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.

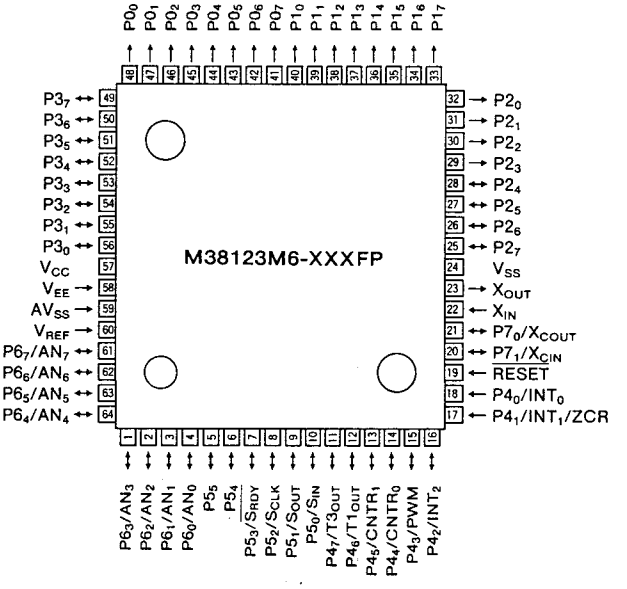
FEATURES

- 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.

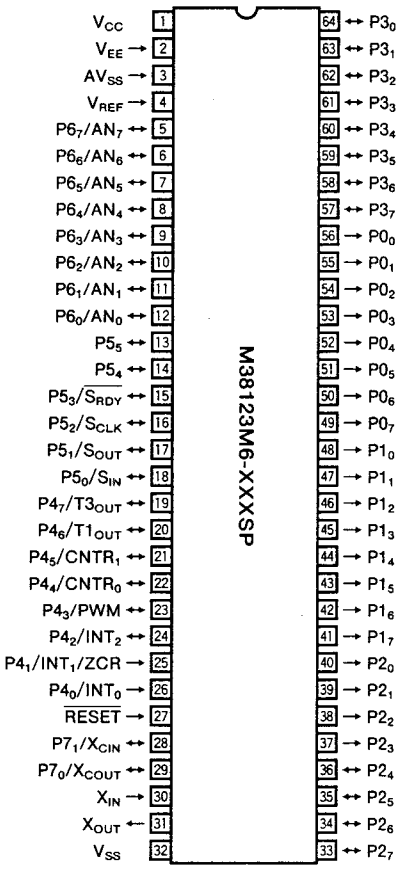
PIN CONFIGURATION (TOP VIEW)



Package type : 64P6N-A

64-pin plastic-molded QFP

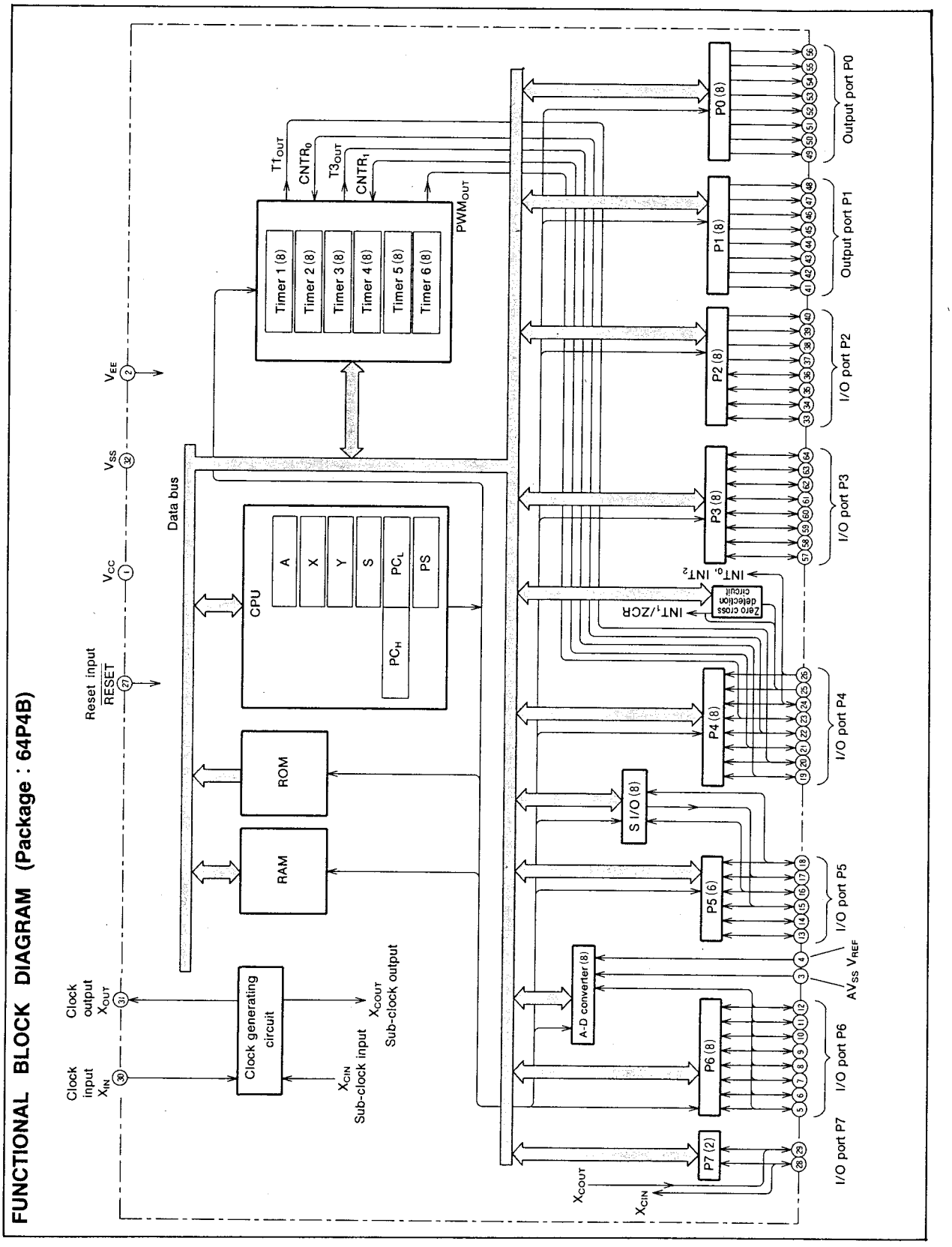
PIN CONFIGURATION (TOP VIEW)



