M5M27C128K, -2, -3

131 072-BIT(16384-WORD BY 8-BIT) CMOS ERASABLE AND ELECTRICALLY REPROGRAMMABLE ROM

DESCRIPTION

The Mitsubishi M5M27C128K is a high-speed 131072-bit ultraviolet erasable and electrically reprogrammable read only memory. It is suitable for microprocessor programming applications where rapid turn-around is required. The M5M27C128K is fabricated by N-channel double polysilicon Memory gate and CMOS technology for peripheral circuits, and available in a 28 pin DIL package with a transparent lid.

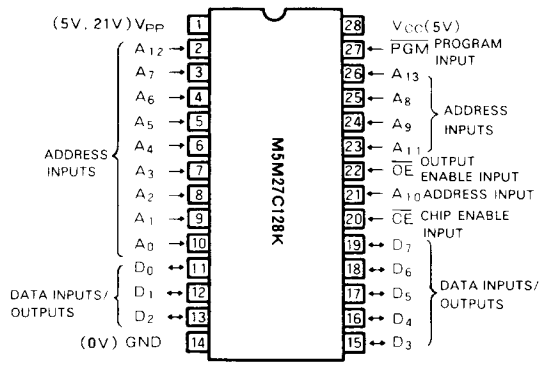
FEATURES

- 16384 word x 8 bit organization
- Access time M5M27C128K-2 . . . . . 200ns (max.)
  M5M27C128K . . . . . 250ns (max.)
  M5M27C128K-3 . . . . . 300ns (max.)
- Two line control $\overline{OE}$, $\overline{CE}$
- Low power current (I_{CC}): Active . . . . . 30mA (max.)
  Standby . . . . 1mA (max.)
- Single 5V power supply
- 3-State output buffer
- Input and output TTL-compatible in read and program mode
- Standard 28-pin DIL package
- Fast programming algorithm
- Interchangeable with M5L27128K

APPLICATION

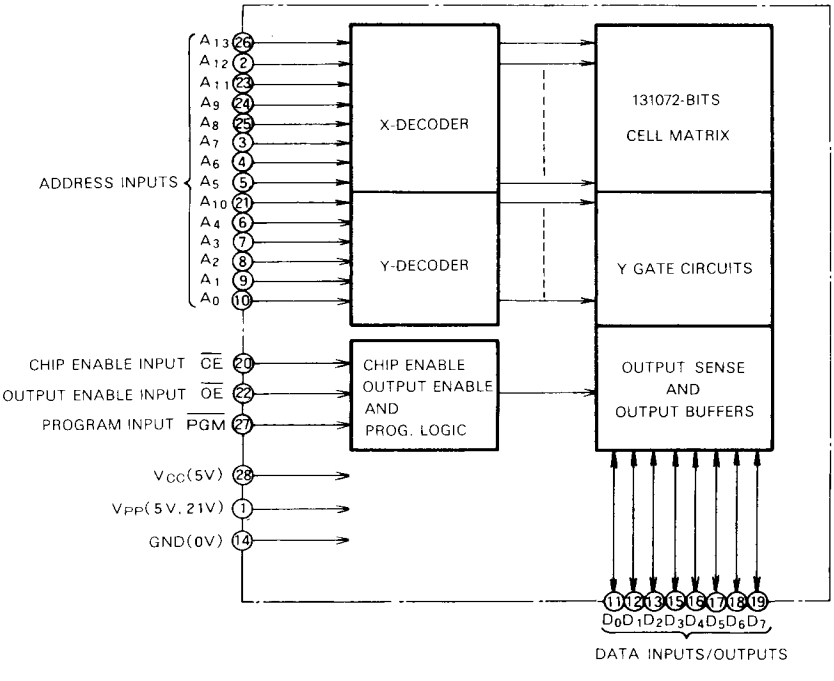
- Microcomputer systems and peripheral equipment

PIN CONFIGURATION (TOP VIEW)



Outline 28K4

BLOCK DIAGRAM



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FUNCTION

Read

Set the $\overline{CE}$ and $\overline{OE}$ terminals to the read mode (low level). Low level input to $\overline{CE}$ and $\overline{OE}$ and address signals to the address inputs ($A_0 \sim A_{13}$) make the data contents of the designated address location available at the data input/output ($D_0 \sim D_7$). When the $\overline{CE}$ or $\overline{OE}$ signal is high, data input/output are in a floating state.

