HYUNDAI SEMICONDUCTOR

HY6264A

8K×8-Bit CMOS SRAM

M261201B-MAY92

DESCRIPTION

The HY6264A is a high speed, low power 8,192 words by 8-bit CMOS static RAM fabricated using a twin tub CMOS process technology. This high reliability process coupled with innovative circuit design techniques, yields maximum access time of 70ns.

The HY6264A has a data retention mode that guarantees data to remain valid at a minimum power supply voltage of 2.0 volt.

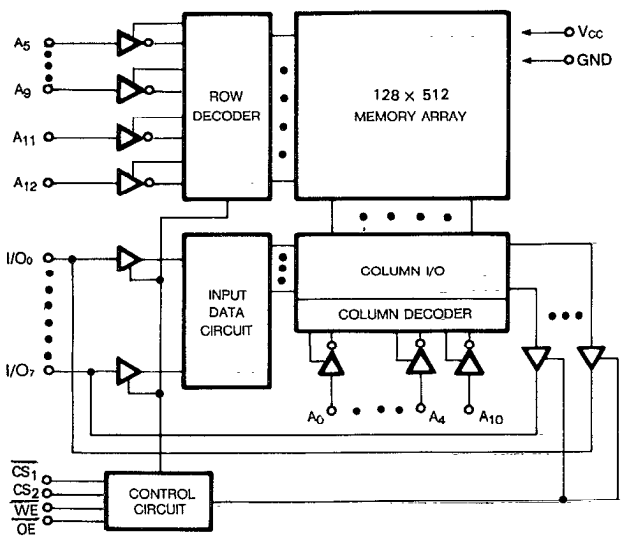
Using CMOS technology, supply voltage from 2.0 to 5.5 volt have little effect on supply current in data retention mode. Reducing the supply voltage to minimize current drain is unnecessary with the HY6264A family.

FEATURES

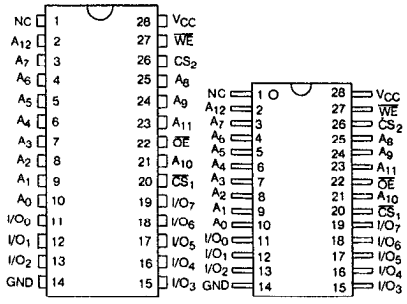
- High speed − 70/ 85/100/120/150ns (max.)
- Low power consumption
  - − 200 mW typical operating
  - − 10 μW typical standby (L/LL-version)
- Battery back up (L/LL-version)
  - − 2 volt data retention
- Fully static operation
  - − No clock or refresh required
- All inputs and outputs directly TTL compatible
- Tri-state output
- High reliability 28 pin 600 mil P-DIP and 330 mil SOP

		HY6264A-70	HY6264A-85	HY6264A-10	HY6264A-12	HY6264A-15
Maximum Access Time(ns)		70	85	100	120	150
Maximum Operating Current(mA)		50	50	50	50	50
Maximum Standby Current(mA)		2	2	2	2	2
	L	0.1	0.1	0.1	0.1	0.1
	LL	0.05	0.05	0.05	0.05	0.05

BLOCK DIAGRAM



PIN CONNECTIONS



DIP SOP

PIN NAMES

A_0-A_{12}	ADDRESS INPUT
I/O_0-I/O_7	DATA INPUT/OUTPUT
$\overline{CS_1}$	CHIP SELECT ONE
CS_2	CHIP SELECT TWO
$\overline{WE}$	WRITE ENABLE
$\overline{OE}$	OUTPUT ENABLE
V_{CC}	POWER
GND	GROUND

ABSOLUTE MAXIMUM RATINGS[1]

SYMBOL	PARAMETER	RATING	UNIT
V_{DD}, V_{IN}, $V_{I/O}$	Power Supply, Input, Input/Output Voltage	−0.5[2] to 7.0	V
T_{BIAS}	Temperature Under Bias	−10 to 125	°C
T_{STG}	Storage Temperature	−65 to 150	°C
P_D	Power Dissipation	1.0	W
I_{OUT}	Data Output Current	50	mA

NOTES :
1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
2. −3.5V for 20ns pulse.

RECOMMENDED DC OPERATING CONDITIONS
(T_A=0°C to 70°C)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{CC}	Supply Voltage	4.5	5.0	5.5	V
V_{IH}	Input High Voltage	2.2	3.5	6.0	V
V_{IL}	Input Low Voltage	−0.5[1]	0	0.8	V

NOTES :
1. −3.5V for 20ns pulse.

