

LH5268A

CMOS 64K (8K × 8) Static RAM

FEATURES

- 8,192 × 8 bit organization
- Access time: 100 ns (MAX.)
- Power consumption:
 - Operating:
 - 220 mW (MAX.)
 - 55 mW (MAX.) (t_{RC} , $t_{WC} = 1 \mu s$)
 - Standby:
 - 220 μW (MAX.)
 - Data retention:
 - 3.0 μW ($V_{CC} = 3 V$, $T_A = 25^\circ C$)
- Fully-static operation
- Three-state outputs
- Single +5 V power supply
- TTL compatible I/O
- Packages:
 - 28-pin, 600-mil DIP
 - 28-pin, 300-mil SK-DIP
 - 28-pin, 450-mil SOP

DESCRIPTION

The LH5268A is a static RAM organized as 8,192 × 8 bits. It is fabricated using silicon-gate CMOS process technology.

PIN CONNECTIONS

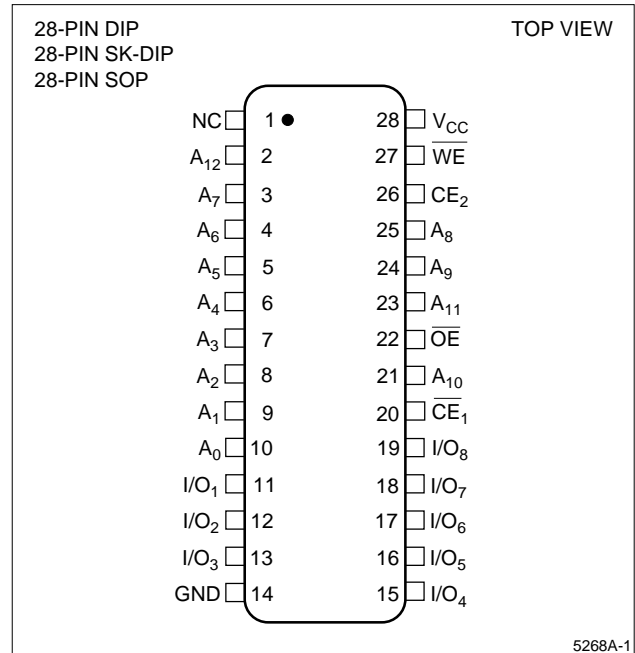


Figure 1. Pin Connections for DIP, SK-DIP, and SOP Packages

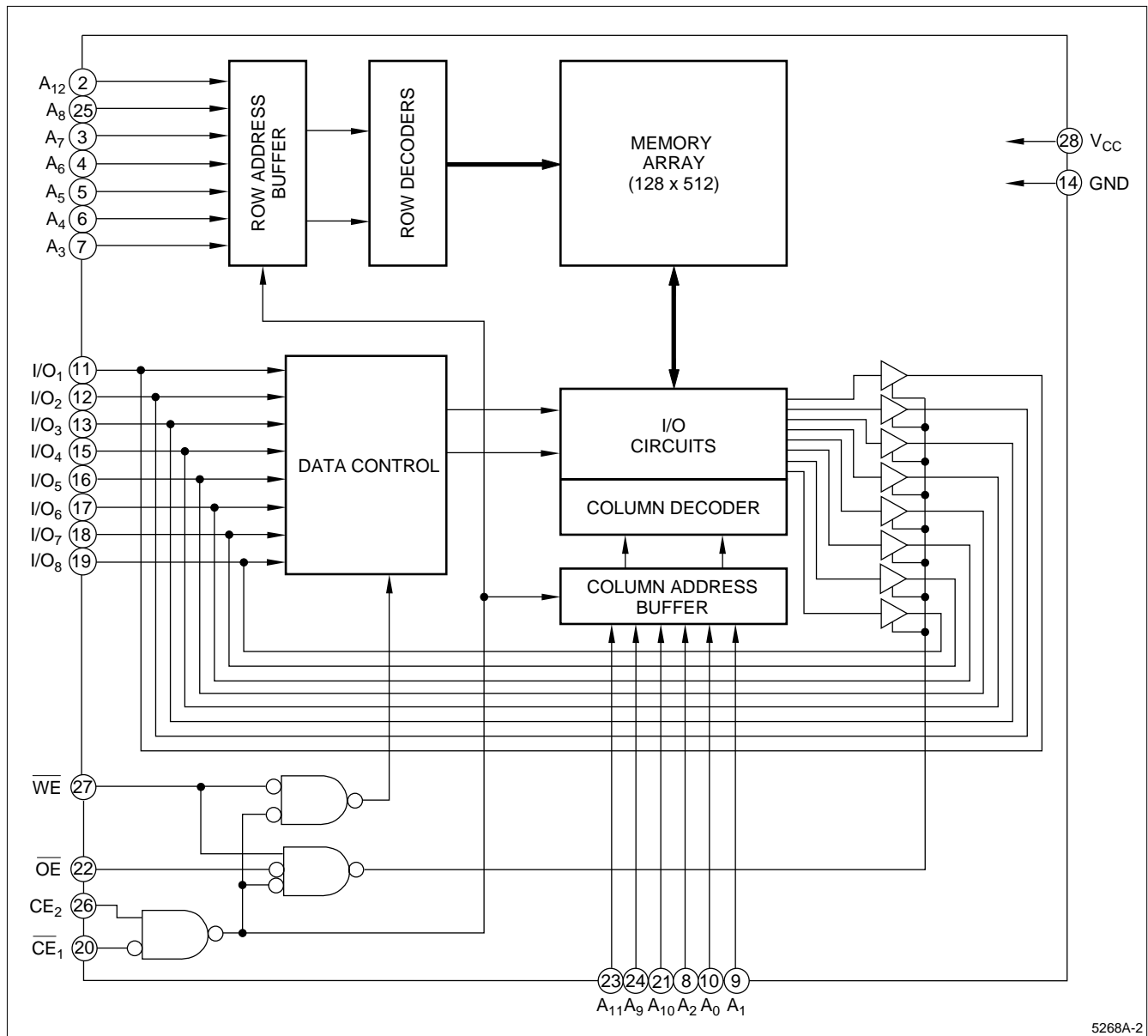


Figure 2. LH5268A Block Diagram

PIN DESCRIPTION

SIGNAL	PIN NAME
A ₀ - A ₁₂	Address inputs
CE ₁ - CE ₂	Chip Enable input
WE	Write Enable input
OE	Output Enable input

SIGNAL	PIN NAME
I/O ₁ - I/O ₈	Data inputs and outputs
V _{CC}	Power supply
GND	Ground
NC	No connection

TRUTH TABLE

\overline{CE}_1	CE_2	\overline{WE}	\overline{OE}	MODE	I/O ₁ - I/O ₈	SUPPLY CURRENT	NOTE
H	X	X	X	Deselect	High-Z	Standby (I _{SB})	1
X	L	X	X	Deselect	High-Z	Standby (I _{SB})	1
L	H	L	X	Write	D _{IN}	Operating (I _{CC})	1
L	H	H	L	Read	D _{OUT}	Operating (I _{CC})	
L	H	H	H	Output disable	High-Z	Operating (I _{CC})	

NOTE:

- X = H or L

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT	NOTE