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

Programming

(Fast programming algorithm)

First set $V_{CC} = 6V$, $V_{PP} = 21V$ and then set an address to first address to be programmed. After applying 1 ms program pulse ($\overline{PGM}$) to the address, verify is performed. If the output data of that address is not verified correctly, apply one more 1 ms program pulse. The programmer continues 1 ms pulse-then-verify routines until the device verify correctly or fifteen of these pulse-then-verify routines have been completed. The programmer also maintains its total number of 1 ms pulses applied to that address in register X. And then applied a program pulse 4 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. (See P.6-24)

(Conventional programming algorithm)

The device enters the programming mode when 21V is supplied to the V_{PP} power supply input and $\overline{CE}$ is at low level. A location is designated by address signals ($A_0 \sim A_{13}$), and the data to be programmed must be applied at 8-bits in parallel to the data inputs ($D_0 \sim D_7$). A program pulse to the $\overline{PGM}$ at this state will effect programming. Only one programming pulse is required, but its width must satisfy the condition 45 ms $\leqq t_{PW} \leqq$ 55 ms.

Erase

Erase is effected by exposure to ultraviolet light with a wavelength of 2537Å at an intensity of appoximately 15WS/cm^2. Sunlight and fluorescent light may contain ultraviolet light sufficient to erase the programmed information. For any operation in the read mode, the transparent lid should be covered with opaque tape.

MODE SELECTION

Mode \ Pins	$\overline{CE}$(20)	$\overline{OE}$(22)	$\overline{PGM}$(27)	V_{PP}(1)	V_{CC}(28)	Outputs (11~13, 15~19)
Read	V_{IL}	V_{IL}	V_{IH}	V_{CC}	V_{CC}	Data out
Standby	V_{IH}	X*	X*	V_{CC}	V_{CC}	Floating
Program	V_{IL}	V_{IH}	V_{IL}	V_{PP}	V_{CC}	Data in
Program verify	V_{IL}	V_{IL}	V_{IH}	V_{PP}	V_{CC}	Data out
Program inhibit	V_{IH}	X*	X*	V_{PP}	V_{CC}	Floating

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

ABSOLUTE MAXIMUM RATINGS (Note 1)

Symbol	Parameter	Limits	Unit
T_{opr}	Temperature under bias	−10~80	°C
T_{stg}	Storage temperature	−65~125	°C
V_{I1}	All input or output voltage (Note 2)	−0.6~7	V
V_{I2}	V_{PP} supply voltage during programming (Note 2)	−0.6~22.0	V

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.

2: With respect to Ground.

MITSUBISHI ELECTRIC

READ OPERATION

DC ELECTRICAL CHARACTERISTICS ($Ta=0\sim70°C$, $V_{CC}=5V\pm5\%$, $V_{PP}=V_{CC}$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{LI}	Input load current	$V_{IN}=5.25V$			10	μA
I_{LO}	Output leakage current	$V_{OUT}=5.25V$			10	μA
I_{PP1}	V_{PP} current read	$V_{PP}=5.25V$		1	100	μA
I_{CC1}	V_{CC} current standby	$\overline{CE}=V_{IH}$			1	mA
		$\overline{CE}=V_{CC}$		1	100	μA
I_{CC2}	V_{CC} current Active	$\overline{CE}=\overline{OE}=V_{IL}$			30	mA
		f=4MHz			30	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	$I_{OH}=-400\mu A$	2.4			V

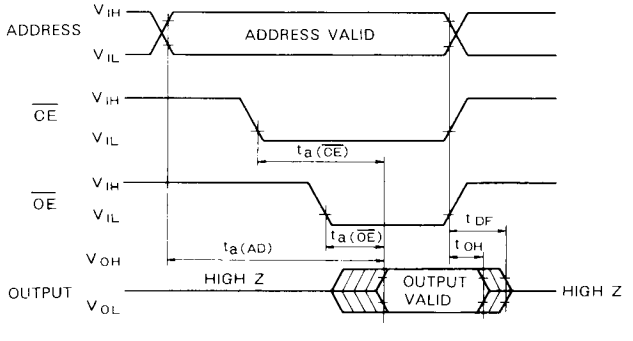
Note 3: Typical values are at Ta = 25°C and nominal supply voltages.

