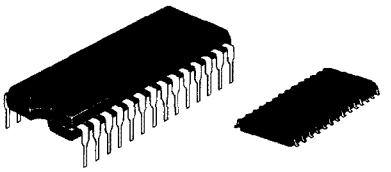
M5M27C512AP,FP-15

524288-BIT(65536-WORD BY 8-BIT) CMOS ONE TIME PROGRAMMABLE ROM



DESCRIPTION

The Mitsubishi M5M27C512AP, FP are high-speed 524288-bit one time programmable read only menories.

They are suitable for microprocessor programming applications where rapid turn-around is required. The M5M27C512AP, FP are fabricated by N-channel double polysilicon gate and CMOS technology for peripheral circuits and are available in 28-pin plastic packages.

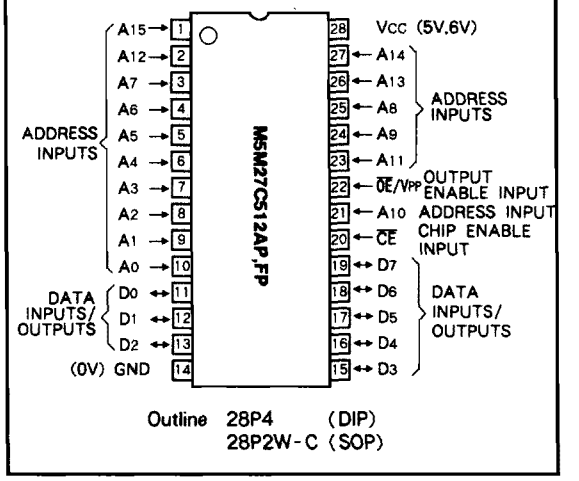
FEATURES

- 65536 Word × 8-bit organization
- Package DIP M5M27C512AP-15
  SOP M5M27C512AFP-15
- Access time..... 150ns (max.)
- Programming voltage :..... 12.5V
- Two line control $\overline{OE}$, $\overline{CE}$
- Low power current (I_{CC}) : Active ..... 50mA (max.)
  Stand by ..... 1mA (max.)
- Single 5V power supply
- 3-State output buffer
- Input and output TTL-compatible in read and program mode
- Fast programming algorithm

APPLICATION

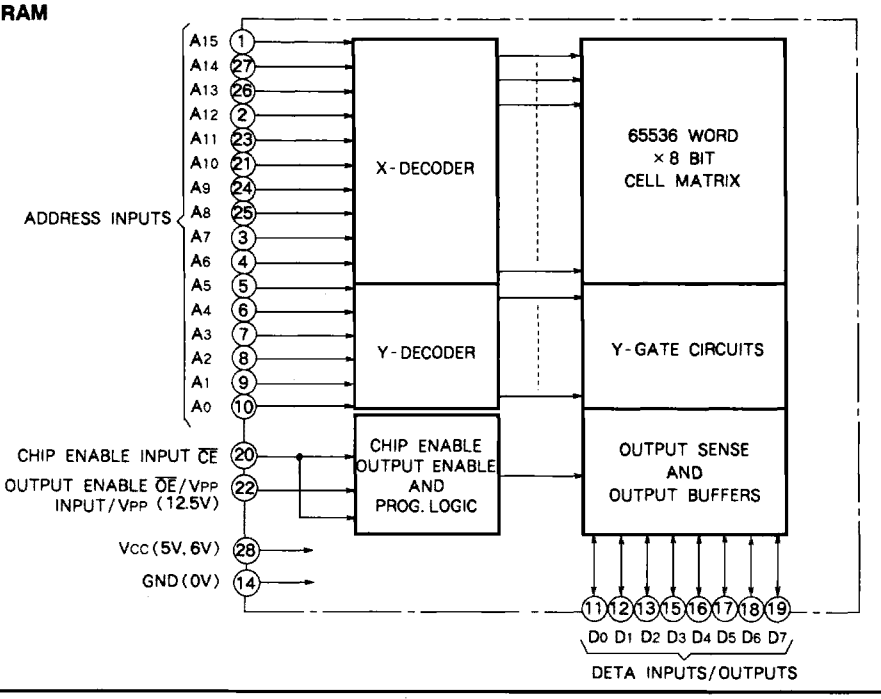
Microcomputer systems and peripheral equipment

PIN CONFIGURATION (TOP VIEW)



Outline 28P4 (DIP)
28P2W-C (SOP)

BLOCK DIAGRAM



FUNCTION

Read

Set the $\overline{CE}$ and $\overline{OE}/V_{PP}$ terminals to the read mode (low level). Low level input to $\overline{CE}$ and $\overline{OE}/V_{PP}$ and address signals to the address inputs (A_0~A_{15}) make the data contents of the designated address location available at the data input /output (D_0~D_7). When the $\overline{CE}$ or $\overline{OE}/V_{PP}$ signal is high, data input/output are in a floating state.

