NEC

MOS INTEGRATED CIRCUI

μPD424100, 424100-L

4 M-BIT DYNAMIC RAM
4 M-WORD BY 1-BIT, FAST PAGE MODE

Description

The μPD424100, 424100-L are 4 194 304 words by 1 bit dynamic CMOS RAMs. The fast page mode capability realize high speed access and low power consumption.

These are packed in 26-pin plastic TSOP(II), 26-pin plastic SOJ and 20-pin plastic ZIP.

Features

- 4 194 304 words by 1 bit organization
- Single +5.0 V±10 % power supply
- Fast access and cycle time

Part number	Power consumption		Refresh cycle	Access time (MAX.)	R/W cycle time (MIN.)	Fast page mode cycle time (MIN.)
	Active (MAX.)	Standby(MAX.)				
μPD424100-60	660 mW	5.5 mW (CMOS level input)	1 024 cycles/ 16ms	60 ns	120 ns	40 ns
μPD424100-70	550 mW			70 ns	140 ns	45 ns
μPD424100-80	495 mW			80 ns	160 ns	50 ns
μPD424100-10	440 mW			100 ns	190 ns	60 ns
μPD424100-60L	660 mW	1.1 mW (CMOS level input)	1 024 cycles/ 128ms	60 ns	120 ns	40 ns
μPD424100-70L	550 mW			70 ns	140 ns	45 ns
μPD424100-80L	495 mW			80 ns	160 ns	50 ns
μPD424100-10L	440 mW			100 ns	190 ns	60 ns

- $\overline{CAS}$ before $\overline{RAS}$ refresh, $\overline{RAS}$ only refresh, Hidden refresh
- Multiplexed address inputs ····· Row address : A0 to A10, Column address : A0 to A10

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The information in this document is subject to change without notice.

Ordering Information

Part number	Access time (MAX.)	Package	Refresh cycle	Quality grade
μPD424100GS-60	60 ns	26-pin Plastic TSOP (II) (300 mil)	1 024 cycles/ 16 ms	Standard
μPD424100GS-70	70 ns			
μPD424100GS-80	80 ns			
μPD424100GS-10	100 ns			
μPD424100LA-60	60 ns	26-pin Plastic SOJ (300 mil)		
μPD424100LA-70	70 ns			
μPD424100LA-80	80 ns			
μPD424100LA-10	100 ns			
μPD424100V-60	60 ns	20-pin Plastic ZIP (400 mil)		
μPD424100V-70	70 ns			
μPD424100V-80	80 ns			
μPD424100V-10	100 ns			
μPD424100GS-60L	60 ns	26-pin Plastic TSOP (II) (300 mil)	1 024 cycles/ 128 ms	
μPD424100GS-70L	70 ns			
μPD424100GS-80L	80 ns			
μPD424100GS-10L	100 ns			
μPD424100LA-60L	60 ns	26-pin Plastic SOJ (300 mil)		
μPD424100LA-70L	70 ns			
μPD424100LA-80L	80 ns			
μPD424100LA-10L	100 ns			
μPD424100V-60L	60 ns	20-pin Plastic ZIP (400 mil)		
μPD424100V-70L	70 ns			
μPD424100V-80L	80 ns			
μPD424100V-10L	100 ns			

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

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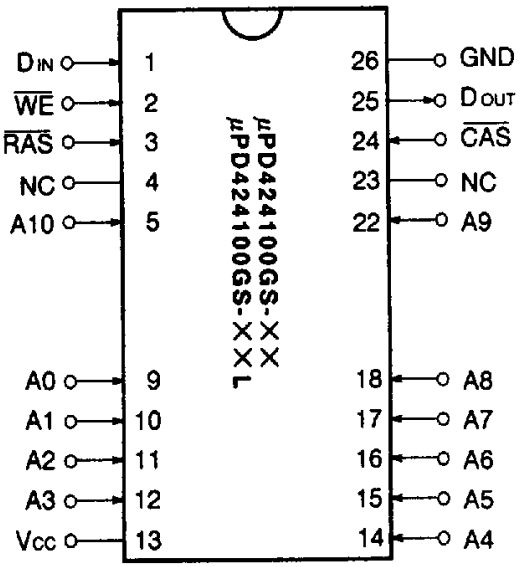
Pin Configurations (Marking Side)

26-pin Plastic TSOP(II) (300 mil)



A0 to A10	: Address Inputs
D_{IN}	: Data Input
D_{OUT}	: Data Output
$\overline{RAS}$	: Row Address Strobe
$\overline{CAS}$	: Column Address Strobe
$\overline{WE}$	: Write Enable
V_{CC}	: Power Supply
GND	: Ground
NC	: No Connection

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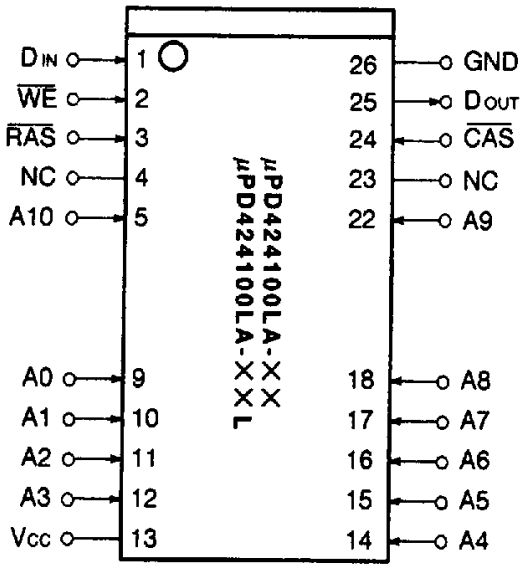
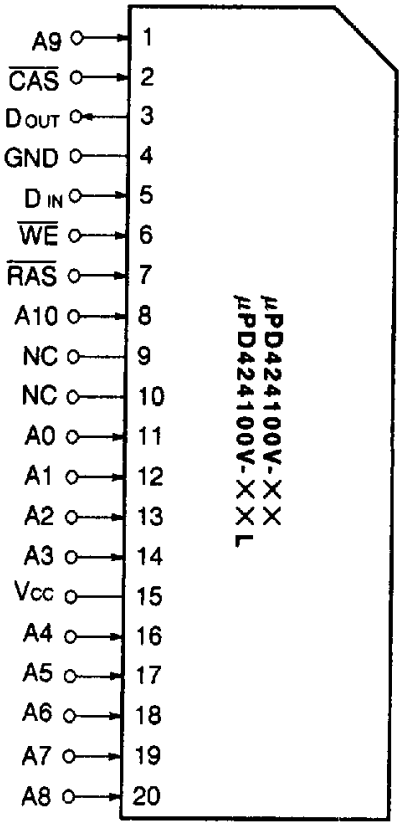
26-pin Plastic SOJ (300 mil)



20-pin Plastic ZIP (400 mil)



A0 to A10	: Address Inputs
DIN	: Data Input
DOUT	: Data Output
$\overline{RAS}$	: Row Address Strobe
$\overline{CAS}$	: Column Address Strobe
$\overline{WE}$	: Write Enable
Vcc	: Power Supply
GND	: Ground
NC	: No Connection

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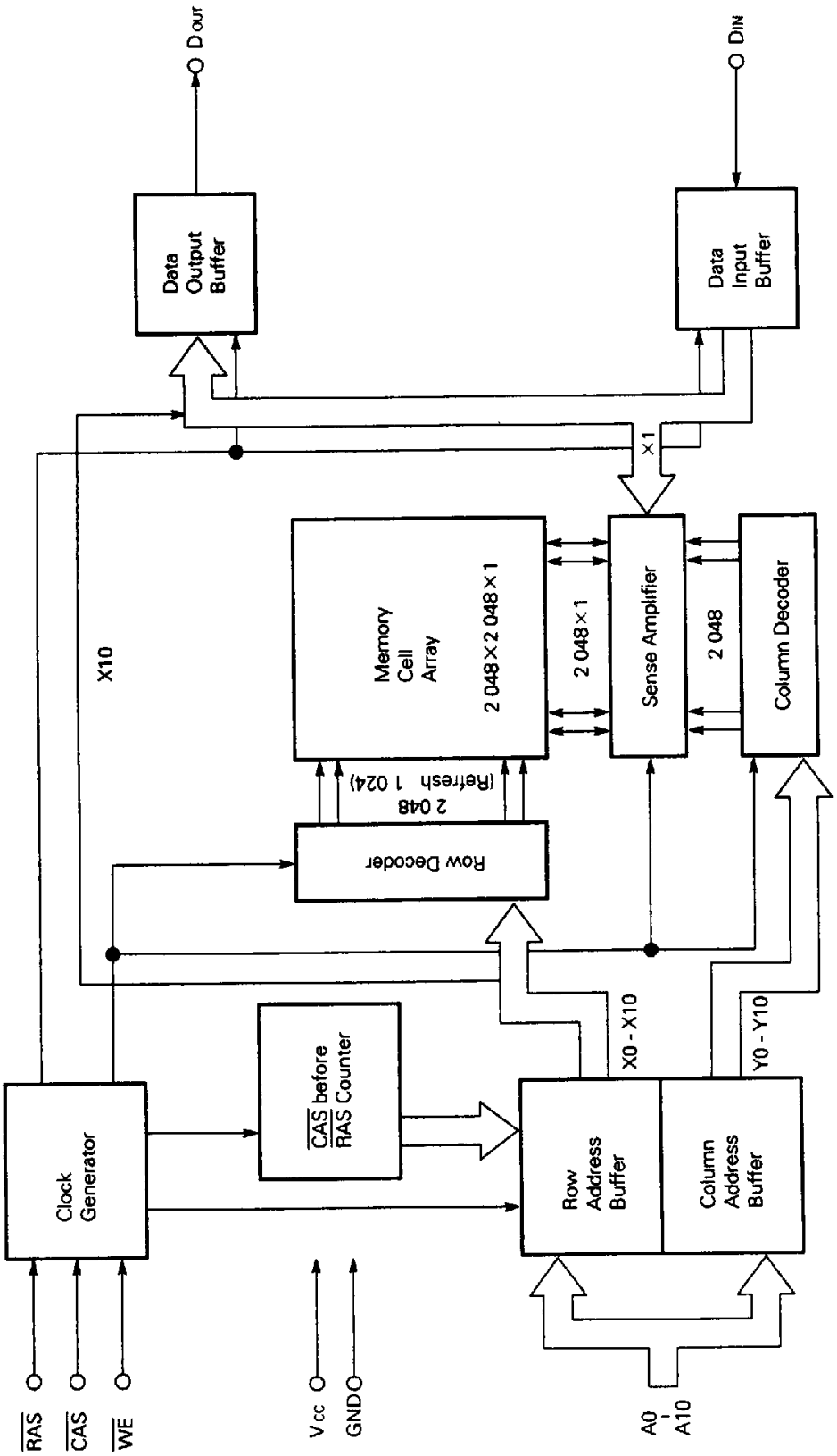
Block Diagram



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Input/Output Pin Functions

The μPD424100, 424100-L have input pins $\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$, A0 to A10, D_{IN} and output pin D_{OUT}.

