

M5M27C201K, JK-12I, -15I

2097152-BIT(262144-WORD BY 8-BIT)
CMOS ERASABLE AND ELECTRICALLY REPROGRAMMABLE ROM

DESCRIPTION

The Mitsubishi M5M27C201K, JK-12I, -15I are high-speed 2097152-bit ultraviolet erasable and electrically reprogrammable read only memories. They are suitable for micro-processor programming applications where rapid turn-around is required. The M5M27C201K, JK-12I, -15I are fabricated by N-channel double polysilicon gate for Memory and CMOS technology for peripheral circuits, and are available in a 32-pin DIP and CLCC with a transparent lid.

FEATURES

- 262144 word × 8 bit organization
- Access time
M5M27C201K-12I, JK-12I..... 120ns (max.)
M5M27C201K-15I, JK-15I..... 150ns (max.)
- Two line control \overline{OE} , \overline{CE}
- Low power current (I_{CC}): Active..... 30mA (max.)
(I_{SB2}): Stand-by..... 0.1mA (max.)
- Single 5V power supply (read operation)
- Programming voltage..... 12.5V
- 3-State output buffer
- Input and output TTL-compatible in read and program mode
- Standard 32-pin DIP
- Byte programming algorithm
- Page programming algorithm
- Wide temperature range: - 40 °C ~ + 85 °C

APPLICATION

Microcomputer systems and peripheral equipment

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 ($A_0 \sim A_{17}$) 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 stand by mode or power-down mode.

Programming

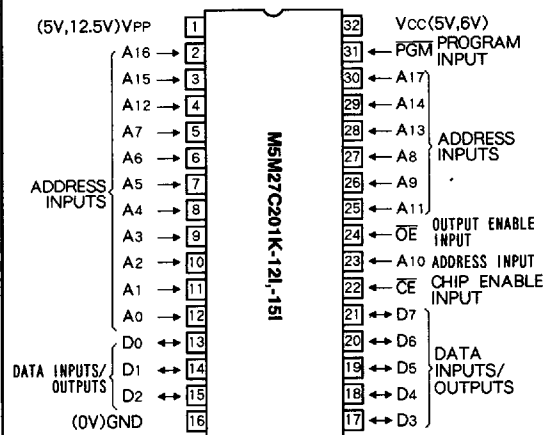
(Byte programming algorithm)

The M5M27C201K, JK-12I, -15I enter the byte programming mode when 12.5V is supplied to the V_{PP} power supply input, \overline{CE} is at low level and \overline{OE} is at high level. A location is designated by address signals ($A_0 \sim A_{17}$), and the data to be programmed must be applied at 8-bits in parallel to the data inputs ($D_0 \sim D_7$). In this state, byte programming is completed when \overline{PGM} is at low level.

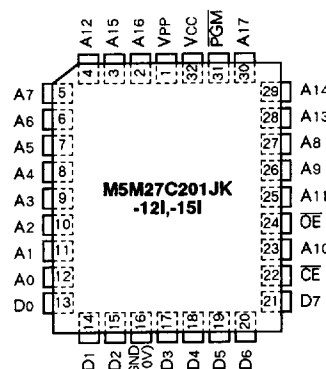
(Page programming algorithm)

Page programming feature of the M5M27C201K, JK-12I, -15I allows 4 bytes of data to be simultaneously programmed. The destination addresses for a page programming operation must reside on the same page; that is, A_2 through A_{17} must not change. At first, the M5M27C201K, JK-12I, -15I enter the page data latch mode when $V_{PP} = 12.5V$, $\overline{CE} = "H"$, \overline{OE}

PIN CONFIGURATION (TOP VIEW)



Outline 32K4 (CERDIP : K)



Outline 32K0 (CLCC : JK)

