

2M x 8-Bit Dynamic RAM 2k-Refresh (Hyper Page Mode- EDO)

HYB 3117805BSJ(L)-50/-60/-70

Advanced Information

- 2 097 152 words by 8-bit organization
- 0 to 70 °C operating temperature
- Performance:

		-50	-60	-70	
t_{RAC}	\overline{RAS} access time	50	60	70	ns
t_{CAC}	\overline{CAS} access time	13	15	20	ns
t_{AA}	Access time from address	25	30	35	ns
t_{RC}	Read/Write cycle time	84	104	124	ns
t_{HPC}	Hyper page mode (EDO) cycle time	20	25	30	ns

- Single + 3.3 V (± 0.3 V) supply
- Low power dissipation
 - max. 432 mW active (-50 version)
 - max. 396 mW active (-60 version)
 - max. 360 mW active (-70 version)
 - 7.2 mW standby (LV-TTL)
 - 3.6 mW standby (CMOS)
 - 720 µA standby for L-version
- Read, write, read-modify-write, \overline{CAS} -before- \overline{RAS} refresh, \overline{RAS} -only refresh, hidden refresh, self refresh and test mode
- Hyper page mode (EDO) capability
- All inputs, outputs and clocks fully TTL-compatible
- 2048 refresh cycles / 32 ms (2k-Refresh)
- Plastic Package: P-SOJ-28-3 400 mil

The HYB 3117805BSJ is a 16 MBit dynamic RAM organized as 2 097 152 words by 8-bits. The HYB 3117805BSJ utilizes a submicron CMOS silicon gate process technology, as well as advanced circuit techniques to provide wide operating margins, both internally and for the system user. Multiplexed address inputs permit the HYB 3117805BSJ to be packaged in a standard SOJ 28 plastic package with 400 mil width. These packages provide high system bit densities and are compatible with commonly used automatic testing and insertion equipment. System-oriented features include single + 3.3 V (± 0.3 V) power supply, direct interfacing with high-performance logic device families such as Schottky TTL. The HYB 3117805BSJL parts have a very low power „sleep mode“ supported by self refresh.

