

# MOS INTEGRATED CIRCUIT

## $\mu$ PD42S16160L, 42S17160L, 42S18160L

16 M BIT DYNAMIC RAM  
(3.3 V FAST PAGE MODE & BYTE READ/WRITE MODE)

### PRELIMINARY

#### DESCRIPTION

The NEC  $\mu$ PD42S16160L,  $\mu$ PD42S17160L and  $\mu$ PD42S18160L are 1 048 576 words by 16 bits dynamic CMOS RAM with optional fast page mode. CMOS sense amplifier, peripheral circuits and 1 transistor memory cell technique realize high speed access, cycle time and low power dissipation.

Refresh is accomplished by performing  $\overline{\text{RAS}}$  only refresh cycles, hidden refresh cycles,  $\overline{\text{CAS}}$  before  $\overline{\text{RAS}}$  refresh cycles,  $\overline{\text{CAS}}$  before  $\overline{\text{RAS}}$  self refresh cycles or normal read or write cycles on the 4096 address combinations of A0 to A11 (for  $\mu$ PD42S16160L) or 2048 address combinations of A0 to A10 (for  $\mu$ PD42S17160L) or 1024 address combinations of A0 to A9 (for  $\mu$ PD42S18160L) during a 256 ms period.

The  $\mu$ PD42S16160L,  $\mu$ PD42S17160L and  $\mu$ PD42S18160L are packaged in 42-pin plastic SOJ and 50-pin plastic TSOP.

#### FEATURES

- 1 048 576 words by 16 bits organization
- Single +3.3V $\pm$ 0.3V power supply
- On-chip substrate bias generator
- Non latched I/O, TTL-compatible
- Multiplexed address inputs
- Read-modify-write, Fast Page Mode and Byte Read/Write Mode capability
- $\overline{\text{RAS}}$  only refresh, hidden refresh and  $\overline{\text{CAS}}$  before  $\overline{\text{RAS}}$  internal address refresh
- $\overline{\text{CAS}}$  before  $\overline{\text{RAS}}$  self refresh

DEVICE	Row Address	Column Address	Refresh cycle
$\mu$ PD42S16160L	A0 to A11	A0 to A7	4096 cycles/256 ms
$\mu$ PD42S17160L	A0 to A10	A0 to A8	2048 cycles/256 ms
$\mu$ PD42S18160L	A0 to A9	A0 to A9	1024 cycles/256 ms

#### 4 performance ranges

DEVICE	ACCESS TIME (MAX.)	R/W CYCLE (MIN.)	PAGE MODE CYCLE (MIN.)	Low power dissipation	
				Active (MAX.)	Standby
$\mu$ PD42S16160L-A60	60 ns	110 ns	40 ns	324 mW	0.36 mW (MAX.) (CMOS level)
$\mu$ PD42S17160L-A60				396 mW	
$\mu$ PD42S18160L-A60				540 mW	
$\mu$ PD42S16160L-A70	70 ns	130 ns	45 ns	288 mW	
$\mu$ PD42S17160L-A70				360 mW	
$\mu$ PD42S18160L-A70				504 mW	
$\mu$ PD42S16160L-A80	80 ns	150 ns	50 ns	252 mW	
$\mu$ PD42S17160L-A80				324 mW	
$\mu$ PD42S18160L-A80				468 mW	

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ORDERING INFORMATION

PART NUMBER	ACCESS TIME (MAX.)	PACKAGE	QUALITY GRADE
μPD42S16160LLE-A60	60ns	42-pin Plastic SOJ	STANDARD
μPD42S17160LLE-A60			
μPD42S18160LLE-A60			
μPD42S16160LLE-A70	70ns		
μPD42S17160LLE-A70			
μPD42S18160LLE-A70			
μPD42S16160LLE-A80	80ns		
μPD42S17160LLE-A80			
μPD42S18160LLE-A80			
μPD42S16160LG5-A60-7JF	60ns	50-pin Plastic TSOP	
μPD42S17160LG5-A60-7JF			
μPD42S18160LG5-A60-7JF			
μPD42S16160LG5-A70-7JF	70ns		
μPD42S17160LG5-A70-7JF			
μPD42S18160LG5-A70-7JF			
μPD42S16160LG5-A80-7JF	80ns		
μPD42S17160LG5-A80-7JF			
μPD42S18160LG5-A80-7JF			
μPD42S16160LG5-A60-7KF	60ns	50-pin Plastic TSOP (Reverse bent)	
μPD42S17160LG5-A60-7KF			
μPD42S18160LG5-A60-7KF			
μPD42S16160LG5-A70-7KF	70ns		
μPD42S17160LG5-A70-7KF			
μPD42S18160LG5-A70-7KF			
μPD42S16160LG5-A80-7KF	80ns		
μPD42S17160LG5-A80-7KF			
μPD42S18160LG5-A80-7KF			

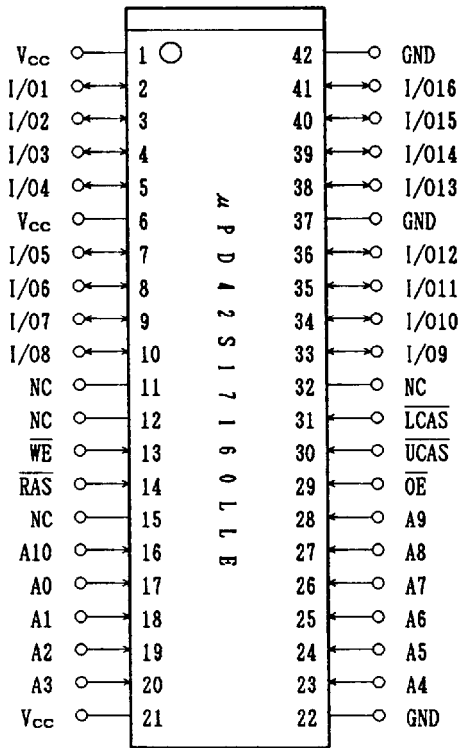
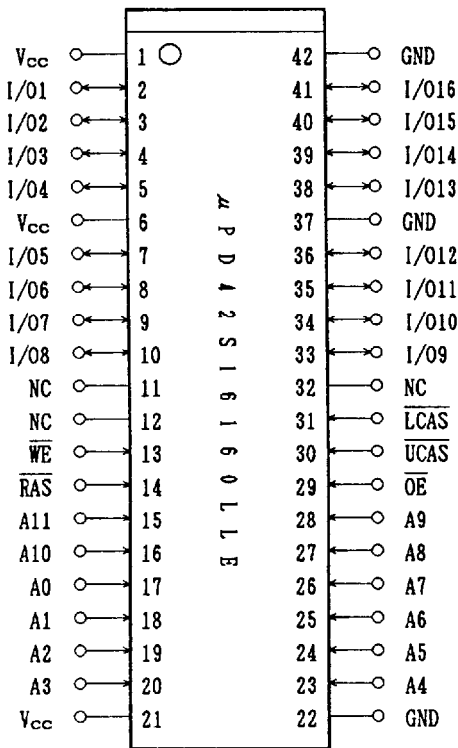
Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

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**PIN CONFIGURATION (Marking Side)**

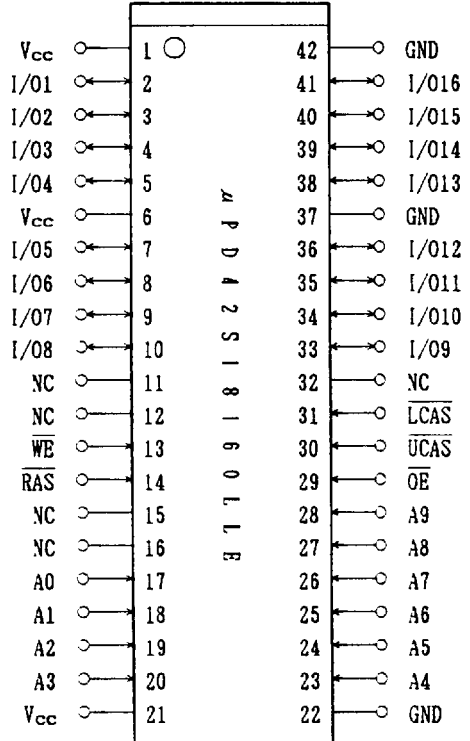
- A0 to A9/A10/A11 : Address Inputs
- I/O1 to I/O16 : Data Inputs/Outputs
- $\overline{\text{RAS}}$  : Row Address Strobe
- $\overline{\text{UCAS}}$  : Column Address Strobe(upper)
- $\overline{\text{LCAS}}$  : Column Address Strobe(lower)
- $\overline{\text{WE}}$  : Write Enable
- $\overline{\text{OE}}$  : Output Enable
- V<sub>cc</sub> : Supply Voltage
- GND : Ground
- NC : No Connection

**42-pin Plastic SOJ (400 mil)**



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42-pin Plastic SOJ (400 mil)

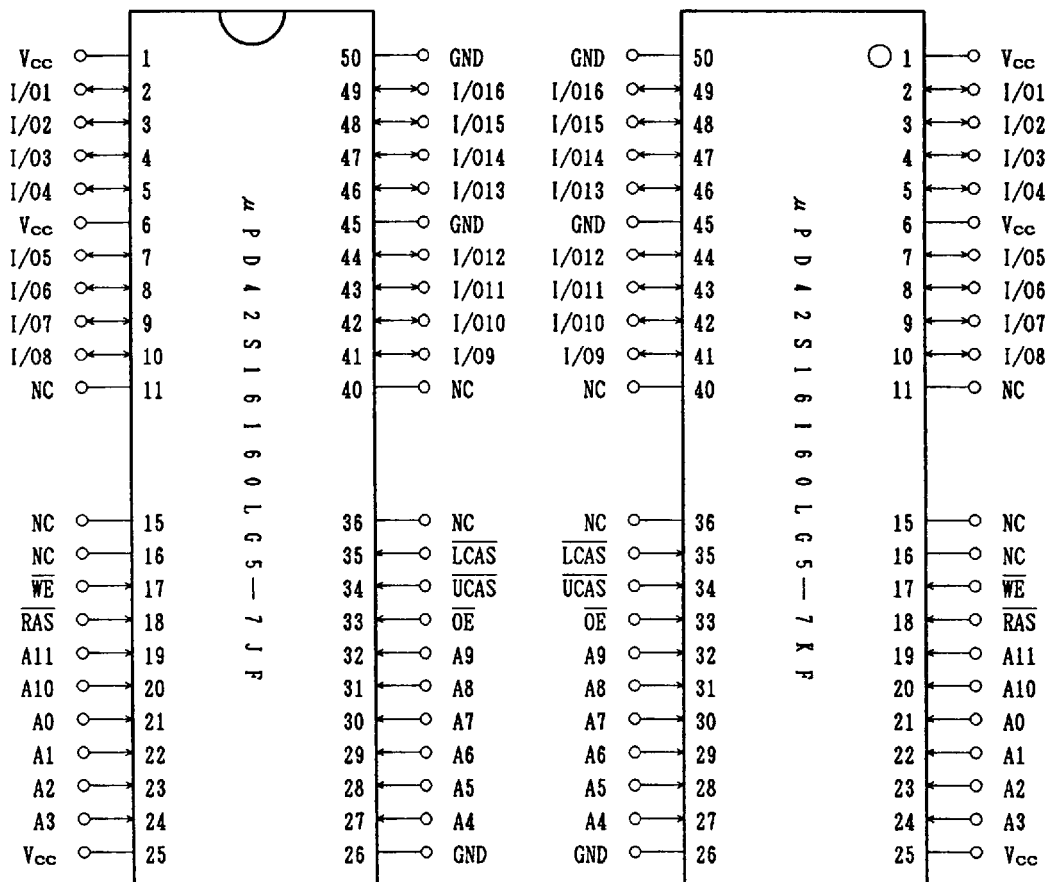


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50-pin Plastic TSOP (400 mil)

【μPD42S16160L】

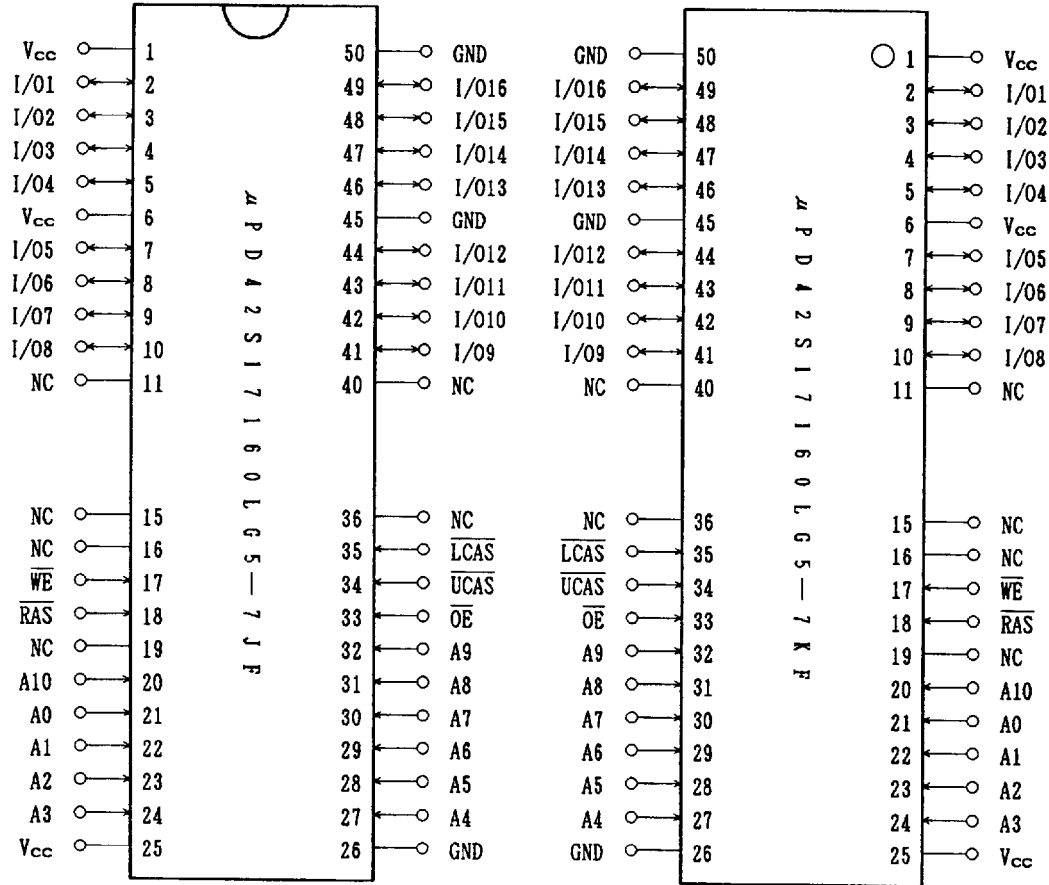
Reverse bent



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【 $\mu$ PD42S17160L】

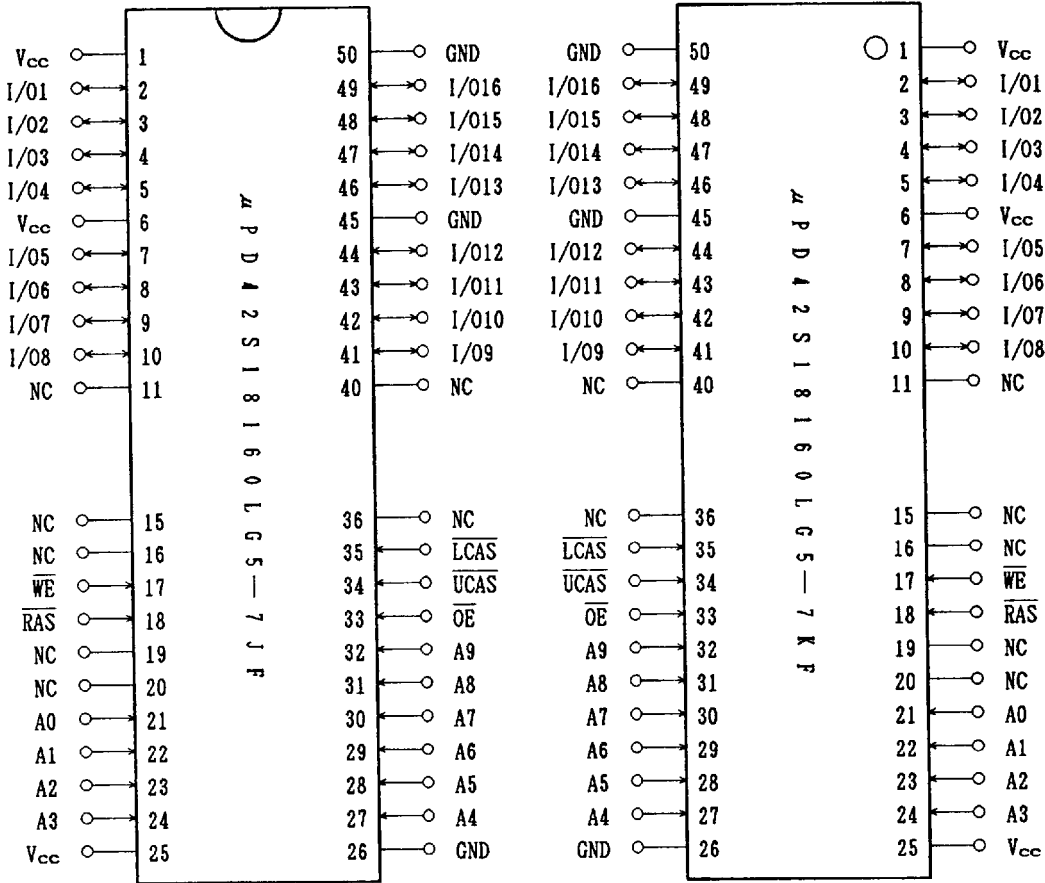
Reverse bent



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【μPD42S18160L】

Reverse bent



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## ELECTRICAL SPECIFICATIONS

## ABSOLUTE MAXIMUM RATINGS\*

PARAMETER	SYMBOL	TEST CONDITION	RATING	UNIT
Voltage on Any Pin Relative to GND	$V_T$		-0.5 to +4.6	V
Short Circuit Output Current	$I_O$		20	mA
Power Dissipation	$P_D$		1	W
Operating Temperature	$T_{opt}$		0 to 70	$^{\circ}C$
Storage Temperature	$T_{stg}$		-55 to +125	$^{\circ}C$

\*COMMENT : 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 sections of this specification. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

## RECOMMENDED OPERATING CONDITIONS NOTES:1,2

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	$V_{CC}$		3.0	3.3	3.6	V
High Level Input Voltage	$V_{IH}$		2.0		$V_{CC}+0.3$	V
Low Level Input Voltage	$V_{IL}$		-0.3		0.8	V
Ambient Temperature	$T_a$		0		70	$^{\circ}C$

CAPACITANCE ( $T_a=25^{\circ}C$ ,  $f=1$  MHz)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Capacitance	$C_{I1}$	A0 to A9/A10/A11			5	pF
	$C_{I2}$	$\overline{RAS}$ , $\overline{UCAS}$ , $\overline{LCAS}$ , $\overline{WE}$ , $\overline{OE}$			7	pF
Data Input/Output Capacitance	$C_D$	I/O1 to I/O16			7	pF



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DC CHARACTERISTICS (Recommended Operating Conditions unless Otherwise noted)

【 $\mu$ PD42S16160L】

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	NOTES
Operating Current	$I_{CC1}$	$\overline{RAS}, \overline{CAS}$ Cycling $t_{RC}=t_{RC(MIN.)}, I_O=0mA$	$\mu$ PD42S16160L-A60		90	mA	3
			$\mu$ PD42S16160L-A70		80		
			$\mu$ PD42S16160L-A80		70		
Standby Current	$I_{CC2}$	$\overline{RAS}, \overline{CAS} \geq V_{IH(MIN.)}, I_O=0mA$			0.5	mA	
		$\overline{RAS}, \overline{CAS} \geq V_{CC}-0.2V, I_O=0mA$			0.1		
Refresh Current ( $\overline{RAS}$ Only Refresh)	$I_{CC3}$	$\overline{RAS}$ Cycling, $\overline{CAS} \geq V_{IH(MIN.)}$ $t_{RC}=t_{RC(MIN.)}, I_O=0mA$	$\mu$ PD42S16160L-A60		90	mA	3
			$\mu$ PD42S16160L-A70		80		
			$\mu$ PD42S16160L-A80		70		
Operating Current (Fast Page Mode)	$I_{CC4}$	$\overline{CAS}$ Cycling, $\overline{RAS} \leq V_{IL(MAX.)}$ $t_{PC}=t_{PC(MIN.)}, I_O=0mA$	$\mu$ PD42S16160L-A60		90	mA	3
			$\mu$ PD42S16160L-A70		80		
			$\mu$ PD42S16160L-A80		70		
Refresh Current ( $\overline{CAS}$ before $\overline{RAS}$ Refresh)	$I_{CC5}$	$\overline{RAS}$ Cycling, $t_{RC}=t_{RC(MIN.)}, I_O=0mA$	$\mu$ PD42S16160L-A60		90	mA	3
			$\mu$ PD42S16160L-A70		80		
			$\mu$ PD42S16160L-A80		70		
Battery back-up Current (Standby with $\overline{CAS}$ before $\overline{RAS}$ Refresh)	$I_{CC6}$	Standby: $V_{CC}-0.2V \leq \overline{RAS}$ , $\overline{CAS}$ before $\overline{RAS}$ Refresh: 4096 Cycle/256 ms $\overline{RAS}, \overline{CAS}: 0V \leq V_{IL} \leq 0.2V$ $V_{CC}-0.2V \leq V_{IH} \leq V_{IH MAX.}$ $\overline{WE}, \overline{OE}: V_{IH}$ Address: Don't care Output: OPEN	$t_{RAS} \leq 300ns$		140	$\mu A$	
			$t_{RAS} \leq 1\mu s$		140		
Self Refresh Current ( $\overline{CAS}$ before $\overline{RAS}$ Self Refresh)	$I_{CC7}$	$\overline{RAS}, \overline{CAS}: 0V \leq V_{IL} \leq 0.2V$ $V_{CC}-0.2V \leq V_{IH} \leq V_{IH MAX.}, I_O=0mA$			80	$\mu A$	
Input Leakage Current	$I_{I(L)}$	$V_i=0$ to 3.6V, all other pins= 0V	-5		5	$\mu A$	
Output Leakage Current	$I_{O(L)}$	$D_{OUT}$ is disabled, $V_o=0$ to 3.6V	-5		5	$\mu A$	
Output High Voltage	$V_{OH}$	$I_o=-2mA$	2.4			V	
Output Low Voltage	$V_{OL}$	$I_o=2mA$			0.4	V	

