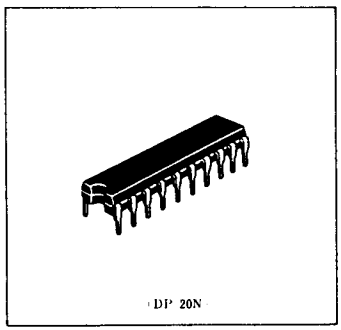
HM6168H Series — Maintenance Only

(Substitute HM6268P)

4096-word x 4-bit High Speed CMOS Static RAM

■FEATURES

- High Speed: Fast Access Time 45/55/70 ns (max.)
- Single +5V Supply and High Density 20 Pin Package
- Low Power Standby: 100μW typ, 5μW typ. (L-version)
  Active: 200mW typ.
- Completely Static Memory
  No Clock or Timing Strobe Required
- Equal Access and Cycle Times
- Directly TTL Compatible – All Inputs and Outputs
- Capability of Battery Back Up Operation (L-version)

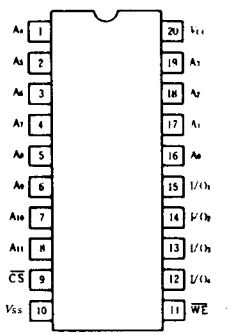


DP 20N

■ORDERING INFORMATION

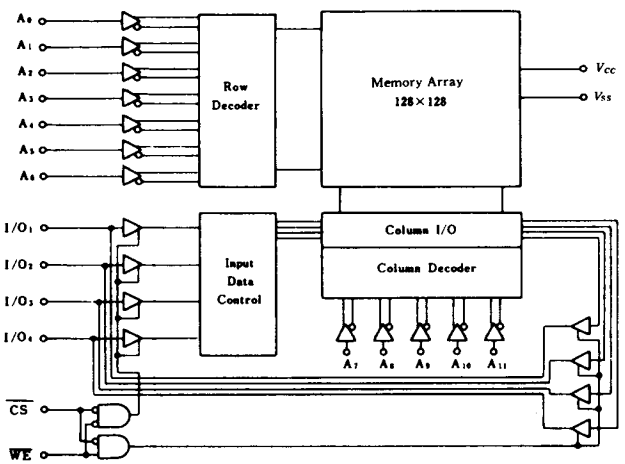
Type No.	Access Time	Package
HM6168HP-45	45ns	300mil 20pin Plastic DIP
HM6168HP-55	55ns	
HM6168HP-70	70ns	
HM6168HLP-45	45ns	
HM6168HLP-55	55ns	
HM6168HLP-70	70ns	

■PIN ARRANGEMENT



(Top View)

■FUNCTIONAL BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Voltage on Any Pin Relative to V_{SS}	V_T	−0.5*1 to +7.0	V
Power Dissipation	P_T	1.0	W
Operating Temperature	T_{opr}	0 to +70	°C
Storage Temperature (Plastic)	T_{stg}	−55 to +125	°C
Storage Temperature under Bias	T_{bias}	−10 to +85	°C

Note) *1. −3.5V for pulse width≤20ns.

■ TRUTH TABLE

$\overline{CS}$	$\overline{WE}$	Mode	V_{CC} Current	I/O Pin	Reference Cycle
H	X	Not selected	I_{SB}, I_{SB1}	High Z	
L	H	Read	I_{CC}	Dout	Read Cycle 1, 2
L	L	Write	I_{CC}	Din	Write Cycle 1, 2

■ RECOMMENDED DC OPERATING CONDITIONS (Ta = 0 to + 70°C)

Item	Symbol	min	typ	max	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
	V_{SS}	0	0	0	V
Input Voltage	V_{IH}	2.2	–	6.0	V
	V_{IL}	−0.5*1	–	0.8	V

Note) *1. −3.0V for pulse width ≦ 20ns

■ DC AND OPERATING CHARACTERISTICS (V_{CC} = 5V ±10%, V_{SS} = 0V, T_a = 0 to +70°C)