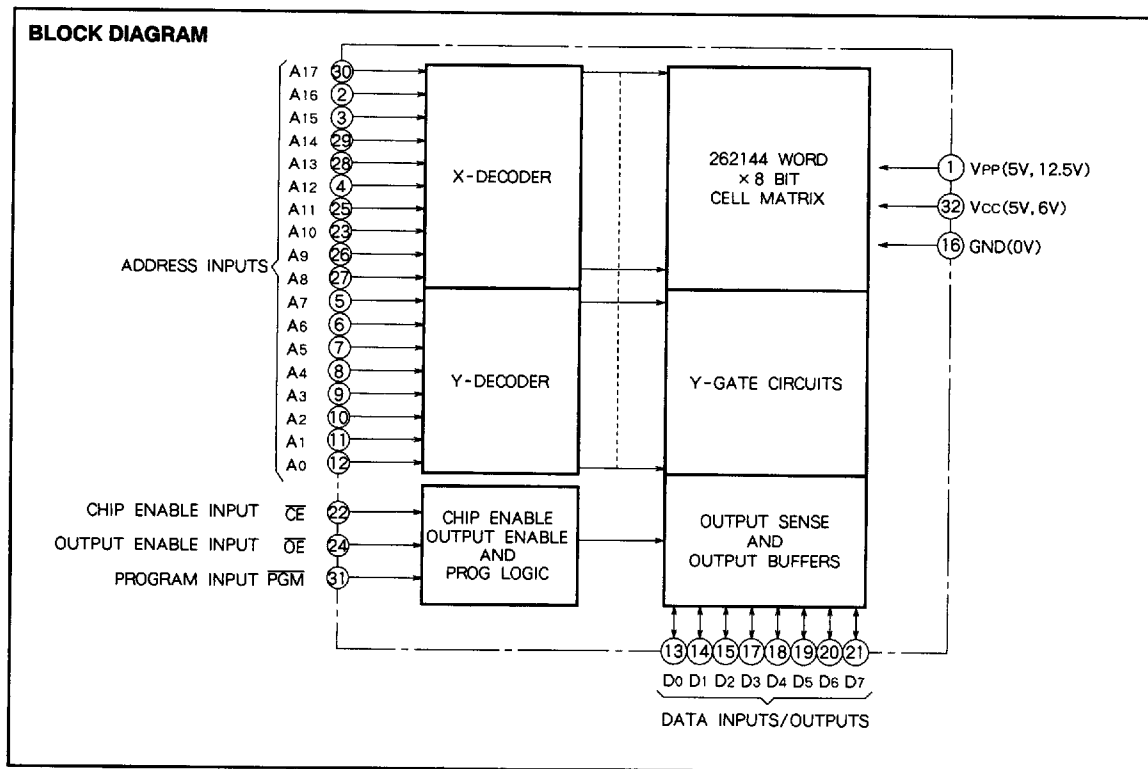
= "L" and $\overline{PGM} = "H"$. The four locations in same page are designated by address signals (A_0, A_1 change) and the data to be programmed must be applied to each location at 8-bits in parallel to the data inputs ($D_0 \sim D_7$). In this state, the data (4-bytes) latch is completed. Then the M5M27C201K, JK-12I, -15I enter the page programming mode when $\overline{OE} = "H"$. In this state, page (4-bytes) programming is completed when $\overline{PGM} = "L"$.

Erase

Erase is effected by exposure to ultraviolet light with a wavelength of 2537Å at an intensity of approximately 15WS/cm². 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.

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MODE SELECTION

Mode	Pins	CE (22)	OE (24)	PGM (31)	VPP (1)	VCC (32)	Data I/O (13~15,17~21)
Read		V _{IL}	V _{IL}	X*	5V	5V	Data out
Output disable		V _{IL}	V _{IH}	X*	5V	5V	Floating
Standby (Power down)		V _{IH}	X*	X*	5V	5V	Floating
Byte program		V _{IL}	V _{IH}	V _{IL}	12.5V	6V	Data in
Program verify		V _{IL}	V _{IL}	V _{IH}	12.5V	6V	Data out
Page data latch		V _{IH}	V _{IL}	V _{IH}	12.5V	6V	Data in
Page program		V _{IH}	V _{IH}	V _{IL}	12.5V	6V	Floating
Program inhibit		V _{IL}	V _{IL}	V _{IL}	12.5V	6V	Floating
		V _{IL}	V _{IH}	V _{IH}	12.5V	6V	
		V _{IH}	V _{IL}	V _{IL}	12.5V	6V	
		V _{IH}	V _{IH}	V _{IH}	12.5V	6V	

* : 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 except V _{PP} · A _S	With respect to Ground	- 0.6~7	V
V _{I2}	V _{PP} supply voltage		- 0.6~14.0	V
V _{I3}	A _S supply voltage		- 0.6~13.5	V
T _{opr}	Operating temperature		- 50~95	°C
T _{stg}	Storage temperature		- 65~125	°C

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 those 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.

