

Description

The GM76C88AL is a 65,536 bit static random access memory organized as 8,192 words by 8 bits using CMOS technology and operated from a single 5V supply. Advanced circuit techniques provide low power feature with a maximum operating current of 40mA and standby current of max 100 μ A. Its very low standby power requirement makes it ideal for applications requiring nonvolatile storage with back-up batteries. The asynchronous and static nature of the memory requires no external clock or refreshing circuits.

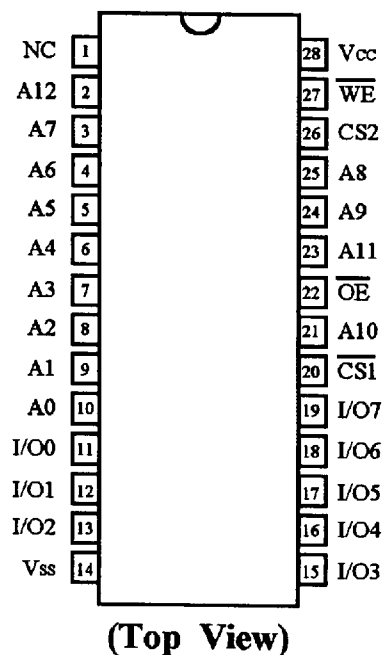
Features

- Fast Access Time : 120/150ns
- Low Power Operation
Standby : 2 μ A (Typ)
Operation : 25mA (Typ)
- Completely Static RAM : No Clock or Timing Strobe Required
- Non-Volatile Storage with Back-up Batteries
- 3-State Output with Wired-OR Capability
- Directly TTL Compatible : All Inputs and Outputs
- Single Power Supply (5V $\pm$ 10%)
- Standard 28 DIP, SOP and S-DIP

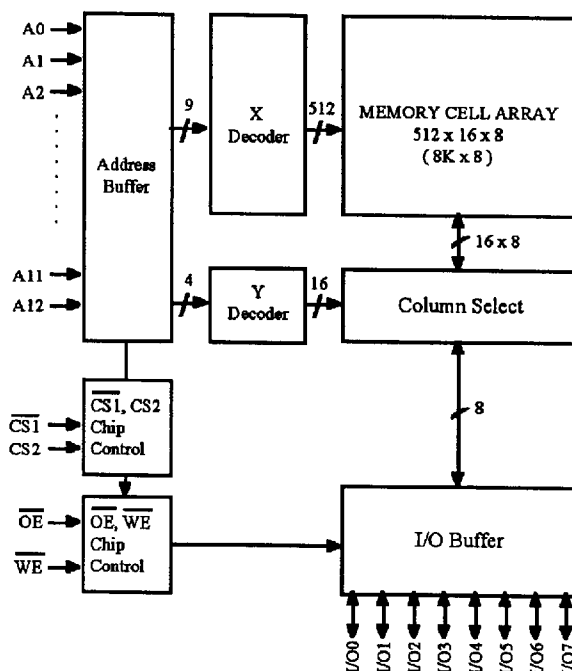
Pin Description

Pin	Function
A0-A12	Address Inputs
$\overline{WE}$	Write Enable Input
$\overline{CS1}$, CS2	Chip Select
$\overline{OE}$	Output Enable
I/O0-I/O7	Data Input/Output
Vcc	Power Supply (+5V)
Vss	Ground
NC	No Connection

Pin Configuration



Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
T_A	Ambient Temperature under Bias	0 ~ 70	°C
T_{STG}	Storage Temperature	-65 ~ 150	°C
T_{SOL}	Soldering Temperature and Time	260, 10 (at lead)	°C, S
V_{CC}	Supply Voltage	-0.5 ~ 7.0	V
V_{IN}	Input Voltage	-0.5 ~ 7.0	V
P_d	Power Dissipation	1.0	W

Recommended Operating Conditions ($T_A = 0 \sim 70^\circ\text{C}$)

