78K0 CAN family

Product Letter

μPD78F0828B
μPD780824/26B

8-bit Microcontrollers

Description

The μPD78(F)082x with an on-chip CAN interface is a member of a new branch of NEC's 78K0 8-bit microcomputer family. Based on 0.35 μm technology, the devices integrate powerful application-specific peripherals. They offer outstanding perspectives and opportunities for system solutions at an excellent price/performance ratio. There are now over 200 different devices in NEC's established and powerful 78K0 8-bit microcomputer family. All new products will be offered as mask ROM and Flash EPROM.

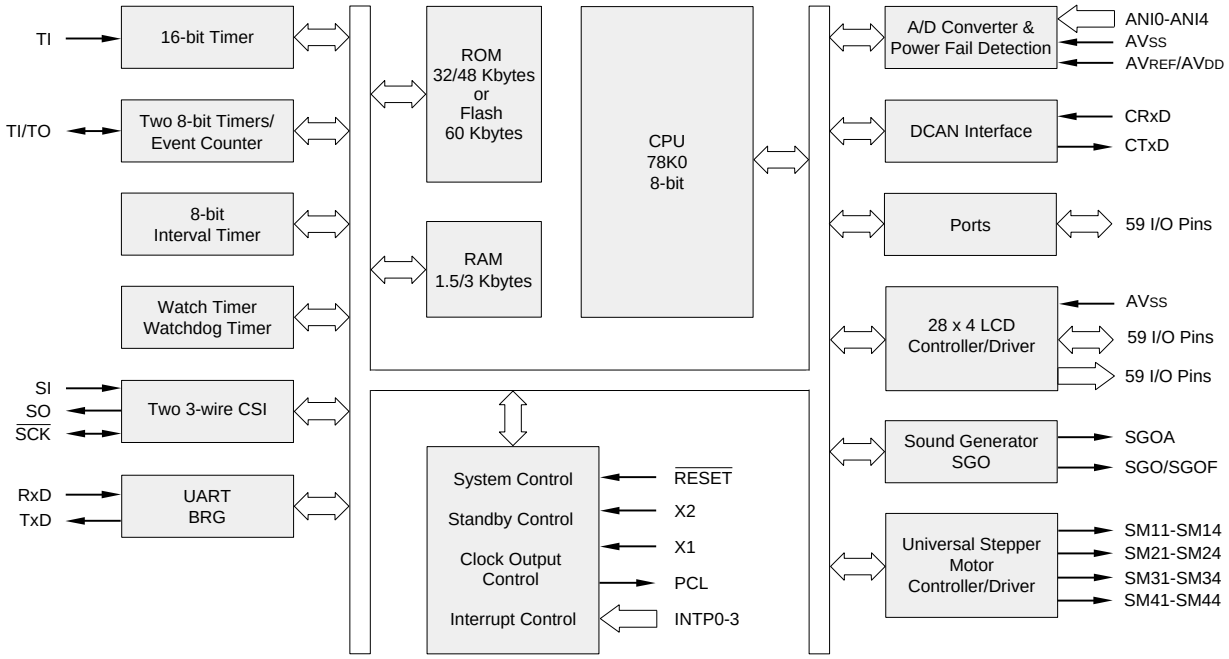
Applications

The μPD78(F)082x is suited for dashboard applications including universal instrument motor drivers in the automotive sector. In addition, the device is ideal for industrial applications where CAN functionality is combined with control-oriented peripherals. In particular, there is full support for systems connected to an LCD display together with high drive outputs.

Features

- 32/48 Kbytes internal mask ROM or 60 Kbytes Flash EPROM
- Mask ROM: 1.5 Kbytes internal RAM (high speed 1024 bytes; expansion 480 bytes)
- Flash: 3 Kbytes internal RAM (high speed 1024 bytes; expansion 2016 bytes)
- Instructions execution time adjustable from 0.25 μs to 4 μs at 8 MHz
- Powerful instruction set
- Bit manipulation in entire address space
- Built-in multiply and divide instructions
- DCAN Interface (2 transmit buffers; up to 16 program receive buffers)
- Serial interface (2 x 3-wire, 1 x UART)
- 4 x 28 segments LCD controller/driver
- 5-channel 8-bit A/D converter, including power failure detector
- Timer channels (1 x 16-bit timer, 3 x 8-bit timer/event counter, watch timer, watchdog timer)
- Sound generator
- Four universal stepper motor drivers
- Vectored interrupts (20 internal, 3 external)
- 59 I/O ports
- Built-in clock oscillator circuit
- Standby control (HALT, STOP mode)
- Operating supply voltage: 4.0 – 5.5 V
- 80-pin QFP package (14 mm x 14 mm)
- Operating temperature: -40 to +85°C

Block Diagram



Functional Block Description

CPU

The heart of the 78K0 family is a powerful 8-bit CPU. The 0.35 µm process technology ensures an excellent power/performance ratio. The CPU is equipped with four register banks comprising eight 8-bit registers each. These 8-bit registers can be concentenated to four 16-bit registers in order to support 16-bit operations, eg, 8-bit multiplication with a 16-bit result or 16-bit index addressing. The 64-Kbyte linear address space is accessed via 16-bit addresses. Bit manipulation operations are supported on all registers and the entire RAM address space. Subclock CPU operation to reduce system power consumption is also supported.