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READ OPERATION

DC ELECTRICAL CHARACTERISTICS (Ta = -40~85°C, Vcc = 5V ± 10%, Vpp = Vcc, 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}	Output leakage current	V _{OUT} = 0~V _{CC}			10	μA
I _{PP1}	V _{PP} current read/stand-by	V _{PP} = V _{CC} = 5.5V		1	100	μA
I _{SB1}	V _{CC} current stand-by	CE = V _{IH}			1	mA
I _{SB2}		CE = V _{CC}		1	100	μA
I _{CC1}	V _{CC} current Active	CE = OE = V _{IL} , DC, I _{OUT} = 0mA			30	mA
I _{CC2}		CE = V _{IL} , f = 8.3MHz, I _{OUT} = 0mA			30	mA
V _{IL}	Input low voltage		-0.1		0.8	V
V _{IH}	Input high voltage		2.4		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

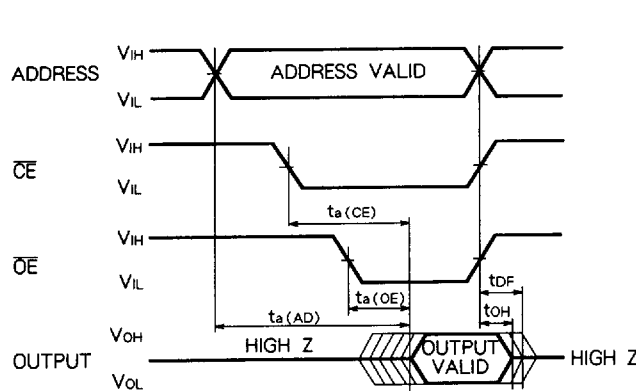
Note 2: Typical values are at Ta = 25°C and nominal supply voltages.

AC ELECTRICAL CHARACTERISTICS (Ta = -40~85°C, Vcc = 5V ± 10%, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits				Unit
			M5M27C201K-121		M5M27C201K-151		
			Min	Max	Min	Max	
t _{a(AD)}	Address to output delay	CE = OE = V _{IL}		120		150	ns
t _{a(CE)}	CE to output delay	OE = V _{IL}		120		150	ns
t _{a(OE)}	OE to output delay	CE = V _{IL}		60		60	ns
t _{DF}	OE high to output float	CE = V _{IL}	0	50	0	50	ns
t _{OH}	Output hold from CE, OE or address		0		0		ns

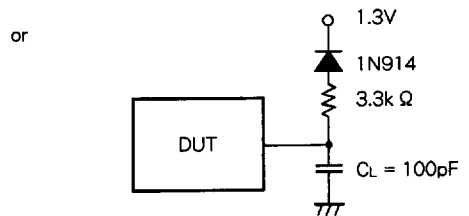
Note 3: V_{CC} must be applied simultaneously V_{PP} and removed simultaneously V_{PP}.

AC WAVEFORMS



Test conditions for A.C. characteristics
Input voltage : V_{IL} = 0.45V , V_{IH} = 3.0V
Input rise and fall times : ≤ 10ns
Reference voltage at timing measurement : 1.5V

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



CAPACITANCE

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
C _{IN}	Input capacitance (Address, CE, OE, PGM)	Ta = 25°C, f = 1MHz, V _i = V _o = 0V			15	pF
C _{OUT}	Output capacitance				15	pF

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PROGRAM OPERATION
BYTE PROGRAMMING ALGORITHM

First set $V_{CC} = 6V$, $V_{PP} = 12.5V$ and then set an address to first address to be programmed. After applying 0.2ms program pulse (PGM) to the address, verify is performed. If the output data of that address is not verified correctly, apply one more 0.2ms program pulse. The programmer continues 0.2ms 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 0.2ms pulse applied to that address in register X. And then applied a program pulse X times of 0.2ms width 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. When the entire addresses have been programmed completely, all addresses should be verified with $V_{CC} = V_{PP} = 5V$.

