

78K4 family

Product Letter

μPD784225

16-bit Microcontrollers

Description

The μPD784225 microcontrollers are members of NEC's 16-bit 78K4 family. Compatible with 8-bit 78K0 microcontrollers, this family offers an easy migration to large internal memory and high processing performance. The μPD784225 peripheral set is a superset of the 78K0 peripherals in the 78005x subfamily.

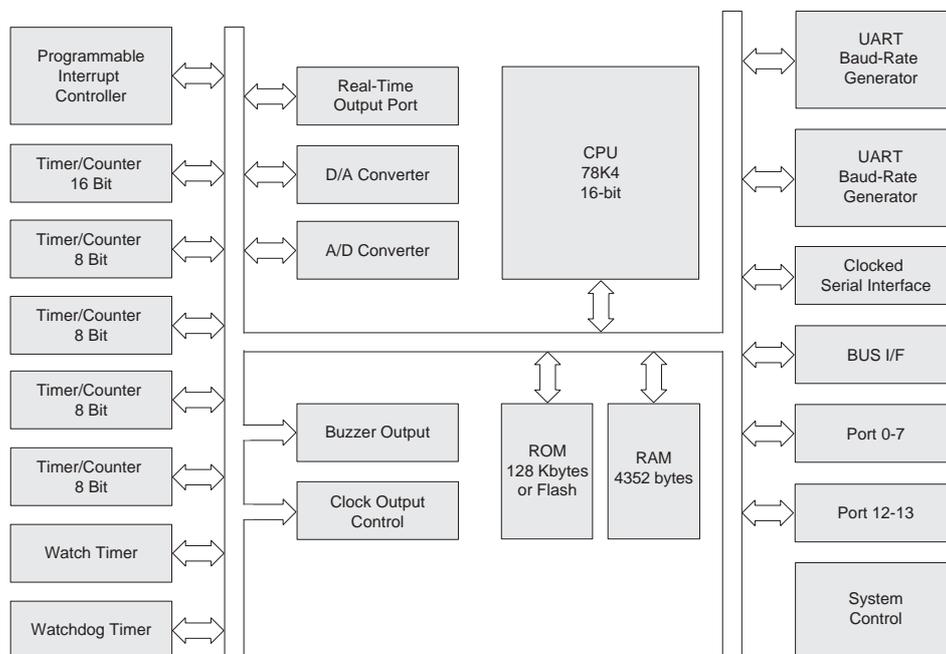
Applications

μPD784225 devices are the preferred choice whenever high computing power and large on-chip memory are required. Typical application areas are telecommunications, car audio equipment and data processing.

Features

- 128 Kbytes Mask ROM and Flash versions
- 4352 bytes RAM
- 1 Mbyte linear address space
- 160 ns instruction cycle time at 12.5 MHz (61 μs at subsystem clock operation)
- Bit manipulation over the entire address space
- Multiply and divide instructions
- 3 serial interfaces including 2 UARTs
- 8-channel A/D converter
- 2-channel D/A converter
- 8-channel real time output port
- Timer/counter: 1 x 16-bit and 6 x 8-bit or 2 x 16-bit (cascaded)
- Buzzer output
- 67 I/O pins
- Interrupt controller (4 programmable priority levels)
- Real time subsystem clock
- Clock prescaler (enabled by software)
- Standby control (HALT, STOP mode)
- Power supply voltage: 1.8 – 5.5 V
- 80-pin QFP and TQFP packages

