NEC

MOS INTEGRATED CIRCUIT

μPD42S4800, 424800

4 M-BIT DYNAMIC RAM
512 K-WORD BY 8-BIT, FAST PAGE MODE

DESCRIPTION

The μPD42S4800, 424800 are 524 288 words by 8 bits dynamic CMOS RAMs. The fast page mode capability realize high speed access and low power consumption.

Besides, the μPD42S4800 can execute $\overline{CAS}$ before $\overline{RAS}$ self refresh.

These devices are packed in 28-pin plastic TSOP, 28-pin plastic SOJ and 28-pin plastic ZIP.

FEATURES

★

- 524 288 words by 8 bits organization
- Single +5.0 V ± 10 % power supply
- Fast access and cycle time

Part number	Power consumption Active (MAX.)	Access time (MAX.)	R/W cycle time (MIN.)	Fast page mode cycle time (MIN.)
μPD42S4800-70, 424800-70	577.5 mW	70 ns	140 ns	45 ns
μPD42S4800-80, 424800-80	522.5 mW	80 ns	150 ns	50 ns
μPD42S4800-10, 424800-10	440.0 mW	100 ns	180 ns	60 ns

- The μPD42S4800 can execute $\overline{CAS}$ before $\overline{RAS}$ self refresh

Part number	Refresh cycle	Refresh	Power consumption at standby (MAX.)
μPD42S4800	1 024 cycles/128 ms	$\overline{CAS}$ before $\overline{RAS}$ self refresh, $\overline{CAS}$ before $\overline{RAS}$ refresh, $\overline{RAS}$ only refresh, Hidden refresh	1.1 mW (CMOS level input)
μPD424800	1 024 cycles/16 ms	$\overline{CAS}$ before $\overline{RAS}$ refresh, $\overline{RAS}$ only refresh, Hidden refresh	5.5 mW (CMOS level input)

- Multiplexed address inputs ··· Row address : A0 to A9, Column address : A0 to A8

Document No IC-2716C
(O D No IC-8213C)
Date Published June 1993 M
Printed in Japan

The mark ★ shows revised points.

★ ORDERING INFORMATION

Part number	Access time (MAX.)	Package	Refresh
μPD42S4800G5-70-7JD	70 ns	28-pin Plastic TSOP (400 mil)	$\overline{CAS}$ before $\overline{RAS}$ self refresh $\overline{CAS}$ before $\overline{RAS}$ refresh $\overline{RAS}$ only refresh Hidden refresh
μPD42S4800G5-80-7JD	80 ns		
μPD42S4800G5-10-7JD	100 ns		
μPD42S4800G5-70-7KD	70 ns	28-pin Plastic TSOP (Reverse bent) (400 mil)	
μPD42S4800G5-80-7KD	80 ns		
μPD42S4800G5-10-7KD	100 ns		
μPD42S4800LE-70	70 ns	28-pin Plastic SOJ (400 mil)	
μPD42S4800LE-80	80 ns		
μPD42S4800LE-10	100 ns		
μPD42S4800V-70	70 ns	28-pin Plastic ZIP (400 mil)	
μPD42S4800V-80	80 ns		
μPD42S4800V-10	100 ns		
μPD424800G5-70-7JD	70 ns	28-pin Plastic TSOP (400 mil)	$\overline{CAS}$ before $\overline{RAS}$ refresh $\overline{RAS}$ only refresh Hidden refresh
μPD424800G5-80-7JD	80 ns		
μPD424800G5-10-7JD	100 ns		
μPD424800G5-70-7KD	70 ns	28-pin Plastic TSOP (Reverse bent) (400 mil)	
μPD424800G5-80-7KD	80 ns		
μPD424800G5-10-7KD	100 ns		
μPD424800LE-70	70 ns	28-pin Plastic SOJ (400 mil)	
μPD424800LE-80	80 ns		
μPD424800LE-10	100 ns		
μPD424800V-70	70 ns	28-pin Plastic ZIP (400 mil)	
μPD424800V-80	80 ns		
μPD424800V-10	100 ns		

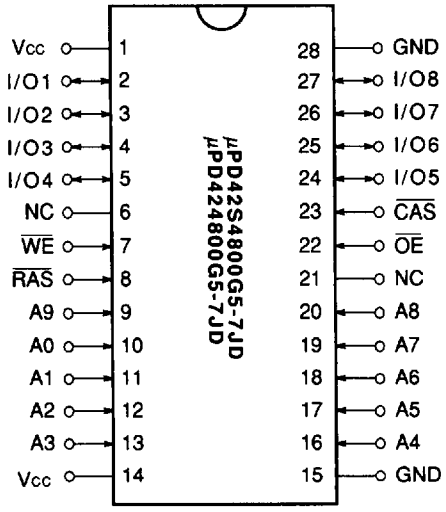
QUALITY GRADE

STANDARD

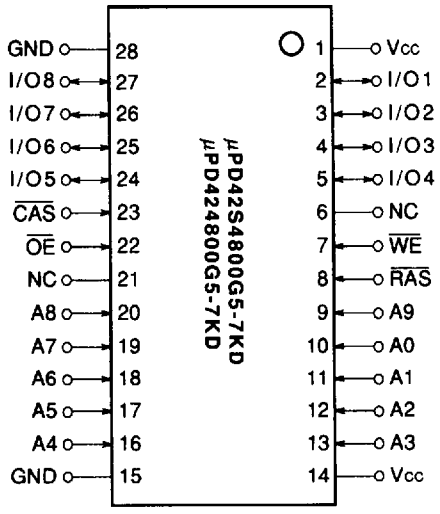
Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

PIN CONFIGURATIONS (Marking side)

28-pin Plastic TSOP (400 mil)

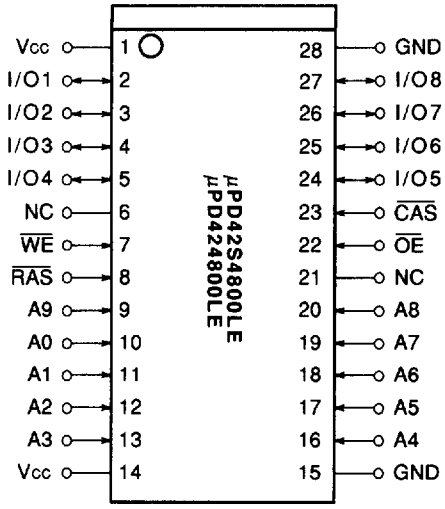


28-pin Plastic TSOP (Reverse bent) (400 mil)

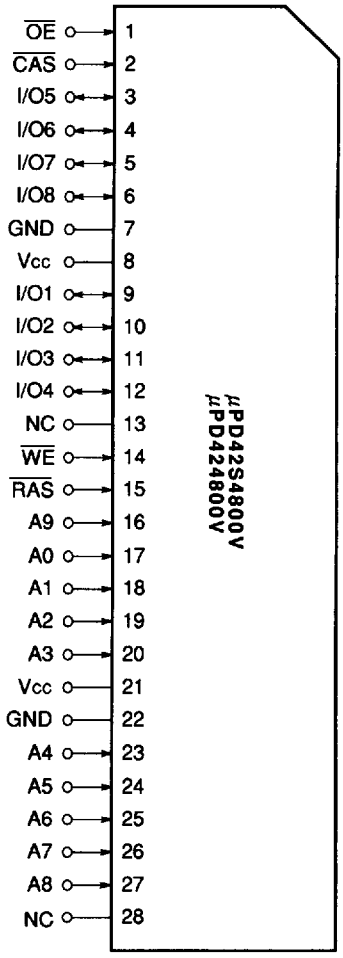


A0 to A9	: Address Inputs
I/O1 to I/O8	: Data Inputs/Outputs
$\overline{RAS}$	: Row Address Strobe
$\overline{CAS}$	: Column Address Strobe
$\overline{WE}$	: Write Enable
$\overline{OE}$	: Output Enable
Vcc	: Supply Voltage
GND	: Ground
NC	: No Connection

28-pin Plastic SOJ
(400 mil)

