

# HM65256B Series

5.0 V Supply

32,768-word × 8-bit High Speed Pseudo Static RAM

## Features

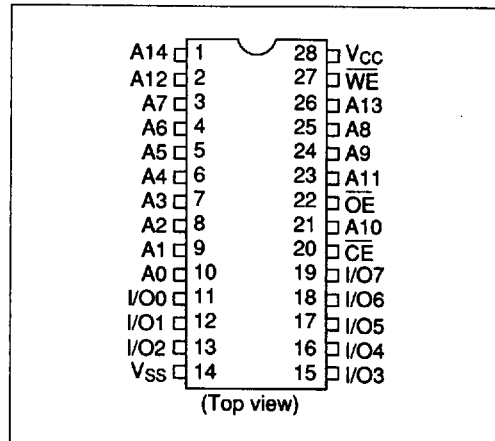
- Single 5 V (±10%)
- Access time
  - $\overline{CE}$  access time: 100/120/150/200 ns
  - Address access time: 50/60/75/100 ns (in static column mode)
- Cycle time
  - Random read/write cycle time: 160/190/235/310 ns
  - Static column mode cycle time: 55/65/80/105 ns
- Low power: 175 mW typ. active
- All inputs and outputs TTL compatible
- Static column mode capability
- Non-multiplexed address
- 256 refresh cycles (4 ms)
- Refresh functions
  - Address refresh
  - Automatic refresh
  - Self refresh

Type No.	Access time	Package
HM65256BLSP-10	100 ns	300-mil 28-pin plastic DIP (DP-28N)
HM65256BLSP-12	120 ns	
HM65256BLSP-15	150 ns	
HM65256BLSP-20	200 ns	
HM65256BFP-10T	100 ns	28-pin plastic SOP (FP-28DA)
HM65256BFP-12T	120 ns	
HM65256BFP-15T	150 ns	
HM65256BFP-20T	200 ns	
HM65256BLFP-10T	100 ns	
HM65256BLFP-12T	120 ns	
HM65256BLFP-15T	150 ns	
HM65256BLFP-20T	200 ns	

## Ordering Information

Type No.	Access time	Package
HM65256BP-10	100 ns	600-mil 28-pin plastic DIP (DP-28)
HM65256BP-12	120 ns	
HM65256BP-15	150 ns	
HM65256BP-20	200 ns	
HM65256BLP-10	100 ns	
HM65256BLP-12	120 ns	
HM65256BLP-15	150 ns	
HM65256BLP-20	200 ns	
HM65256BSP-10	100 ns	300-mil 28-pin plastic DIP (DP-28N)
HM65256BSP-12	120 ns	
HM65256BSP-15	150 ns	
HM65256BSP-20	200 ns	

## Pin Arrangement



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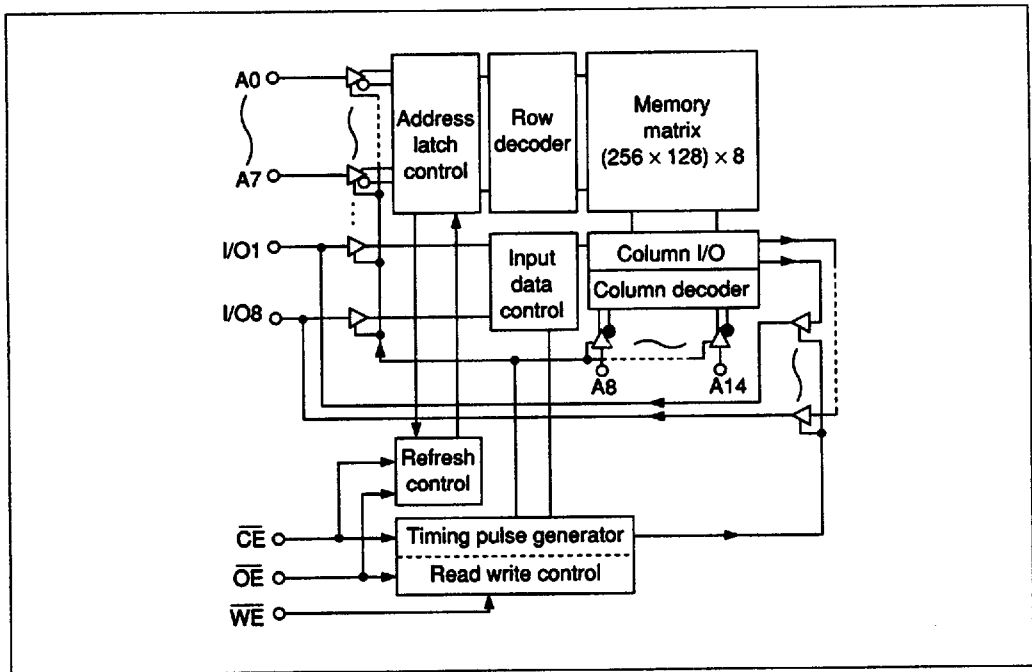
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## Block Diagram



