

SM3903

4-Bit Single-Chip Microcomputer (For Remote Control)

DESCRIPTION

The SM3903 is a CMOS 4-bit single-chip microcomputer incorporating 4-bit parallel processing function, carrier output circuit for remote control, ROM, RAM, 15-stage divider. Provided with 132 segments LCD drive circuit, this microcomputer is applicable to remote control system with a Low power consumption.

FEATURES

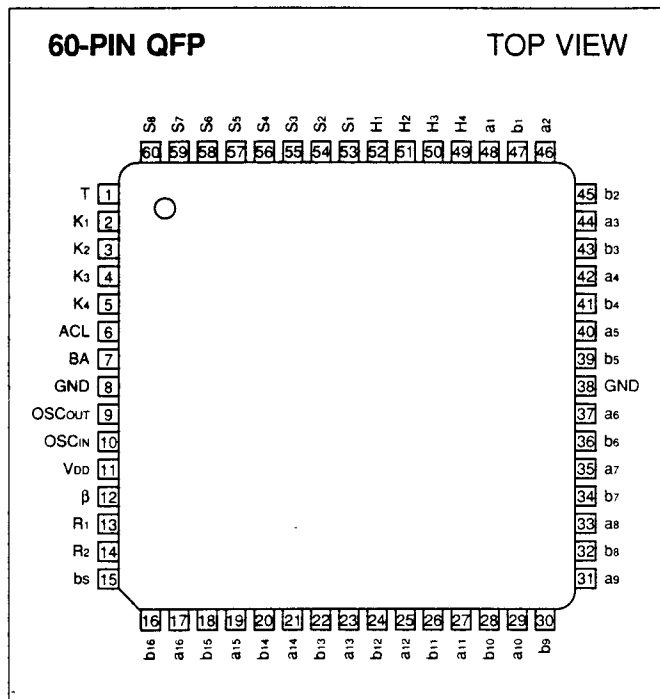
- ROM capacity : 2 772 x 8 bits
- RAM capacity : 128 x 4 bits (including 32 x 4 bits display RAM)
- Instruction sets : 49
- Subroutine nesting : 2 levels
- I/O Port :

Input	6
Output	10

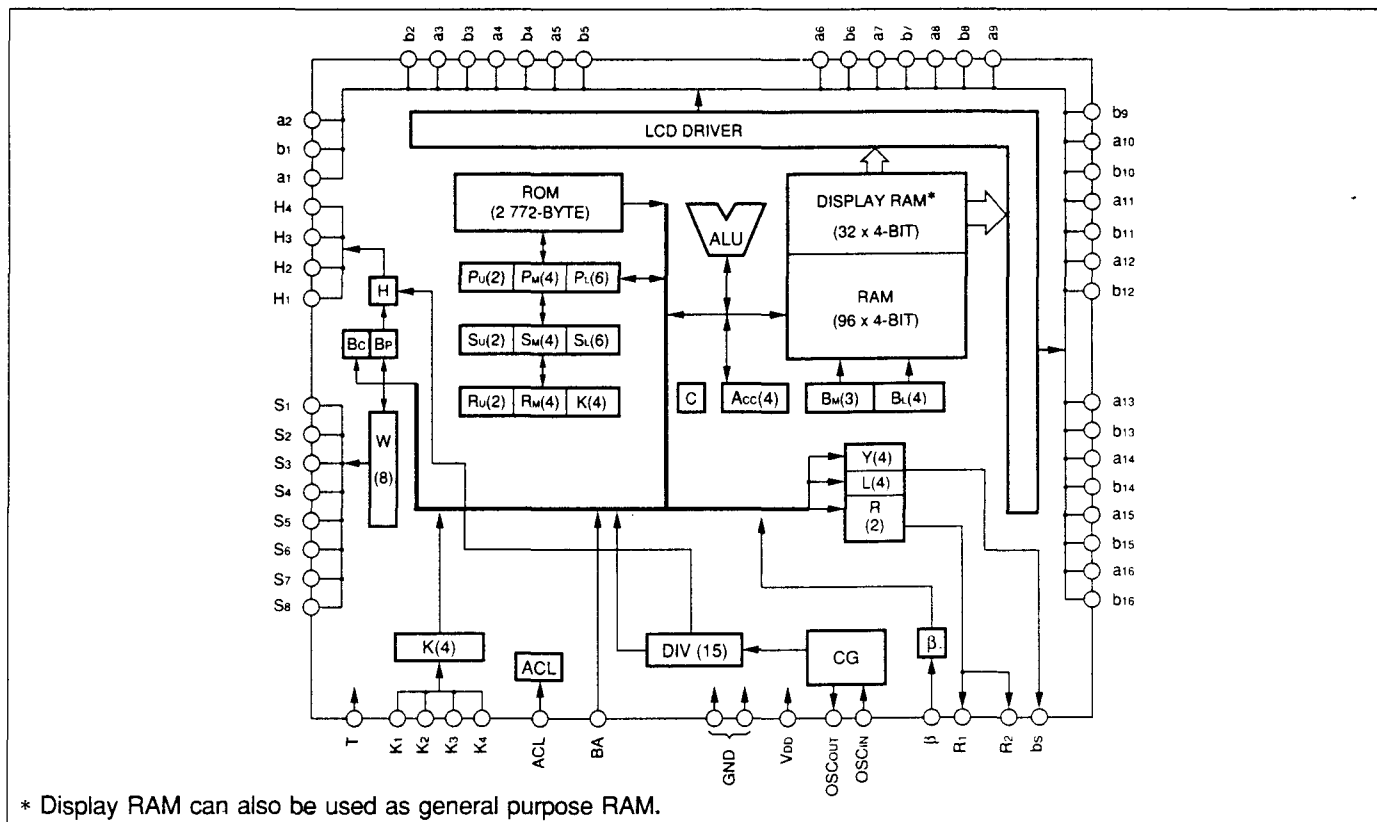
 - 33 (Used as LCD segment output port)
 - 4 (Used as LCD common output port)
- Built-in main clock oscillator for system clock
- Signal generation for real time clock
- Built-in 15 stages divider circuit for real time clock
- Built-in carrier output circuit for remote control
- Built-in LCD driver : 132 segments (1/3 bias, 1/4 duty cycle)
- Built-in carrier output circuit for remote control

