

HD404678 Series

4-Bit Single-Chip Microcomputer (Built-in DTMF Receiver)

Description

The HD404678 Series is a 4-bit single-chip HMCS400 series microcomputer for telephone applications designed to increase program productivity. It features a high-precision dual-tone multi-frequency (DTMF) receiver that is especially suitable for answering machines.

The HD404678 Series includes three chips: the HD404676 with 6-kword ROM; the HD404678 with 8-kword ROM; and the HD4074678 with 8-kword PROM (ZTAT™ version).

The HD4074678 is a PROM version (ZTAT™) microcomputer. A program can be written to the PROM by a PROM writer, which can dramatically shorten system development periods and smooth the process from debugging to mass production. (The ZTAT™ version is 27256-compatible.)

Features

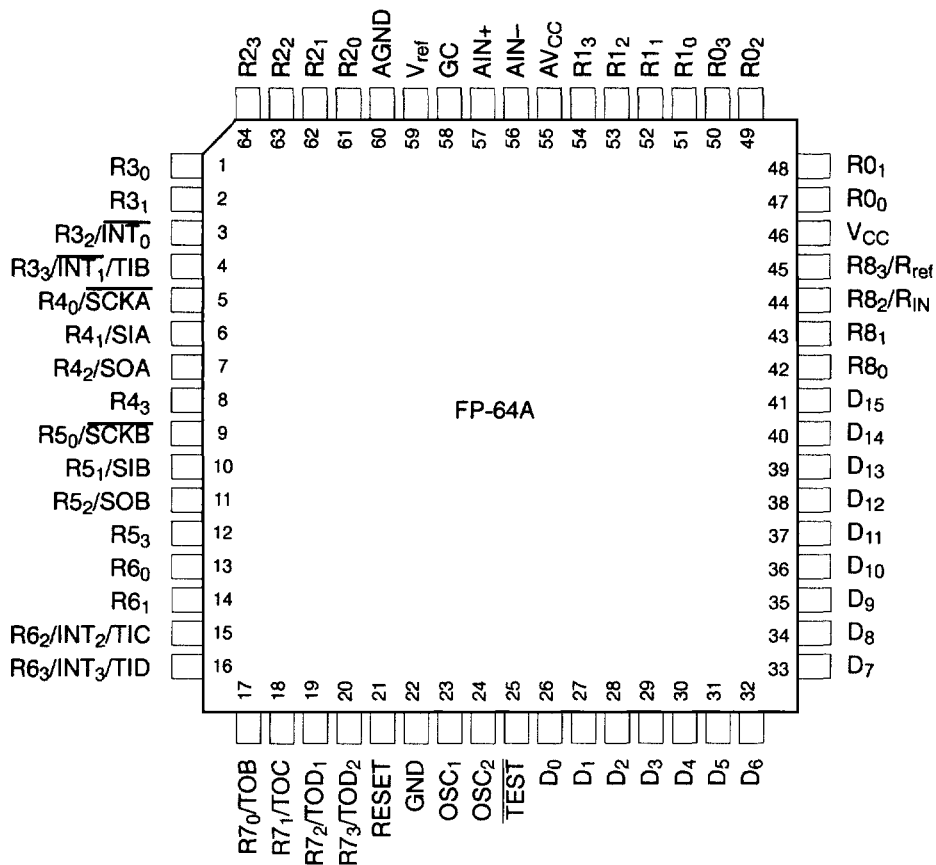
- 6,144-word × 10-bit ROM (HD404676)
- 8,192-word × 10-bit ROM (HD404678, HD4074678)
- 512-digit × 4-bit RAM
- 48 I/O pins and four dedicated input pins
 - 16 large-current output pins: Ten 15-mA sinks (a maximum of 7 pins can be used at the same time) and six 10-mA sources
- Four timer/counters
 - One 8-bit free-running timer
 - Three 8-bit auto-reload timer/counter output circuits
- Two-channel clock-synchronous 8-bit serial interface
- Built-in DTMF receiver
- Reset voltage variable function
- 11 interrupt sources
 - Four by external sources
 - Four by timer/counters sources
 - Two by serial interface sources
 - One by DTMF receiver source
- Subroutine stack up to 16 levels, including interrupts
- Instruction cycle time: 2 μs
- Two low-power dissipation modes
 - Standby mode
 - Stop mode
- Package
 - 64-pin flat plastic package (FP-64A)
- Operation modes
 - MCU mode
 - PROM mode (HD4074678)

