

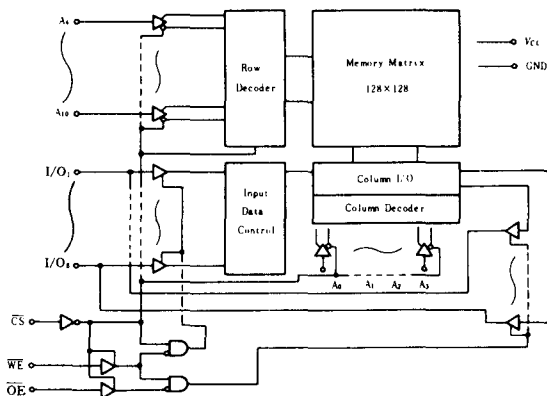
HM6116AP-12, HM6116AP-15, HM6116AP-20, HM6116ASP-12, HM6116ASP-15, HM6116ASP-20

2048-word×8-bit High Speed Static CMOS RAM

■ FUTURES

- High speed: Fast Access Time 120ns/150ns/200ns (max.)
- Low Power Standby and Standby: 100μW (typ.)
Low Power Operation Operation: 15mW (typ.) (f = 1MHz)
- Single 5V Supply and High Density 24 Pin Package
- Completely Static RAM: No clock or Timing Strobe Required
- Directly TTL Compatible: All Input and Output
- Pin Out Compatible with Standard 16K EPROM/MASK ROM
- Equal Access and Cycle Time

■FUNCTIONAL BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

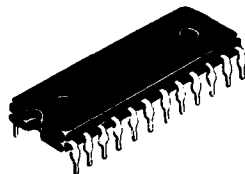
Item	Symbol	Rating	Unit
Voltage on Any Pin Relative to GND	V_T	-0.5° to $+7.0$	V
Operating Temperature	T_{op}	0 to $+70$	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-55 to $+125$	$^{\circ}\text{C}$
Temperature Under Bias	T_{hstg}	-10 to $+85$	$^{\circ}\text{C}$
Power Dissipation	P_T	1.0	W

* Pulse Width 50ns : -3.5V

■ TRUTH TABLE

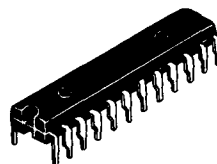
CS	OE	WE	Mode	V _{CC} Current	I/O Pin	Ref. Cycle
H	x	x	Not Selected	I _{SA} , I _{SB}	High Z	
L	L	H	Read	I _{CC}	Dout	Read Cycle (1)~(3)
L	H	L	Write	I _{CC}	Din	Write Cycle (1)
L	L	L	Write	I _{CC}	Din	Write Cycle (2)

HM6116AP Series



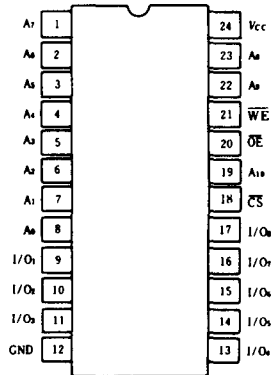
(DP-24)

HM6116ASP Series



(DP-24A)

■ PIN ARRANGEMENT



(Top View)

■ RECOMMENDED DC OPERATING CONDITIONS ($T_a = 0$ to $+70^\circ\text{C}$)

Item	Symbol	min	typ	max	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
	GND	0	0	0	V
Input Voltage	V_{IH}	2.2	3.5	6.0	V
	V_{IL}	-3.0^*	—	0.8	V

* Pulse Width : 50ns, DC : V_{IL} min = 0.3V

■ DC AND OPERATING CHARACTERISTICS ($V_{CC} = 5V \pm 10\%$, GND = 0V, $T_a = 0$ to $+70^\circ\text{C}$)

Item	Symbol	Test Condition	HM6116AP/ ASP-12			HM6116AP/ ASP-15			HM6116AP/ ASP-20			Unit
			min	typ*	max	min	typ*	max	min	typ*	max	
Input Leakage Current	$ I_{LI} $	$V_{CC}=5.5V$, $V_{in} = \text{GND}$ to V_{CC}	—	—	2	—	—	2	—	—	2	μA
Output Leakage Current	$ I_{LO} $	$CS = V_{IH}$ or $OE = V_{IH}$, $V_{I/O} = \text{GND}$ to V_{CC}	—	—	2	—	—	2	—	—	2	μA
Operating Power Supply Current	I_{CC}	$CS = V_{IL}$, $I_{I/O} = 0\text{mA}$ $V_{in} = V_{IH}$ or V_{IL}	—	5	15	—	5	15	—	5	15	mA
	I_{CC1}	$V_{IH} = V_{CC}$, $V_{IL} = 0V$, $CS = V_{IL}$, $I_{I/O} = 0\text{mA}$, $f = 1\text{MHz}$	—	3	6	—	3	6	—	3	6	mA
Average Operating Current	I_{CC2}	min. cycle, duty = 100%	—	35	60	—	25	45	—	20	35	mA
Standby Power Supply Current	I_{SB}	$CS = V_{IH}$	—	1	4	—	1	4	—	1	4	mA
	I_{SB1}	$CS \geq V_{CC} - 0.2V$	—	0.02	2	—	0.02	2	—	0.02	2	mA
Output Voltage	V_{OL}	$I_{OL} = 4\text{mA}$	—	—	0.4	—	—	0.4	—	—	0.4	V
	V_{OH}	$I_{OH} = -1.0\text{mA}$	2.4	—	—	2.4	—	—	2.4	—	—	V

