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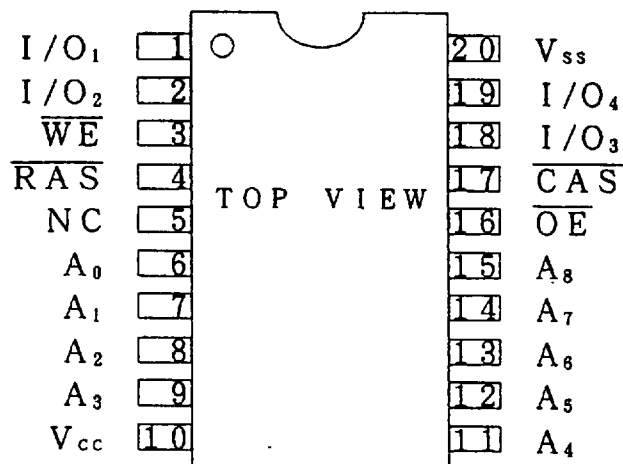
1. General

SHARP LH64256CD-70 is a 262,144word x 4bit Dynamic Random Access Memory which allows fast page mode access. The LH64256CD-70 is fabricated on SHARP's advanced CMOS double-level polysilicon gate technology. With its input multiplexed and packaged in the standard 20pin DIP, it is easy to realize the memory systems with low power dissipation and large memory capacity. The LH64256CD-70 operates on a single +5.0V power supply and the built-in biasing voltage generator circuit.

2. Features

- 262,144word x 4bit
- Standard 300mil 20pin DIP(WIDE) plastic package
- Access time 70ns (Max.)
- Cycle time 130ns (Min.)
- Fast page mode with cycle time 50ns (Min.)
- Power supply +5.0V $\pm$ 10%
- Power consumption (Max.) 385.0mW (Operating: $t_{RC}=130ns$)
11mW (Standby: TTL input level)
5.5mW (Standby: CMOS input level)
- Built-in latch circuit for Row-address, Column-address and Input-data
- $\overline{OE}$ =Don't care in early write operation
- RAS only refresh, Hidden refresh and $\overline{CAS}$ before $\overline{RAS}$ refresh capability
- On-chip refresh counter
- 512 refresh cycle / 8ms
- Not designed or rated as radiation hardened
- P-type bulk silicon CMOS process
- Operating temperature range : 0 to +70°C

3. Pin configuration



Symbol	Pin Name
A ₀ to A ₈	Address Input
$\overline{RAS}$	Row Address Strobe
$\overline{CAS}$	Column Address Strobe
$\overline{WE}$	Write Enable
$\overline{OE}$	Output Enable
I/O ₁ to I/O ₄	Data Input/Output
V _{cc}	Power Supply(+5.0V)
V _{ss}	Power Supply(0V)
NC	No-Connection

5. Absolute Maximum Ratings

Parameter	Rating	Unit	Note
Applied voltage on all pins	-1.0 to +7.0	V	1
Operating temperature	0 to +70	°C	
Storage temperature	-65 to +150	°C	
Output short circuit current	50	mA	
Power dissipation	600	mW	2

Note 1. With respect to V_{SS}.Note 2. T_a=25°C

6. 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	
	V _{SS}	0	0	0	V	
Input voltage	V _{IH}	2.8		V _{CC} +0.3V	V	
	V _{IL}	-0.3		0.6	V	

7. Pin Capacitance

(T_a=0 to +70°C, V_{CC}=5.0V±10%, f=1MHz)

Parameter		Symbol	MIN.	MAX.	Unit
Input capacitance	A ₀ to A ₈	C _{IN1}	—	7	pF
	$\overline{\text{RAS}}$, $\overline{\text{OE}}$, $\overline{\text{CAS}}$, $\overline{\text{WE}}$	C _{IN2}	—	7	pF
Input/Output capacitance	I/O ₁ to I/O ₄	C _{OUT1}	—	8	pF

8. DC Electrical Characteristics

(Ta=0 to +70°C, V_{cc}=5.0V±10%)

Parameter			Symbol	MIN.	MAX.	Unit	Note
Average supply current in normal operation t _{RC} =MIN.			I _{cc1}	—	70	mA	3.4
Average supply current in standby mode	TTL	RAS=CAS=V _{ih}	I _{cc2}	—	2.0	mA	3
	CMOS	RAS=CAS≥V _{cc} -0.2V		—	1.0	mA	
Average supply current in fast page mode t _{CP} =MIN.			I _{cc4}	—	65	mA	3.4
Average supply current in CAS before RAS refresh cycle			I _{cc8}	—	70	mA	3.4
Average supply current in RAS only refresh cycle			I _{cc3}	—	70	mA	3.4
Input leakage current	0V≤V _{IN} ≤6.5V 0V except on test pins		I _{L1}	-10	10	μA	
Output leakage current	0V≤V _{OUT} ≤V _{cc} +0.3V Output=Disable		I _{Lo}	-10	10	μA	5
Output "High" voltage	I _{OH} =-5mA		V _{OH}	2.4	—	V	
Output "Low" voltage	I _{OL} =4.2mA		V _{OL}	—	0.4	V	

Note 3. The output pins are in high impedance state.