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【μPD42S17160L】

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	NOTES
Operating Current	I <sub>CC1</sub>	$\overline{\text{RAS}}, \overline{\text{CAS}}$ Cycling $t_{\text{RC}} = t_{\text{RC}(\text{MIN.})}, I_{\text{O}} = 0\text{mA}$	μPD42S17160L-A60		110	mA	3
			μPD42S17160L-A70		100		
			μPD42S17160L-A80		90		
Standby Current	I <sub>CC2</sub>	$\overline{\text{RAS}}, \overline{\text{CAS}} \geq V_{\text{IH}(\text{MIN.})}, I_{\text{O}} = 0\text{mA}$			0.5	mA	
		$\overline{\text{RAS}}, \overline{\text{CAS}} \geq V_{\text{CC}} - 0.2\text{V}, I_{\text{O}} = 0\text{mA}$			0.1		
Refresh Current (RAS Only Refresh)	I <sub>CC3</sub>	$\overline{\text{RAS}}$ Cycling, $\overline{\text{CAS}} \geq V_{\text{IH}(\text{MIN.})}$ $t_{\text{RC}} = t_{\text{RC}(\text{MIN.})}, I_{\text{O}} = 0\text{mA}$	μPD42S17160L-A60		110	mA	3
			μPD42S17160L-A70		100		
			μPD42S17160L-A80		90		
Operating Current (Fast Page Mode)	I <sub>CC4</sub>	$\overline{\text{CAS}}$ Cycling, $\overline{\text{RAS}} \leq V_{\text{IL}(\text{MAX.})}$ $t_{\text{PC}} = t_{\text{PC}(\text{MIN.})}, I_{\text{O}} = 0\text{mA}$	μPD42S17160L-A60		90	mA	3
			μPD42S17160L-A70		80		
			μPD42S17160L-A80		70		
Refresh Current (CAS before RAS Refresh)	I <sub>CC5</sub>	$\overline{\text{RAS}}$ Cycling, $t_{\text{RC}} = t_{\text{RC}(\text{MIN.})}, I_{\text{O}} = 0\text{mA}$	μPD42S17160L-A60		110	mA	3
			μPD42S17160L-A70		100		
			μPD42S17160L-A80		90		
Battery back-up Current (Standby with $\overline{\text{CAS}}$ before RAS Refresh)	I <sub>CC6</sub>	Standby: $V_{\text{CC}} - 0.2\text{V} \leq \overline{\text{RAS}},$ $\overline{\text{CAS}}$ before RAS Refresh: 2048 Cycle/256 ms $\overline{\text{RAS}}, \overline{\text{CAS}}: 0\text{V} \leq V_{\text{IL}} \leq 0.2\text{V}$ $V_{\text{CC}} - 0.2\text{V} \leq V_{\text{IH}} \leq V_{\text{IH MAX.}}$ $\overline{\text{WE}}, \overline{\text{OE}}: V_{\text{IH}}$ Address: Don't care Output: OPEN	$t_{\text{RAS}} \leq 300\text{ns}$		120	μA	
			$t_{\text{RAS}} \leq 1\mu\text{s}$		120		
Self Refresh Current (CAS before RAS Self Refresh)	I <sub>CC7</sub>	$\overline{\text{RAS}}, \overline{\text{CAS}}: 0\text{V} \leq V_{\text{IL}} \leq 0.2\text{V}$ $V_{\text{CC}} - 0.2\text{V} \leq V_{\text{IH}} \leq V_{\text{IH MAX.}}, I_{\text{O}} = 0\text{mA}$			80	μA	
Input Leakage Current	I <sub>I(L)</sub>	$V_{\text{I}} = 0$ to 3.6V, all other pins = 0V	-5		5	μA	
Output Leakage Current	I <sub>O(L)</sub>	D <sub>OUT</sub> is disabled, $V_{\text{O}} = 0$ to 3.6V	-5		5	μA	
Output High Voltage	V <sub>OH</sub>	$I_{\text{O}} = -2\text{mA}$	2.4			V	
Output Low Voltage	V <sub>OL</sub>	$I_{\text{O}} = 2\text{mA}$			0.4	V	

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PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	NOTES
Operating Current	$I_{CC1}$	$\overline{RAS}, \overline{CAS}$ Cycling $t_{RC}=t_{RC(MIN.)}, I_O=0mA$	$\mu$ PD42S18160L-A60		150	mA	3
			$\mu$ PD42S18160L-A70		140		
			$\mu$ PD42S18160L-A80		130		
Standby Current	$I_{CC2}$	$\overline{RAS}, \overline{CAS} \geq V_{IH(MIN.)}, I_O=0mA$			0.5	mA	
		$\overline{RAS}, \overline{CAS} \geq V_{CC}-0.2V, I_O=0mA$			0.1		
Refresh Current (RAS Only Refresh)	$I_{CC3}$	$\overline{RAS}$ Cycling, $\overline{CAS} \geq V_{IH(MIN.)}$ $t_{RC}=t_{RC(MIN.)}, I_O=0mA$	$\mu$ PD42S18160L-A60		150	mA	3
			$\mu$ PD42S18160L-A70		140		
			$\mu$ PD42S18160L-A80		130		
Operating Current (Fast Page Mode)	$I_{CC4}$	$\overline{CAS}$ Cycling, $\overline{RAS} \leq V_{IL(MAX.)}$ $t_{PC}=t_{PC(MIN.)}, I_O=0mA$	$\mu$ PD42S18160L-A60		90	mA	3
			$\mu$ PD42S18160L-A70		80		
			$\mu$ PD42S18160L-A80		70		
Refresh Current (CAS before RAS Refresh)	$I_{CC5}$	$\overline{RAS}$ Cycling, $t_{RC}=t_{RC(MIN.)}, I_O=0mA$	$\mu$ PD42S18160L-A60		150	mA	3
			$\mu$ PD42S18160L-A70		140		
			$\mu$ PD42S18160L-A80		130		
Battery back-up Current (Standby with $\overline{CAS}$ before RAS Refresh)	$I_{CC6}$	Standby: $V_{CC}-0.2V \leq \overline{RAS}$ , CAS before RAS Refresh: 1024 Cycle/256 ms RAS, CAS: $0V \leq V_{IL} \leq 0.2V$ $V_{CC}-0.2V \leq V_{IH} \leq V_{IH MAX.}$ $\overline{WE}, \overline{OE}: V_{IH}$ Address: Don't care Output: OPEN	$t_{RAS} \leq 300ns$		110	$\mu A$	
			$t_{RAS} \leq 1\mu s$		110		
Self Refresh Current (CAS before RAS Self Refresh)	$I_{CC7}$	$\overline{RAS}, \overline{CAS}: 0V \leq V_{IL} \leq 0.2V$ $V_{CC}-0.2V \leq V_{IH} \leq V_{IH MAX.}, I_O=0mA$			80	$\mu A$	
Input Leakage Current	$I_{I(L)}$	$V_I=0$ to 3.6V, all other pins= 0V	-5		5	$\mu A$	
Output Leakage Current	$I_{O(L)}$	$D_{OUT}$ is disabled, $V_O=0$ to 3.6V	-5		5	$\mu A$	
Output High Voltage	$V_{OH}$	$I_O=-2mA$	2.4			V	
Output Low Voltage	$V_{OL}$	$I_O=2mA$			0.4	V	

**μPD42S16160L,42S17160L,42S18160L**

**AC CHARACTERISTICS**

(Recommended Operating Conditions unless Otherwise noted) **NOTES: 2,4,5**

(1/2)

PARAMETER	SYMBOL	μ PD42S16160L-A60	μ PD42S17160L-A60	μ PD42S18160L-A60	μ PD42S16160L-A70	μ PD42S17160L-A70	μ PD42S18160L-A70	μ PD42S16160L-A80	μ PD42S17160L-A80	μ PD42S18160L-A80	UNIT	NOTES
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.			
Random Read or Write Cycle Time	t <sub>RC</sub>	110			130			150			ns	6
Read Write Cycle Time	t <sub>RWC</sub>	160			180			200			ns	6
Fast Page Mode Cycle Time(Read or Write)	t <sub>PC</sub>	40			45			50			ns	6
Read Modify Write Cycle Time(Fast Page Mode)	t <sub>PRWC</sub>	85			90			105			ns	6
Access Time from $\overline{\text{RAS}}$	t <sub>RAC</sub>		60		70			80			ns	7, 8
Access Time from $\overline{\text{CAS}}$ (Falling Edge)	t <sub>CAC</sub>		15		20			20			ns	7, 8
Access Time from Column Address	t <sub>AA</sub>		30		35			40			ns	7, 8
Access Time from $\overline{\text{CAS}}$ Precharge	t <sub>ACP</sub>		35		40			45			ns	7
Access Time from $\overline{\text{OE}}$	t <sub>OEA</sub>		15		20			20			ns	
$\overline{\text{RAS}}$ to Column Address Delay Time	t <sub>RAD</sub>	15	30	15	35	17	40				ns	8
$\overline{\text{CAS}}$ -Data Set-up Time	t <sub>CLZ</sub>	0		0		0					ns	7
$\overline{\text{OE}}$ -Data Set-up Time	t <sub>OLZ</sub>	0		0		0					ns	7
Output Buffer Turn-off Delay ( $\overline{\text{CAS}}$ )	t <sub>OFF</sub>	0	13	0	15	0	15				ns	9
$\overline{\text{OE}}$ Data Delay Time	t <sub>OED</sub>	13		15		15					ns	
Output Buffer Turn-off Delay ( $\overline{\text{OE}}$ )	t <sub>OBZ</sub>	0	13	0	15	0	15				ns	9
$\overline{\text{OE}}$ Command Hold Time	t <sub>OBH</sub>	0		0		0					ns	
$\overline{\text{OE}}$ to $\overline{\text{RAS}}$ inactive Set-up Time	t <sub>OBS</sub>	0		0		0					ns	
Transition Time (Rise and Fall)	t <sub>T</sub>	3	50	3	50	3	50				ns	
$\overline{\text{RAS}}$ Precharge Time	t <sub>RP</sub>	40		50		60					ns	
$\overline{\text{RAS}}$ Pulse Width (Random Read, Write Cycle)	t <sub>RAS</sub>	60	10000	70	10000	80	10000				ns	
$\overline{\text{RAS}}$ Pulse Width (Fast Page Mode)	t <sub>RASP</sub>	60	125000	70	125000	80	125000				ns	
$\overline{\text{RAS}}$ Hold Time	t <sub>RSH</sub>	15		18		20					ns	
$\overline{\text{CAS}}$ Pulse Width	t <sub>CAS</sub>	15	10000	20	10000	20	10000				ns	
$\overline{\text{CAS}}$ Hold Time	t <sub>CSH</sub>	60		70		80					ns	
$\overline{\text{RAS}}$ to $\overline{\text{CAS}}$ Delay Time	t <sub>RCD</sub>	20	45	20	50	25	60				ns	8
$\overline{\text{CAS}}$ to $\overline{\text{RAS}}$ Precharge Time	t <sub>CRP</sub>	5		5		5					ns	10
$\overline{\text{CAS}}$ Precharge Time	t <sub>CPN</sub>	10		10		10					ns	
$\overline{\text{CAS}}$ Precharge Time (Fast Page Mode)	t <sub>CP</sub>	10		10		10					ns	
$\overline{\text{RAS}}$ Precharge $\overline{\text{CAS}}$ Hold Time	t <sub>RPC</sub>	5		5		5					ns	
$\overline{\text{RAS}}$ Hold Time from $\overline{\text{CAS}}$ Precharge	t <sub>RHCP</sub>	35		40		45					ns	
Row Address Set-up Time	t <sub>ASR</sub>	0		0		0					ns	
Row Address Hold Time	t <sub>RAH</sub>	10		10		12					ns	

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PARAMETER	SYMBOL	$\mu$ PD42S16160L-A60	$\mu$ PD42S16160L-A70	$\mu$ PD42S16160L-A80	UNIT	NOTES
		$\mu$ PD42S17160L-A60 $\mu$ PD42S18160L-A60	$\mu$ PD42S17160L-A70 $\mu$ PD42S18160L-A70	$\mu$ PD42S17160L-A80 $\mu$ PD42S18160L-A80		
		MIN.	MIN.	MAX.	MAX.	
Column Address Set-up Time	$t_{ASC}$	0		0		ns
Column Address Hold Time	$t_{CAH}$	15		15		ns
Column Address Lead Time Referenced to $\overline{RAS}$	$t_{RAL}$	30		35		ns
Read Command Set-up Time	$t_{RCS}$	0		0		ns
Read Command Hold Time Referenced to $\overline{RAS}$	$t_{RRH}$	0		0		ns 11
Read Command Hold Time Referenced to $\overline{CAS}$	$t_{RCH}$	0		0		ns 11
Write Command Hold Time Referenced to $\overline{CAS}$	$t_{WCH}$	10		10		ns 12
Write Command Pulse Width	$t_{WP}$	10		10		ns 12
Data-in Set-up Time	$t_{DS}$	0		0		ns 13
Data-in Hold Time	$t_{DH}$	10		15		ns 13
$\overline{WE}$ Command Set-up Time	$t_{WCS}$	0		0		ns 14
$\overline{CAS}$ Precharge to $\overline{WE}$ Delay Time(Fast Page)	$t_{CPWD}$	60		65		ns 15
$\overline{CAS}$ to $\overline{WE}$ Delay	$t_{CWD}$	38		40		ns 15
$\overline{RAS}$ to $\overline{WE}$ Delay	$t_{RWD}$	83		95		ns 15
Column Address to $\overline{WE}$ Delay Time	$t_{AWD}$	53		60		ns 15
Write Command to $\overline{RAS}$ Lead Time	$t_{RWL}$	20		20		ns
Write Command to $\overline{CAS}$ Lead Time	$t_{CWL}$	15		15		ns
$\overline{CAS}$ Set-up Time for CBR Refresh	$t_{CSR}$	5		5		ns
$\overline{CAS}$ Hold Time for CBR Refresh	$t_{CHR}$	10		10		ns
Masked Byte Hold Time Referenced to $\overline{RAS}$	$t_{MRH}$	0		0		ns
$\overline{RAS}$ Pulse Width (Self Refresh Cycle)	$t_{RASS}$	100		100		$\mu$ s
$\overline{RAS}$ Precharge Time (Self Refresh Cycle)	$t_{RPS}$	110		130		ns
$\overline{CAS}$ Hold Time (Self Refresh Cycle)	$t_{CHS}$	-50		-50		ns
Refresh Period	$t_{REF}$		256		256	ms 16

$\mu$ PD42S16160L, 42S17160L, 42S18160L

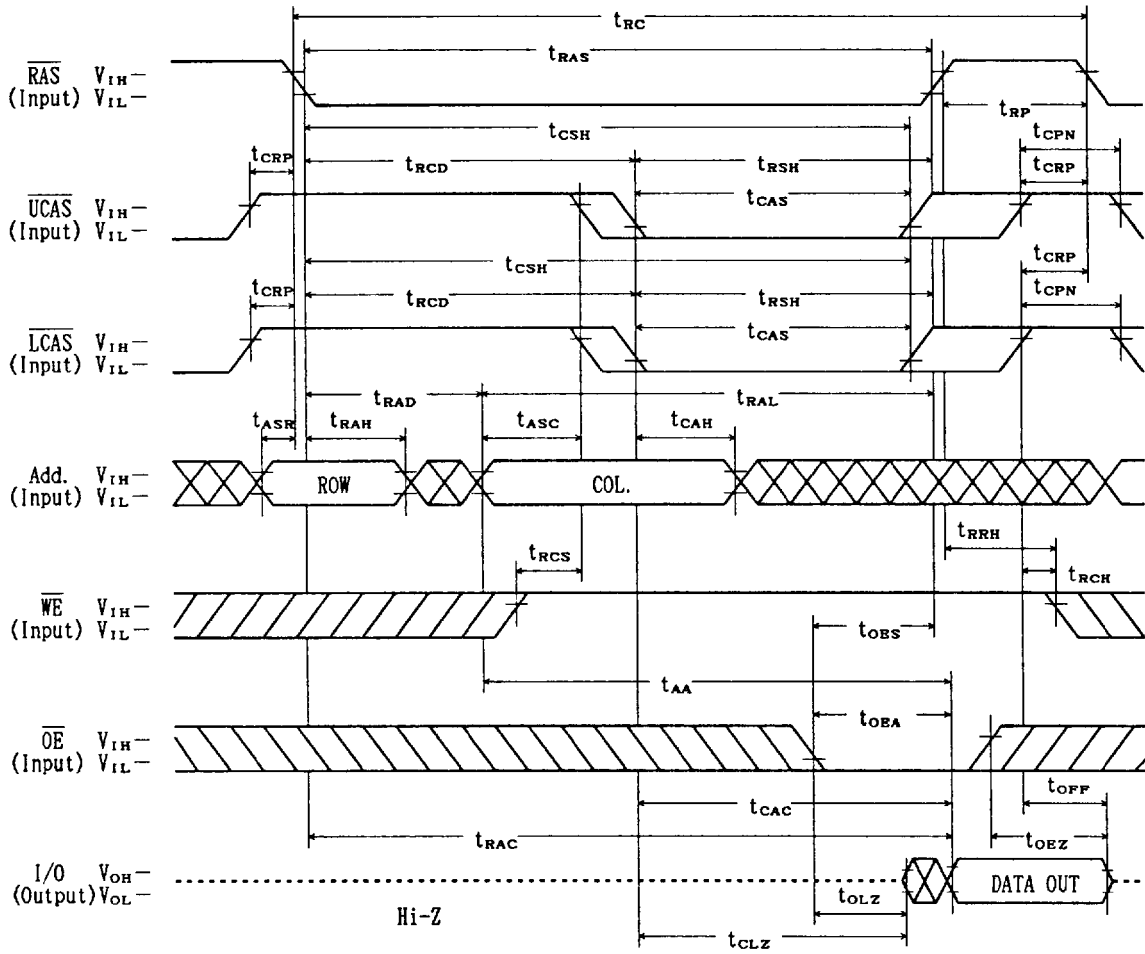
## NOTES:

- All voltages referenced to GND.
- An initial pause of  $100\mu s$  required after power-on followed by 8 refresh ( $\overline{\text{RAS}}$  only refresh or CAS before RAS refresh) cycles before proper device operation is achieved.
- $I_{CC1}$ ,  $I_{CC3}$ ,  $I_{CC4}$  and  $I_{CC5}$  depend on output loading and cycle rates. Specified values are obtained with the output open. In addition to this,  $I_{CC3}$  is measured on condition that column addresses in  $\overline{\text{RAS}}$  only cycle are held high or low level and  $I_{CC4}$  is measured on condition that column addresses in fast page mode are changed only one time during  $t_{PC(MIN.)}$ .
- AC measurements assume  $t_T=5ns$
- $V_{IH(MIN.)}$  and  $V_{IL(MAX.)}$  are reference levels for measuring timing of input signals. Transition times are measured between  $V_{IH}$  and  $V_{IL}$ .
- The minimum specifications are used only to indicate cycle time at which proper operation over the full temperature range ( $T_a=0$  to  $70^\circ C$ ) is assured.
- Load = 1 TTL loads and  $100pF$  ( $V_{OH}=2.0V$ ,  $V_{OL}=0.8V$ )
- The access time is determined by  $\overline{\text{RAS}}$  access time  $t_{RAC}$ , address access time  $t_{AA}$ , and  $\overline{\text{CAS}}$  address time  $t_{CAC}$ . The relationship between these access time and  $t_{RCD}$ ,  $t_{RAD}$  is as follows.

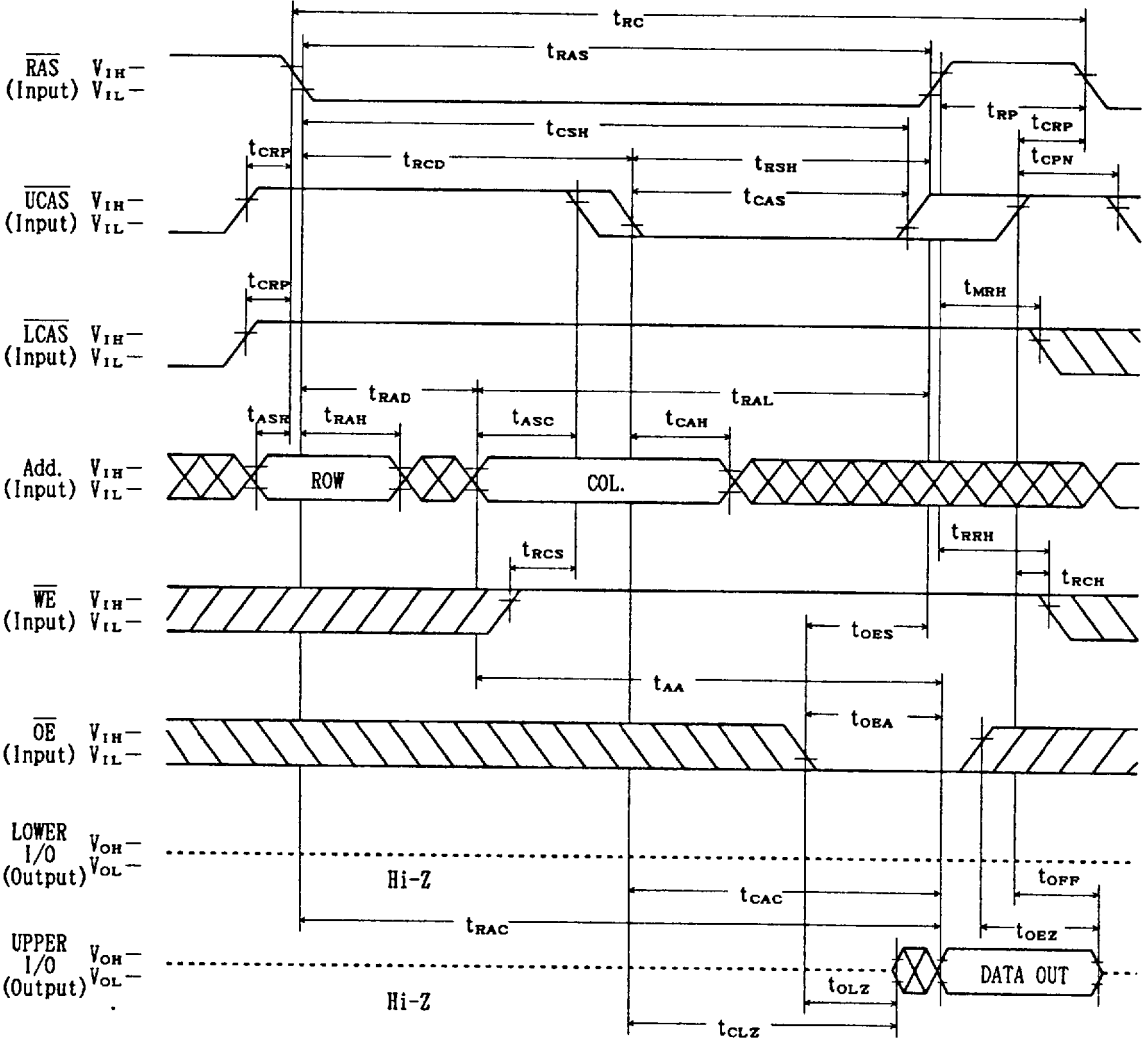
CONDITION	ACCESS TIME
$t_{RAD} \leq t_{RAD(MAX.)}$ and $t_{RCD} \leq t_{RCD(MAX.)}$	$t_{RAC(MAX.)}$
$t_{RAD} \geq t_{RAD(MAX.)}$	$t_{AA(MAX.)}$
$t_{RCD} \geq t_{RCD(MAX.)}$	$t_{CAC(MAX.)}$

- $t_{OFF(MAX.)}$  and  $t_{OEZ(MAX.)}$  defines the time at which the output achieves the open circuit condition and is not referenced to  $V_{OH}$  or  $V_{OL}$ .
- $t_{CRP}$  requirement should be applicable for  $\overline{\text{RAS}}$ / $\overline{\text{CAS}}$  cycles preceded by any cycles.
- Either  $t_{RRH}$  or  $t_{RCH}$  must be satisfied for a read cycle.
- $t_{WP}$  is applicable for late write cycle. If the cycle is early write, it should be satisfied value of  $t_{WCH}$ .
- These parameters are referenced to  $\overline{\text{UCAS}}$ / $\overline{\text{LCAS}}$  leading edge in early write cycles and to  $\overline{\text{WE}}$  leading edge in late write or read-modify-write cycles.
- If  $t_{WCS} \geq t_{WCS(MIN.)}$  the cycle is an early write cycle and the data output will remain open circuit throughout the entire cycle.
- If  $t_{CPWD} \geq t_{CPWD(MIN.)}$ ,  $t_{CWD} \geq t_{CWD(MIN.)}$ ,  $t_{RWD} \geq t_{RWD(MIN.)}$ ,  $t_{AWD} \geq t_{AWD(MIN.)}$  the cycle is a read-write and the data output will contain data read from the selected cell. If neither of the above conditions are met, the condition of the data out (at access time and until  $\overline{\text{CAS}}$  goes back to  $V_{IH}$ ) is indeterminate.
- How to enter into CAS before RAS self refresh mode.
  - In case of using distributed CAS before RAS refresh  
Refresh 4096 or 2048 or 1024 times during a 256ms (Before set into the  $\overline{\text{CAS}}$  before RAS self refresh mode, and after reset).
  - In case of using burst CAS before RAS refresh  
Refresh 4096 times during a 64ms ( $\mu$ PD42S16160L) or 2048 times during a 32ms ( $\mu$ PD42S17160L) or 1024 times during a 16ms ( $\mu$ PD42S18160L) (Before set into the  $\overline{\text{CAS}}$  before RAS self refresh mode, and after reset).
  - In case of use  $\overline{\text{RAS}}$  only refresh  
Refresh against all refresh address during 64ms ( $\mu$ PD42S16160L) or 32ms ( $\mu$ PD42S17160L) or 16ms ( $\mu$ PD42S18160L) (Before set into the  $\overline{\text{CAS}}$  before RAS self refresh mode, and after reset).