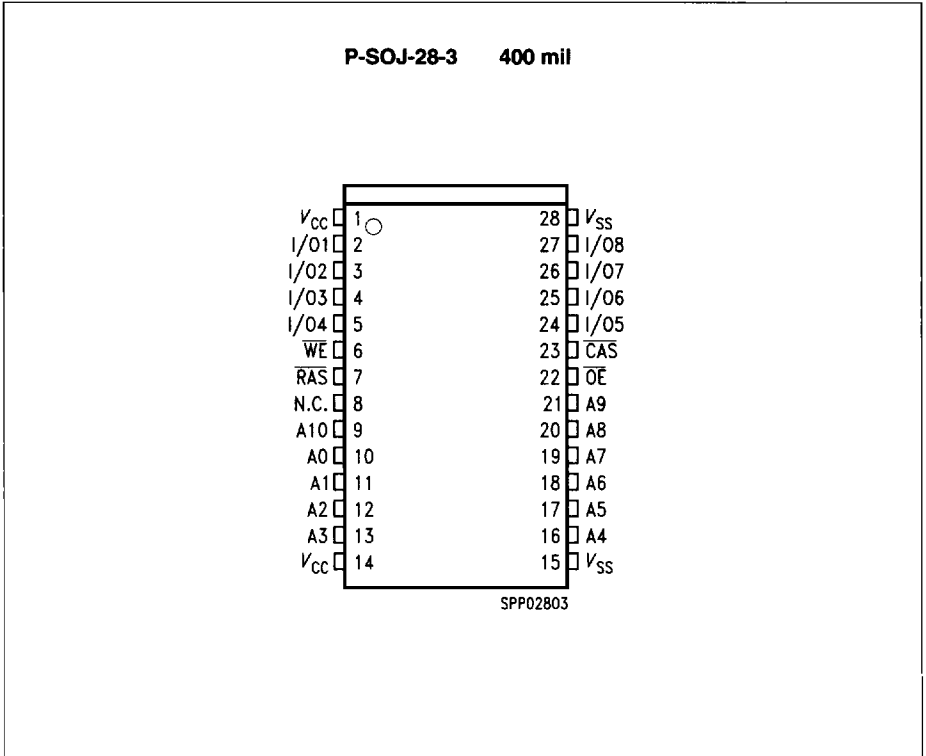
Ordering Information

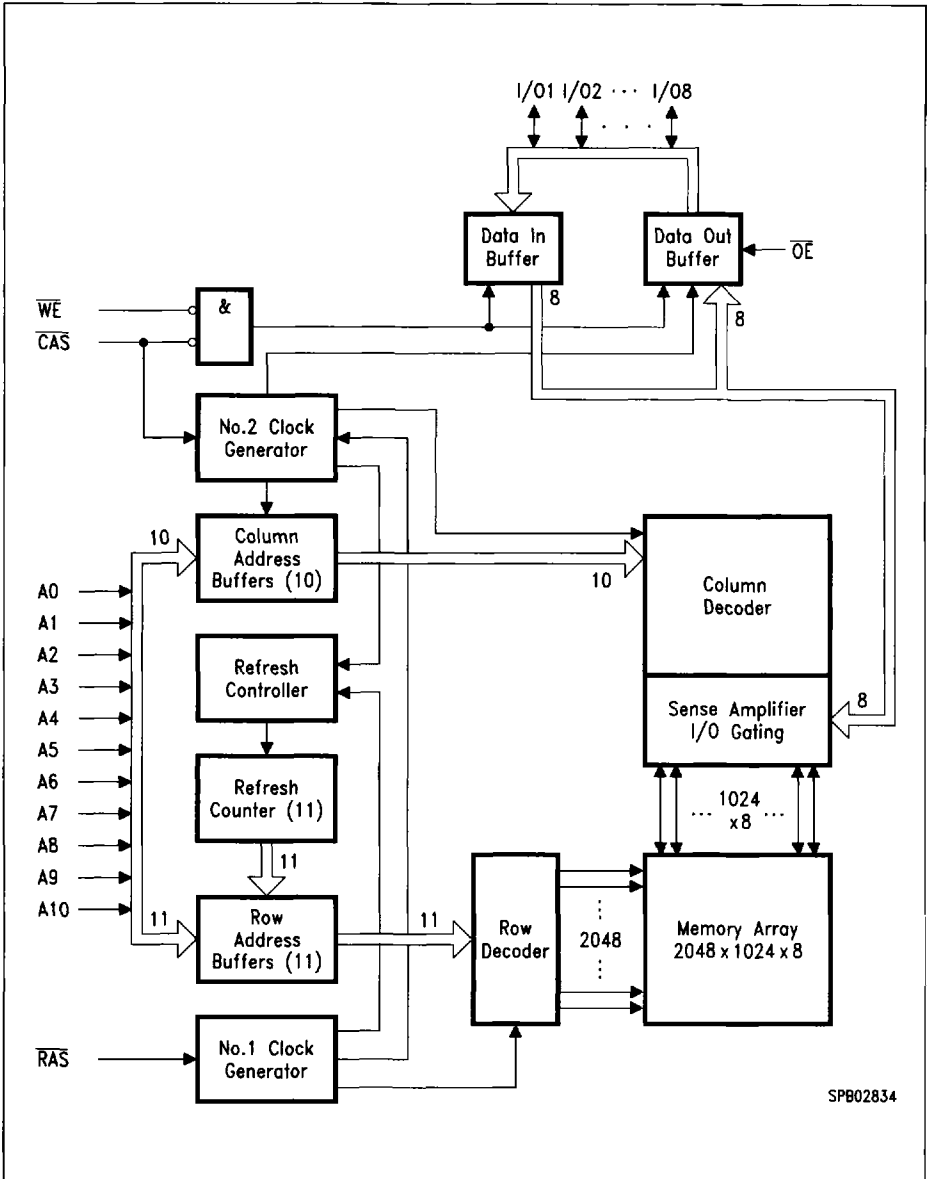
Type	Ordering Code	Package	Descriptions
HYB 3117805BSJ-50	Q67100-Q1151	P-SOJ-28-3 400 mil	DRAM (access time 50 ns)
HYB 3117805BSJ-60	Q67100-Q1152	P-SOJ-28-3 400 mil	DRAM (access time 60 ns)
HYB 3117805BSJ-70	on request	P-SOJ-28-3 400 mil	DRAM (access time 70 ns)
HYB 3117805BSJL-50	on request	P-SOJ-28-3 400 mil	LP-DRAM (access time 50 ns)
HYB 3117805BSJL-60	on request	P-SOJ-28-3 400 mil	LP-DRAM (access time 60 ns)
HYB 3117805BSJL-70	on request	P-SOJ-28-3 400 mil	LP-DRAM (access time 70 ns)