Pin name	Input/ Output	Function
$\overline{RAS}$ (Row address strobe)	Input	$\overline{RAS}$ activates the sense amplifier by latching a row address and selecting a corresponding word line. It refreshes memory cell array of one line selected by the row address. It also selects the following function. • $\overline{CAS}$ before $\overline{RAS}$ refresh
$\overline{CAS}$ (Column address strobe)		$\overline{CAS}$ activates data input/output circuit by latching column address and selecting a digit line connected with the sense amplifier.
A0 to A10 (Address input)		Address bus. Input total 22-bit of address signal, upper 11-bit and lower 11-bit in sequence (address multiplex method). Therefore, one word is selected from 4 194 304-word by 1-bit memory cell array. In actual operation, latch row address by specifying row address and activating $\overline{RAS}$. Then, switch the address bus to column address and activate $\overline{CAS}$. Each address is taken into the device when $\overline{RAS}$ and $\overline{CAS}$ are activated. Therefore, the address input setup time (t_{ASR}, t_{ASC}) and hold time (t_{RAH}, t_{CAH}) are specified for the activation of $\overline{RAS}$ and $\overline{CAS}$.
$\overline{WE}$ (Write enable)		Write control signal. Write operation is executed by activating $\overline{RAS}$, $\overline{CAS}$ and $\overline{WE}$.
D_{IN} (Data input)		Data bus. D_{IN} is used to input data.
D_{OUT} (Data output)	Output	Data bus. D_{OUT} is used to output data.

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Electrical Specifications

- All voltages are referenced to GND.
- After power up, wait more than 100 μs and then, execute eight $\overline{CAS}$ before $\overline{RAS}$ or $\overline{RAS}$ only refresh cycles as dummy cycles to initialize internal circuit.

Absolute Maximum Ratings

Parameter	Symbol	Condition	Rating	Unit
Voltage on Any Pin Relative to GND	V_T		−1.0 to +7.0	V
Supply Voltage	V_{CC}		−1.0 to +7.0	V
Output Current	I_O		50	mA
Power Dissipation	P_D		1	W
Operating Temperature	T_{opt}		0 to +70	°C
Storage Temperature	T_{stg}		−55 to +125	°C

Caution Exposing the device to stress above those listed in Absolute Maximum Ratings could cause permanent damage. The device is not meant to be operated under conditions outside the limits described in the operational section of this specification. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}		4.5	5.0	5.5	V
High Level Input Voltage	V_{IH}		2.4		V_{CC} +1.0	V
Low Level Input Voltage	V_{IL}		−1.0		+0.8	V
Ambient Temperature	T_a		0		70	°C

Capacitance (T_a = 25 °C, f = 1 MHz)

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Input Capacitance	C_{I1}	Address, D_{IN}			5	pF
	C_{I2}	$\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$			7	pF
Data Output Capacitance	C_O	D_{OUT}			7	pF

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DC Characteristics (Recommended operating conditions unless otherwise noted)

Parameter		Symbol	Test Condition		MIN.	TYP.	MAX.	Unit	Notes
Operating current		I_{CC1}	$\overline{RAS}$, $\overline{CAS}$ Cycling $t_{RC} = t_{RC\ (MIN.)}$ I_O = 0 mA	t_{RAC} = 60 ns			120	mA	1, 2, 3
				t_{RAC} = 70 ns			100		
				t_{RAC} = 80 ns			90		
				t_{RAC} = 100 ns			80		
Standby current	μPD424100	I_{CC2}	$\overline{RAS}$, $\overline{CAS} \geqq V_{IH\ (MIN.)}$, I_O = 0 mA				2	mA	
			$\overline{RAS}$, $\overline{CAS} \geqq V_{CC}$ – 0.2 V, I_O = 0 mA				1		
	μPD424100-L		$\overline{RAS}$, $\overline{CAS} \geqq V_{IH\ (MIN.)}$, I_O = 0 mA				2		
			$\overline{RAS}$, $\overline{CAS} \geqq V_{CC}$ – 0.2 V, I_O = 0 mA				0.2		
$\overline{RAS}$ only refresh current		I_{CC3}	$\overline{RAS}$ Cycling, $\overline{CAS} \geqq V_{IH\ (MIN.)}$ $t_{RC} = t_{RC\ (MIN.)}$, I_O = 0 mA	t_{RAC} = 60 ns			120	mA	1,2,3,4
				t_{RAC} = 70 ns			100		
				t_{RAC} = 80 ns			90		
				t_{RAC} = 100 ns			80		
Operating current (Fast page mode)		I_{CC4}	$\overline{RAS} \leqq V_{IL\ (MAX.)}$, $\overline{CAS}$ Cycling $t_{PC} = t_{PC\ (MIN.)}$, I_O = 0 mA	t_{RAC} = 60 ns			90	mA	1, 2, 5
				t_{RAC} = 70 ns			80		
				t_{RAC} = 80 ns			70		
				t_{RAC} = 100 ns			60		
$\overline{CAS}$ before $\overline{RAS}$ refresh current		I_{CC5}	$\overline{RAS}$ Cycling $t_{RC} = t_{RC\ (MIN.)}$ I_O = 0 mA	t_{RAC} = 60 ns			120	mA	1, 2
				t_{RAC} = 70 ns			100		
				t_{RAC} = 80 ns			90		
				t_{RAC} = 100 ns			80		
$\overline{CAS}$ before $\overline{RAS}$ long refresh current (1 024 Cycles / 128 ms, only for the μPD424100-L)		I_{CC6}	$\overline{CAS}$ before $\overline{RAS}$ refresh : 1 024 Cycles / 128 ms $\overline{RAS}$, $\overline{CAS}$: V_{CC}–0.2 V $\leqq V_{IH} \leqq V_{IH\ (MAX.)}$ 0 V $\leqq V_{IL} \leqq$ 0.2 V Standby : $\overline{RAS}$, $\overline{CAS} \geqq V_{CC}$–0.2 V Address : V_{IH} or V_{IL} $\overline{WE}$: V_{IH} I_O = 0 mA	$t_{RAS} \leqq$ 200 ns			300	μA	1, 2
				$t_{RAS} \leqq$ 1 μs			500		
Input leakage current		$I_{I\ (L)}$	V_I = 0 to 5.5 V All other pins not under test = 0 V		–10		+10	μA	
Output leakage current		$I_{O\ (L)}$	V_O = 0 to 5.5 V Output is disabled (Hi-Z)		–10		+10	μA	
High level output voltage		V_{OH}	I_O = –5.0 mA		2.4			V	
Low level output voltage		V_{OL}	I_O = +4.2 mA				0.4	V	

Notes
1. I_{CC1}, I_{CC3}, I_{CC4}, I_{CC5} and I_{CC6} depend on cycle rates (t_{RC} and t_{PC}).
2. Specified values are obtained with outputs unloaded.
3. I_{CC1} and I_{CC3} are measured assuming that address can be changed once or less during $\overline{RAS} \leqq V_{IL(MAX.)}$ and $\overline{CAS} \geqq V_{IH(MIN.)}$.
4. I_{CC3} is measured assuming that all column address inputs are held at either high or low.
5. I_{CC4} is measured assuming that all column address inputs are switched only once during each fast page cycle.

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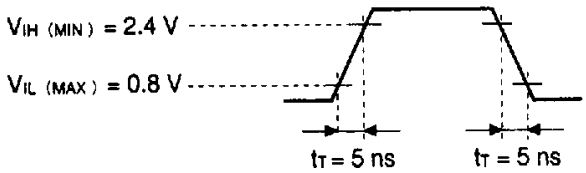
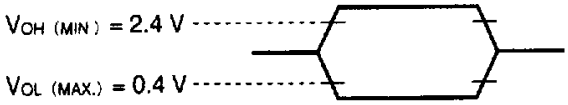
AC Characteristics (Recommended Operating Conditions unless otherwise noted)

AC Characteristics Test Conditions

(1) Input timing specification



(2) Output timing specification



(3) Loading conditions are 100 pF + 2 TTLs.

Common to Read, Write, Read Modify Write Cycle

Parameter		Symbol	tRAC = 60 ns		tRAC = 70 ns		tRAC = 80 ns		tRAC = 100 ns		Unit	Notes
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Read / Write Cycle Time		tRC	120	–	140	–	160	–	190	–	ns	
$\overline{RAS}$ Precharge Time		tRP	50	–	60	–	70	–	80	–	ns	
$\overline{CAS}$ Precharge Time		tCPN	10	–	10	–	10	–	10	–	ns	
$\overline{RAS}$ Pulse Width		tRAS	60	10 000	70	10 000	80	10 000	100	10 000	ns	
$\overline{CAS}$ Pulse Width		tCAS	15	10 000	20	10 000	20	10 000	25	10 000	ns	
$\overline{RAS}$ Hold Time		tRSH	20	–	20	–	20	–	25	–	ns	
$\overline{CAS}$ Hold Time		tCSH	60	–	70	–	80	–	100	–	ns	
$\overline{RAS}$ to $\overline{CAS}$ Delay Time		tRCD	20	40	20	50	25	60	25	75	ns	1
$\overline{RAS}$ to Column Address Delay Time		tRAD	15	30	15	35	17	40	17	50	ns	1
$\overline{CAS}$ to $\overline{RAS}$ Precharge Time		tCRP	10	–	10	–	10	–	10	–	ns	2
Row Address Setup Time		tASR	0	–	0	–	0	–	0	–	ns	
Row Address Hold Time		tRAH	10	–	10	–	12	–	12	–	ns	
Column Address Setup Time		tASC	0	–	0	–	0	–	0	–	ns	
Column Address Hold Time		tCAH	15	–	15	–	15	–	20	–	ns	
$\overline{CAS}$ to Data Setup Time		tCLZ	0	–	0	–	0	–	0	–	ns	
Transition Time (Rise and Fall)		tT	3	50	3	50	3	50	3	50	ns	
Refresh Time	μPD424100	tREF	–	16	–	16	–	16	–	16	ms	
	μPD424100-L		–	128	–	128	–	128	–	128	ms	

Notes 1. For read cycles, access time is defined as follows:

Input Conditions	Access Time	Access Time from $\overline{RAS}$
tRAD ≦ tRAD (MAX.) and tRCD ≦ tRCD (MAX.)	tRAC (MAX.)	tRAC (MAX.)
tRAD > tRAD (MAX.) and tRCD ≦ tRCD (MAX.)	tAA (MAX.)	tRAD + tAA (MAX.)
tRCD > tRCD (MAX.)	tCAC (MAX.)	tRCD + tCAC (MAX.)

tRAD(MAX.) and tRCD(MAX.) are specified as reference points only ; they are not restrictive operating parameters. They are used to determine which access time(tRAC, tAA or tCAC) is to be used for finding out when output data will be available. Therefore, the input conditions tRAD ≧ tRAD(MAX.) and tRCD ≧ tRCD(MAX.) will not cause any operation problems.