Symbol	Parameter	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	4.5	5.0	5.5	V
V_{IH}	Input High Voltage	2.2	-	$V_{CC} + 0.5$	V
V_{IL}	Input Low Voltage	-0.5	-	0.8	V

Truth Table

$\overline{CS1}$	CS2	$\overline{OE}$	$\overline{WE}$	A0 to A12	DATA I/O	MODE
H	X	X	X	-	Hi-Z	Standby
X	L	X	X	-	Hi-Z	
L	H	X	L	Stable	Input Data	Write
L	H	L	H	Stable	Output Data	Read
L	H	H	H	Stable	Hi-Z	Output Disable

*Note: X means don't care.

DC Electrical Characteristics ($V_{CC} = 5V \pm 10\%$, $T_A = 0 \sim 70^\circ\text{C}$)

Symbol	Parameter	Conditions	Min	*Typ	Max	Unit
V_{OH}	Output High Voltage	$I_{OH} = -1.0\text{mA}$	2.4	$V_{CC} - 0.1$	-	V
V_{OL}	Output Low Voltage	$I_{OL} = 4.0\text{mA}$	-	0.2	0.4	V
I_{IL}	Input Leakage Current	$V_I = 0 \text{ to } V_{CC}$	-	-	1	μA
I_{OL}	Output Leakage Current	$\overline{CS1} = V_{IH}$ or $CS2 = V_{IL}$ or $\overline{WE} = V_{IL}$ or $OE = V_{IH}$, $V_{IO} = 0 \text{ to } V_{CC}$	-	-	1	μA
I_{CC1}	Operating Supply Current	$V_I = V_{IL}, V_{IH}$ $I_{IO} = 0\text{mA}$	$t_{RC} = 1\mu\text{s}$	-	6	mA
I_{CC2}			$t_{PC} = \text{Min}$	-	25	
		$V_I = 0.2V/V_{CC} - 0.2V$ $I_{IO} = 0\text{mA}$	$t_{RC} = 1\mu\text{s}$	-	3	mA
			$t_{PC} = \text{Min}$	-	20	
I_{CCS1}	Standby Power Supply Current	$\overline{CS1} = V_{IH}$ or $CS2 = V_{IL}$	-	1.5	3	mA
I_{CCS2}		$\overline{CS1} = CS2 \geq V_{CC} - 0.2V$ or $CS2 \leq 0.2V$	-	2	100	μA

*TYP. Values are measured at 25°C , $V_{CC} = 5V$

AC Electrical Characteristics ($V_{CC} = 5V \pm 10\%$, $T_A = 0 \sim 70^\circ C$)

Read Cycle

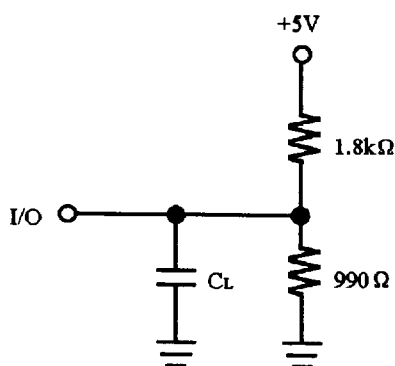
Symbol	Parameter	Conditions	GM76C88AL-12		GM76C88AL-15		Unit
			Min	Max	Min	Max	
t_{RC}	Read Cycle Time	*1	120	-	150	-	ns
t_{AA}	Address Access Time		-	120	-	150	ns
t_{ACS1}	Chip Select 1 Access Time		-	120	-	150	ns
t_{ACS2}	Chip Select 2 Access Time		-	120	-	150	ns
t_{OE}	Output Enable Access Time		-	60	-	70	ns
t_{OH}	Output Hold Time		30	-	30	-	ns
t_{CLZ1}	Chip Select 1 Output Setup Time	*2	10	-	10	-	ns
t_{CHZ1}	Chip Select 1 Output Floating		-	60	-	70	ns
t_{CLZ2}	Chip Select 2 Output Setup Time		10	-	10	-	ns
t_{CHZ2}	Chip Select 2 Output Floating		-	60	-	70	ns
t_{OLZ}	Output Enable Output Setup Time		5	-	5	-	ns
t_{OHZ}	Output Enable Output Floating		-	55	-	60	ns