Pin Names

A0-A10	Row Address Inputs
A0-A9	Column Address Inputs
RAS	Row Address Strobe
OE	Output Enable
I/O1-I/O8	Data Input/Output
CAS	Column Address Strobe
WE	Read/Write Input
V _{CC}	Power Supply (+ 3.3 V)
V _{SS}	Ground (0 V)
N.C.	not connected

Pin Configuration (top view)





SPB02834

Block Diagram

Absolute Maximum Ratings

Operating temperature range	0 to 70 °C
Storage temperature range.....	- 55 to 150 °C
Input/output voltage	- 0.5 to min ($V_{CC} + 0.5, 4.6$) V
Power supply voltage.....	- 1.0 V to 4.6 V
Power dissipation.....	0.5 W
Data out current (short circuit)	50 mA

Note: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage of the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Characteristics

$T_A = 0$ to 70 °C, $V_{SS} = 0$ V, $V_{CC} = 3.3$ V \pm 0.3 V, $t_T = 2$ ns

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		
Input high voltage	V_{IH}	2.0	$V_{CC} + 0.5$	V	1)
Input low voltage	V_{IL}	- 0.5	0.8	V	1)
TTL Output high voltage ($I_{OUT} = - 2$ mA)	V_{OH}	2.4	-	V	1)
TTL Output low voltage ($I_{OUT} = 2$ mA)	V_{OL}	-	0.4	V	1)
CMOS Output high voltage ($I_{OUT} = - 100$ μ A)	V_{OH}	$V_{CC} - 0.2$	-	V	
CMOS Output low voltage ($I_{OUT} = 100$ μ A)	V_{OL}	-	0.2	V	
Input leakage current ($0 \leq V_{IH} \leq V_{CC} + 0.3$ V, all other pins = 0 V)	$I_{I(L)}$	- 10	10	μ A	1)
Output leakage current (DO is disabled, $0 \leq V_{OUT} \leq V_{CC} + 0.3$ V)	$I_{O(L)}$	- 10	10	μ A	1)
Average V_{CC} supply current: -50 ns version -60 ns version -70 ns version	I_{CC1}	-	120 110 100	mA mA mA	2) 3) 4) 2) 3) 4) 2) 3) 4)
(\overline{RAS} , \overline{CAS} , address cycling, $t_{RC} = t_{RC}$ min.)					
Standby V_{CC} supply current ($\overline{RAS} = \overline{CAS} = V_{IH}$)	I_{CC2}	-	2	mA	-
Average V_{CC} supply current, during \overline{RAS} -only refresh cycles: -50 ns version -60 ns version -70 ns version	I_{CC3}	-	120 110 100	mA mA mA	2) 4) 2) 4) 2) 4)
(\overline{RAS} cycling: $\overline{CAS} = V_{IH}$, $t_{RC} = t_{RC}$ min.)					

DC Characteristics (cont'd)

$T_A = 0$ to 70 °C, $V_{SS} = 0$ V, $V_{CC} = 3.3$ V \pm 0.3 V, $t_T = 2$ ns

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		
Average V_{CC} supply current, during hyper page mode EDO): -50 ns version -60 ns version -70 ns version	I_{CC4}	-	70 55 45	mA mA mA	2) 3) 4) 2) 3) 4) 2) 3) 4)
($\overline{RAS} = V_{IL}$, \overline{CAS} , address cycling, $t_{PC} = t_{PC}$ min.)					
Standby V_{CC} supply current ($\overline{RAS} = \overline{CAS} = V_{CC} - 0.2$ V)	I_{CC5}	-	1 200	mA μ A	1) L-version
Average V_{CC} supply current, during \overline{CAS} -before-RAS refresh mode -50 ns version -60 ns version -70 ns version	I_{CC6}	-	120 110 100	mA mA mA	2) 4) 2) 4) 2) 4)
(\overline{RAS} , \overline{CAS} cycling, $t_{RC} = t_{RC}$ min.)					
Average Self Refresh Current (CBR cycle with $t_{RAS} > t_{RASS}$ min., \overline{CAS} held low, $\overline{WE} = V_{CC} - 0.2$ V, Address and Din = $V_{CC} - 0.2$ V or 0.2 V)	I_{CC7}	-	1 250	mA μ A	L-version