4. I_{cc1}, I_{cc4}, I_{cc8} and I_{cc3} depend on cycle time.5. The output pins are disabled by RAS=CAS=V_{ih} or CAS=V_{ih}.

9. AC Electrical Characteristics (Note 6, 7, 8, 9)

Read Cycle

(Ta=0 to +70°C, Vcc=5.0V ±10%)

Parameter	Symbol	MIN.	MAX.	Unit	Note
Random read or write cycle time	t _{RC}	130	—	ns	
Access time from RAS	t _{RAC}	—	70	ns	14
Access time from column address	t _{AA}	—	35	ns	14
Access time from CAS	t _{CAC}	—	25	ns	14
Access time from OE	t _{OE A}	—	20	ns	14
Row address set-up time	t _{ASR}	0	—	ns	
Row address hold time	t _{RAH}	10	—	ns	
Column address set-up time	t _{ASC}	0	—	ns	
Column address hold time (RAS)	t _{CAH}	15	—	ns	
Column address delay time (RAS)	t _{RAD}	15	35	ns	10
Column address lead time (RAS)	t _{RAL}	35	—	ns	
RAS pulse width	t _{RAS}	70	10,000	ns	
RAS precharge time	t _{RP}	50	—	ns	
CAS precharge time (RAS↓)	t _{CRP}	10	—	ns	
CAS delay time (RAS)	t _{RCD}	20	45	ns	11
CAS lead time (RAS)	t _{RS L}	25	—	ns	
CAS pulse width	t _{CAS}	25	10,000	ns	
CAS hold time	t _{CSH}	70	—	ns	
OE lead time (RAS)	t _{ROL}	0	—	ns	
Output data disable time (CAS)	t _{OFF}	—	20	ns	
Output data disable time (OE)	t _{OE Z}	—	20	ns	
Output data hold time (CAS)	t _{SOH}	0	—	ns	
Output data hold time (OE)	t _{OOH}	0	—	ns	
Read command set-up time (CAS)	t _{RCS}	0	—	ns	
Read command hold time (CAS)	t _{RCH}	0	—	ns	13
Read command hold time (RAS↑)	t _{RRH}	10	—	ns	13
Transition time (rise and fall)	t _T	3	50	ns	
Refresh time interval	t _{REF}	—	8	ms	

Fast Page Mode Cycle

Parameter	Symbol	MIN.	MAX.	Unit	Note
Fast page mode cycle time	t_{PC}	50	—	ns	
$\overline{CAS}$ precharge time	t_{CP}	10	—	ns	
$\overline{CAS}$ precharge access time	t_{CAP}	—	45	ns	
Read-write cycle time (page mode)	t_{PRWC}	100	—	ns	12

Write Cycle

Parameter	Symbol	MIN.	MAX.	Unit	Note
(Early Write)					
Write command set-up time ($\overline{CAS}$)	t_{WCS}	0	—	ns	12
Write command hold time ($\overline{CAS}$)	t_{WCH}	15	—	ns	
Data input set-up time	t_{DS}	0	—	ns	
Data input hold time	t_{DH}	15	—	ns	
(OE Controlled)					
$\overline{CAS}$ set-up time	t_{CWS}	0	—	ns	12
Write command lead time ($\overline{RAS}$)	t_{RWL}	20	—	ns	
Write command lead time ($\overline{CAS}$)	t_{CWL}	20	—	ns	
Write pulse width ($\overline{WE}$)	t_{WP}	10	—	ns	
OE hold time ($\overline{WE}$)	t_{OEH}	20	—	ns	

Read-Write Cycle / Read Modify Write Cycle

Parameter	Symbol	MIN.	MAX.	Unit	Note
Read-write cycle time	t_{RWC}	180	—	ns	12
$\overline{WE}$ delay time ($\overline{RAS}$)	t_{RWD}	95	—	ns	12
Column address delay time ($\overline{WE}$)	t_{AWD}	60	—	ns	12
$\overline{WE}$ delay time ($\overline{CAS}$)	t_{CWD}	45	—	ns	12
OE delay time	t_{OED}	20	—	ns	

 $\overline{CAS}$ Before $\overline{RAS}$ Refresh Cycle / Hidden Refresh Cycle

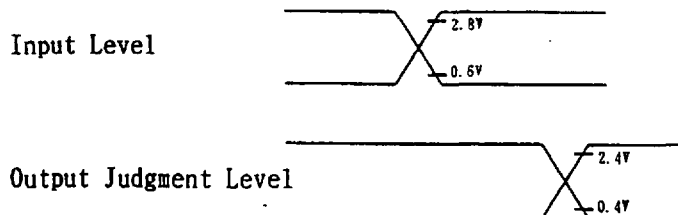
Parameter	Symbol	MIN.	MAX.	Unit	Note
$\overline{CAS}$ set-up time ($\overline{RAS}$)	t_{CSR}	10	—	ns	
$\overline{CAS}$ hold time ($\overline{RAS}$)	t_{CHR}	15	—	ns	
$\overline{RAS} \cdot \overline{CAS}$ precharge time ($\overline{RAS} \uparrow$)	t_{RPCP}	10	—	ns	
$\overline{WE}$ precharge time ($\overline{RAS}$)	t_{WRP}	0	—	ns	

Note 6. For properly functioning the memory, it is necessary to pause at least 200 μ s after power-on and followed by several dummy cycles. When $\overline{RAS}=V_{IH}$ is continued for more than 8ms, the above dummy cycles should be given. Usually 8 ordinary refresh cycles should be given.