Supply voltage	V _{CC}	-0.3 to +7.0	V	1
Input voltage	V _{IN}	-0.3 to V _{CC} + 0.3	V	1,2
Operating temperature	T _{opr}	0 to +70	°C	
Storage temperature	T _{stg}	-65 to +150	°C	

NOTES:

- The maximum applicable voltage on any pin with respect to GND.
- V_{IN} (MIN.) = -3.0 V for pulse width ≤ 50 ns.

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

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Supply voltage	V _{CC}	4.5	5.0	5.5	V	
Input voltage	V _{IH}	2.2		V _{CC} + 0.3	V	
	V _{IL}	-0.3		0.8	V	1

NOTE:

- V_{IN} (MIN.) = -3.0 V for pulse width ≤ 50 ns.

DC CHARACTERISTICS (T_A = 0 to +70°C, V_{CC} = 5 V ± 10%)

PARAMETER	SYMBOL	CONDITIONS	MIN.	MAX.	UNIT	NOTE
Input leakage current	I _{LI}	V _{IN} = 0 to V _{CC}	-1	1	μA	
Output leakage current	I _{LO}	$\overline{CE}_1 = V_{IH}$ or $CE_2 = V_{IL}$ or $\overline{OE} = V_{IH}$ or $\overline{WE} = V_{IL}$ V _{I/O} = 0 V to V _{CC}	-1	1	μA	
Operating current	I _{CC}	$\overline{CE}_1 = V_{IL}$, V _{IN} = V _{IL} or V _{IH} CE ₂ = V _{IH} , I _{I/O} = 0 mA		40	mA	
		$\overline{CE}_1 = 0.2$ V, V _{IN} = 0.2 V or V _{CC} - 0.2 V CE ₂ = V _{CC} - 0.2 V, I _{I/O} = 0 mA		10	mA	
Standby current	I _{SB1}	$\overline{CE}_1 = V_{IH}$ or CE ₂ = V _{IL}		3	mA	
	I _{SB}	CE ₂ ≤ 0.2 V or CE ₁ ≥ V _{CC} - 0.2 V		40	μA	1
Output voltage	V _{OL}	I _{OL} = 2.1 mA		0.4	V	
	V _{OH}	I _{OH} = -1.0 mA	2.4		V	

NOTE:

- CE₂ should be ≥ V_{CC} - 0.2 V or ≤ 0.2 V when $\overline{CE}_1 \geq V_{CC} - 0.2$ V.

