To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

3812 Group

SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

DESCRIPTION

The 3812 group is the 8-bit microcomputer based on the 740 family core technology.

The 3812 group has six 8-bit timers, and an 8-channel A-D converter as additional functions.

The various microcomputers in the 3812 group include variations of internal memory size and packaging. For details, refer to the section on part numbering.

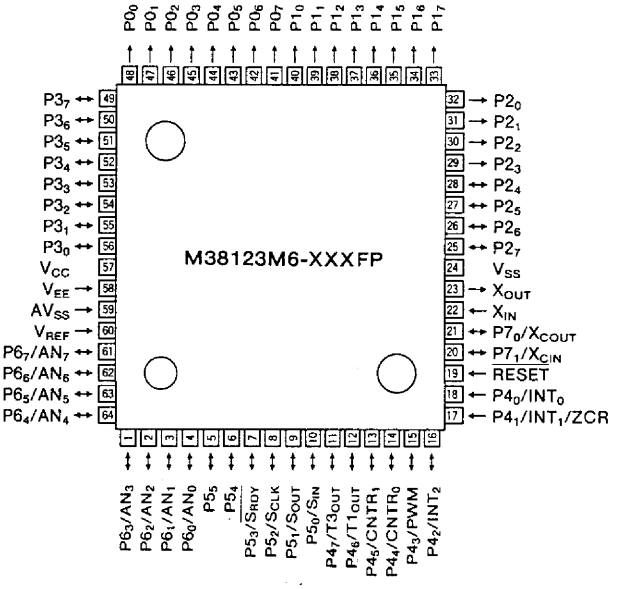
FEATURES

- Basic machine-language instructions 71
- The minimum instruction execution time ..... 0.63μs (at 6.3MHz oscillation frequency)
- Memory size
  - ROM ..... 4K to 60K bytes
  - RAM ..... 192 to 1024 bytes
- Programmable input/output ports 34
- High-breakdown-voltage output ports 28
- Software pull-up/pull-down resistors ($P2_4$-$P2_7$, $P5_0$-$P5_5$)
- Interrupts ..... 14 sources, 13 vectors
- Timers ..... 8-bit×6
- Serial I/O ..... 8-bit×1 (Clock-synchronized)
- A-D converter ..... 8-bit×8 channel
- Zero cross detection input ..... 1 channel
- 2 Clock generating circuit
  - Clock (X_{IN}-X_{OUT}) ..... Internal feedback resistor
  - Sub-clock (X_{CIN}-X_{COUT}) ..... without internal feedback resistor
  - (connect to an external ceramic resonator or a quartz-crystal oscillator)
- Power source voltage
  - In high-speed mode ..... 4.0 to 5.5V (at 6.3MHz oscillation frequency and high-speed selected)
  - In middle-speed mode ..... 2.8 to 5.5V (at 6.3MHz oscillation frequency and middle-speed selected)
  - In low-speed mode ..... 2.8 to 5.5V (at 32KHz oscillation frequency)
- Power dissipation
  - In high-speed mode ..... 38mW (at 6.3MHz oscillation frequency)
  - In low-speed mode ..... 300μW (at 32kHz oscillation frequency)
- Operating temperature range ..... −10 to +85°C

APPLICATIONS

VCRs, tuners, musical instruments, office automation, etc.

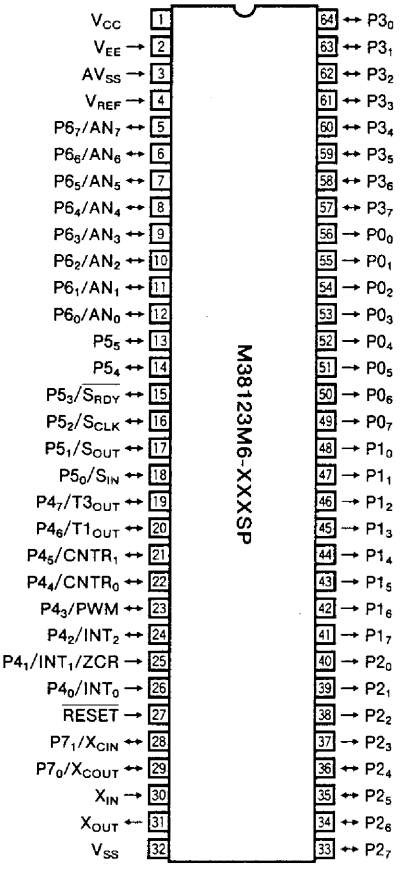
PIN CONFIGURATION (TOP VIEW)



