

HM6264 Series**Maintenance Only**
(Substitute HM6264A)

T-46-23-12

B192-word x 8-bit High Speed CMOS Static RAM**■ FEATURES**

- Fast access Time 100ns/120ns/150ns (max.)
- Low Power Standby Standby: 0.1mW (typ.)
10 μ W (typ.) L-/LL-version
- Low Power Operation Operating: 200mW/MHz (typ.)
- Single +5V Supply
- Completely Static Memory. . . . No clock or Timing Strobe Required
- Equal Access and Cycle Time
- Common Data Input and Output, Three State Output
- Directly TTL Compatible: All Input and Output
- Standard 28pin Package Configuration
- Pin Out Compatible with 64K EPROM HN482764
- Capability of Battery Back Up Operation (L-/LL-version)

■ ORDERING INFORMATION

Type No.	Access Time	Package
HM6264P-10	100ns	600 mil 28 pin Plastic DIP
HM6264P-12	120ns	
HM6264P-15	150ns	
HM6264LP-10	100ns	600 mil 28 pin Plastic DIP
HM6264LP-12	120ns	
HM6264LP-15	150ns	
HM6264LP-10L	100ns	600 mil 28 pin Plastic DIP
HM6264LP-12L	120ns	
HM6264LP-15L	150ns	
HM6264FP-10	100ns	28 pin Plastic SOP (Note)
HM6264FP-12	120ns	
HM6264FP-15	150ns	
HM6264LFP-10	100ns	28 pin Plastic SOP (Note)
HM6264LFP-12	120ns	
HM6264LFP-15	150ns	
HM6264LFP-10L	100ns	28 pin Plastic SOP (Note)
HM6264LFP-12L	120ns	
HM6264LFP-15L	150ns	

Note) A character T is added to the end of type No. for SOP of 3.00 mm (max.) thickness.

■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Terminal Voltage *1	V_T	-0.5*2 to +7.0	V
Power Dissipation	P_T	1.0	W
Operating Temperature	T_{opr}	0 to +70	°C
Storage Temperature	T_{stg}	-55 to +125	°C
Storage Temperature Under Bias	T_{bias}	-10 to +85	°C

Notes) *1. With respect to V_{SS}

*2. -3.0V for pulse width $\leq$ 50ns

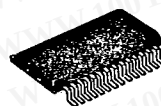
Note) This device is not available for new application.

HM6264P Series

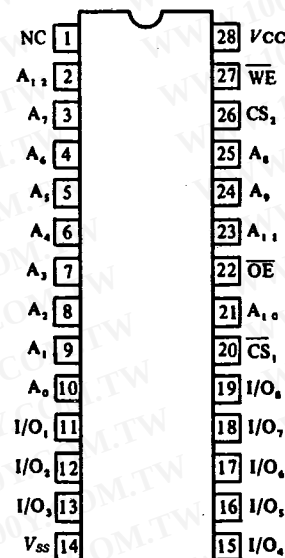


(DP-28)

HM6264FP Series



(FP-28D/DA)

■ PIN ARRANGEMENT

(Top View)

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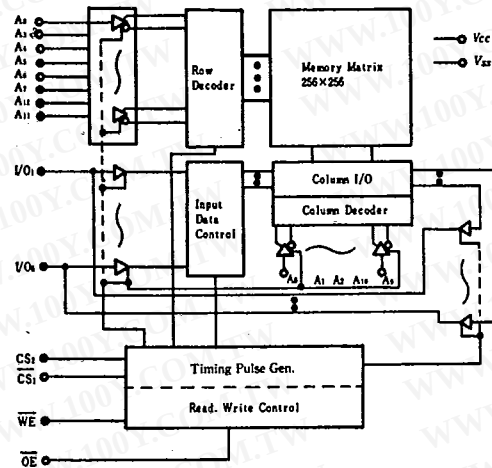
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■ BLOCK DIAGRAM