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2. tCRP(MIN.) requirement is applied to $\overline{RAS}$, $\overline{CAS}$ cycles preceded by any cycle.

Read Cycle

Parameter	Symbol	t_{RAC} = 60 ns		t_{RAC} = 70 ns		t_{RAC} = 80 ns		t_{RAC} = 100 ns		Unit	Notes
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Access Time from $\overline{RAS}$	t_{RAC}	–	60	–	70	–	80	–	100	ns	1
Access Time from $\overline{CAS}$	t_{CAC}	–	15	–	20	–	20	–	25	ns	1
Access Time from Column Address	t_{AA}	–	30	–	35	–	40	–	50	ns	1
Column Address Lead Time Referenced to $\overline{RAS}$	t_{RAL}	30	–	35	–	40	–	50	–	ns	
Read Command Setup Time	t_{RCS}	0	–	0	–	0	–	0	–	ns	
Read Command Hold Time Referenced to $\overline{RAS}$	t_{RRH}	10	–	10	–	10	–	10	–	ns	2
Read Command Hold Time Referenced to $\overline{CAS}$	t_{RCH}	0	–	0	–	0	–	0	–	ns	2
Output Buffer Turn-off Delay Time from $\overline{CAS}$	t_{OFF}	0	15	0	15	0	20	0	25	ns	3

Notes 1. For read cycles, access time is defined as follows:

Input Conditions	Access Time	Access Time from $\overline{RAS}$
$t_{RAD} \leqq t_{RAD\,(MAX)}$ and $t_{RCD} \leqq t_{RCD\,(MAX.)}$	$t_{RAC\,(MAX)}$	$t_{RAC\,(MAX.)}$
$t_{RAD} > t_{RAD\,(MAX)}$ and $t_{RCD} \leqq t_{RCD\,(MAX)}$	$t_{AA\,(MAX)}$	$t_{RAD} + t_{AA\,(MAX.)}$
$t_{RCD} > t_{RCD\,(MAX.)}$	$t_{CAC\,(MAX)}$	$t_{RCD} + t_{CAC\,(MAX.)}$

$t_{RAD(MAX.)}$ and $t_{RCD(MAX.)}$ are specified as reference points only ; they are not restrictive operating parameters. They are used to determine which access time(t_{RAC}, t_{AA} or t_{CAC}) is to be used for finding out when output data will be available. Therefore, the input conditions $t_{RAD} \geqq t_{RAD(MAX.)}$ and $t_{RCD} \geqq t_{RCD(MAX)}$ will not cause any operation problems.

2. Either $t_{RCH(MIN.)}$ or $t_{RRH(MIN)}$ should be met in read cycles.
3. $t_{OFF(MAX)}$ defines the time when the output achieves the condition of Hi - Z and is not referenced to V_{OH} or V_{OL}.

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Write Cycle

Parameter	Symbol	t_{RAC} = 60 ns		t_{RAC} = 70 ns		t_{RAC} = 80 ns		t_{RAC} = 100 ns		Unit	Notes
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
$\overline{WE}$ Hold Time Referenced to $\overline{CAS}$	t_{WCH}	15	–	15	–	15	–	20	–	ns	1
$\overline{WE}$ Pulse Width	t_{WP}	15	–	15	–	15	–	20	–	ns	1
$\overline{WE}$ Lead Time Referenced to $\overline{RAS}$	t_{RWL}	20	–	20	–	20	–	25	–	ns	
$\overline{WE}$ Lead Time Referenced to $\overline{CAS}$	t_{CWL}	15	–	15	–	15	–	20	–	ns	
$\overline{WE}$ Setup Time	t_{WCS}	0	–	0	–	0	–	0	–	ns	2
Data-in Setup Time	t_{DS}	0	–	0	–	0	–	0	–	ns	3
Data-in Hold Time	t_{DH}	15	–	15	–	15	–	20	–	ns	3

Notes 1. $t_{WP(MIN.)}$ is applied to late write cycles or read modify write cycles. In early write cycles, $t_{WCH(MIN.)}$ should be met.

2. If $t_{WCS} \geqq t_{WCS(MIN.)}$, the cycle is an early write cycle and the data out will remain Hi - Z through the entire cycle.

3. $t_{DS(MIN)}$ and $t_{DH(MIN.)}$ are referenced to the $\overline{CAS}$ falling edge in early write cycles. In late write cycles and read modify write cycles, they are referenced to the $\overline{WE}$ falling edge.

Read Modify Write Cycle

Parameter	Symbol	t_{RAC} = 60 ns		t_{RAC} = 70 ns		t_{RAC} = 80 ns		t_{RAC} = 100 ns		Unit	Note
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Read Modify Write Cycle Time	t_{RWC}	145	–	165	–	185	–	220	–	ns	
$\overline{RAS}$ to $\overline{WE}$ Delay Time	t_{RWD}	60	–	70	–	80	–	100	–	ns	1
$\overline{CAS}$ to $\overline{WE}$ Delay Time	t_{CWD}	20	–	20	–	20	–	25	–	ns	1
Column Address to $\overline{WE}$ Delay Time	t_{AWD}	30	–	35	–	40	–	50	–	ns	1

Note 1. If $t_{WCS} \geqq t_{WCS(MIN)}$, the cycle is an early write cycle and the data out will remain Hi - Z through the entire cycle. If $t_{RWD} \geqq t_{RWD(MIN)}$, $t_{CWD} \geqq t_{CWD(MIN)}$, $t_{AWD} \geqq t_{AWD(MIN)}$, and $t_{CPWD} \geqq t_{CPWD(MIN)}$, the cycle is a read modify write cycle and the data out will contain data read from the selected cell. If neither of the above conditions is met, the state of the data out is indeterminate.

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Fast Page Mode

Parameter	Symbol	t_{RAC} = 60 ns		t_{RAC} = 70 ns		t_{RAC} = 80 ns		t_{RAC} = 100 ns		Unit	Note
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Fast Page Mode Cycle Time	t_{PC}	40	–	45	–	50	–	60	–	ns	
Access Time from $\overline{CAS}$ Precharge	t_{ACP}	–	35	–	40	–	45	–	55	ns	
$\overline{RAS}$ Pulse Width	t_{RASP}	60	125 000	70	125 000	80	125 000	100	125 000	ns	
$\overline{CAS}$ Precharge Time	t_{CP}	10	–	10	–	10	–	10	–	ns	
$\overline{RAS}$ Hold Time from $\overline{CAS}$ Precharge	t_{RHCP}	35	–	40	–	45	–	55	–	ns	
Read Modify Write Cycle Time	t_{PRWC}	65	–	70	–	75	–	90	–	ns	
$\overline{CAS}$ Precharge to $\overline{WE}$ Delay Time	t_{CPWD}	55	–	60	–	70	–	85	–	ns	1

Note 1. If $t_{WCS} \geqq t_{WCS(MIN)}$, the cycle is an early write cycle and the data out will remain Hi - Z through the entire cycle. If $t_{RWD} \geqq t_{RWD(MIN)}$, $t_{CWD} \geqq t_{CWD(MIN)}$, $t_{AWD} \geqq t_{AWD(MIN)}$, and $t_{CPWD} \geqq t_{CPWD(MIN.)}$, the cycle is a read modify write cycle and the data out will contain data read from the selected cell. If neither of the above conditions is met, the state of the data out is indeterminate.

Refresh Cycle

Parameter	Symbol	t_{RAC} = 60 ns		t_{RAC} = 70 ns		t_{RAC} = 80 ns		t_{RAC} = 100 ns		Unit	Note
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
$\overline{CAS}$ Setup Time	t_{CSR}	10	–	10	–	10	–	10	–	ns	
$\overline{CAS}$ Hold Time ($\overline{CAS}$ before $\overline{RAS}$ Refresh)	t_{CHR}	15	–	15	–	15	–	20	–	ns	
$\overline{RAS}$ Precharge $\overline{CAS}$ Hold Time	t_{RPC}	10	–	10	–	10	–	10	–	ns	
$\overline{WE}$ Setup Time	t_{WSR}	10	–	10	–	10	–	10	–	ns	
$\overline{WE}$ Hold Time	t_{WHR}	15	–	15	–	15	–	20	–	ns	

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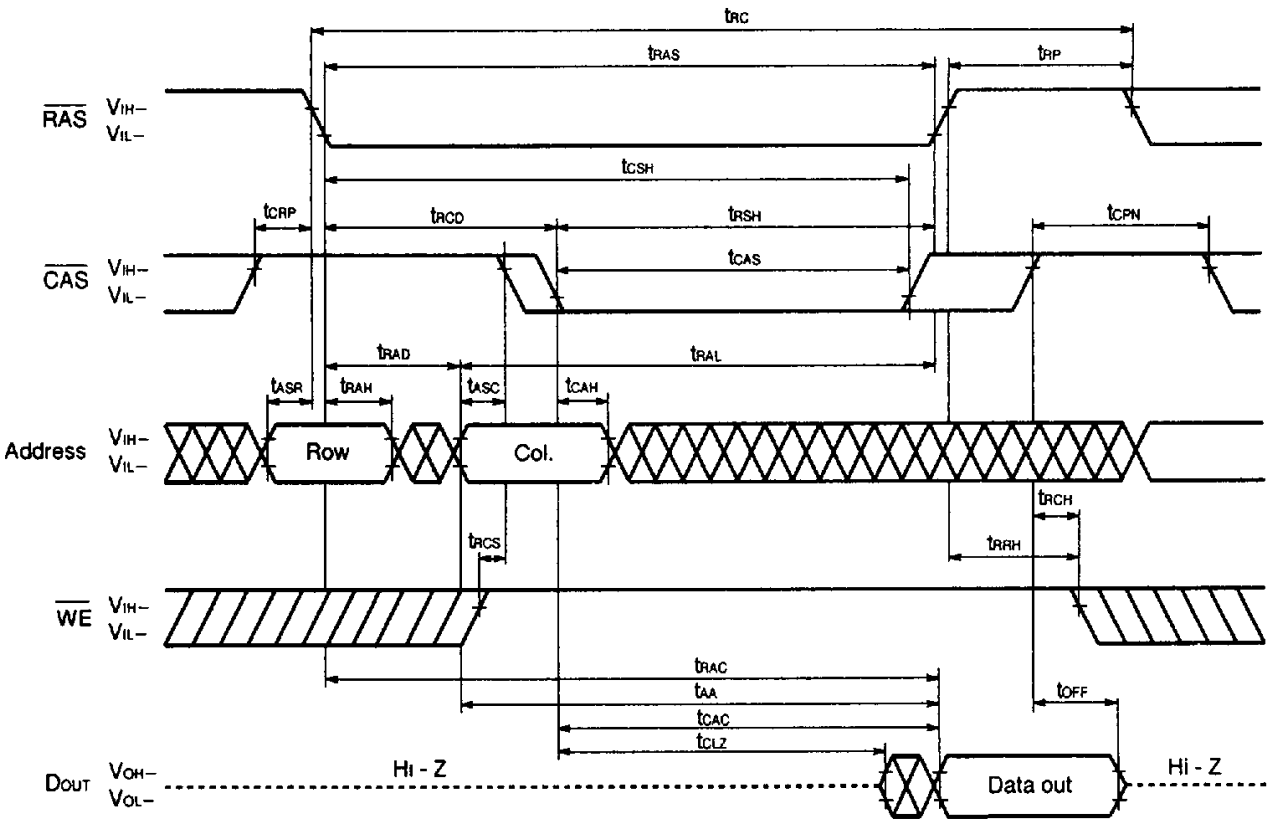
Read Cycle