## Truth Table

$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	I/O Pin	Mode
L	L	H	Low Z	Read
L	x	L	High Z	Write
L	H	H	High Z	—
H	L	x	High Z	Refresh
H	H	x	High Z	Standby

**Absolute Maximum Ratings**

Parameter	Symbol	Rating	Unit
Terminal voltage with respect to $V_{SS}$	$V_T$	-1.0 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

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

Parameter	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
	$V_{IL}$	-0.5*	—	0.8	V

Note:  $V_{IL}$  min = -3.0 V for pulse width  $\leq$  10 ns.

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

Parameter	Symbol	HM65256B			HM65256BL			Unit	Test conditions
		Min	Typ	Max	Min	Typ	Max		
Operating power supply current	$I_{CC1}$	—	35	65	—	35	65	mA	$I_{VO} = 0\text{ mA}$ $t_{cyc} = \text{min}$
Standby power supply current	$I_{SB1}$	—	1	2	—	1	2	mA	$\overline{CE} = V_{IH}$ , $\overline{OE} = V_{IH}$ , $V_{in} \geq 0\text{ V}$
	$I_{SB2}$	—	—	—	—	0.05	0.1	mA	$\overline{CE} > V_{CC} - 0.2\text{ V}$ , $\overline{OE} \geq V_{CC} - 0.2$ , $V_{in} \geq 0$
Operating power supply current in self refresh mode	$I_{CC2}$	—	1	2	—	0.6	1	mA	$\overline{CE} = V_{IH}$ , $\overline{OE} = V_{IL}$ , $V_{in} \geq 0\text{ V}$
	$I_{CC3}$	—	—	—	—	50	100	$\mu\text{A}$	$\overline{CE} \geq V_{CC} - 0.2\text{ V}$ , $\overline{OE} \leq 0.2\text{ V}$ , $V_{in} \geq 0\text{ V}$
Input leakage current	$I_{LI}$	-10	—	10	-10	—	10	$\mu\text{A}$	$V_{CC} = 5.5\text{ V}$ , $V_{in} = V_{SS}$ to $V_{CC}$
Output leakage current	$I_{LO}$	-10	—	10	-10	—	10	$\mu\text{A}$	$\overline{OE} = V_{IH}$ , $V_{VO} = V_{SS}$ to $V_{CC}$
Output voltage	$V_{OL}$	—	—	0.4	—	—	0.4	V	$I_{OL} = 2.1\text{ mA}$
	$V_{OH}$	2.4	—	—	2.4	—	—	V	$I_{OH} = -1\text{ mA}$

## Capacitance

Parameter	Symbol	Typ	Max	Unit	Test conditions
Input capacitance	$C_{in}$	—	5	pF	$V_{in} = 0\text{ V}$
Input/output capacitance	$C_{VO}$	—	7	pF	$V_{VO} = 0\text{ V}$

Note: These parameters are sampled and not 100% tested.

## AC Characteristics (Ta = 0 to +70°C, V<sub>CC</sub> = 5 V ± 10%)

### AC Test Conditions:

- Input pulse levels: 2.4 V, 0.4 V
- Input rise and fall times: 5 ns
- Timing measurement level: 2.2 V, 0.8 V
- Reference level: V<sub>OH</sub> = 2.0 V  
V<sub>OL</sub> = 0.8 V
- Output load: 1 TTL and 100 pF  
(including scope and jig)