DC ELECTRICAL CHARACTERISTICS ($T_a = 25 \pm 5^\circ C$, $V_{CC} = 6V \pm 0.25V$, $V_{PP} = 12.5V \pm 0.3V$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{LI}	Input leakage current	$V_{IN} = 0 \sim V_{CC}$			10	μA
V_{OL}	Output low voltage (verify)	$I_{OL} = 2.1mA$			0.45	V
V_{OH}	Output high voltage (verify)	$I_{OH} = -400 \mu A$	2.4			V
V_{IL}	Input low voltage		-0.1		0.8	V
V_{IH}	Input high voltage		2.2		V_{CC}	V
I_{CC}	V_{CC} supply current				30	mA
I_{PP}	V_{PP} supply current	PGM = V_{IL}			30	mA

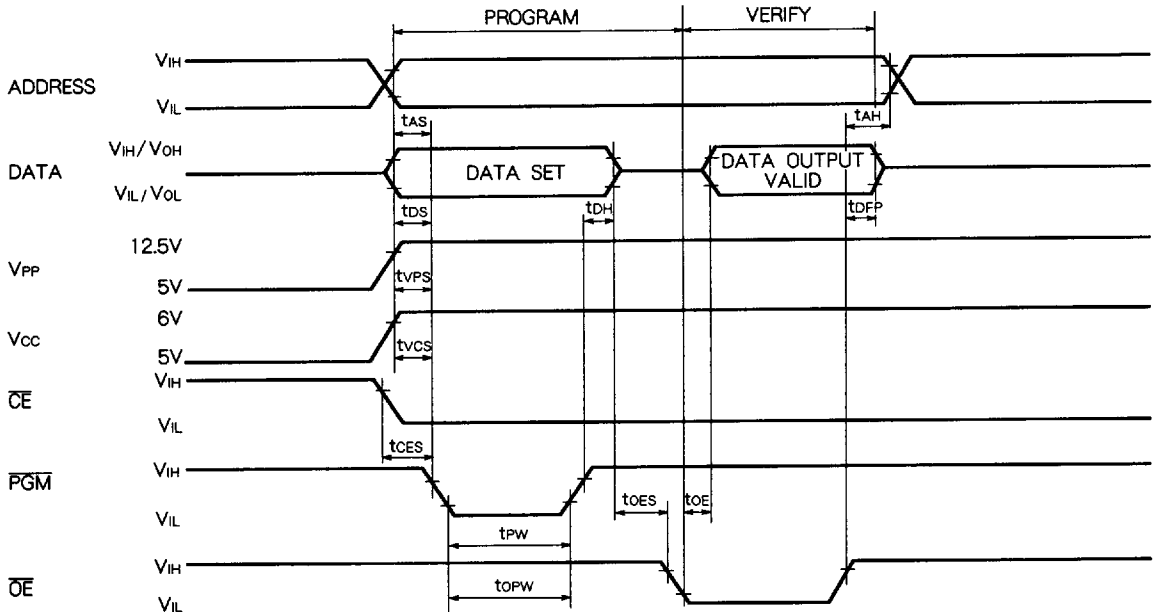
AC ELECTRICAL CHARACTERISTICS ($T_a = 25 \pm 5^\circ C$, $V_{CC} = 6V \pm 0.25V$, $V_{PP} = 12.5V \pm 0.3V$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{AS}	Address setup time		2			μs
t_{OES}	\overline{OE} 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_{DFP}	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_{PW}	PGM initial program pulse width		0.19	0.2	0.21	ms
t_{OPW}	PGM over program pulse width		0.19		5.25	ms
t_{CES}	\overline{CE} setup time		2			μs
t_{OE}	Data valid from \overline{OE}				150	ns