7. The current consumption (I_{cc}) during power on is dependent on the input level of $\overline{RAS}$. If $\overline{RAS}$ is V_{IL} during power on, the device goes into an active cycle automatically, and I_{cc} exhibits large current transients. It is recommended that $\overline{RAS}$ tracks with V_{CC} or be held at a valid V_{IH} during power on.

8. AC characteristics assume $t_r=5$ ns.

9. AC characteristics assume the following condition.



10. $t_{RAD}(MAX.)$ is the maximum point for t_{RAD} where $t_{RAC}(MAX.)$ is ensured, and does not represent a limit of operation.

If $t_{RAD} \geq t_{RAD}(MAX.)$, the access time comes under the control of t_{AA} .

11. $t_{RCD}(MAX.)$ is the maximum point for t_{RCD} where $t_{RAC}(MAX.)$ is ensured, and does not represent a limit of operation.

If $t_{RCD} \geq t_{RCD}(MAX.)$, the access time comes under the control of t_{CAC} .

12. t_{WCS} , t_{RWD} , t_{AWD} and t_{CWD} are the restrictive operating parameters and do not represent a limit of operation.

If $t_{WCS} \geq t_{WCS}(MIN.)$, the cycle is the early write cycle and data out buffers remain inactive until $\overline{CAS}$ rises up again.

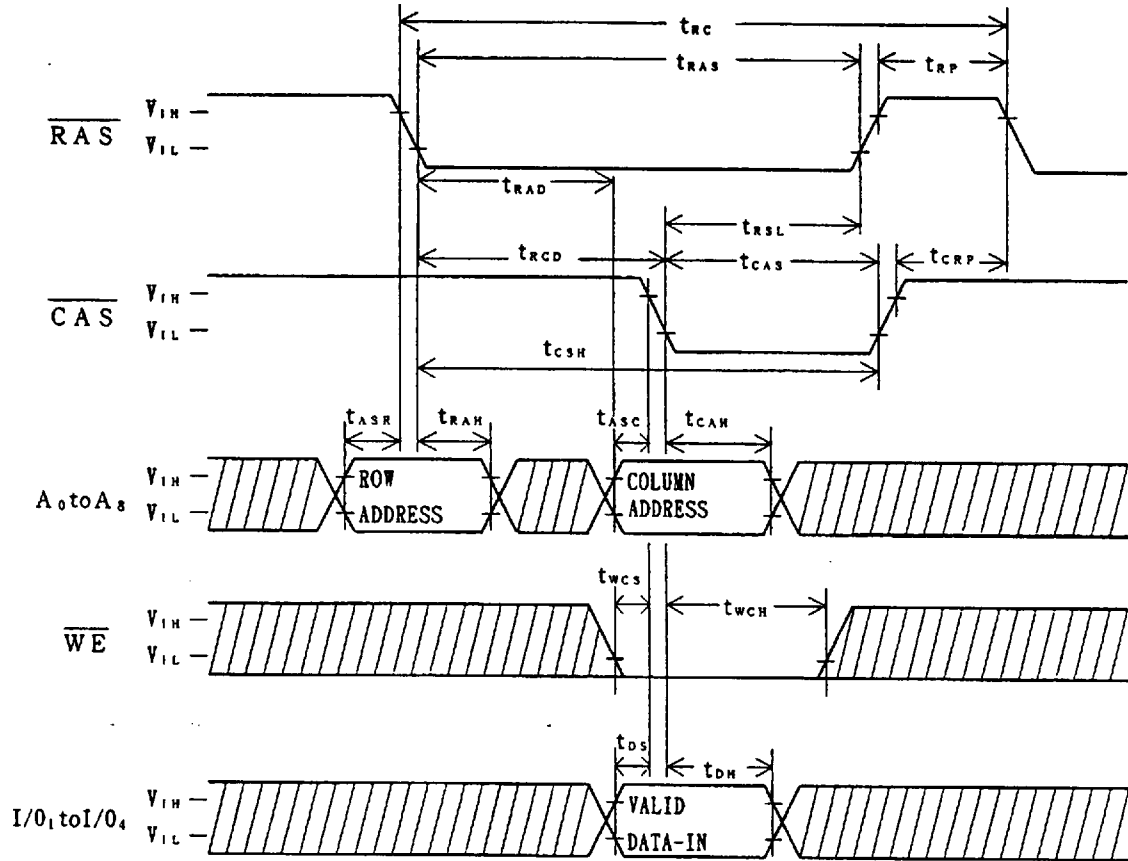
If $t_{CWD} \geq t_{CWD}(MIN.)$, $t_{RWD} \geq t_{RWD}(MIN.)$ and $t_{AWD} \geq t_{AWD}(MIN.)$, the cycle is the read modify write cycle and the output data will be the information of the selected cell. Except for the above timing, the output data will be indefinite.