Package type : 64P4B

64-pin shrink plastic-molded DIP

FUNCTIONAL BLOCK DIAGRAM (Package : 64P4B)



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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

Product M3812 3 M 6 - XXX SP

Package type
SP : 64P4B package
FP : 64P6N-A package
SS : 64S1B-E package
FS : 64D0 package

ROM number
Omitted in some types.

ROM/PROM size
1 : 4096 bytes
2 : 8192 bytes
3 : 12288 bytes
4 : 16384 bytes
5 : 20480 bytes
6 : 24576 bytes
7 : 28672 bytes
8 : 32768 bytes
9 : 36864 bytes
A : 40960 bytes
B : 45056 bytes
C : 49152 bytes
D : 53248 bytes
E : 57344 bytes
F : 61440 bytes

The first 128 bytes and the last 2 bytes of ROM are reserved areas; they can not be used.

Memory type
M : Mask ROM version
E : EPROM or One Time PROM version

RAM size
0 : 192 bytes
1 : 256 bytes
2 : 384 bytes
3 : 512 bytes
4 : 640 bytes
5 : 768 bytes
6 : 896 bytes
7 : 1024 bytes

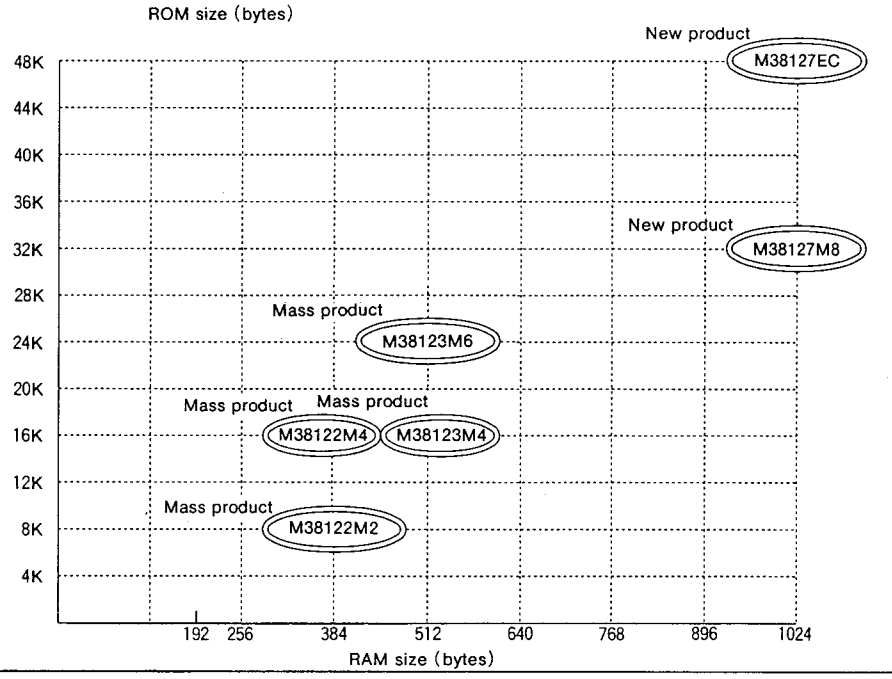
GROUP EXPANSION

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 (16254)		64P4B	Mask ROM version
M38122M4-XXXFP			64P6N-A	Mask ROM version
M38123M4-XXXSP		512	64P4B	Mask ROM version
M38123M4-XXXFP			64P6N-A	Mask ROM version
M38123M6-XXXSP	24576 (24446)		64P4B	Mask ROM version
M38123M6-XXXFP			64P6N-A	Mask ROM version
M38127M8-XXXSP	32768 (32638)	1024	64P4B	Mask ROM version
M38127M8-XXXFP			64P6N-A	Mask ROM version
M38127EC-XXXSP	49152 (49022)		64P4B	One Time PROM version
M38127EC-XXXFP			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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