Parameter	Symbol	HM65256B-10		HM65256B-12		HM65256B-15		HM65256B-20		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
Random read or write cycle time	t <sub>RC</sub>	160	—	190	—	235	—	310	—	ns
Static column mode read or write cycle	t <sub>RSC</sub>	55	—	65	—	80	—	105	—	ns
Chip enable access time	t <sub>CEA</sub>	—	100	—	120	—	150	—	200	ns
Address access time	t <sub>AA</sub>	—	50	—	60	—	75	—	100	ns
Output enable access time	t <sub>OEA</sub>	—	40	—	50	—	60	—	75	ns
Chip disable to output in high Z	t <sub>CHZ</sub>	—	25	—	25	—	30	—	35	ns
Chip enable to output in low Z	t <sub>CLZ</sub>	30	—	30	—	35	—	40	—	ns
Output enable to output in low Z	t <sub>OLZ</sub>	10	—	10	—	10	—	10	—	ns
Output disable to output in high Z	t <sub>OHZ</sub>	—	25	—	25	—	30	—	35	ns
Chip enable pulse width	t <sub>CE</sub>	100 ns 4 ms		120 ns 4 ms		150 ns 4 ms		200 ns 4 ms		
Chip enable precharge time	t <sub>p</sub>	50	—	60	—	75	—	100	—	ns
Address set-up time	t <sub>AS</sub>	0	—	0	—	0	—	0	—	ns
Row address hold time	t <sub>RAH</sub>	20	—	20	—	25	—	30	—	ns
Column address hold time	t <sub>CAH</sub>	100	—	120	—	150	—	200	—	ns
Read command set-up time	t <sub>RCS</sub>	0	—	0	—	0	—	0	—	ns
Read command hold time	t <sub>RCH</sub>	0	—	0	—	0	—	0	—	ns
Output enable hold time	t <sub>OHC</sub>	0	—	0	—	0	—	0	—	ns
Output enable to chip enable delay time	t <sub> OCD</sub>	0	—	0	—	0	—	0	—	ns
Output hold time from column address	t <sub>OH</sub>	5	—	5	—	5	—	10	—	ns
Write command pulse width	t <sub>WP</sub>	25	—	25	—	30	—	35	—	ns
Chip enable to end of write	t <sub>CW</sub>	100	—	120	—	150	—	200	—	ns

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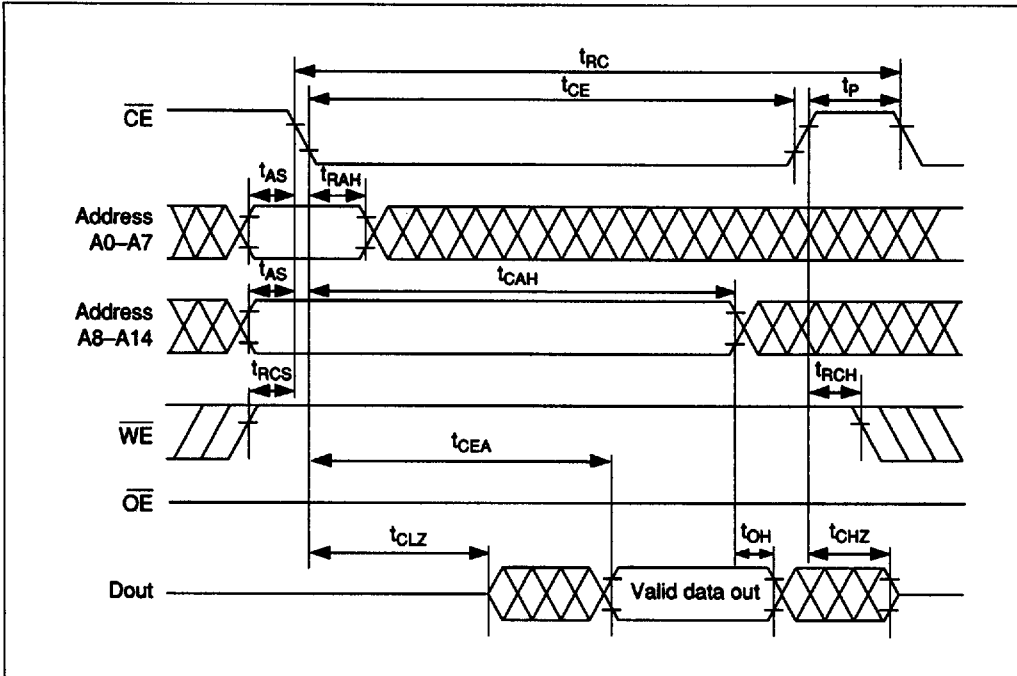
## AC Characteristics (Ta = 0 to +70°C, V<sub>CC</sub> = 5 V ± 10%) (cont)