Ordering Information

Type	Product Name	ROM (Words)	Package
Mask ROM	HD404676H	6,144	FP-64A
	HD404678H	8,192	FP-64A
ZTAT™	HD4074678H	8,192	FP-64A

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Pin Arrangement



(Top view)

Pin Description

Function	Symbol	Pin No.	I/O	Description
Power	V_{CC}	46		Power supply voltage (5 V $\pm$ 10%).
	GND	22		Connected to ground.
Test	$\overline{TEST}$	25		Used for factory tests. Connected to V_{CC} .
Reset	RESET	21	I	Resets the MCU.
Oscillator	OSC ₁	23	I	Input or output pins for the internal oscillator circuit. Connected to the crystal oscillator or external oscillation circuit. External oscillation circuit can be connected to OSC ₁ .
	OSC ₂	24	O	
Port	D ₀ –D ₉	26–35	I/O	Input/output ports. All bits can be accessed separately. Port pins are large current sink pins with pull-up MOS.
	D ₁₀ –D ₁₅	36–41	I/O	Input/output ports. All bits can be accessed separately. Port pins are large current source pins with pull-down MOS.
	R0 ₀ –R7 ₃	1–20, 47–54, 61–64	I/O	Input/output ports accessed with 4-bit-wide digits. Pins R0 ₀ –R5 ₃ are standard pins with pull-up MOS while R6 ₀ –R7 ₃ each has pull-down MOS.
	R8 ₀ –R8 ₃	42–45	I	An input port accessed with 4-bit-wide digits. Port pins are standard pins with pull-down MOS.
Interrupt	$\overline{INT_0}$, $\overline{INT_1}$ $\overline{INT_2}$, $\overline{INT_3}$	3, 4 15, 16	I	External interrupts. These pins are multiplexed with R3 ₂ , R3 ₃ /TIB, R6 ₂ /TIC, and R6 ₃ /TID, respectively.
Serial interface	$\overline{SCKA}$, $\overline{SCKB}$	5, 9	I/O	Transmit clock input/output pins for serial interface A and serial interface B.
	SIA, SIB	6, 10	I	Receive data input pins for serial interface A and serial interface B.
	SOA, SOB	7, 11	O	Transmit data output pins for serial interface A and serial interface B.
Timer	TIB, TIC, TID	4, 15, 16	I	External clock input pins for timers B, C, and D. These pins are multiplexed with R3 ₃ /INT ₁ , R6 ₂ /INT ₂ , and R6 ₃ /INT ₃ , respectively.
	TOB, TOC, TOD ₁ , TOD ₂	17–20	O	Timer output pins for timers B, C, and D. These pins are multiplexed with R7 ₀ , R7 ₁ , R7 ₂ , and R7 ₃ , respectively.
DTMF receiver	AV _{CC}	55		Power supply pin for the DTMF receiver analog block. Connect it as close as possible to the power supply to set AV _{CC} at the same potential as V _{CC} . Stabilized power supply must be applied.

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Pin Description (cont)

Function	Symbol	Pin No.	I/O	
DTMF receiver (cont)	AGND	60		Power supply pin for the DTMF receiver analog block. Connect it as close as possible to the power supply to put AGND to the same potential as GND.
	R _{ref}	59		DTMF receiver analog block reference voltage. A stabilized voltage $AV_{CC}/2$ must be applied.
	AIN+, AIN–	57, 56	I	DTMF signal input pins for the DTMF receiver.
	GC	58	O	DTMF receiver gain control pin.
Reset voltage variable circuit	R _{ref}	45	I	A reference voltage input pin for threshold voltage of the reset voltage, variable circuitry. R _{ref} is multiplexed with R8 ₃ .
	R _{IN}	44	I	An analog input pin of the reset voltage variable circuit. R _{IN} is multiplexed with R8 ₂ .

Block Diagram