DCAN Module

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. Support of 11-bit and 29-bit identifiers (spec. 2.0B active) is provided. Transmission is supported by two independent transmit buffers with easy priority control. With up to 16 mailboxes in the communication RAM, the receive path provides virtually "Full CAN" performance. The expansion RAM is used as CAN data RAM to the CPU. The number of mailboxes for transmission and CAN can be configured by setting the DCAN's SFR registers. Each message buffer allocates 16 bytes of expansion RAM, resulting in a RAM requirement of maximum 288 bytes for the DCAN module.

A/D Converter

The converter has 5 channels with 8-bit resolution. One of the channels can be used as a failure detector that generates an internal interrupt on recognizing an analog input above/below a certain voltage. The 8-bit conversion time per channel is typically below 18 µs at 8 MHz. The A/D resistor chain can be switched off to reduce power consumption.

Serial Interface

The serial interface includes one UART (Universal Asynchronous Receiver Transmitter) that supports transfer rates up to 125 kbps. A dedicated baud rate generator sets the transfer rate. Two 3-wire CSI (Clocked Serial Interface) for transfer rates up to 500 Kbps are also provided.

Timer

A flexible timer offers a total of 6 timer channels. One-channel 16-bit timers can be used for precise pulse measurements with up to three 16-bit capture registers. Two/three-channel 8-bit timers can be used as interval timers, for PWM output and as external event counters. The watch timer generates a watch time and can be used simultaneously as an interval timer. The on-chip watchdog timer monitors the CPU and generates either an internal reset or a non-maskable interrupt. It can also be used as an additional interval timer if the watchdog function is not required.

LCD Driver

The LCD controller/driver can drive up to 112 LCD segments (28 segments, 4 commons). All LCD segments are shared with ports and can be selected bitwise to ensure maximum port pin availability if the application does not require all LCD segments.

Sound Generator

The sound generator produces sounds composed of a frequency output and a 32/64 KHz PWM signal for volume control. The generated frequency is in the range of 256 Hz to 7.7 KHz. It can be used for simple alarm sounds, like buzzer, gong and beeper.

Instrument Drivers

The on-chip universal instrument motor drivers are able to drive 4 cross coil/stepper motors with up to 30 mA drive capability per coil. Alternatively, the outputs can be used as simple 8-channel, 9-bit PWM outputs or as high drive output ports.

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CAN Family Roadmap

At its European Technology Center (ETC), NEC has started work on a series of ASSPs (Application Specific Standard Products) targeted at the CAN market. The CAN product roadmap, based on the 78K0 8-bit CPU core, is shown in the table below. Located at NEC's European headquarters in Düsseldorf, the ETC enables NEC to respond faster and more flexibly to the demands of European customers. Further CAN products, based on different microcontroller cores like the 78K0 8-bit or V850 32-bit RISC family, are under development.

Part Number	Package	ROM	FLASH	RAM	Features	Miscellaneous
μPD780814	64 QFP	32 Kbytes	-	1.5 Kbytes	8.3 MHz/240 ns A/D converter + power-fail detector, UART, 6 timer channels, PWM, DCAN (2 transmit + 16 receive)	RC subclock, clock monitor, 2 x SIO
μPD780816	64 QFP	48 Kbytes	-	1.5 Kbytes		
μPD78F0818	64 QFP	-	60 Kbytes	3.0 Kbytes		
μPD780824B	80 QFP	32 Kbytes	-	1.5 Kbytes		2 x SIO, stepper motor driver, sound generator, 4 x 28 LCD
μPD780826B	80 QFP	48 Kbytes	-	1.5 Kbytes		
μPD78F0828B	80 QFP	-	60 Kbytes	3.0 Kbytes		
μPD780948(A)	100 QFP	60 Kbytes	-	2.0 Kbytes		RC subclock, sound generator, 2 x SIO 4 x 40 LCD
μPD78F0948	100 QFP	-	60 Kbytes	2.0 Kbytes		

Ordering Information

Devices

Part Number	ROM	RAM	Flash ROM
μPD780824BGC-8BT	32 Kbytes	1.5 Kbytes	-
μPD780826BGC-8BT	48 Kbytes	1.5 Kbytes	-
μPD78F0828BGC-8BT	-	3 Kbytes	60 Kbytes

Documentation

Doc Number	Devices	Description	Type
U12326EJ3V0UM00	μPD780824/26, μPD78F828	78K0 Series Instruction	User's Manual
U13402EE1V0UM00	μPD780824/26, μPD78F828	Device User Manual	Preliminary User's Manual
U13446EE1V0PM00	μPD780824, μPD780826,	Functional Description &	Preliminary Product
U13240EE1V0PM00	μPD78F0828	Specification	Information

Tools

Order Number	Description	Type
78K0-NS-PCI-SET*	Tool Kit	Software/Hardware
IE-78K0-NS-P04	I/O Emulation Board	Hardware
IE-780828-NS-EM4	Probe Board	Hardware
NP-80GC-TQ	Emulation Probe	Hardware
Flashmaster	Flash Programmer	Hardware
FA-80GC	Programming Adapter	Hardware
DSWIN-I3HD-780xx	Simulator	Software

* Tool Kit includes Assembler, C Compiler, Debugger, In-circuit Emulator, PC Interface Board and Power Supply.

For further information on NEC's 78K0 family or other NEC products visit our European website at **www.ee.nec.de**

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