Parameter	Symbol	HM65256B-10		HM65256B-12		HM65256B-15		HM65256B-20		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
Column address set-up time	t <sub>ASW</sub>	0	—	0	—	0	—	0	—	ns
Column address hold time after write	t <sub>AHW</sub>	0	—	0	—	0	—	0	—	ns
Data valid to end of write	t <sub>DW</sub>	20	—	20	—	25	—	30	—	ns
Data in hold time for write	t <sub>DH</sub>	0	—	0	—	0	—	0	—	ns
Output active from end of write	t <sub>OW</sub>	5	—	5	—	5	—	5	—	ns
Write to output in high Z	t <sub>WHZ</sub>	—	25	—	25	—	30	—	35	ns
Transition time (rise and fall)	t <sub>T</sub>	3	50	3	50	3	50	3	50	ns
Refresh command delay time	t <sub>RFD</sub>	50	—	60	—	75	—	100	—	ns
Refresh precharge time	t <sub>FP</sub>	30	—	30	—	30	—	30	—	ns
Refresh command pulse width for automatic refresh	t <sub>FAP</sub>	80	10000	80	10000	80	10000	80	10000	ns
Automatic refresh cycle time	t <sub>FC</sub>	160	—	190	—	235	—	310	—	ns
Refresh command pulse width for self refresh	t <sub>FAS</sub>	10000	—	10000	—	10000	—	10000	—	ns
Refresh reset time for self refresh	t <sub>FRS</sub>	160	—	190	—	235	—	310	—	ns
Refresh period	t <sub>REF</sub>	—	4	—	4	—	4	—	4	ns

- Notes:
1. t<sub>CHZ</sub>, t<sub>OHZ</sub>, and t<sub>WHZ</sub> are defined as the time at which the output achieves the open circuit conditions.
  2. t<sub>CLZ</sub>, t<sub>OLZ</sub> and t<sub>OW</sub> are sampled under the condition of t<sub>T</sub> = 5 ns, and not 100% tested.
  3. A write occurs during the overlap of a low CE and low WE.
  4. If CE goes low simultaneously with WE going low or after WE going low, the outputs remain in high impedance state.
  5. If input signals of opposite phase to the outputs are applied in a write cycle, OE or WE must disable output buffers prior to applying data to the device and data inputs must be floating prior to OE or WE turning on output buffers.
  6. V<sub>IH</sub> (min.) and V<sub>IL</sub> (max.) are reference levels for measuring timing of input signals. Also, transition times are measured between V<sub>IH</sub> and V<sub>IL</sub>.
  7. An initial pause of 100 μs is required after power-up followed by a minimum of 8 initialization cycles.
  8. At the end of self refresh, refresh reset time (t<sub>FRS</sub>) is required to reset the internal self refresh operation of the RAM. During t<sub>FRS</sub>, CE and OE must be kept high. If auto refresh follows self refresh, low transition of OE at the beginning of auto refresh must not occur during t<sub>FRS</sub> period.