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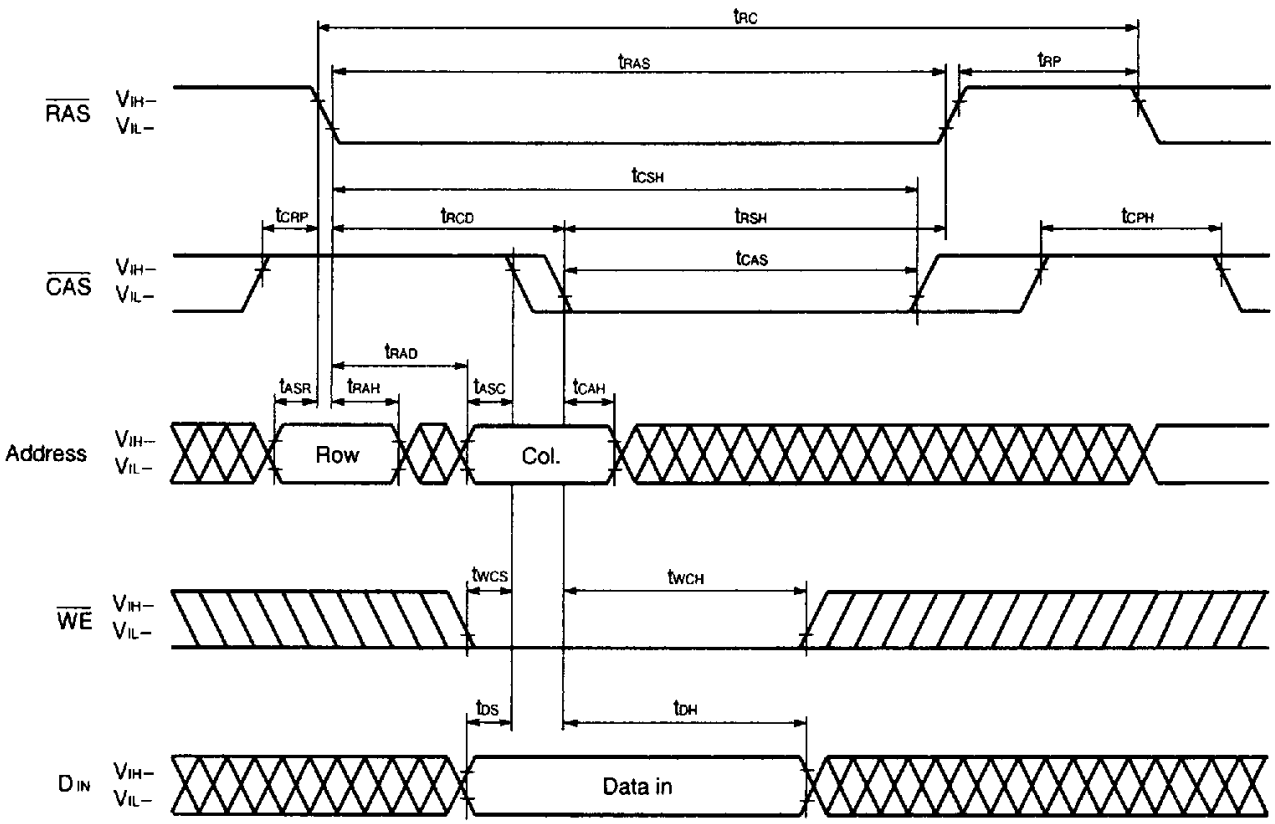
Early Write Cycle



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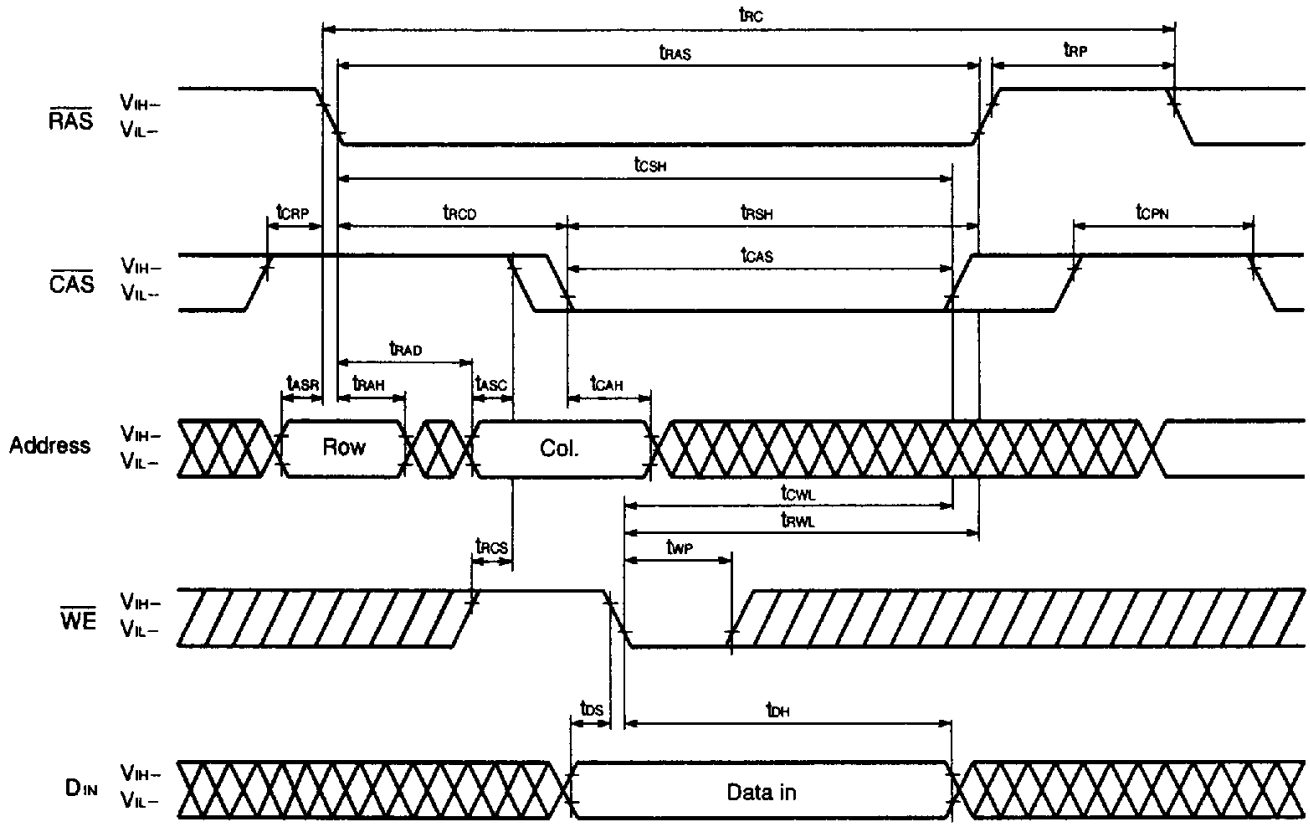
Late Write Cycle



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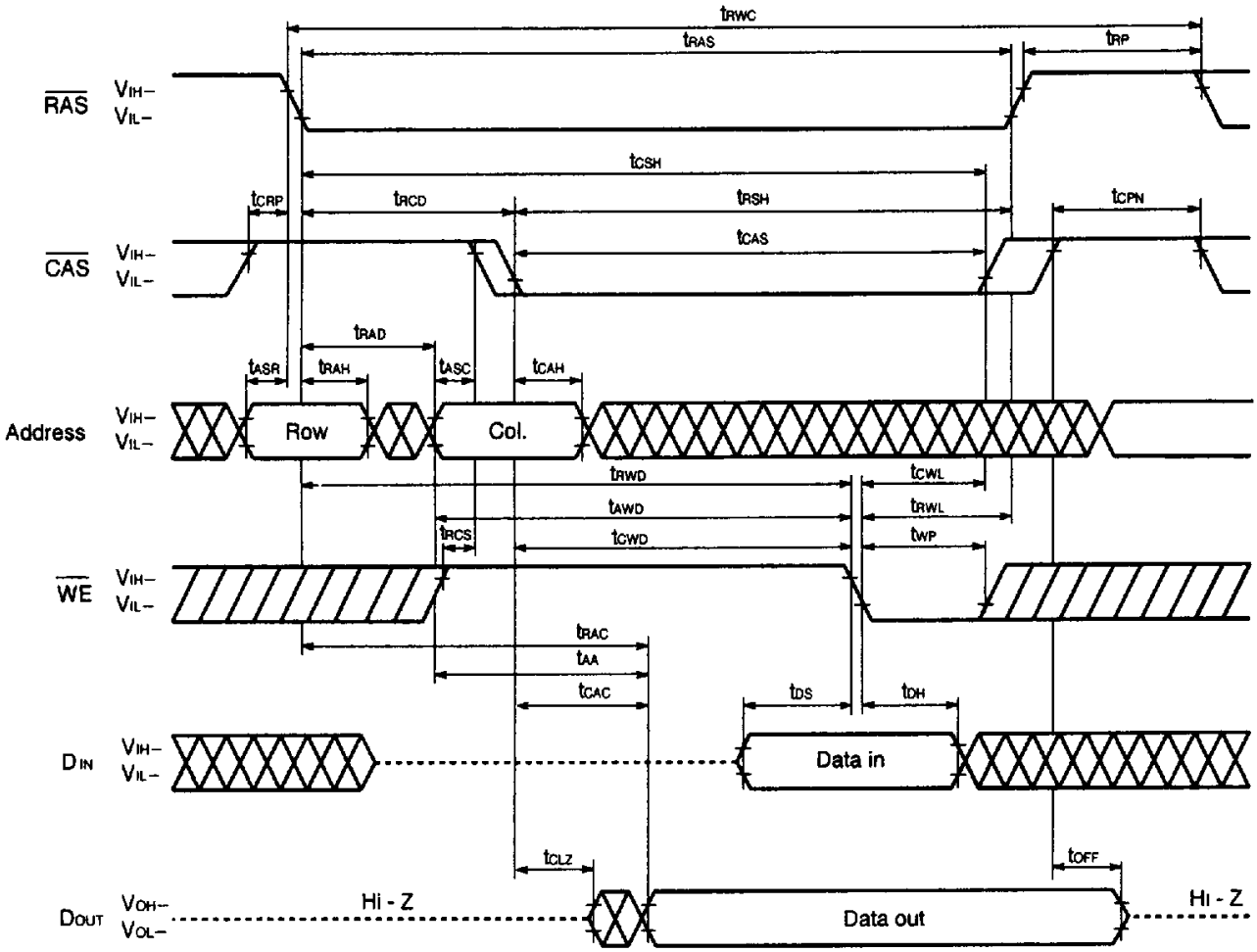
Read Modify Write Cycle