AC CHARACTERISTICS

(1) READ CYCLE ($T_A = 0$ to $+70^\circ\text{C}$, $V_{CC} = 5\text{ V} \pm 10\%$)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	NOTE	
Read cycle time	t_{RC}	100		ns		
Address access time	t_{AA}		100	ns		
Chip enable access time	(CE ₁)	t_{ACE1}		100	ns	
	(CE ₂)	t_{ACE2}		100	ns	
Output enable access time	t_{OE}		40	ns		
Output hold time	t_{OH}	10		ns		
Chip enable to output in Low-Z	(CE ₁)	t_{LZ1}	10	ns	1	
	(CE ₂)	t_{LZ2}	10	ns	1	
Output enable to output in Low-Z	t_{OLZ}	5		ns	1	
Chip enable to output in High-Z	(CE ₁)	t_{HZ1}	0	30	ns	1
	(CE ₂)	t_{HZ2}	0	30	ns	1
Output disable to output in High-Z	t_{OHZ}	0	20	ns	1	

NOTE:

- Active output to high-impedance and high-impedance to output active tests specified for a ± 200 mV transition from steady state levels into the test load.

(2) WRITE CYCLE ($T_A = 0$ to $+70^\circ\text{C}$, $V_{CC} = 5\text{ V} \pm 10\%$)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	NOTE
Write cycle time	t_{WC}	100		ns	
Chip enable to end of write	t_{CW}	80		ns	
Address valid to end of write	t_{AW}	80		ns	
Address setup time	t_{AS}	0		ns	
Write pulse width	t_{WP}	60		ns	
Write recovery time	t_{WR}	0		ns	
Data valid to end of write	t_{DW}	40		ns	
Data hold time	t_{DH}	0		ns	
Output active from end of write	t_{OW}	10		ns	1
\overline{WE} to output in High-Z	t_{WZ}	0	30	ns	1
\overline{OE} to output in High-Z	t_{OHZ}	0	20	ns	1

NOTE:

- Active output to high-impedance and high-impedance to output active tests specified for a ± 200 mV transition from steady state levels into the test load.

AC TEST CONDITIONS

PARAMETER	MODE	NOTE
Input voltage amplitude	0.6 to 2.4 V	
Input rise/fall time	10 ns	
Timing reference level	1.5 V	
Output load conditions	1TTL + C _L (100 pF)	1

NOTE:

- Includes scope and jig capacitance.

CAPACITANCE ¹ (T_A = 25°C, f = 1 MHz)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input capacitance	C _{IN}	V _{IN} = 0 V			7	pF
Input/output capacitance	C _{I/O}	V _{I/O} = 0 V			10	pF

NOTE:

1. This parameter is sampled and not production tested.

DATA RETENTION CHARACTERISTICS (T_A = 0 to +70°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	MAX.	UNIT	NOTE
Data retention voltage	V _{CCDR}	CE ₂ ≤ 0.2 V or CE ₁ ≥ V _{CCDR} - 0.2 V	2.0	5.5	V	1
Data retention current	I _{CCDR}	V _{CCDR} = 3 V, CE ₂ ≤ 0.2 V or CE ₁ ≥ V _{CCDR} - 0.2 V		1	μA	1
		T _A = 25°C		20	μA	
Chip disable to data retention	t _{CDR}		0		ns	
Recovery time	t _R		t _{RC}		ns	2

NOTES:

1. CE₂ should be ≥ V_{CCDR} - 0.2 V or ≤ 0.2 V when CE₁ ≥ V_{CCDR} - 0.2 V
2. t_{RC} = Read cycle time

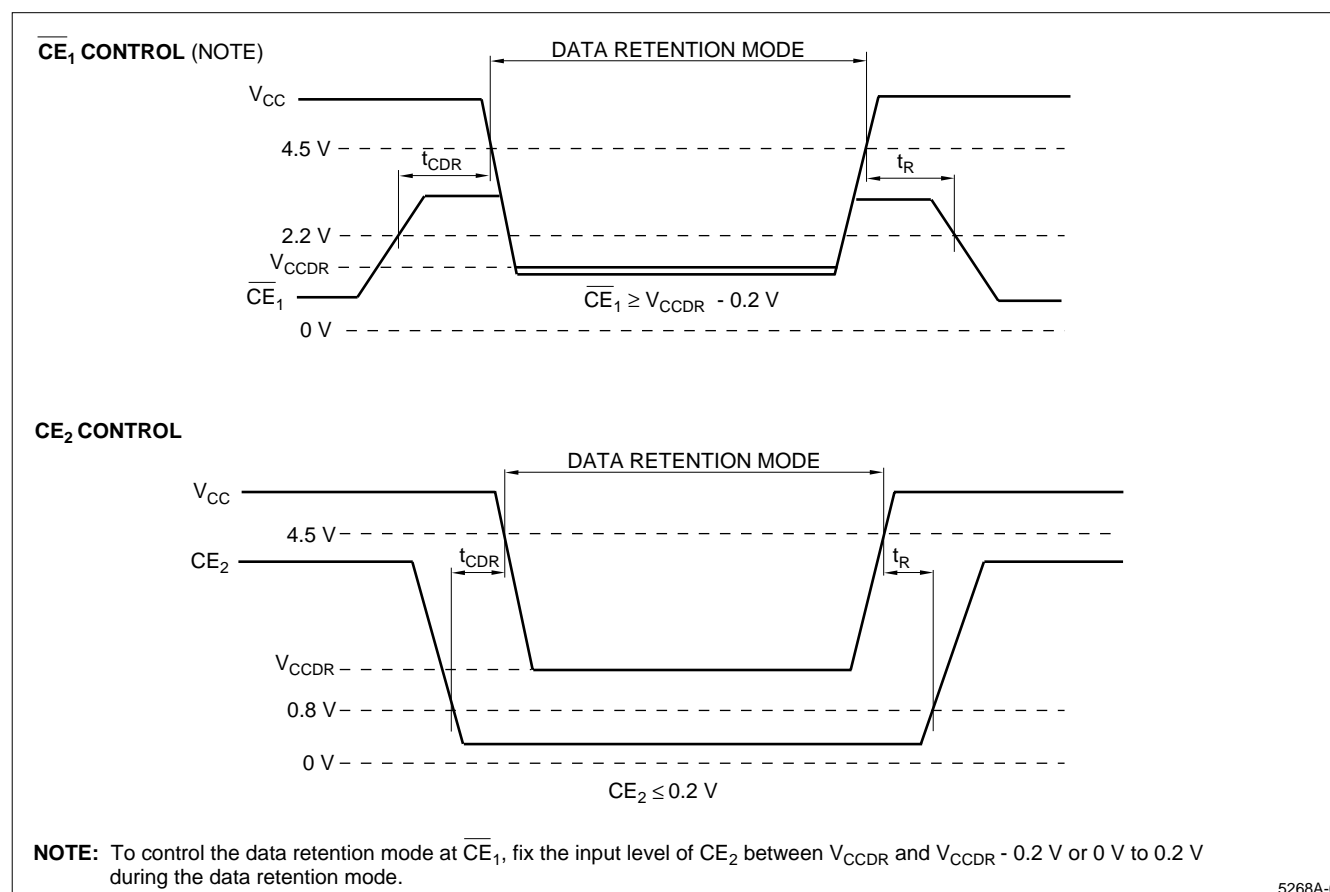