Item	Symbol	Test Conditions	min	typ*1	max	Unit
Input Leakage Current	$\lvert I_{LI} \rvert$	V_{CC}=5.5V, V_{in}= V_{SS} to V_{CC}	–	–	2.0	μA
Output Leakage Current	$\lvert I_{LO} \rvert$	$\overline{CS}$ = V_{IH}, $V_{I/O}$ = V_{SS} to V_{CC}	–	–	2.0	μA
Operating Power Supply Current	I_{CC}	$\overline{CS}$ = V_{IL}, $I_{I/O}$ = 0mA	–	40	90	mA
Standby Power Supply Current	I_{SB}	$\overline{CS}$ = V_{IH}	–	15	25	mA
Standby Power Supply Current(1)	I_{SB1}	$\overline{CS}$ = V_{CC} −0.2V, V_{IN} ≦ 0.2V or V_{IN} ≧ V_{CC} −0.2V	–	0.02	2.0	mA
			–	1*2	50*2	μA
Output Low Voltage	V_{OL}	I_{OL} = 8mA	–	–	0.4	V
Output High Voltage	V_{OH}	I_{OH} = −4mA	2.4	–	–	V

Notes) *1. Typical limits are at V_{CC} = 5.0V, Ta = 25°C and specified loading.
*2. This characteristics is guaranteed only for L-version.

■ CAPACITANCE (Ta = 25°C, f = 1MHz)

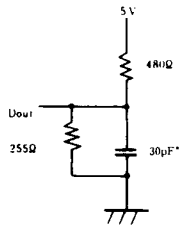
Item	Symbol	Test Conditions	min	max	Unit
Input Capacitance	C_{in}	V_{IN} = 0V	–	6	pF
Input/Output Capacitance	$C_{I/O}$	$V_{I/O}$ = 0V	–	8	pF

Note: This parameters are sampled and not 100% tested.

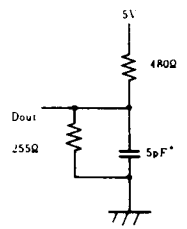
■ AC CHARACTERISTICS (V_{CC}=5V ±10%, Ta=0 to + 70°C, unless otherwise noted.)

• AC TEST CONDITION

Input pulse levels: V_{SS} to 3.0V
Input rise and fall times: 5ns
Input and Output timing reference levels: 1.5V
Output load: See Figure



Output Load (A)



Output Load (B)
(for t_{HZ}, t_{LZ}, t_{WZ}, t_{OW})

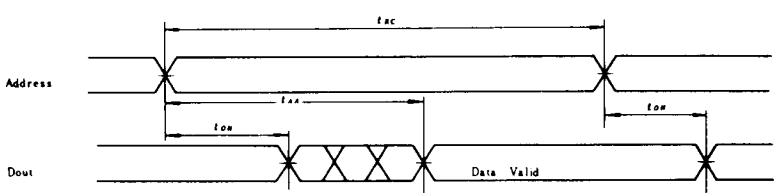
* Including scope and jig.

• READ CYCLE

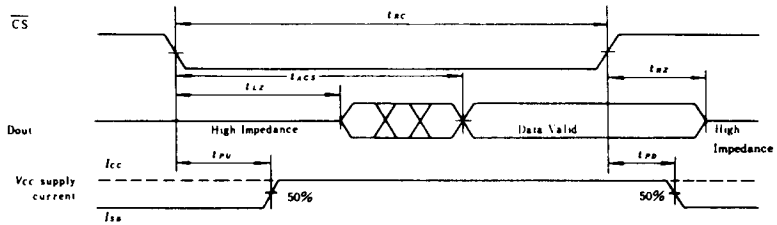
Item	Symbol	HM6168H-45		HM6168H-55		HM6168H-70		Unit
		min	max	min	max	min	max	
Read Cycle Time	t_{RC}	45	–	55	–	70	–	ns
Address Access Time	t_{AA}	–	45	–	55	–	70	ns
Chip Select Access Time	t_{ACS}	–	45	–	55	–	70	ns
Output Hold from Address Change	t_{OH}	5	–	5	–	5	–	ns
Chip Selection to Output in Low Z*1	t_{LZ}	20	–	20	–	20	–	ns
Chip Deselection to Output in High Z*1	t_{HZ}	0	20	0	20	0	20	ns
Chip Selection to Power Up Time	t_{PU}	0	–	0	–	0	–	ns
Chip Deselection to Power Down Time	t_{PD}	–	30	–	30	–	30	ns