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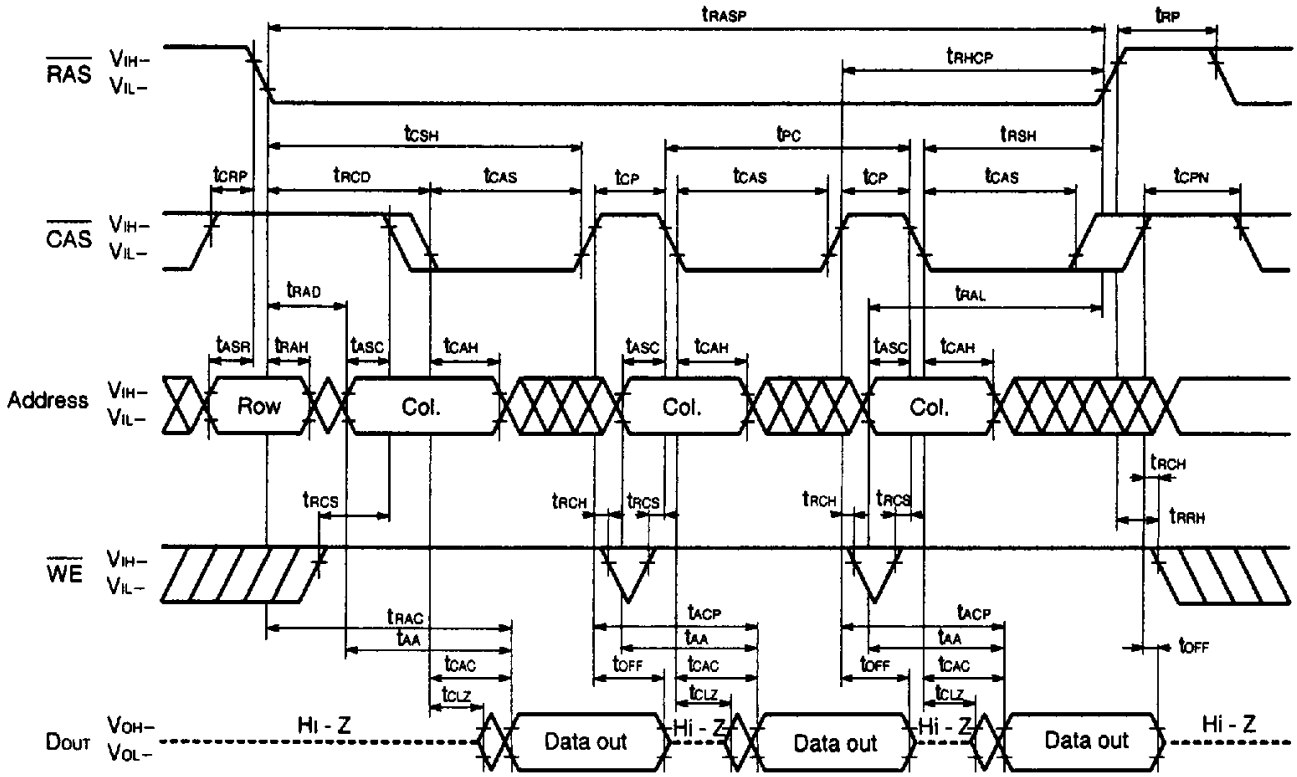
Fast Page Mode Read Cycle



Remark In the fast page mode, read, write and read modify write cycles are available for each of the consecutive $\overline{CAS}$ cycles within the same $\overline{RAS}$ cycle.

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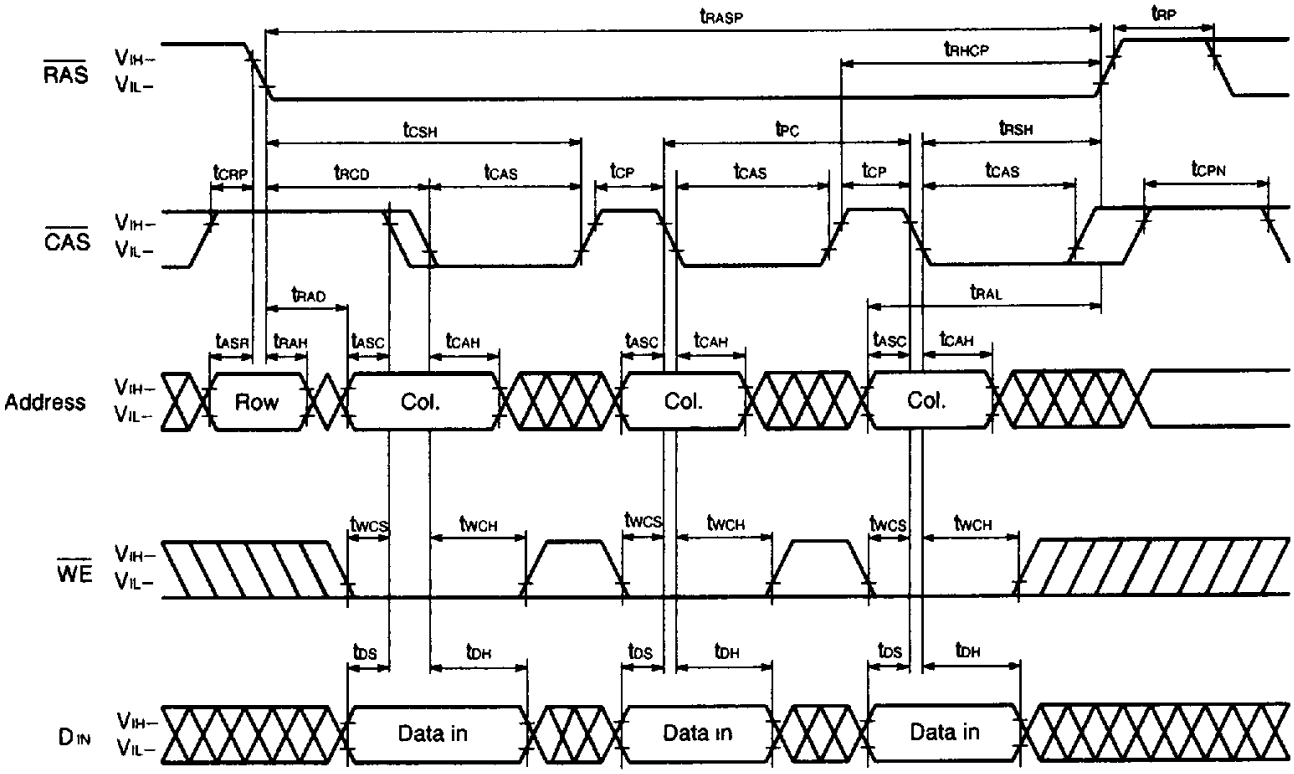
Fast Page Mode Early Write Cycle



Remark In the fast page mode, read, write and read modify write cycles are available for each of the consecutive $\overline{CAS}$ cycles within the same $\overline{RAS}$ cycle.

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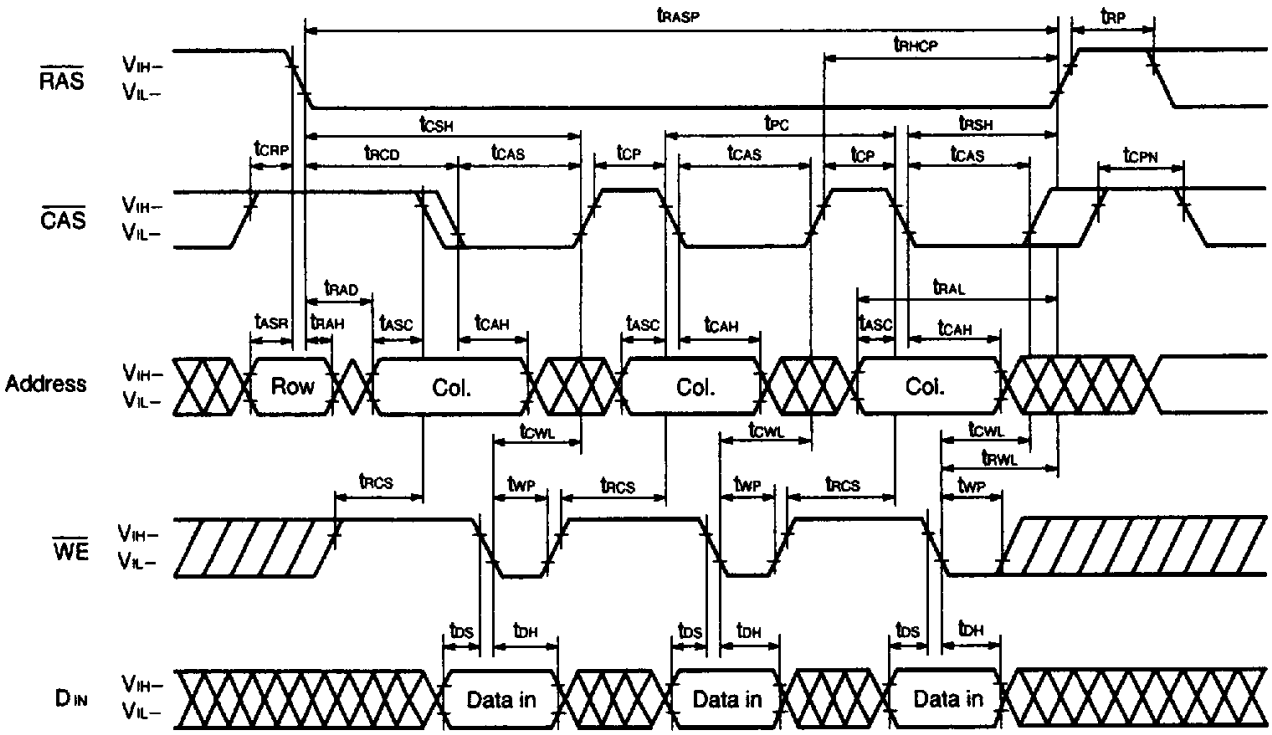
Fast Page Mode Late Write Cycle



Remark In the fast page mode, read, write and read modify write cycles are available for each of the consecutive $\overline{CAS}$ cycles within the same $\overline{RAS}$ cycle.