TRUTH TABLE

MODE	$\overline{CS_1}$	CS_2	$\overline{WE}$	$\overline{OE}$	I/O OPERATION
Standby	H	X	X	X	High-Z
	X	L	X	X	High-Z
Output Disabled	L	H	H	H	High-Z
Read	L	H	H	L	D_{OUT}
Write	L	H	L	X	D_{IN}

DC CHARACTERISTICS

(V_{CC}=5V± 10%, T_A=0°C to 70°C)

SYMBOL	PARAMETER	TEST CONDITIONS		HY6264A MIN.	HY6264A TYP.(1)	HY6264A MAX.	UNIT
$\|I_{LI}\|$	Input Leakage Current	V_{IN}=GND to V_{CC}		–	–	1	μA
$\|I_{LO}\|$	Output Leakage Current	$\overline{CS_1}$=V_{IH}, CS_2=V_{IL} or $\overline{OE}$=V_{IH}, $V_{I/O}$=GND to V_{CC}		–	–	1	μA
I_{CC}	Operating Power Supply Current	$\overline{CS_1}$=V_{IL}, CS_2=V_{IH}, $I_{I/O}$=0mA		–	7	15	mA
I_{CC1}	Average Operating Current	$\overline{CS_1}$=V_{IL}, CS_2=V_{IH}, Min, Duty Cycle=100%.	70	–	30	50	mA
			85	–	27	50	mA
			100	–	24	50	mA
			120	–	21	50	mA
			150	–	18	50	mA
I_{SB}	Standby Power Supply Current	$\overline{CS_1}$=V_{IH} or CS_2=V_{IL}		–	0.4	2	mA
I_{SB1}(2)		$\overline{CS_1}$ ≥ V_{CC}−0.2V, CS_2 ≤ 0.2V or ≥ V_{CC}−0.2V		–	20	1000	μA
			L	–	2	100	
			LL	–	2	50	
I_{SB2}		$\overline{CS_1}$ ≤ 0.2V or ≥ V_{CC}− 0.2V, CS_2 ≤ 0.2V		–	20	1000	μA
			L	–	2	100	
			LL	–	2	50	
V_{OL}	Output Low Voltage	I_{OL}=2.1mA		–	–	0.4	V
V_{OH}	Output High Voltage	I_{OH}=−1.0mA		2.4	–	–	V

NOTES :
1. Typical values are at V_{CC}=5V, T_A=25°C and specified loading.
2. V_{IL} min=−0.5V

AC CHARACTERISTICS

(V_{CC}=5V± 10%, T_A= 0°C to 70°C)

READ CYCLE

SYMBOL	PARAMETER		HY6264A-70 MIN.	HY6264A-70 MAX.	HY6264A-85 MIN.	HY6264A-85 MAX.	HY6264A-10 MIN.	HY6264A-10 MAX.	HY6264A-12 MIN.	HY6264A-12 MAX.	HY6264A-15 MIN.	HY6264A-15 MAX.	UNIT
t_{RC}	Read Cycle Time		70	–	85	–	100	–	120	–	150	–	ns
t_{AA}	Address Access Time		–	70	–	85	–	100	–	120	–	150	ns
t_{ACS1}	Chip Select Access Time	$\overline{CS_1}$	–	70	–	85	–	100	–	120	–	150	ns
t_{ACS2}		CS_2	–	70	–	85	–	100	–	120	–	150	ns
t_{OE}	Output Enable to Output Valid		–	45	–	50	–	55	–	60	–	70	ns
t_{CLZ1}	Chip Select to Output in Low-Z	$\overline{CS_1}$	10	–	10	–	10	–	10	–	15	–	ns
t_{CLZ2}		CS_2	10	–	10	–	10	–	10	–	15	–	ns
t_{OLZ}	Output Enable to Output in Low-Z		5	–	5	–	5	–	5	–	5	–	ns
t_{CHZ1}	Chip Deselect to Output in High-Z	$\overline{CS_1}$	0	30	0	35	0	35	0	40	0	50	ns
t_{CHZ2}		CS_2	0	30	0	35	0	35	0	40	0	50	ns
t_{OHZ}	Output Disable to Output in High-Z		0	30	0	35	0	35	0	40	0	50	ns
t_{OH}	Output Hold from Address Change		5	–	5	–	10	–	10	–	10	–	ns

WRITE CYCLE

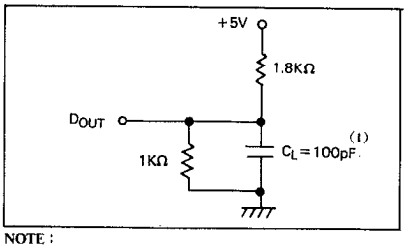
SYMBOL	PARAMETER		HY6264A-70		HY6264A-85		HY6264A-10		HY6264A-12		HY6264A-15		UNIT
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{WC}	Write Cycle Time		70	–	85	–	100	–	120	–	150	–	ns
t_{CW}	Chip Select to End of Write		55	–	60	–	70	–	85	–	100	–	ns
t_{AS}	Address Setup Time		0	–	0	–	0	–	0	–	0	–	ns
t_{AW}	Address Valid to End of Write		55	–	60	–	70	–	85	–	100	–	ns
t_{WP}	Write Pulse Width		50	–	55	–	60	–	70	–	90	–	ns
t_{WR1}	Write Recovery Time	$\overline{CS_1}$,$\overline{WE}$	0	–	0	–	0	–	0	–	0	–	ns
t_{WR2}		CS_2	0	–	0	–	0	–	0	–	0	–	ns
t_{WHZ}	Write to Output in High-Z		0	30	0	35	0	35	0	40	0	50	ns
t_{DW}	Data to Write Time Overlap		35	–	35	–	40	–	50	–	60	–	ns
t_{DH}	Data Hold from Write Time		0	–	0	–	0	–	0	–	0	–	ns
t_{OHZ}	Output Disable to Output in High-Z		0	30	0	35	0	35	0	40	0	50	ns
t_{OW}	Output Active from End of Write		5	–	5	–	5	–	5	–	10	–	ns