When the $\overline{CE}$ signals is high, the device is in the standby mode or power-down mode.

Programming

(Fast programming algorithm)

First set $V_{CC} = 6V$, $\overline{OE}/V_{PP} = 12.5V$ and then set an address to first address to be programmed. After applying 1ms program pulse ($\overline{CE}$) to the address, verify is performed. If the output data of that address is not verified correctly, apply one more 1ms program pulse. The programmer continues 1ms pulse-then-verify routines until the device verify correctly or twenty five of these pulse-then-verify routines have been completed. The programmer also maintains its total number of 1ms pulses applied to that address in register X. And then applied a program pulse 3 times of register X value long as an overprogram pulse. When the programming procedure above is finished, step to the next address and repeat this procedure till last address to be programmed.

Erase

The M5M27C512AP, FP cannot be erased, because it is packaged in plastic without transparent lid.

MODE SELECTION

Mode \ Pins	$\overline{CE}$ (20)	$\overline{OE}/V_{PP}$ (22)	V_{CC} (28)	Outputs (11~13, 15~19)
Read	V_{IL}	V_{IL}	5V	Data out
Output disable	V_{IL}	V_{IH}	5V	Floating
Standby	V_{IH}	X*	5V	Floating
Program	V_{IL}	12.5V	6V	Data in
Program inhibit	V_{IH}	12.5V	6V	Floating

* : X can be either V_{IL} or V_{IH}.

ABSOLUTE MAXIMUM RATINGS (Note 1)

Symbol	Parameter	Conditions	Ratings	Unit
V_{I1}	All input or output voltage	With respect to Ground	−0.6~7.0	V
V_{I2}	$\overline{OE}/V_{PP}$ supply voltage		−0.6~14.0	V
V_{I3}	A_9 input voltage		−0.6~13.5	V
T_{opr}	Operating temperature		−10~80	℃
T_{stg}	Storage temperature		−65~150	℃

Note 1 : Stresses above those listed may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods affects device reliability.

READ OPERATION

DC ELECTRICAL CHARACTERISTICS (T_a = 0~70℃, V_{CC} = 5V ± 10%, unless otherwise noted)

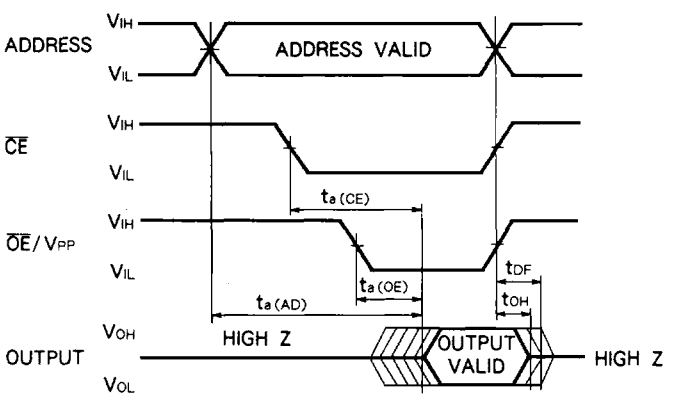
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{LI}	Input leakage current	V_{IN} = 0~V_{CC}			10	μA
I_{LO}	Outout leakage current	V_{OUT} = 0~V_{CC}			10	μA
I_{SB1}	V_{CC} current standby	$\overline{CE}$ = V_{IH}			1	mA
I_{SB2}		$\overline{CE}$ = V_{CC}		1	100	μA
I_{CC1}	V_{CC} current active	$\overline{CE}$ = $\overline{OE}$/V_{PP} = V_{IL}			50	mA
I_{CC2}		f = 10MHz, I_{OUT} = 0mA			50	mA
V_{IL}	Input low voltage		−0.1		0.8	V
V_{IH}	Input high voltage		2.0		V_{CC}+1	V
V_{OL}	Output low voltage	I_{OL} = 2.1mA			0.45	V
V_{OH}	Output high voltage	I_{OH} = −400 μA	2.4			V

Note 2 : Typical values are at T_a = 25℃ and nominal supply voltage.