AC ELECTRICAL CHARACTERISTICS ($Ta=0\sim70°C$, $V_{CC}=5V\pm5\%$, $V_{PP}=V_{CC}$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits						Unit
			M5M27C128K-2		M5M27C128K		M5M27C128K-3		
			Min	Max	Min	Max	Min	Max	
$t_{a(AD)}$	Address to output delay	$\overline{CE}=\overline{OE}=V_{IL}$		200		250		300	ns
$t_{a(\overline{CE})}$	$\overline{CE}$ to output delay	$\overline{OE}=V_{IL}$		200		250		300	ns
$t_{a(\overline{OE})}$	Output enable to output delay	$\overline{CE}=V_{IL}$		75		100		120	ns
t_{DF}	Output enable high to output float	$\overline{CE}=V_{IL}$	0	60	0	85	0	105	ns
t_{OH}	Output hold from $\overline{CE}$ or $\overline{OE}$	$\overline{CE}=\overline{OE}=V_{IL}$	0		0		0		ns

Note 4: V_{CC} must be applied simultaneously V_{PP} and removed simultaneously V_{PP}.

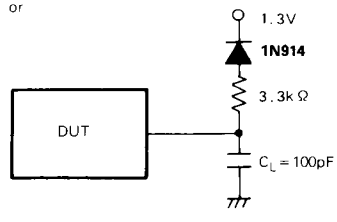
AC WAVEFORMS



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: Inputs 1V and 2V Output 0.8V, and 2V

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

or



CAPACITANCE

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
C_{IN}	Input capacitance (Address, $\overline{CE}$, $\overline{OE}$, $\overline{PGM}$)	$T_a=25°C$, f= 1MHz, $V_I=V_O=0V$		4	6	pF
C_{OUT}	Output capacitance			8	12	pF

PROGRAM OPERATION

FAST PROGRAMMING ALGORITHM

DC ELECTRICAL CHARACTERISTICS

($Ta = 25 \pm 5°C$, $V_{CC} = 6V \pm 0.25V$, $V_{PP} = 21V \pm 0.5V$, unless otherwise noted)

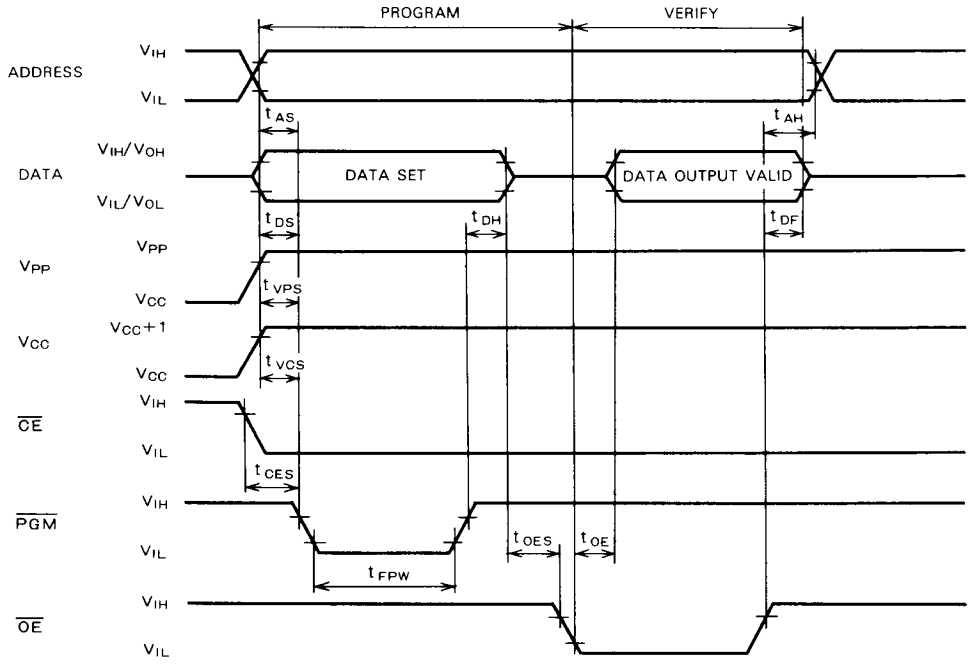
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{LI}	Input current	$V_{IN} = V_{IL}$ or V_{IH}			10	μA
V_{OL}	Output low voltage	$I_{OL} = 2.1mA$			0.45	V
V_{OH}	Output high voltage	$I_{OH} = -400\mu A$	2.4			V
V_{IL}	Input low voltage		−0.1		0.8	V
V_{IH}	Input high voltage		2.0		V_{CC}	V
I_{CC2}	V_{CC} supply current				30	mA
I_{PP2}	V_{PP} supply current	$\overline{CE} = V_{IL} = \overline{PGM}$			30	mA