Figure 3. Low Voltage Data Retention

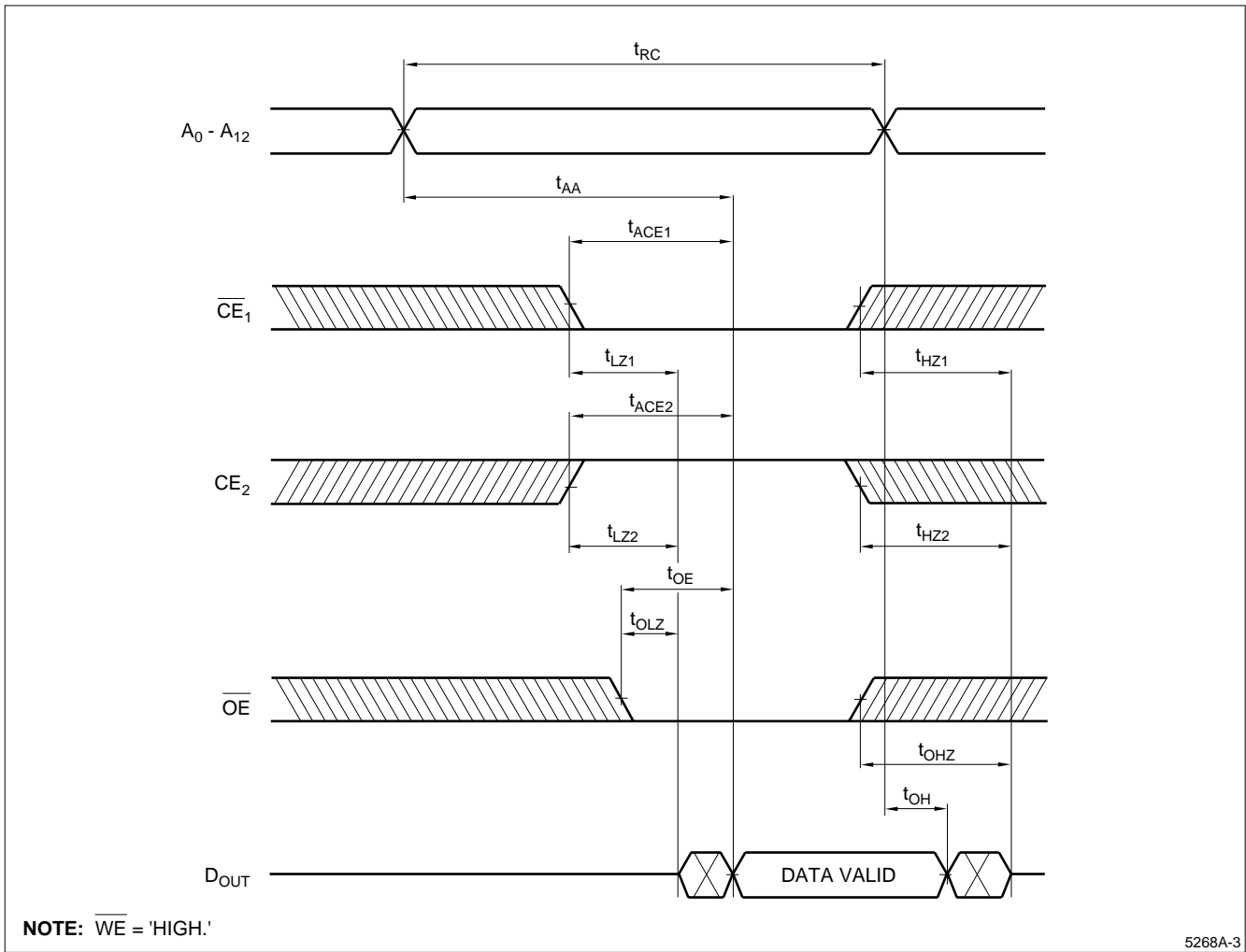
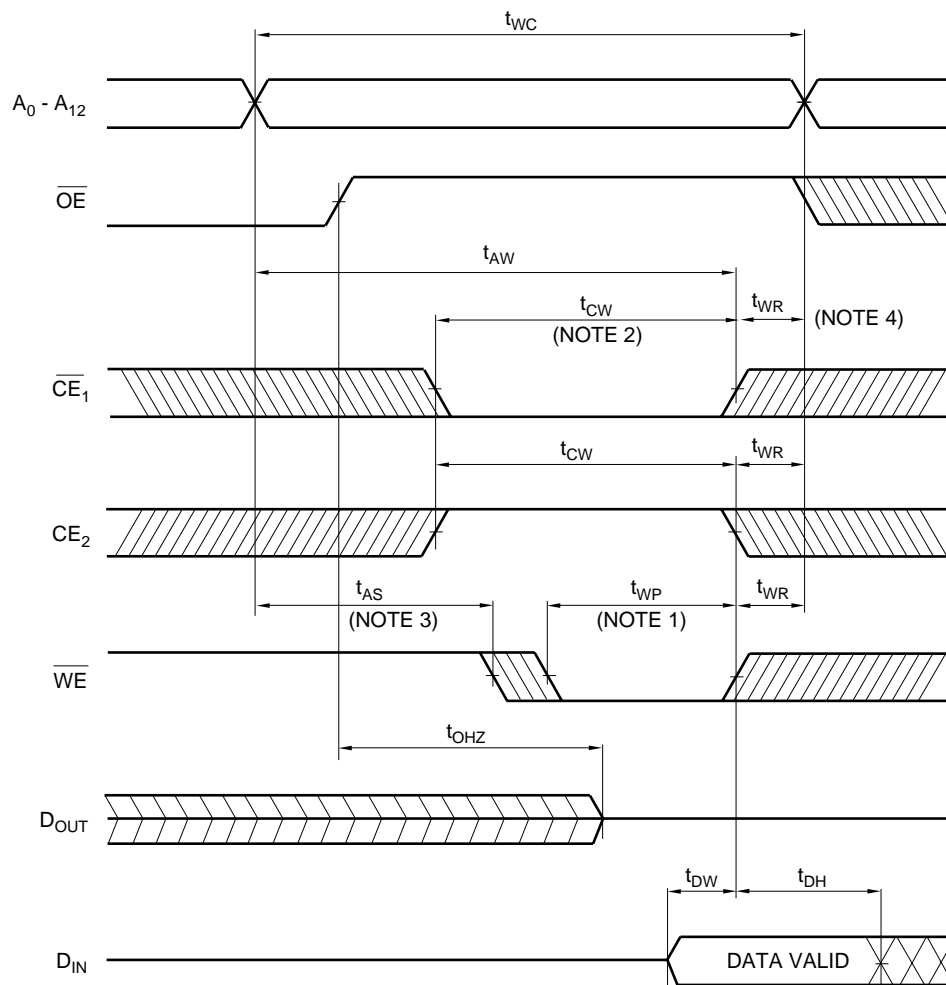