AC ELECTRICAL CHARACTERISTICS (T_a = 0~70℃, V_{CC} = 5V ± 10%, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{a(AD)}$	Address to output delay	$\overline{CE}$ = $\overline{OE}$/V_{PP} = V_{IL}			150	ns
$t_{a(CE)}$	$\overline{CE}$ to output delay	$\overline{OE}$/V_{PP} = V_{IL}			150	ns
$t_{a(OE)}$	$\overline{OE}$ to output delay	$\overline{CE}$ = V_{IL}			60	ns
t_{DF}	$\overline{OE}$ high to output float	$\overline{CE}$ = V_{IL}	0		50	ns
t_{OH}	Output hold from $\overline{CE}$ = $\overline{OE}$ or address	$\overline{CE}$ = $\overline{OE}$/V_{PP} = V_{IL}	0			ns

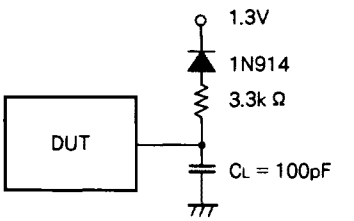
AC WAVEFORMS



Test conditions for A.C characteristics
Input voltage : V_{IL} = 0.45V, V_{IH} = 2.4V
Input rise and fall times : ≦ 10ns
Reference voltage at timing measurement : 1.5V

Output load : 1TTL gate + C_L (100pF)

or



CAPACITANCE

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
C_{IN}	Input capacitance	T_a = 25℃, f = 1MHz, V_I = V_O = 0V		4	6	pF
$C_{\overline{OE}/V_{PP}}$	$\overline{OE}$/V_{PP} inpuut capacitance			25	30	pF
C_{OUT}	Output capacitance			8	12	pF

PROGRAM OPERATION

FAST PROGRAMMING ALGORITHM

DC ELECTRICAL CHARACTERISTICS (T_a = 25 ± 5℃, V_{CC} = 6V ± 0.25V, V_{PP} = 12.5V ± 0.3V, unless otherwise noted)

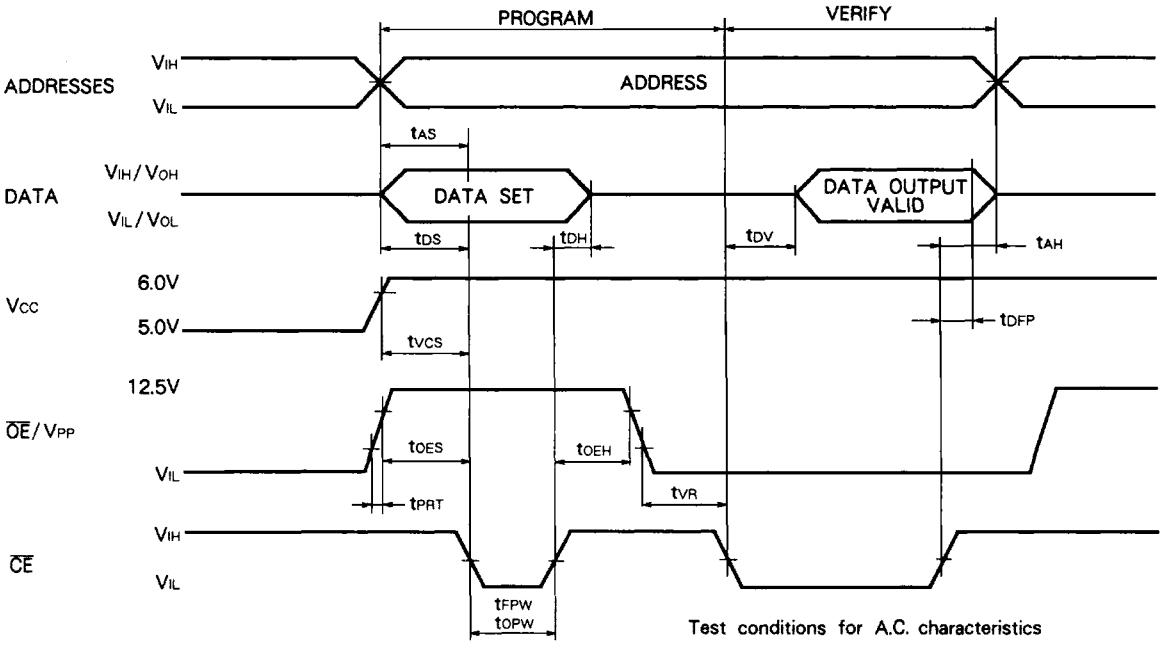
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Tpy	Max	
I_{LI}	Input current	V_{IN} = 0~V_{CC}			10	μA
V_{OL}	Output low voltage	I_{OL} = 2.1mA			0.45	V
V_{OH}	Output high voltage	I_{OH} = −400 μA	2.4			V
V_{IL}	Input low voltage		−0.1		0.8	V
V_{IH}	Input high voltage		2.0		V_{CC}	V
I_{CC}	V_{CC} supply current				50	mA
I_{PP}	$\overline{OE}/V_{PP}$ supply current	$\overline{CE}$ = V_{IL}			50	mA