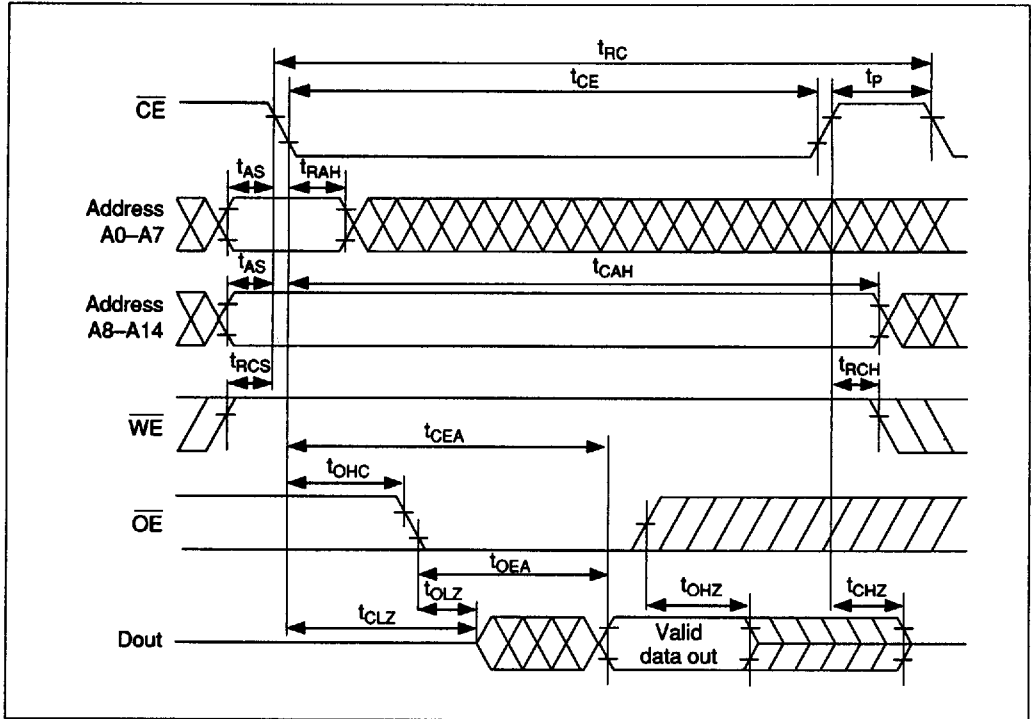
Timing Waveforms

Read Cycle (1) ( $\overline{CE}$  controlled)



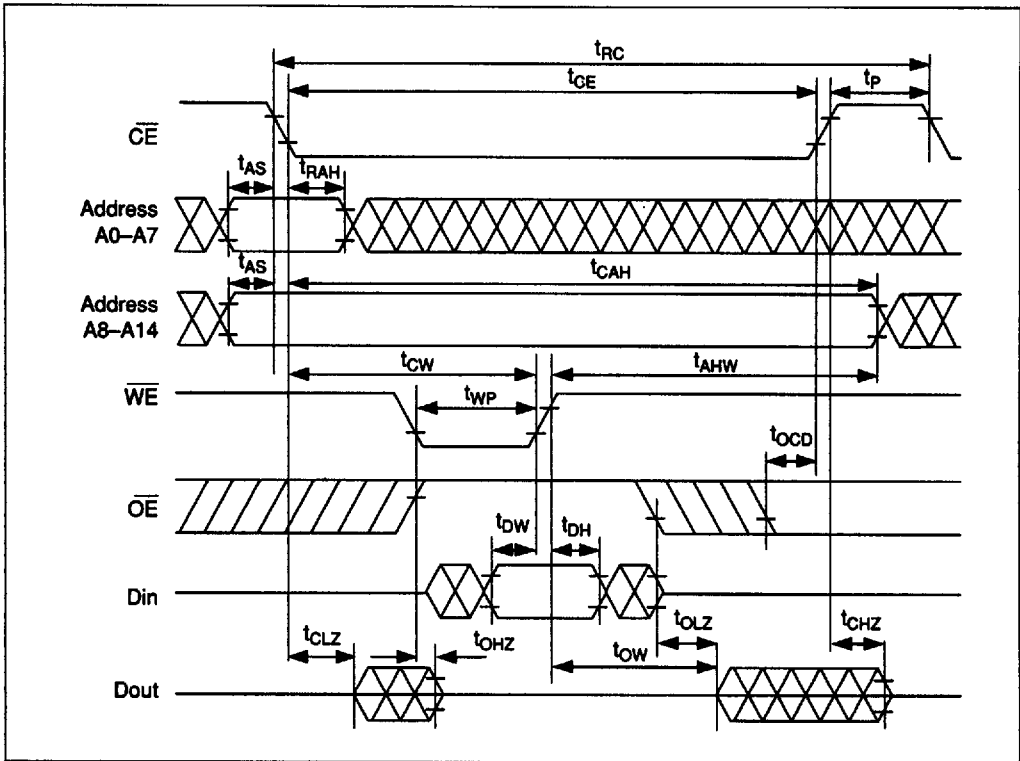
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## Read Cycle (2) ( $\overline{OE}$ controlled)