TIMING DIAGRAMS  
READ CYCLE

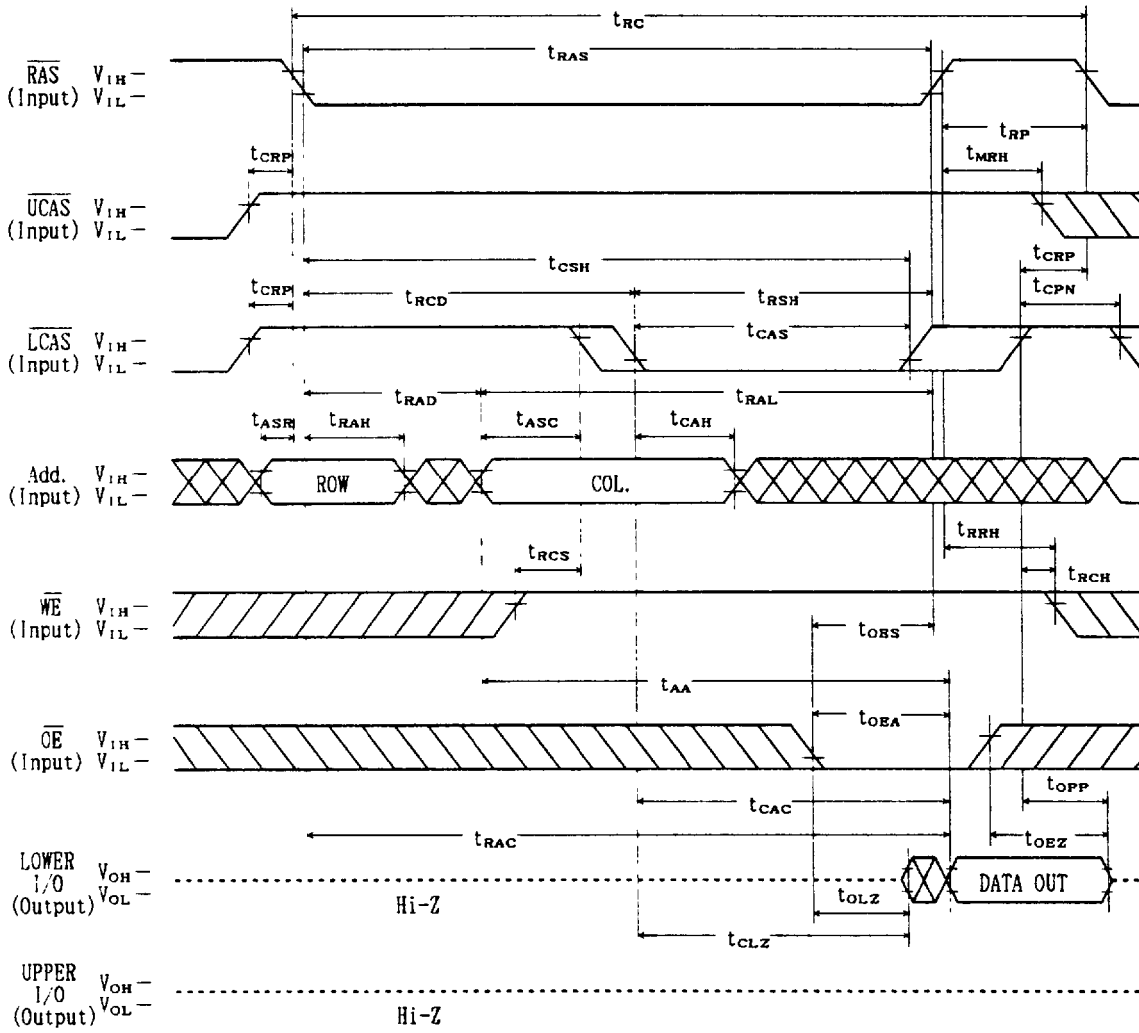


UPPER BYTE READ CYCLE



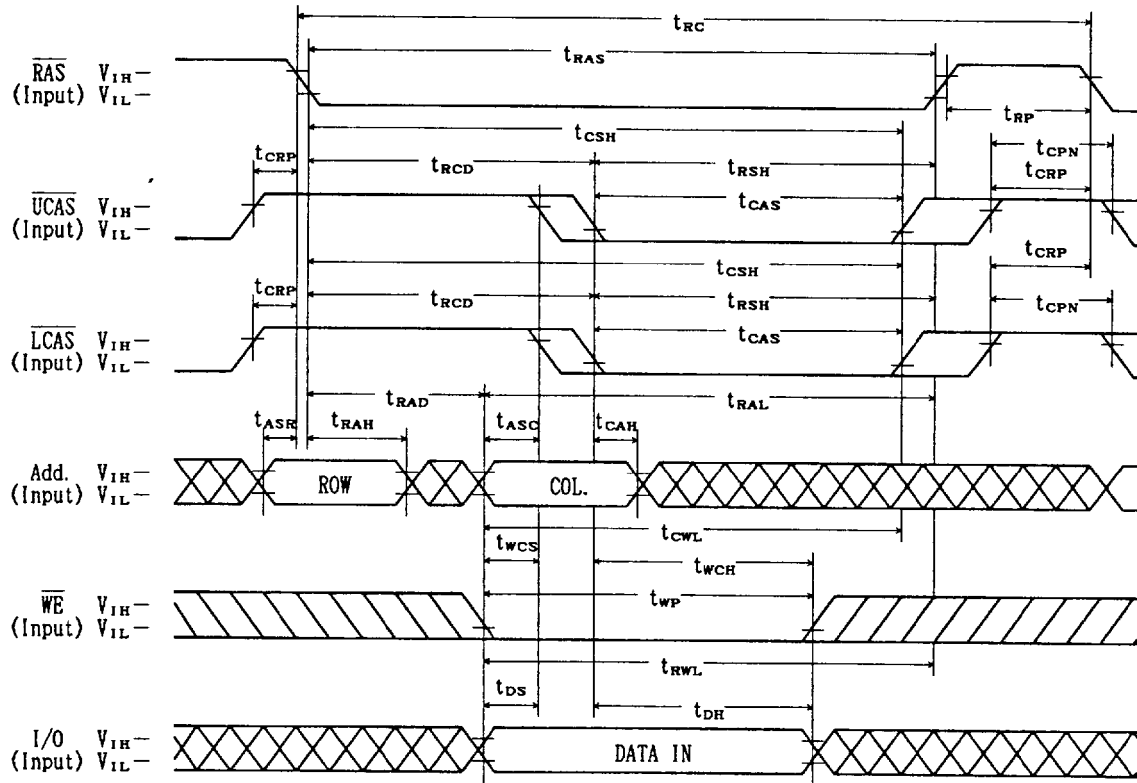


LOWER BYTE READ CYCLE



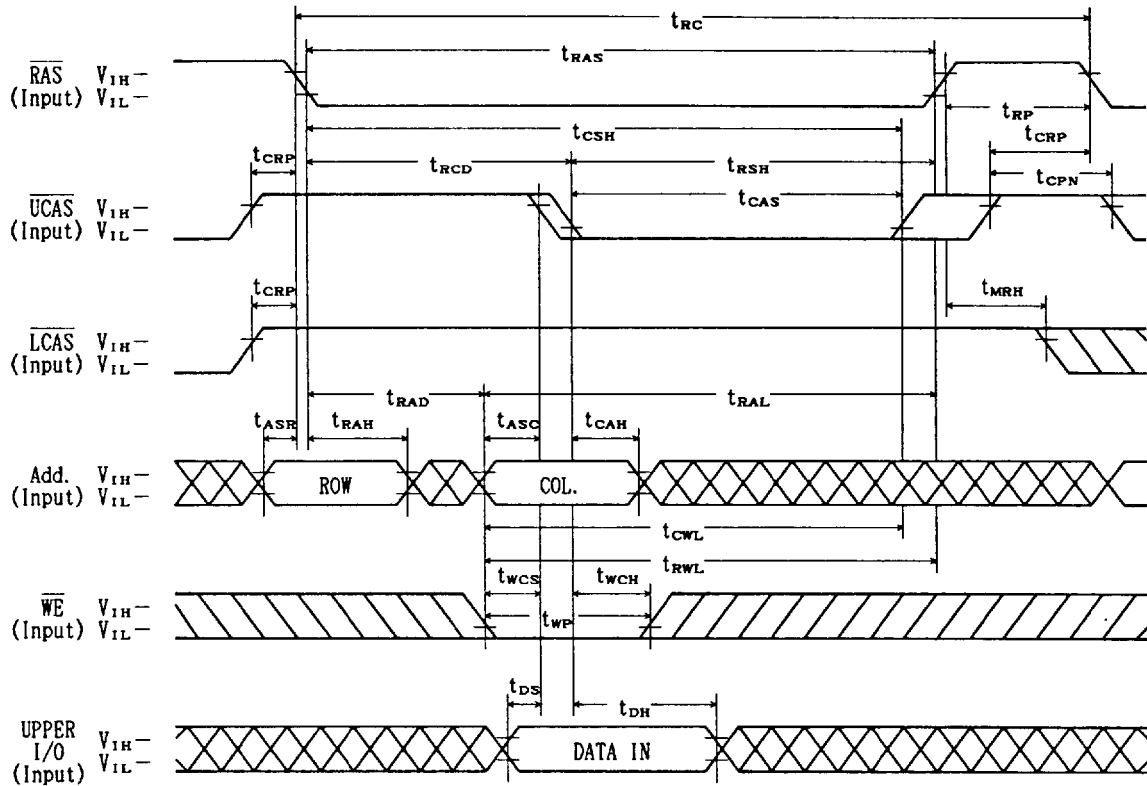
$\mu$ PD42S16160L, 42S17160L, 42S18160L

EARLY WRITE CYCLE



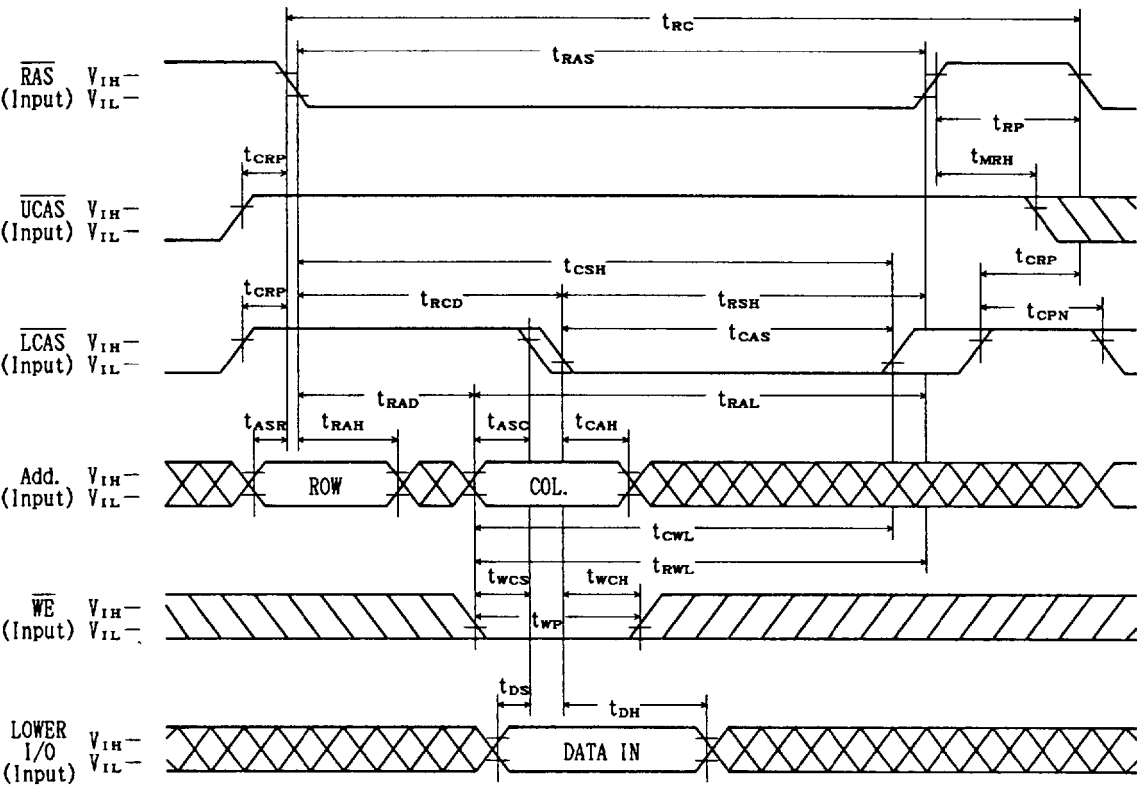
Note:  $\overline{OE}$ =Don't care

UPPER BYTE EARLY WRITE CYCLE



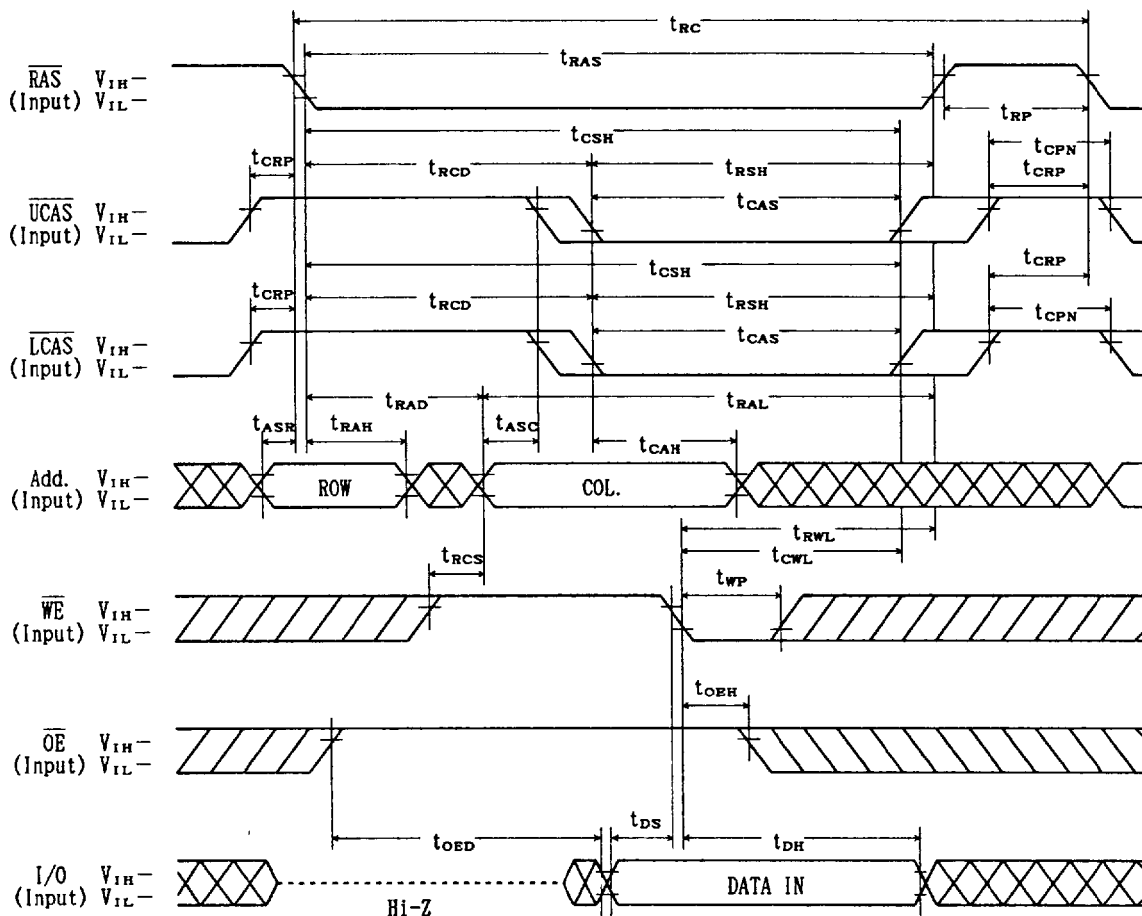
Note:  $\overline{OE}$ , LOWER I/O=Don't care

LOWER BYTE EARLY WRITE CYCLE



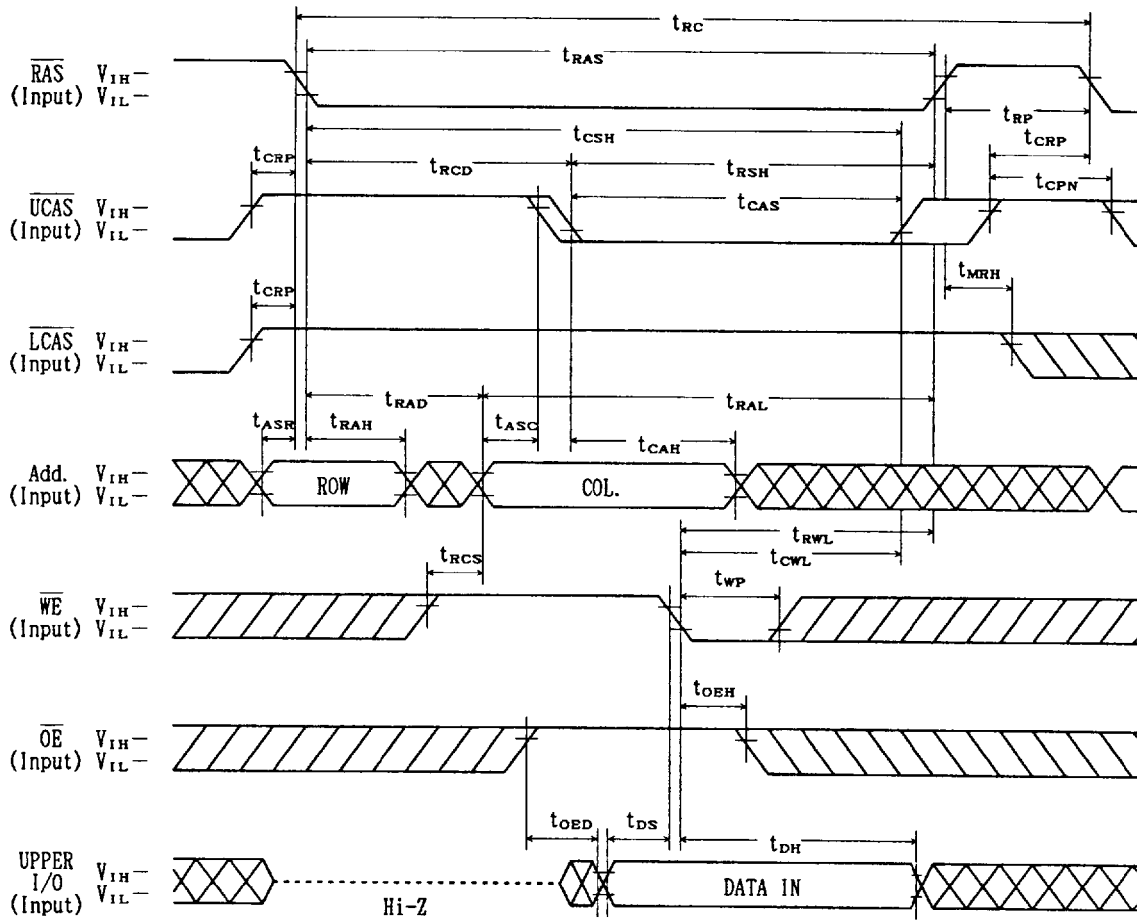
Note:  $\overline{OE}$ , UPPER I/O=Don't care