Capacitance

$T_A = 0$ to 70 °C, $V_{CC} = 3.3$ V \pm 0.3V, $f = 1$ MHz

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Input capacitance (A0 to A10)	C_{11}	-	5	pF
Input capacitance (RAS, CAS, \overline{WE} , OE)	C_{12}	-	7	pF
I/O capacitance (I/O1-I/O8)	C_{10}	-	7	pF

AC Characteristics ⁵⁾⁶⁾

16E

 $T_A = 0 \text{ to } 70 \text{ }^\circ\text{C}$, $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$, $t_T = 2 \text{ ns}$

Parameter	Symbol	Limit Values						Unit	Note
		-50		-60		-70			
		min.	max.	min.	max.	min.	max.		

Common Parameters

Random read or write cycle time	t_{RC}	84	–	104	–	124	–	ns	
$\overline{\text{RAS}}$ precharge time	t_{RP}	30	–	40	–	50	–	ns	
RAS pulse width	t_{RAS}	50	10k	60	10k	70	10k	ns	
CAS pulse width	t_{CAS}	8	10k	10	10k	12	10k	ns	
Row address setup time	t_{ASR}	0	–	0	–	0	–	ns	
Row address hold time	t_{RAH}	8	–	10	–	10	–	ns	
Column address setup time	t_{ASC}	0	–	0	–	0	–	ns	
Column address hold time	t_{CAH}	8	–	10	–	12	–	ns	
RAS to CAS delay time	t_{RCD}	12	37	14	45	14	53	ns	
RAS to column address delay	t_{RAD}	10	25	12	30	12	35	ns	
RAS hold time	t_{RSH}	13	–	15	–	17	–	ns	
CAS hold time	t_{CSH}	40	–	50	–	60	–	ns	
CAS to RAS precharge time	t_{CRP}	5	–	5	–	5	–	ns	
Transition time (rise and fall)	t_T	1	50	1	50	1	50	ns	7
Refresh period	t_{REF}	–	32	–	32	–	32	ms	
Refresh period for L-version	t_{REF}	–	256	–	256	–	256	ms	

Read Cycle

Access time from RAS	t_{RAC}	–	50	–	60	–	70	ns	8, 9
Access time from CAS	t_{CAC}	–	13	–	15	–	17	ns	8, 9
Access time from column address	t_{AA}	–	25	–	30	–	35	ns	8, 10
OE access time	t_{OEA}	–	13	–	15	–	17	ns	
Column address to RAS lead time	t_{RAL}	25	–	30	–	35	–	ns	
Read command setup time	t_{RCS}	0	–	0	–	0	–	ns	
Read command hold time	t_{RCH}	0	–	0	–	0	–	ns	11
Read command hold time referenced to RAS	t_{RRH}	0	–	0	–	0	–	ns	11

AC Characteristics (cont'd) ⁵⁾⁶⁾
 $T_A = 0 \text{ to } 70 \text{ }^\circ\text{C}$, $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$, $t_T = 2 \text{ ns}$

Parameter	Symbol	Limit Values						Unit	Note
		-50		-60		-70			
		min.	max.	min.	max.	min.	max.		
CAS to output in low-Z	t_{CLZ}	0	-	0	-	0	-	ns	8
Output buffer turn-off delay	t_{OFF}	0	13	0	15	0	17	ns	12
Output turn-off delay from OE	t_{OEZ}	0	13	0	15	0	17	ns	12
Data to CAS low delay	t_{DZC}	0	-	0	-	0	-	ns	13
Data to OE low delay	t_{DZO}	0	-	0	-	0	-	ns	13
CAS high to data delay	t_{CDD}	10	-	13	-	15	-	ns	14
OE high to data delay	t_{ODD}	10	-	13	-	15	-	ns	14

Write Cycle

Write command hold time	t_{WCH}	8	-	10	-	10	-	ns	
Write command pulse width	t_{WP}	8	-	10	-	10	-	ns	
Write command setup time	t_{WCS}	0	-	0	-	0	-	ns	15
Write command to RAS lead time	t_{RWL}	13	-	15	-	17	-	ns	
Write command to CAS lead time	t_{CWL}	13	-	15	-	17	-	ns	
Data setup time	t_{DS}	0	-	0	-	0	-	ns	16
Data hold time	t_{DH}	8	-	10	-	12	-	ns	16