■ TRUTH TABLE

WE	CS ₁	CS ₂	OE	Mode	I/O Pin	V _{CC} Current	Note
X	H	X	X	Not Selected (Power Down)	High Z	I _{SB} , I _{SB1}	
X	X	L	X		High Z	I _{SB} , I _{SB2}	
H	L	H	H	Output Disabled	High Z	I _{CC} , I _{CC1}	
H	L	H	L	Read	Dout	I _{CC} , I _{CC1}	
L	L	H	H	Write	Din	I _{CC} , I _{CC1}	Write Cycle (1)
L	L	H	L		Din	I _{CC} , I _{CC1}	Write Cycle (2)

X : H or L

■ RECOMMENDED DC OPERATING CONDITIONS (T_a = 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}	-0.3*1	—	0.8	V

Note) *1. -3.0V for pulse width ≤ 50ns

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

Item	Symbol	Test Condition	min	typ*1	max	Unit
Input Leakage Current	I _{LI}	V _{in} = V _{SS} to V _{CC}	—	—	2	μA
Output Leakage Current	I _{LO}	CS ₁ = V _{IH} or CS ₂ = V _{IL} or OE = V _{IH} or WE = V _{IL} , V _{I/O} = V _{SS} to V _{CC}	—	—	2	μA
Operating Power Supply Current	I _{CC}	CS ₁ = V _{IL} , CS ₂ = V _{IH} , I _{I/O} = 0mA	—	40	80	mA
Average Operating Current	I _{CC1}	Min. cycle, duty = 100%, I _{I/O} = 0mA	—	60	110	mA
Standby Power Supply Current	I _{SB}	CS ₁ = V _{IH} or CS ₂ = V _{IL}	—	1	3	mA
	I _{SB1} *2	CS ₁ ≥ V _{CC} - 0.2V, CS ₂ ≥ V _{CC} - 0.2V or CS ₂ ≤ 0.2V	—	0.02	2	mA
			—	2*3	100*3	μA
			—	2*4	50*4	μA
	I _{SB2} *2	CS ₂ ≤ 0.2V	—	0.02	2	mA
			—	2*3	100*3	μA
Output Voltage	V _{OL}	I _{OL} = 2.1mA	—	—	0.4	V
	V _{OH}	I _{OH} = -1.0 mA	2.4	—	—	V

Notes) *1. Typical limits are at V_{CC} = 5.0V, T_a = 25°C and specified loading.*2. V_{IL} min = -0.3V

*3. This characteristics is guaranteed only for L-version.

*4. This characteristics is guaranteed only for LL-version.



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

Item	Symbol	Test Condition	typ	max	Unit
Input Capacitance	C_{in}	$V_{in} = 0\text{V}$	-	6	pF
Input/Output Capacitance	$C_{I/O}$	$V_{I/O} = 0\text{V}$	-	8	pF

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

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

● AC TEST CONDITIONS

Input Pulse Levels: 0.8 to 2.4V

Input Rise and Fall Times: 10ns

Input and Output Timing Reference Level: 1.5V

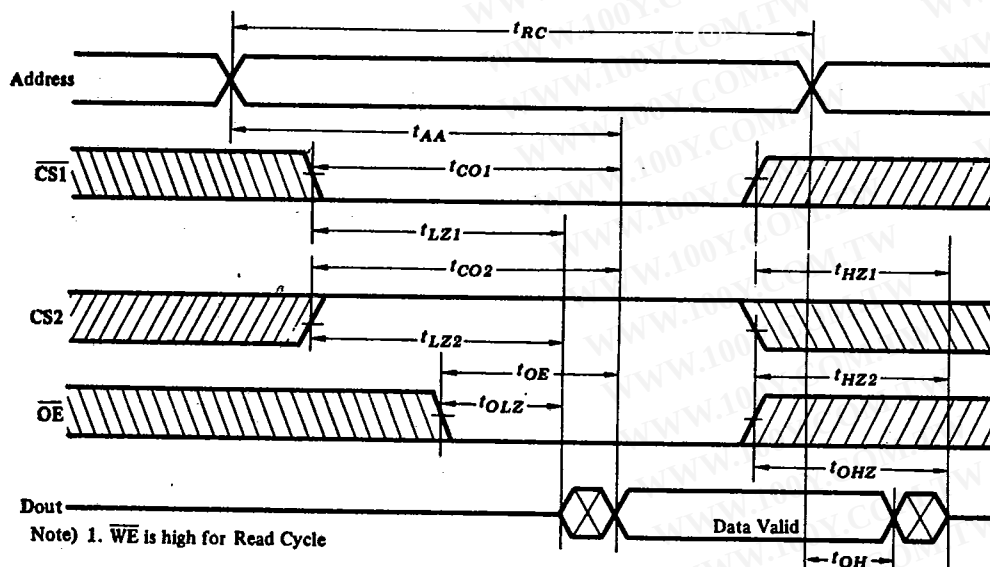
Output Load: 1TTL Gate and C_L (100pF) (including scope and jig)