LATE WRITE CYCLE



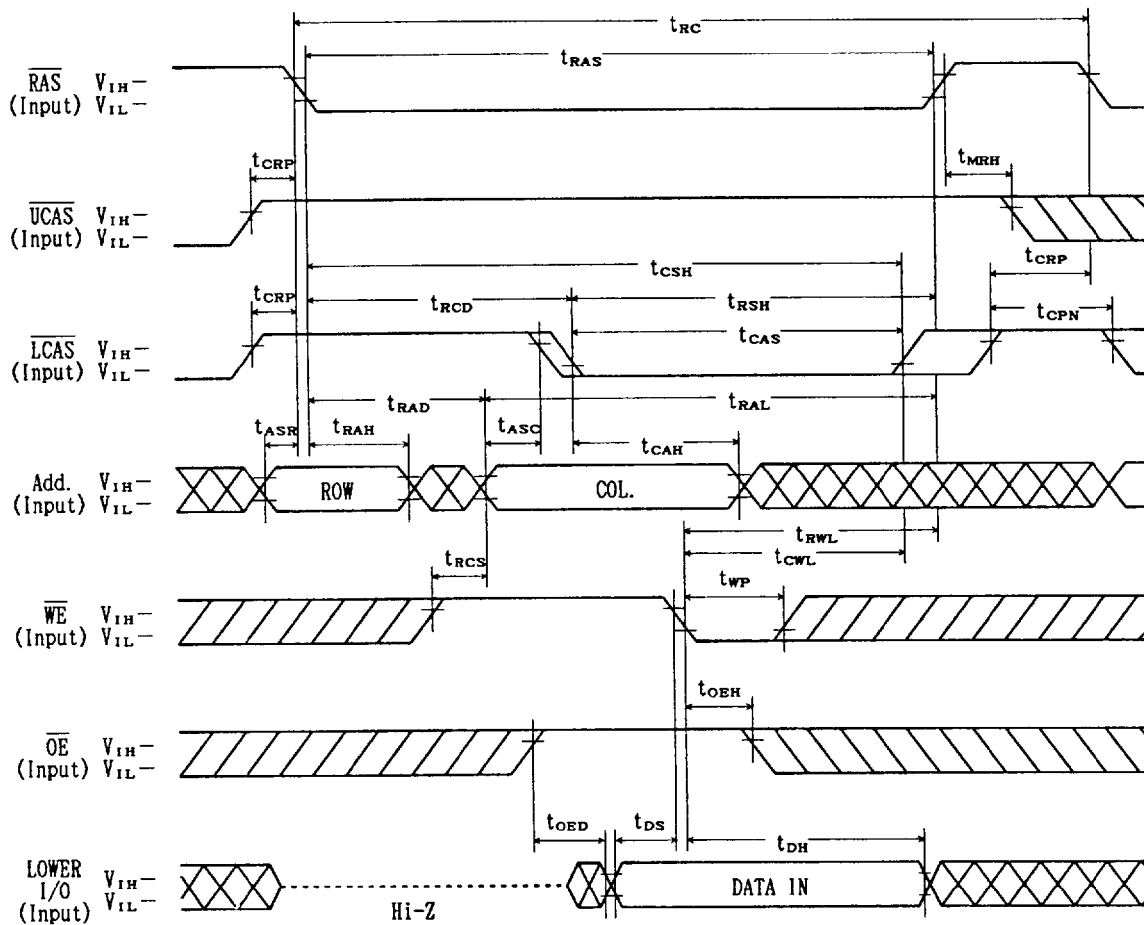
$\mu$ PD42S16160L,42S17160L,42S18160L

UPPER BYTE LATE WRITE CYCLE



Note : LOWER I/O=Don't care

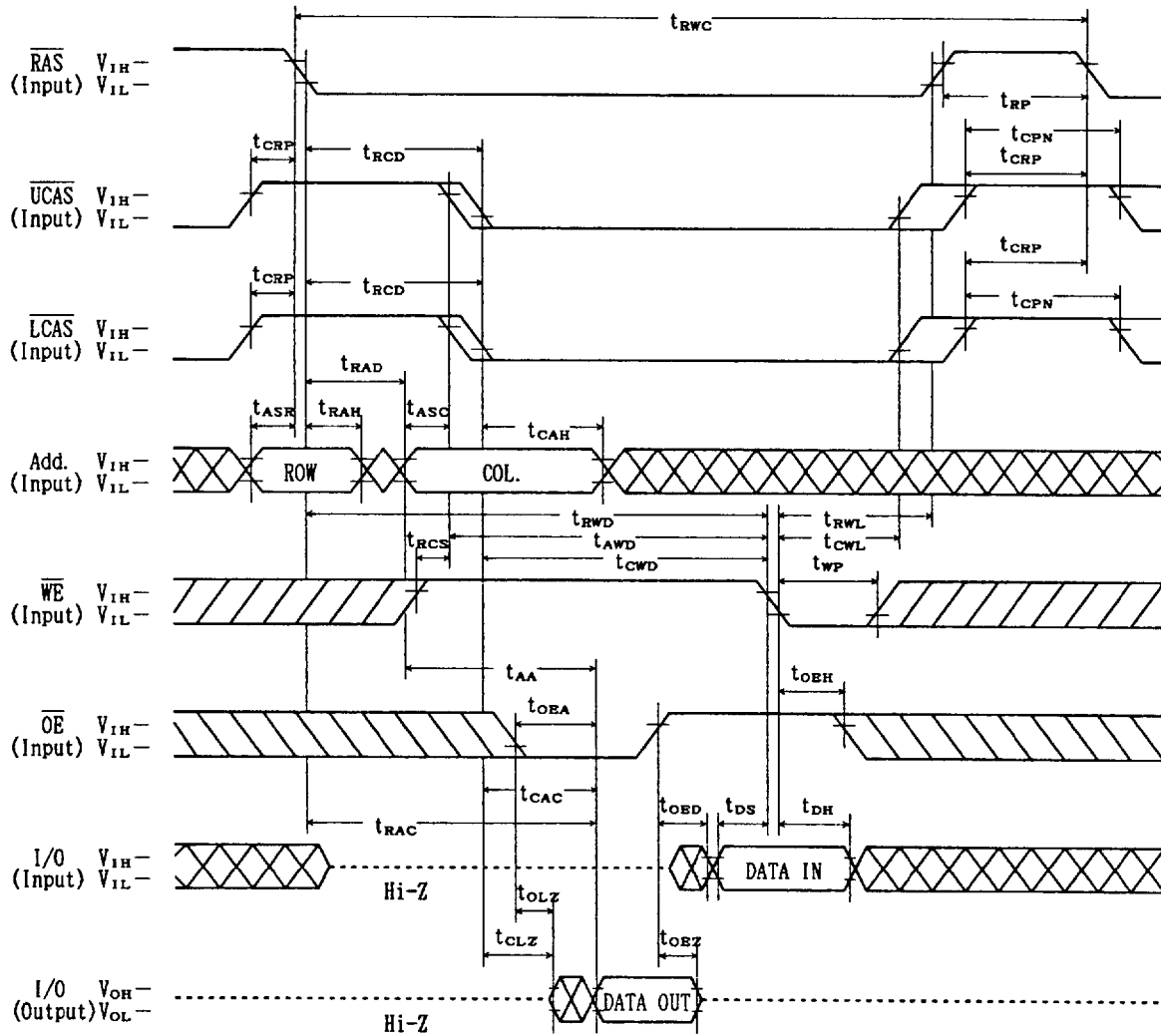
LOWER BYTE LATE WRITE CYCLE



Note: UPPER I/O=Don't care

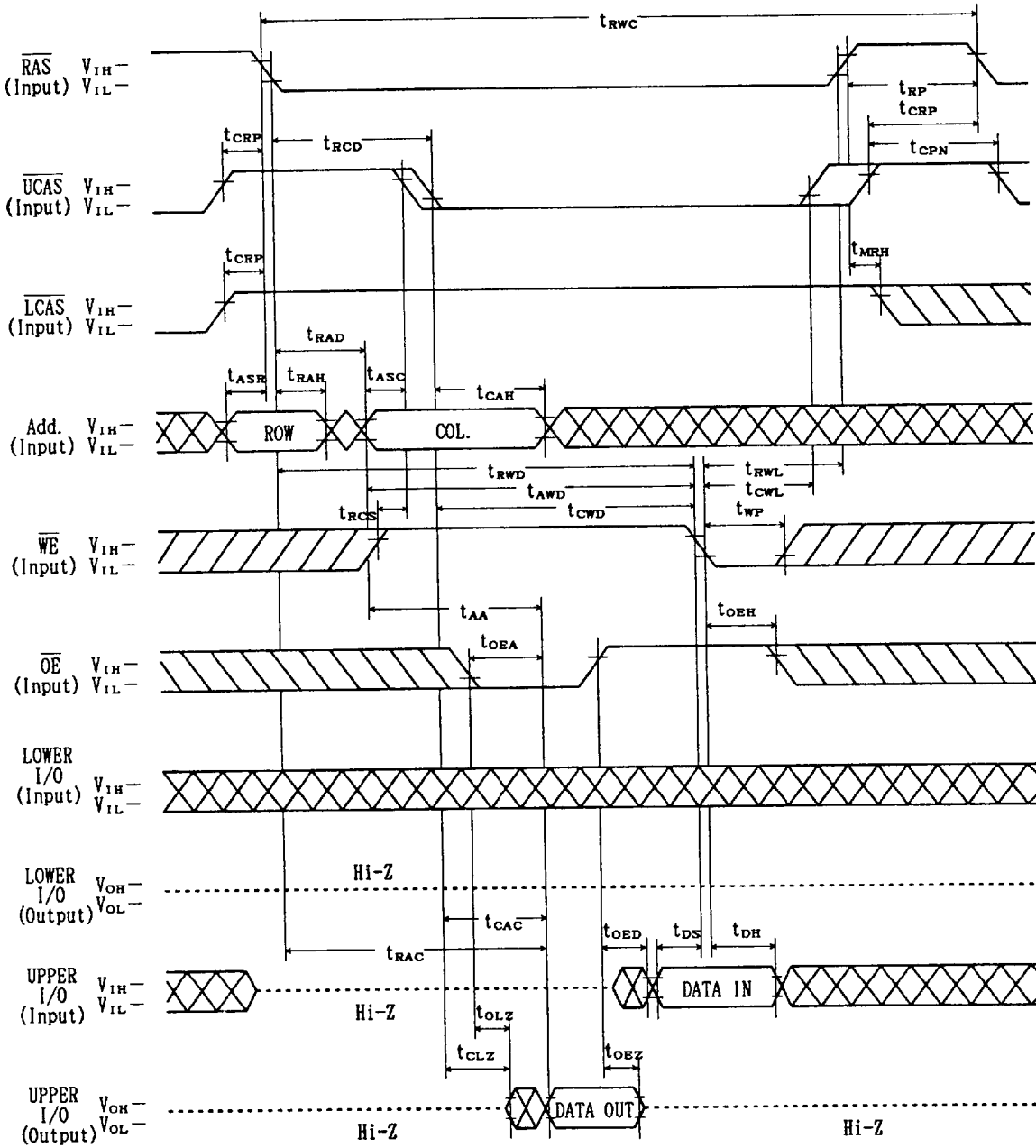
$\mu$ PD42S16160L,42S17160L,42S18160L

READ MODIFY WRITE CYCLE

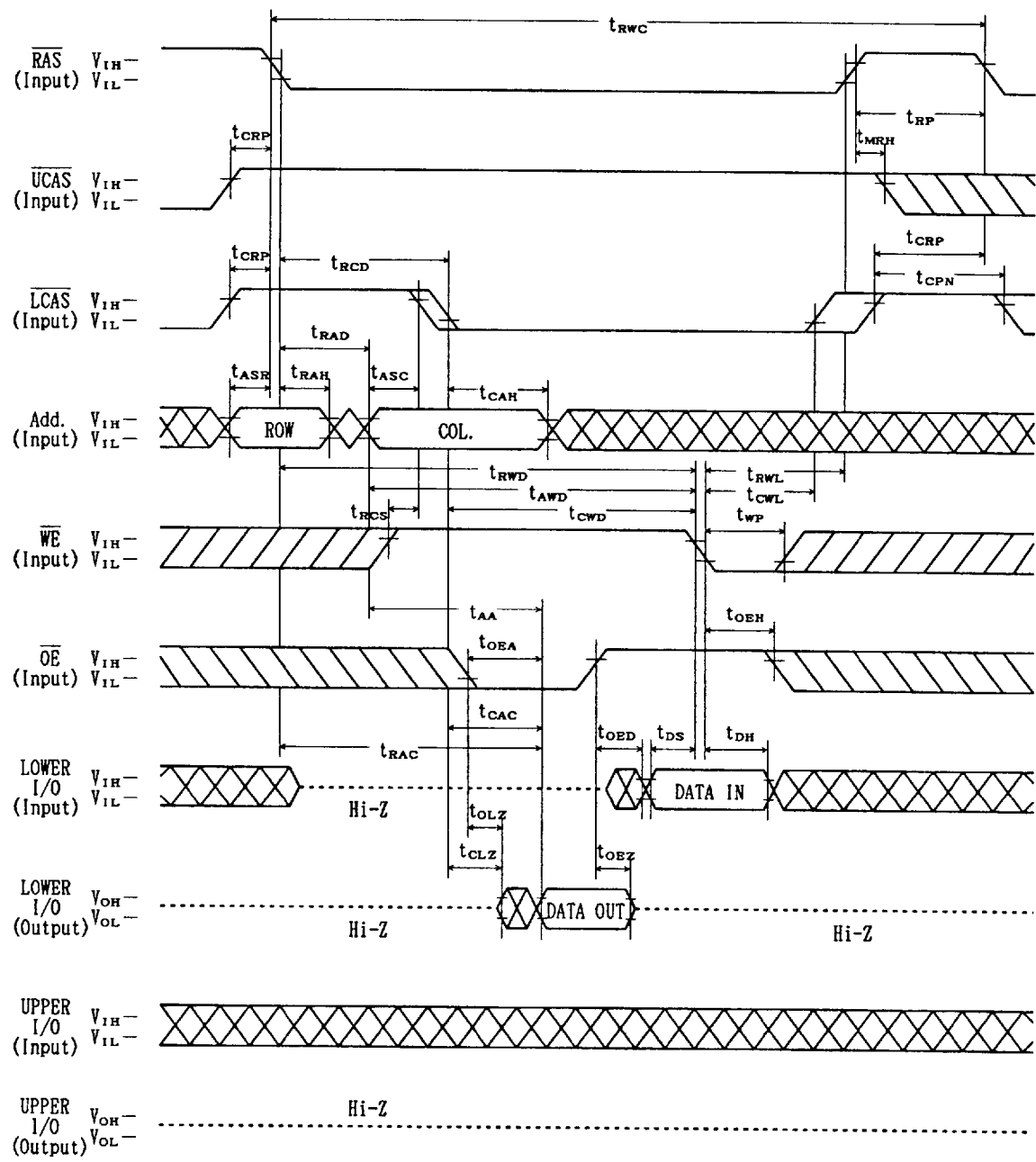




UPPER BYTE READ MODIFY WRITE CYCLE



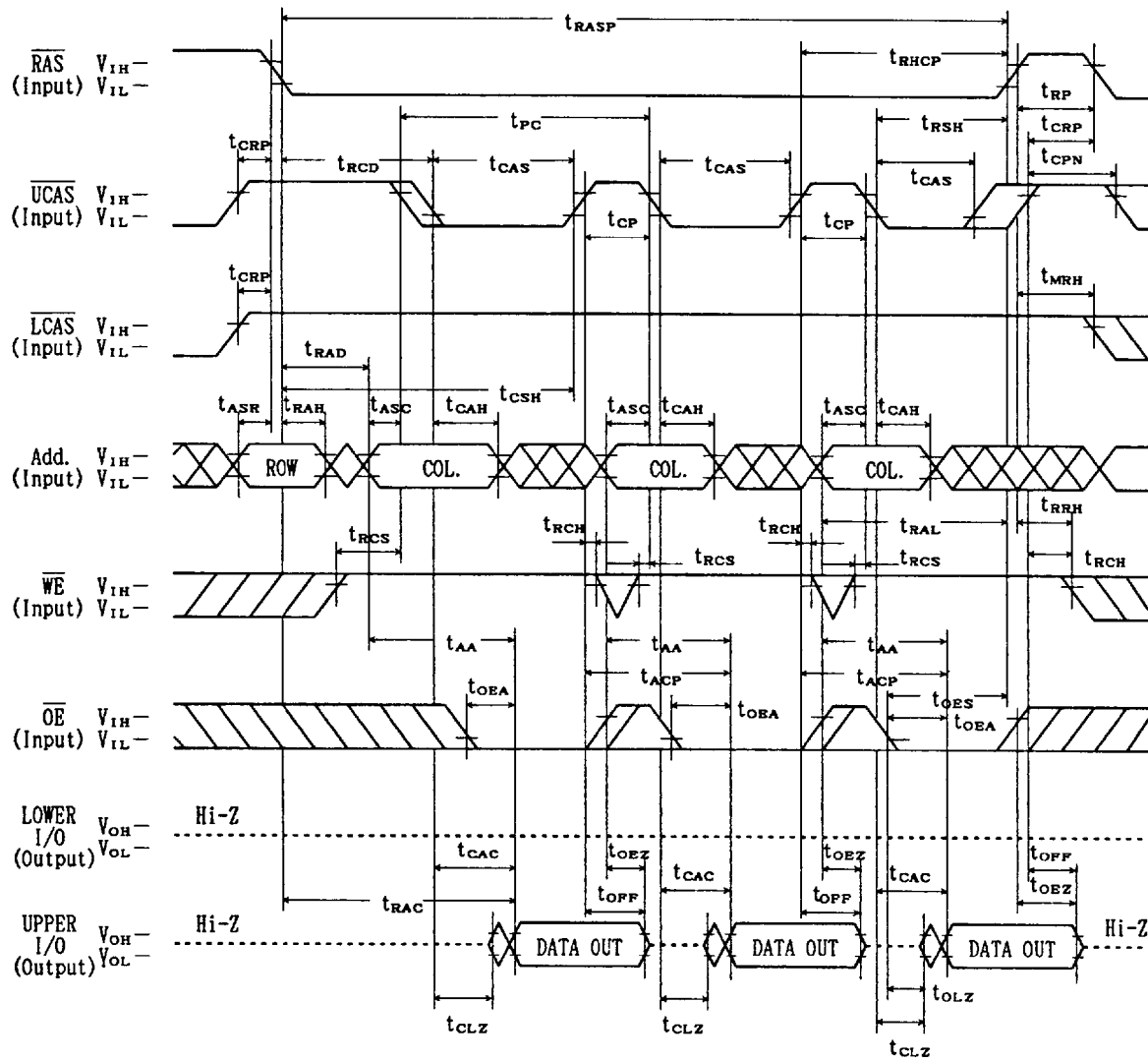
LOWER BYTE READ MODIFY WRITE CYCLE





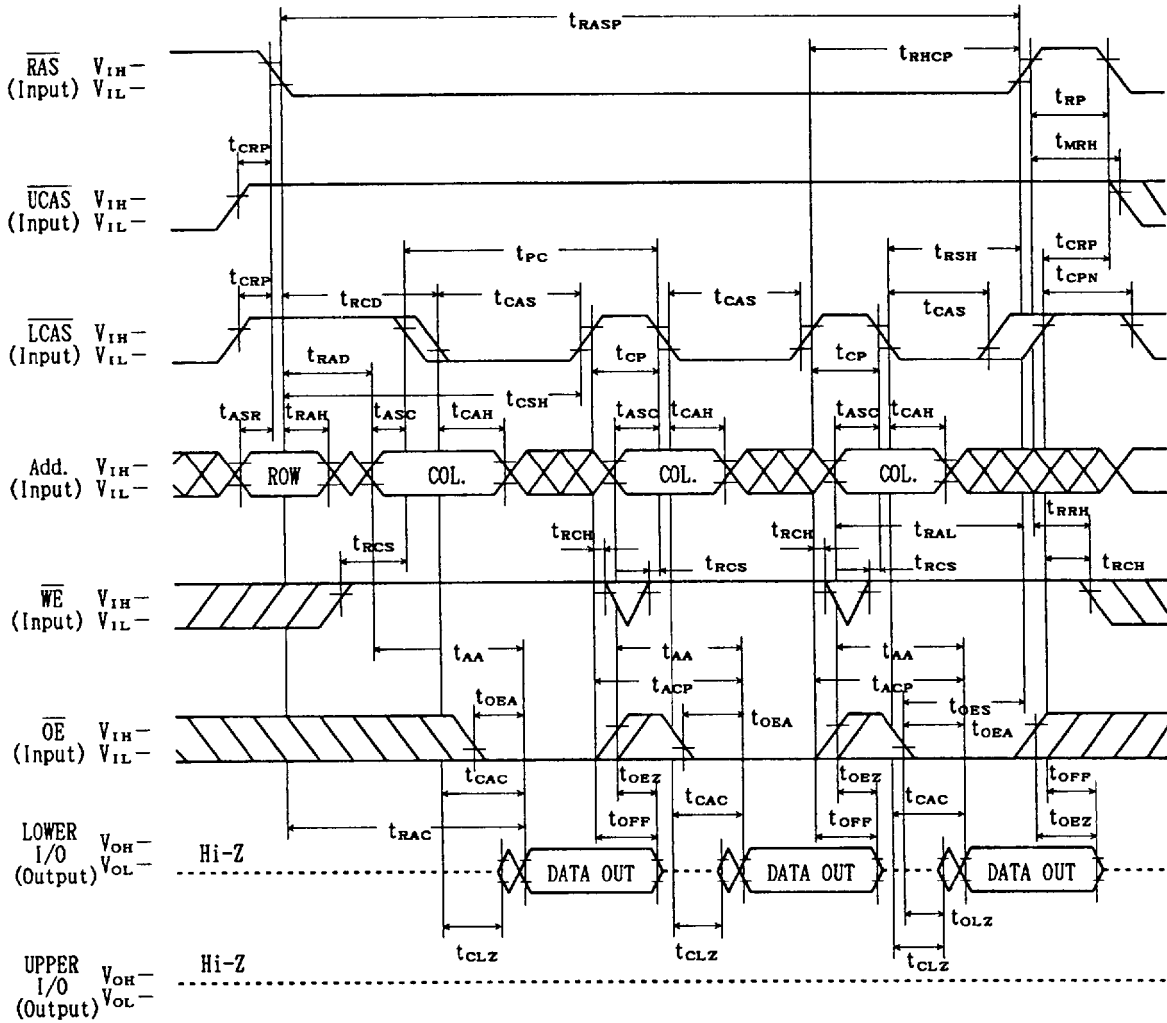
$\mu$ PD42S16160L, 42S17160L, 42S18160L

FAST PAGE MODE UPPER BYTE READ CYCLE



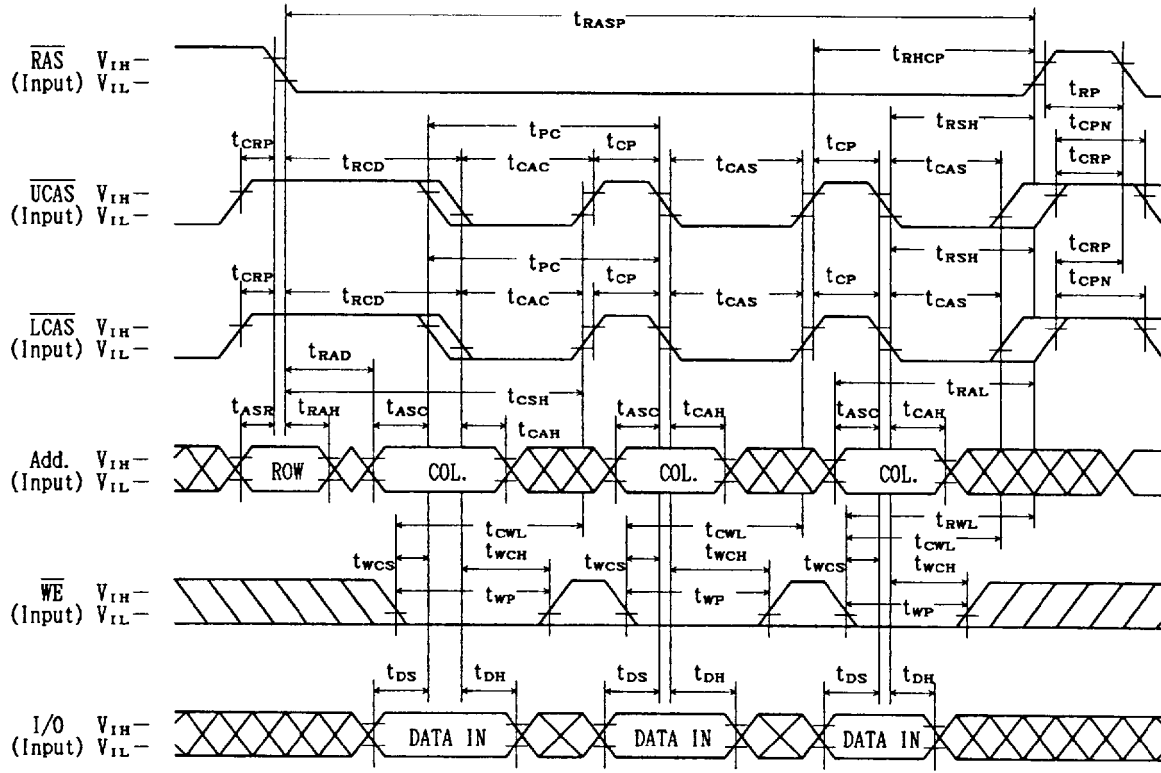
$\mu$ PD42S16160L, 42S17160L, 42S18160L

FAST PAGE MODE LOWER BYTE READ CYCLE



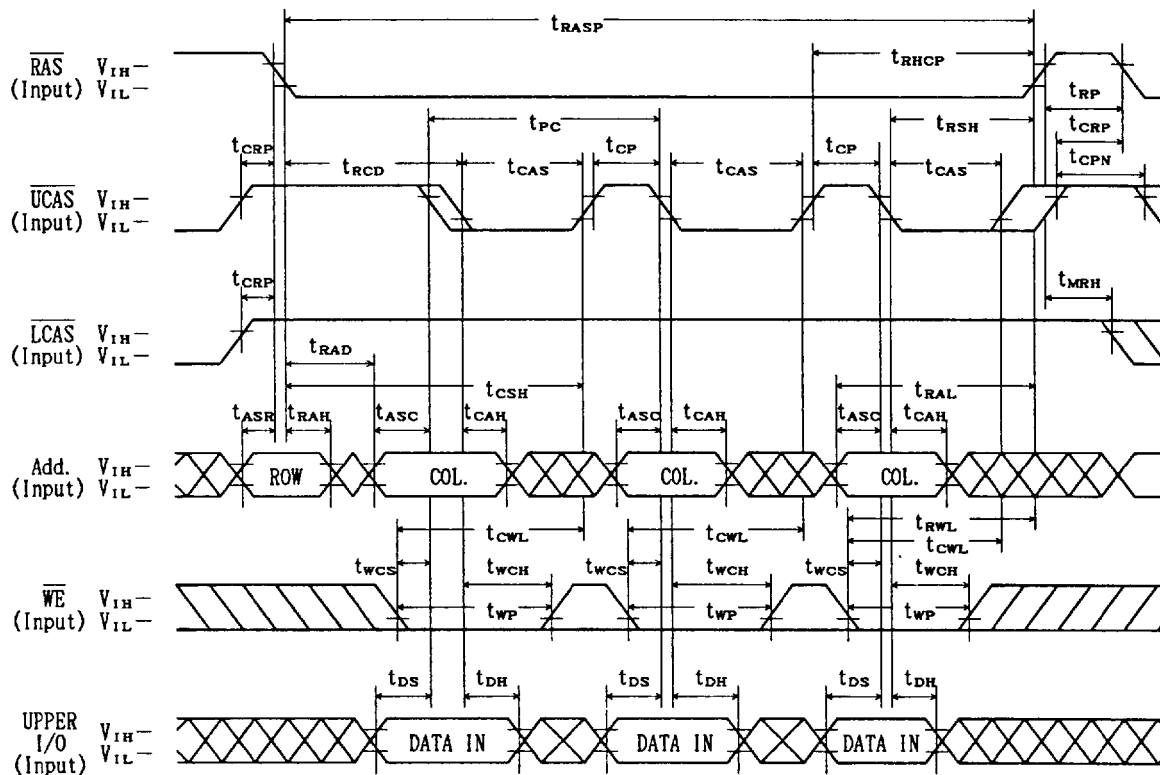