AC TEST CONDITIONS

(T_A=0°C to 70°C)

Input Pulse Level	0.8V to 2.4V
Input Rise and Fall Time	5ns
Input and Output Timing Reference Level	1.5V

OUTPUT LOAD



NOTE :
1. Including scope and the jig.

CAPACITANCE[1]

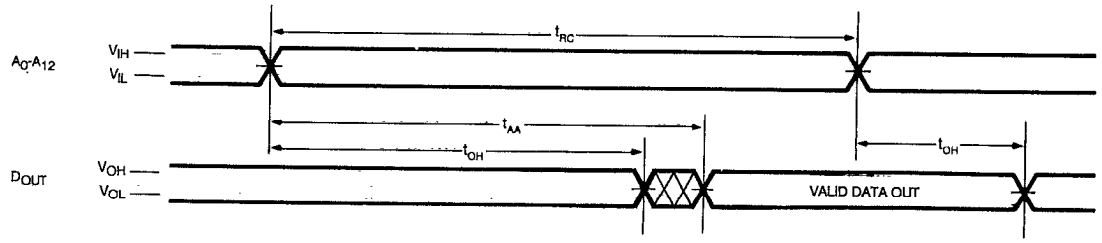
(T_A=25°C, f=1.0MHz)

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
C_{IN}	Input Capacitance	V_{IN}=0V	6	pF
$C_{I/O}$	Input/Output Capacitance	$V_{I/O}$=0V	8	pF

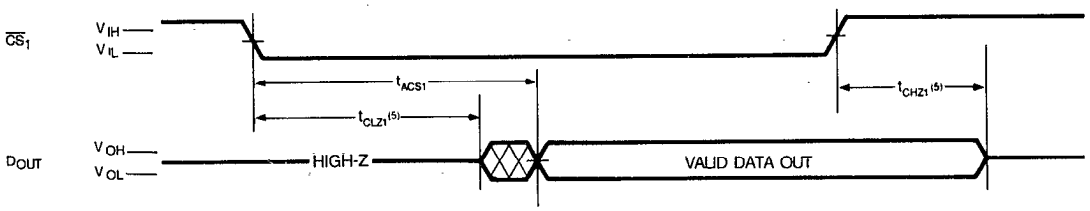
NOTE :
1. This parameter is sampled and not 100% tested.

TIMING DIAGRAMS

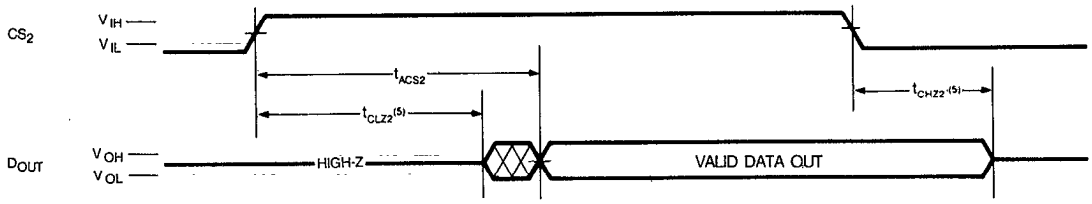
READ CYCLE 1[1,2,4]