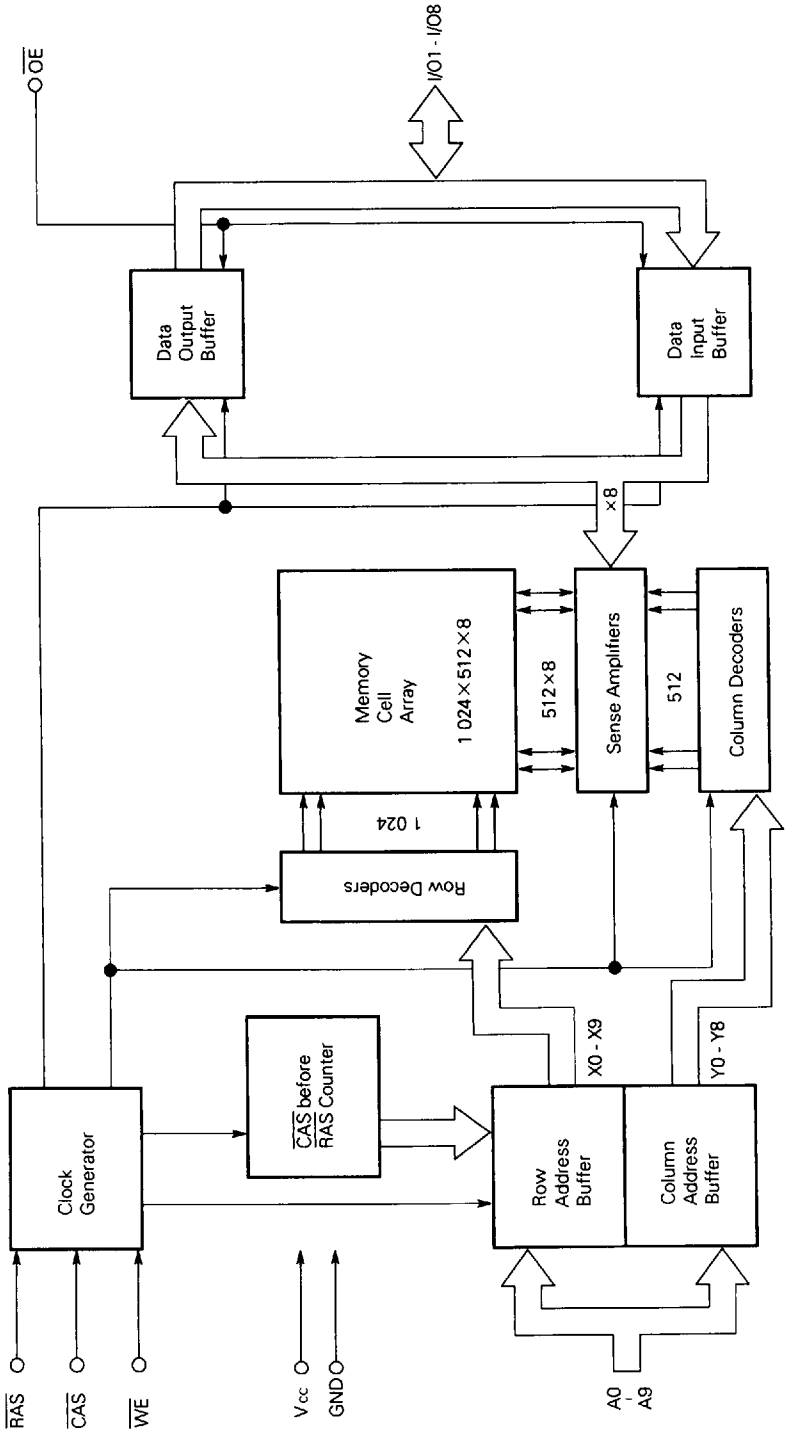


28-pin Plastic ZIP
(400 mil)



A0 to A9	: Address Inputs
I/O1 to I/O8	: Data Inputs/Outputs
$\overline{RAS}$	: Row Address Strobe
$\overline{CAS}$	: Column Address Strobe
$\overline{WE}$	: Write Enable
$\overline{OE}$	: Output Enable
Vcc	: Supply Voltage
GND	: Ground
NC	: No Connection

BLOCK DIAGRAM



★ INPUT/OUTPUT PIN FUNCTIONS

The μPD42S4800, 424800 have input pins $\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$, $\overline{OE}$, A0 to A9 and input/output pins I/O1 to I/O8.

Pin name	Input/ Output	Function
$\overline{RAS}$ (Row address strobe)	Input	$\overline{RAS}$ activates the sense amplifier by latching a row address (A0 to A9) and selecting a corresponding word line. It refreshes memory cell array of one line (4 096-bit) selected by the row address (A0 to A9). It also selects the following function. • $\overline{CAS}$ before $\overline{RAS}$ refresh.
$\overline{CAS}$ (Column address strobe)	Input	$\overline{CAS}$ activates data input/output circuit by latching column address (A0 to A8) and selecting a digit line connected with the sense amplifier.
A0 to A9 (Address input)	Input	10-bit address bus. Input total 19-bit of address signal, upper 10-bit and lower 9-bit in sequence (address multiplex method). Therefore, one word (8-bit) is selected from 524 288-word by 8-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)	Input	Write control signal. Write operation is executed by activating $\overline{RAS}$, $\overline{CAS}$ and $\overline{WE}$.
$\overline{OE}$ (Output enable)	Input	Read control signal. Read operation can be executed by activating $\overline{RAS}$, $\overline{CAS}$ and $\overline{OE}$. If $\overline{WE}$ is activated during read operation, $\overline{OE}$ is to be ineffective in the device. Therefore, read operation cannot be executed.
I/O1 to I/O8 (Data input/output)	Input/ Output	8-bit data bus. I/O1 to I/O8 are used to input/output data.

ELECTRICAL SPECIFICATIONS NOTES 1, 2

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	℃
Storage Temperature	T_{stg}		−55 to +125	℃

Remark 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	℃

CAPACITANCE (T_a = +25 ℃, f = 1 MHz)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Capacitance	C_{I1}	A0 to A9			5	pF
	C_{I2}	$\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$, $\overline{OE}$			7	pF
Data Input/Output Capacitance	C_D	I/O1 to I/O8			7	pF

DC CHARACTERISTICS (Recommended Operating Conditions unless otherwise noted)

PARAMETER		SYMBOL	TEST CONDITION		MIN.	MAX.	UNIT	NOTES
Operating current		I_{CC1}	$\overline{RAS}$, $\overline{CAS}$ Cycling $t_{RC} = t_{RC(MIN)}$ I_O = 0 mA	t_{RAC} = 70 ns		105	mA	3,4
				t_{RAC} = 80 ns		95		
				t_{RAC} = 100 ns		80		
Standby current	μPD42S4800	I_{CC2}	$V_{IH(MIN)} \leqq \overline{RAS}$, $\overline{CAS}$	I_O = 0 mA		2	mA	
			V_{CC}−0.2 V ≦ $\overline{RAS}$, $\overline{CAS}$	I_O = 0 mA		0.2		
	μPD424800		$V_{IH(MIN)} \leqq \overline{RAS}$, $\overline{CAS}$	I_O = 0 mA		2		
			V_{CC}−0.2 V ≦ $\overline{RAS}$, $\overline{CAS}$	I_O = 0 mA		1		
$\overline{RAS}$ only refresh current		I_{CC3}	$\overline{RAS}$ Cycling, $V_{IH(MIN)} \leqq \overline{CAS}$ $t_{RC} = t_{RC(MIN.)}$ I_O = 0 mA	t_{RAC} = 70 ns		105	mA	3,4
				t_{RAC} = 80 ns		95		
				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} = 70 ns		80	mA	3,4
				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} = 70 ns		105	mA	3,4
				t_{RAC} = 80 ns		95		
				t_{RAC} = 100 ns		80		
$\overline{CAS}$ before $\overline{RAS}$ long refresh current (1 024 cycles/128 ms, only for μPD42S4800)		I_{CC6}	Standby : $\overline{RAS}$, $\overline{CAS}$: V_{CC}−0.2 V ≦ V_{IH} ≦ $V_{IH(MAX)}$ $\overline{CAS}$ before $\overline{RAS}$ Refresh : 1 024 cycles/128 ms $\overline{RAS}$, $\overline{CAS}$: 0 V ≦ V_{IL} ≦ 0.2 V V_{CC}−0.2 V ≦ V_{IH} ≦ $V_{IH(MAX)}$ $\overline{OE}$: V_{IH} Address input, $\overline{WE}$: V_{IH} or V_{IL} Output : Hi-Z	$t_{RAS} \leqq 200$ ns		200	μA	3,4
				$t_{RAS} \leqq 1$ μs		300		
Self refresh current ($\overline{CAS}$ before $\overline{RAS}$ self refresh, only for μPD42S4800)		I_{CC7}	I_O = 0 mA $\overline{RAS}$, $\overline{CAS}$: 0 V ≦ V_{IL} ≦ 0.2 V V_{CC}−0.2 V ≦ V_{IH} ≦ $V_{IH(MAX)}$			150	μA	
Input leakage current		$I_{I(L)}$	V_I = 0 to 5.5 V all other pins except for testing pin = 0 V		−10	+10	μA	
Output leakage current		$I_{O(L)}$	Outputs are disabled (Hi-Z) V_O = 0 to 5.5 V		−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	