$\mu$ PD42S16160L, 42S17160L, 42S18160L

FAST PAGE MODE EARLY WRITE CYCLE



Note:  $\overline{OE}$ =Don't care

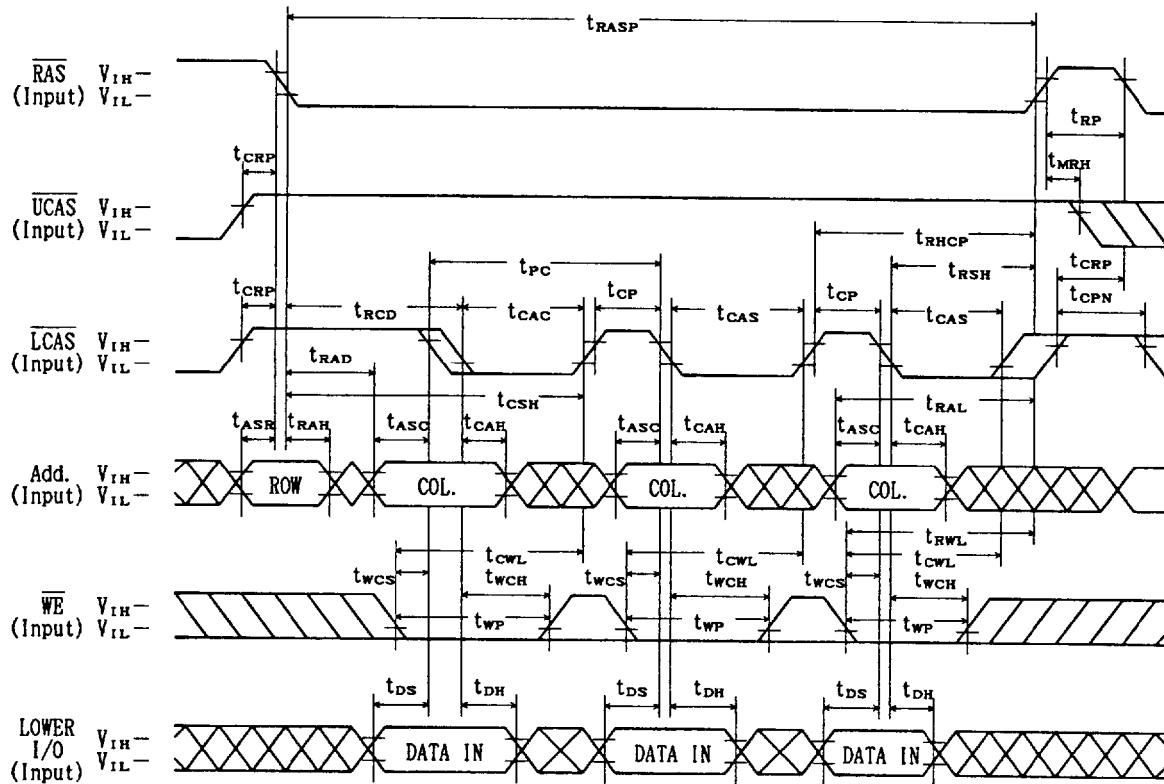
FAST PAGE MODE UPPER BYTE EARLY WRITE CYCLE



Note:  $\overline{OE}$ , LOWER I/O=Don't care

$\mu$ PD42S16160L,42S17160L,42S18160L

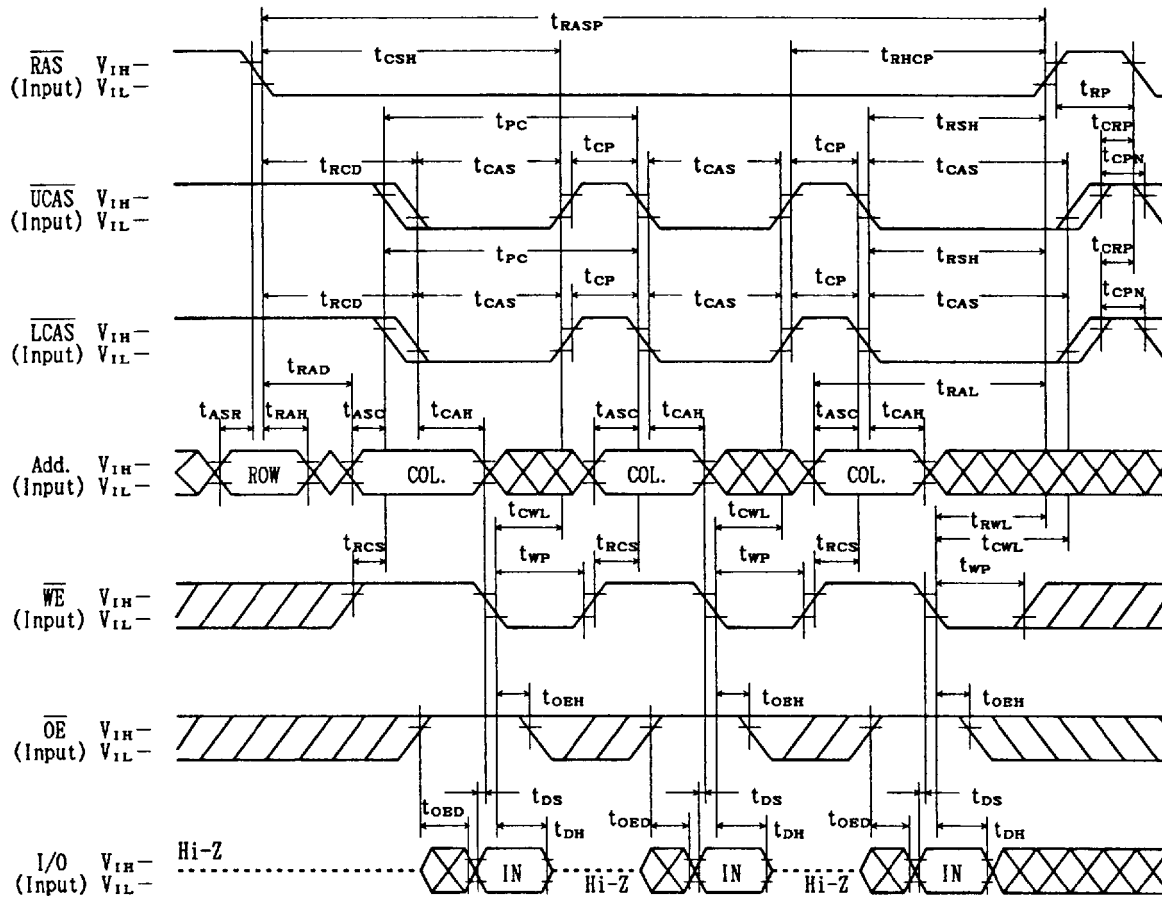
FAST PAGE MODE LOWER BYTE EARLY WRITE CYCLE



Note:  $\overline{OE}$ , UPPER I/O=Don't care

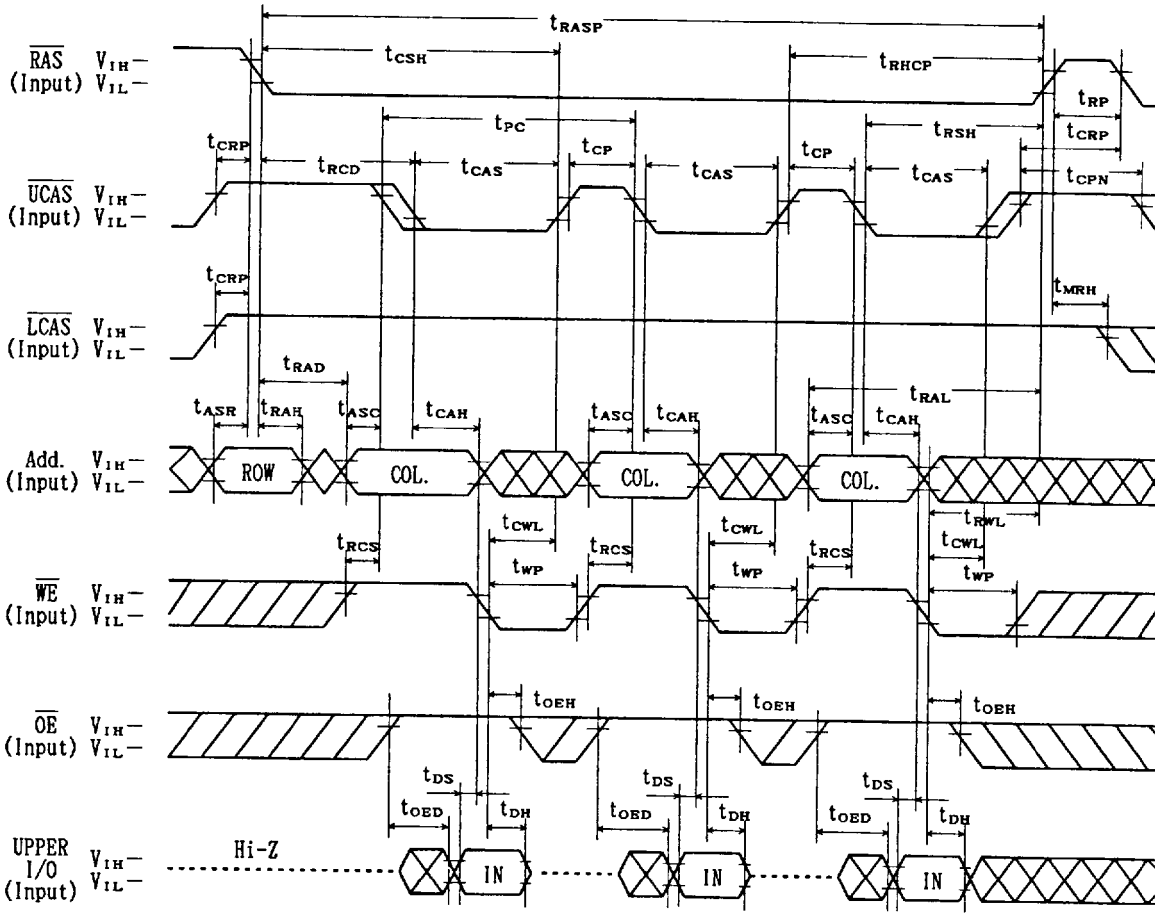


FAST PAGE MODE LATE WRITE CYCLE



$\mu$ PD42S16160L, 42S17160L, 42S18160L

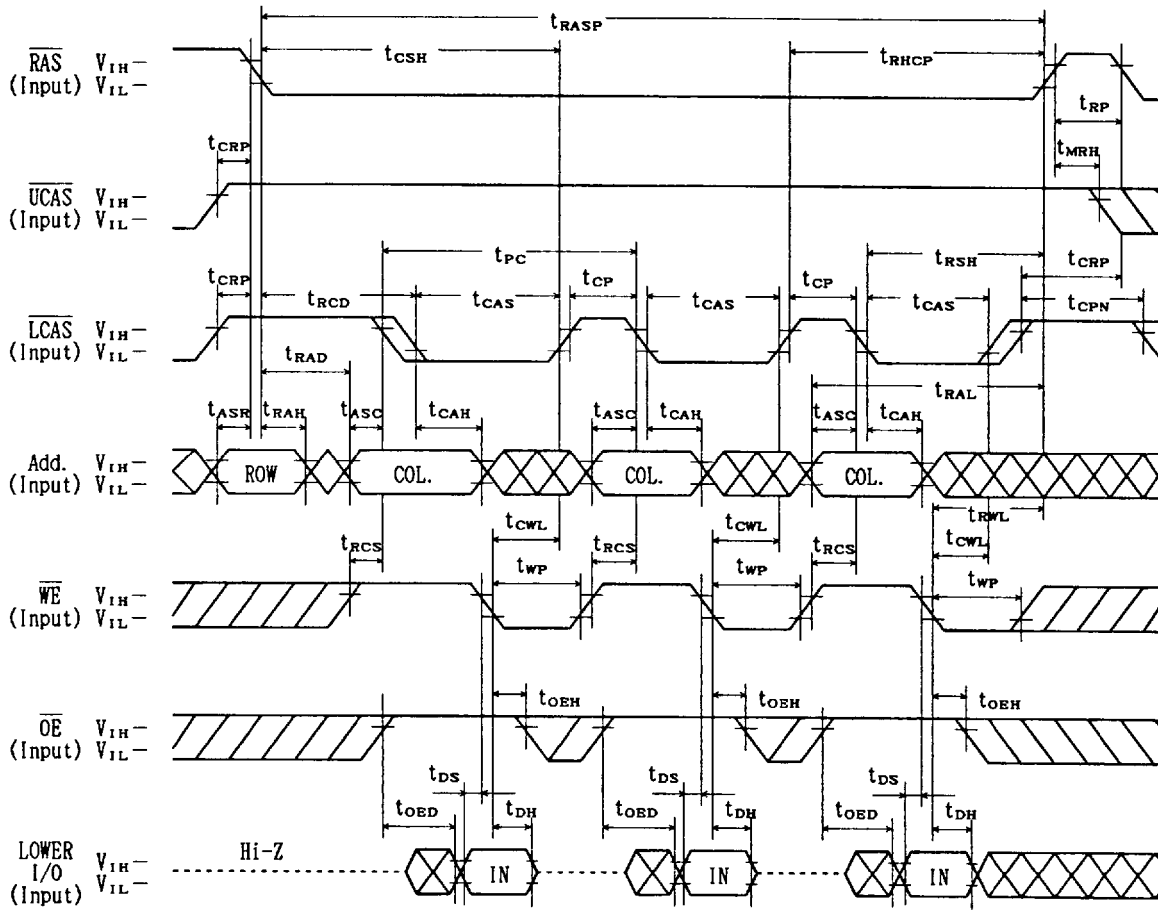
FAST PAGE MODE UPPER BYTE LATE WRITE CYCLE



Note: LOWER I/O=Don't care

$\mu$ PD42S16160L, 42S17160L, 42S18160L

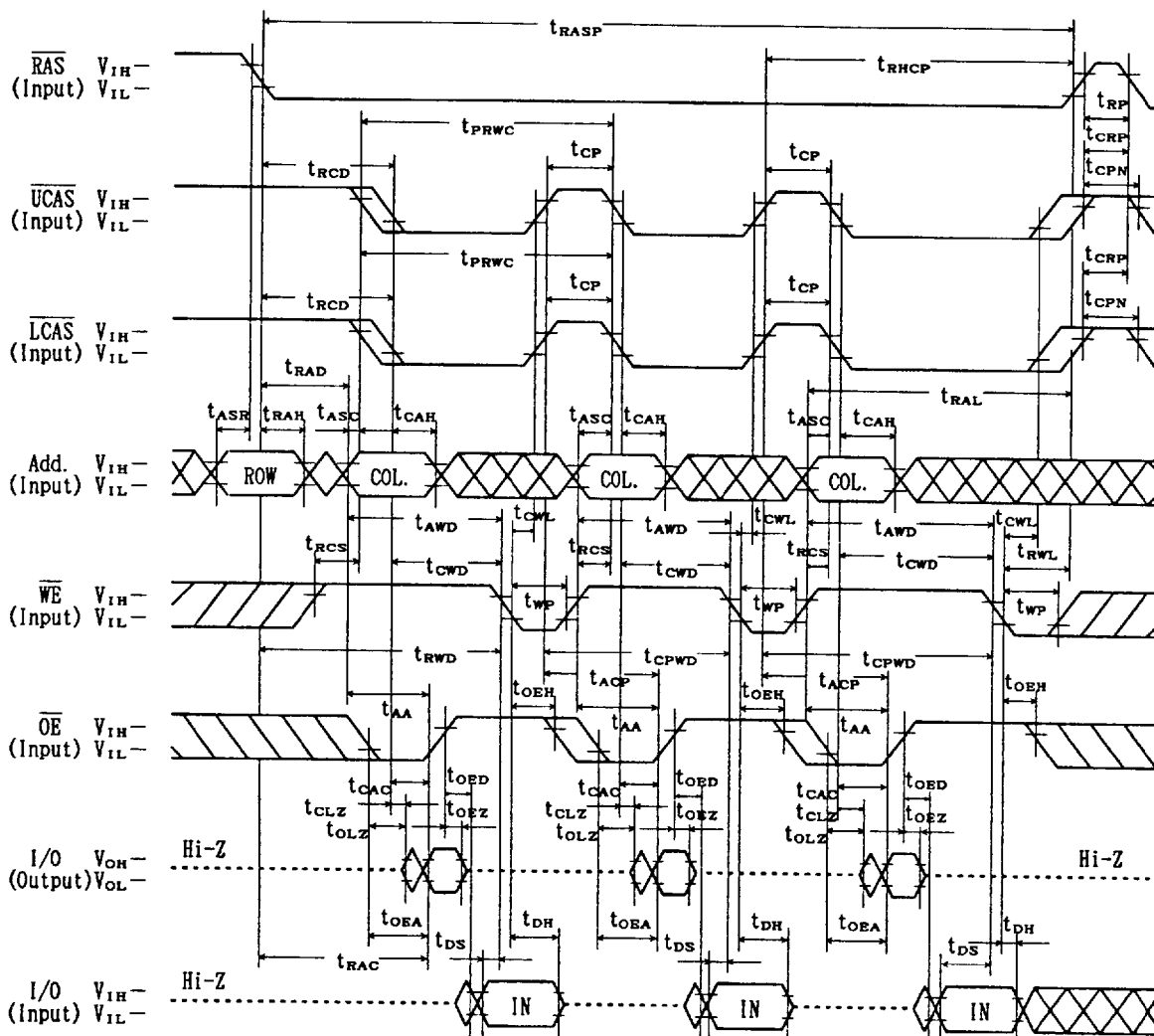
FAST PAGE MODE LOWER BYTE LATE WRITE CYCLE