Note) *1. Transition is measured ±500mV from steady state voltage with Load (B).
This parameter is sampled and not 100% tested.

• TIMING WAVEFORM OF READ CYCLE NO. 1(1), (2)



• TIMING WAVEFORM OF READ CYCLE NO. 2[1], [3]



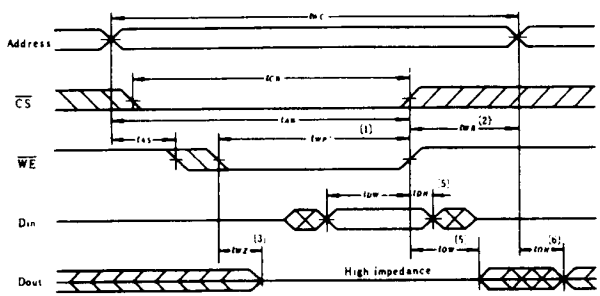
Notes) 1. $\overline{WE}$ is High for Read Cycle.
2. Device is continuously selected, $\overline{CS} = V_{IL}$.
3. Address Valid prior to or coincident with $\overline{CS}$ transition Low.

• WRITE CYCLE

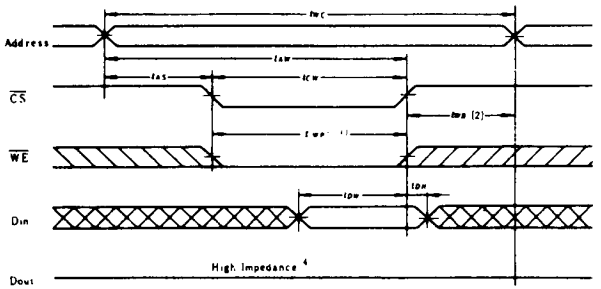
Item	Symbol	HM6168H-45		HM6168H-55		HM6168H-70		Unit
		min	max	min	max	min	max	
Write Cycle Time	t_{WC}	45	–	55	–	70	–	ns
Chip Selection to End of Write	t_{CW}	40	–	50	–	60	–	ns
Address Valid to End of Write	t_{AW}	40	–	50	–	60	–	ns
Address Setup Time	t_{AS}	0	–	0	–	0	–	ns
Write Pulse Width	t_{WP}	35	–	45	–	55	–	ns
Write Recovery Time	t_{WR}	0	–	0	–	0	–	ns
Data Valid to End of Write	t_{DW}	20	–	25	–	30	–	ns
Data Hold Time	t_{DH}	0	–	0	–	0	–	ns
Write Enabled to Output in High Z*1	t_{WZ}	0	15	0	20	0	25	ns
Output Active from End of Write*1	t_{OW}	0	–	0	–	0	–	ns

Note) *1. Transition is measured ±500mV from steady state voltage with Load (B).
This parameter is sampled and not 100% tested.

• TIMING WAVEFORM OF WRITE CYCLE NO. 1 ($\overline{WE}$ Controlled)



• TIMING WAVEFORM OF WRITE CYCLE NO. 2 ($\overline{CS}$ Controlled)



Notes) 1. A write occurs during the overlap of a low $\overline{CS}$ and a low $\overline{WE}$, (t_{WP})
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 $\overline{WE}$ transition or after the $\overline{WE}$ transition, the output buffers remain in a high impedance state.
5. If 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.
6. Dout is the same phase of Write data of this write cycle, if t_{WR} is long enough.