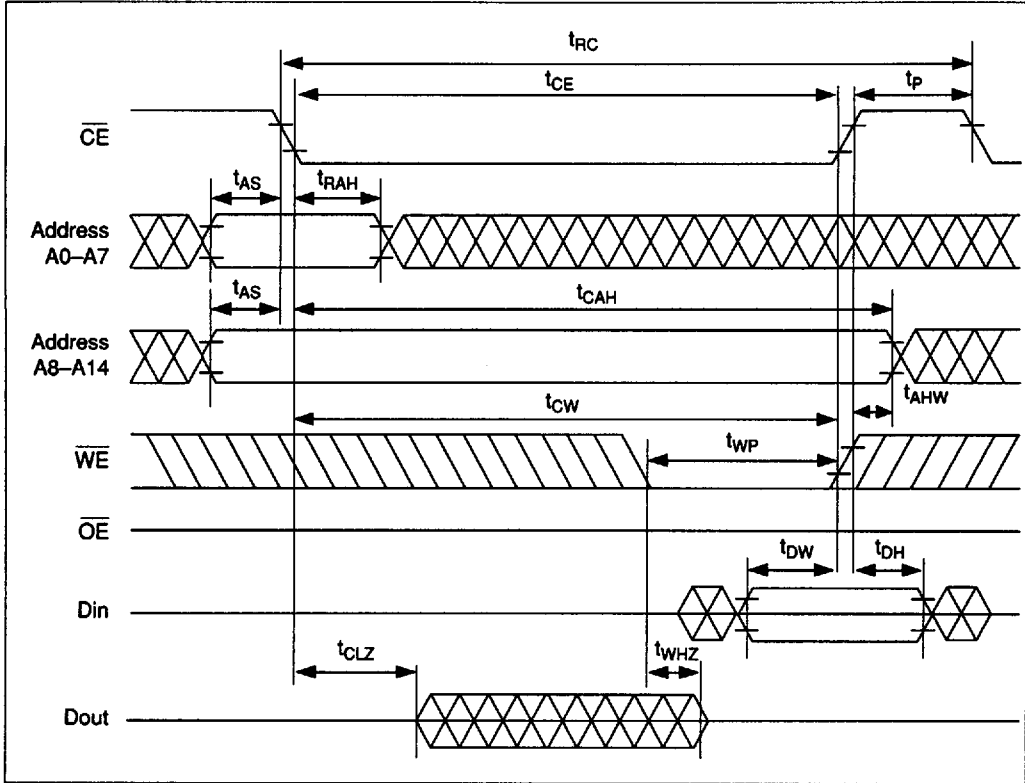


Write Cycle (1) ( $\overline{OE}$  Clock)

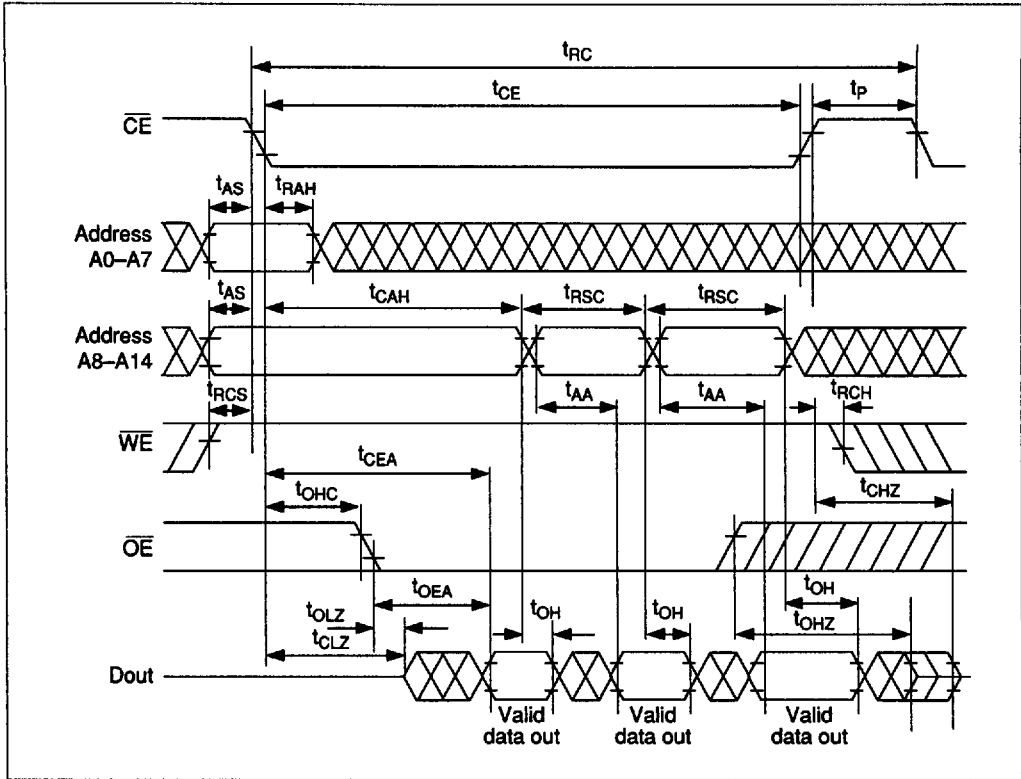


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Write Cycle (2) ( $\overline{OE}$  fixed low)