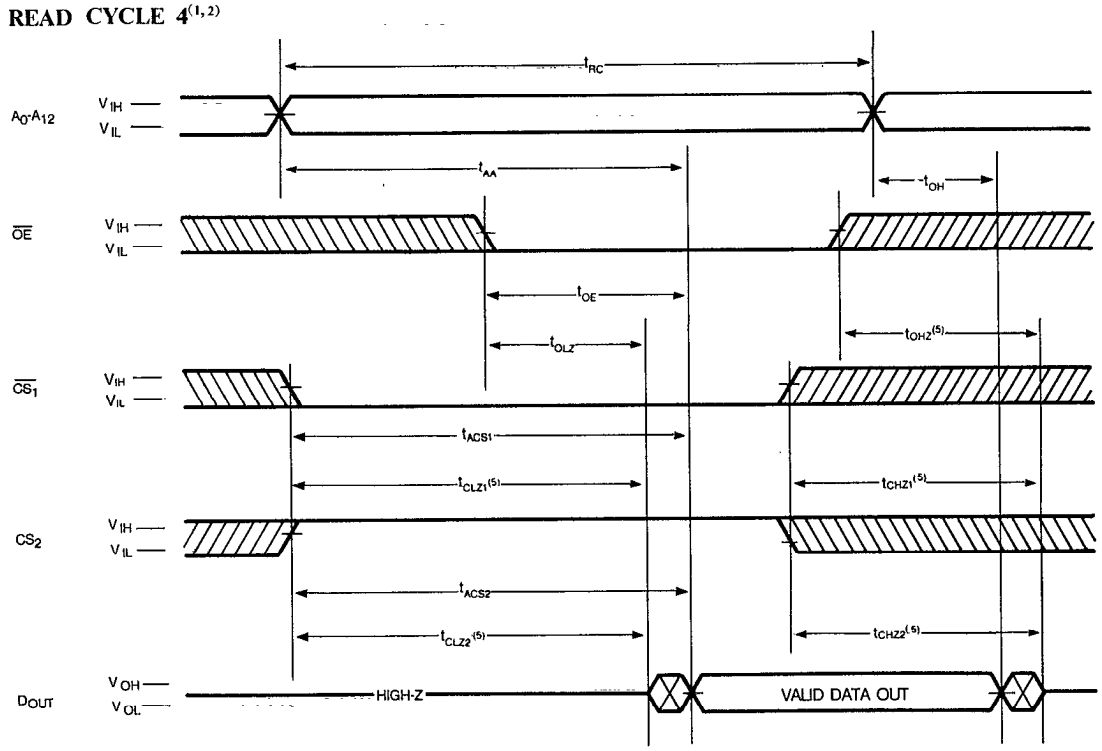
READ CYCLE 2[1,3,4,6]



READ CYCLE 3[1,4,7]

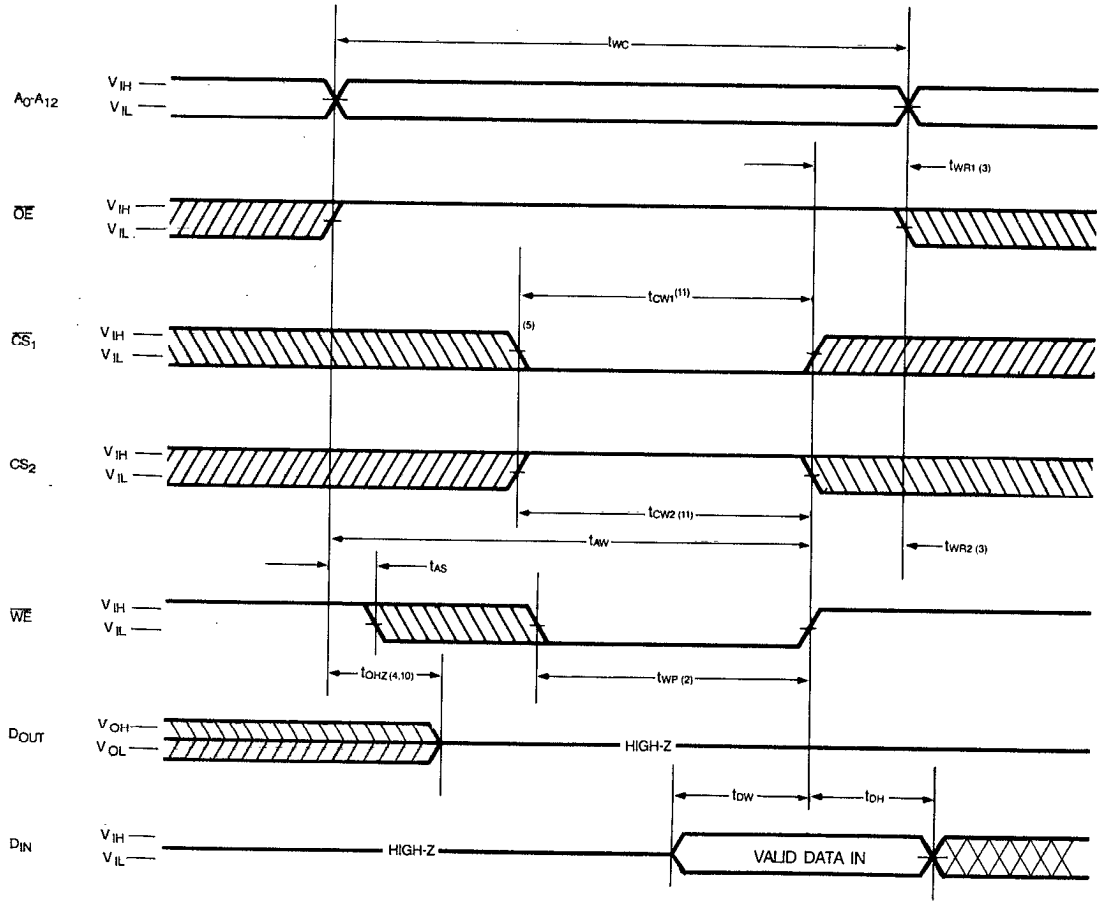


READ CYCLE 4[1,2]

