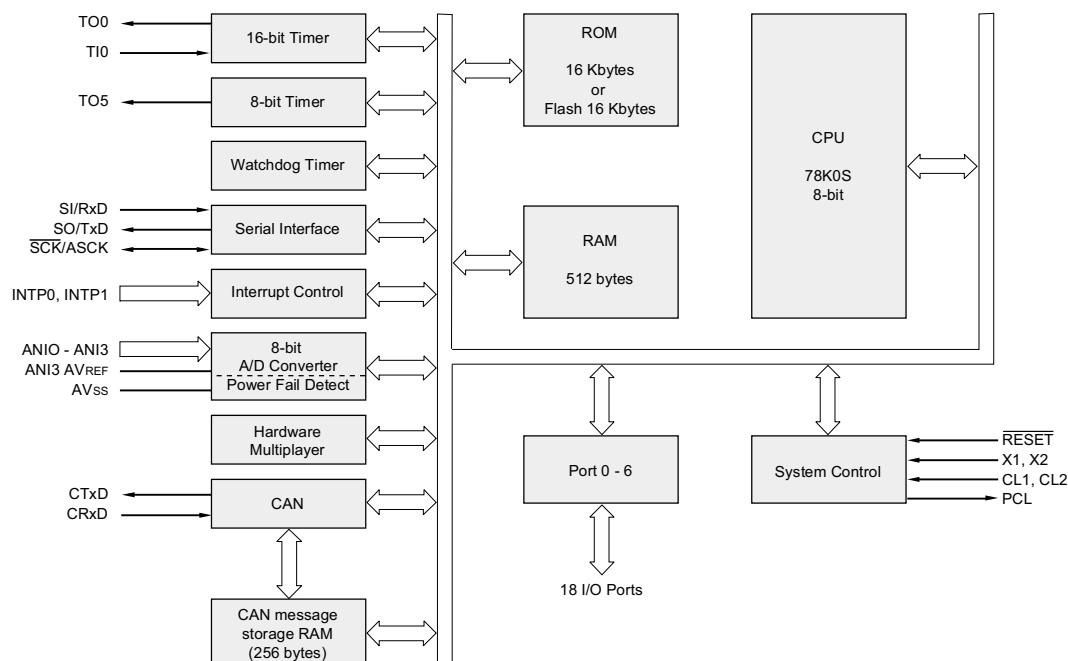
### Applications

Due to its on-chip DCAN controller, the  $\mu$ PD789850 fits very well into all applications where a low-cost device with CAN functionality is needed. This might be in the automotive sector (e. g. door, mirror and roof modules, seat/climate control, low end airbags) as well as in the field of industrial control (security systems, intelligent office control, ...).

### Features

- Mask ROM and flash memory version available
- DCAN controller on chip (2 transmit, 14 receive buffers)
- 4-channel 8-bit A/D-converter
- 2 serial interfaces (UART, 3-wire serial I/O mode)
- 16-bit hardware multiplier ( $8 \times 8 \rightarrow 6$ )
- 18 I/O ports
- 16-bit timer/event counter
- 8-bit timer
- Watchdog timer
- Interrupt controller
- 40 kHz subsystem clock
- Clock prescaler and selector
- Minimum instruction execution time from 0.25  $\mu$ s to 100  $\mu$ s
- Powerful instruction set
- Bit manipulation in entire address space
- Voltage range: 4.0 – 5.5 V (both flash and mask ROM)
- Two power saving modes: HALT, STOP
- Package: 30-pin plastic SSOP

### Block Diagram



## Functional Block Description

<b>CPU</b>	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 $\mu\text{m}$ process technology for the $\mu\text{PD789850}$ an excellent power/performance ratio has been achieved. The instruction set consists of 48 optimized commands. Bit manipulation operations are supported on all registers and the entire RAM address space.
<b>Memory</b>	The $\mu\text{PD789850}$ is available with mask as well as flash ROM. The programming of flash memory devices is possible even with the device already mounted in the target system. Besides the 512 bytes High-Speed RAM, the device is equipped with additional 256 bytes RAM for CAN message storage.
<b>Ports</b>	This controller provides a total of 18 I/O lines: 14 CMOS I/O pins and 4 CMOS input only pins. All I/O ports feature internal pull-up resistors, which can be enabled via software when the port is used as input.
<b>DCAN Controller</b>	With its minimized circuit design, NEC's DCAN module is an ideal solution for providing full hardware support for most stand-alone CAN communication applications. Transmission is supported by two independent transmit buffers and easy priority control. With up to 14 mail-boxes in the communication RAM, the receiving path provides virtually "Full CAN" performance. The maximum speed of transmission is 500 kbps.
<b>A/D Converter</b>	A 4-channel A/D-converter with a resolution of 8 bits is incorporated into this device. The conversion itself can be started by hard- or software and is done by successive approximation. After it has been finished, a maskable interrupt request signals that a new digital value is ready to be read out.
<b>Serial Interfaces</b>	For communications, both a UART and a 3-wire serial interface are integrated. An on-chip baud rate generator allows data transfers in a wide range of different speeds up to 250 kbps.
<b>Timer</b>	Three timer channels are provided: one 16-bit timer/event counter, one 8-bit timer, and one watchdog timer. The 8-bit timer is also capable of PWM output. The watchdog timer has interval functionality and may generate non-maskable or maskable interrupts. It is used to detect inadvertent program loops.
<b>Clock Generator</b>	Controlled by the processor clock control register (PCC), 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 (4.0 to 8.0 MHz) and can support an additional RC resonator for the so-called "subclock mode". 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.
<b>Interrupt Controller</b>	The interrupt controller can handle three different kinds of interrupt requests issued by 16 sources, with the watchdog being the only one which can trigger a non-maskable interrupt.

### Ordering Information

#### Devices

Part Number	Mask ROM (Kbytes)	Flash (Kbytes)
$\mu$ PD789850MC	16	-
$\mu$ PD78F9850MC	-	16

#### Documentation

Doc Number	Devices	Type
U13919EE2V0CD00	NEC Micro-Components	CD-ROM
U11047EJ3V0UM00	78K0S	Instruction Manual
U14340EJ1V0PM00	$\mu$ PD789850	Product Information
U14341EJ1V0PM00	$\mu$ PD78F9850	Product Information

#### Tools

Order Number	Devices	Description	Type
78K0S-NS-PCI-SET	78K0S	Toolset* with PCI Interface Card	Hardware & Software
78K0S-NS-PCMCIA-SET	78K0S	Toolset* with PCMCIA Interface Card	Hardware & Software
IE-789850-NS-EM1	$\mu$ PD78(F)9850	Emulation Board	Hardware
NP-36GS	MC Style Packages	Emulation Probe	Hardware
NGS-30	MC Style Packages	Board Socket	Hardware
DSWIN-I3HD-789XX	78K0S	Simulator	Software
FLASHMASTER	78K Flash devices	Flash Programmer	Hardware
FA-30MC	MC Style Packages	Programming Adapter	Hardware

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

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