* $V_{CC} = 5V$, $T_a = 25^\circ\text{C}$

■ AC CHARACTERISTICS ($V_{CC} = 5V \pm 10\%$, $T_a = 0$ to $+70^\circ\text{C}$)

● AC TEST CONDITIONS

Input Pulse Levels: 0.8 to 2.4V

Input Rise and Fall Times: 10 ns

Input and Output Timing Reference Levels: 1.5V

Output Load: 1TTL Gate and $C_L = 100\text{pF}$ (including scope and jig)

● READ CYCLE

Item	Symbol	HM6116AP/ ASP-12		HM6116AP/ ASP-15		HM6116AP/ ASP-20		Unit
		min	max	min	max	min	max	
Read Cycle Time	t_{RC}	120	—	150	—	200	—	ns
Address Access Time	t_{AA}	—	120	—	150	—	200	ns
Chip Select Access Time	t_{ACS}	—	120	—	150	—	200	ns
Chip Selection to Output in Low Z	t_{CLZ}	10	—	10	—	10	—	ns
Output Enable to Output Valid	t_{OE}	—	55	—	60	—	70	ns
Output Enable to Output in Low Z	t_{OLZ}	10	—	10	—	10	—	ns
Chip Deselection to Output in High Z	t_{CHZ}	0	40	0	50	0	60	ns
Chip Disable to Output in High Z	t_{OHZ}	0	40	0	50	0	60	ns
Output Hold from Address Change	t_{OH}	10	—	15	—	20	—	ns

● WRITE CYCLE

Item	Symbol	HM6116AP/ ASP-12		HM6116AP/ ASP-15		HM6116AP/ ASP-20		Unit
		min	max	min	max	min	max	
Write Cycle Time	t_{WC}	120	—	150	—	200	—	ns
Chip Selection to End of Write	t_{CW}	70	—	90	—	120	—	ns
Address Valid to End of Write	t_{AW}	105	—	120	—	140	—	ns
Address Set Up Time	t_{AS}	0	—	0	—	0	—	ns
Write Pulse Width	t_{WP}	70	—	80	—	100	—	ns
Write Recovery Time	t_{WR}	0	—	0	—	0	—	ns
Output Disable to Output in High Z	t_{OHZ}	0	40	0	50	0	60	ns
Write to Output in High Z	t_{WHZ}	0	35	0	40	0	50	ns
Data to Write Time Overlap	t_{DW}	35	—	40	—	50	—	ns
Data Hold from Write Time	t_{DH}	0	—	0	—	0	—	ns
Output Active from End of Write	t_{OW}	10	—	10	—	10	—	ns

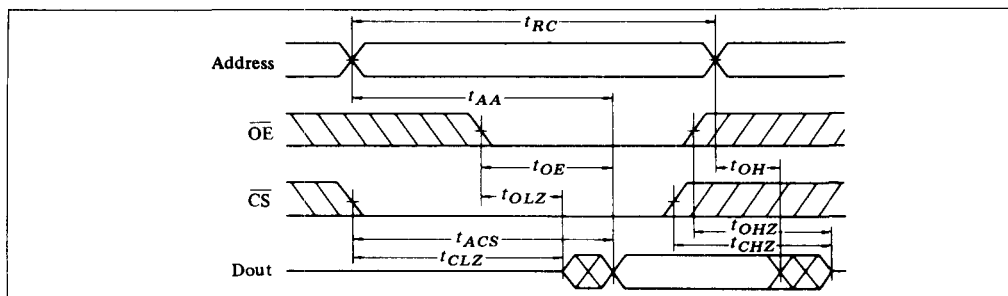
■ CAPACITANCE ($f=1\text{MHz}$, $T_a=25^\circ\text{C}$)

Item	Symbol	Test Conditions	typ	max	Unit
Input Capacitance	C_{in}	$V_{in}=0\text{V}$	3	5	pF
Input/Output Capacitance	$C_{in/o}$	$V_{in/o}=0\text{V}$	5	7	pF

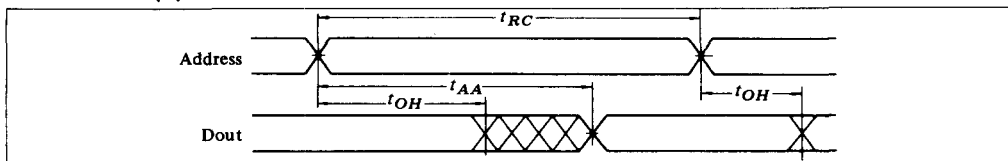
Note) This parameter is sampled and not 100% tested.