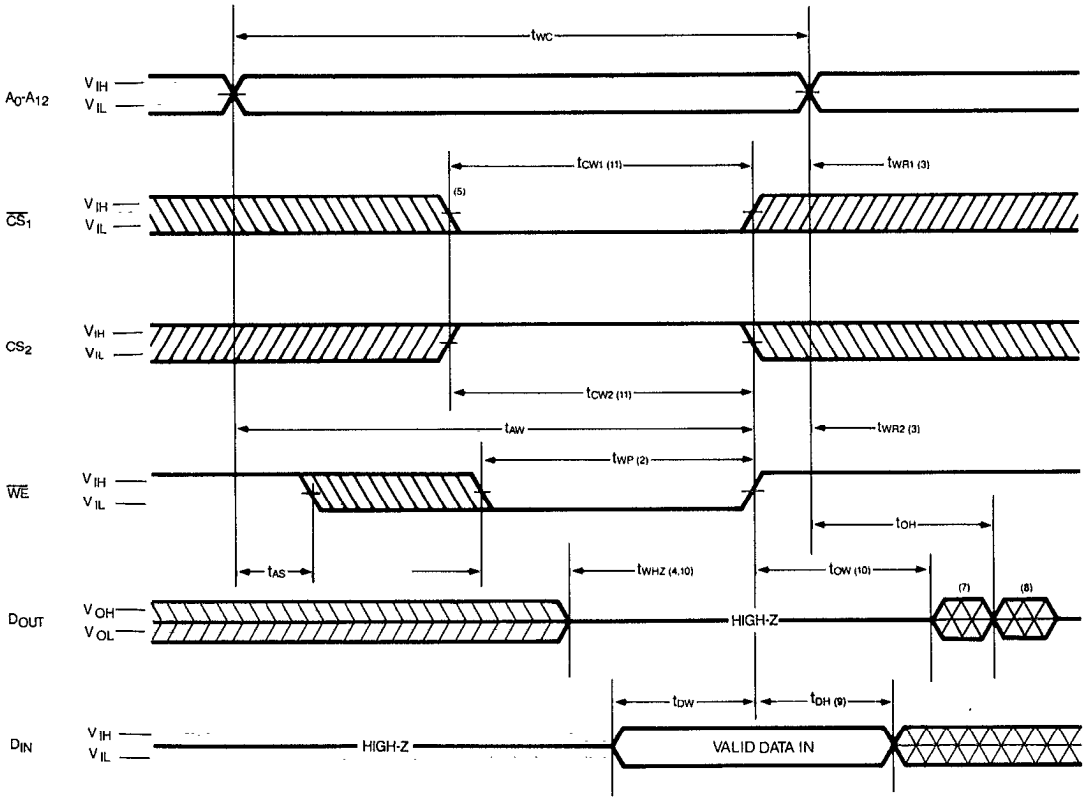


NOTES :
1. $\overline{WE}$ is high for read cycle.
2. Device is continuously selected $\overline{CS_1}=V_{IL}$ and $CS_2=V_{IH}$.
3. Addresses are valid prior to or coincident with $\overline{CS_1}$ transition low.
4. $\overline{OE}=V_{IL}$.
5. Transition is measured ± 500mV from steady state. This parameter is sampled and not 100% tested.
6. CS_2 is high.
7. $\overline{CS_1}$ is low.

WRITE CYCLE I[1]



WRITE CYCLE 2[1,6]



NOTES :

1. $\overline{WE}$ must be high during address transitions.
2. A write occurs during the overlap(t_{WP}) of low $\overline{CS_1}$, high CS_2 and low $\overline{WE}$.
3. t_{WR} is measured from the earlier of $\overline{CS_1}$ or $\overline{WE}$ going high or CS_2 going low to the end of write cycle.
4. During this period, I/O pins are in output state so that the input signals of opposite phase to the output must not be applied.
5. If the $\overline{CS_1}$ low transition or the CS_2 high transition occurs simultaneously with the $\overline{WE}$ low transition or after the $\overline{WE}$ transition, outputs remain in a high impedance state.
6. $\overline{OE}$ is continuously low($\overline{OE}=V_{IL}$).
7. D_{OUT} is the same phase of write data of this write cycle.
8. D_{OUT} is the read data of next address.
9. If $\overline{CS_1}$ is low and CS_2 is high during this period, I/O pins are in the output state. Then the data input signals of opposite phase to the output must not be applied to them.
10. Transition is measured ± 500mV from steady state.
11. t_{CW} is measured from the later of $\overline{CS_1}$ going low or CS_2 going high to the end of write.