13. The operation is ensured when either t_{RRH} or t_{RCH} is satisfied.

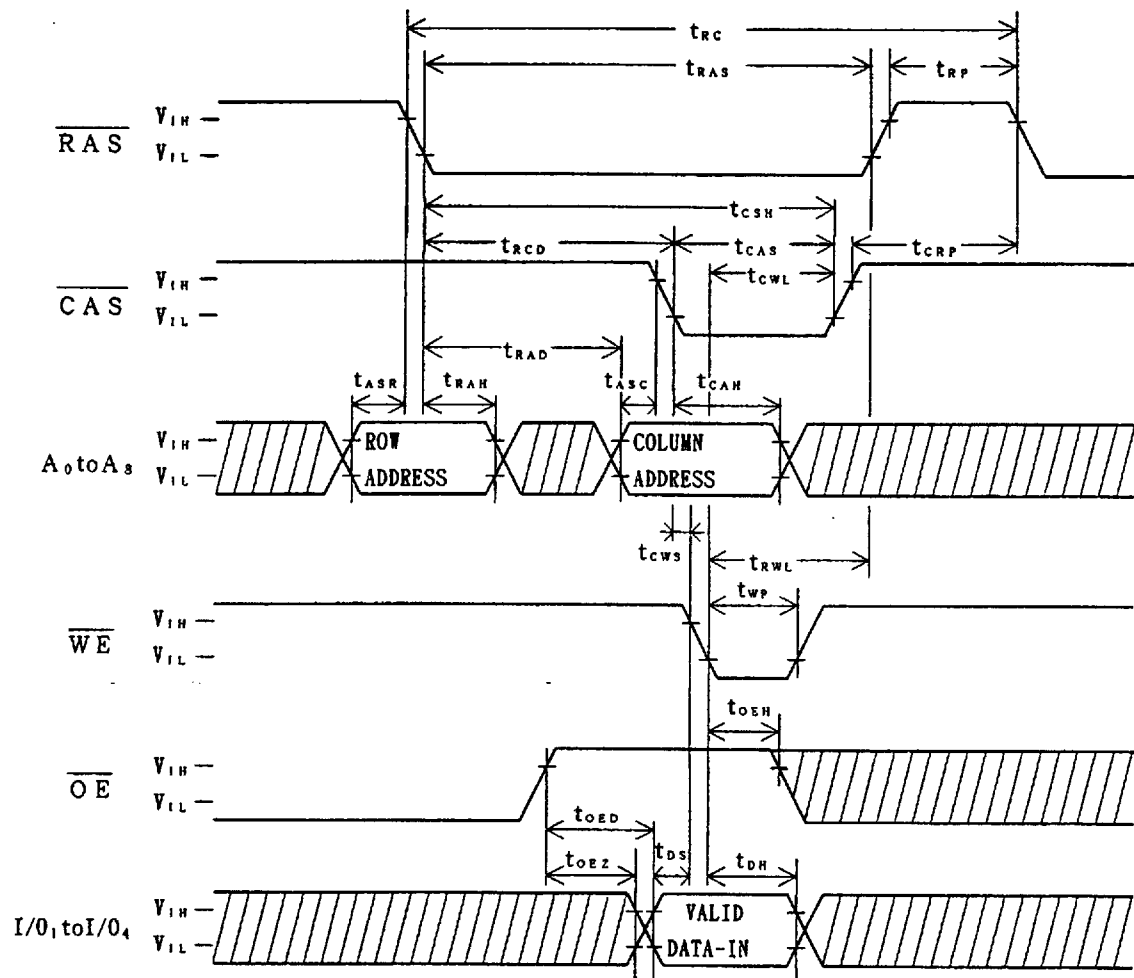
14. Measured with a load equivalent to

2 TTL (-1mA, +4mA) + C_{load} (100pF).
(Including the scope and the jig)

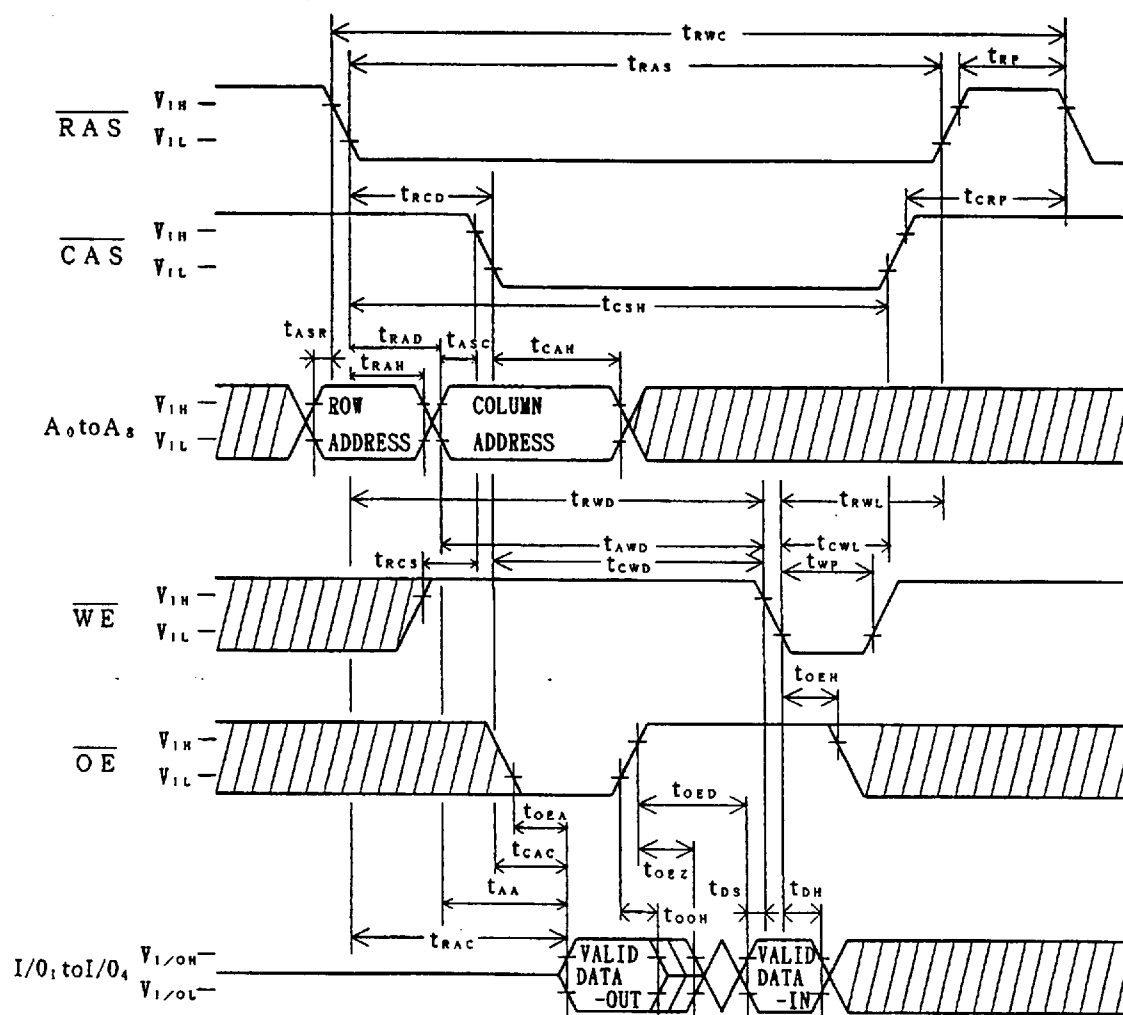
Write Cycle (Early Write)