Block Diagram



Functional Block Description

CPU	The 78K4 CPU features 8 general register banks with 8 x 16-bit or 16 x 8-bit registers plus 4 x 8-bit registers for 24-bit address expansion. The general purpose registers are mapped to the internal RAM. The register banks can be switched by software or context switching. Registers can be manipulated in 8-bit units. Pairs of 8-bit general purpose registers can be manipulated in 16-bit units. For 24-bit address expansion, four of the 16-bit registers can be combined with 8-bit registers. A prefetch queue with 5 bytes for internal fetch and 3 bytes for external fetch ensures high speed instruction fetch. The CPU processes 113 different basic instructions including advanced arithmetic operations like Multiply and Accumulate.
Memory	μPD784225 devices have a 1 Mbyte linear address space. On-chip memory includes 128 Kbytes ROM or Flash, and 4352 bytes RAM.
Ports	All devices have 67 input/output pins, 16 of which are capable of directly driving LEDs. 57 input/output pins have internal pull-up resistors that can be enabled via software.
A/D Converter	An 8-channel A/D converter with 8-bit resolution is provided on chip using successive approximation. The overall power consumption of the system can be reduced by disabling the A/D resistor chain.
D/A Converter	A 2-channel D/A converter with 8-bit resolution uses the R-2R resistor ladder method. The D/A converter can be used in real time mode. In this case, analog voltage output is synchronized with the output trigger. This mode allows sine wave generation.
Serial Interface	The 3 serial interfaces include two full-duplex UARTs with on-chip baud rate generators. The additional CSI (Clocked Serial Interface) supports data transfer up to 1.25 Mbps and can be used in I ² C mode on the μPD784225Y.
Timer	All devices have 7 timer channels. One 16-bit timer/counter is available for basic interval timing, as a PWM, square wave or one shot pulse output. Two 8-bit timers/counters have similar functionality and can also be used as external event counters. A further two 8-bit timers are provided. All 8-bit timers can be combined to 16-bit timers. A total of 6 interrupt requests are provided for these 5 timers/counters. The watch timer can be used simultaneously as watch timer and as interval timer. The on-chip watchdog timer monitors CPU operation.
Clock Generator	The on-chip clock generator oscillates at frequencies between 2 and 12.5 MHz.
Subsystem Clock	The subsystem clock operates at 32.768 kHz. Power consumption is significantly reduced in subclock mode.
Interrupt Controller	Powerful interrupt handling capability is based on a macro service, context switching and vectored interrupts. Four programmable and an external non-maskable interrupt are provided. The interrupt controller handles various interrupt requests, maskable or non-maskable, issued by internal peripheral hardware or external devices. One of the ports is equipped with a key interrupt function. This feature can be used by an external event to wake up the CPU from power-saving STOP or HALT mode.

Ordering Information

Devices

Part Number	ROM (Kbytes)	Flash (Kbytes)	RAM (bytes)
μPD784225xx	128	-	4352
μPD784225xx	-	128	4352

Note: "xx" is the package code GC (QFP), GK (TQFP). All devices are also available with I²C bus.

Documentation

Doc Number	Devices	Type
U11933EE2V0CD00	NEC Microcontrollers	CD-ROM
U12697EJ1V0UM00	μPD78(F)4225(Y)	User's Manual HW
U10905EJ1V0UM00	78K4 Series (instructions)	User's Manual SW
U12498EJ6V0PM00	μPD784225	PPI
U12376EJ1V0PM00	μPD784225Y	PPI

Tools

Order Number	Description	Type
RAMSD-I3HD-784xx	Assembler	Software
CCMSD-I3HD-784xx	C Compiler/Assembler	Software
DSWIN-I3HD-784xx	Simulator	Software
DIWIN-I3HD-784xx	GUI Debugger	Software
IE-78400-R + IE-78400-R-EM + IE-70000-PC-IF-C	In-circuit Emulator	Hardware
IE-784225-NS-EM1 + IE-78K4-R-EX2	Emulation Board	Hardware
EP-78230GC-R	Emulation Probe	Hardware
EP-78054GK-R	Emulation Probe	Hardware
EV-9200GC-80	LCC Socket	Hardware
TGK-80SDW	LCC Socket	Hardware
FA-80GC	Programming Adapter	Hardware
FA-80GK	Programming Adapter	Hardware
FLASHMASTER	Flash Programmer	Hardware

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