● READ CYCLE

Item		Symbol	HM6264-10		HM6264-12		HM6264-15		Unit
			min	max	min	max	min	max	
Read Cycle Time		t_{RC}	100	—	120	—	150	—	ns
Address Access Time		t_{AA}	—	100	—	120	—	150	ns
Chip Selection to Output	$\overline{CS1}$	t_{CO1}	—	100	—	120	—	150	ns
	$\overline{CS2}$	t_{CO2}	—	100	—	120	—	150	ns
Output Enable to Output Valid		t_{OE}	—	50	—	60	—	70	ns
Chip Selection to Output in Low Z	$\overline{CS1}$	t_{LZ1}	10	—	10	—	15	—	ns
	$\overline{CS2}$	t_{LZ2}	10	—	10	—	15	—	ns
Output Enable to Output in Low Z		t_{OLZ}	5	—	5	—	5	—	ns
Chip Deselection to Output in High Z	$\overline{CS1}$	t_{HZ1}	0	35	0	40	0	50	ns
	$\overline{CS2}$	t_{HZ2}	0	35	0	40	0	50	ns
Output Disable to Output in High Z		t_{OHZ}	0	35	0	40	0	50	ns
Output Hold from Address Change		t_{OH}	10	—	10	—	15	—	ns

Notes) 1. t_{HZ} and t_{OHZ} are defined as the time at which the outputs achieve the open circuit condition and are not referred to output voltage levels.2. At any given temperature and voltage condition, t_{HZ} max is less than t_{LZ} min both for a given device and from device to device.

● READ CYCLE



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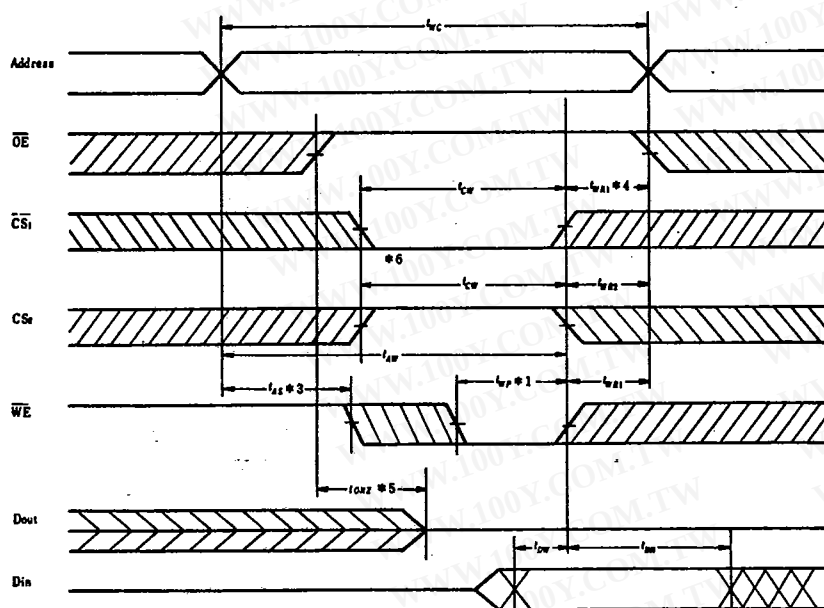
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• WRITE CYCLE