■ TIMING WAVEFORM

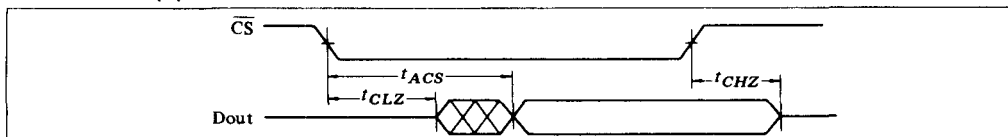
● READ CYCLE (1) ⁽¹⁾



● READ CYCLE (2) ⁽¹⁾⁽²⁾⁽⁴⁾

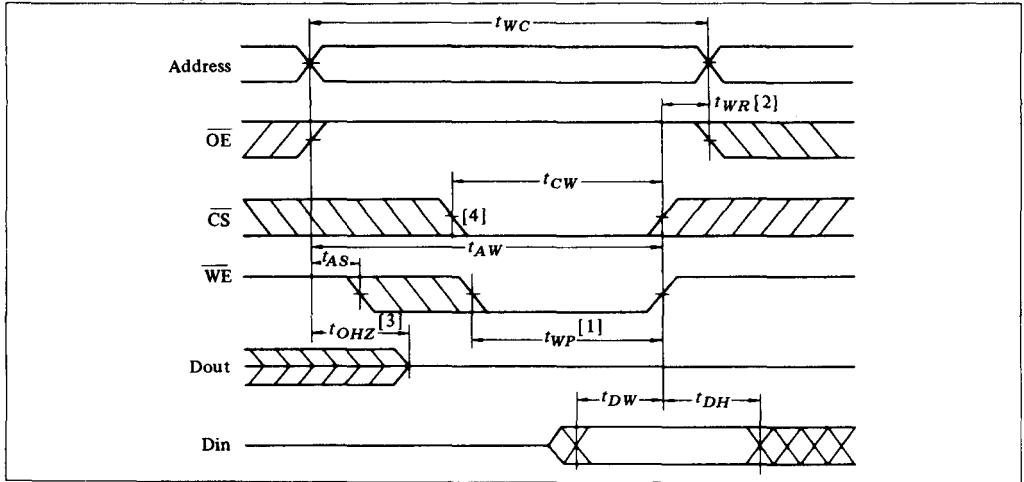


● READ CYCLE (3) ⁽¹⁾⁽³⁾⁽⁴⁾

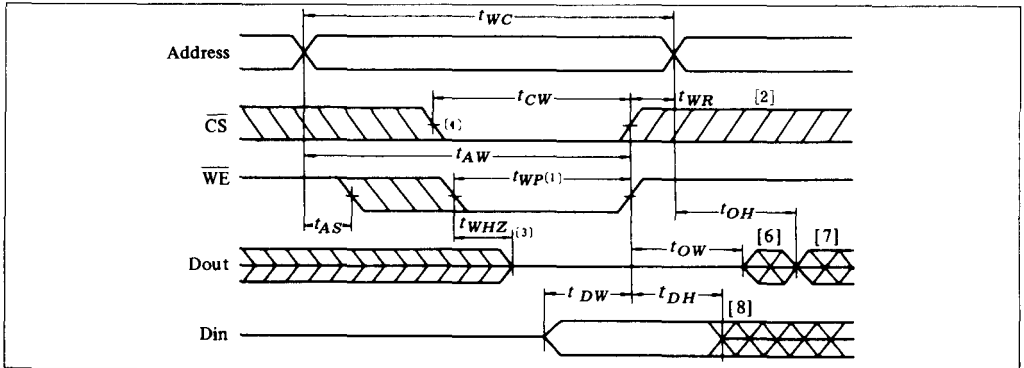


- NOTES: 1. WE is High for Read Cycle.
2. Device is continuously selected, $\overline{CS} = V_{IL}$.
3. Address Valid prior to or coincident with $\overline{CS}$ transition Low.
4. $\overline{OE} = V_{IL}$.

● WRITE CYCLE(1)



● WRITE CYCLE(2)⁽⁵⁾



- NOTES:
1. A write occurs during the overlap (t_{WP}) of a low $\overline{CS}$ and a low $\overline{WE}$.
 2. t_{WR} is measured from the earlier of $\overline{CS}$ or $\overline{WE}$ going high to the end of write cycle.
 3. During this period, I/O pins are in the output state so that the input signals of opposite phase to the outputs must not be applied.
 4. If the $\overline{CS}$ low transition occurs simultaneously with the $\overline{WE}$ low transitions or after the $\overline{WE}$ transition, output remain in a high impedance state.
 5. $\overline{OE}$ is continuously low. ($\overline{OE} = V_{IL}$)
 6. D_{out} is the same phase of write data of this write cycle.
 7. D_{out} is the read data of next address.
 8. If $\overline{CS}$ is Low during this period, I/O pins are in the output state. Then the data input signals of opposite phase to the outputs must not be applied to them.