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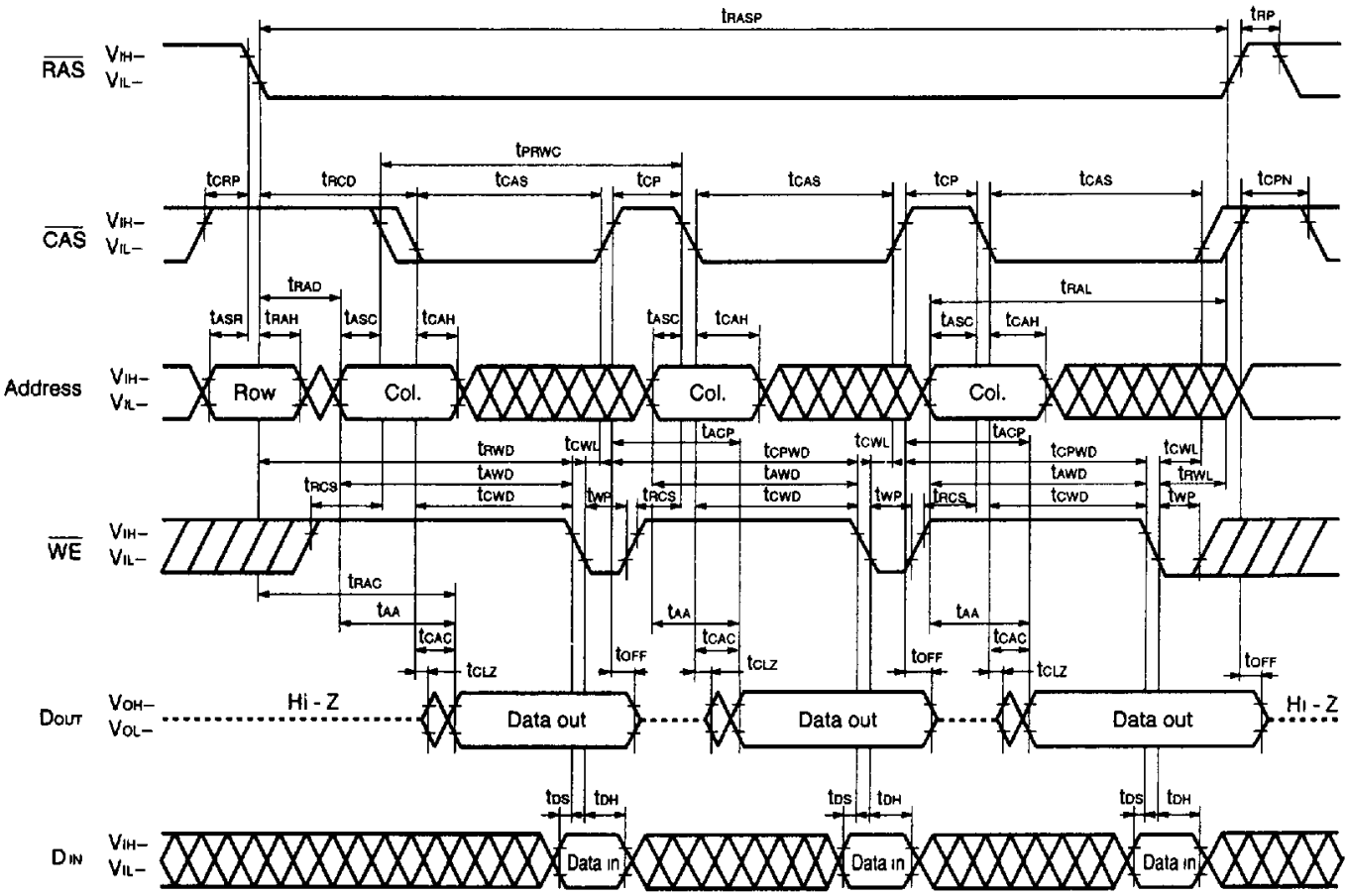
Fast Page Mode Read Modify Write Cycle



Remark In the fast page mode, read, write and read modify write cycles are available for each of the consecutive $\overline{CAS}$ cycles within the same $\overline{RAS}$ cycle.

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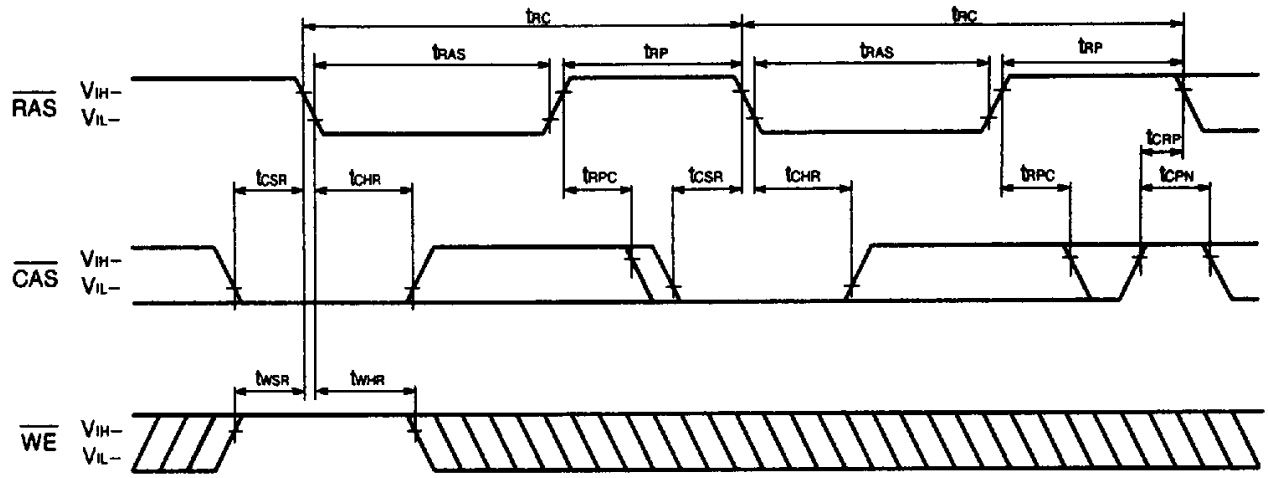
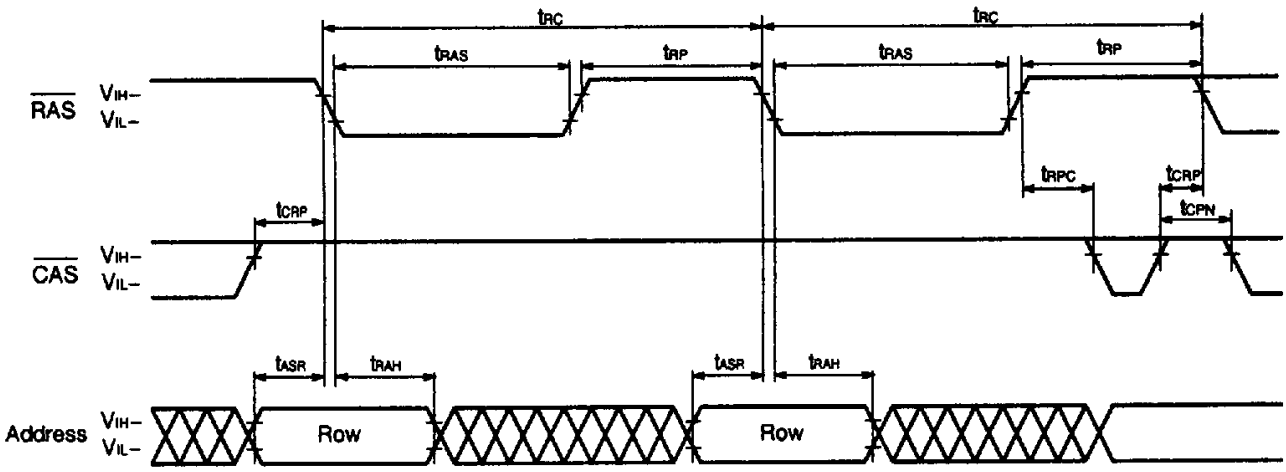
$\overline{CAS}$ Before $\overline{RAS}$ Refresh Cycle



Remark Address, DIN : Don't care DOUT : Hi - Z

$\overline{RAS}$ Only Refresh Cycle



Remark $\overline{WE}$, DIN : Don't care DOUT : Hi - Z

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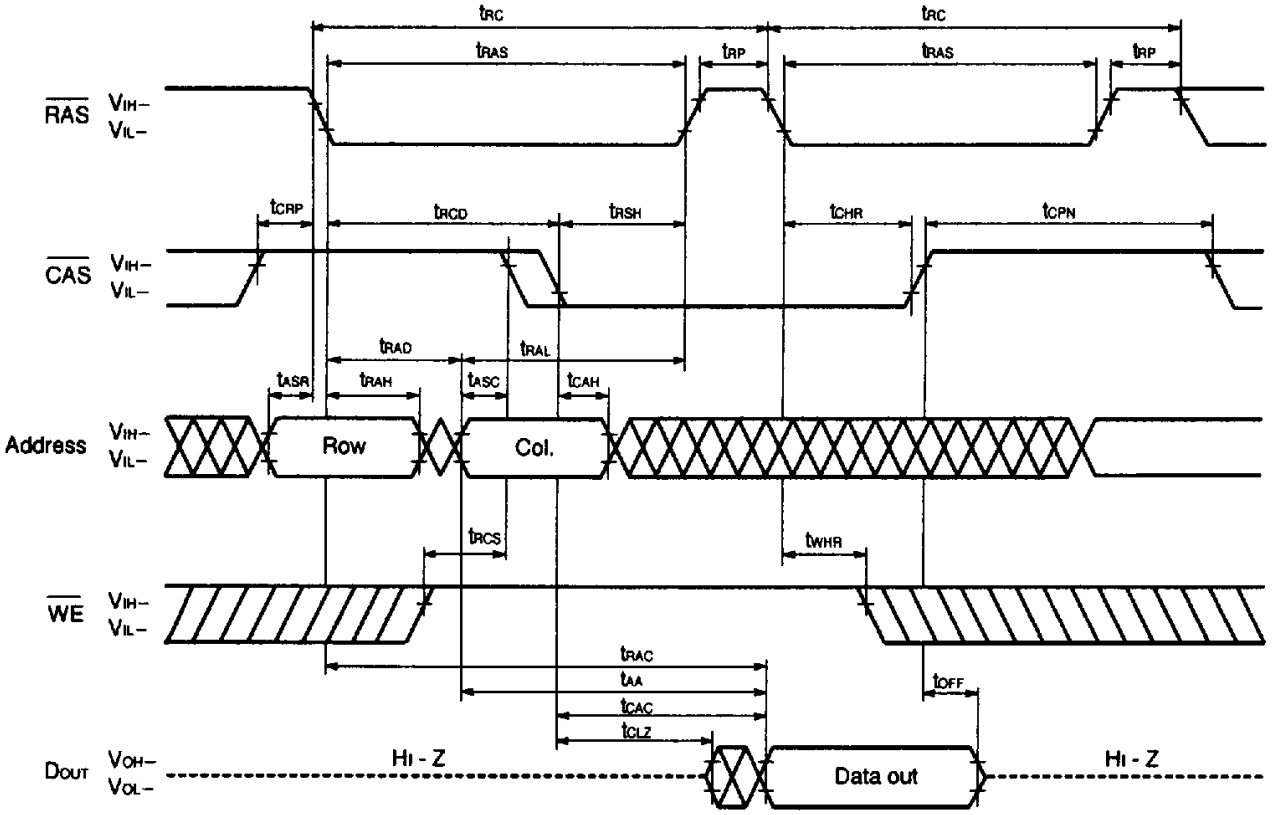
Hidden Refresh Cycle (Read)