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

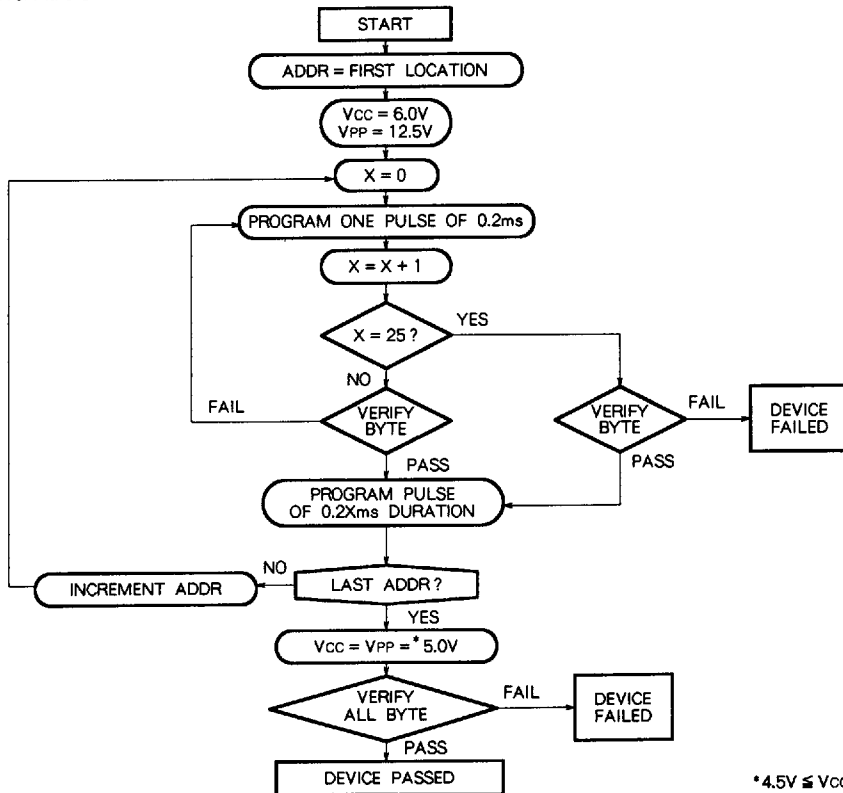
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AC WAVEFORMS



Test conditions for A.C. characteristics
Input voltage : $V_{IL} = 0.45V$, $V_{IH} = 2.4V$
Input rise and fall times : $\leq 20ns$
Reference voltage at timing measurement : Input, Output
"L" = 0.8V, "H" = 2V.

BYTE PROGRAMMING ALGORITHM
FLOW CHART



* $0.45V \leq V_{CC} = V_{PP} \leq 5.5V$

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PAGE PROGRAMMING ALGORITHM

First set $V_{CC} = 6V$, $V_{PP} = 12.5V$ and then set an address to first page address to be programmed. After data of 4 bytes are latched, these latch data are programmed simultaneously by applying 0.2ms program pulse. Then a verify is performed. If each output data is not verified correctly, apply one more 0.2ms program pulse. The programmer continues 0.2ms pulse - then - verify routines until each output data is verified correctly or twenty five of these pulse-then-verify routines have been completed. The programmer also maintains its total

number of 0.2ms pulse applied to that page addresses in register X. And then applied a program pulse X times of 0.2ms width as an overprogram pulse. When the programming procedure above is finished, step to the next page address and repeat this procedure till last page address to be programmed. When the entire page addresses have been programmed completely, all addresses should be verified with $V_{CC} = V_{PP} = 5V$.

DC ELECTRICAL CHARACTERISTICS ($T_a = 25 \pm 5^\circ C$, $V_{CC} = 6V \pm 0.25V$, $V_{PP} = 12.5V \pm 0.3V$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{LI}	Input leakage current	$V_{IN} = 0 \sim V_{CC}$			10	μA
V_{OL}	Output low voltage (verify)	$I_{OL} = 2.1mA$			0.45	V
V_{OH}	Output high voltage (verify)	$I_{OH} = -400 \mu A$	2.4			V
V_{IL}	Input low voltage		-0.1		0.8	V
V_{IH}	Input high voltage		2.2		V_{CC}	V
I_{CC}	V_{CC} supply current				30	mA
I_{PP}	V_{PP} supply current	$PGM = V_{IL}$			100	mA