Figure 4. Read Cycle

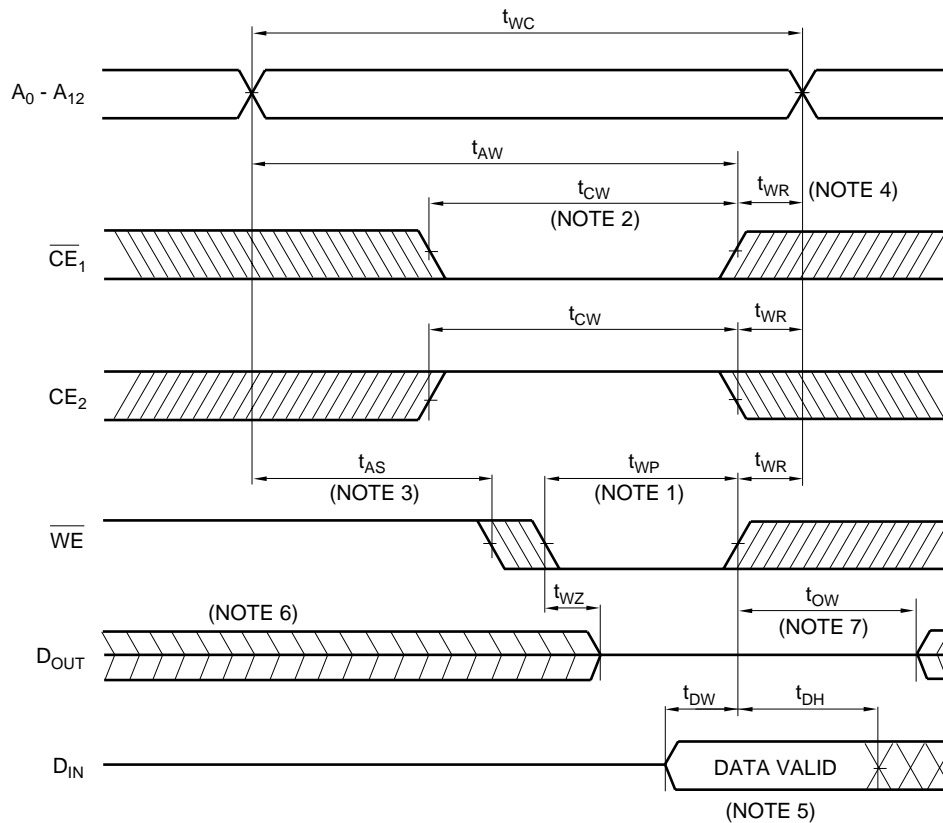


NOTES:

1. The writing occurs during an overlapping period of $\overline{CE}_1 = \text{'LOW'}$, $CE_2 = \text{'HIGH'}$, and $\overline{WE} = \text{'LOW'}$ (t_{WP}).
2. t_{CW} is defined as the time from the last occurring transition, either \overline{CE}_1 LOW transition or CE_2 HIGH transition, to the time when the writing is finished.
3. t_{AS} is defined as the time from address change to writing start.
4. t_{WR} is defined as the time from writing finish to address change.

