

131072-Word × 9-Bit High Speed CMOS Static RAM**Description**

The Hitachi HM62V9128 is a CMOS static RAM organized 128 kword × 9 bit. It realizes higher density, higher performance and low power consumption by employing 0.8 μ m Hi-CMOS process technology.

It offers low power standby power dissipation; therefore, it is suitable for battery back-up systems. The device, packaged in a 525-mil SOP (460-mil body SOP) or a 600-mil plastic DIP, or a 8 × 20 mm TSOP with thickness of 1.2 mm, is available for high density mounting. TSOP package is suitable for cards.

Features

- High Speed
Fast access time: 150 ns (max)
- Low power
Active: 30 mW (typ)
Standby: 3 μ W (typ) (L-/L-L/L-SL version)
- Single 3 V supply
- Completely static memory
No clock or timing strobe required
- Equal access and cycle times
- Common data input and output
Three state output
- All inputs and outputs CMOS compatible.
- Capability of battery back up operation
(L-/L-L/L-SL version)
2 chip selection for battery back up

Ordering Information

Type No.	Access time	Package
HM62V9128LP-15	150 ns	600-mil 32-pin plastic DIP (DP-32)
HM62V9128LP-15L	150 ns	
HM62V9128LP-15SL	150 ns	
HM62V9128LFP-15	150 ns	525-mil 32-pin plastic SOP (FP-32D)
HM62V9128LFP-15L	150 ns	
HM62V9128LFP-15SL	150 ns	
HM62V9128LT-15	150 ns	8mm × 20mm 32-pin TSOP (normal type) (TFP-32D)
HM62V9128LT-15L	150 ns	
HM62V9128LT-15SL	150 ns	

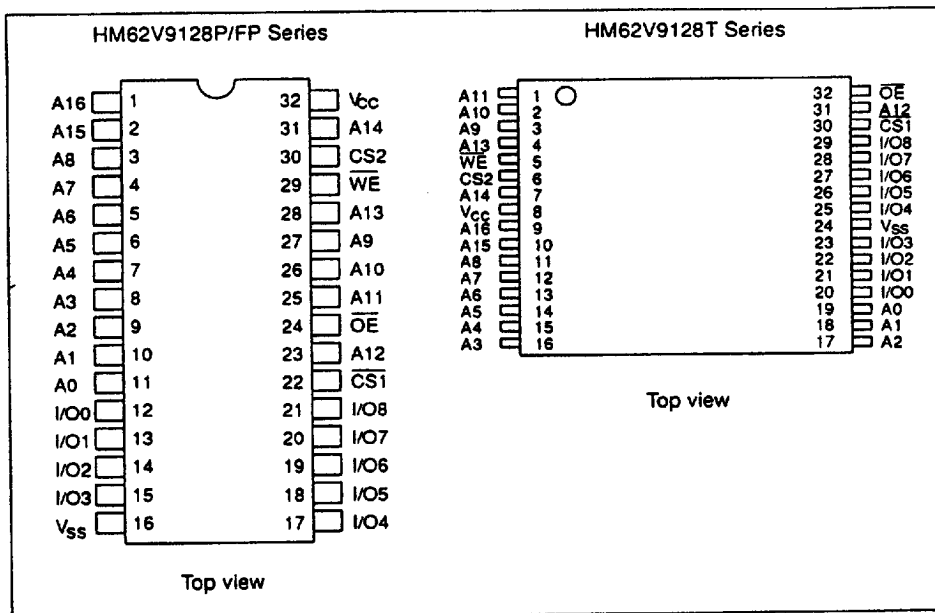
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Pin Arrangement