Write Cycle

Symbol	Parameter	Conditions	GM76C88AL-12		GM76C88AL-15		Unit
			Min	Max	Min	Max	
t_{WC}	Write Cycle Time	*1	120	-	150	-	ns
t_{CW1}	Chip select Time 1		100	-	120	-	ns
t_{CW2}	Chip Select Time 2		100	-	120	-	ns
t_{AW}	Address Enable Time		100	-	120	-	ns
t_{AS}	Address Setup Time		0	-	0	-	ns
t_{WP}	Write Pulse Width		85	-	100	-	ns
t_{WR}	Address Hold Time		0	-	0	-	ns
t_{DW}	Input Data Setup Time		50	-	60	-	ns
t_{DH}	Input Data Hold Time		0	-	0	-	ns
t_{WHZ}	R/W Output Floating	*2	-	60	-	70	ns
t_{OW}	R/W Output Setup Time		10	-	10	-	ns

***1 Test Conditions.**

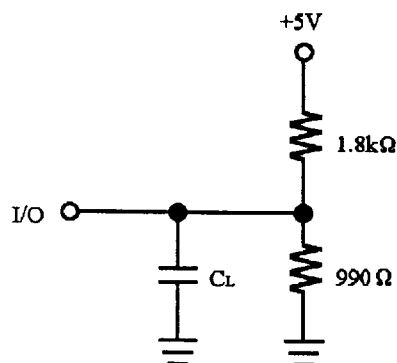
1. Input pulse level : 0.8V to 2.2V
2. $t_r = t_f = 5\text{ns}$
3. Input/output timing reference level : 1.5V
4. Output load : 1TTL + 100pF



$C_L = 100\text{pF}$ (Includes Jig Capacitance)

***2 Test Conditions.**

1. Input pulse level : 0.8V to 2.2V
2. $t_r = t_f = 10\text{ns}$
3. Input timing reference level : 1.5V
4. Output timing reference levels : $\pm 200\text{mV}$ (the level displace from stable output voltage level)
5. Output load : 1TTL + 5pF