AC CHARACTERISTICS ★

(Recommended Operating Conditions unless otherwise noted) NOTES 5, 6 (1/2)

PARAMETER	SYMBOL	t_{RAC} = 70 ns		t_{RAC} = 80 ns		t_{RAC} = 100 ns		UNIT	NOTES
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Random Read or Write Cycle Time	t_{RC}	140		150		180		ns	7
Read Modify Write Cycle Time	t_{RWC}	185		210		250		ns	7
Fast Page Mode Cycle Time	t_{PC}	45		50		60		ns	7
Read Modify Write Cycle Time (Fast Page Mode)	t_{PRWC}	90		100		120		ns	7
Access Time from $\overline{RAS}$	t_{RAC}		70		80		100	ns	8, 9
Access Time from $\overline{CAS}$	t_{CAC}		20		20		25	ns	8, 9
Access Time from Column Address	t_{AA}		35		40		50	ns	8, 9
Access Time from $\overline{CAS}$ Precharge	t_{ACP}		40		45		55	ns	9
$\overline{CAS}$ to Output Data Setup Time	t_{CLZ}	0		0		0		ns	9
Output Buffer Turn-off Delay Time ($\overline{CAS}$)	t_{OFF}	0	15	0	15	0	20	ns	10
Transition Time (rise and fall)	t_T	3	50	3	50	3	50	ns	
$\overline{RAS}$ Precharge Time	t_{RP}	60		60		70		ns	
$\overline{RAS}$ Pulse Width	t_{RAS}	70	10 000	80	10 000	100	10 000	ns	
$\overline{RAS}$ Pulse Width (Fast Page Mode)	t_{RASP}	70	125 000	80	125 000	100	125 000	ns	
$\overline{RAS}$ Hold Time	t_{RSH}	20		20		25		ns	
$\overline{CAS}$ Hold Time	t_{CSH}	70		80		100		ns	
$\overline{CAS}$ Pulse Width	t_{CAS}	20	10 000	20	10 000	25	10 000	ns	
$\overline{RAS}$ to $\overline{CAS}$ Delay Time	t_{RCD}	20	50	25	60	25	75	ns	8
$\overline{RAS}$ to Column Address Delay Time	t_{RAD}	15	35	17	40	17	50	ns	8
$\overline{CAS}$ to $\overline{RAS}$ Precharge Time	t_{CRP}	5		5		5		ns	11
$\overline{CAS}$ Precharge Time (Fast Page Mode)	t_{CP}	10		10		10		ns	
Row Address Setup Time	t_{ASR}	0		0		0		ns	
Row Address Hold Time	t_{RAH}	10		12		12		ns	
Column Address Setup Time	t_{ASC}	0		0		0		ns	
Column Address Hold Time	t_{CAH}	15		15		20		ns	
$\overline{CAS}$ Precharge Time	t_{CPN}	10		10		10		ns	
Column Address Lead Time Referenced to $\overline{RAS}$	t_{RAL}	35		40		50		ns	
Read Command Setup Time	t_{RCS}	0		0		0		ns	
Read Command Hold Time Referenced to $\overline{CAS}$	t_{RCH}	0		0		0		ns	12
Read Command Hold Time Referenced to $\overline{RAS}$	t_{RRH}	0		0		0		ns	12
Write Command Hold Time Referenced to $\overline{CAS}$	t_{WCH}	10		15		20		ns	13
Write Command Pulse Width	t_{WP}	10		15		20		ns	13
Write Command Lead Time Referenced to $\overline{RAS}$	t_{RWL}	20		20		25		ns	
Write Command Lead Time Referenced to $\overline{CAS}$	t_{CWL}	15		15		20		ns	
Data-in Setup Time	t_{DS}	0		0		0		ns	14
Data-in Hold Time	t_{DH}	15		15		20		ns	14

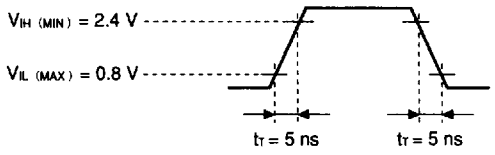
(2/2)

PARAMETER		SYMBOL	t_{RAC} = 70 ns		t_{RAC} = 80 ns		t_{RAC} = 100 ns		UNIT	NOTES
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Refresh Time	μPD42S4800	t_{REF}		128		128		128	ms	16
	μPD424800			16		16		16	ms	
Write Command Setup Time		t_{WCS}	0		0		0		ns	15
$\overline{CAS}$ to $\overline{WE}$ Delay Time		t_{CWD}	40		45		55		ns	15
$\overline{RAS}$ to $\overline{WE}$ Delay Time		t_{RWD}	90		105		130		ns	15
$\overline{CAS}$ Precharge Delay Time Referenced to $\overline{WE}$ (Fast Page Mode)		t_{CPWD}	60		70		85		ns	15
Column Address Delay Time Referenced to $\overline{WE}$		t_{AWD}	55		65		80		ns	15
$\overline{CAS}$ Setup Time ($\overline{CAS}$ before $\overline{RAS}$ Refresh)		t_{CSR}	5		5		5		ns	
$\overline{CAS}$ Hold Time ($\overline{CAS}$ before $\overline{RAS}$ Refresh)		t_{CHR}	10		10		10		ns	
$\overline{RAS}$ Precharge $\overline{CAS}$ Hold Time		t_{RPC}	5		5		5		ns	
$\overline{OE}$ to $\overline{RAS}$ inactive Setup Time		t_{OES}	0		0		0		ns	
Access Time from $\overline{OE}$		t_{OEA}		20		20		25	ns	9
$\overline{OE}$ Data Delay Time		t_{OED}	15		15		20		ns	
Output Buffer Turn-off Delay Time ($\overline{OE}$)		t_{OEZ}	0	15	0	15	0	20	ns	10
$\overline{OE}$ Output Data Setup Time		t_{OLZ}	0		0		0		ns	
$\overline{OE}$ Hold Time		t_{OEH}	0		0		0		ns	
$\overline{RAS}$ Hold Time Referenced to $\overline{CAS}$ Precharge		t_{RHCP}	40		45		55		ns	
$\overline{RAS}$ Pulse Width ($\overline{CAS}$ before $\overline{RAS}$ Self Refresh)		t_{RASS}	100		100		100		μs	16
$\overline{RAS}$ Precharge Time ($\overline{CAS}$ before $\overline{RAS}$ Self Refresh)		t_{RPS}	130		150		180		ns	16
$\overline{CAS}$ Hold Time ($\overline{CAS}$ before $\overline{RAS}$ Self Refresh)		t_{CHS}	−50		−50		−50		ns	16