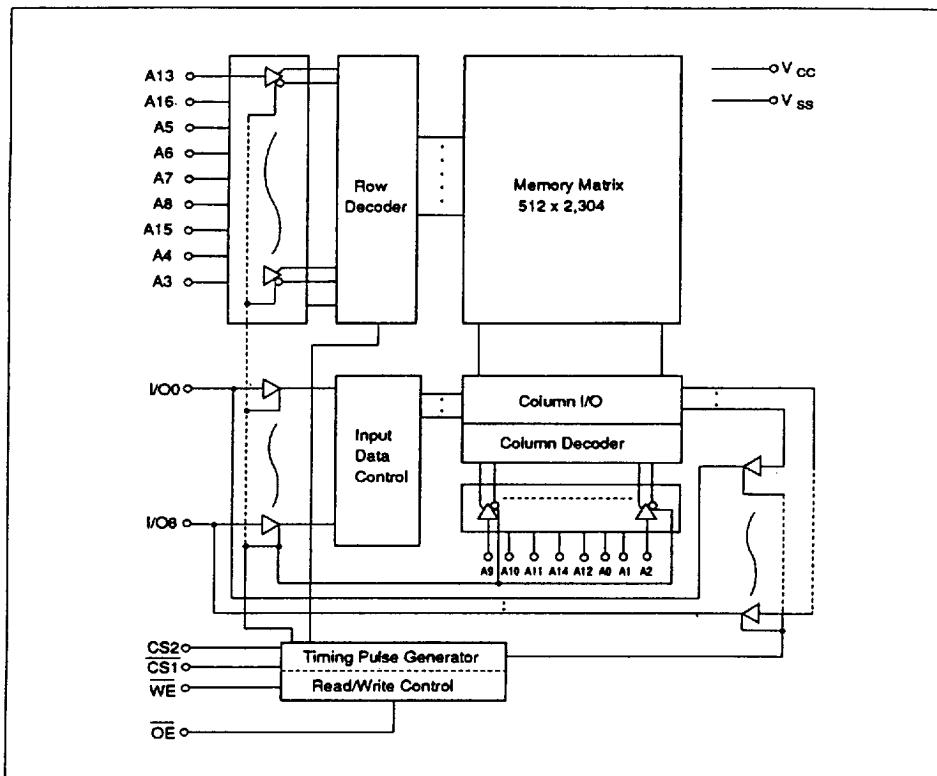


Pin Description

Pin name	Function
A0 – A16	Address
I/O0 – I/O8	Input/output
CS1	Chip select 1
CS2	Chip select 2
WE	Write enable
OE	Output enable
NC	No connection
Vcc	Power supply
Vss	Ground

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Block Diagram



Function Table

CST	CS2	OE	WE	Mode	V _{CC} current	I/O pin	Ref. cycle
H	X	X	X	Standby	I _{SB} , I _{SB1}	High-Z	—
X	L	X	X	Standby	I _{SB} , I _{SB1}	High-Z	—
L	H	H	H	Output disable	I _{CC}	High-Z	—
L	H	L	H	Read	I _{CC}	Dout	Read cycle
L	H	H	L	Write	I _{CC}	Din	Write cycle (1)
L	H	L	L	Write	I _{CC}	Din	Write cycle (2)

Note: 1. X: H or L

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Absolute Maximum Ratings

Item	Symbol	Value	Unit
Supply voltage relative to V_{SS}	V_{CC}	-0.5 to + 5.5	V
Voltage on any pin relative to V_{SS}	V_T	-0.5 ^{*1} to $V_{CC}+0.3$	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. -1.2 V for pulse half-width $\leq$ 30 ns

2. Maximum voltage is 5.5V.

Recommended DC Operating Conditions ($T_a = 0$ to +70°C)

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{CC}	2.7	3.0	3.3	V
	V_{SS}	0	0	0	V
Input voltage	V_{IH}	2.3	—	$V_{CC}+0.3$	V
	V_{IL}	-0.3 ^{*1}	—	0.4	V

Note: 1. -1.2 V for pulse half-width $\leq$ 30 ns

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DC Characteristics ($T_a = 0$ to $+70^\circ\text{C}$, $V_{CC} = 3\text{ V} \pm 10\%$, $V_{SS} = 0\text{ V}$)

