

# SM8311/SM8313/ SM8314/SM8315

## 8-Bit Single-Chip Microcomputer (Controllers For Home Appliances)

### DESCRIPTION

The SM8311/13/14/15 is a CMOS 8-bit single-chip microcomputer incorporating an 8-bit CPU core (SM83), ROM, RAM, timer/counter, serial interface, watch dog timer and A/D converter.

It facilitates complex timing control by providing 5 timers, 10 interrupts and a pulse width measuring feature. It also has a watch dog timer to detect program overrun, enabling the chip to be used for high reliable applications including household apparatus and office equipment.

### FEATURES

- ROM capacity : 8 192 x 8 bits (SM8311)  
16 384 x 8 bits (SM8313)  
24 576 x 8 bits (SM8314)  
32 768 x 8 bits (SM8315)
- RAM capacity : 512 x 8 bits (SM8311/SM8313)  
1 024 x 8 bits (SM8314/SM8315)
- Instruction sets : 74
- A RAM area is used as subroutine stack
- I/O ports :
 

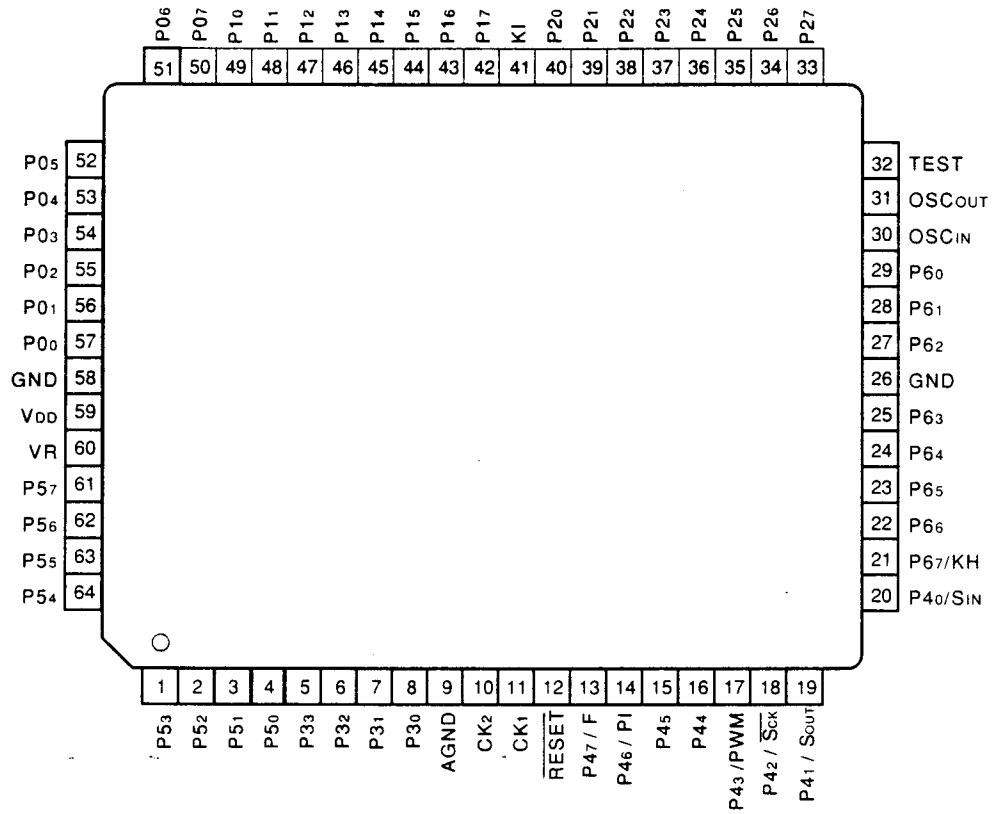
Input	12 (also used as analog input pins)
Output	16 (high current outputs)
Input/output	24 (include double function pins)
- Interrupts :
  - Non-maskable interrupt x 1 (watch dog timer)
  - Maskable interrupts;
    - Internal interrupts x 7 (timer x 4, serial I/O x 1, A/D converter x 1, pulse width measurement x 1)
    - External interrupts x 2 (KI pin, KH pin)
- A/D converter :
 