Package type : 64P6N-A

64-pin plastic-molded QFP

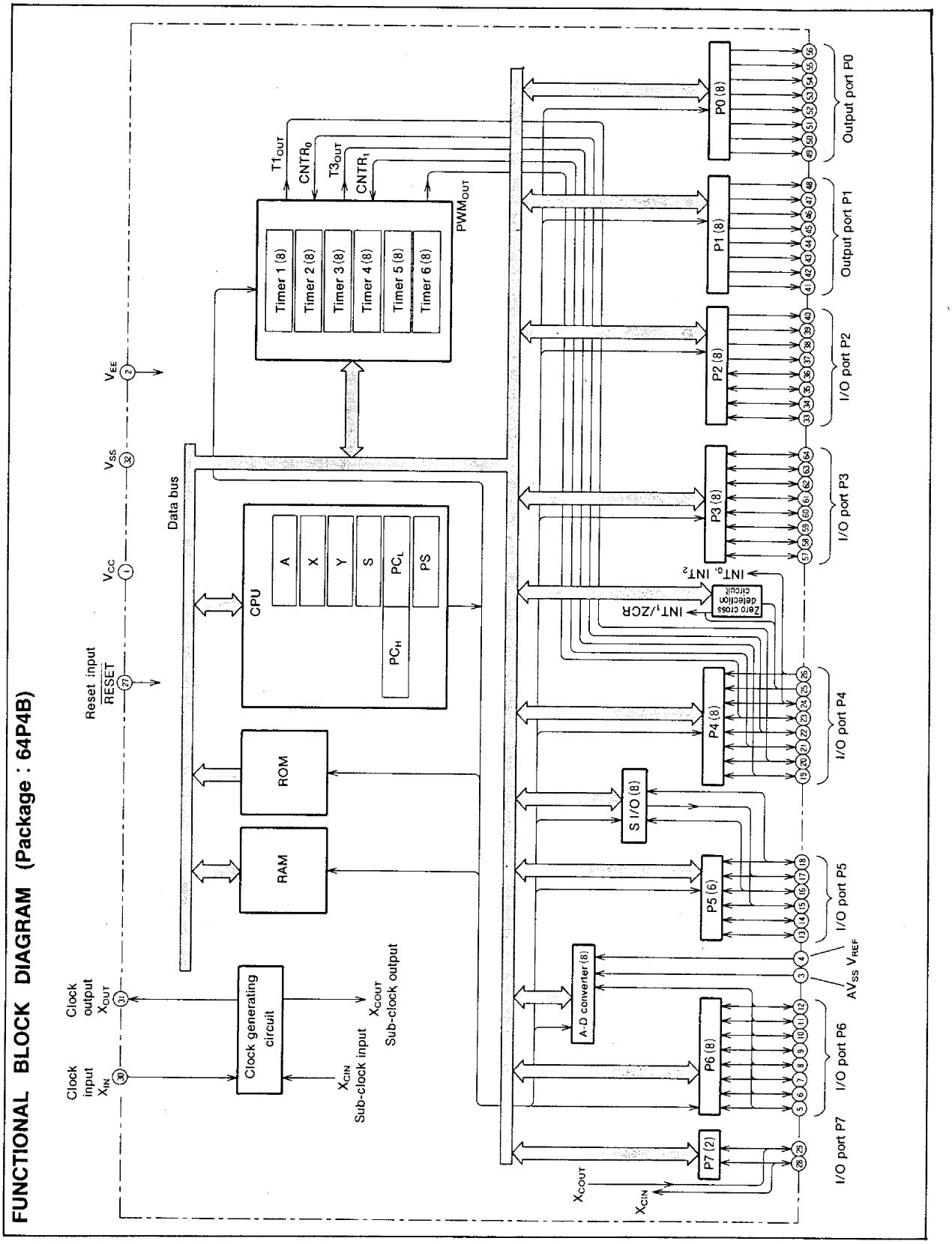
PIN CONFIGURATION (TOP VIEW)