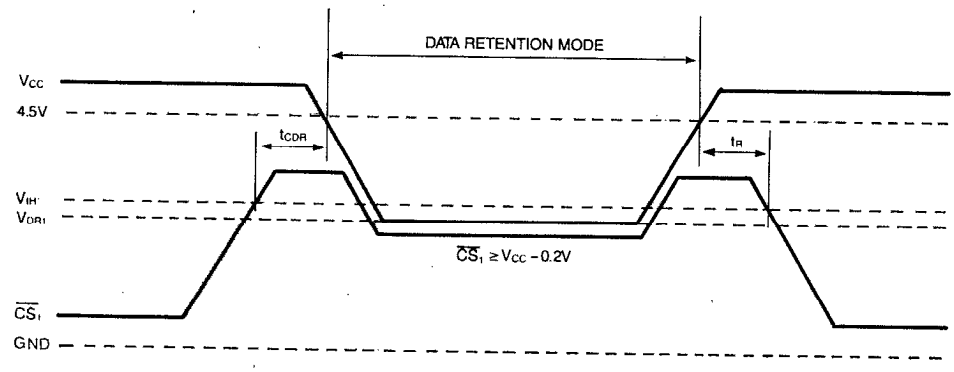
DATA RETENTION CHARACTERISTICS[1]

(T_A=0°C to 70°C)

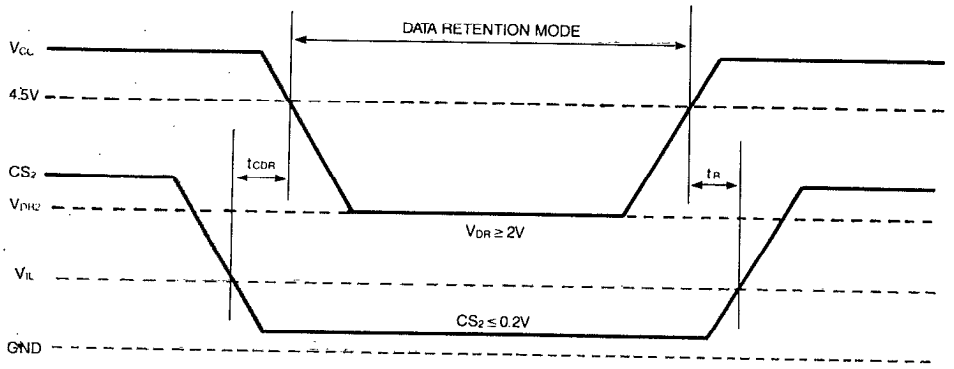
SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
V_{DR1}	Data Retention Supply Voltage	$\overline{CS_1} \geq V_{CC}-0.2V$, $CS_2 \geq V_{CC}-0.2V$ or $CS_2 \leq 0.2V$		2.0	–	–	V
V_{DR2}		$CS_2 \leq 0.2V$, $\overline{CS_1} \geq V_{CC}-0.2V$ or $\overline{CS_1} \leq 0.2V$		2.0	–	–	V
I_{CCDR1}	Data Retention Current	V_{CC}=3V, V_{IN}= 0V to V_{CC}	L	–	1	50	µA
		$\overline{CS_1} \geq V_{CC}-0.2V$, $CS_2 \geq V_{CC}-0.2V$ or $CS_2 \leq 0.2V$	LL	–	1	5[2]	
I_{CCDR2}		V_{CC}=3V, V_{IN}= 0V to V_{CC}	L	–	1	50	µA
		$CS_2 \leq 0.2V$, $\overline{CS_1} \geq V_{CC}-0.2V$ or $\overline{CS_1} \leq 0.2V$	LL	–	1	5[2]	
t_{CDR}	Chip Deselect to Data Retention Time	See Data Retention Timing Diagram		0	–	–	ns
t_R	Operation Recovery Time			t_{RC}[3]	–	–	ns

NOTES :
1. These characteristics are guaranteed for L and LL-version.
2. 3µA max. at T_A=0°C to 40°C
3. t_{RC}=Read Cycle Time

DATA RETENTION TIMING DIAGRAM 1 ($\overline{CS_1}$ Controlled)



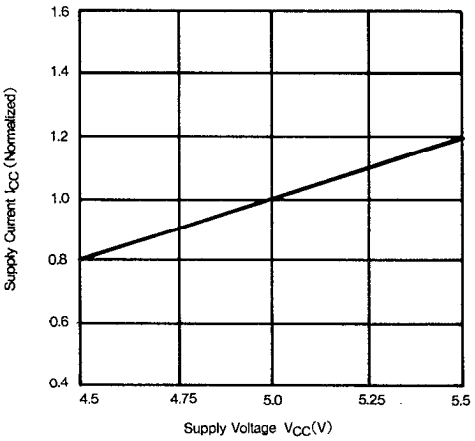
DATA RETENTION TIMING DIAGRAM 2 (CS_2 Controlled)



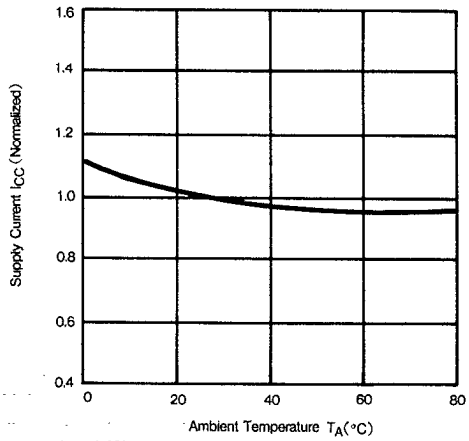
ELECTRICAL CHARACTERISTIC CURVES

(V_{CC}=5V, T_A=25°C, unless otherwise noted)