Item		Symbol	HM6264-10		HM6264-12		HM6264-15		Unit
			min	max	min	max	min	max	
Write Cycle Time		t_{WC}	100	—	120	—	150	—	ns
Chip Selection to End of Write		t_{CW}	80	—	85	—	100	—	ns
Address Setup Time		t_{AS}	0	—	0	—	0	—	ns
Address Valid to End of Write		t_{AW}	80	—	85	—	100	—	ns
Write Pulse Width		t_{WP}	60	—	70	—	90	—	ns
Write Recovery Time	$\overline{CS1}, \overline{WE}$	t_{WR1}	5	—	5	—	10	—	ns
	CS2	t_{WR2}	15	—	15	—	15	—	ns
Write to Output in High Z		t_{WHZ}	0	35	0	40	0	50	ns
Data to Write Time Overlap		t_{DW}	40	—	50	—	60	—	ns
Data Hold from Write Time		t_{DH}	0	—	0	—	0	—	ns
$\overline{OE}$ to Output in High Z		t_{OHZ}	0	35	0	40	0	50	ns
Output Active from End of Write		t_{OW}	5	—	5	—	10	—	ns

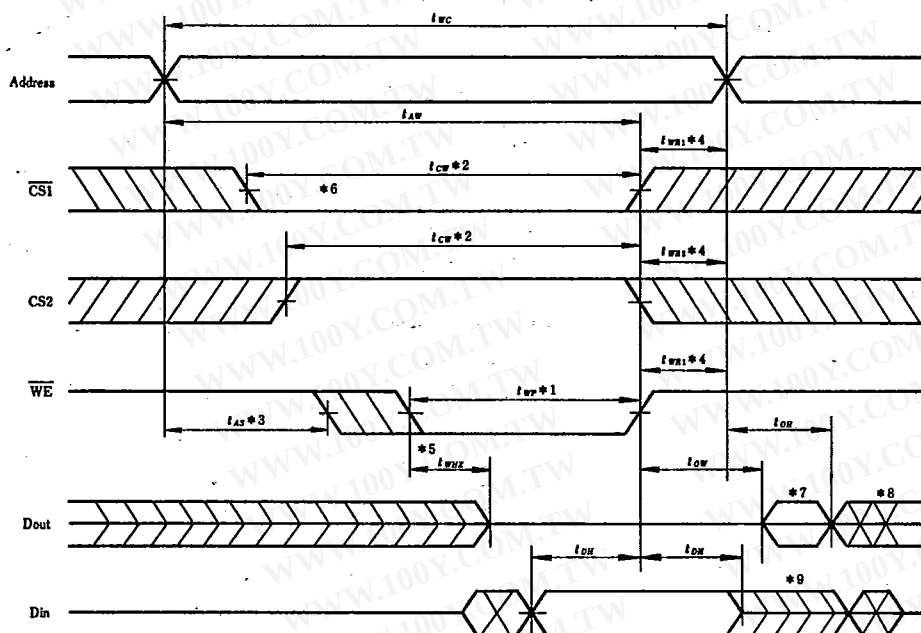
• WRITE CYCLE (1) ($\overline{OE}$ clock)

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• **WRITE CYCLE (2) ($\overline{OE}$ Low Fix)**

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- Notes)
1. A write occurs during the overlap of a low $\overline{CS1}$, a high CS2 and a low $\overline{WE}$. A write begins at the latest transition among CS1 going low, CS2 going high and $\overline{WE}$ going low. A write ends at the earliest transition among $\overline{CS1}$ going high, CS2 going low and $\overline{WE}$ going high. t_{WP} is measured from the beginning of write to the end of write.
 2. t_{CW} is measured from the later of CS1 going low or CS2 going high to the end of write.
 3. t_{AS} is measured from the address valid to the beginning of write.
 4. t_{WR} is measured from the end of write to the address change.
 t_{WR1} applies in case a write ends at $\overline{CS1}$ or $\overline{WE}$ going high.
 t_{WR2} applies in case a write ends at CS2 going low.
 5. During this period, I/O pins are in the output state, therefore the input signals of opposite phase to the outputs must not be applied.
 6. If $\overline{CS1}$ goes low simultaneously with $\overline{WE}$ going low or after $\overline{WE}$ going low, the outputs remain in high impedance state.
 7. $\overline{Dout}$ is the same phase of the latest written data in this write cycle.
 8. $\overline{Dout}$ is the read data of next address.
 9. If $\overline{CS1}$ is low and CS2 is high during this period, I/O pins are in the output state. Therefore, the input signals of opposite phase to the outputs must not be applied to them.