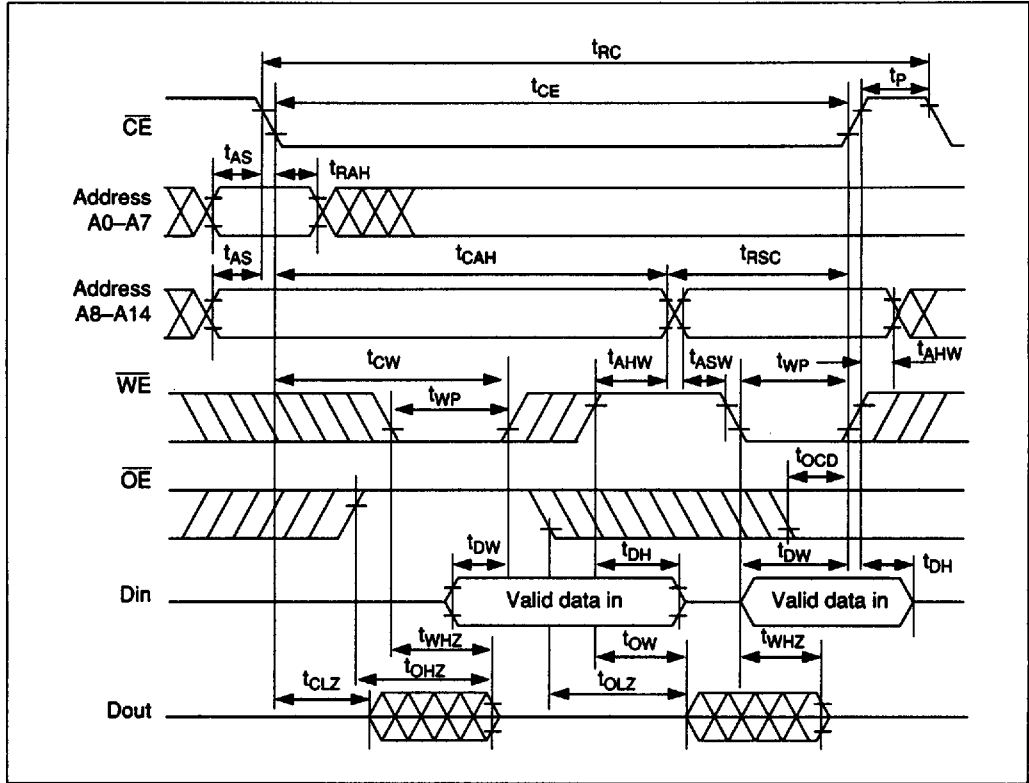


Static Column Mode Read Cycle

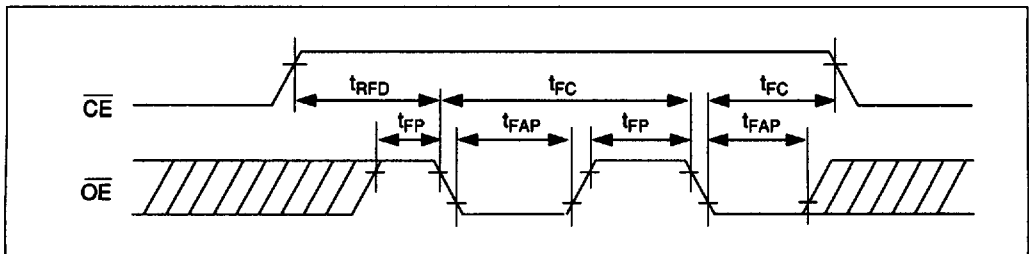


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## Static Column Mode Write Cycle



## Automatic Refresh Cycle



## Self Refresh Cycle