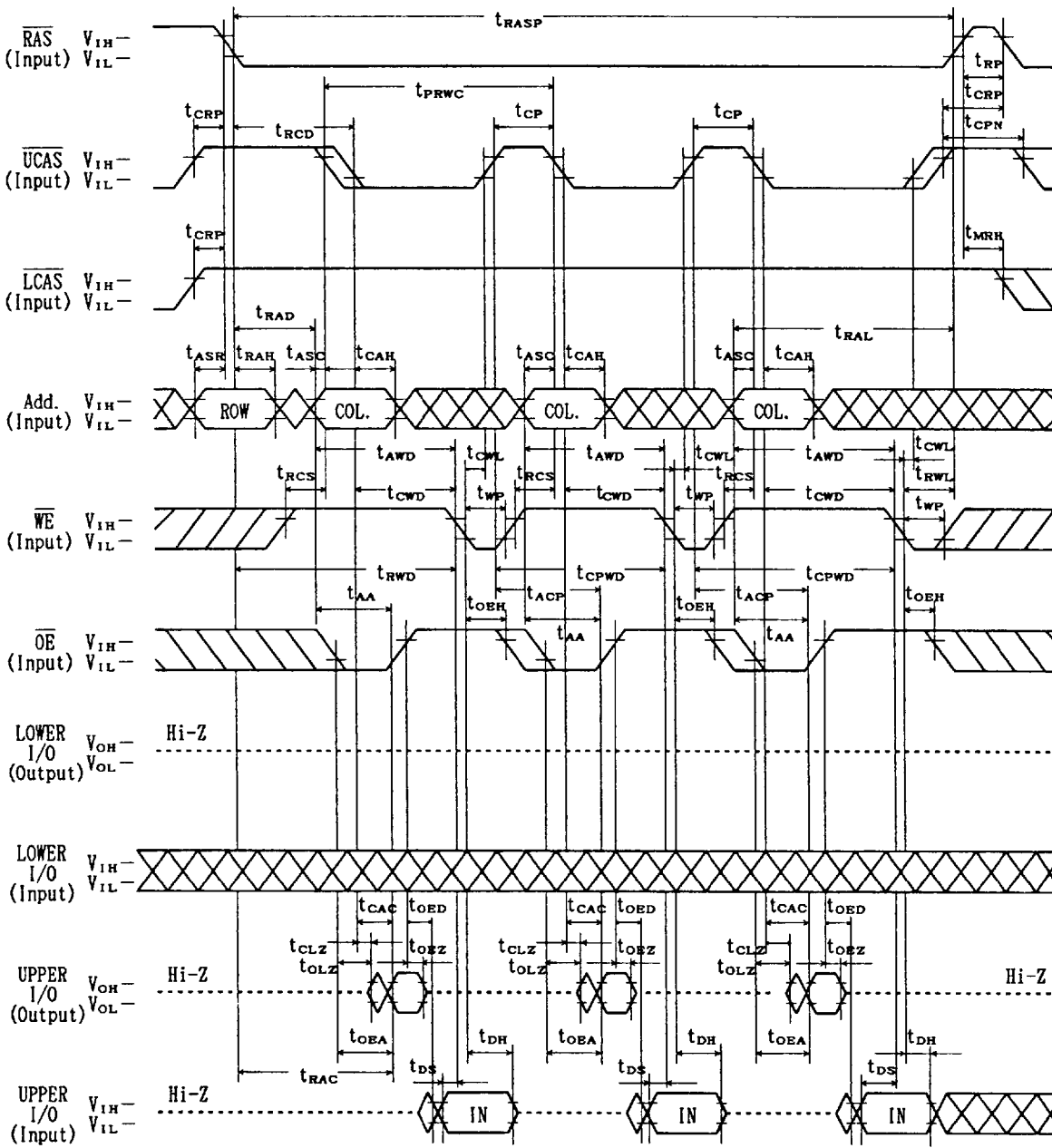
Note: UPPER I/O=Don't care

μPD42S16160L, 42S17160L, 42S18160L

FAST PAGE MODE READ MODIFY WRITE CYCLE

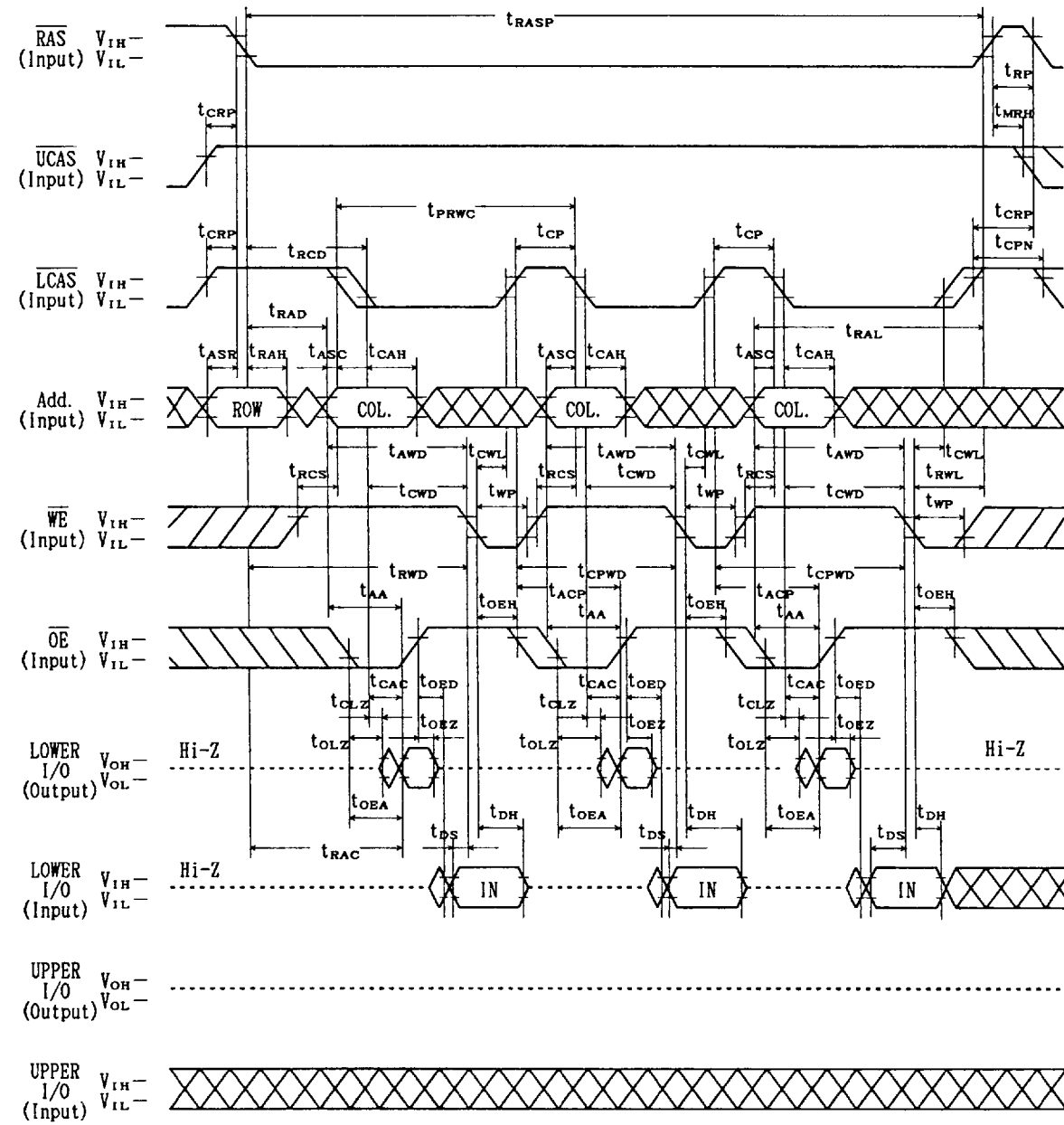


FAST PAGE MODE UPPER BYTE READ MODIFY WRITE CYCLE



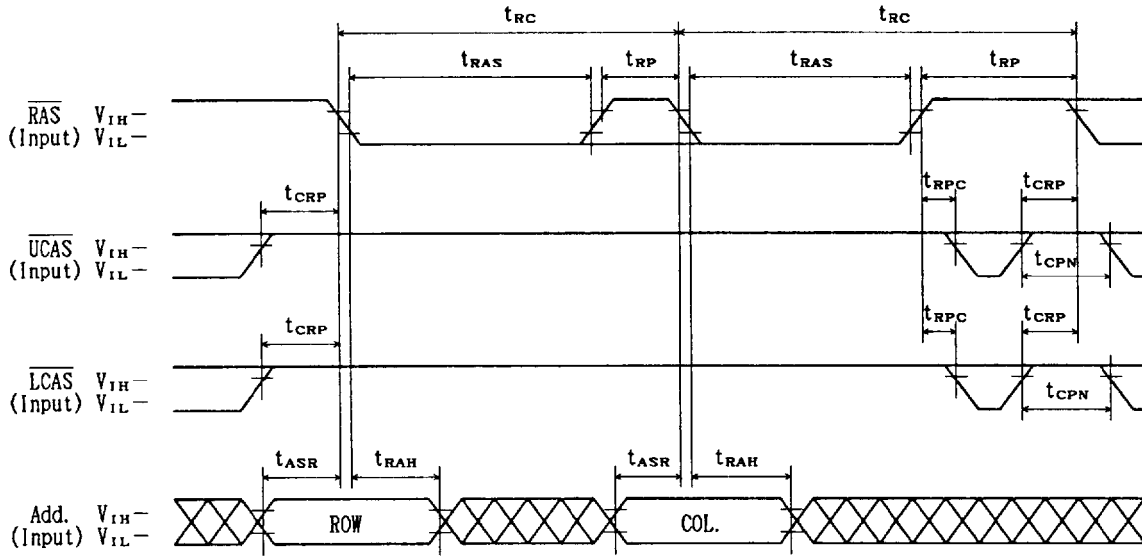
$\mu$ PD42S16160L,42S17160L,42S18160L

FAST PAGE MODE LOWER BYTE READ MODIFY WRITE CYCLE



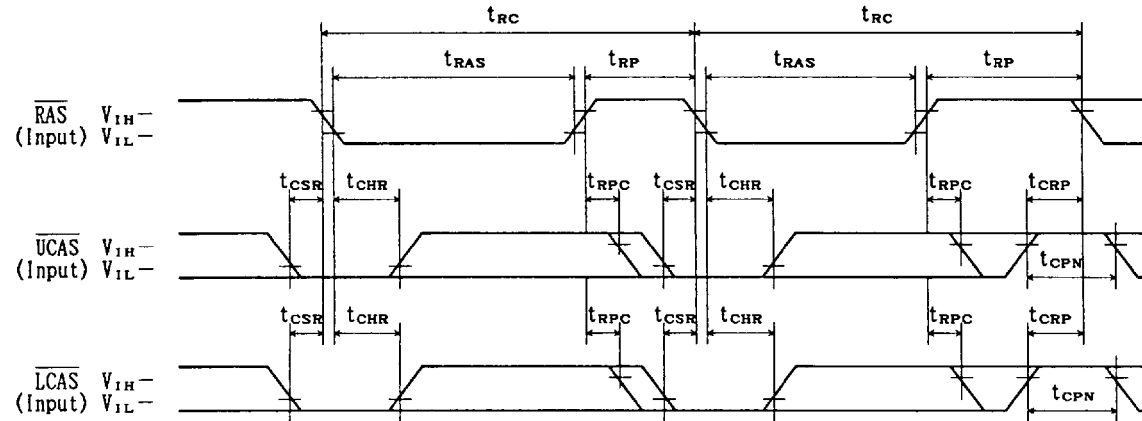
$\mu$ PD42S16160L, 42S17160L, 42S18160L

RAS ONLY REFRESH CYCLE



Note:  $\overline{WE}, \overline{OE}$ =Don't care  
I/O=Hi-Z

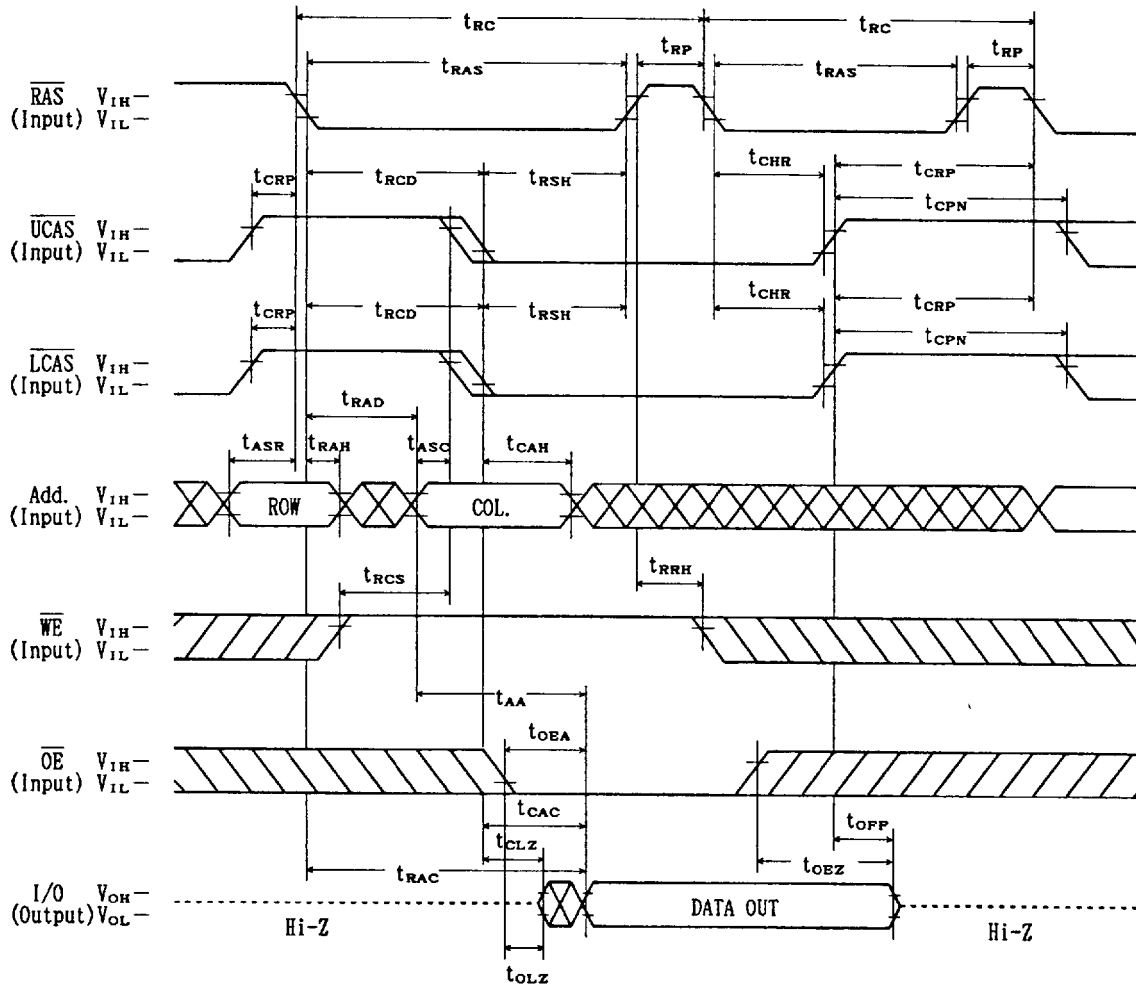
CAS BEFORE RAS REFRESH CYCLE



Note:  $\overline{WE}, \overline{OE}$ =Don't care  
Add.=Don't care  
I/O=Hi-Z

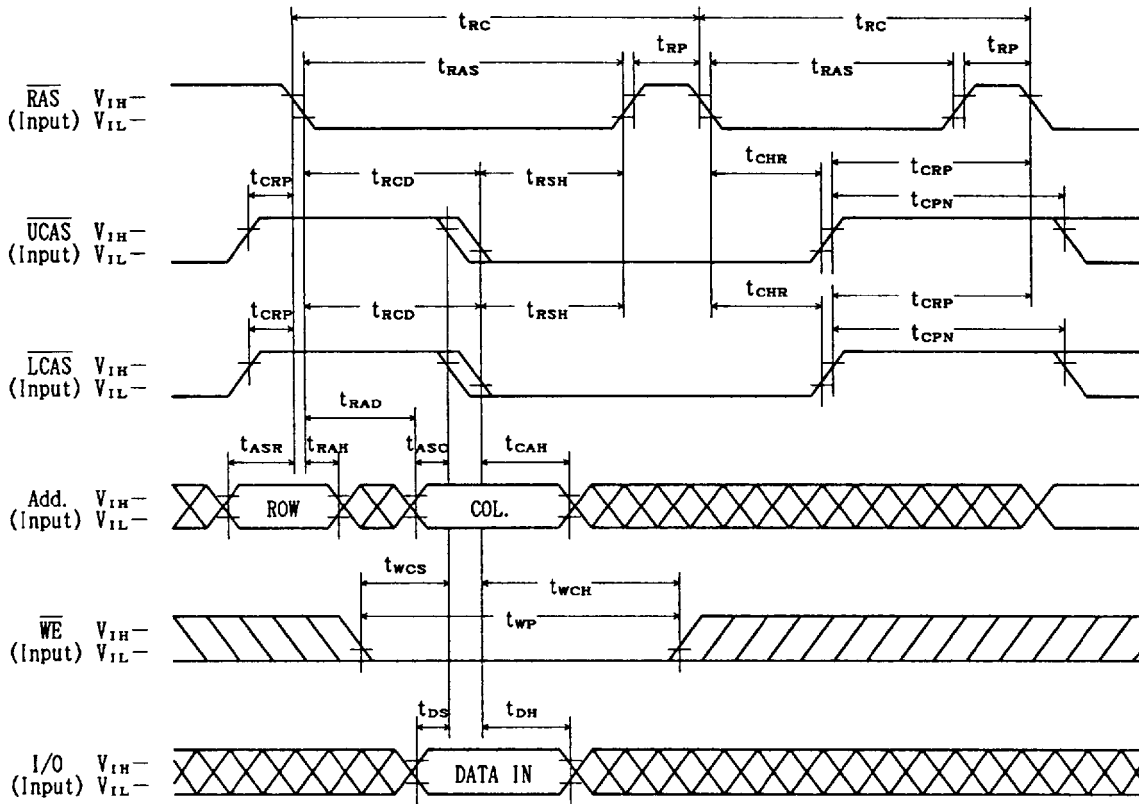
$\mu$ PD42S16160L, 42S17160L, 42S18160L

HIDDEN REFRESH CYCLE (READ)





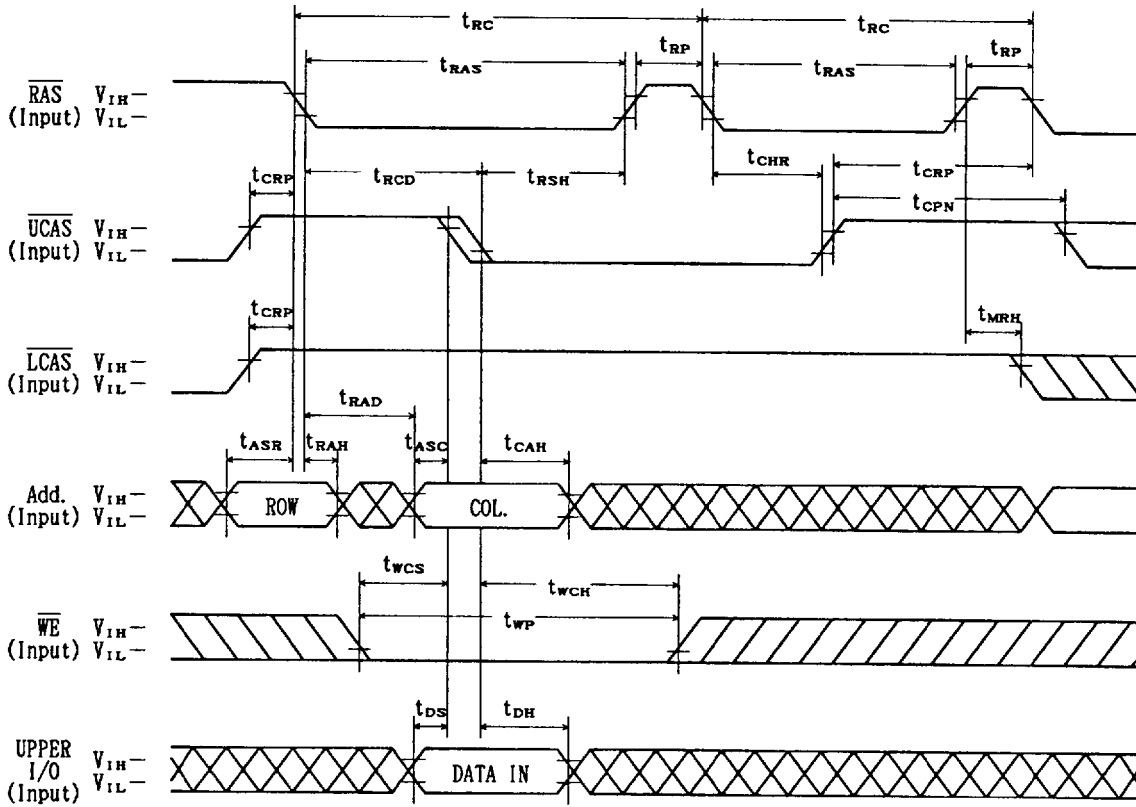
HIDDEN REFRESH CYCLE (WRITE)



Note:  $\overline{OE}$ =Don't care

$\mu$ PD42S16160L, 42S17160L, 42S18160L

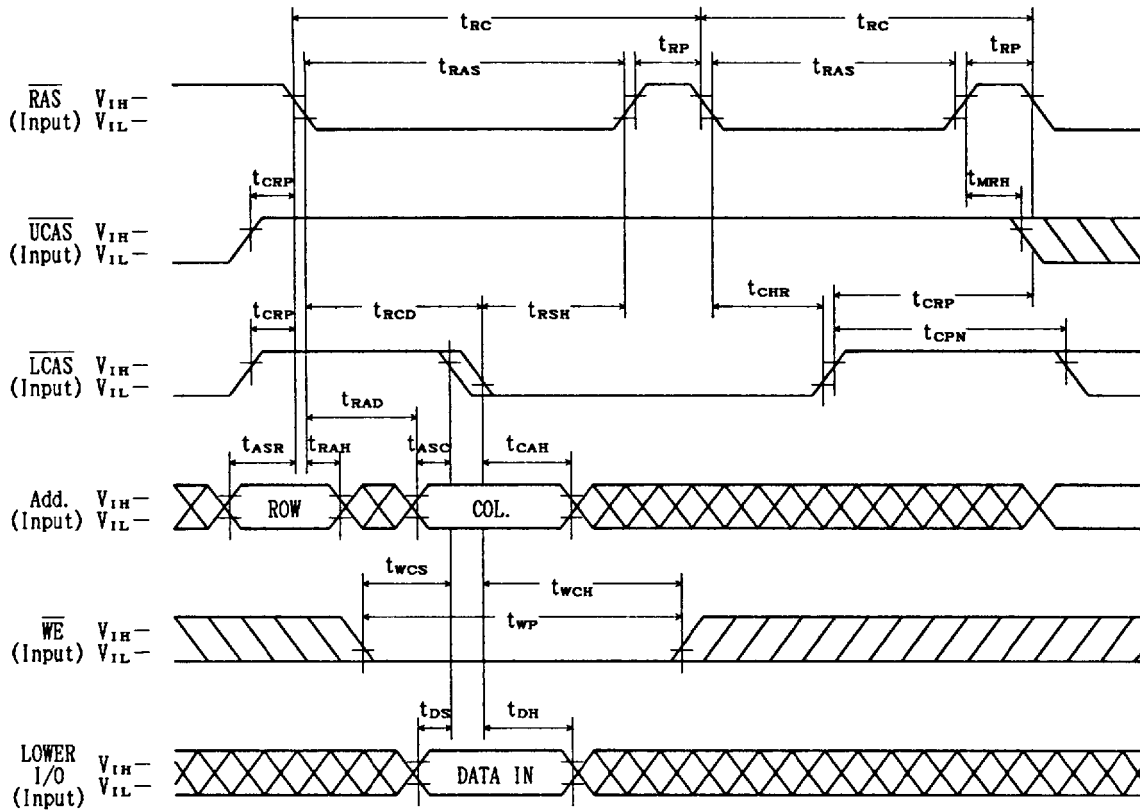
HIDDEN REFRESH CYCLE (UPPER BYTE WRITE)



Note:  $\overline{OE}$ , LOWER I/O=Don't care

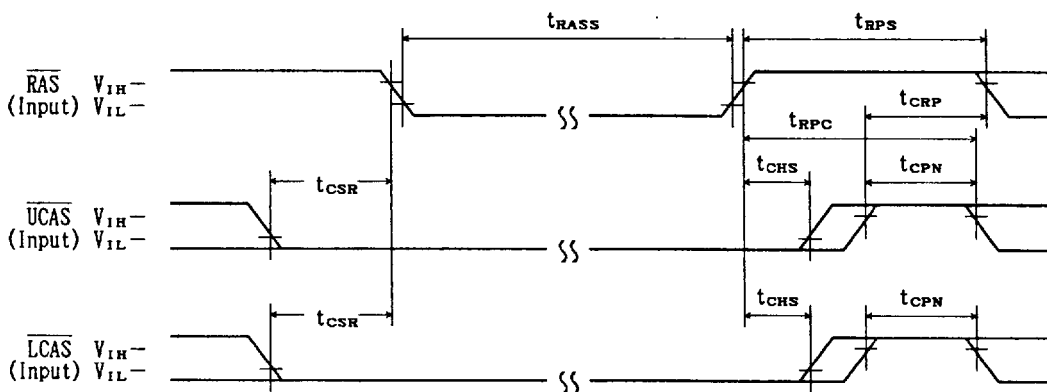
μPD42S16160L, 42S17160L, 42S18160L

HIDDEN REFRESH CYCLE (LOWER BYTE WRITE)



Note:  $\overline{OE}$ , UPPER I/O=Don't care

CAS BEFORE RAS SELF REFRESH CYCLE



Note:  $\overline{WE}$ ,  $\overline{OE}$ =Don't care  
I/O=Hi-Z

### 3. PACKAGE DRAWINGS

26 PIN PLASTIC SOJ (300mil)	24 Leads	495
28 PIN PLASTIC SOJ (400mil)	24 Leads	496
28 PIN PLASTIC SOJ (400mil)	28 Leads	497
32 PIN PLASTIC SOJ (400mil)		498
42 PIN PLASTIC SOJ (400mil)		499
26 PIN PLASTIC TSOP (300mil) *	24 Leads	500
26 PIN PLASTIC TSOP (300mil) *	24 Leads Reverse bent	501
28 PIN PLASTIC TSOP (400mil)	24 Leads	502
28 PIN PLASTIC TSOP (400mil)	24 Leads Reverse bent	503
28 PIN PLASTIC TSOP (400mil)	28 Leads	504
28 PIN PLASTIC TSOP (400mil)	28 Leads Reverse bent	505
32 PIN PLASTIC TSOP (400mil)		506
32 PIN PLASTIC TSOP (400mil)	Reverse bent	507
50 PIN PLASTIC TSOP (400mil)	44 Leads	508
50 PIN PLASTIC TSOP (400mil)	44 Leads Reverse bent	509
24 PIN PLASTIC ZIP (475mil)		510
28 PIN PLASTIC ZIP (475mil)		511
32 PIN PLASTIC ZIP (475mil)		512