Read-modify-Write Cycle

Read-write cycle time	t_{RWC}	113	-	138	-	162	-	ns	
RAS to WE delay time	t_{RWD}	64	-	77	-	89	-	ns	15
CAS to WE delay time	t_{CWD}	27	-	32	-	36	-	ns	15
Column address to WE delay time	t_{AWD}	39	-	47	-	54	-	ns	15
OE command hold time	t_{OEH}	10	-	13	-	15	-	ns	

Hyper Page Mode (EDO) Cycle

Hyper page mode (EDO) cycle time	t_{HPC}	20	-	25	-	30	-	ns	
CAS precharge time	t_{CP}	8	-	10	-	10	-	ns	
Access time from CAS precharge	t_{CPA}	-	27	-	32	-	37	ns	7

AC Characteristics (cont'd) ⁵⁾⁶⁾
 $T_A = 0 \text{ to } 70 \text{ }^\circ\text{C}$, $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$, $t_T = 2 \text{ ns}$

Parameter	Symbol	Limit Values						Unit	Note
		-50		-60		-70			
		min.	max.	min.	max.	min.	max.		
Output data hold time	t_{COH}	5	–	5	–	5	–	ns	
$\overline{\text{RAS}}$ pulse width in EDO mode	t_{RAS}	50	200k	60	200k	70	200k	ns	
$\overline{\text{CAS}}$ precharge to $\overline{\text{RAS}}$ Delay	t_{RHPC}	27	–	32	–	37	–	ns	

Hyper Page Mode (EDO) Read-modify-Write Cycle

Hyper page mode (EDO) read-write cycle time	t_{PRWC}	58	–	68	–	77	–	ns	
$\overline{\text{CAS}}$ precharge to $\overline{\text{WE}}$	t_{CPWD}	41	–	49	–	56	–	ns	

 $\overline{\text{CAS}}$ -before- $\overline{\text{RAS}}$ Refresh Cycle

CAS setup time	t_{CSR}	10	–	10	–	10	–	ns	
CAS hold time	t_{CHR}	10	–	10	–	10	–	ns	
RAS to CAS precharge time	t_{RPC}	5	–	5	–	5	–	ns	
Write to RAS precharge time	t_{WRP}	10	–	10	–	10	–	ns	
Write hold time referenced to RAS	t_{WRH}	10	–	10	–	10	–	ns	

 $\overline{\text{CAS}}$ -before- $\overline{\text{RAS}}$ Counter Test Cycle

CAS precharge time	t_{CPT}	35	–	40	–	40	–	ns	
--------------------	-----------	----	---	----	---	----	---	----	--

Self Refresh Cycle

$\overline{\text{RAS}}$ pulse width	t_{RASS}	100k	–	100k	–	100k	–	ns	17
$\overline{\text{RAS}}$ precharge	t_{RPS}	95	–	110	–	130	–	ns	17
$\overline{\text{CAS}}$ hold time	t_{CHS}	– 50	–	– 50	–	– 50	–	ns	17