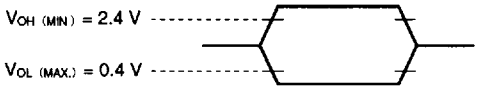
NOTES

1. All voltages are referenced to GND.
2. An initial pause of 100 μs is required after power up followed by 8 $\overline{RAS}$ only refresh cycles before proper device operation is achieved. In case of using internal address refresh counter, a minimum of 8 $\overline{CAS}$ before $\overline{RAS}$ refresh cycles instead of 8 $\overline{RAS}$ only refresh cycles are required.
3. I_{CC1}, I_{CC3}, I_{CC4}, I_{CC5}, and I_{CC6} depend on t_{RC} and t_{PC}. Specified values are obtained with outputs open.
4. Address can be changed once or less while $\overline{RAS}$ = V_{IL} and $\overline{CAS}$ = V_{IH}.
5. AC measurements assume t_T = 5 ns.
6. AC Characteristics test condition

(1) Input timing specification



(2) Output timing specification



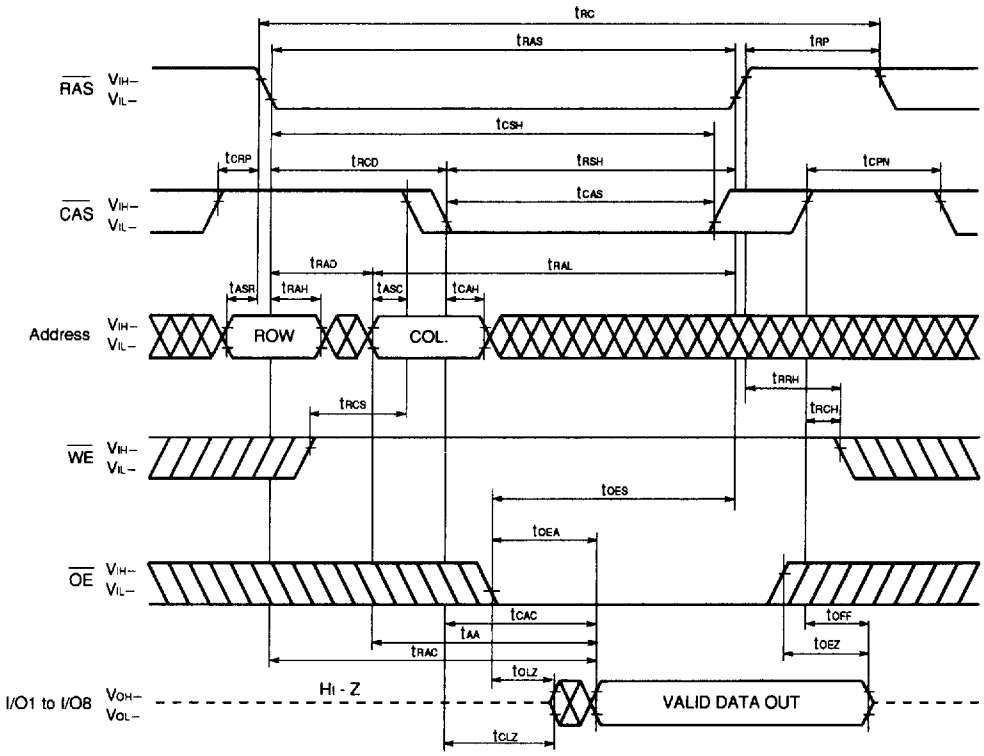
7. The minimum specifications are used only to indicate cycle time at which proper operation over the full temperature range (T_a = 0 to 70 °C) is assured.
8. In random read cycle, the access time is changed by the conditions of t_{RAD} and t_{RCD} as follows.

CONDITION	ACCESS TIME
$t_{RAD} \leqq t_{RAD\,(MAX.)}$ and $t_{RCD} \leqq t_{RCD\,(MAX.)}$	$t_{RAC\,(MAX.)}$
$t_{RAD\,(MAX.)} \leqq t_{RAD}$ and $t_{RCD} \leqq t_{RCD\,(MAX.)}$	$t_{AA\,(MAX.)}$
$t_{RCD\,(MAX.)} \leqq t_{RCD}$	$t_{CAC\,(MAX.)}$

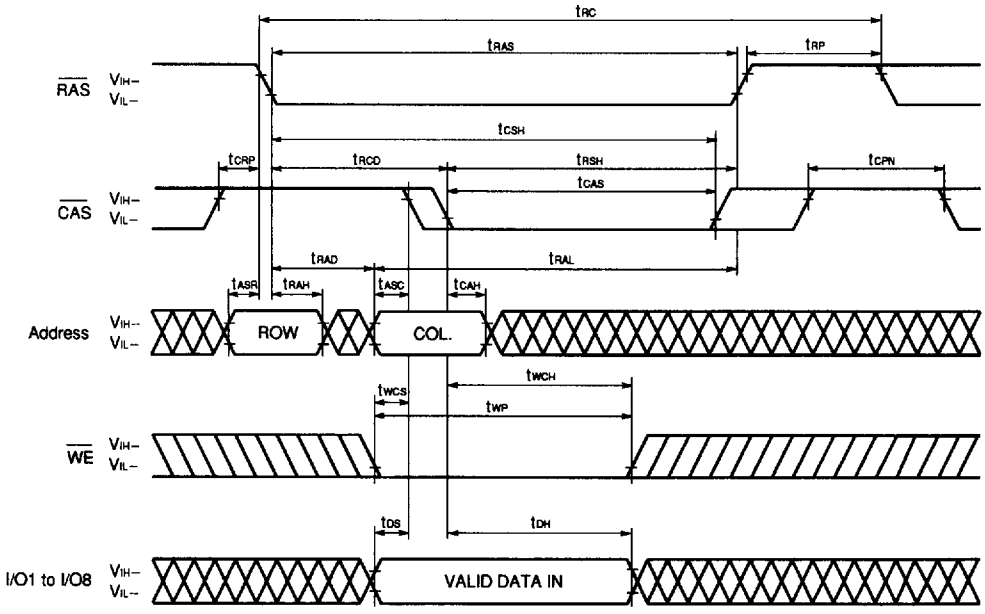
$t_{RAD\,(MAX.)}$ and $t_{RCD\,(MAX.)}$ indicate the points which the access time changes and are not the limits of operation.

9. Loading conditions are 2 TTL and 100 pF.
10. $t_{OFF\,(MAX.)}$ and $t_{OEZ\,(MAX.)}$ define the time at which the output achieves the open circuit condition and are not referenced to V_{OH} or V_{OL}.
11. $t_{CRP\,(MIN.)}$ requirement should be applicable for $\overline{RAS}$ / $\overline{CAS}$ cycles preceded by any cycles.
12. Either $t_{RCH\,(MIN.)}$ or $t_{RRH\,(MIN.)}$ must be satisfied for a read cycle.
13. $t_{WP\,(MIN.)}$ is applicable for late write cycle or read modify write cycle. In early write cycles, $t_{WCH\,(MIN.)}$ should be satisfied.
14. This specification is referenced to $\overline{CAS}$ falling edge in early write cycles and to $\overline{WE}$ falling edge in late write or read modify write cycles.
15. t_{WCS}, t_{RWD}, t_{CWD}, t_{AWD} and t_{CPWD} are not restrictive operating parameters. They are included in the data sheet as electrical characteristics only. If $t_{WCS\,(MIN.)} \leqq t_{WCS}$, the cycle is an early write cycle and the data out pins will remain Hi-Z through the entire cycle. If $t_{RWD\,(MIN.)} \leqq t_{RWD}$, $t_{CWD\,(MIN.)} \leqq t_{CWD}$, $t_{AWD\,(MIN.)} \leqq t_{AWD}$ and $t_{CPWD\,(MIN.)} \leqq t_{CPWD}$, the cycle is a read modify write cycle and condition of the data out (at access time) is indeterminate.
16. This specification is applicable only for μPD42S4800.

