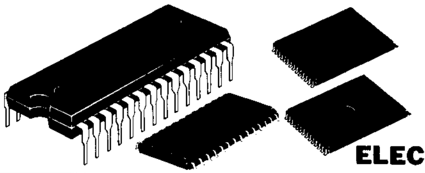


M5M28C64AP,FP,VP,RV,-15

65536-BIT(8192-WORD BY 8-BIT) ELECTRICALLY ERASABLE AND PROGRAMMABLE ROM

DESCRIPTION

The Mitsubishi M5M28C64A, -15 65536-bit electrically erasable and programmable high speed read-only memories. They are suitable for microprocessor programming applications where on-board programming is required. They are fabricated by N-channel double polysilicon Memory gate and CMOS technology for peripheral circuits.

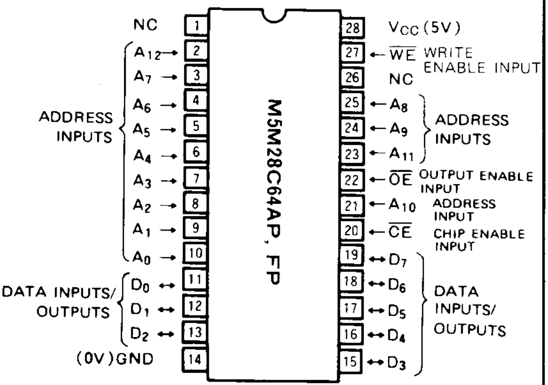
FEATURES

- 5V Only operation
- Fast read access time
  - M5M28C64AP-15 .... 150ns (max)
  - M5M28C64AFP-15 .... 150ns (max)
  - M5M28C64AVP-15 .... 150ns (max)
  - M5M28C64ARV-15 .... 150ns (max)
  - M5M28C64AP .... 200ns (max)
  - M5M28C64AFP .... 200ns (max)
  - M5M28C64AVP .... 200ns (max)
  - M5M28C64ARV .... 200ns (max)
- Low power current (I_{CC}) Active ...... 30mA (max)
  - Standby ..... 1mA (max)
- Programming time .... 10ms (max)
- Page mode programming .... 32 byte (max)
- Data polling
- 10000 erase/write cycles
- 10 years data retention

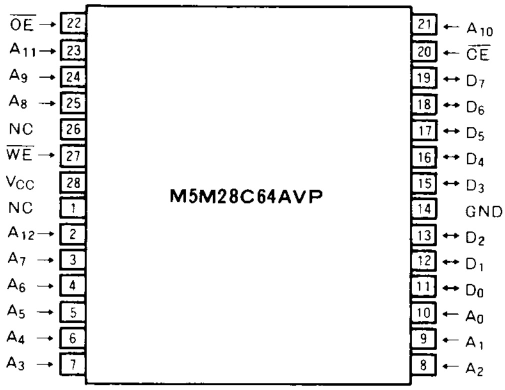
APPLICATION

Microcomputer systems and peripheral equipment

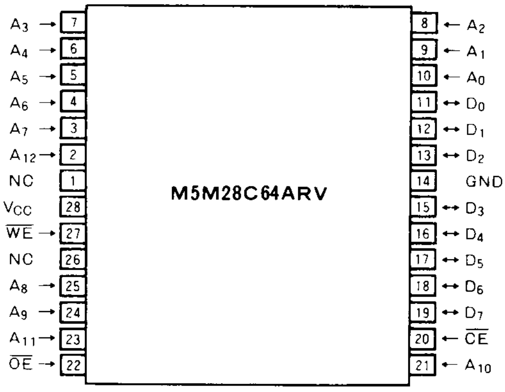
PIN CONFIGURATION (TOP VIEW)



Outline 28P4 (P)
28P2W-C(FP)