Package type : 64P4B

64-pin shrink plastic-molded DIP

FUNCTIONAL BLOCK DIAGRAM (Package : 64P4B)



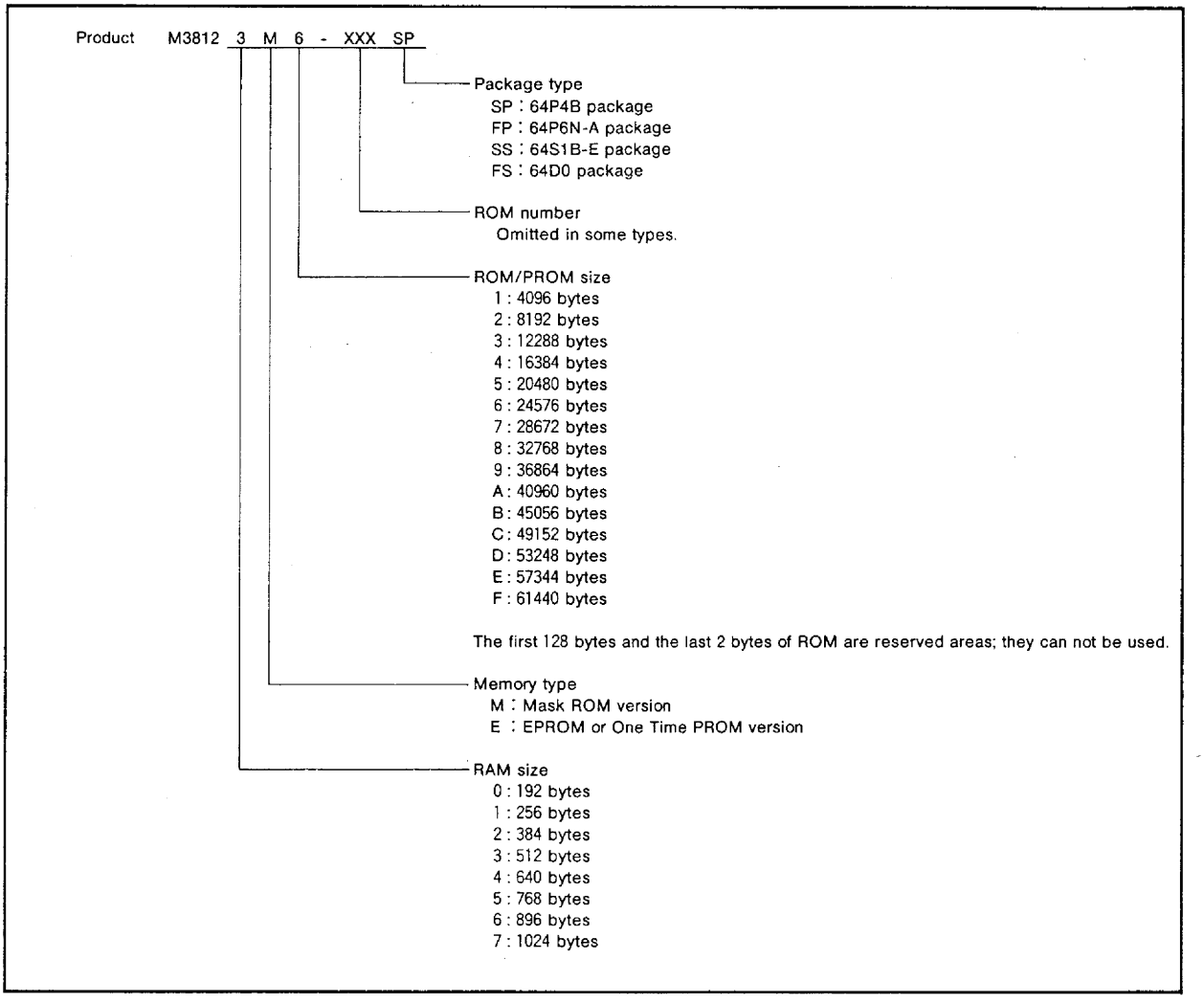
PIN DESCRIPTION

Pin	Name	Function	Function except a port function
V_{CC}, V_{SS}	Power source	• Apply voltage of 4.0 to 5.5V to V_{CC}, and 0V to V_{SS}.	
V_{EE}	Pull-down power source input	• Applies voltage supplied to pull-down resistors of ports P0, P1, and $P2_0$-$P2_3$.	
V_{REF}	Analog reference voltage	• Reference voltage input pin for A-D converter	
AV_{SS}	Analog power source	• Analog power source input pin for A-D converter • Connect AV_{SS} to V_{SS}.	
$\overline{RESET}$	Reset input	• Reset input pin for active "L"	
X_{IN}	Clock input	• Input and output signals for the internal clock generating circuit. • Feedback resistor is built in between X_{IN} pin and X_{OUT} pin. • Connect a ceramic resonator or a quartz-crystal oscillator between the X_{IN} and X_{OUT} pins to set the oscillation frequency. • If an external clock is used, connect the clock source to the X_{IN} pin and leave the X_{OUT} pin open. • This clock is used as the oscillating source of system clock.	
X_{OUT}	Clock output		
$P0_0$-$P0_7$	Output port P0	• 8-bit output port • Each port builds in pull-down resistor between the output and the V_{EE} pin. • The high-breakdown-voltage p-channel open-drain output • At reset these pins are set to the V_{EE} pin level.	
$P1_0$-$P1_7$	Output port P1		
$P2_0$-$P2_3$	Output port P2	• 4-bit output port with the same function as port P0.	
$P2_4$-$P2_7$	I/O port P2	• 4-bit I/O port • I/O direction register allows each pin to be individually programmed as either input or output. • At reset this port is set to input mode. • Pull-up/pull-down register and I/O direction register allow each pin to be programmed as pull-down. • TTL input level • CMOS 3-state output	