AC ELECTRICAL CHARACTERISTICS ($T_a = 25 \pm 5^\circ C$, $V_{CC} = 6V \pm 0.25V$, $V_{PP} = 12.5V \pm 0.3V$, unless otherwise noted)

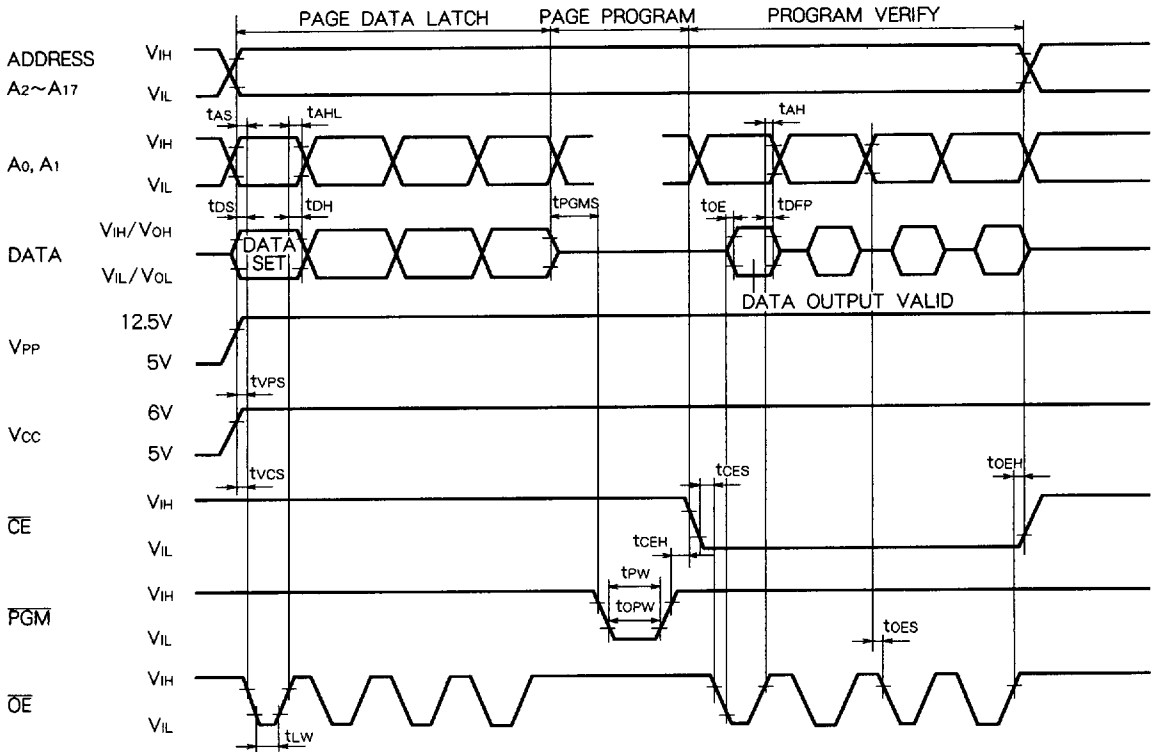
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{AS}	Address setup time		2			μs
t_{OES}	\overline{OE} setup time		2			μs
t_{DS}	Data setup time		2			μs
t_{AH}	Address hold time		0			μs
t_{AHL}			2			μs
t_{DH}	Data hold time		2			μs
t_{DFP}	\overline{OE} to output float delay		0		130	ns
t_{VCS}	V_{CC} setup time		2			μs
t_{VPS}	V_{PP} setup time		2			μs
t_{PW}	\overline{PGM} initial program pulse width		0.19	0.2	0.21	ms
t_{OPW}	\overline{PGM} over program pulse width		0.19		5.25	ms
t_{CES}	\overline{CE} setup time		2			μs
t_{OE}	Data valid from \overline{OE}				150	ns
t_{LW}	Data latch time		1			μs
t_{PGMS}	\overline{PGM} setup time		2			μs
t_{CEH}	\overline{CE} hold time		2			μs
t_{OEH}	\overline{OE} hold time		2			μs

Note 5: V_{CC} must be applied simultaneously V_{PP} and removed simultaneously V_{PP} .