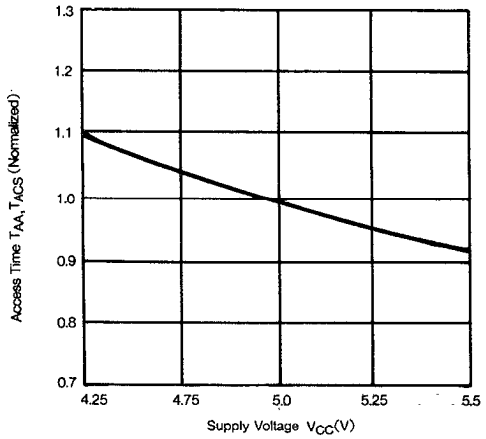
SUPPLY CURRENT vs. SUPPLY VOLTAGE



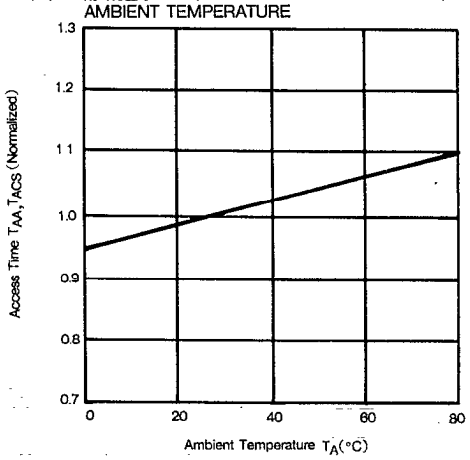
SUPPLY CURRENT vs. AMBIENT TEMPERATURE



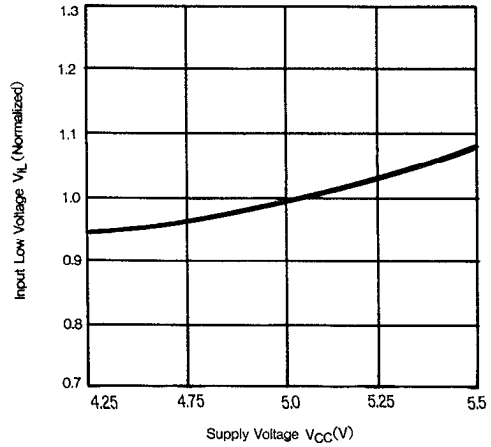
ACCESS TIME vs. SUPPLY VOLTAGE



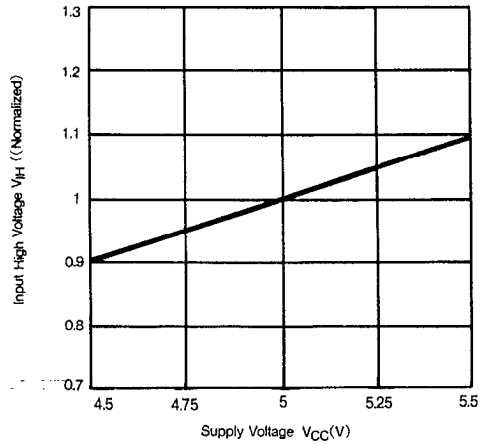
ACCESS TIME vs. AMBIENT TEMPERATURE



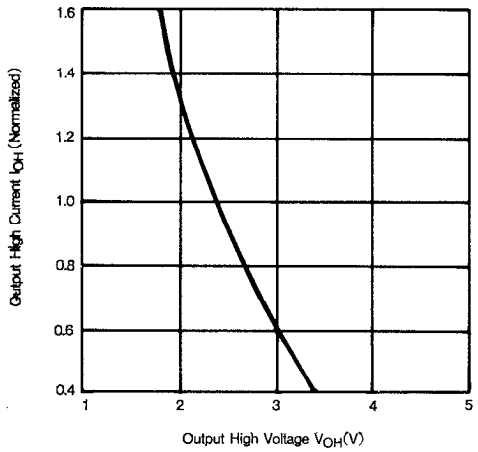
INPUT LOW VOLTAGE vs. SUPPLY VOLTAGE



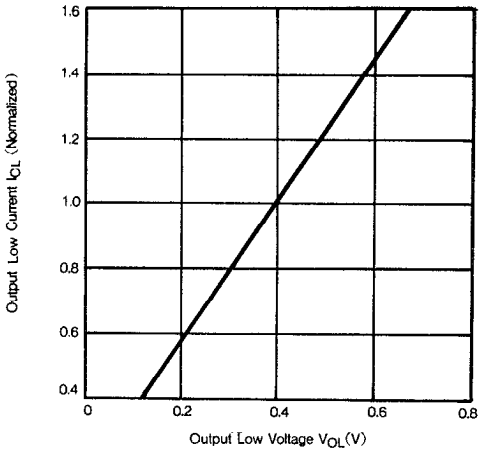