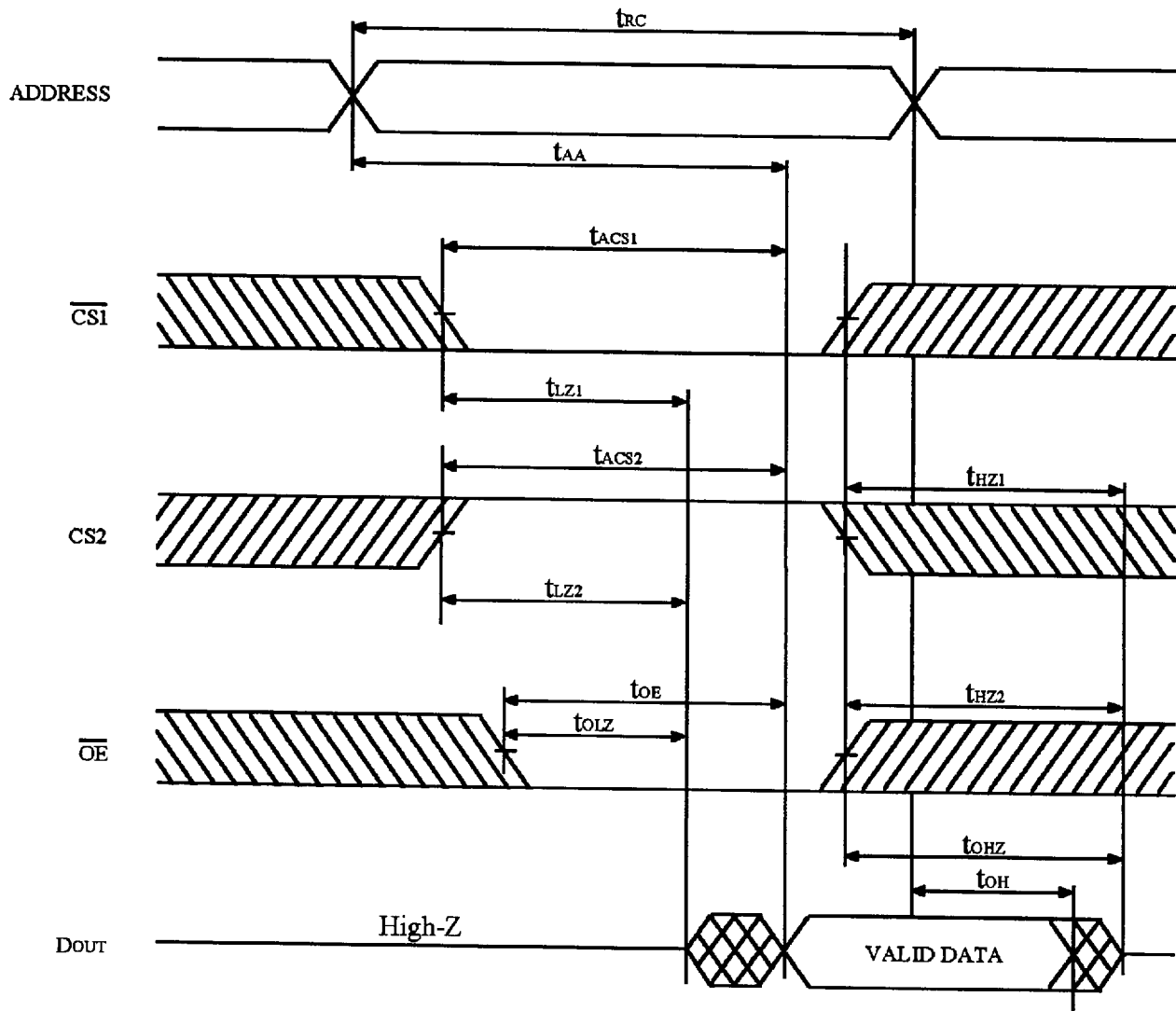
$C_L = 5\text{pF}$ (Includes Jig Capacitance)

Capacitance ($f = 1\text{MHz}$, $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test Conditions	Min	Max	Unit
C_{IN}	Input Capacitance	$V_I = 0\text{V}$	-	6	pF
C_{OUT}	Output Capacitance	$V_O = 0\text{V}$	-	8	pF