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AC WAVEFORMS

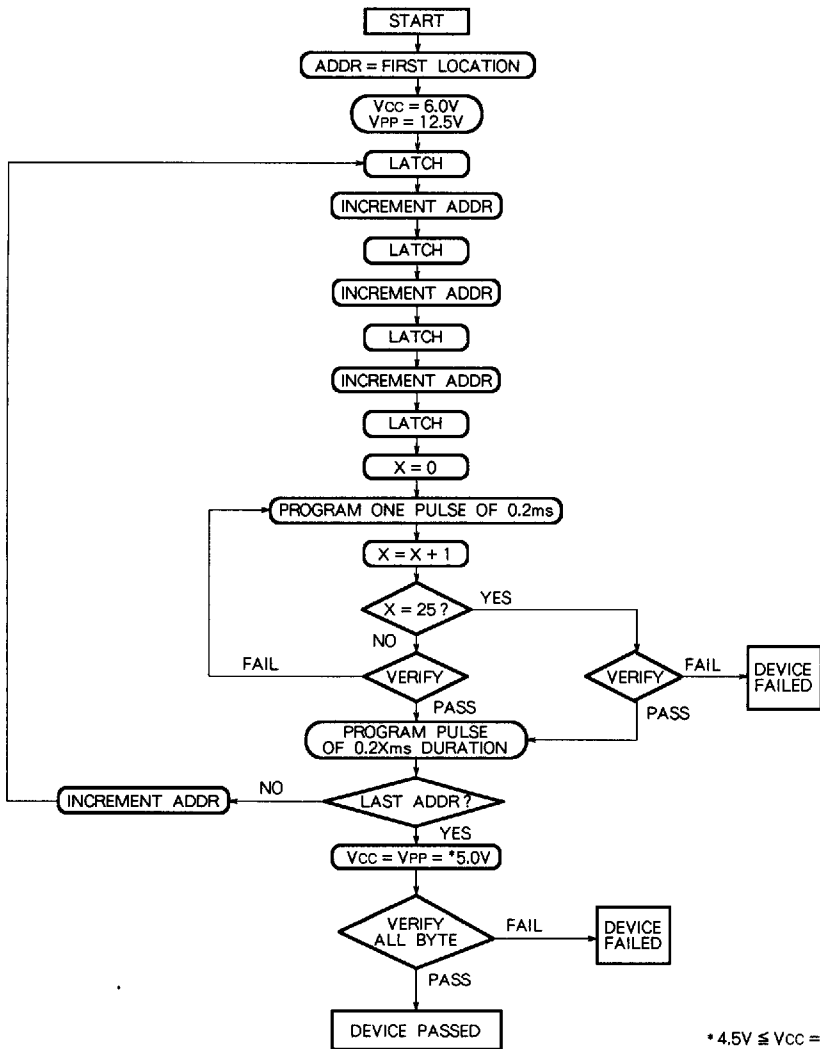


Test condition for A.C. characteristics
 Input voltage : $V_{IL} = 0.45V, V_{IH} = 2.4V$
 Input rise and fall time : (10%~90%) : $\leq 20ns$
 Reference voltage at timing measurement : Input, Output "L" = 0.8V, "H" = 2V.

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PAGE PROGRAMMING ALGORITHM
FLOW CHART



* 4.5V ≤ VCC = VPP ≤ 5.5V

DEVICE IDENTIFIER MODE

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

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

M5M27C201K, JK-12I, -15I DEVICE IDENTIFIER CODE

Code \ Pin	A0 (12)	D7 (21)	D6 (20)	D5 (19)	D4 (18)	D3 (17)	D2 (15)	D1 (14)	D0 (13)	Hex Data
Manufacturer code	V _{IL}	0	0	0	1	1	1	0	0	1C
Device code	V _{IH}	1	0	0	0	1	0	1	0	8A

Note 6 : A9 = 12.0 ± 0.5V
A1~A8, A10~A17, CE, OE = V_{IL}, PGM = V_{IH}
VCC = VPP = 5V ± 10%