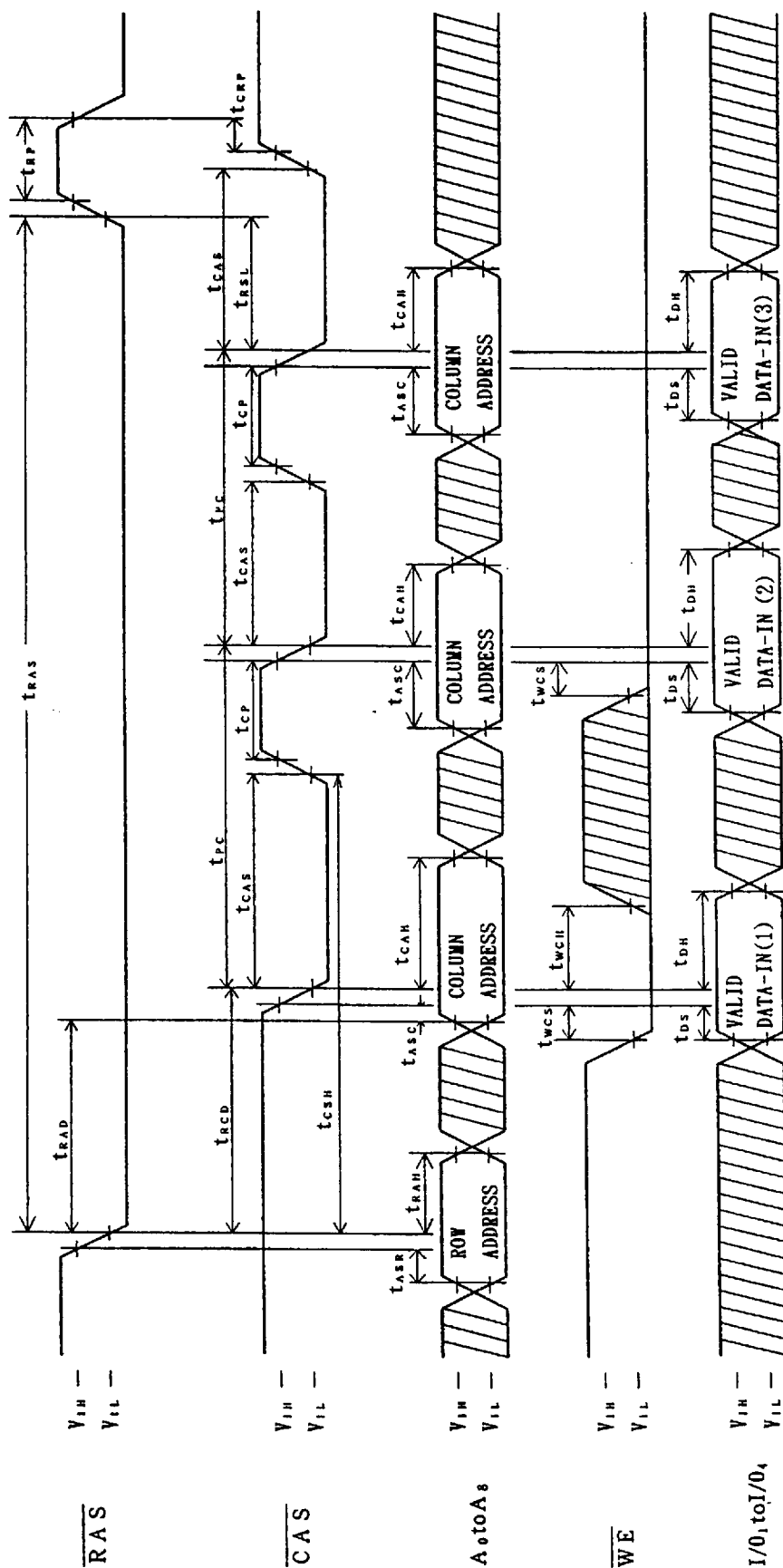
$\overline{OE}$ = Don't Care

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

Read/Write Cycle

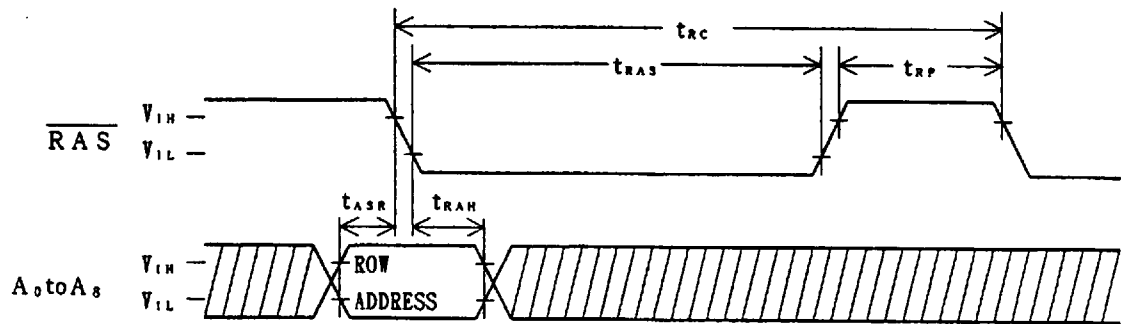


Fast Page Mode Write Cycle



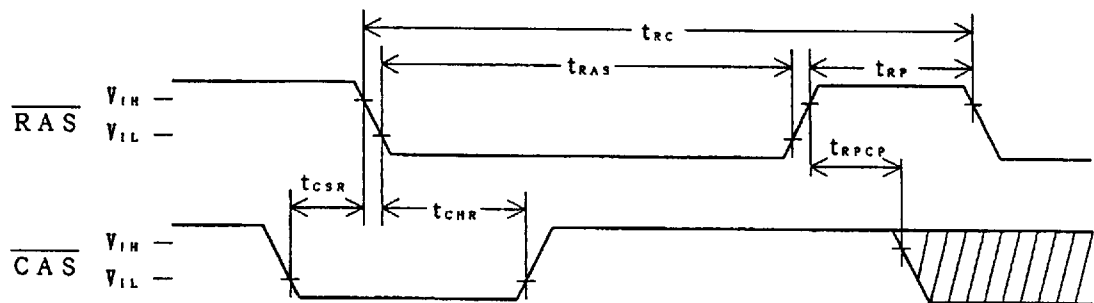
OE = Don't Care

$\overline{\text{RAS}}$ Only Refresh Cycle

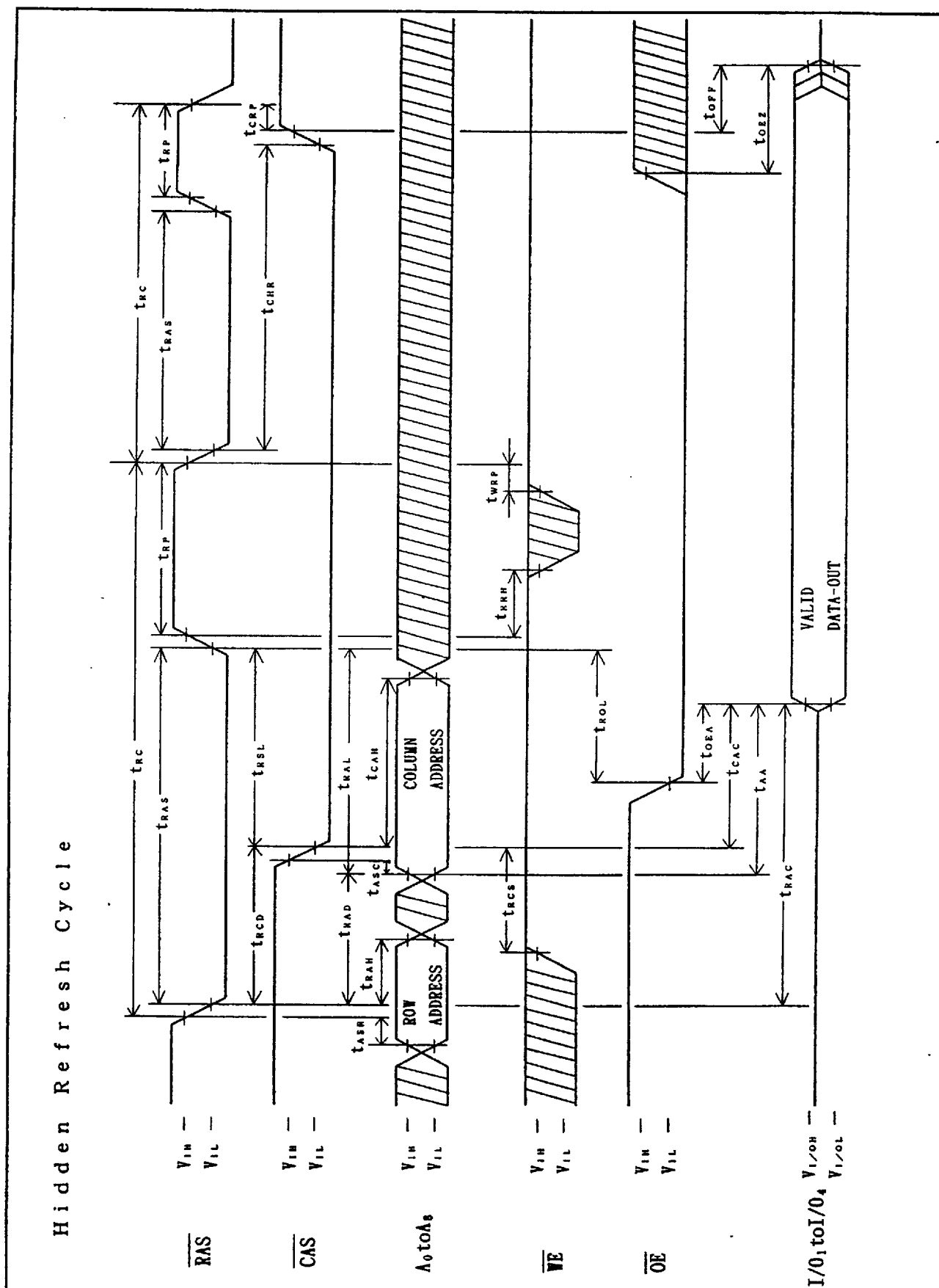


$\overline{\text{CAS}} = "H"$, $\overline{\text{WE}}$, $\overline{\text{OE}} = \text{Don't Care}$

$\overline{\text{CAS}}$ Before $\overline{\text{RAS}}$ Refresh Cycle



$\overline{\text{WE}}$, $\overline{\text{OE}}$, $A_0 \sim A_8 = \text{Don't Care}$