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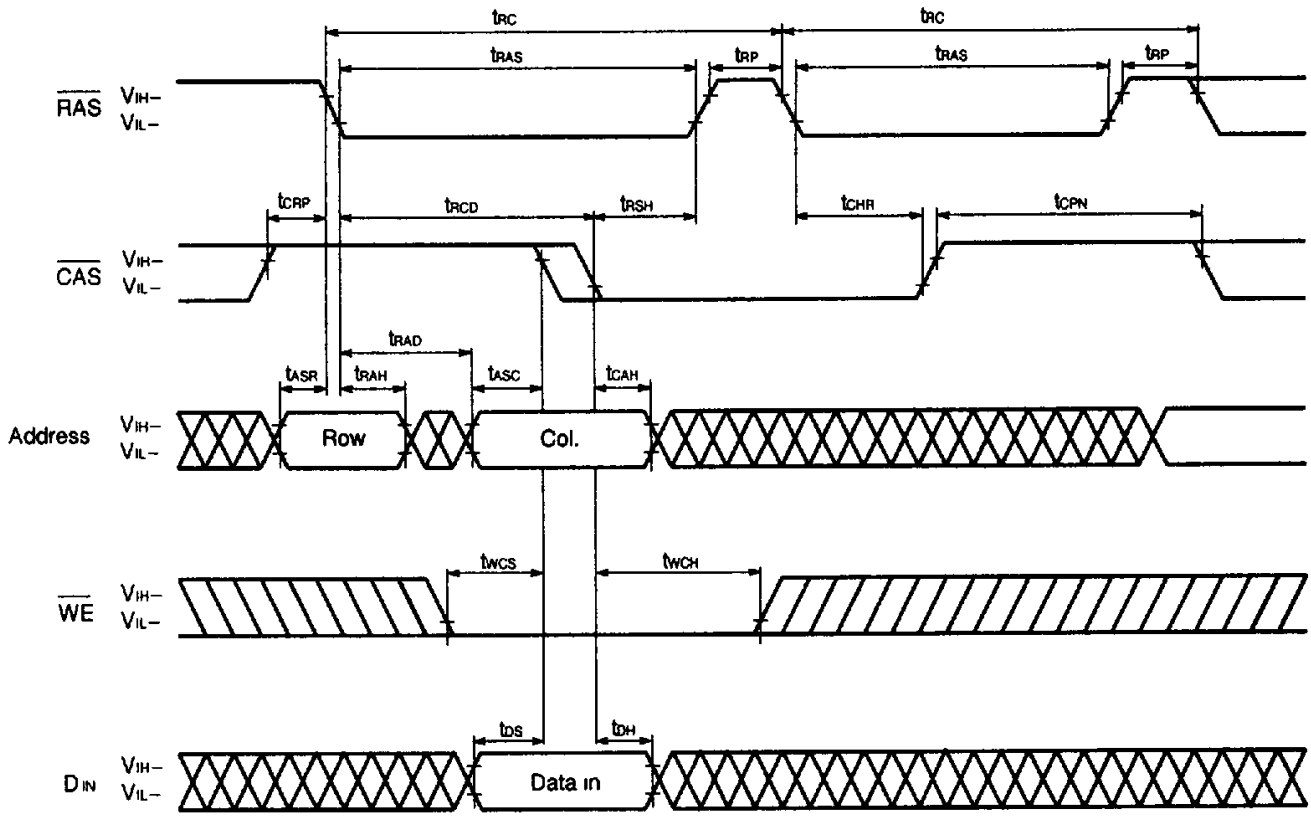
Hidden Refresh Cycle (Write)



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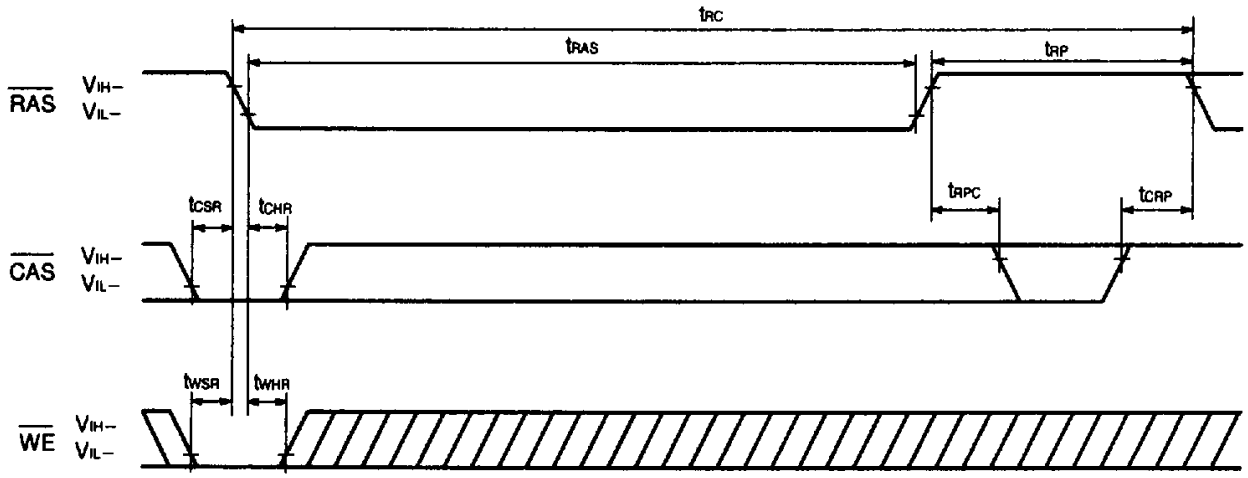
Test Mode Set Cycle ($\overline{WE}$, $\overline{CAS}$ Before $\overline{RAS}$ Refresh Cycle)



Remark Address, DIN : Don't care DOUT : Hi - Z

Test Mode

By using the test mode, the test time can be reduced. The reason for this is that, the memory emulates the × 8-bit structure during test mode.

(1) Setting the mode

Executing the test mode cycle ($\overline{WE}$, $\overline{CAS}$ before $\overline{RAS}$ refresh cycle) sets the test mode.

(2) Write/read operation

When either a "0" or a "1" is written to the input pin in test mode, this data is written to 8 bits of memory cell.

Next, when the data is read from the output pin at the same address, the cell can be checked.

Output="1": Normal write (all memory cells)
Output="0": Abnormal write

(3) Refresh

Refresh in the test mode must be performed with the $\overline{RAS}$ / $\overline{CAS}$ cycle or with the $\overline{WE}$, $\overline{CAS}$ before $\overline{RAS}$ refresh cycle. The $\overline{WE}$, $\overline{CAS}$ before $\overline{RAS}$ refresh cycle use the same counter as the $\overline{CAS}$ before $\overline{RAS}$ refresh's internal counter.

(4) Mode Cancellation

The test mode is cancelled by executing one cycle of $\overline{RAS}$ only refresh cycle or $\overline{CAS}$ before $\overline{RAS}$ refresh cycle.

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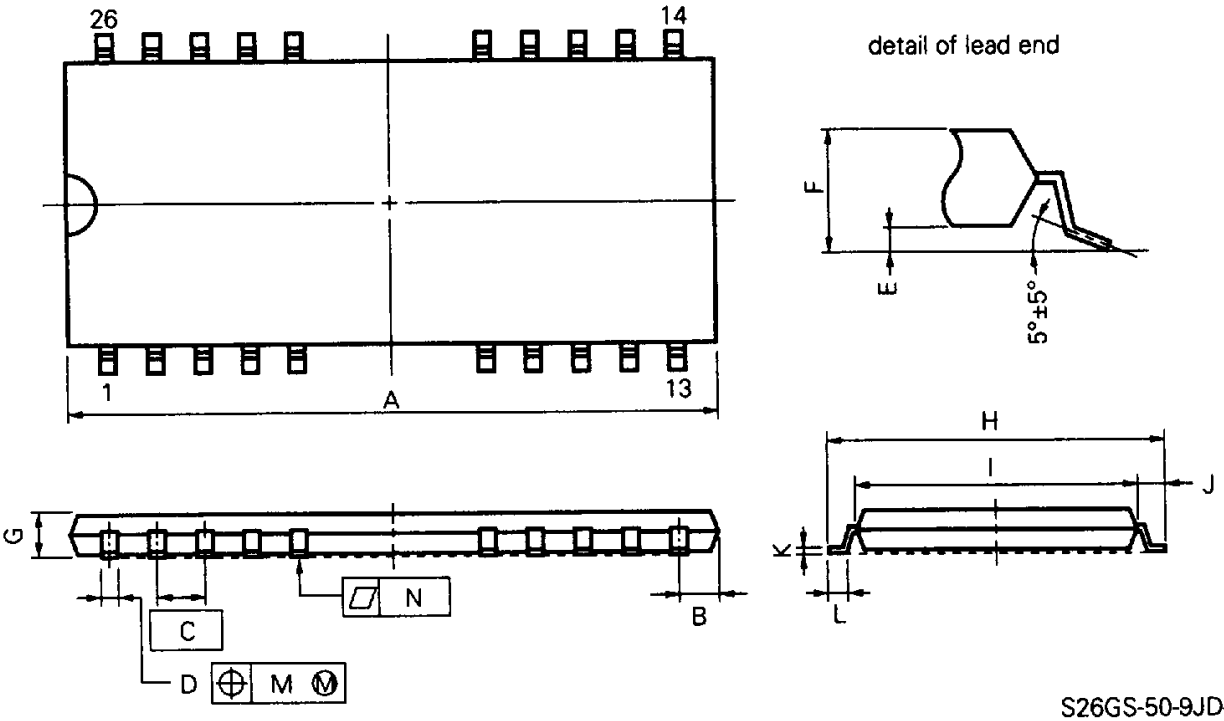
Package Drawings