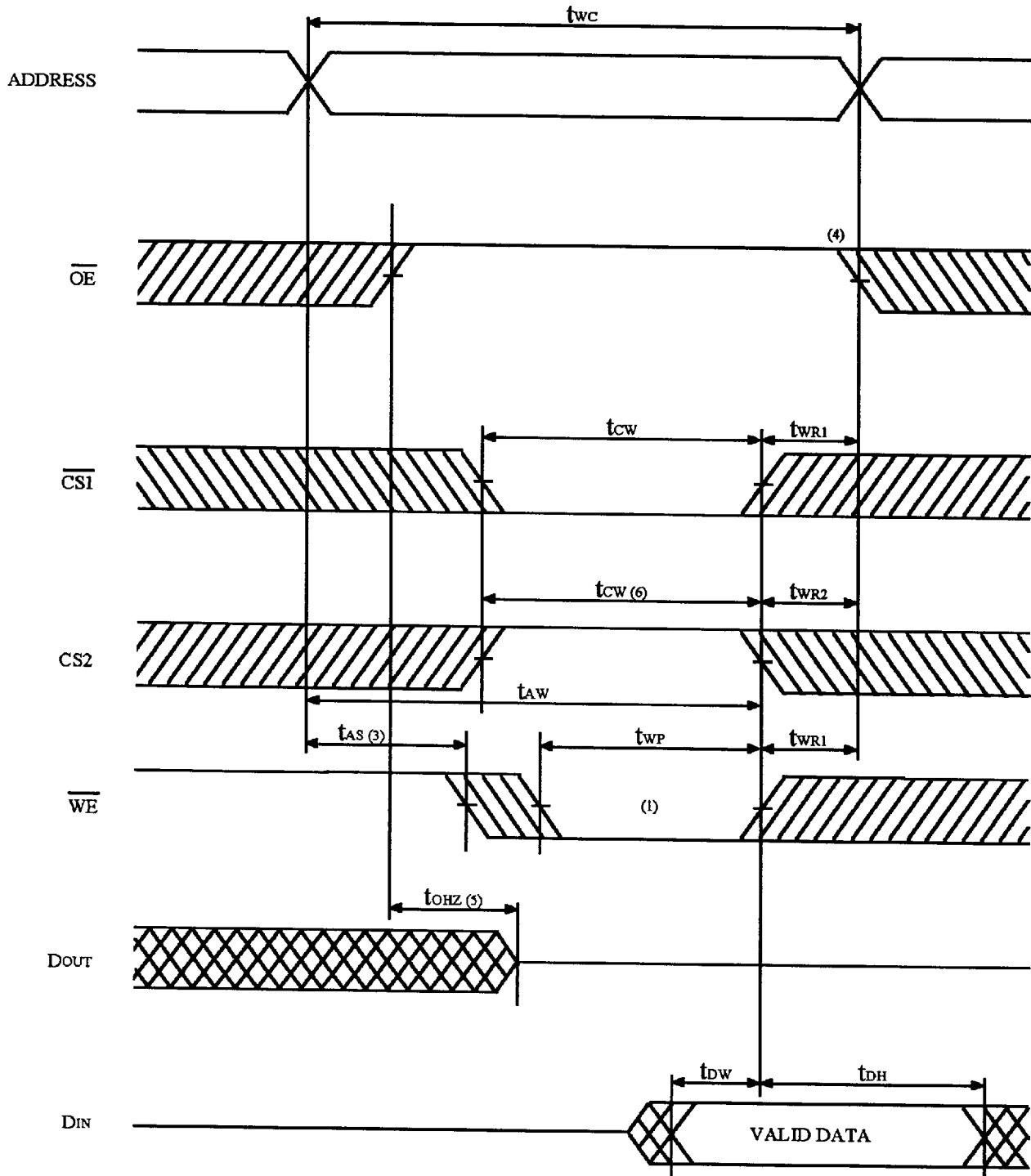
Timing Waveforms

Read Cycle

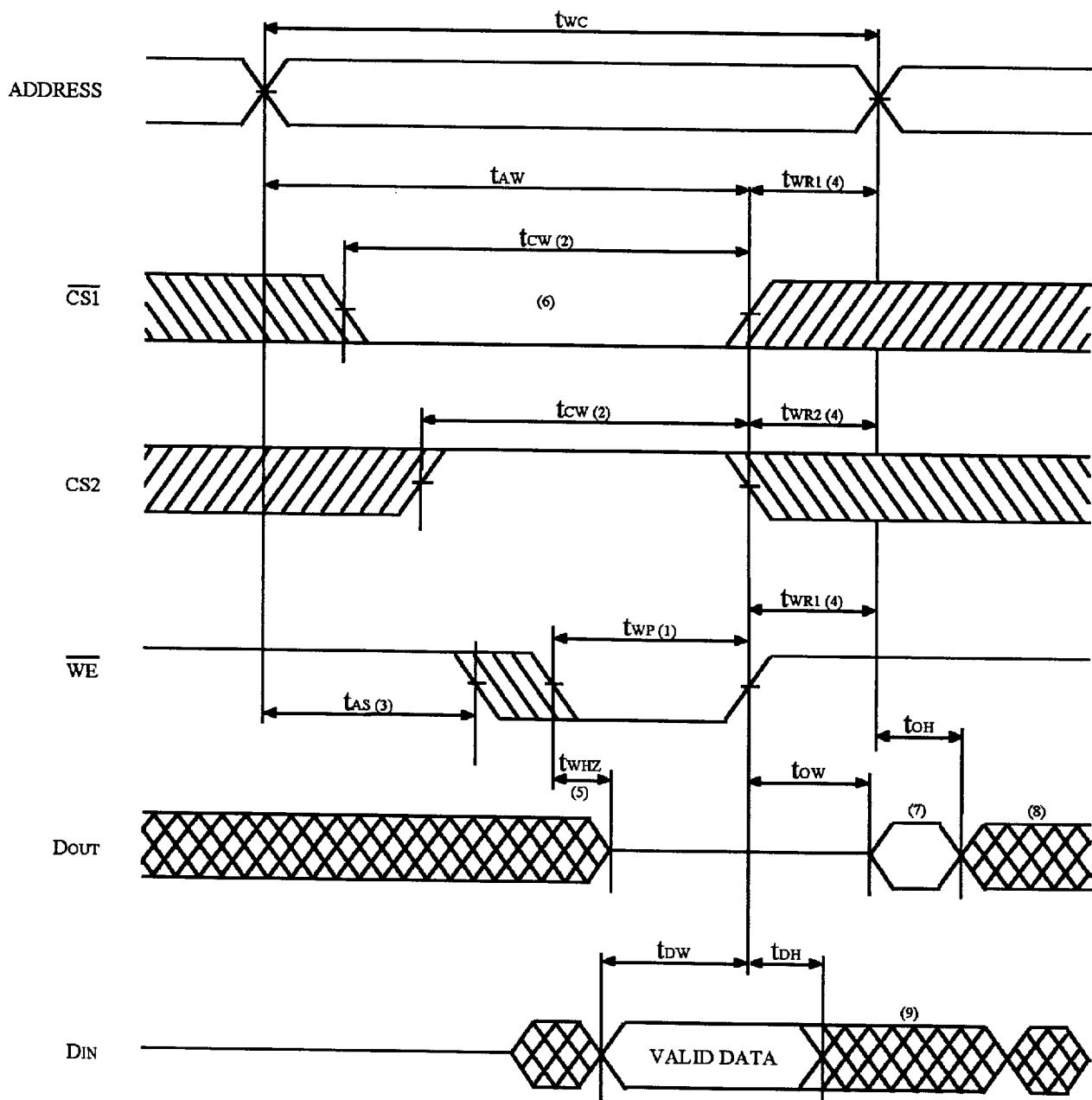


Note : 1) $\overline{WE}$ is High for Read Cycle

Write Cycle (1) ($\overline{\text{OE}}$ Controlled)



Write Cycle (2) ($\overline{OE}$ Low Fix)



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 $\overline{CS1}$ 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 $\overline{CS1}$ 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. D_{out} is the same phase of the latest written data in this write cycle.
8. D_{out} 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.

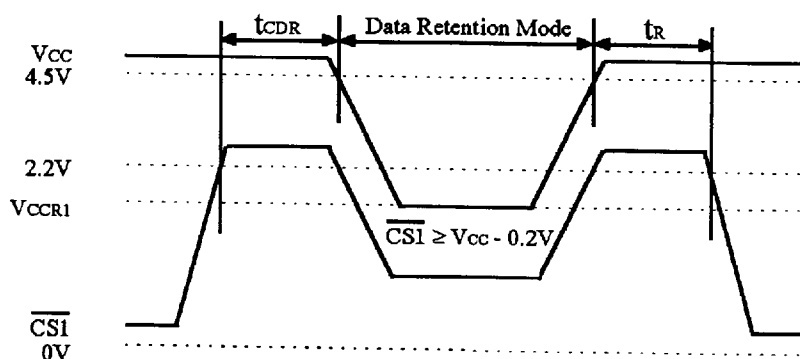
Data Retention Characteristics ($T_A = 0 \sim 70^\circ\text{C}$)