Outline 28P2C-A

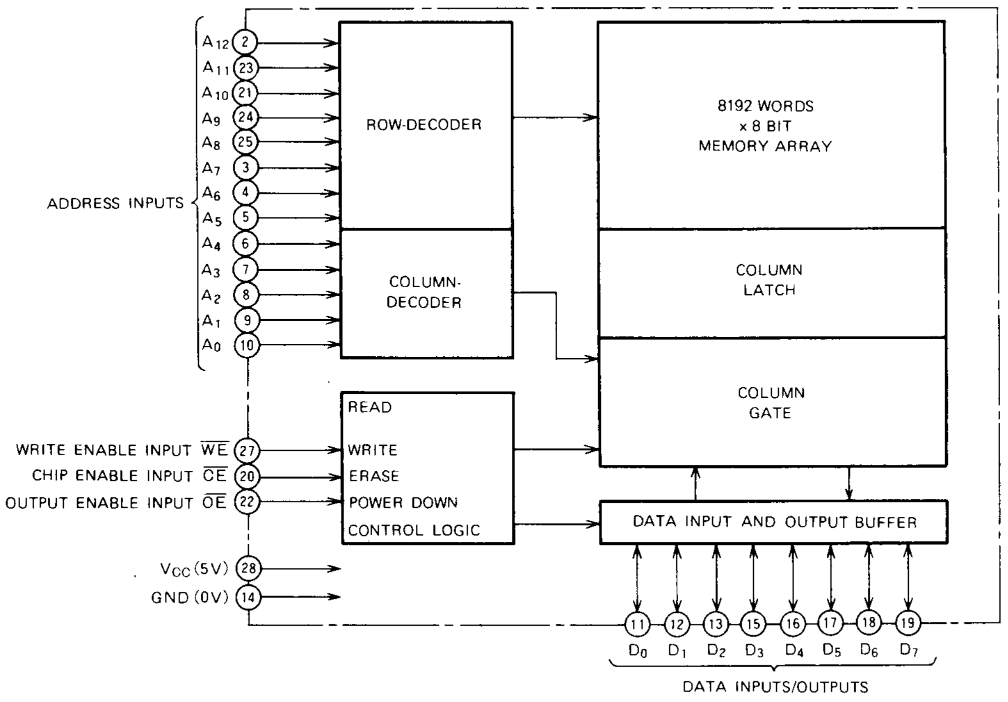


Outline 28P2C-B

NC: NO CONNECTION

MITSUBISHI ELECTRIC

BLOCK DIAGRAM



FUNCTION

Read

Low level input to $\overline{CE}$ and $\overline{OE}$, High level input to $\overline{WE}$ and address signals to the address inputs ($A_0 \sim A_{12}$) 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.

Page Mode Write

The page mode write is the function to be able to write the data of several bytes in a single write cycle, and allows from 1 to 32 bytes of data to be written. The page is set by $A_5 \sim A_{12}$.

After the data of first byte is loaded, unless $\overline{WE}$ transits from High to Low before 30μs, the automatic erase/write starts, and completes within 10ms.

Then the page must not be changed during the load of the data.

MODE SELECTION

Pins / Mode	$\overline{CE}$ (20)	$\overline{OE}$ (22)	$\overline{WE}$ (27)	Din/Dout (11~13, 15~19)
Read	V_{IL}	V_{IL}	V_{IH}	Dout
Standby	V_{IH}	X *1	X *1	High-Z
Program	V_{IL}	V_{IH}	V_{IL}	Din
Program inhibit	X *1	X *1	V_{IH}	— *2
Program inhibit	X *1	V_{IL}	X *1	— *2

*1 X can be either V_{IH} or V_{IL}.
*2 depend on the input condition.

ABSOLUTE MAXIMUM RATINGS (Note 1)

Symbol	Parameter	Condition	Ratings	Unit
V_{I1}	Input voltage (V_{CC}, Data, Address, $\overline{CE}$, $\overline{WE}$, $\overline{OE}$)	With respect to GND	−0.6～7	V
V_{I2}	Input voltage (A_9)		−0.6～14	V
Topr	Operating temperature		−10～80	°C
Tstg	Storage temperature		−65～150	°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 these or at any other conditions above these 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