READ CYCLE

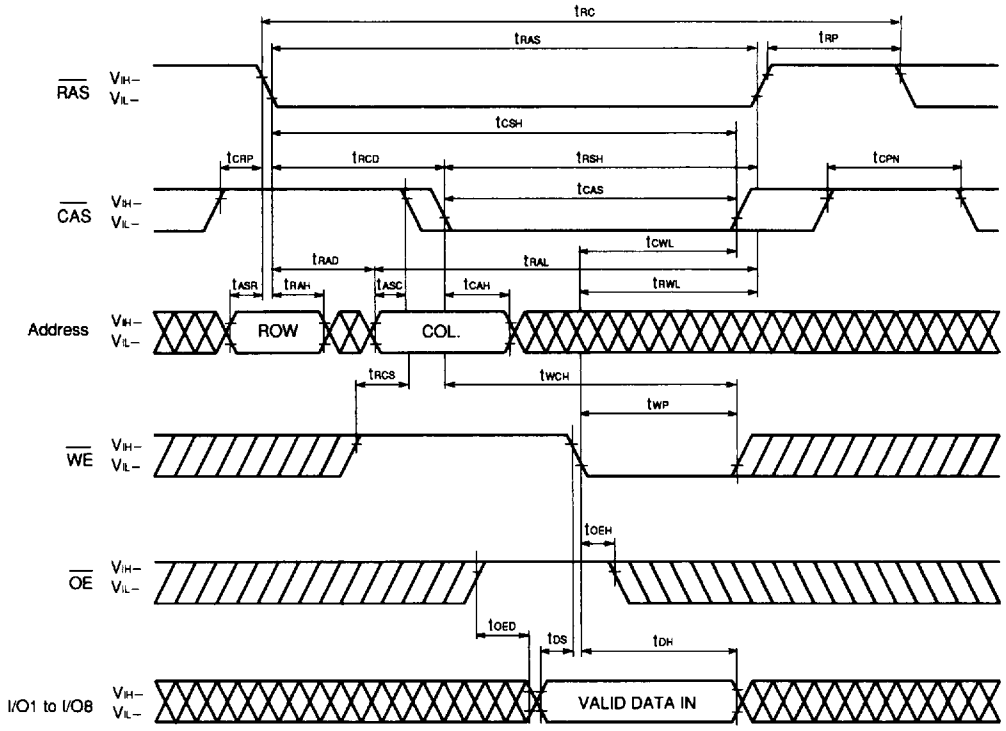


EARLY WRITE CYCLE

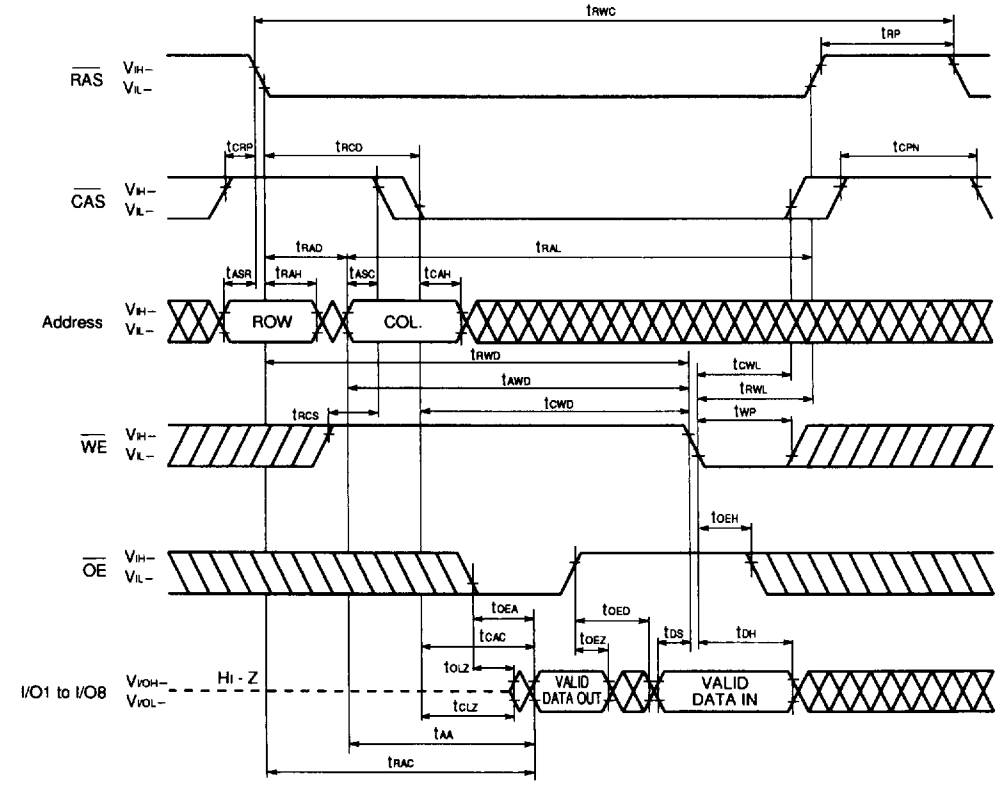


Remark $\overline{OE}$ = Don't Care

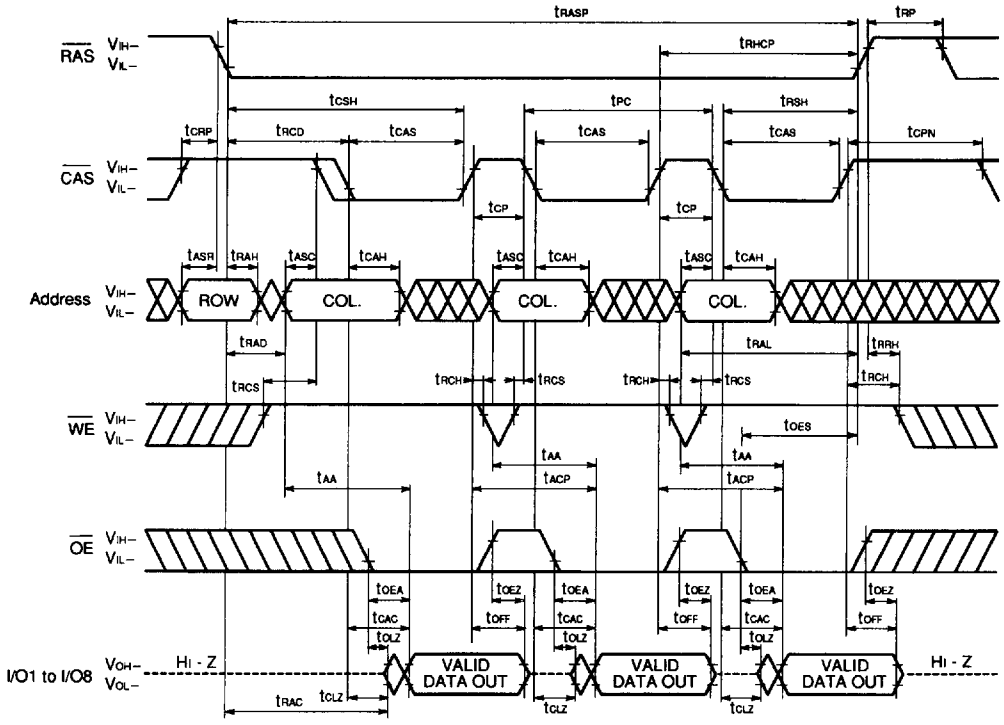
LATE WRITE CYCLE



READ MODIFY WRITE CYCLE

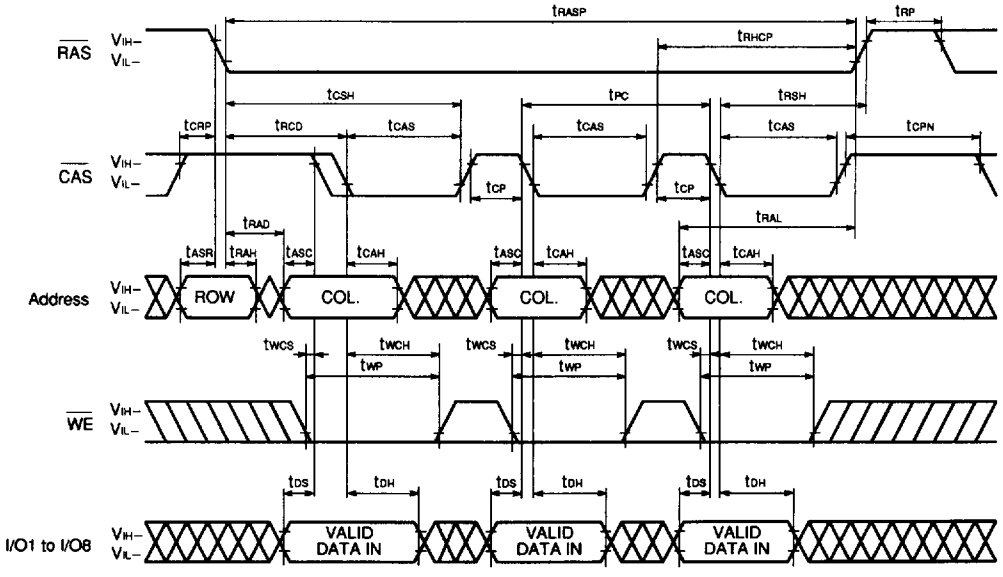


FAST PAGE MODE READ CYCLE



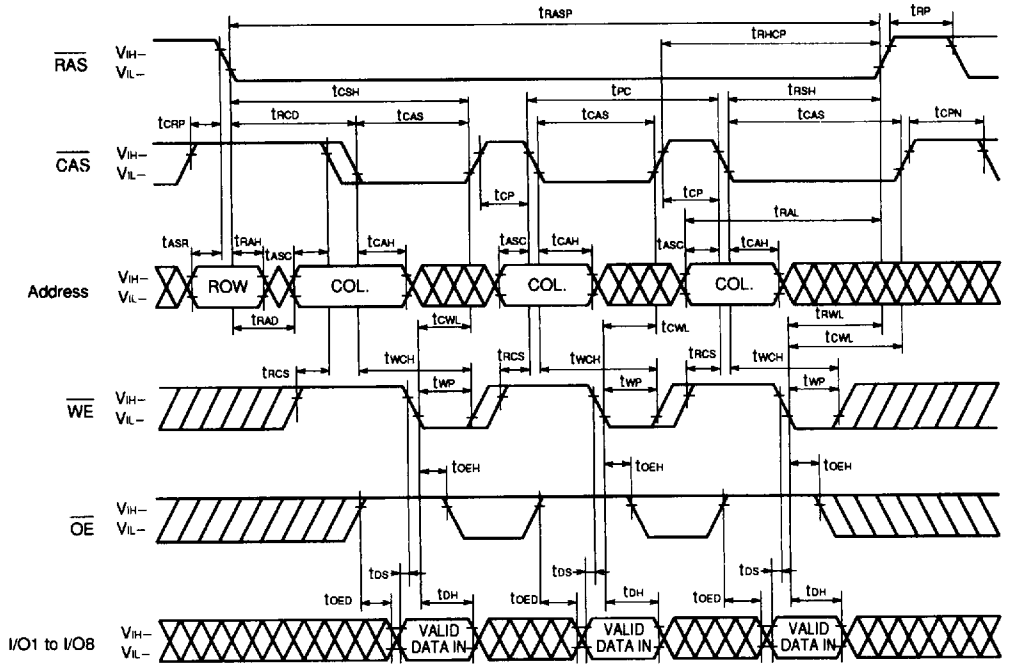
Remark In the fast page mode, read, write and read modify write cycles are available for each of the consecutive $\overline{CAS}$ cycles within the same $\overline{RAS}$ cycle.

FAST PAGE MODE EARLY WRITE CYCLE



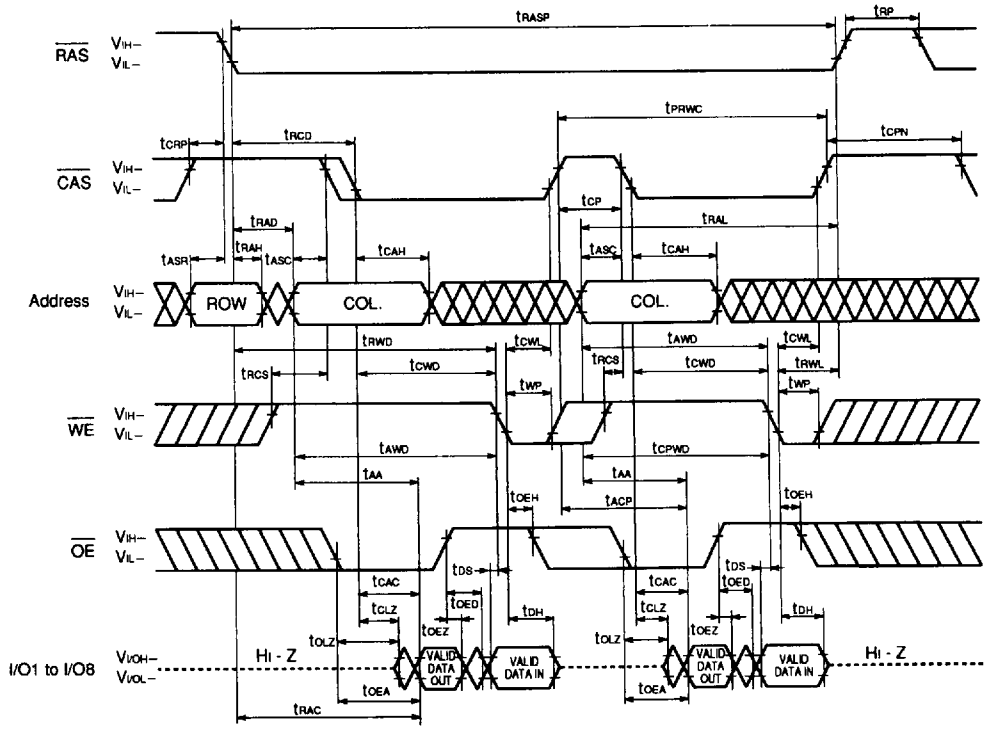
Remark $\overline{OE}$ = Don't Care
In the fast page mode, read, write and read modify write cycles are available for each of the consecutive $\overline{CAS}$ cycles within the same $\overline{RAS}$ cycle.