Symbol	Parameter		Test Conditions	Min	Typ	Max	Unit
V_{CCR}	Data Retention Supply Voltage	V_{CCR1}	$\overline{CS1} \geq V_{CC}-0.2V$, $CS2 \geq V_{CC}-0.2V$ or $CS2 \leq 0.2V$	2.0	-	5.5	V
		V_{CCR2}	$CS2 \leq 0.2V$	2.0	-	-	V
I_{CCR}	Data Retention Current	I_{CCR1}	$V_{CC} = 3.0V$, $\overline{CS1} \geq V_{CC}-0.2V$ $CS2 \geq V_{CC}-0.2V$ or $CS2 \leq 0.2V$	-	1	50*	μA
		I_{CCR2}	$V_{CC} = 3.0V$, $CS2 \leq 0.2V$	-	1	50*	μA
t_{CDR}	Chip Select to Data Retention Time	t_{CDR}	See Retention Waveform	0	-	-	ns
t_r	Operation Recovery Time	t_r		t_{RC}^{**}	-	-	ns

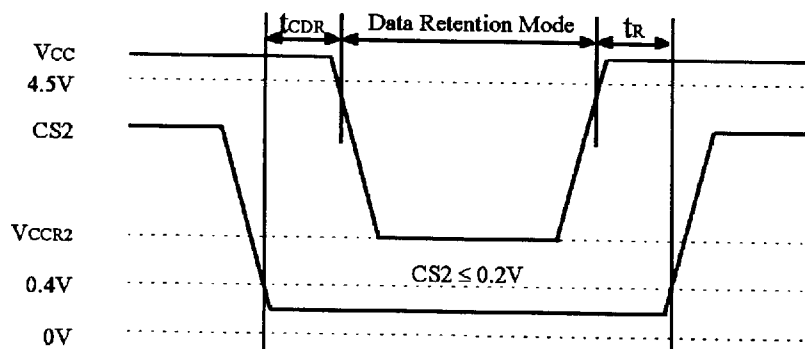
* V_{IL} min = -3V, $1\mu A$ max at $T_A = 0 \sim 40^\circ\text{C}$