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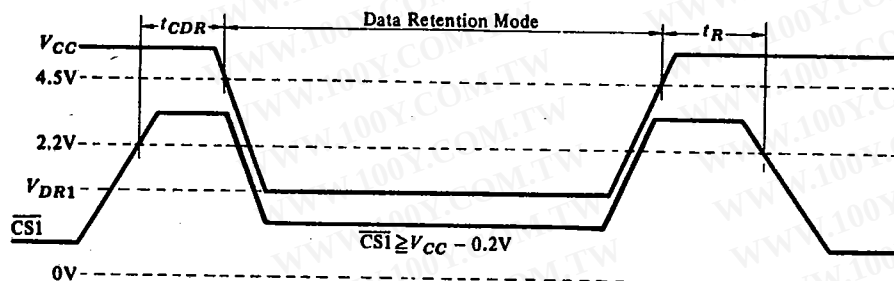
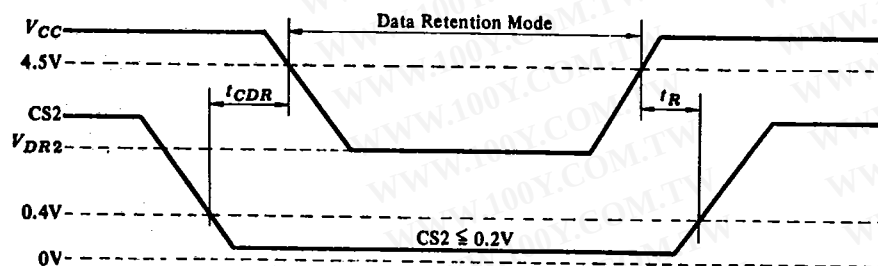
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■ LOW V_{CC} DATA RETENTION CHARACTERISTICS ($T_a = 0$ to $+70^\circ\text{C}$)

This characteristics is guaranteed only for L/LL-version.

Item	Symbol	Test Condition	min	typ	max	Unit
V_{CC} for Data Retention	V_{DR1}	$CS1 \geq V_{CC} - 0.2\text{V}$, $CS2 \geq V_{CC} - 0.2\text{V}$ or $CS2 \leq 0.2\text{V}$	2.0	—	—	V
	V_{DR2}	$CS2 \leq 0.2\text{V}$	2.0	—	—	V
Data Retention Current	I_{CCDR1}	$V_{CC} = 3.0\text{V}$, $CS1 \geq V_{CC} - 0.2\text{V}$	—	1*1	50*1	μA
		$CS2 \geq V_{CC} - 0.2\text{V}$ or $CS2 \leq 0.2\text{V}$	—	1*2	25*2	μA
	I_{CCDR2}	$V_{CC} = 3.0\text{V}$, $CS2 \leq 0.2\text{V}$	—	1*1	50*1	μA
Chip Deselect to Data Retention Time	t_{CDR}	See Retention Waveform	0	—	—	ns
Operation Recovery Time	t_R		t_{RC}^{*3}	—	—	ns

Notes) *1. V_{IL} min = -0.3V , $20\mu\text{A}$ max at $T_a = 0$ to 40°C . This characteristics is guaranteed only for L-version.
 *2. V_{IL} min = -0.3V , $10\mu\text{A}$ max at $T_a = 0$ to 40°C . This characteristics is guaranteed only for LL-version.
 *3. t_{RC} = Read Cycle Time