$P3_0$-$P3_7$	I/O port P3	• 8-bit I/O port with the same function as port $P2_4$-$P2_7$ • CMOS compatible input level • The high-breakdown-voltage P-channel open-drain.	
$P4_0/INT_0$, $P4_1/INT_1$/ ZCR	Input port P4	• 2-bit input port. • CMOS compatible input level	External interrupt input pins A zero cross detection circuit input pin ($P4_1$)
$P4_2/INT_2$	I/O port P4	• 6-bit CMOS I/O port with the same function as port $P2_4$-$P2_7$ • CMOS compatible input level • CMOS 3-state output	
$P4_3$/PWM			A PWM output pin (Timer output pin)
$P4_4/CNTR_0$, $P4_5/CNTR_1$			Timer 2, Timer 4 input pins
$P4_6/T1_{OUT}$, $P4_7/T3_{OUT}$			Timer 1, Timer 3 output pins

PIN DESCRIPTION (Continued)

Pin	Name	Function	Function except a port function
$P5_0/S_{IN}$, $P5_1/S_{OUT}$, $P5_2/\overline{S_{CLK}}$, $P5_3/\overline{S_{RDY}}$	I/O port P5	• 8-bit CMOS I/O port with the same function as port $P2_4$-$P2_7$ • Keep the input voltage of this port between 0V and V_{CC}. • The pull-up/pull-down register and I/O direction register allow each pin to be programmed as pull-up. • CMOS compatible input level • N-channel open-drain output	Serial I/O pins
$P5_4$, $P5_5$		• 2-bit CMOS I/O port with the same function as port $P2_4$-$P2_7$ • The pull-up/pull-down register and I/O direction register allow each pin to be programmed as pull-up. • CMOS compatible input level • CMOS 3-state output	
$P6_0/AN_0$-$P6_7/AN_7$	I/O port P6	• 8-bit CMOS I/O port with the same function as port $P2_4$-$P2_7$ • CMOS compatible input level • CMOS 3-state output	A-D converter input pins
$P7_0/X_{COUT}$, $P7_1/X_{CIN}$	I/O port P7	• 2-bit CMOS I/O port with the same function as port $P2_4$-$P2_7$ • CMOS compatible input level • CMOS 3-state output	An I/O pin for the internal sub-clock generating circuit (connect a ceramic resonator or a quartz-crystal oscillator)