AC ELECTRICAL CHARACTERISTICS

($Ta = 25 \pm 5°C$, $V_{CC} = 6V \pm 0.25V$, $V_{PP} = 21V \pm 0.5V$, unless otherwise noted)

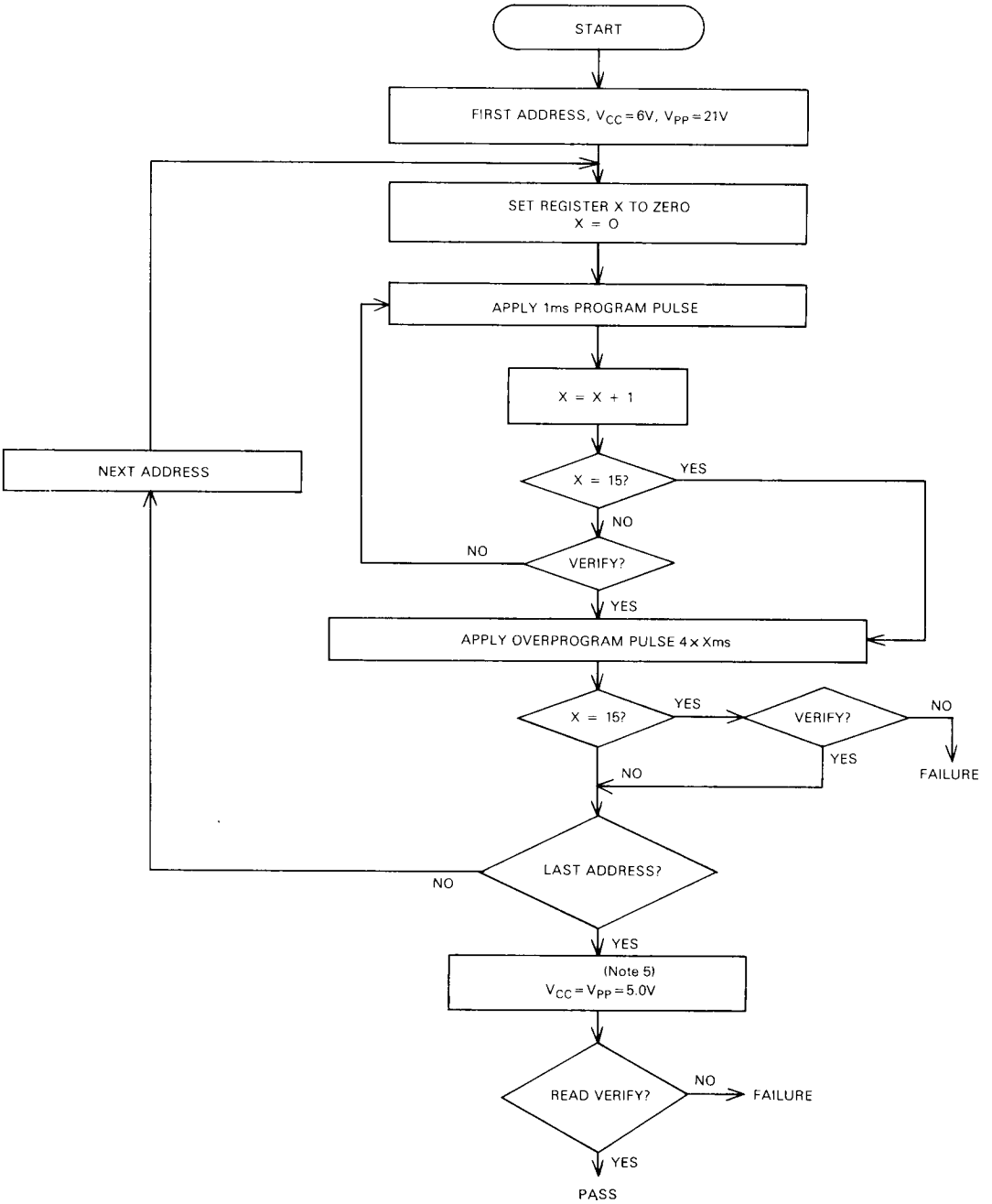
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{AS}	Address setup time		2			μs
t_{OES}	$\overline{OE}$ set up time		2			μs
t_{DS}	Data setup time		2			μs
t_{AH}	Address hold time		0			μs
t_{DH}	Data hold time		2			μs
t_{DF}	Chip enable to output float delay		0		130	ns
t_{VCS}	V_{CC} setup time		2			μs
t_{VPS}	V_{PP} setup time		2			μs
t_{FPW}	$\overline{PGM}$ initial program pulse width		0.95	1	1.05	ms
t_{OPW}	$\overline{PGM}$ over program pulse width		3.8		63	ms
t_{CES}	$\overline{CE}$ setup time		2			μs
t_{OE}	Data valid from $\overline{OE}$				150	ns