INPUT HIGH VOLTAGE vs. SUPPLY VOLTAGE



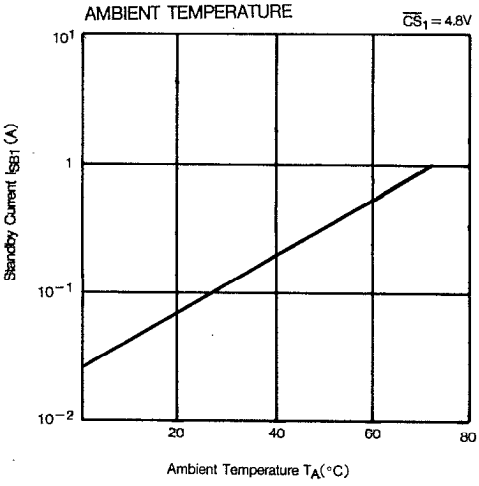
OUTPUT CURRENT vs.
OUTPUT VOLTAGE



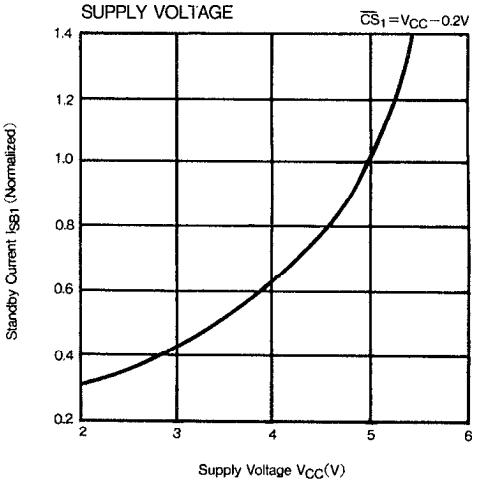
OUTPUT CURRENT vs.
OUTPUT VOLTAGE



STANDBY CURRENT vs.
AMBIENT TEMPERATURE

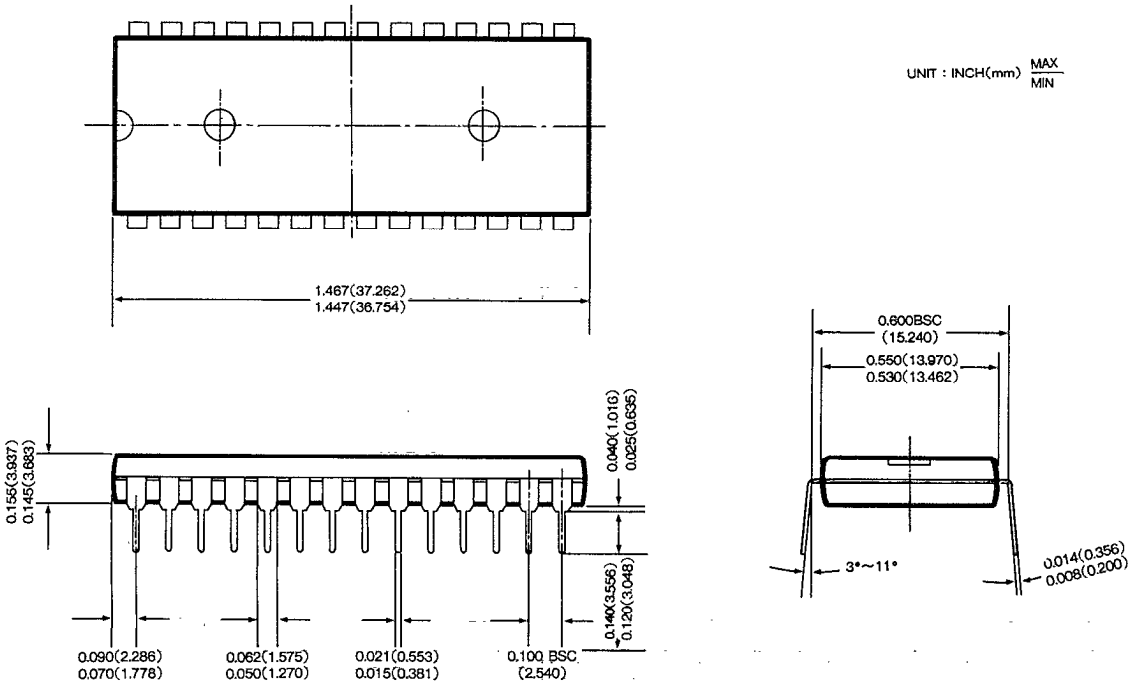


STANDBY CURRENT vs.
SUPPLY VOLTAGE



PACKAGE INFORMATION

• 28 PIN PLASTIC DUAL IN LINE PACKAGE−600MIL



• 28 PIN SMALL OUTLINE PACKAGE−330MIL