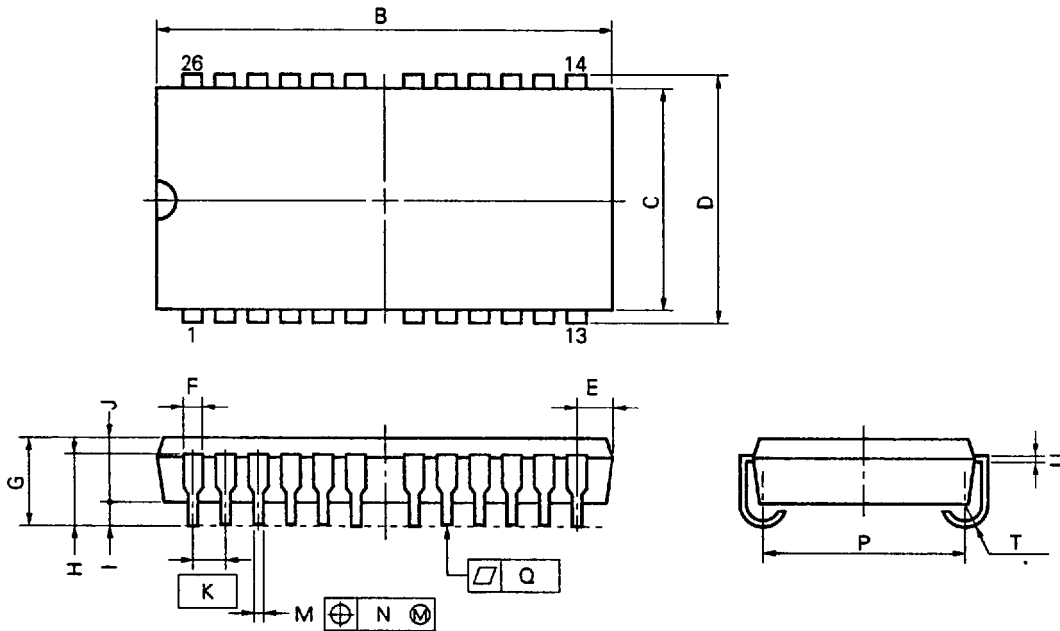
\* : under development

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494

26 PIN PLASTIC SOJ (300mil)  
24 Leads

NEC Cord:S26LA-300A



S26LA-300A

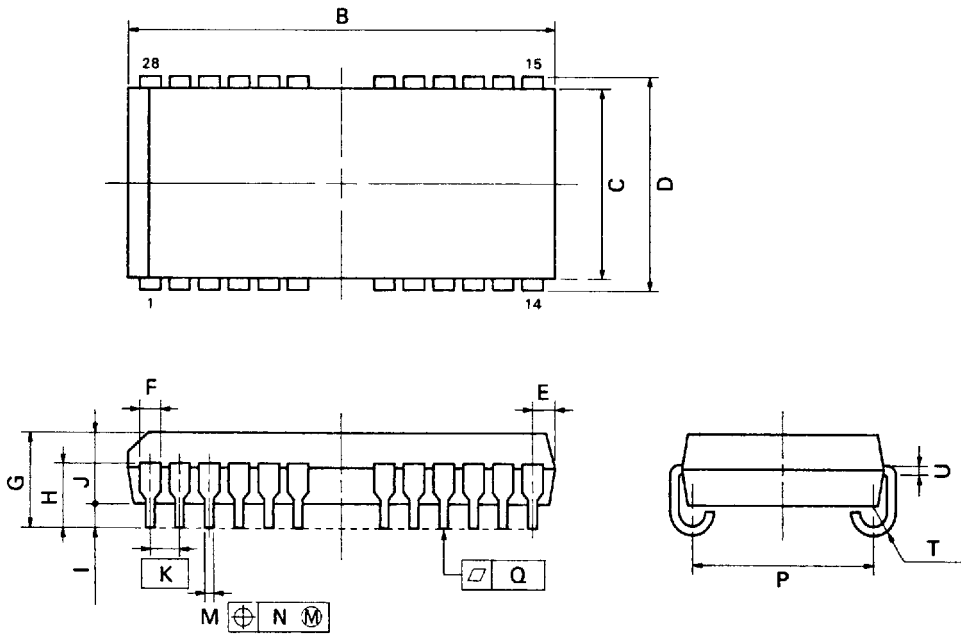
**NOTE**

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	17.1 <sup>+0.25</sup> <sub>-0.05</sub>	0.673 <sup>+0.010</sup> <sub>-0.002</sub>
C	7.62	0.300
D	8.47±0.2	0.333 <sup>+0.009</sup> <sub>-0.008</sub>
E	1.03±0.15	0.041 <sup>+0.006</sup> <sub>-0.007</sub>
F	0.74	0.029
G	3.5±0.2	0.138±0.008
H	2.545±0.2	0.100±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±0.10	0.016 <sup>+0.004</sup> <sub>-0.005</sub>
N	0.12	0.005
P	6.73±0.20	0.265±0.008
Q	0.10	0.004
T	R 0.85	R 0.033
U	0.20 <sup>+0.10</sup> <sub>-0.05</sub>	0.008 <sup>+0.004</sup> <sub>-0.002</sub>

28 PIN PLASTIC SOJ (400mil)  
24 Leads

NEC Cord:P28LE-400A



P28LE-400A

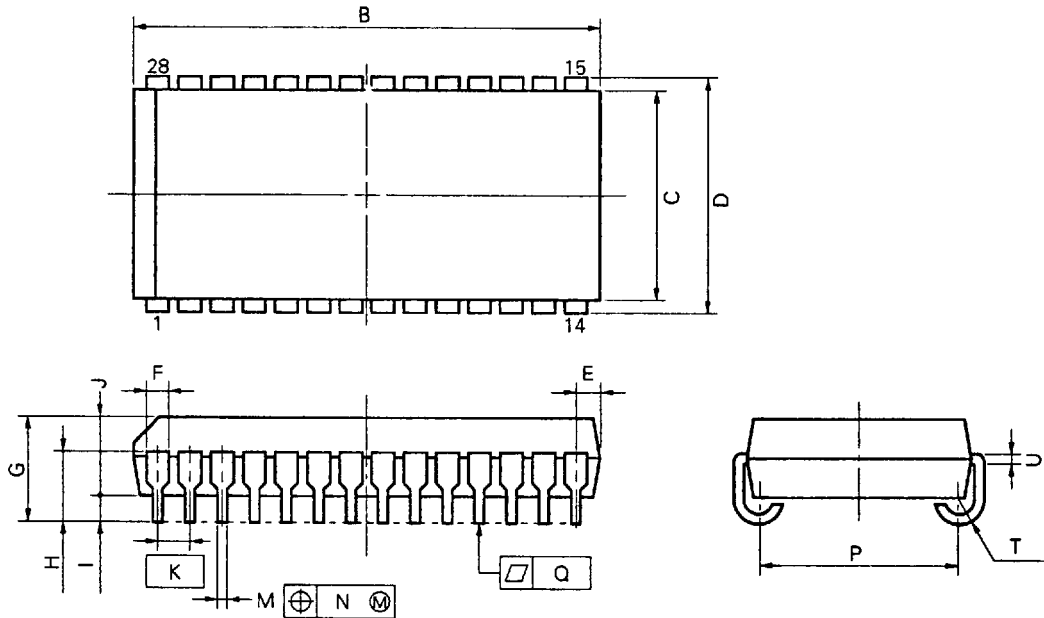
**NOTE**

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 <sup>+0.2</sup> / <sub>-0.35</sub>	0.735 <sup>+0.008</sup> / <sub>-0.013</sub>
C	10.16	0.400
D	11.18 <sup>±0.2</sup>	0.440 <sup>-0.008</sup> / <sub>-0.009</sub>
E	1.08 <sup>-0.15</sup>	0.043 <sup>-0.006</sup> / <sub>-0.007</sub>
F	0.7	0.028
G	3.5 <sup>±0.2</sup>	0.138 <sup>-0.008</sup> / <sub>-0.007</sub>
H	2.4 <sup>±0.2</sup>	0.094 <sup>-0.008</sup> / <sub>-0.008</sub>
I	0.8 MIN	0.031 MIN.
J	2.6	0.102
K	1.27 (T.P.)	0.050 (T.P.)
M	0.40 <sup>±0.10</sup>	0.016 <sup>-0.004</sup> / <sub>-0.005</sub>
N	0.12	0.005
P	9.40 <sup>-0.20</sup>	0.370 <sup>-0.008</sup> / <sub>-0.007</sub>
Q	0.15	0.006
T	R0.85	R0.033
U	0.20 <sup>-0.10</sup> / <sub>-0.09</sub>	0.008 <sup>-0.002</sup> / <sub>-0.002</sub>

28 PIN PLASTIC SOJ (400mil)  
28 Leads

NEC Cord:P28LE-400A1



**NOTE**

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

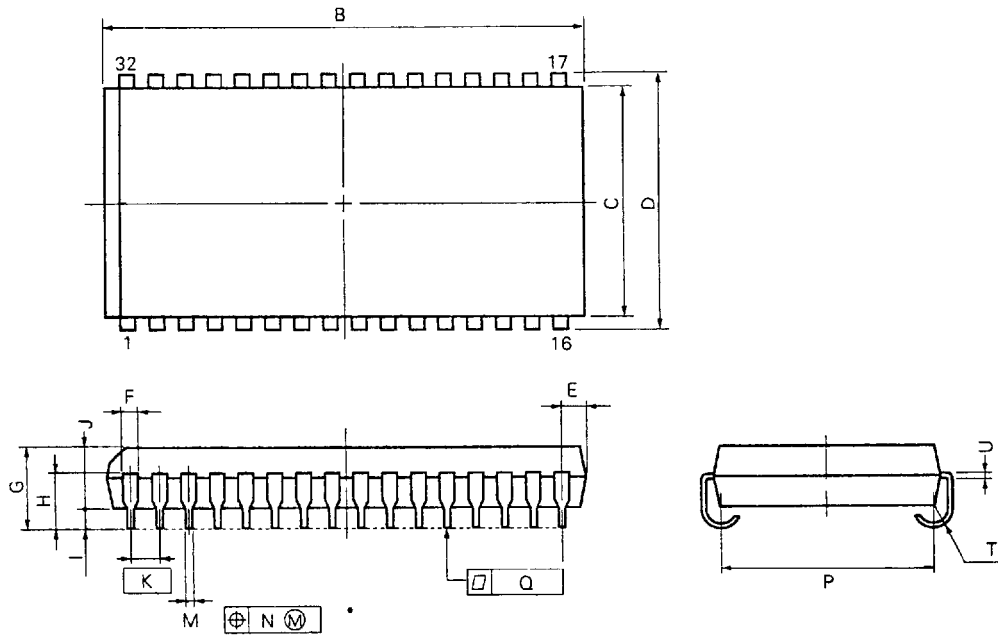
P28LE-400A1

ITEM	MILLIMETERS	INCHES
B	18.67 <sup>+0.2</sup> <sub>-0.35</sub>	0.735 <sup>+0.008</sup> <sub>-0.013</sub>
C	10.16	0.400
D	11.18±0.2	0.440 <sup>+0.008</sup> <sub>-0.007</sub>
E	1.08±0.15	0.043 <sup>+0.006</sup> <sub>-0.007</sub>
F	0.74	0.029
G	3.5±0.2	0.138 <sup>+0.008</sup> <sub>-0.007</sub>
H	2.545±0.2	0.100±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±0.10	0.016 <sup>+0.004</sup> <sub>-0.005</sub>
N	0.12	0.005
P	9.40±0.20	0.370 <sup>+0.008</sup> <sub>-0.007</sub>
Q	0.10	0.004
T	R 0.85	R 0.033
U	0.20 <sup>+0.10</sup> <sub>-0.05</sub>	0.008 <sup>+0.004</sup> <sub>-0.002</sub>



32 PIN PLASTIC SOJ (400mil)

NEC Cord:P32LE-400A



**NOTE**

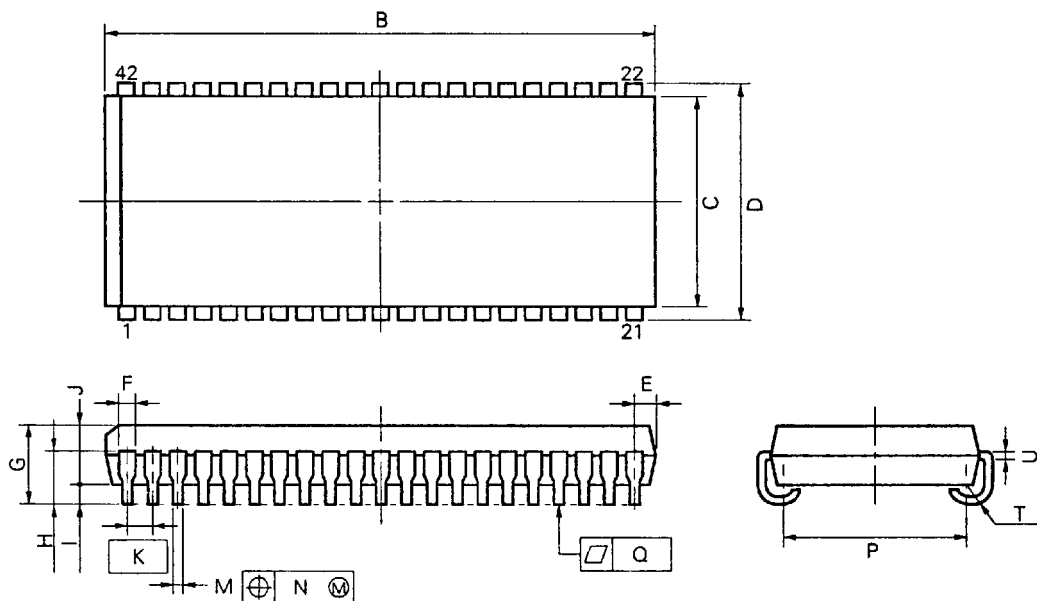
Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition

P32LE-400A

ITEM	MILLIMETERS	INCHES
B	21.06±0.2	0.829±0.008
C	10.16	0.400
D	11.18±0.2	0.440±0.008
E	1.005±0.1	0.040 <sup>+0.004</sup> / <sub>-0.005</sub>
F	0.74	0.029
G	3.5±0.2	0.138±0.008
H	2.545±0.2	0.100±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±0.10	0.016 <sup>+0.004</sup> / <sub>-0.005</sub>
N	0.12	0.005
P	9.4±0.20	0.370±0.008
Q	0.1	0.004
T	R 0.85	R 0.033
U	0.20 <sup>+0.10</sup> / <sub>-0.02</sub>	0.008 <sup>+0.004</sup> / <sub>-0.002</sub>

42 PIN PLASTIC SOJ (400mil)

NEC Cord:P42LE-400A



**NOTE**

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

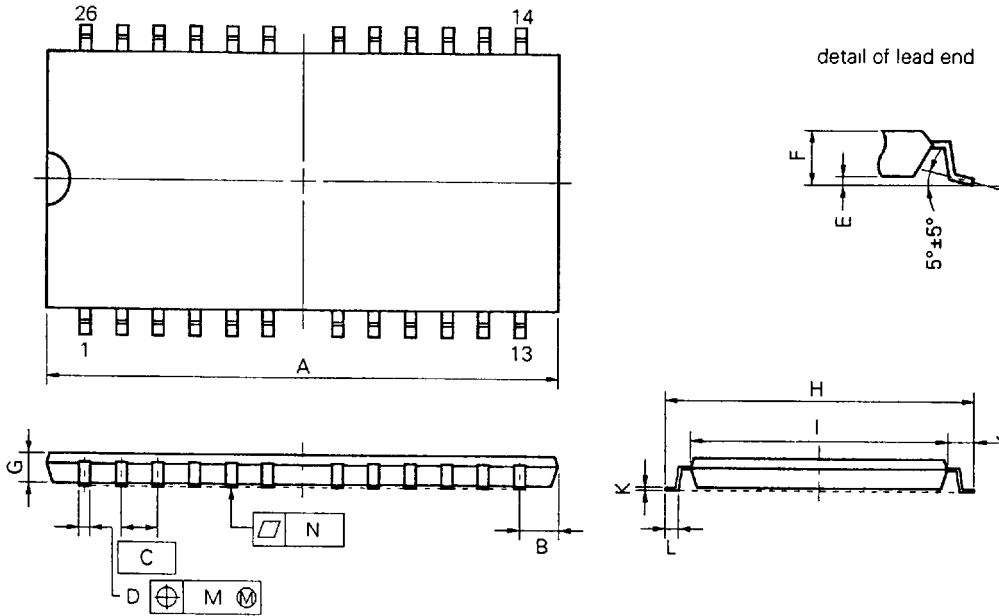
P42LE-400A

ITEM	MILLIMETERS	INCHES
B	27.56 <sup>+0.2</sup> <sub>-0.35</sub>	1.085 <sup>+0.008</sup> <sub>-0.014</sub>
C	10.16	0.400
D	11.18±0.2	0.440±0.008
E	1.08±0.15	0.043 <sup>+0.006</sup> <sub>-0.007</sub>
F	0.74	0.029
G	3.5±0.2	0.138±0.008
H	2.545±0.2	0.100±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±0.10	0.016 <sup>+0.004</sup> <sub>-0.005</sub>
N	0.12	0.005
P	9.4±0.20	0.370±0.008
Q	0.10	0.004
T	R 0.85	R 0.033
U	0.20 <sup>+0.10</sup> <sub>-0.05</sub>	0.008 <sup>+0.004</sup> <sub>-0.002</sub>

26 PIN PLASTIC TSOP (300mil) \*  
24 Leads

\* : under development

NEC Cord:S26G3-50-7JD



**NOTE**

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

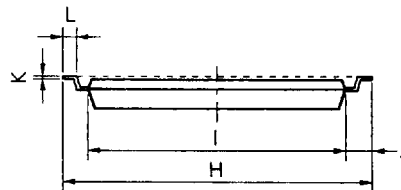
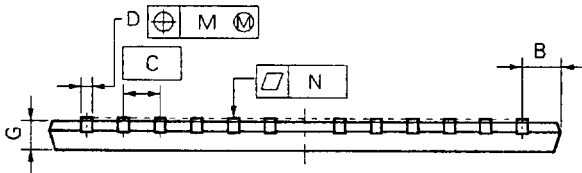
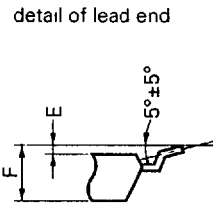
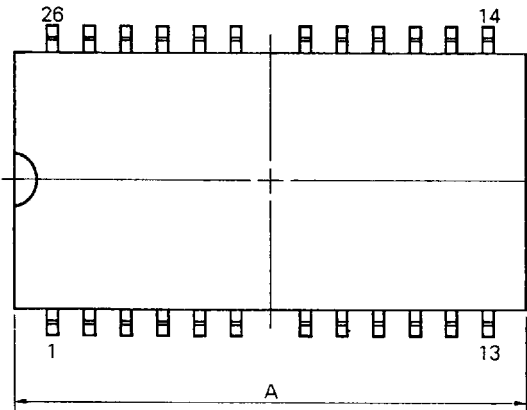
S26G3-50-7JD

ITEM	MILLIMETERS	INCHES
A	17.40 MAX.	0.685 MAX.
B	1.06 MAX.	0.042 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	0.40±0.10	0.016 <sup>+0.004</sup> / <sub>-0.005</sub>
E	0.05±0.05	0.002±0.002
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
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 <sup>+0.009</sup> / <sub>-0.008</sub>
K	0.125 <sup>+0.10</sup> / <sub>-0.05</sub>	0.005 <sup>+0.004</sup> / <sub>-0.002</sub>
L	0.5±0.1	0.020 <sup>+0.004</sup> / <sub>-0.005</sub>
M	0.21	0.009
N	0.10	0.004

26 PIN PLASTIC TSOP (300mil) \*  
24 Leads Reverse bent

\* : under development

NEC Cord:S26G3-50-7KD



S26G3-50-7KD

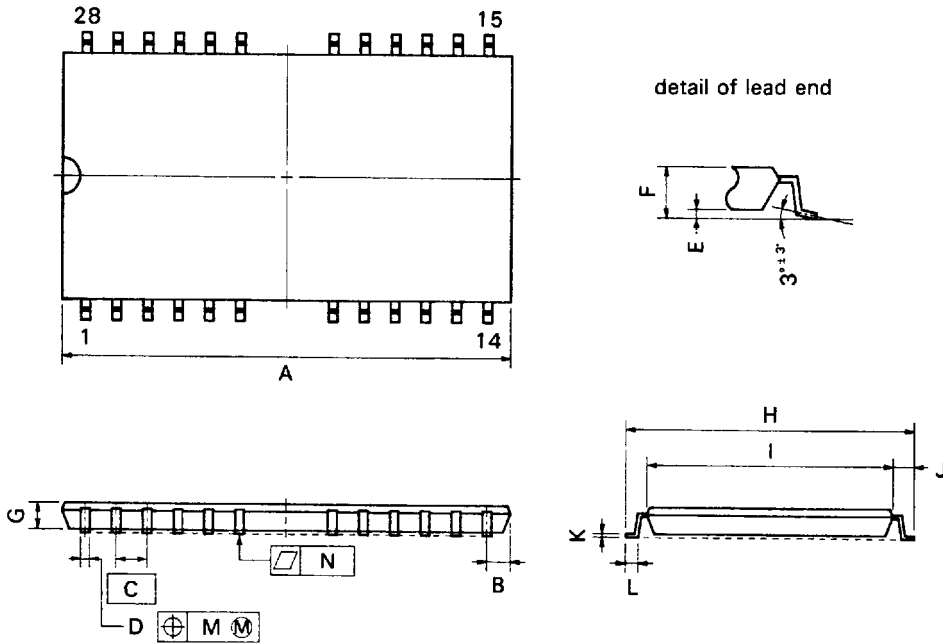
**NOTE**

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	17.40 MAX.	0.685 MAX.
B	1.06 MAX.	0.042 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	0.40 ± 0.10	0.016 <sup>+0.004</sup> / <sub>-0.005</sub>
E	0.05 ± 0.05	0.002 ± 0.002
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
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 <sup>+0.009</sup> / <sub>-0.008</sub>
K	0.125 <sup>+0.10</sup> / <sub>-0.05</sub>	0.005 <sup>+0.004</sup> / <sub>-0.002</sub>
L	0.5 ± 0.1	0.020 <sup>+0.004</sup> / <sub>-0.005</sub>
M	0.21	0.009
N	0.10	0.004

28 PIN PLASTIC TSOP (400mil)  
24 Leads

NEC Cord:S28G5-50-7JD1



S28G5-50-7JD1

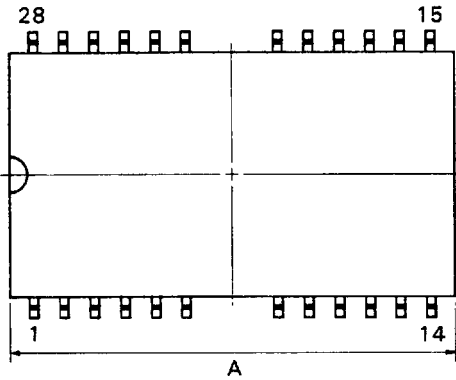
**NOTE**

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

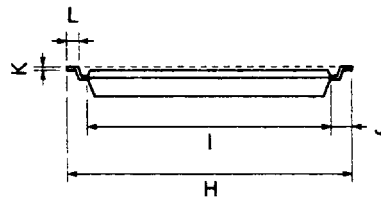
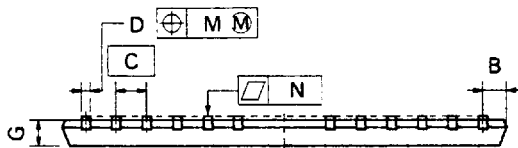
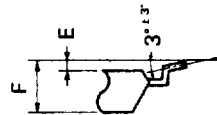
ITEM	MILLIMETERS	INCHES
A	18.81 MAX.	0.741 MAX.
B	1.15 MAX.	0.046 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	0.40 <sup>+0.10</sup>	0.016 <sup>+0.004</sup> <sub>-0.005</sub>
E	0.05 <sup>+0.05</sup>	0.002 <sup>+0.002</sup>
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
H	11.76 <sup>+0.2</sup>	0.463 <sup>+0.008</sup>
I	10.16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

28 PIN PLASTIC TSOP (400mil)  
24 Leads Reverse bent

NEC Cord:S28G5-50-7KD1



detail of lead end



S28G5-50-7KD1

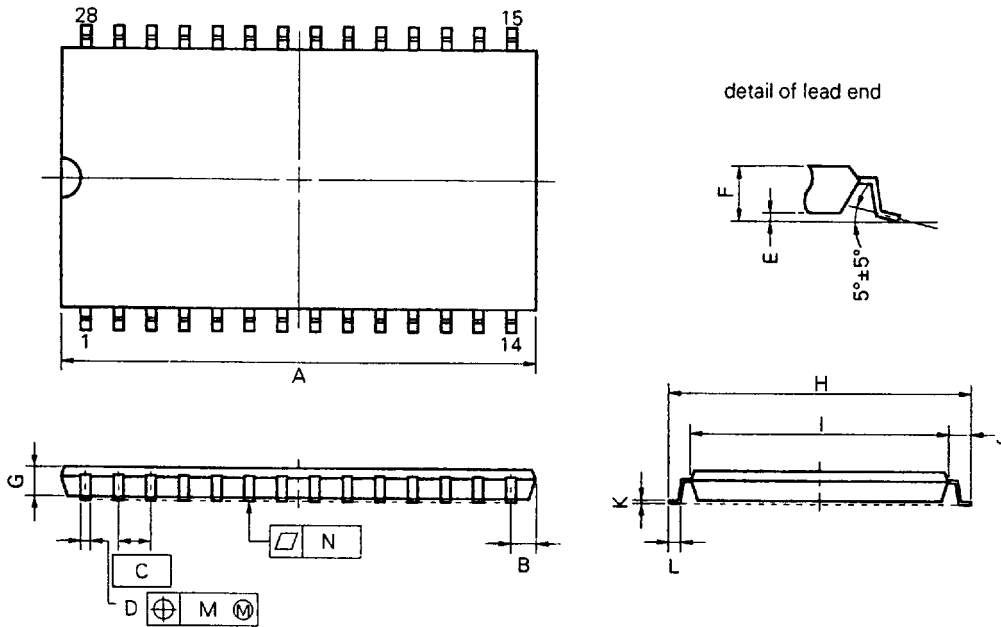
**NOTE**

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 <sup>+0.10</sup>	0.016 <sup>-0.004</sup> <sub>-0.005</sub>
E	0.05 <sup>+0.05</sup>	0.002 <sup>+0.002</sup>
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
H	11.76 <sup>+0.2</sup>	0.463 <sup>+0.008</sup>
I	10.16 <sup>+0.1</sup>	0.400 <sup>+0.004</sup>
J	0.8 <sup>+0.2</sup>	0.031 <sup>-0.008</sup> <sub>-0.008</sub>
K	0.125 <sup>-0.02</sup> <sub>-0.02</sub>	0.005 <sup>-0.004</sup> <sub>-0.002</sub>
L	0.5 <sup>+0.1</sup>	0.020 <sup>-0.004</sup> <sub>-0.004</sub>
M	0.21	0.009
N	0.10	0.004