11 Package and packing specification

1. Package Outline Specification

Refer to drawing No. AA1000

2. Markings

2-1. Marking contents

(1) Product name : LH64256CD-70

(2) Company name : SHARP

(3) Date code

(Example) YY WW XXX

Indicates the product was manufactured in the WWth week of 19YY.

Denotes the production ref. code (1-3)

Denotes the production week. (01, 02, 03, 52, 53)

Denotes the production year. (Lower two digits of the year.)

(4) The marking of "JAPAN" indicates the country of origin.

2-2. Marking layout

Refer drawing No. AA1000

(This layout do not define the dimensions of marking character and marking position.)

3. Packing Specification

3-1. Packing materials

Material Name	Material Specification	Purpose
Magazine	Anti-static treated plastic (20devices/magazine)	Packing of device
Stopper	Plastic or rubber	Fixing of device
Label	Paper	Indication of product name, quantity and date of manufacture.
Inner case	Cardboard (800devices/case)	Fixing of magazine
Outer case	Cardboard	Outer packing of magazine

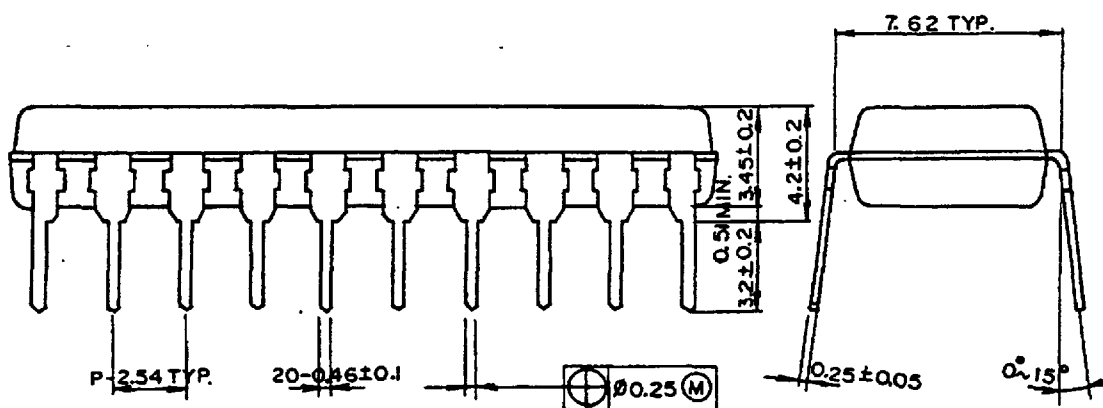
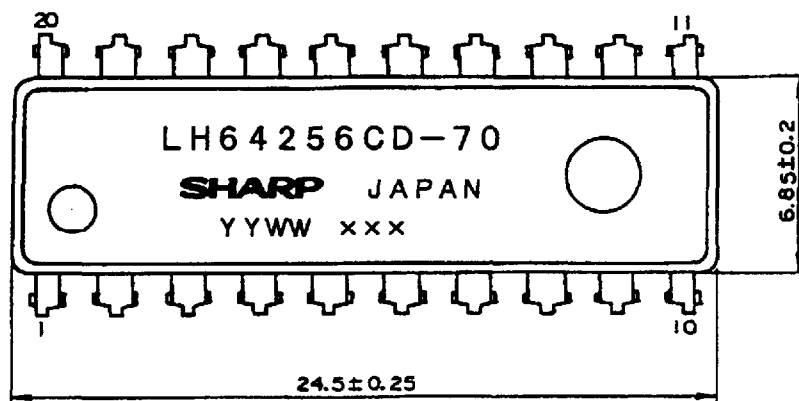
(Devices shall be inserted into a magazine (sleeve) in the same direction.)