Parameter	Symbol	Min	Typ ^{*1}	Max	Unit	Test conditions	Notes
Input leakage current	I_{LI}	—	—	1	μA	$V_{in} = V_{SS}$ to V_{CC}	
Output leakage current	I_{LO}	—	—	1	μA	$\overline{CS1} = V_{IH}$ or $CS2 = V_{IL}$ or $\overline{OE} = V_{IH}$ or $\overline{WE} = V_{IL}$, $V_{I/O} = V_{SS}$ to V_{CC}	
Operating power supply current: DC	I_{CC} (Read)	—	1	5	mA	$\overline{CS1} = V_{IL}$, $CS2 = V_{IH}$, Others = V_{IH}/V_{IL}	
	(Write)	—	5	10	mA	$I_{I/O} = 0\text{ mA}$	
Operating power supply current	I_{CC1}	—	15	30	mA	Min cycle, duty = 100%, $\overline{CS1} = V_{IL}$, $CS2 = V_{IH}$, Others = V_{IH}/V_{IL} , $I_{I/O} = 0\text{ mA}$	
	I_{CC2} (Read)	—	3	5	mA	Cycle time = 1 μs , duty = 100%, $I_{I/O} = 0\text{ mA}$, $\overline{CS1} \leq 0.2\text{ V}$,	
	(Write)	—	10	15	mA	$CS2 \geq V_{CC} - 0.2\text{ V}$ $V_{IH} \geq V_{CC} - 0.2\text{ V}$, $V_{IL} \leq 0.2\text{ V}$	
Standby power supply current: DC	I_{SB}	—	0.5	2	mA	(1) $\overline{CS1} = V_{IH}$, $CS2 = V_{IH}$ (2) $CS2 = V_{IL}$	
Standby power supply current (1): DC	I_{SB1}	—	0.01	1	mA	(1) $0\text{ V} \leq V_{in} \leq V_{CC}$, $\overline{CS1} \geq V_{CC} - 0.2\text{ V}$, ———	
		—	1	70	μA	$CS2 \geq V_{CC} - 0.2\text{ V}$	L-version
		—	1	50	μA	(2) $0\text{ V} \leq V_{in} \leq V_{CC}$ $0\text{ V} \leq CS2 \leq 0.2\text{ V}$	L-L version
		—	1	30	μA		L-SLversion
Output voltage	V_{OL}	—	—	0.1	V	$I_{OL} = 100\text{ }\mu\text{A}$	
	V_{OH}	2.6	—	—	V	$I_{OH} = -100\text{ }\mu\text{A}$	

Note: 1. Typical values are at $V_{CC} = 3.0\text{ V}$, $T_a = +25^\circ\text{C}$ and specified loading.

Capacitance ($T_a = 25^\circ\text{C}$, $f = 1.0\text{ MHz}$)*¹

Parameter	Symbol	Min	Typ	Max	Unit	Test conditions
Input capacitance	C_{in}	—	—	8	pF	$V_{in} = 0\text{ V}$
Input/output capacitance	$C_{I/O}$	—	—	10	pF	$V_{I/O} = 0\text{ V}$

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

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AC Characteristics (Ta = 0 to +70°C, V_{CC} = 3 V ± 10%, unless otherwise noted.)

Test Conditions

- Input pulse levels: 0.4 V to 2.4 V
- Input rise and fall times: 5 ns
- Input and output timing reference levels: 1.5 V
- Output load: 1 TTL Gate and C_L (100 pF)
(Including scope & jig)

Read Cycle

Parameter	Symbol	HM62V9128-15		Unit	Notes
		Min	Max		
Read cycle time	t _{RC}	150	—	ns	
Address access time	t _{AA}	—	150	ns	
Chip selection to output valid	t _{CO1}	—	150	ns	
	t _{CO2}	—	150	ns	
Output enable to output valid	t _{OE}	—	100	ns	
Chip selection to output in low-Z	t _{LZ1}	20	—	ns	2
	t _{LZ2}	20	—	ns	2
Output enable to output in low-Z	t _{OLZ}	10	—	ns	2
Chip deselection to output in high-Z	t _{HZ1}	0	60	ns	1, 2
	t _{HZ2}	0	60	ns	1, 2
Output disable to output in high-Z	t _{OHZ}	0	60	ns	1, 2
Output hold from address change	t _{OH}	20	—	ns	