28 PIN PLASTIC TSOP (400mil)  
28 Leads

NEC Cord:S28G5-50-7JD2



**NOTE**

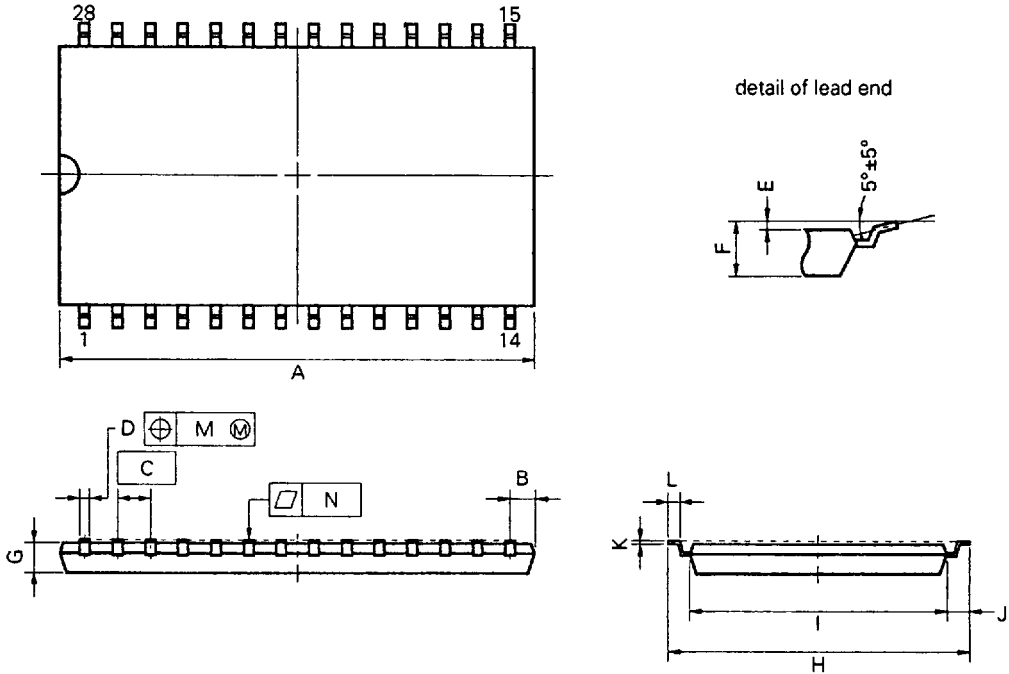
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

S28G5-50-7JD2

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 <sup>+0.004</sup> <sub>-0.005</sub>
E	0.05±0.05	0.002±0.002
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
H	11.76±0.2	0.463±0.008
I	10.16±0.1	0.400±0.004
J	0.8±0.2	0.031 <sup>+0.009</sup> <sub>-0.008</sub>
K	0.125 <sup>+0.10</sup> <sub>-0.05</sub>	0.005 <sup>+0.004</sup> <sub>-0.002</sub>
L	0.5±0.15	0.020 <sup>+0.006</sup> <sub>-0.007</sub>
M	0.21	0.009
N	0.10	0.004

28 PIN PLASTIC TSOP (400mil)  
28 Leads Reverse bent

NEC Cord:S28G5-50-7KD2



**NOTE**

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

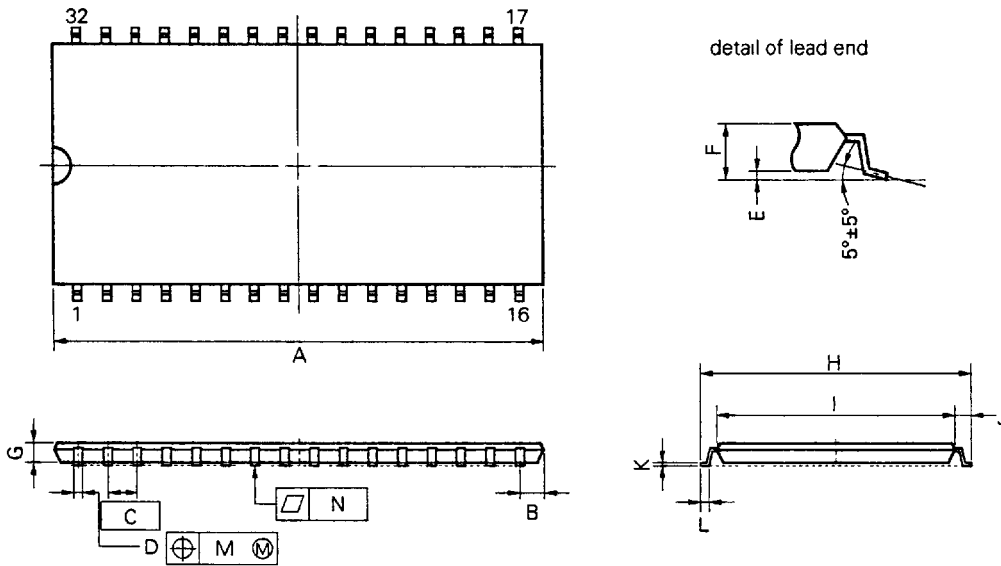
S28G5-50-7KD2

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 <sup>-0.004</sup> / <sub>-0.005</sub>
E	0.05±0.05	0.002±0.002
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
H	11.76±0.2	0.463±0.008
I	10.16±0.1	0.400±0.004
J	0.8±0.2	0.031 <sup>-0.009</sup> / <sub>-0.008</sub>
K	0.125 <sup>-0.10</sup> / <sub>-0.05</sub>	0.005 <sup>-0.004</sup> / <sub>-0.002</sub>
L	0.5±0.15	0.020 <sup>-0.006</sup> / <sub>-0.007</sub>
M	0.21	0.009
N	0.10	0.004



32 PIN PLASTIC TSOP (400mil)

NEC Cord:S32G5-50-7JD1



**NOTE**

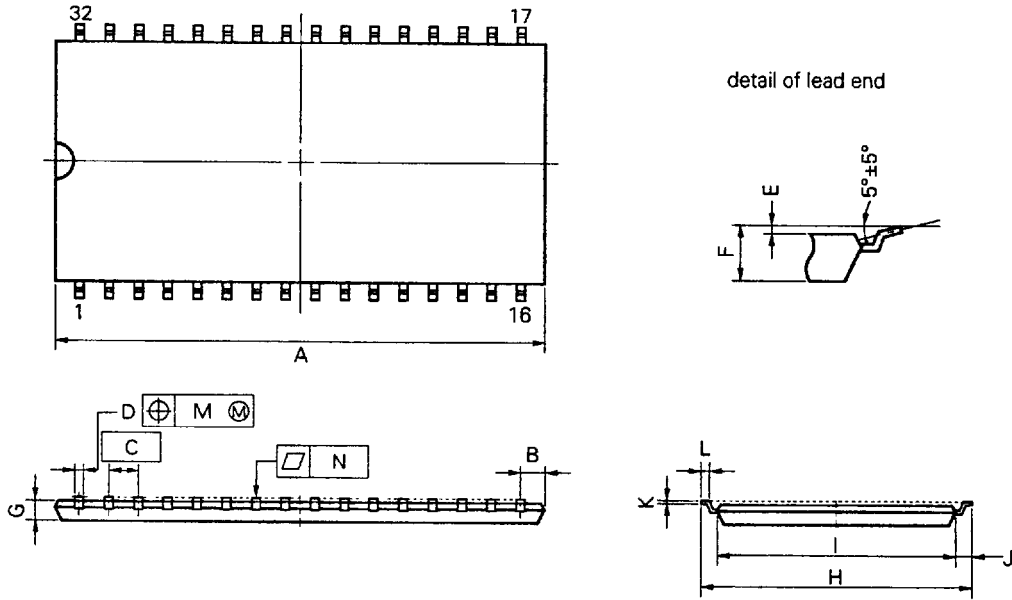
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

S32G5-50-7JD1

ITEM	MILLIMETERS	INCHES
A	21.17 MAX.	0.834 MAX.
B	1.06 MAX.	0.042 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	0.40±0.10	0.016 <sup>+0.004</sup> <sub>-0.005</sub>
E	0.05±0.05	0.002±0.002
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
H	11.76±0.2	0.463±0.008
I	10.16±0.1	0.400±0.004
J	0.8±0.2	0.031 <sup>+0.009</sup> <sub>-0.008</sub>
K	0.125 <sup>+0.10</sup> <sub>-0.05</sub>	0.005 <sup>+0.004</sup> <sub>-0.002</sub>
L	0.5±0.15	0.020 <sup>+0.006</sup> <sub>-0.007</sub>
M	0.21	0.009
N	0.10	0.004

32 PIN PLASTIC TSOP (400mil)  
Reverse bent

NEC Cord:S32G5-50-7KD1



**NOTE**

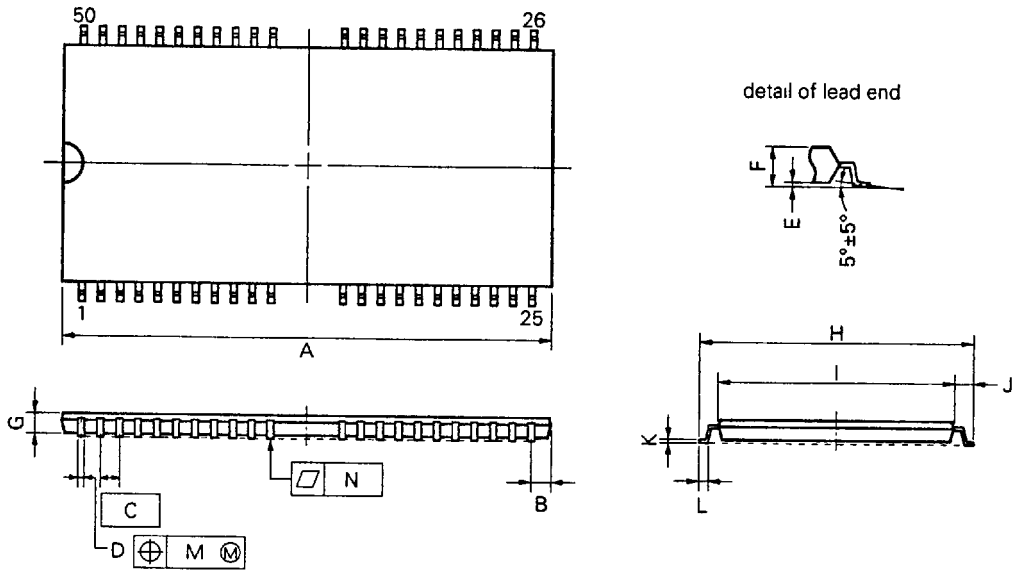
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

S32G5-50-7KD1

ITEM	MILLIMETERS	INCHES
A	21.17 MAX.	0.834 MAX.
B	1.06 MAX.	0.042 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	0.40±0.10	0.016 <sup>+0.004</sup> / <sub>-0.005</sub>
E	0.05±0.05	0.002±0.002
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
H	11.76±0.2	0.463±0.008
I	10.16±0.1	0.400±0.004
J	0.8±0.2	0.031 <sup>+0.009</sup> / <sub>-0.008</sub>
K	0.125 <sup>+0.10</sup> / <sub>-0.05</sub>	0.005 <sup>+0.004</sup> / <sub>-0.002</sub>
L	0.5±0.15	0.020 <sup>+0.006</sup> / <sub>-0.007</sub>
M	0.21	0.009
N	0.10	0.004

50 PIN PLASTIC TSOP (400mil)  
44 Leads

NEC Cord:S50G5-80-7JF



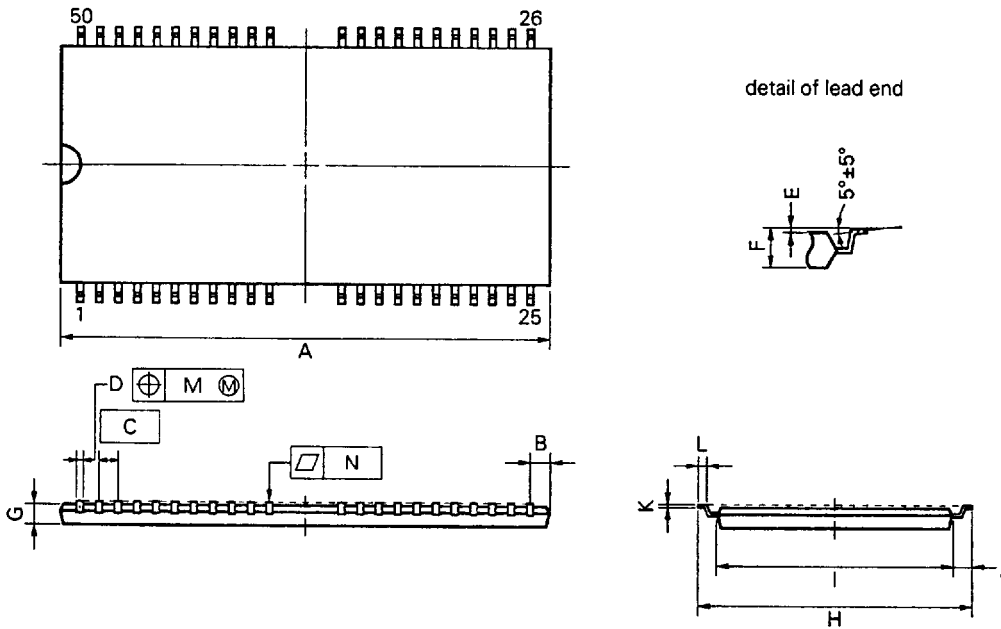
**NOTE**  
Each lead centerline is located within 0.13 mm (0.005 inch) of its true position (T.P) at maximum material condition.

S50G5-80-7JF

ITEM	MILLIMETERS	INCHES
A	21.45 MAX.	0.845 MAX.
B	1.13 MAX.	0.045 MAX.
C	0.8 (T.P.)	0.031 (T.P.)
D	0.30±0.10	0.012 <sup>+0.004</sup> <sub>-0.005</sub>
E	0.05±0.05	0.002±0.002
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
H	11.76±0.2	0.463±0.008
I	10.16±0.1	0.400±0.004
J	0.8±0.2	0.031 <sup>+0.009</sup> <sub>-0.008</sub>
K	0.125 <sup>+0.10</sup> <sub>-0.05</sub>	0.005 <sup>+0.004</sup> <sub>-0.002</sub>
L	0.5±0.15	0.020 <sup>+0.006</sup> <sub>-0.007</sub>
M	0.13	0.005
N	0.10	0.004

50 PIN PLASTIC TSOP (400mil)  
44 Leads Reverse bent

NEC Cord:S50G5-80-7KF



**NOTE**

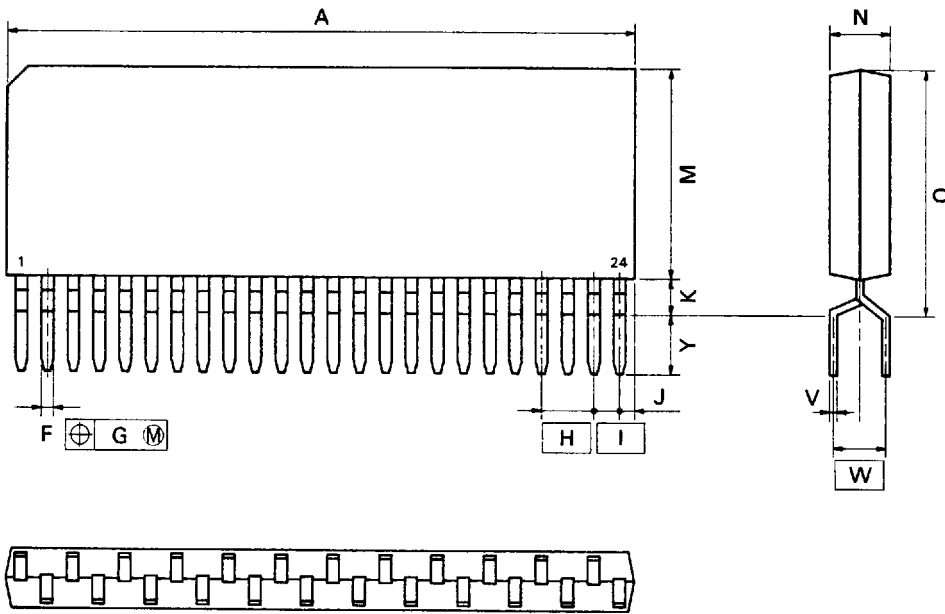
Each lead centerline is located within 0.13 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

S50G5-80-7KF

ITEM	MILLIMETERS	INCHES
A	21.45 MAX.	0.845 MAX.
B	1.13 MAX.	0.045 MAX.
C	0.8 (T.P.)	0.031 (T.P.)
D	0.30±0.10	0.012 <sup>+0.004</sup> / <sub>0.005</sub>
E	0.05±0.05	0.002±0.002
F	1.1 MAX.	0.044 MAX.
G	0.97	0.038
H	11.76±0.2	0.463±0.008
I	10.16±0.1	0.400±0.004
J	0.8±0.2	0.031 <sup>+0.003</sup> / <sub>0.008</sub>
K	0.125 <sup>+0.10</sup> / <sub>-0.05</sub>	0.005 <sup>+0.004</sup> / <sub>-0.002</sub>
L	0.5±0.15	0.020 <sup>+0.006</sup> / <sub>-0.007</sub>
M	0.13	0.005
N	0.10	0.004

24 PIN PLASTIC ZIP (475mil)

NEC Cord:P24V-100-475A



P24V-100-475A

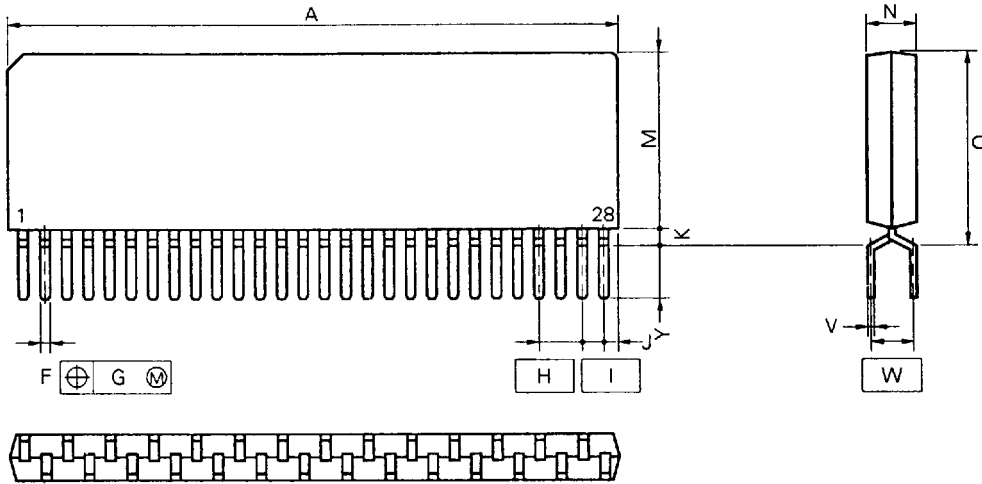
**NOTE**

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	31.75 MAX.	1.250 MAX.
F	0.50 <sup>±0.1</sup>	0.020 <sup>-0.004</sup>
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	10.8 MAX.	0.426 MAX.
N	2.8 <sup>±0.2</sup>	0.110 <sup>-0.008</sup>
Q	12.07 MAX.	0.476 MAX.
V	0.25 <sup>-0.08</sup>	0.010 <sup>-0.003</sup>
W	2.54	0.100
Y	3.3 <sup>±0.5</sup>	0.130 <sup>±0.02</sup>

28 PIN PLASTIC ZIP (475mil)

NEC Cord:P28VF-100-475A



**NOTE**

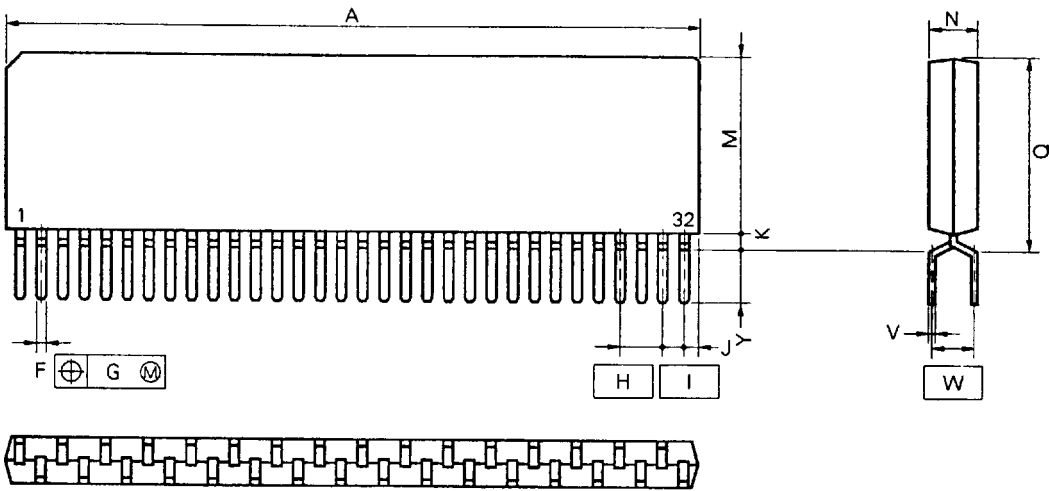
Each lead centerline is located within 0.25 mm (0.010 inch) of its true position (T.P.) at maximum material condition.

P28VF-100-475A

ITEM	MILLIMETERS	INCHES
A	36.83 MAX.	1.450 MAX.
F	0.5 ± 0.10	0.020 <sup>+0.004</sup> <sub>-0.005</sub>
G	0.25	0.010
H	2.54 (T.P.)	0.100 (T.P.)
I	1.27 (T.P.)	0.050 (T.P.)
J	1.27 MAX.	0.050 MAX.
K	0.9 MIN.	0.035 MIN.
M	10.8 MAX.	0.426 MAX.
N	2.8 ± 0.2	0.110 <sup>+0.009</sup> <sub>-0.008</sub>
Q	12.07 MAX.	0.475 MAX.
V	0.25 <sup>+0.10</sup> <sub>-0.05</sub>	0.010 <sup>+0.004</sup> <sub>-0.003</sub>
W	2.54 (T.P.)	0.100 (T.P.)
Y	3.25 ± 0.2	0.128 ± 0.008

32 PIN PLASTIC ZIP (475mil)

NEC Cord:P32VF-100-475A



P32VF-100-475A

**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	41.91 MAX.	1.650 MAX
F	0.5±0.10	0.020 <sup>+0.004</sup> <sub>-0.005</sub>
G	0.25	0.010
H	2.54 (T.P.)	0.100 (T.P.)
I	1.27 (T.P.)	0.050 (T.P.)
J	1.27 MAX.	0.050 MAX.
K	0.9 MIN.	0.035 MIN.
M	10.8 MAX.	0.426 MAX.
N	2.8±0.2	0.110 <sup>+0.009</sup> <sub>-0.008</sub>
Q	12.07 MAX.	0.475 MAX.
V	0.25 <sup>+0.10</sup> <sub>-0.05</sub>	0.010 <sup>+0.004</sup> <sub>-0.003</sub>
W	2.54 (T.P.)	0.100 (T.P.)
Y	3.25±0.2	0.128±0.008