● LOW V_{CC} DATA RETENTION WAVEFORM (1) ($\overline{CS1}$ Controlled)● LOW V_{CC} DATA RETENTION WAVEFORM (2) ($CS2$ Controlled)

NOTE: In Data Retention Mode, $CS2$ controls the Address, $\overline{WE}$, $\overline{CS1}$, $\overline{OE}$ and Din buffer. If $CS2$ controls data retention mode, V_{in} for these inputs can be in the high impedance state. If $\overline{CS1}$ controls the data retention mode, $CS2$ must satisfy either $CS2 \geq V_{CC} - 0.2\text{V}$ or $CS2 \leq 0.2\text{V}$. The other input levels (address, $\overline{WE}$, $\overline{OE}$, I/O) can be in the high impedance state.

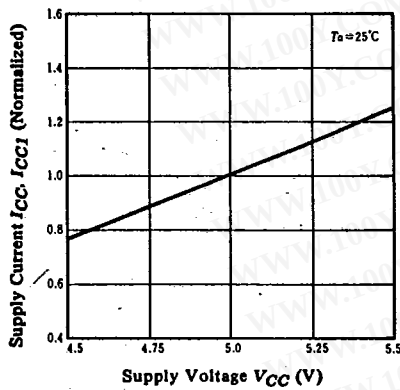
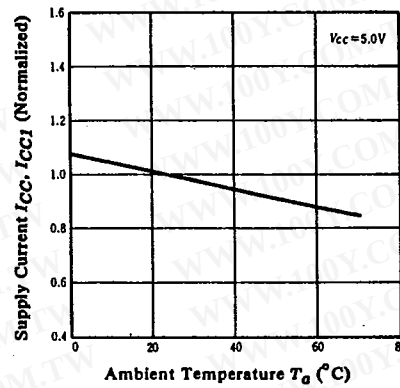
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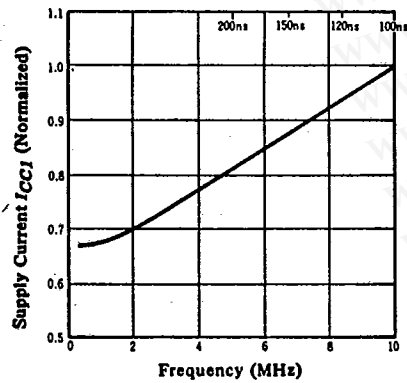
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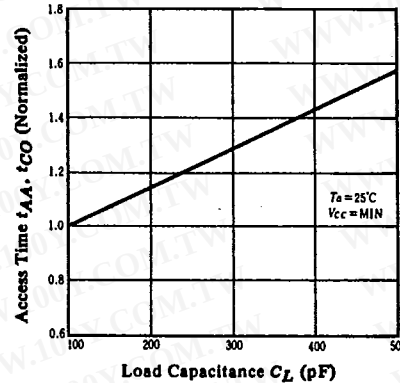
SUPPLY CURRENT vs.
SUPPLY VOLTAGESUPPLY CURRENT vs.
AMBIENT TEMPERATURE

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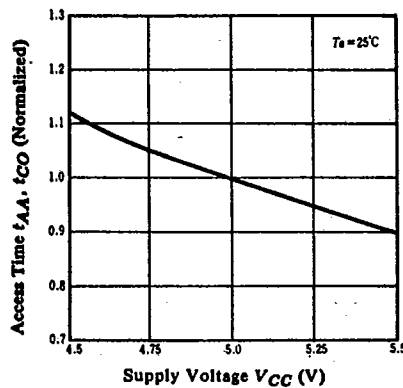
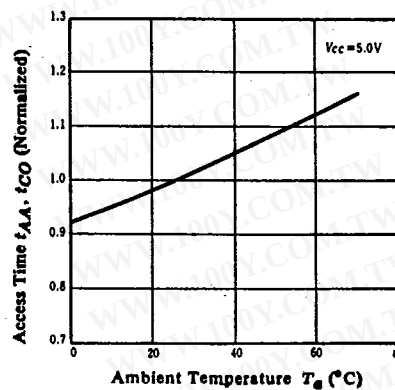
SUPPLY CURRENT vs. FREQUENCY