PART NUMBERING



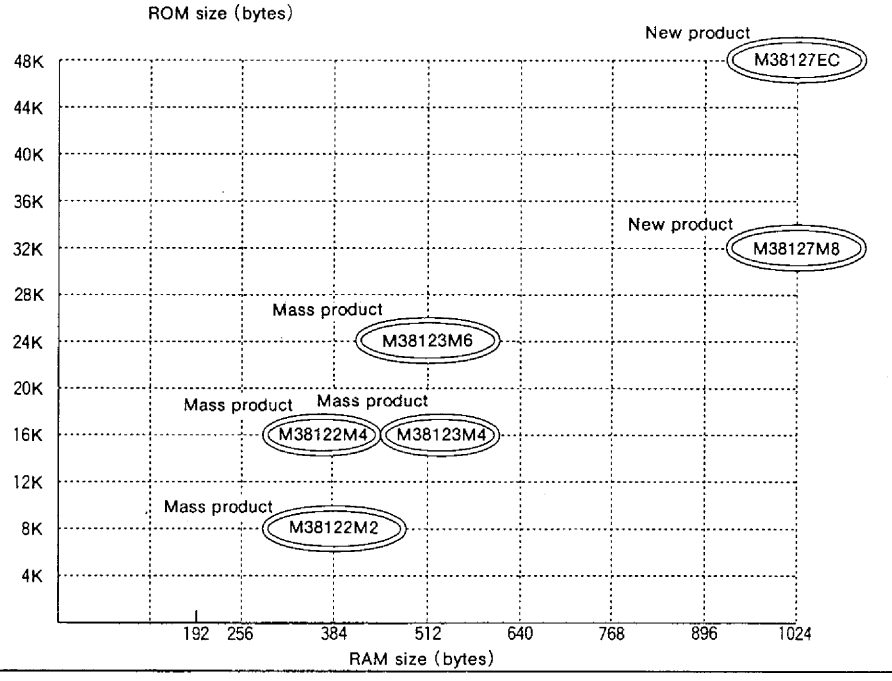
GROUP EXPANSION

Mitsubishi plans to expand the 3812 group as follows:

(1) Support for mask ROM, One Time PROM, and EPROM versions
ROM/PROM size ..... 8K to 48K bytes
RAM size ..... 384 to 1024 bytes

(2) Packages
64P4B ..... Shrink plastic molded DIP
64P6N-A ..... Plastic molded QFP
64S1B-E ..... Shrink ceramic DIP (EPROM version)
64D0 ..... Ceramic LCC (EPROM version)

Memory Expansion Plan



Currently supported products are listed below. As of May 1996

Product	(P) ROM size (bytes) ROM size for User in ( )	RAM size (bytes)	Package	Remarks
M38122M2-XXXSP	8192	384	64P4B	Mask ROM version
M38122M2-XXXFP	(8062)		64P6N-A	Mask ROM version
M38122M4-XXXSP	16384		64P4B	Mask ROM version
M38122M4-XXXFP	(16254)		64P6N-A	Mask ROM version
M38123M4-XXXSP		512	64P4B	Mask ROM version
M38123M4-XXXFP			64P6N-A	Mask ROM version
M38123M6-XXXSP	24576		64P4B	Mask ROM version
M38123M6-XXXFP	(24446)		64P6N-A	Mask ROM version
M38127M8-XXXSP	32768	1024	64P4B	Mask ROM version
M38127M8-XXXFP	(32638)		64P6N-A	Mask ROM version
M38127EC-XXXSP	49152		64P4B	One Time PROM version
M38127EC-XXXFP	(49022)		64P6N-A	One Time PROM version
M38127ECSP			64P4B	One Time PROM version (blank)
M38127ECFP			64P6N-A	One Time PROM version (blank)
M38127ECSS			64S1B-E	EPROM version
M38127ECFS			64D0	EPROM version

MITSUBISHI MICROCOMPUTERS

3812 Group

SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

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RENESAS
Renesas Technology Corp.

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		Page	Summary
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