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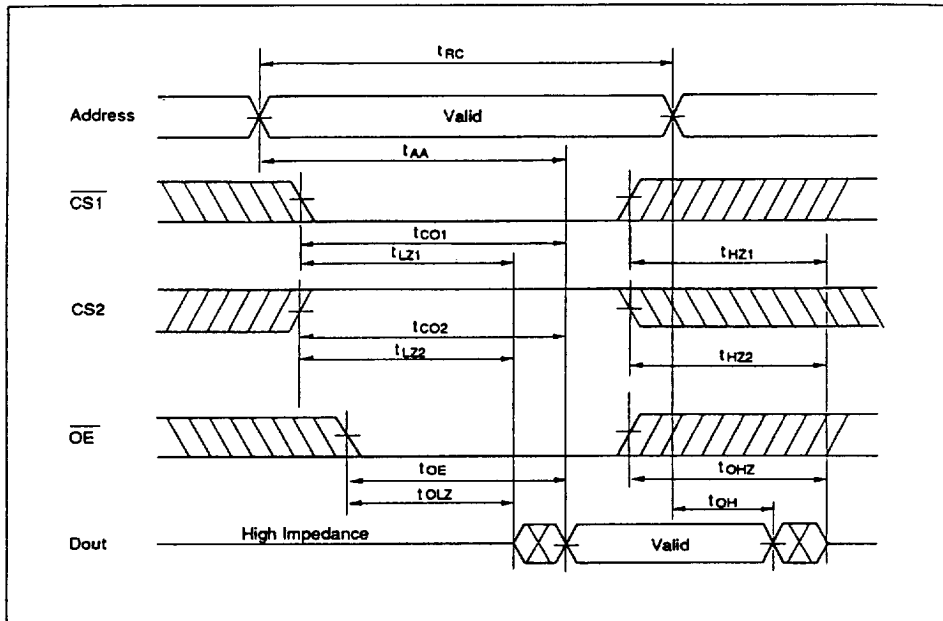
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HM62V9128 Series

Read Timing Waveform *3



- Notes:
1. t_{HZ} and t_{OHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referenced to output voltage levels.
 2. This parameter is sampled and not 100% tested.
 3. WE is high for read cycle.

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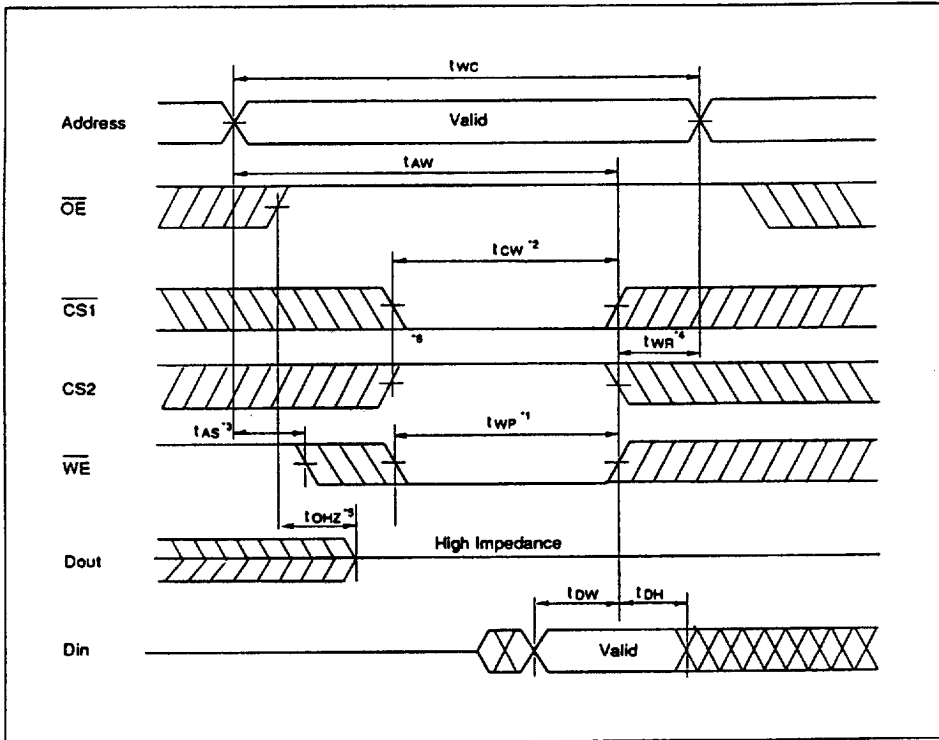
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Write Cycle