ACCESS TIME vs. LOAD CAPACITANCE



ACCESS TIME vs. SUPPLY VOLTAGE

ACCESS TIME vs.
AMBIENT TEMPERATURE

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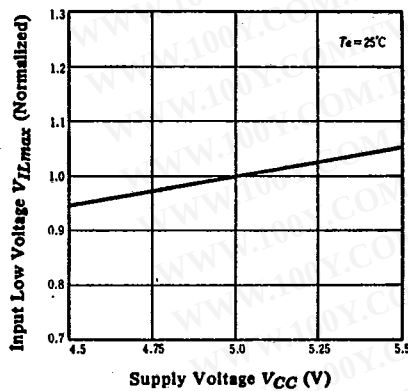
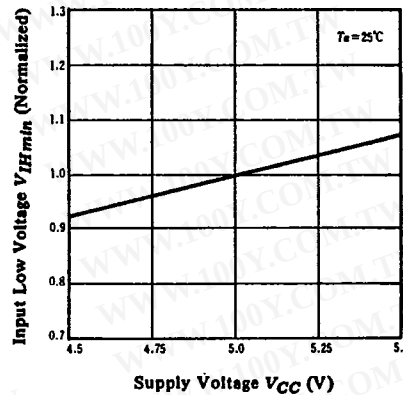
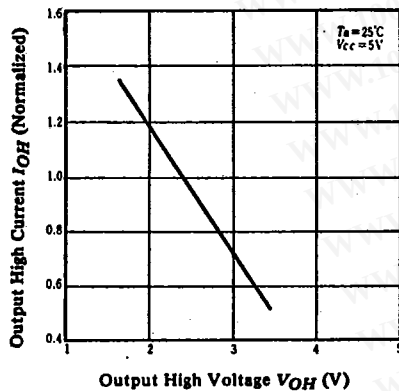
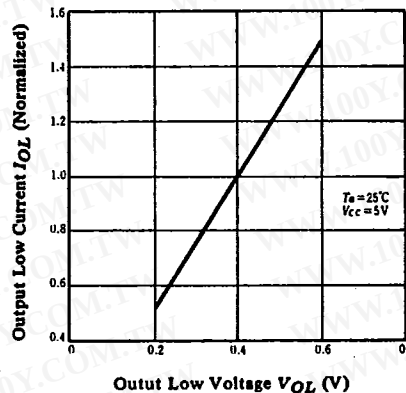
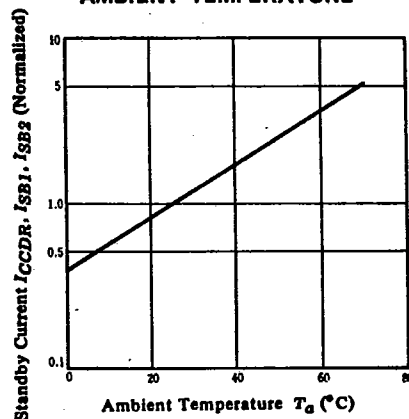
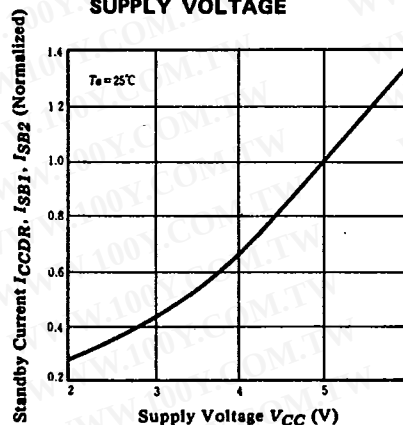


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INPUT LOW VOLTAGE vs.
SUPPLY VOLTAGEINPUT HIGH VOLTAGE vs.
SUPPLY VOLTAGEOUTPUT CURRENT vs.
OUTPUT VOLTAGEOUTPUT CURRENT vs.
OUTPUT VOLTAGESTANDBY CURRENT vs.
AMBIENT TEMPERATURESTANDBY CURRENT vs.
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