** t_{RC} = Read Cycle Time

• **Low V_{CC} Data Retention Mode: (1) $\overline{CS1}$ Controlled**



• **Low V_{CC} Data Retention Mode: (2) $CS2$ Controlled**

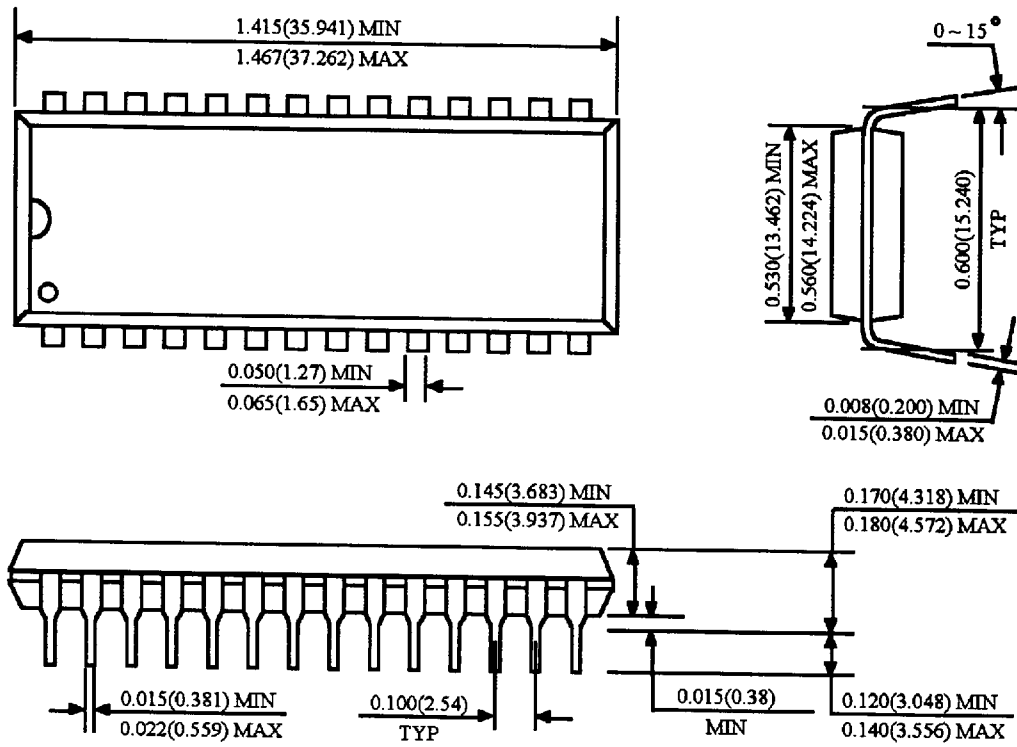


Notes: In Data Retention Mode, $CS2$ controls the Address, $\overline{WE}$, $\overline{CS1}$, $\overline{OE}$ and D_{IN} buffer. If $CS2$ controls data retention mode, V_{IN} for these inputs can be in the high impedance state. If $\overline{CS1}$ controls the data retention mode, $CS2$ must satisfy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

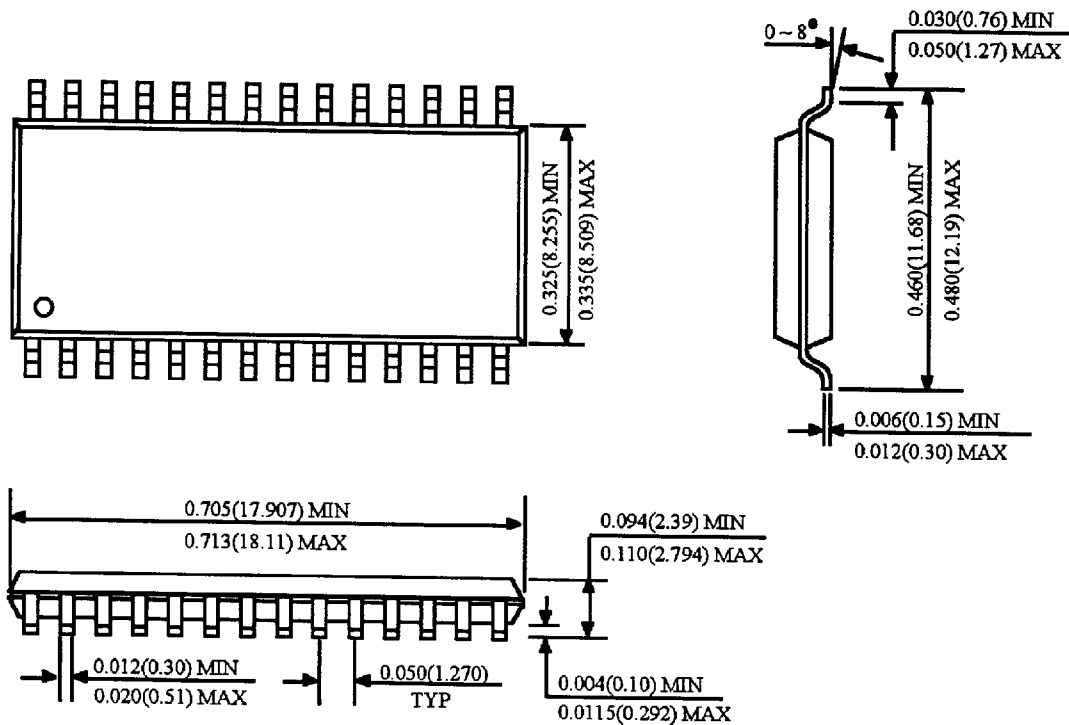
Package Dimensions

Unit: Inches (mm)

28 DIP - A



28 SOP - A



28 SKINNY DIP

Unit: Inches (mm)