Parameter	Symbol	HM62V9128-15		Unit	Notes
		Min	Max		
Write cycle time	t_{WC}	150	—	ns	
Chip selection to end of write	t_{CW}	140	—	ns	
Address setup time	t_{AS}	0	—	ns	
Address valid to end of write	t_{AW}	140	—	ns	
Write pulse width	t_{WP}	130	—	ns	
Write recovery time	t_{WR}	0	—	ns	
		0	—	ns	11
Write to output in high-Z	t_{WHZ}	0	60	ns	10
Data to write time overlap	t_{DW}	80	—	ns	
Write hold from write time	t_{DH}	0	—	ns	
Output active from end of write	t_{OW}	20	—	ns	10

HM62V9128 Series

Write Timing Waveform (1) ($\overline{OE}$ Clock)

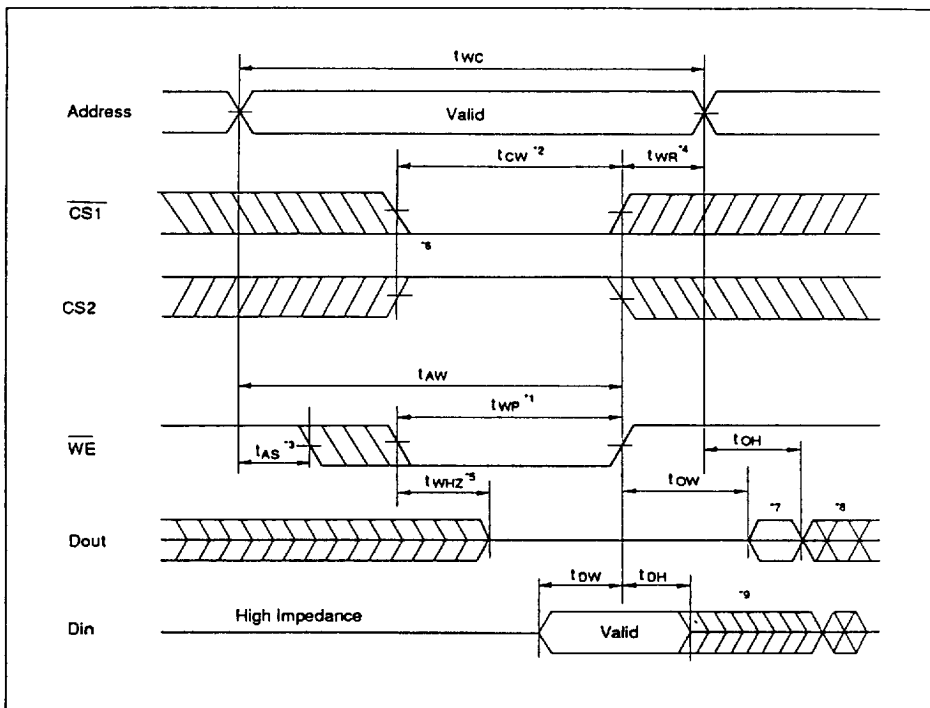


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Write Timing Waveform (2) ($\overline{OE}$ Low Fixed)

- Notes:
1. A write occurs during the overlap of a low $\overline{CS1}$, a high $\overline{CS2}$, and a low $\overline{WE}$. A write begins at the latest transition among $\overline{CS1}$ going low, $\overline{CS2}$ going high, and $\overline{WE}$ going low. A write ends at the earliest transition among $\overline{CS1}$ going high, $\overline{CS2}$ 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 $\overline{CS2}$ 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 earliest of $\overline{CS1}$ or $\overline{WE}$ going high or $\overline{CS2}$ going low to the end of write cycle.
 5. During this period, I/O pins are in the output state; therefore, the input signals of the 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 a 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 $\overline{CS2}$ high during this period, I/O pins are in the output state. Therefore, the input signals of the opposite phase to the outputs must not be applied to them.
 10. This parameter is sampled and not 100% tested.
 11. This value is measured from $\overline{CS2}$ going low to the end of write cycle.