FAST PAGE MODE LATE WRITE CYCLE



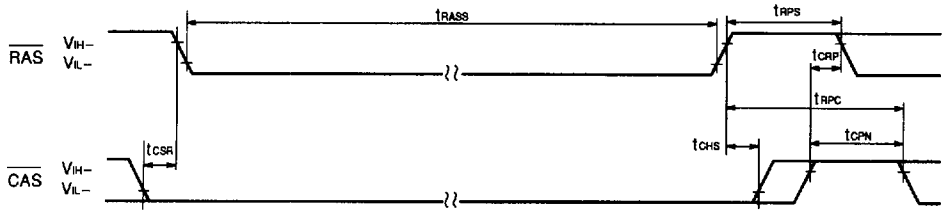
Remark In the fast page mode, read, write and read modify write cycles are available for each of the consecutive $\overline{CAS}$ cycles within the same $\overline{RAS}$ cycle.

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.

★ $\overline{\text{CAS}}$ BEFORE $\overline{\text{RAS}}$ SELF REFRESH CYCLE (Only for μPD42S4800)



Remark Address, $\overline{\text{WE}}$, $\overline{\text{OE}}$ = Don't care I/O1 to I/O8 = HI - Z

How to use $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ self refresh mode.

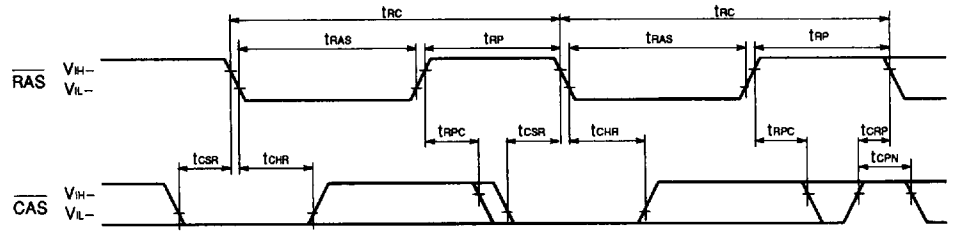
$\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ self refresh mode can't be used by itself. It must be used with perfoming one-of 3 refreshes below.