Resolution	8 bits
Channels	12 (including P3 and P5 ports)
- Timer/counter :
  - 8 bits x 3 (modulo register, input clock selectable)
  - 16 bits timer x 1 (timer 3)
  - Watch dog timer : 8 bits x 1
  - Free running counter : 12 bits x 1 (w/internal 10 bits prescaler)
- Serial interface : 8 bits synchronous x 1
- PWM output circuit x 1 (also used as timer / counter)
- Pulse width measuring circuit x 1 (also used as timer/counter)
- Zero cross detector : 1 ch (KI input)
- Sound output (F pin) : 4 kHz pulse (at 8 MHz main clock)
- Built-in main clock oscillator for system clock
- Built-in sub clock oscillator for real time clock
- Built-in 15 stages divider
- Instruction cycle time :
  - 1  $\mu$ s (MIN.) at 4 MHz main clock  $V_{DD} = 2.7$  to 5.5 V
  - 0.5  $\mu$ s (MIN.) at 8 MHz main clock  $V_{DD} = 4.5$  to 5.5 V
- Supply voltage : 3.0 V  $\pm$  10% at 4 MHz main clock  
5.0 V  $\pm$  10% at 8 MHz main clock
- Packages : 64-pin SDIP (SDIP064-P-0750)  
64-pin QFP (QFP064-P-1420)