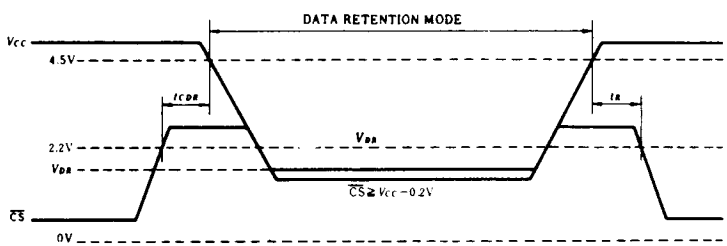
■LOW V_{CC} DATA RETENTION CHARACTERISTICS ($0°C \leqq Ta \leqq 70°C$)

This characteristics is guaranteed only for L-version.

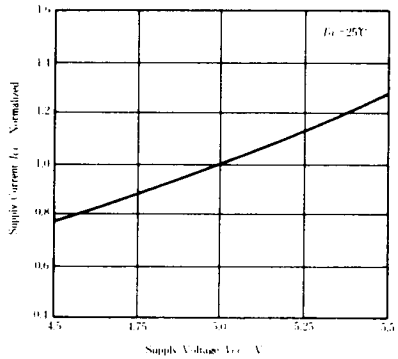
Parameter	Symbol	Test Conditions	min	typ	max	Unit
V_{CC} for Data Retention	V_{DR}	$\overline{CS} \geqq V_{CC} - 0.2V$ $V_{in} \geqq V_{CC} - 0.2V$ or $0V \leqq V_{in} \leqq 0.2V$	2.0	—	—	V
Data Retention Current	I_{CCDR}		—	—	30 *2 20 *3	μA
Chip Deselect to Data Retention Time	t_{CDR}		0	—	—	ns
Operation Recovery Time	t_R		t_{RC} *1	—	—	ns