- **When using distributed $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ refresh**
  Refresh 1 024 times during 128 ms before set into the $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ self refresh mode and after reset.

- **When using burst $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ refresh**
  Refresh 1 024 times during 16 ms before set into the $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ self refresh mode and after reset.

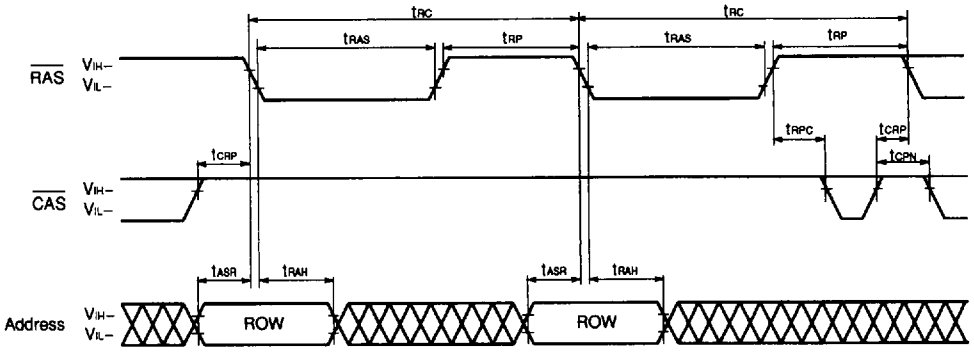
- **When using $\overline{\text{RAS}}$ only refresh**
  Refresh against all refresh addresses during 16 ms before set into the $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ self refresh mode and after reset.

$\overline{CAS}$ BEFORE $\overline{RAS}$ HIDDEN REFRESH CYCLE ★



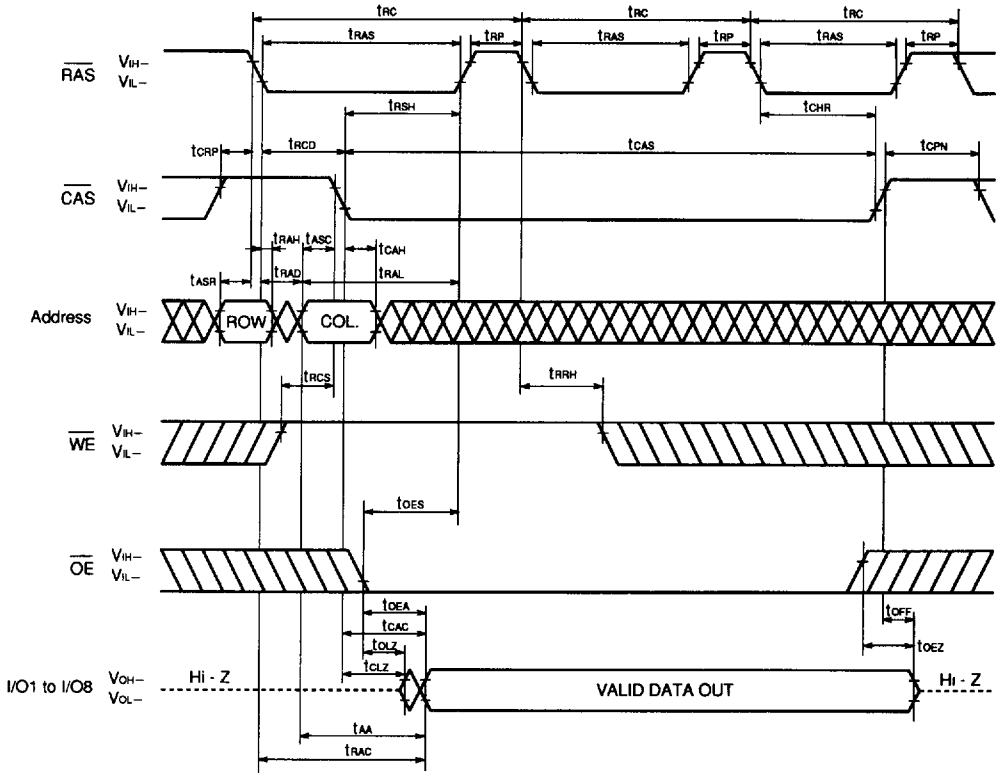
Remark Address, $\overline{WE}$, $\overline{OE}$ = Don't care I/O1 to I/O8 = Hi - Z

$\overline{RAS}$ ONLY REFRESH CYCLE ★



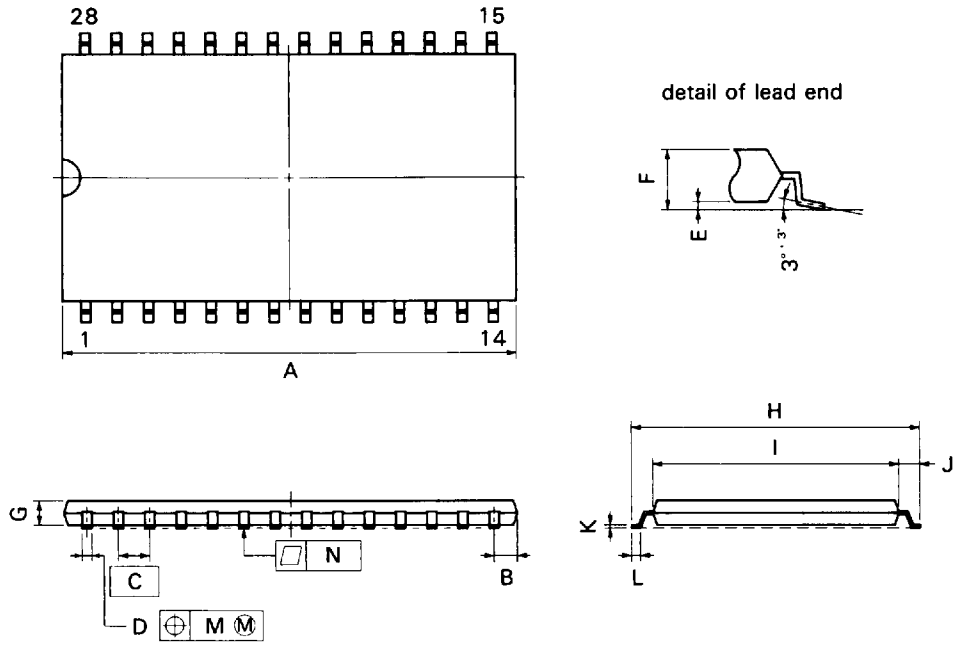
Remark $\overline{WE}$, $\overline{OE}$ = Don't care I/O1 to I/O8 = Hi - Z

HIDDEN REFRESH CYCLE



PACKAGE DRAWINGS

28 PIN PLASTIC TSOP (400mil)



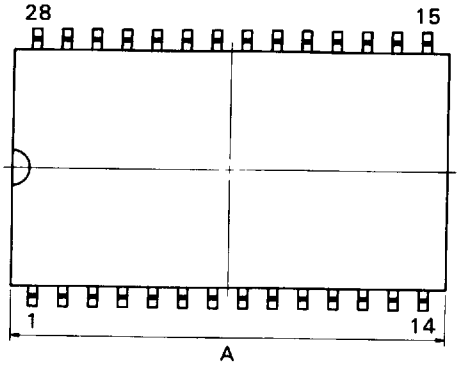
S28G5 50 7JD 1

NOTE

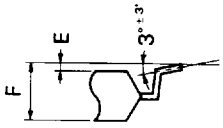
Each lead centerline is located within 0 21 mm (0 009 inch) of its true position (T P.) at maximum material condition.