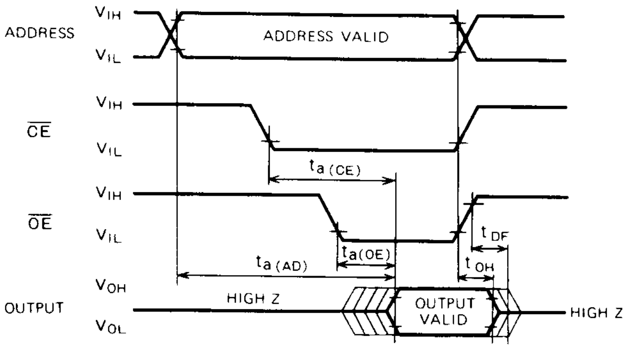
DC ELECTRICAL CHARACTERISTICS (Ta = 0～70°C, V_{CC} = 5V ± 10%, unless otherwise noted)

Symbol	Parameter	Test condition	Limits			Unit
			Min	Typ	Max	
I_{LI}	Input leakage current	$V_{IN} = 0 \sim V_{CC}$			10	μA
I_{LO}	Output leakage current	$V_{OUT} = 0 \sim V_{CC}$			10	μA
I_{CC1}	V_{CC} current standby	$\overline{CE} = V_{IH}$			1.0	mA
I_{CC2}	V_{CC} current active	$\overline{CE} = \overline{OE} = V_{IL}$			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

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

Symbol	Parameter	Test condition	Limits				Unit
			M5M28C64AP-15 M5M28C64AFP-15 M5M28C64AVP-15 M5M28C64ARV-15		M5M28C64AP M5M28C64AFP M5M28C64AVP M5M28C64ARV		
			Min	Max	Min	Max	
$t_{a(AD)}$	Address to output delay	$\overline{CE} = \overline{OE} = V_{IL}$		150		200	ns
$t_{a(CE)}$	$\overline{CE}$ to output delay	$\overline{OE} = V_{IL}$		150		200	ns
$t_{a(OE)}$	$\overline{OE}$ to output delay	$\overline{CE} = V_{IL}$		60		75	ns
t_{DF}	$\overline{OE}$ high to output float	$\overline{CE} = V_{IL}$	0	50	0	60	ns
t_{OH}	Output hold from $\overline{CE}$, $\overline{OE}$ or addresses		0		0		ns

AC WAVEFORMS ($\overline{WE}$ = H)



Test condition 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 0.8V and 2V
Output 0.8V and 2V
Output load: 1TTL gate + C_L (100pF)

CAPACITANCE (Ta = 25°C, f = 1MHz)

Symbol	Parameter	Test condition	Limits			Unit
			Min	Typ	Max	
C_{IN}	Input capacitance	$V_{IN} = 0V$		4	6	pF
C_{OUT}	Output capacitance	$V_{OUT} = 0V$		8	12	pF

ERASE, PROGRAM OPERATION

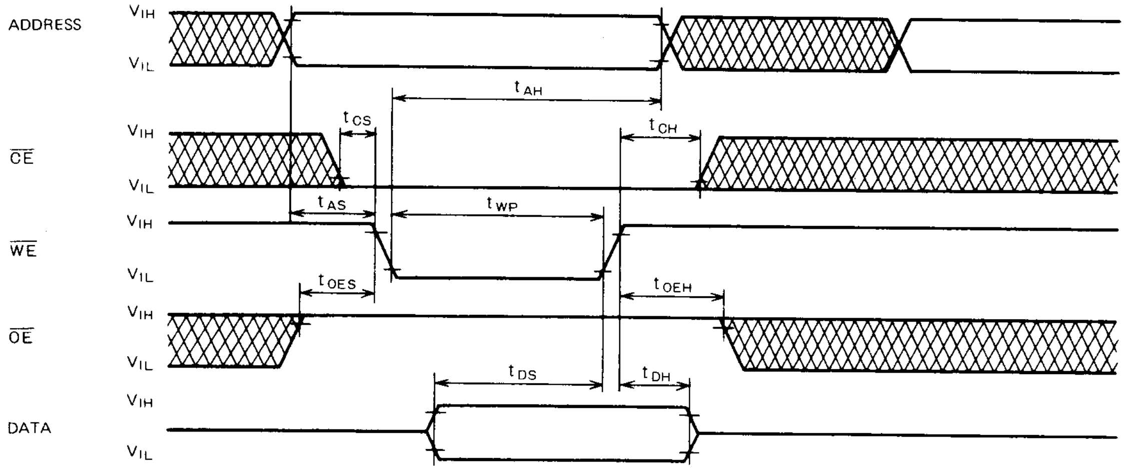
DC ELECTRICAL CHARACTERISTICS (Ta = 0 ~ 70°C, V_{CC} = 5V ± 10%, unless otherwise noted)