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Figure 5. Write Cycle 1

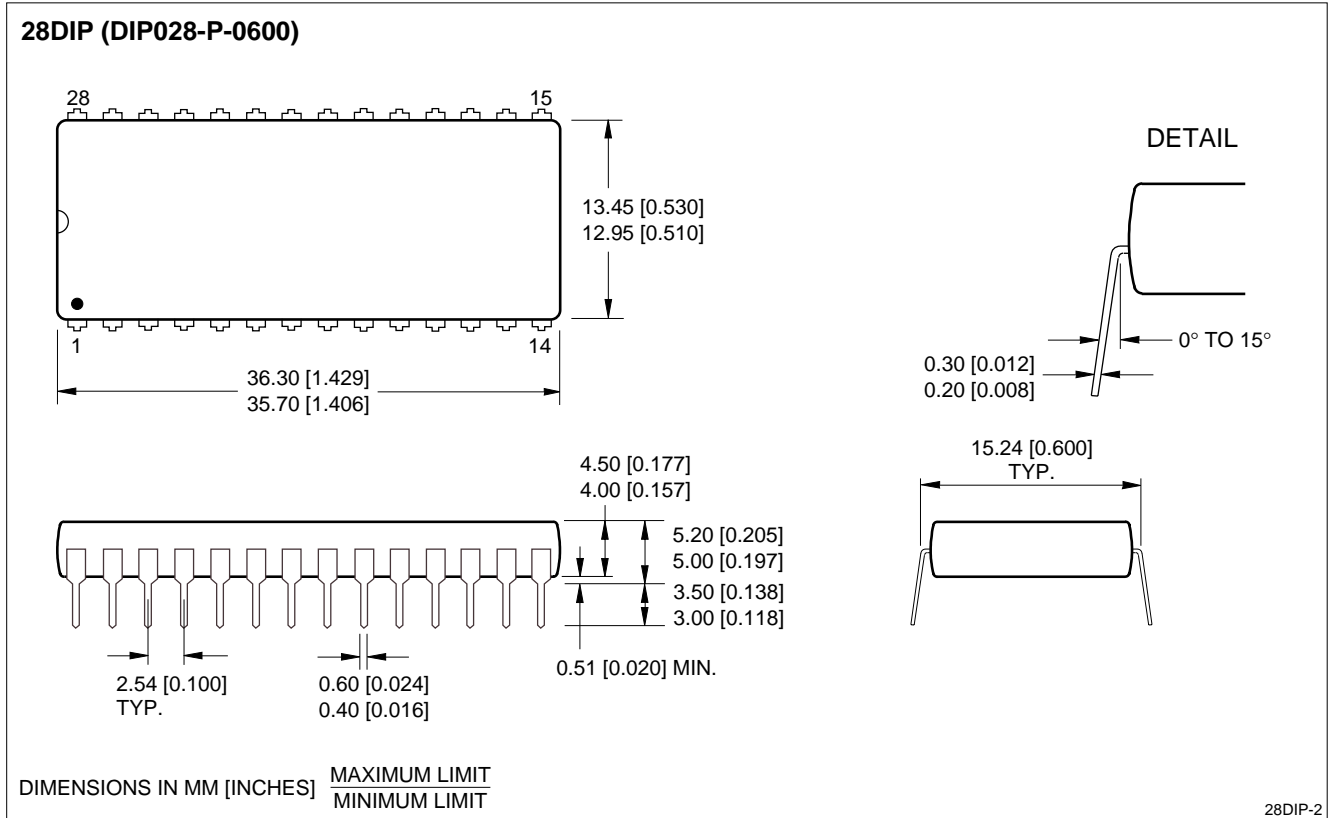
**NOTES:**

1. The writing occurs during an overlapping period of $\overline{CE}_1 = \text{'LOW'}$, $CE_2 = \text{'HIGH'}$, and $\overline{WE} = \text{'LOW'}$ (t_{WP}).
2. t_{CW} is defined as the time from the last occurring transition, either \overline{CE}_1 LOW transition or CE_2 HIGH transition, to the time when the writing is finished.
3. t_{AS} is defined as the time from address change to writing start.
4. t_{WR} is defined as the time from writing finish to address change.
5. When I/O pins are in the output state, input signals with the opposite logic level must not be applied.
6. If \overline{CE}_1 LOW transition or CE_2 HIGH transition occurs at the same time or after \overline{WE} LOW transition, the outputs will remain high-impedance.
7. If \overline{CE}_1 HIGH transition or CE_2 LOW transition occurs at the same time or before \overline{WE} HIGH transition, the outputs will remain high-impedance.

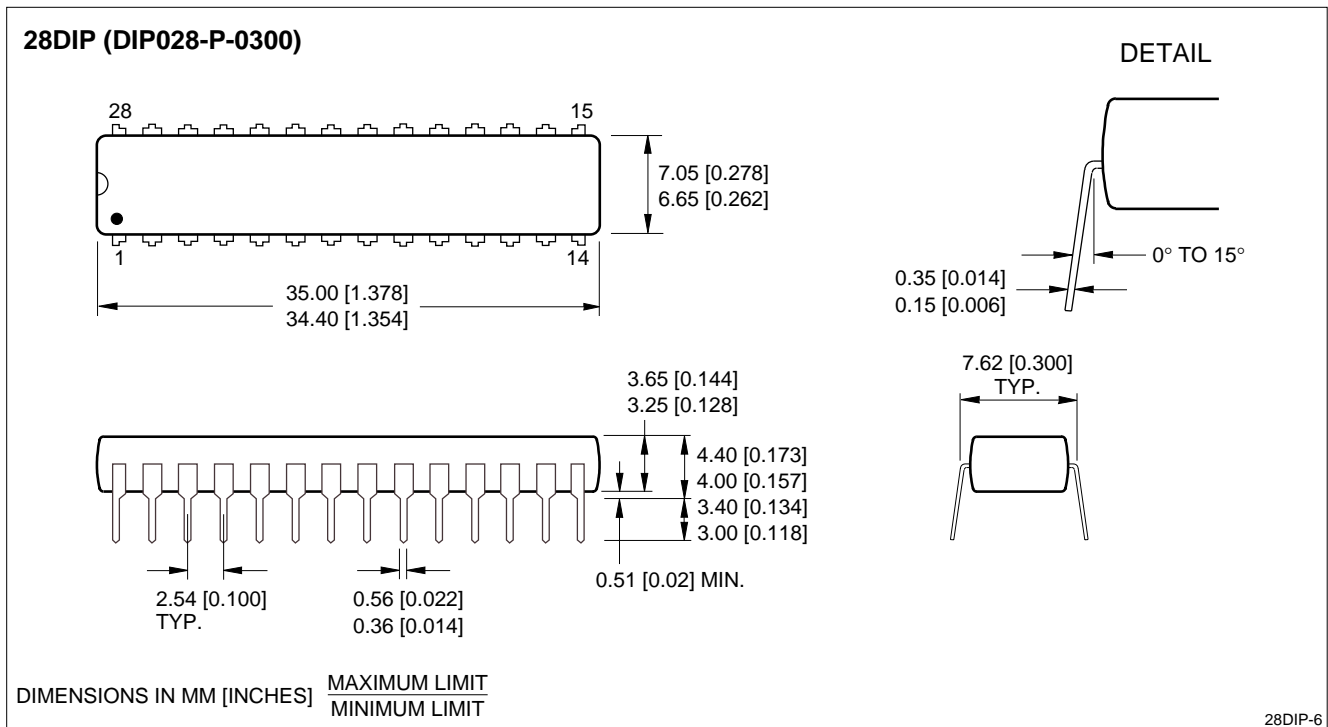
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Figure 6. Write Cycle 2