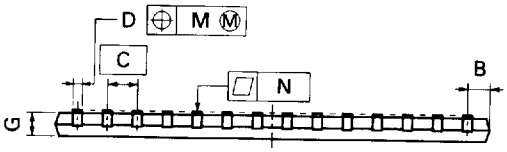
ITEM	MILLIMETERS	INCHES
A	18 81 MAX	0 741 MAX
B	1.15 MAX	0 046 MAX
C	1 27 (T P)	0 050 (T P)
D	$0\ 40^{+0\ 10}$	$0\ 016^{+0\ 004}_{-0\ 005}$
E	$0\ 05^{+0\ 05}$	$0\ 002^{+0\ 002}$
F	1 1 MAX.	0 044 MAX
G	0 97	0 038
H	$11\ 76^{\pm 0\ 2}$	$0.463^{\pm 0\ 008}$
I	$10.16^{\pm 0\ 1}$	$0.400^{\pm 0\ 004}$
J	$0\ 8^{\pm 0\ 2}$	$0.031^{+0\ 009}_{-0\ 008}$
K	$0\ 125^{+0\ 10}_{-0\ 05}$	$0\ 005^{+0\ 004}_{-0\ 002}$
L	$0\ 5^{\pm 0\ 1}$	$0\ 020^{\pm 0\ 004}_{-0\ 005}$
M	0 21	0 009
N	0 10	0 004

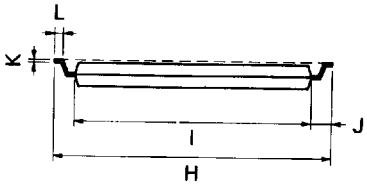
28 PIN PLASTIC TSOP (400mil)



detail of lead end







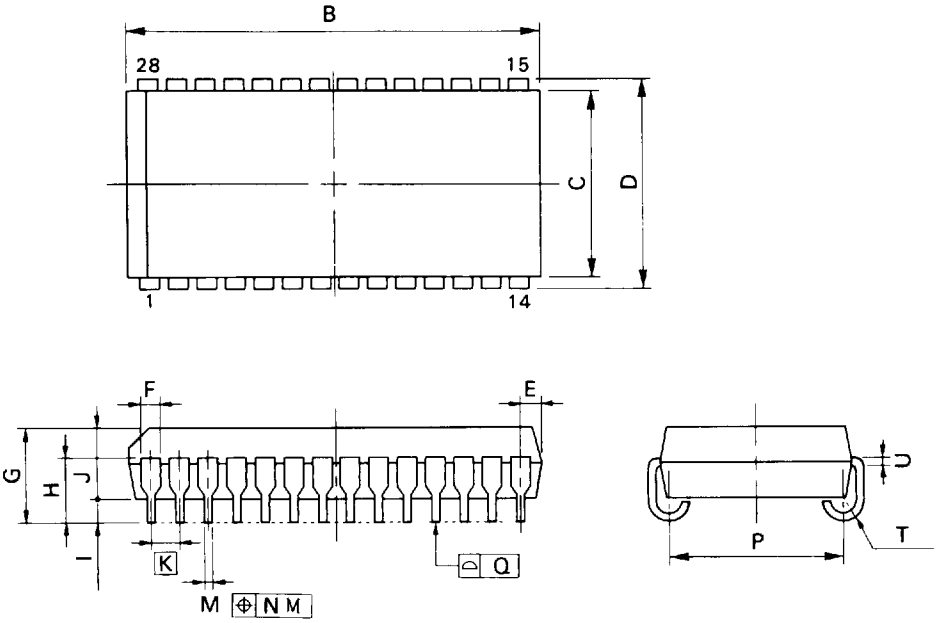
NOTE

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

S28G5 50 7KD 1

ITEM	MILLIMETERS	INCHES
A	18.81 MAX	0.741 MAX
B	1.15 MAX	0.046 MAX
C	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{\pm 0.10}$	$0.016^{+0.004}_{-0.006}$
E	$0.05^{\pm 0.05}$	$0.002^{\pm 0.002}$
F	1.1 MAX	0.044 MAX
G	0.97	0.038
H	$11.76^{\pm 0.2}$	$0.463^{\pm 0.008}$
I	$10.16^{\pm 0.1}$	$0.400^{\pm 0.004}$
J	$0.8^{\pm 0.2}$	$0.031^{+0.009}_{-0.008}$
K	$0.125^{+0.10}_{-0.05}$	$0.005^{+0.004}_{-0.002}$
L	$0.5^{\pm 0.1}$	$0.020^{+0.004}_{-0.005}$
M	0.21	0.009
N	0.10	0.004

28PIN PLASTIC SOJ (400 mil)



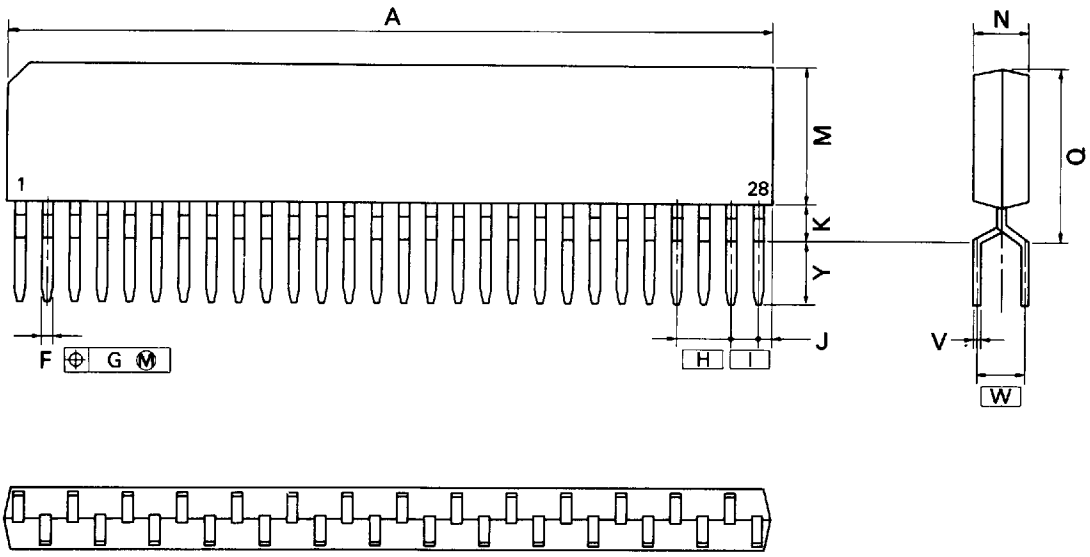
P28LA 400A 1

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	18 67 $^{+0.2}_{-0.35}$	0 735 $^{+0.008}_{-0.013}$
C	10 16	0 400
D	11 18 $^{\pm 0.2}$	0 440 $^{+0.008}_{-0.007}$
E	1 08 $^{\pm 0.15}$	0 043 $^{+0.006}_{-0.007}$
F	0 6	0 024
G	3 5 $^{\pm 0.2}$	0 138 $^{+0.008}_{-0.007}$
H	2 4 $^{\pm 0.2}$	0 094 $^{+0.008}_{-0.007}$
I	0 8 MIN	0 031 MIN
J	2 6	0 102
K	1 27 (T P)	0 050 (T P)
M	0 40 $^{\pm 0.10}$	0 016 $^{+0.004}_{-0.005}$
N	0 12	0 005
P	9 40 $^{\pm 0.20}$	0 370 $^{+0.008}_{-0.007}$
Q	0 15	0 006
T	R0.85	R0 033
U	0 20 $^{+0.10}_{-0.05}$	0 008 $^{+0.004}_{-0.002}$

28PIN PLASTIC ZIP (400mil)



P28V-254-400A

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	36.83 MAX.	1.450 MAX.
F	$0.5^{\pm 0.1}$	$0.020^{+0.004}_{-0.005}$
G	$\phi 0.25$	$\phi 0.010$
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	$2.8^{\pm 0.2}$	$0.110^{+0.009}_{-0.008}$
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	$3.3^{\pm 0.5}$	$0.130^{\pm 0.02}$

RECOMMENDED SOLDERING CONDITIONS ★

Please consult with our sales offices for soldering conditions of the μPD42S4800, 424800.

TYPE OF SURFACE MOUNT DEVICE

μPD42S4800G5, 424800G5 : 28-pin Plastic TSOP (400 mil)
μPD42S4800LE, 424800LE : 28-pin Plastic SOJ (400 mil)

TYPE OF THROUGH HOLE MOUNT DEVICE

μPD42S4800V, 424800V : 28-pin Plastic ZIP (400 mil)