Carrier frequency	32.768 kHz
Basic oscillation frequency (main clock)	32.768 kHz
Duty cycle	1/2
- Instruction cycle time : 61 μ s (TYP., 32.768 kHz, at -3 V)
- Standby function
- Supply voltage : -2.6 to -3.2 V
- Package : 60-pin QFP(QFP060-P-1414)

PIN CONNECTIONS



BLOCK DIAGRAM



Nomenclature

ALU	: Arithmetic logic unit	W	: 8-bit shift register
Acc	: Accumulator	β	: Independent input register
ACL	: Auto clear circuit	B_M, B_L	: RAM address register
C	: Carry F/F	B_P, B_C	: Backplate signal generator circuit
P_U, P_M, P_L	: Program counter	H, L, Y	: 4-bit F/F
S_U, S_M, S_L	: Stack register of program counter	R	: Control register for remote control output
R_U, R_M, R_L	: Stack register of program counter	K	: Key input F/F
DIV	: Divider	CG	: Clock Generator

PIN DESCRIPTION

SYMBOL	I/O	CIRCUIT TYPE	FUNCTION
a_i, b_i	O		Segment output ports ($i = 1$ to 16)
b_s			
H_1-H_4	O		Common output ports
S_1-S_8	O		Strobe output ports
T	I		Test input port (normally connected to GND)
K_1-K_4	I	pull-down	Key input ports
OSC_{IN}			Crystal oscillator
OSC_{OUT}			
BA, β	I	pull-up	Independent input ports
GND, V_{DD}			Power supply
R_1, R_2	O		Remote control carrier output
ACL	I	pull-down	Auto clear input port

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT	NOTE
Supply voltage	V _{DD}	-3.5 to +0.3	V	1
	V _{IN}	V _{DD} to +0.3	V	
Operating temperature	T _{OPR}	0 to +50	°C	
Storage temperature	T _{STG}	-20 to +125	°C	

NOTE :

1. The maximum applicable voltage on any pin with respect to GND.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply voltage	V _{DD}	-3.2 to -2.6	V
Crystal oscillation frequency	fosc	32.768 (TYP.)	kHz

DC CHARACTERISTICS

(V_{DD} = -3.2 to -2.9 V, T_a = 25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Input voltage	V _{IH1}		-0.6			V	1
	V _{IL1}				V _{DD} +0.6	V	
	V _{IH2}		-0.3			V	2
	V _{IL2}				V _{DD} +0.3	V	
Input current	I _{IH}	V _{IN} = 0 V			15	μA	3
	I _{IL}	V _{IN} = V _{DD}			15	μA	4
Output voltage	V _{OH}	I _{OUT} = 50 μA to V _{DD}	-0.5			V	5
	V _{OL}	I _{OUT} = 5 μA to GND			V _{DD} +0.5	V	
	V _{OA}	V _{DD} = -3.0 V No load	-0.3	0	0	V	6
	V _{OB}		-1.3	-1.0	-0.7	V	
	V _{OC}		-2.3	-2.0	-1.7	V	
	V _{OD}		-3.0	-3.0	-2.7	V	
Output current	I _{SO}	V _{OUT} = -0.2 V	100			μA	7
	I _{SIN}	V _{OUT} = V _{DD} +0.2 V	100			μA	
Supply current	I _{DA}	During full-range operation		40		μA	8
	I _{DS}	When system clock is stationary		12		μA	

NOTES :

1. Applied to pins K₁-K₄, β.
2. Applied to pins ACL, BA.
3. Applied to pins K₁-K₄.
4. Applied to pin β.
5. Applied to pins S₁-S₈.
6. Applied to pins a₁-a₁₆, b₁-b₁₆, b_s, H₁-H₄.
7. Applied to pins R₁, R₂.
8. No load condition when bleeder resistance is ON.

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