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: Input 1V and 2V Output 0.8V, and 2V

FAST PROGRAMMING ALGORITHM FLOW CHART



Note 5: $4.75 \leqq V_{CC} = V_{PP} \leqq 5.25V$

CONVENTIONAL PROGRAMMING ALGORITHM

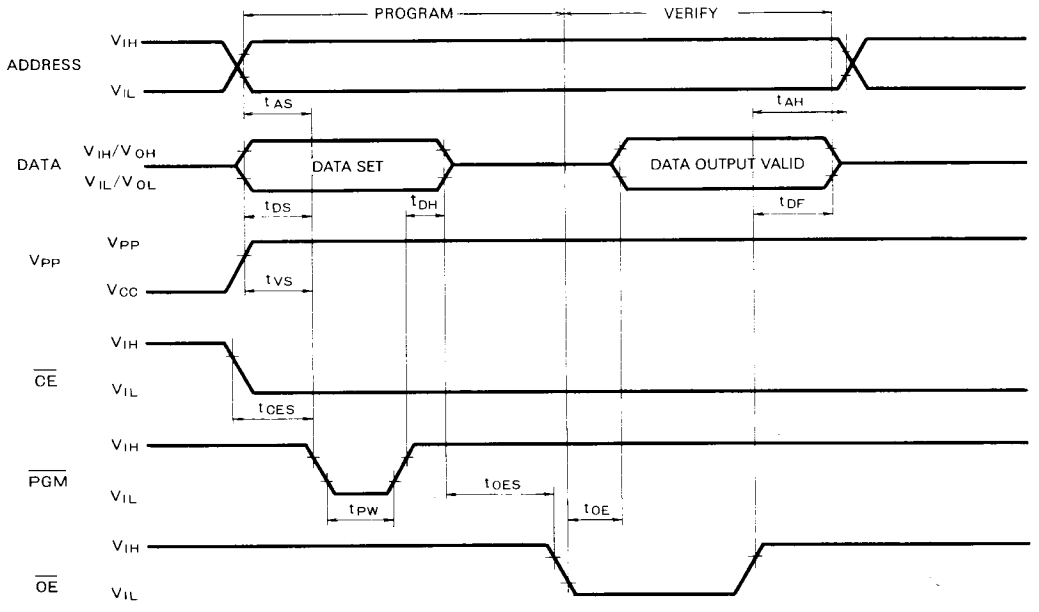
DC ELECTRICAL CHARACTERISTICS ($Ta = 25 \pm 5°C$, $V_{CC} = 5V \pm 5\%$, $V_{PP} = 21V \pm 0.5V$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{LI}	Input current	$V_{IN} = V_{IL}$ or V_{IH}			10	μA
V_{OL}	Output low voltage	$I_{OL} = 2.1mA$			0.45	V
V_{OH}	Output high voltage	$I_{OH} = -400\mu A$	2.4			V
V_{IL}	Input low voltage		−0.1		0.8	V
V_{IH}	Input high voltage		2.0		$V_{CC}+1$	V
I_{CC2}	V_{CC} Supply current				30	mA
I_{PP}	V_{PP} Supply current	$\overline{CE} = V_{IL} = \overline{PGM}$			30	mA

AC ELECTRICAL CHARACTERISTICS ($Ta = 25 \pm 5°C$, $V_{CC} = 5V \pm 5\%$, $V_{PP} = 21V \pm 0.5V$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{AS}	Address set up time		2			μs
t_{OES}	$\overline{OE}$ setup 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_{DF}	Chip enable to output delay		0		130	ns
t_{VS}	V_{PP} setup time		2			μs
t_{PW}	$\overline{PGM}$ Pulse width (during program)		45	50	55	ms
t_{CES}	$\overline{CE}$ setup time		2			μs
t_{OE}	Data valid from $\overline{OE}$				150	ns

AC WAVEFORMS



Test conditions for A.C. characteristics
Input rise and fall time: ≦20ns
Input voltage: V_{IL} = 0.45V, V_{IH} = 2.4V
Reference voltage at timing measurement: Input 1V and 2V
Outputs 0.8V and 2V