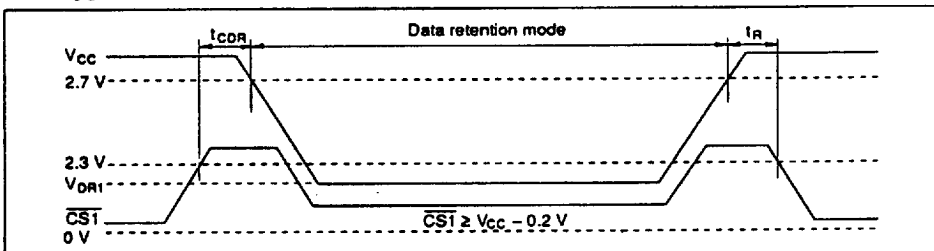
HM62V9128 Series

Low V_{CC} Data Retention Characteristics ($T_a = 0$ to $+70^\circ\text{C}$)

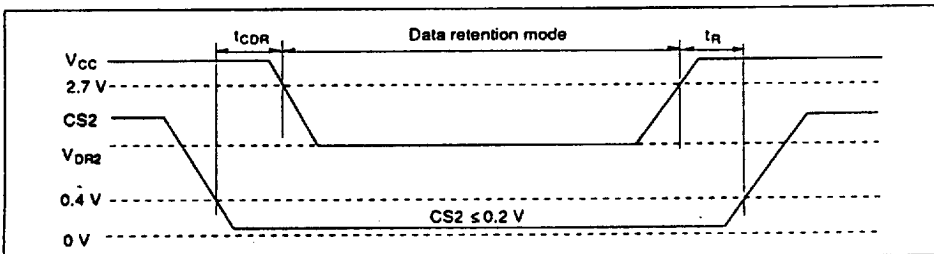
This characteristics is guaranteed only for L-, L-L, and L-SL version.

Parameter	Symbol	Min	Typ	Max	Unit	Test conditions	Notes
V_{CC} for data retention	V_{DR}	2.0	—	—	V	(1) $\overline{CS1} \geq V_{CC} - 0.2 \text{ V}$, $V_{in} \geq 0 \text{ V}$ or (2) $0 \text{ V} \leq \overline{CS2} \leq 0.2 \text{ V}$, $V_{in} \geq 0 \text{ V}$	
Data retention current	I_{CCDR}	—	1	60^{-1}	μA	$V_{CC} = 3.0 \text{ V}$, $V_{CC} \geq V_{in} \geq 0 \text{ V}$	Lversion
		—	1	40^{-2}	μA	(1) $\overline{CS1} \geq V_{CC} - 0.2 \text{ V}$, $\overline{CS2} \geq V_{CC} - 0.2 \text{ V}$ or	L-Lversion
		—	1	20^{-3}	μA	(2) $0 \text{ V} \leq \overline{CS2} \leq 0.2 \text{ V}$	L-SLversion
Chip deselect to data retention time	t_{CDR}	0	—	—	ns	See retention waveform	
Operation recovery time	t_R	5	—	—	ms		

Low V_{CC} Data Retention Timing Waveform (1) ($\overline{CS1}$ Controlled)



Low V_{CC} Data Retention Timing Waveform (2) ($\overline{CS2}$ Controlled)



- Notes:
1. $25 \mu\text{A}$ max at $T_a = 0$ to 40°C (Lversion).
 2. $8 \mu\text{A}$ max at $T_a = 0$ to 40°C (L-Lversion).
 3. $5 \mu\text{A}$ max at $T_a = 0$ to 40°C (L-SLversion).
 4. $\overline{CS2}$ controls address buffer, $\overline{WE}$ buffer, $\overline{OE}$ buffer, $\overline{CS1}$ buffer, and $\overline{Din}$ buffer. If $\overline{CS2}$ controls data retention mode, V_{in} levels (address, $\overline{WE}$, $\overline{OE}$, $\overline{CS1}$, I/O) can be in the high impedance state. If $\overline{CS1}$ controls data retention mode, $\overline{CS2}$ must be $\overline{CS2} > V_{CC} - 0.2 \text{ V}$ or $0 \text{ V} < \overline{CS2} < 0.2 \text{ V}$. The other input levels (address, $\overline{WE}$, $\overline{OE}$, I/O) can be in the high impedance state.

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