AC ELECTRICAL CHARACTERISTICS (T_a = 25 ± 5℃, V_{CC} = 6V ± 0.25V, V_{PP} = 12.5V ± 0.3V, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{AS}	Address setup time		2			μs
t_{OES}	$\overline{OE}/V_{PP}$ setup time		2			μs
t_{OEH}	$\overline{OE}/V_{PP}$ hold time		2			μs
t_{DS}	Data setup time		2			μs
t_{AH}	Address hold time		0			μs
t_{DH}	Data hold time		2			μs
t_{DFP}	$\overline{OE}$ to output float delay		0		130	ns
t_{VCS}	V_{CC} setup time		2			μs
t_{FPW}	$\overline{CE}$ initial program pulse width		0.95	1.0	1.05	ms
t_{OPW}	$\overline{CE}$ over program pulse width		2.85		78.75	ms
t_{DV}	Data valid from $\overline{CE}$				1	μs
t_{VR}	$\overline{OE}/V_{PP}$ recovery time		2			μs
t_{PRT}	$\overline{OE}/V_{PP}$ pulse rise time during program		50			ns

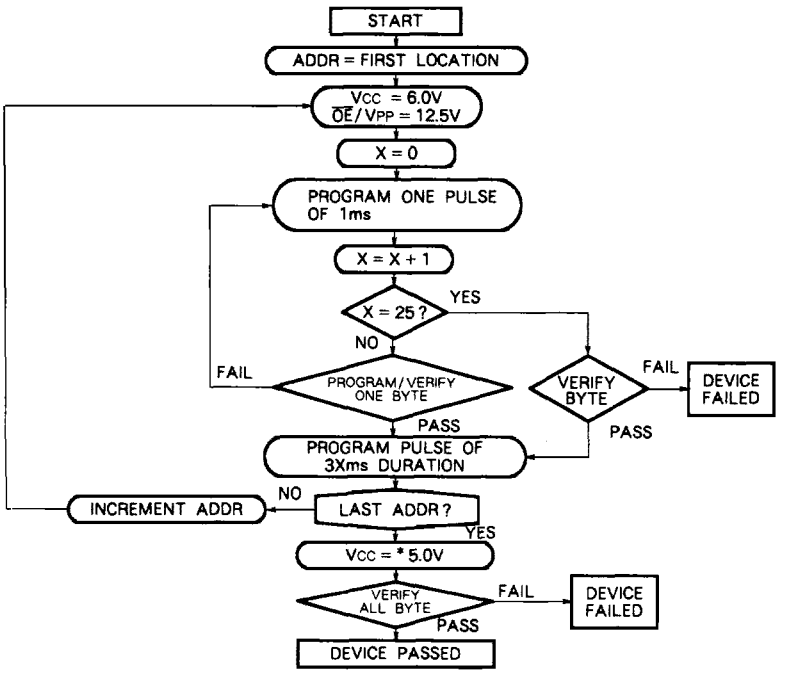
Note 3 : V_{CC} must be applied simultaneously or before $\overline{OE}/V_{PP}$ and removed simultaneously or after $\overline{OE}/V_{PP}$.

FAST PROGRAMMING AC WAVEFORMS



Test conditions for A.C. characteristics
Input voltage : V_{IL} = 0.45V, V_{IH} = 2.4V
Input rise and fall times : ≤ 20ns
Reference voltage at timing measurement : 1.5V

FAST PROGRAMMING ALGORITHM FLOW CHART



* 4.5V ≤ VCC ≤ 5.5V

DEVICE IDENTIFIER MODE

The Device Identifier Mode allows the reading of a binary code from the OTP ROM that identifies the manufacturer and device type.

The PROM Programmer reads the manufacturer code and the device code and automatically selects the corresponding programming algorithm.

M5M27C512AP, FP-15 DEVICE IDENTIFIER CODE

Code \ Pin	A_0 (10)	D_7 (19)	D_6 (18)	D_5 (17)	D_4 (16)	D_3 (15)	D_2 (13)	D_1 (12)	D_0 (11)	Hex Data
Manufacturer code	V_{IL}	0	0	0	1	1	1	0	0	1C
Device code	V_{IH}	0	0	0	0	0	1	1	1	07

Note 4 : V_{CC} = 5V ± 10%, A_9 = 12.0 ± 0.5V, A_1~A_8, A_{10}~A_{15}, $\overline{CE}$, $\overline{OE}/V_{PP}$ = V_{IL}.

RECOMMENDED SCREENING CONDITION

The following screening test is recommended before using.