Notes) *1. t_{RC} = Read Cycle Time
*2. V_{CC} = 3.0V
*3. V_{CC} = 2.0V

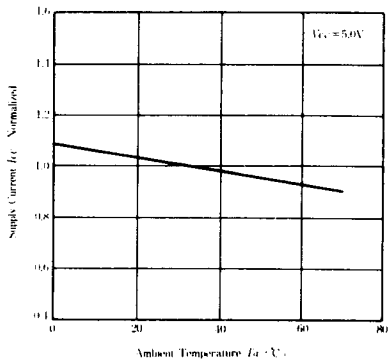
●LOW V_{CC} DATA RETENTION WAVEFORM



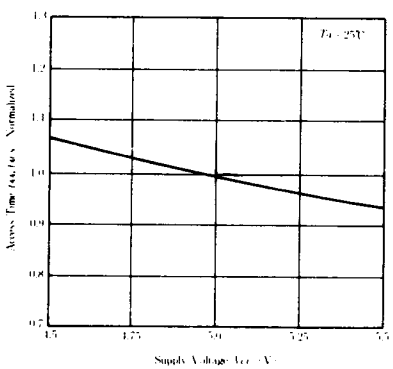
SUPPLY CURRENT VS. SUPPLY VOLTAGE



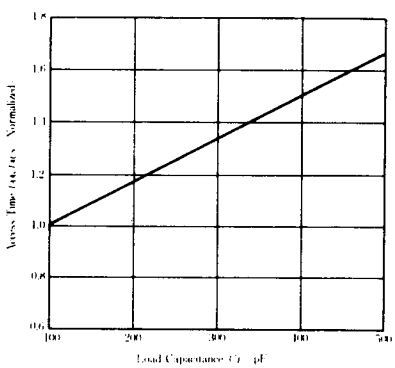
SUPPLY CURRENT VS. AMBIENT TEMPERATURE



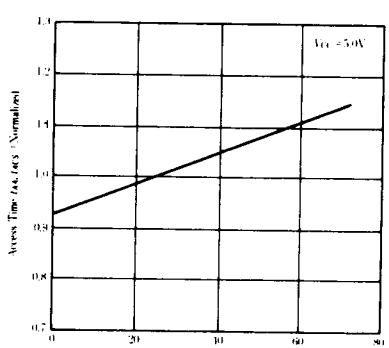
ACCESS TIME VS. SUPPLY VOLTAGE



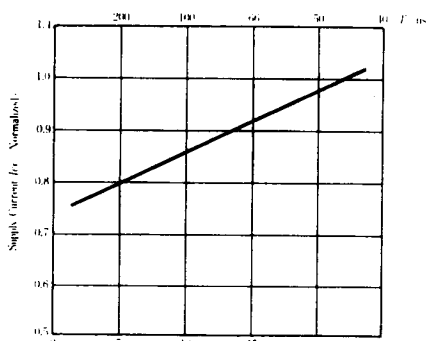
ACCESS TIME VS. LOAD CAPACITANCE



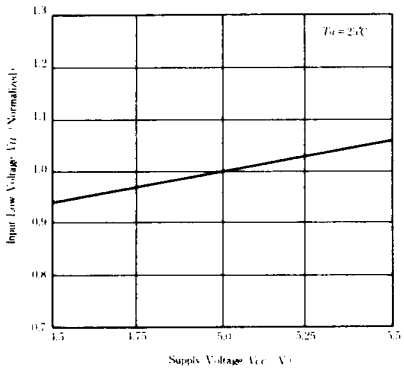
ACCESS TIME VS. AMBIENT TEMPERATURE



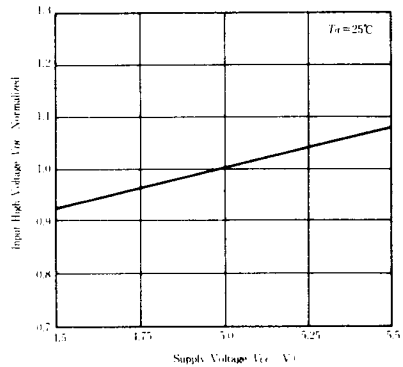
SUPPLY CURRENT VS. FREQUENCY



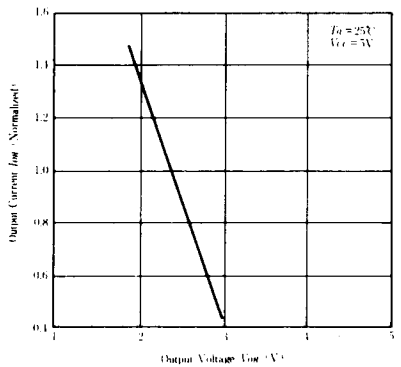
INPUT LOW VOLTAGE VS. SUPPLY VOLTAGE



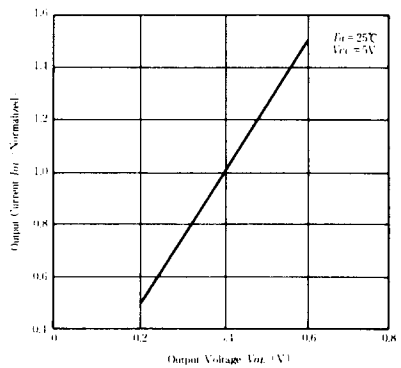
INPUT HIGH VOLTAGE VS. SUPPLY VOLTAGE



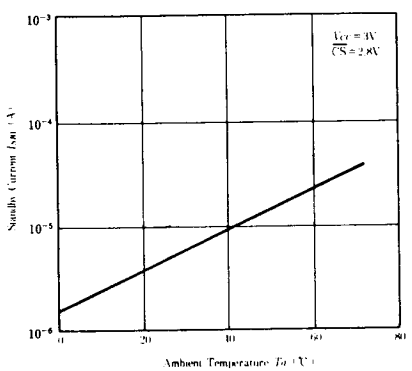
OUTPUT CURRENT VS. OUTPUT VOLTAGE



OUTPUT CURRENT VS. OUTPUT VOLTAGE



STANDBY CURRENT VS. AMBIENT TEMPERATURE



STANDBY CURRENT VS. SUPPLY VOLTAGE