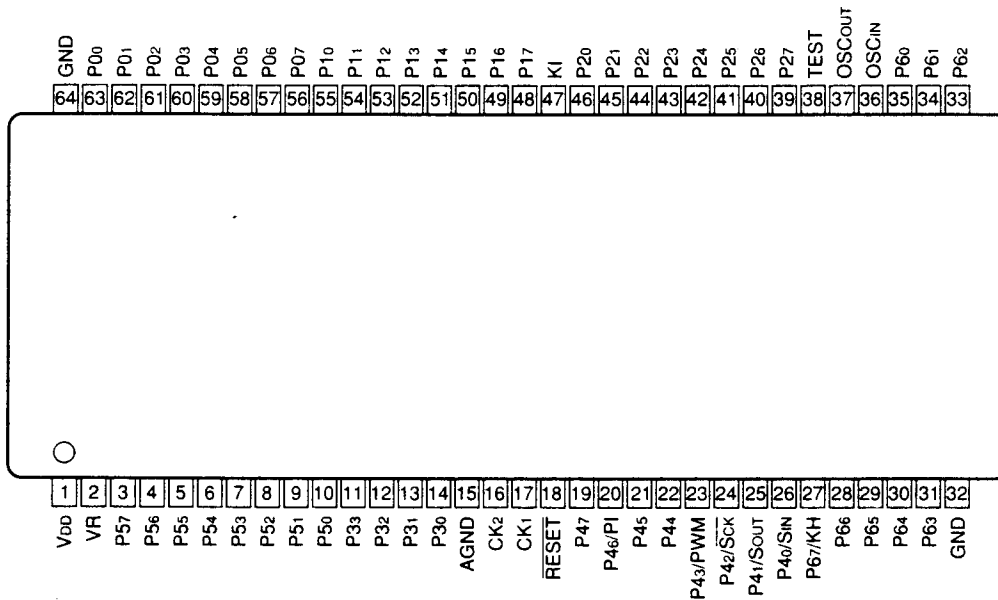
PIN CONNECTION

64-pin QFP

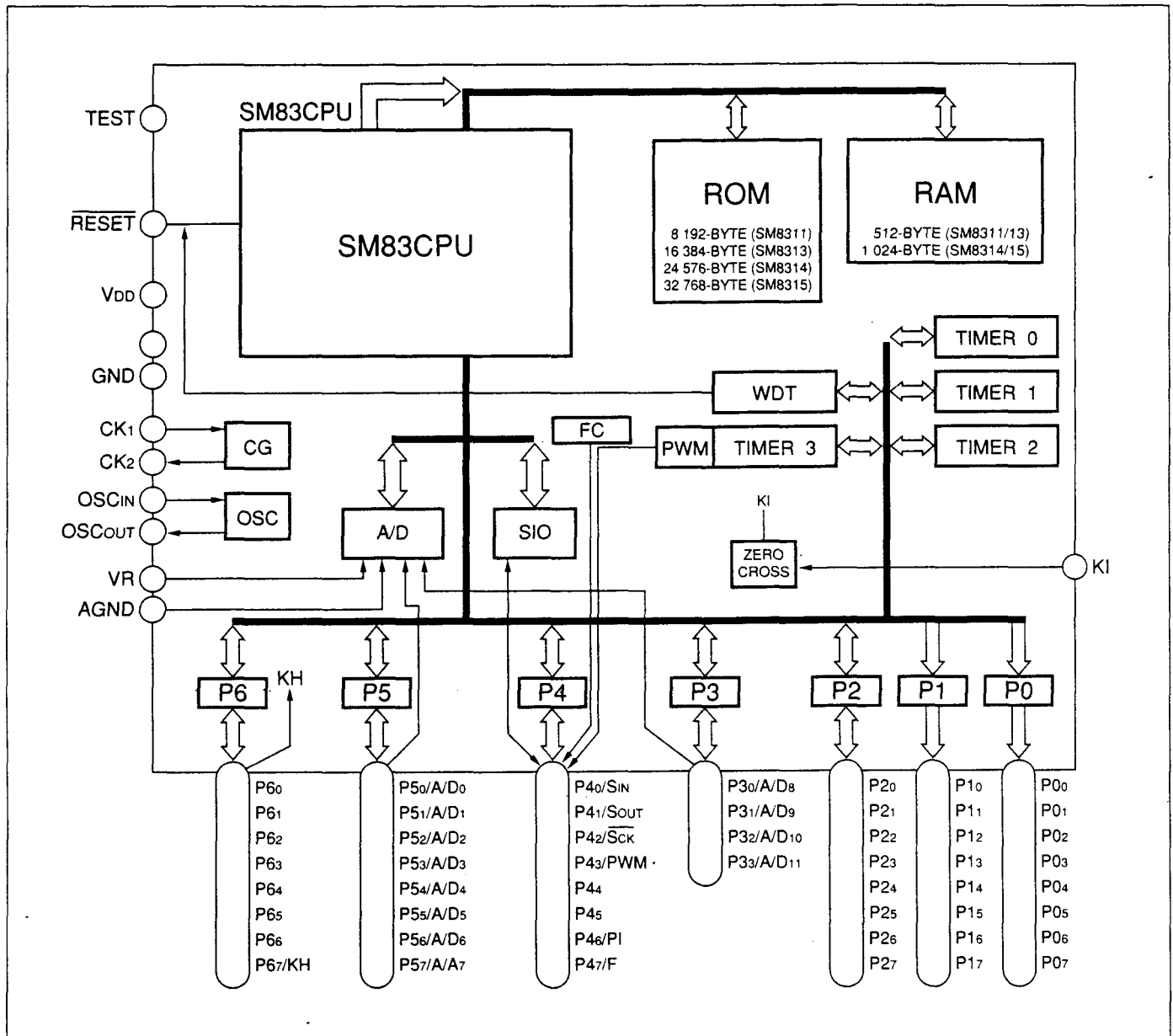
TOP VIEW



64-pin SDIP



BLOCK DIAGRAM



Nomenclature

A	: Accumulator	INT	: Interrupt control unit
A/D	: A/D convertor unit	PC	: Program counter
ALU	: Arithmetic logic unit	P0-P6	: Port register
B, C, D, E	: General-purpose register	PWM	: Pulse width modulator
CG	: System clock generator	SIO	: Serial interface
CTRL	: System control unit	SP	: Stack pointer
FC	: F port control flag	TIMER 0-TIMER 3	: Counter/timer
H, L	: RAM address register	WDT	: Watchdog timer
IE	: Interrupt enable register	ZERO CROSS	: Zero cross unit
IME	: Interrupt master enable flag		
INST/DEC	: Instruction decoder		

Singlechip LH7xxxx '790 '789 '791 SMxxxx 'K series MCU Microcontroller MPU Microprocessor  
ARM Advanced RISC Machines Databank LCD Controller LCD Driver Controllers Processors Portable  
Low Power Low Voltage High Performance Power curve MIPS MIPS/Watt Execution Cycle Multiplier  
High Speed Compact Handheld System on Chip System Integration Chip Integration Integration  
Superchip Standard Cell Core Core based IC VHDL Verilog Synthesis Chip on Board COB Chip on Flex  
COF Device on Board DOB Power Supply Controller Handy Products Development Tools Board Support  
Software Tools Tools 2.10 Software Support Emulators Evaluation Boards ICE In-Circuit Emulators  
ROM ICE SME Series Programmable User Configurable RTOS Real Time Operating Systems  
Third Party Support Software Hardware Yokogawa Digital Cosmic Compiler C Language C Like  
Assembler Linker Debugger Debug A/D D/A DAC Analog Digital 10-bit 4-bit 8-bit 16-bit 32-bit  
Address bus Data Bus