PACKAGE DIAGRAMS

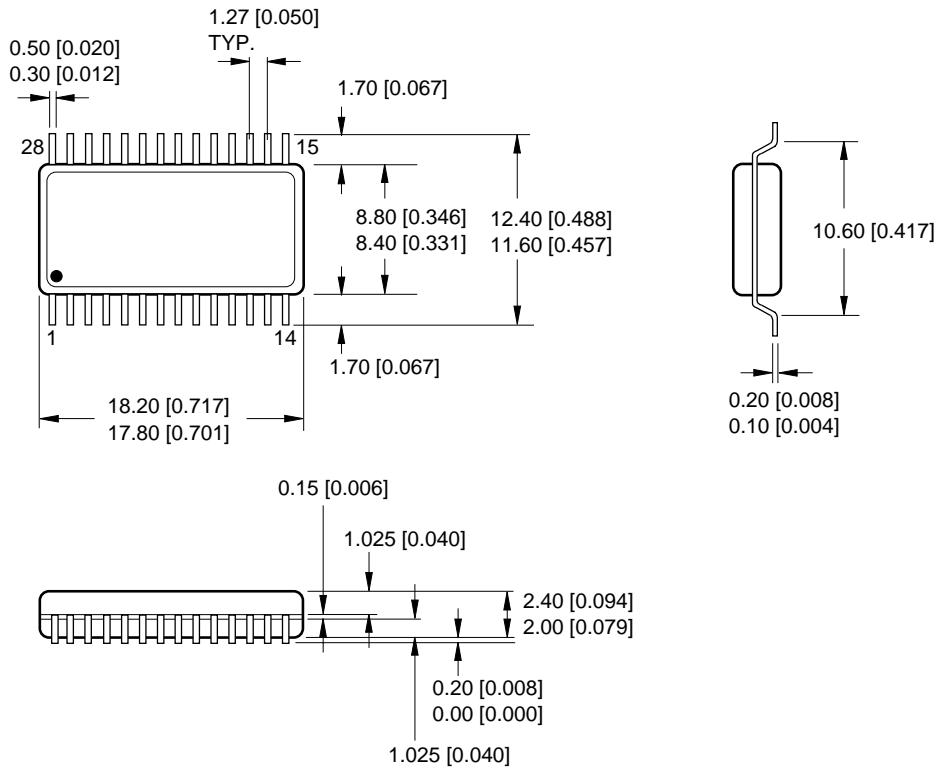


28-pin, 600-mil DIP



28-pin, 300-mil DIP

28SOP (SOP028-P-0450)

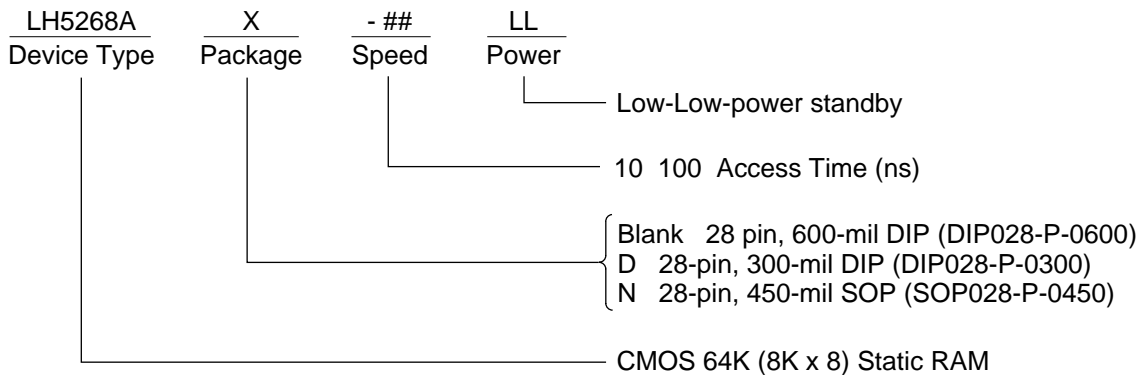


DIMENSIONS IN MM [INCHES] MAXIMUM LIMIT
MINIMUM LIMIT

28SOP

28-pin, 450-mil SOP

ORDERING INFORMATION



Example: LH5268AD-10LL (CMOS 64K (8K x 8) Static RAM, Low-Low-power standby, 100 ns, 28-pin, 300-mil DIP)

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