26 PIN PLASTIC TSOP(II) (300 mil)



S26GS-50-9JD-2

NOTE

Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition

ITEM	MILLIMETERS	INCHES
A	17.54 MAX.	0.691 MAX
B	1.18 MAX.	0.047 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	0.40 ± 0.10	$0.016^{+0.004}_{-0.005}$
E	0.05 ± 0.05	0.002 ± 0.002
F	1.13 MAX	0.045 MAX.
G	1.0	0.039
H	9.22 ± 0.2	0.363 ± 0.008
I	7.62 ± 0.1	0.300 ± 0.004
J	0.8 ± 0.2	$0.031^{+0.009}_{-0.008}$
K	$0.125^{+0.10}_{-0.05}$	$0.005^{+0.004}_{-0.002}$
L	0.5 ± 0.1	$0.020^{+0.004}_{-0.005}$
M	0.21	0.009
N	0.10	0.004

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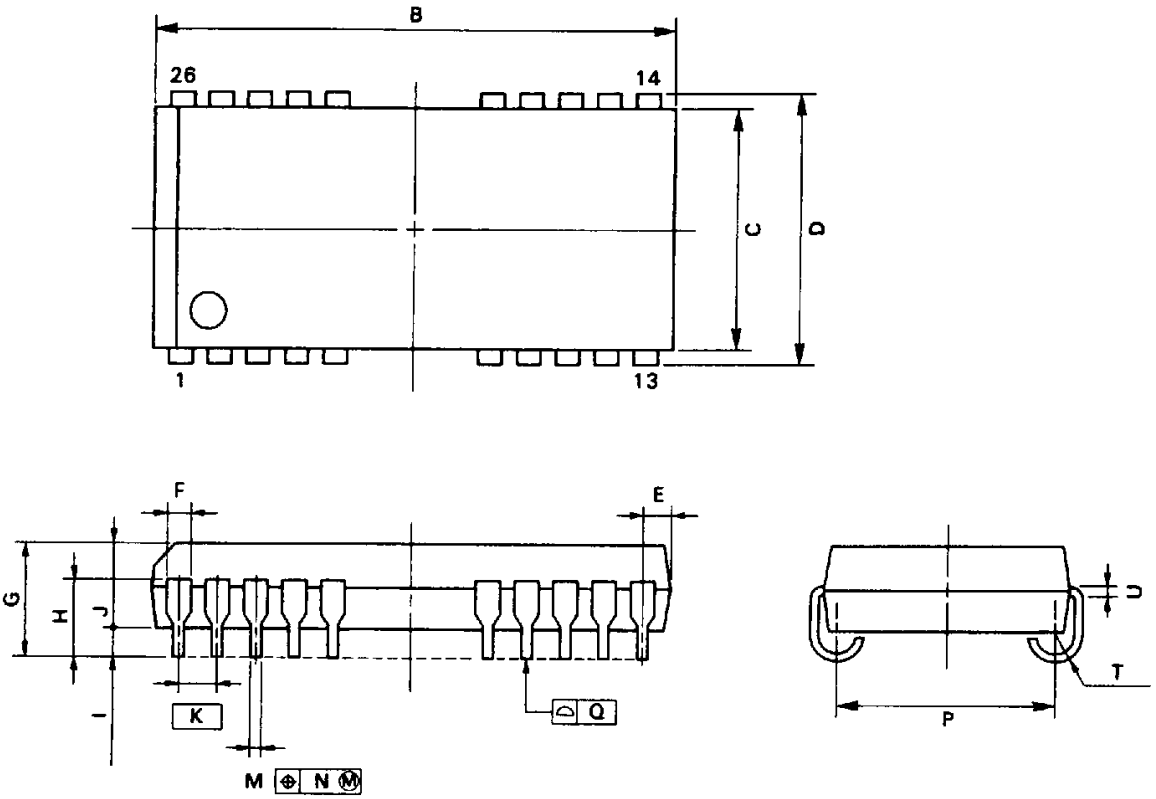
26PIN PLASTIC SOJ (300 mil)



P26LA-50A-1

NOTE

Each lead centerline is located within 0 12 mm (0 005 inch) of its true position (T.P) at maximum material condition

ITEM	MILLIMETERS	INCHES
B	$17.4^{+0.2}_{-0.35}$	$0.685^{+0.008}_{-0.013}$
C	7.57	0.298
D	$8.47^{\pm0.2}$	$0.333^{+0.009}_{-0.008}$
E	$1.08^{\pm0.15}$	$0.043^{+0.006}_{-0.007}$
F	0.6	0.024
G	$3.5^{\pm0.2}$	$0.138^{\pm0.008}$
H	$2.4^{\pm0.2}$	$0.094^{+0.009}_{-0.008}$
I	0.8 MIN	0.031 MIN
J	2.6	0.102
K	1.27(T.P.)	0.050(T.P.)
M	$0.40^{\pm0.10}$	$0.016^{+0.004}_{-0.005}$
N	0.12	0.005
P	$6.73^{\pm0.20}$	$0.265^{\pm0.008}$
Q	0.15	0.006
T	R 0.85	R 0.033
U	$0.20^{+0.10}_{-0.05}$	$0.008^{+0.004}_{-0.002}$

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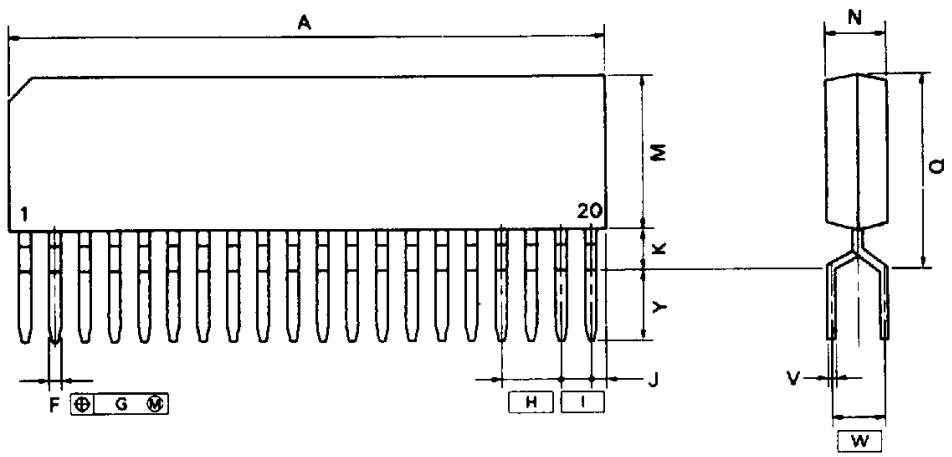
20PIN PLASTIC ZIP (400 mil)



P20V-254-400A-1

NOTE
Each lead centerline is located within 0.25 mm (0.010 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	26.67 MAX	1.050 MAX
F	$0.5^{\pm 0.1}$	$0.020^{+0.004}_{-0.005}$
G	ϕ0.25	ϕ0.010
H	2.54	0.100
I	1.27	0.050
J	1.27 MAX.	0.050 MAX
K	1.0 MIN	0.039 MIN
M	8.9 MAX	0.350 MAX
N	$2.8^{\pm 0.2}$	$0.110^{+0.008}_{-0.005}$
Q	10.16 MAX	0.400 MAX
V	$0.25^{+0.10}_{-0.05}$	$0.010^{+0.004}_{-0.003}$
W	2.54	0.100
Y	$3.3^{\pm 0.5}$	$0.130^{\pm 0.02}$

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Recommended Soldering Conditions

The following conditions (see tables below and next page) must be met for soldering conditions of the μPD424100, 424100-L.

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI–1207).

Please consult with our sales offices in case other soldering process is used, or in case the soldering is done under different conditions.

Types of Surface Mount Device

μPD424100GS-××, 424100GS-××L : 26-pin plastic TSOP(II) (300 mil)

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak temperature of package surface : 235 ℃ or below, Reflow time: 30 seconds or below (210 ℃ or higher), Number of reflow processes: MAX. 2 Exposure limit[Note]: 7 days (10 hours pre-baking is required at 125 ℃ afterwards) **[Remark]** (1) Please start the second reflow process after the temperature, raised by the first reflow process, returns to normal. (2) Please avoid removing the residual flux with water after the first reflow process .	IR35-107-2
VPS	Peak temperature of package : 215 ℃ or below, Reflow time : 40 seconds or below (200 ℃ or higher), Number of reflow processes: MAX. 2 Exposure limit[Note]: 7 days (10 hours pre-baking is required at 125 ℃ afterwards) **[Remark]** (1) Please start the second reflow process after the temperature, raised by the first reflow process, returns to normal. (2) Please avoid removing the residual flux with water after the first reflow process .	VP15-107-2
Partial heating method	Terminal temperature: 300 ℃ or below, Time : 3 seconds or below (Per one side of the device).	———

Note Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Caution Do not apply more than one soldering method at any one time, except for "Partial heating method".

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μPD424100LA-XX, 424100LA-XXL : 26-pin plastic SOJ (300 mil)

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak temperature of package surface : 235 ℃ or below, Reflow time: 30 seconds or below (210 ℃ or higher), Number of reflow processes: MAX. 2 Exposure limit[Note]: 7 days (20 hours pre-baking is required at 125 ℃ afterwards) **[Remark]** (1) Please start the second reflow process after the temperature, raised by the first reflow process, returns to normal. (2) Please avoid removing the residual flux with water after the first reflow process.	IR35-207-2
VPS	Peak temperature of package : 215 ℃ or below, Reflow time : 40 seconds or below (200 ℃ or higher), Number of reflow processes: MAX. 2 Exposure limit[Note]: 7 days (20 hours pre-baking is required at 125 ℃ afterwards) **[Remark]** (1) Please start the second reflow process after the temperature, raised by the first reflow process, returns to normal. (2) Please avoid removing the residual flux with water after the first reflow process.	VP15-207-2
Partial heating method	Terminal temperature: 300 ℃ or below, Time : 3 seconds or below (Per one side of the device).	———

Note Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Caution Do not apply more than one soldering method at any one time, except for "Partial heating method".

Type of Through Hole Mount Device

μPD424100V-XX, 424100V-XXL : 20-pin plastic ZIP (400 mil)

Soldering process	Soldering conditions
Wave soldering	Solder temperture : 260 ℃ or below, Flow time: 10 seconds or below
Partial heating method	Terminal temperature: 260 ℃ or below, Time : 10 seconds or below

Caution Do not jet molten solder on the surface of package.

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