3-2. Outline dimension of magazine (sleeve)

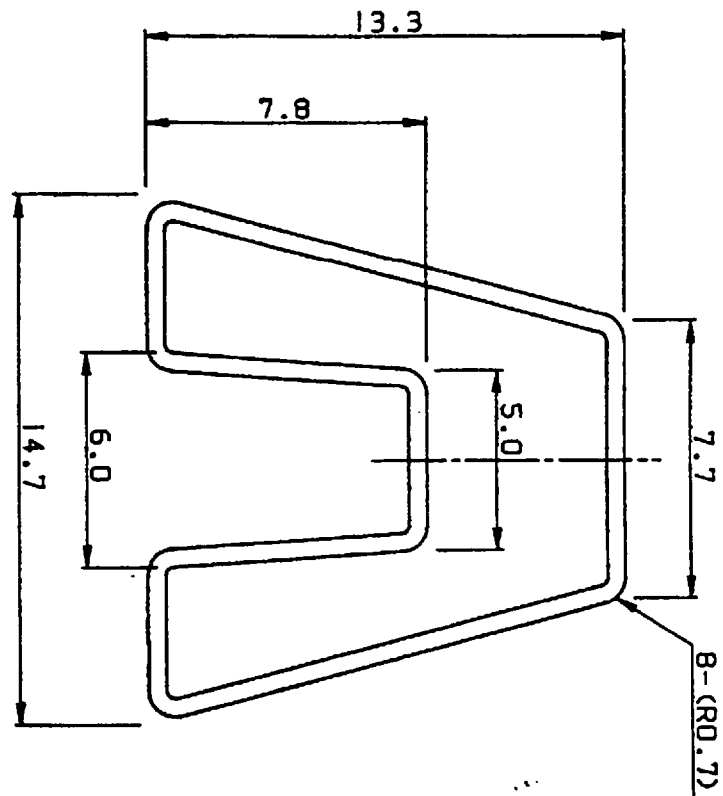
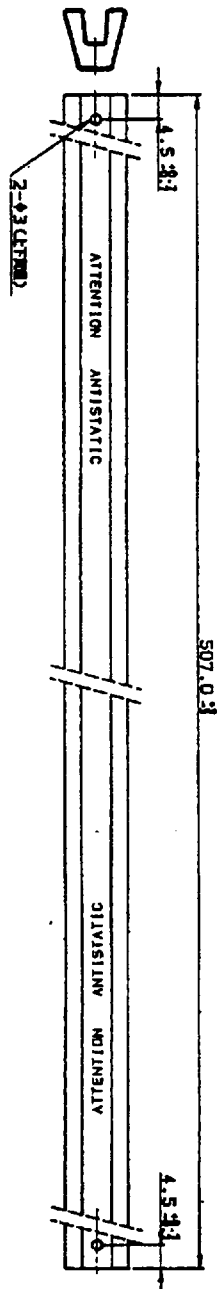
Refer to attached drawing

4. Precaution For Unpacking

- (1) Unpacking should be done on the stand as well as human body treated with anti-ESD.
- (2) Anti-ESD treatment is given to a magazine.
Use the equivalent magazine, if it is changed to another one.
- (3) Be sure to fix two stoppers to both ends of a magazine when storage to prevent the devices from slipping.



名称 NAME	DIP20-P-300A	リード仕上 LEAD FINISH	TIN-LEAD PLATING	備考 NOTE
DRAWING NO.	AA1000	単位 UNIT	mm	プラスチックパッケージ形状は、バリを含めないものとする。 Plastic body dimensions do not include burr of resin.



注記 : 片側ビンストッパー, 片側ゴムストッパーとする。

指示無き寸法公差は全て±0.4とする。

NOTES : One end of magazine (sleeve) is plugged by stopper which is made of rubber, and another end of magazine (sleeve) is plugged by plastic pin-stopper.

All tolerances are ±0.4mm unless otherwise specified

名称 NAME	DP300SPB			備考 NOTE
DRAWING NO.	CV503	単位 UNIT	mm	

8180798 0020084 025