Symbol	Parameter	Test condition	Limits			Unit
			Min	Typ	Max	
I_{LI}	Input leakage current	$V_{IN} = 0 \sim V_{CC}$			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
I_{CC2}	V_{CC} current active				30	mA
V_{IL}	Input low voltage		−0.1		0.8	V
V_{IH}	Input high voltage		2.0		$V_{CC}+1$	V

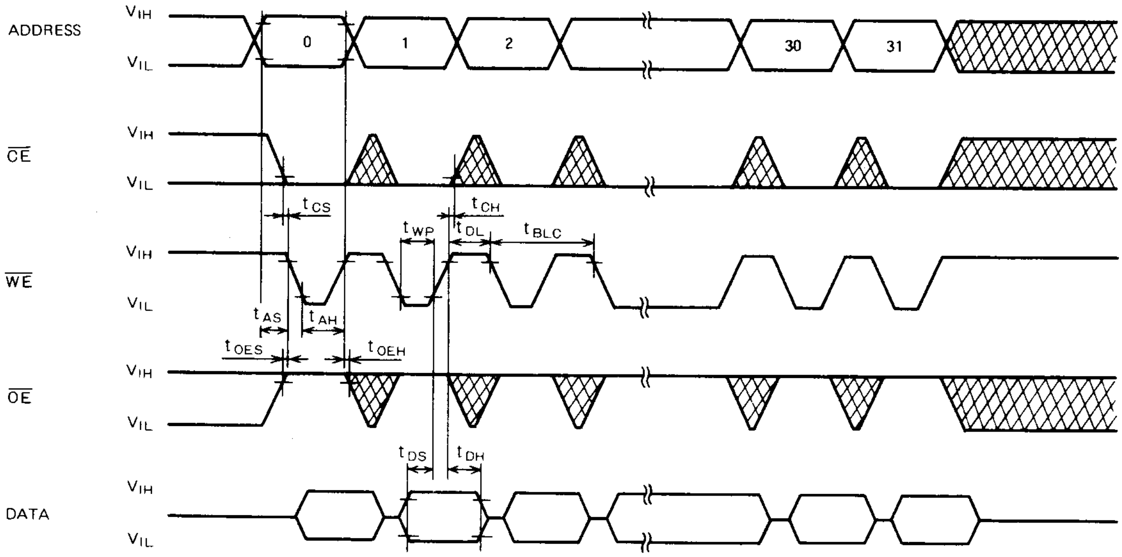
AC ELECTRICAL CHARACTERISTICS (Ta = 0 ~ 70°C, V_{CC} = 5V ± 10%, unless otherwise noted)

Symbol	Parameter	Test condition	Limits			Unit
			Min	Typ	Max	
t_{AS}	Address setup time		10			ns
t_{AH}	Address hold time		100			ns
t_{CS}	$\overline{CE}$ setup time		0			ns
t_{CH}	$\overline{CE}$ hold time		0			ns
t_{DS}	Data setup time		100			ns
t_{DH}	Data hold time		20			ns
t_{OES}	$\overline{OE}$ setup time		0			ns
t_{OEH}	$\overline{OE}$ hold time		0			ns
t_{WP}	Write pulse width		150			ns
t_{DL}	Data latch time		100			ns
t_{BLC}	Byte load cycle time		0.3		30	μs
t_{WC}	Write cycle time		10			ms

Byte program timing chart



Page mode program timing chart



DEVICE IDENTIFIER MODE

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

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

DEVICE IDENTIFIER CODE

Pin / Code	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 Deta
Manufacturer code	V_{IL}	0	0	0	1	1	1	0	0	1C
Device code	V_{IH}	0	1	0	0	0	0	0	0	40

Note 2 : $V_{CC}=5V\pm10\%$, $A_9=12.0\pm0.5V$, $A_1\sim A_8$, $A_{10}\sim A_{12}$, $\overline{CE}$, $\overline{OE}=V_{IL}$, $\overline{WE}=V_{IH}$