Test Mode

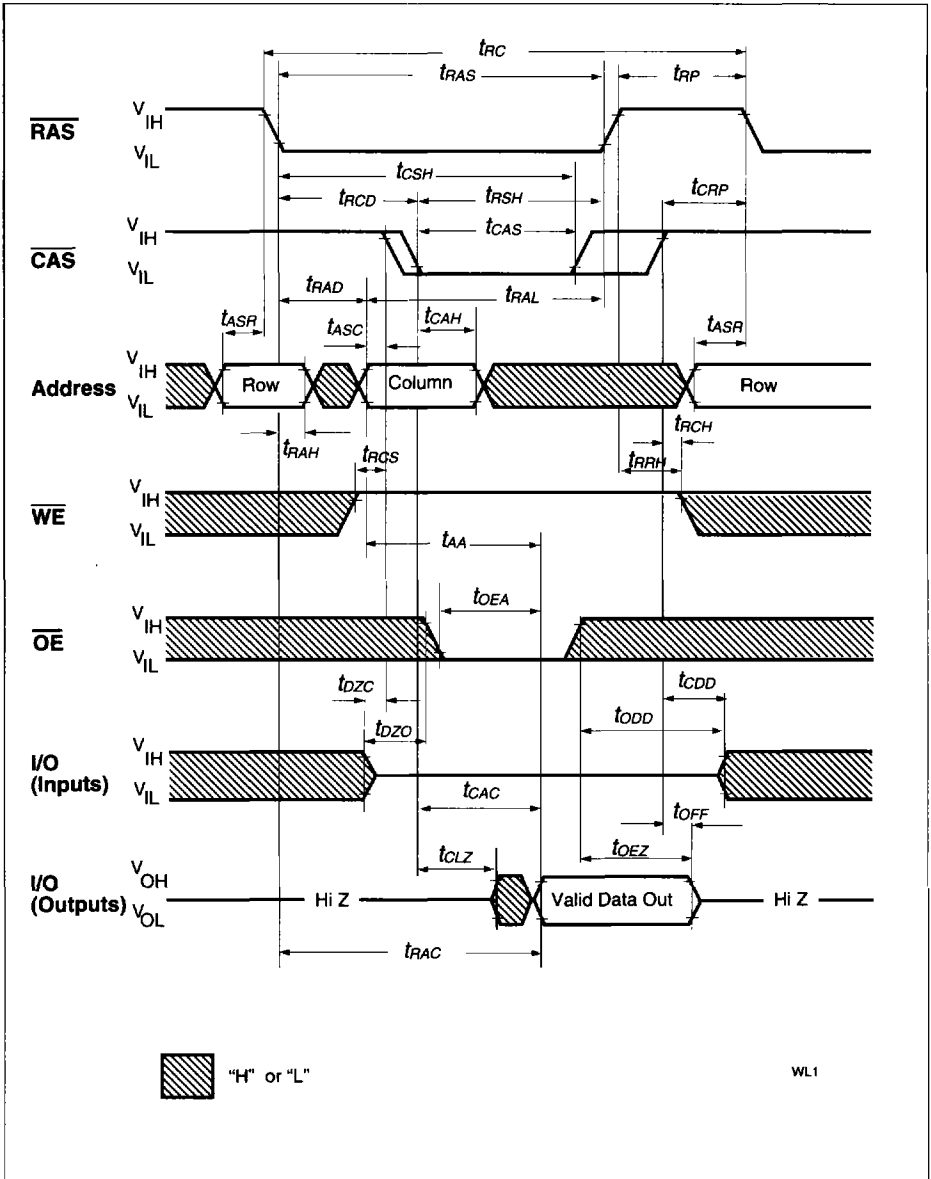
Write command setup time	t_{WTS}	10	–	10	–	10	–	ns	
Write command hold time	t_{WTH}	10	–	10	–	10	–	ns	
$\overline{\text{CAS}}$ hold time	t_{CHRT}	30	–	30	–	30	–	ns	

Notes:

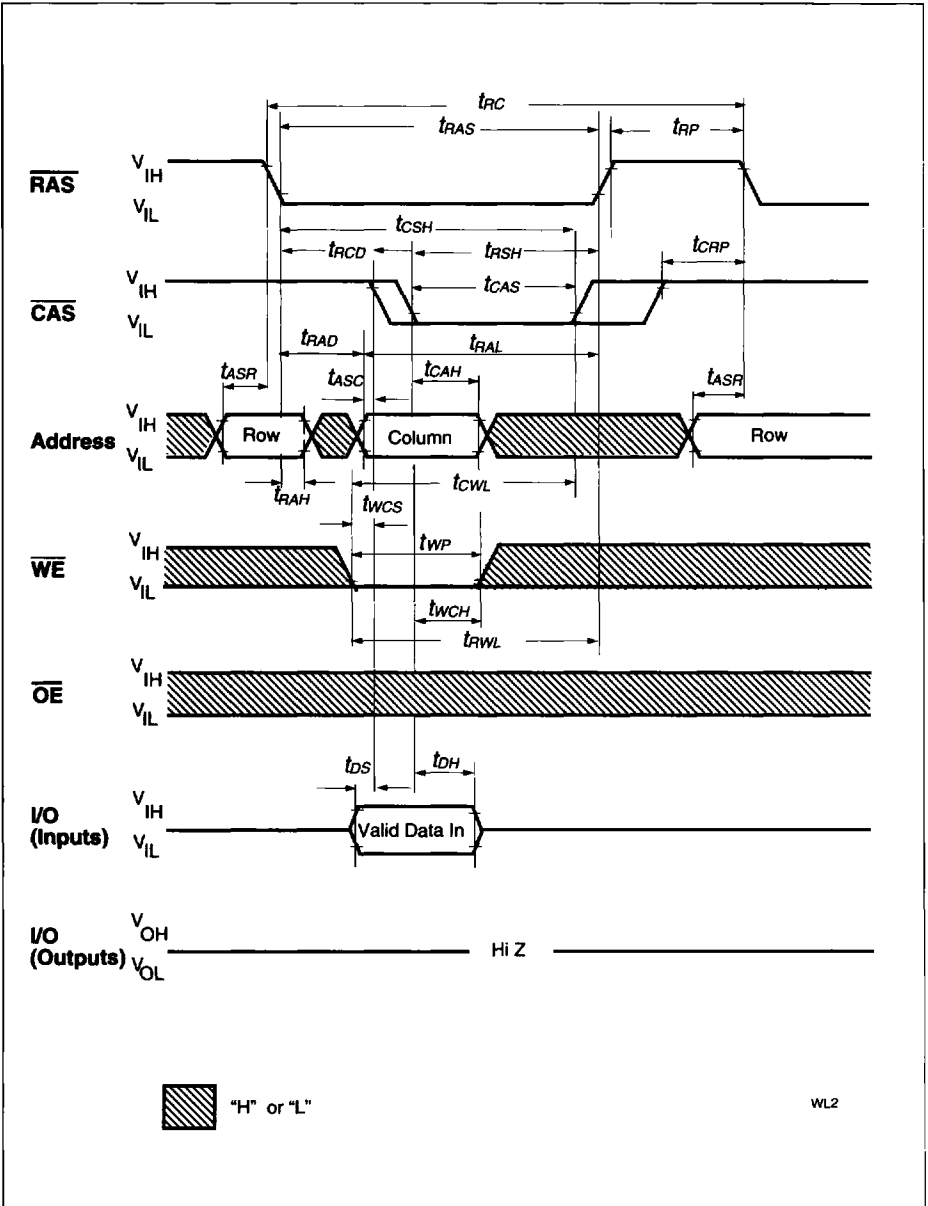
- 1) All voltages are referenced to V_{SS} .
- 2) I_{CC1} , I_{CC3} , I_{CC4} and I_{CC6} depend on cycle rate.
- 3) I_{CC1} and I_{CC4} depend on output loading. Specified values are obtained with the output open.
- 4) Address can be changed once or less while $RAS = V_{IL}$. In case of I_{CC4} it can be changed once or less during a hyper page mode (EDO) cycle
- 5) An initial pause of 200 μs is required after power-up followed by 8 \overline{RAS} cycles of which at least one cycle has to be a refresh cycle, before proper device operation is achieved. In case of using the internal refresh counter, a minimum of 8 CAS-before-RAS initialization cycles instead of 8 \overline{RAS} cycles are required.
- 6) AC measurements assume $t_T = 2$ ns.
- 7) $V_{IH (min.)}$ and $V_{IL (max.)}$ are reference levels for measuring timing of input signals. Transition times are also measured between V_{IH} and V_{IL} .
- 8) Measured with the specified current load and 100 pF at $V_{OL} = 0.8$ V and $V_{OH} = 2.0$ V. Access time is determined by the latter of t_{RAC} , t_{CAC} , t_{AA} , t_{CPA} , t_{OEA} , t_{CAC} is measured from tristate.
- 9) Operation within the $t_{RCD (max.)}$ limit ensures that $t_{RAC (max.)}$ can be met. $t_{RCD (max.)}$ is specified as a reference point only. If t_{RCD} is greater than the specified $t_{RCD (max.)}$ limit, then access time is controlled by t_{CAC} .
- 10) Operation within the $t_{RAD (max.)}$ limit ensures that $t_{RAC (max.)}$ can be met. $t_{RAD (max.)}$ is specified as a reference point only. If t_{RAD} is greater than the specified $t_{RAD (max.)}$ limit, then access time is controlled by t_{AA} .
- 11) Either t_{RCH} or t_{RRH} must be satisfied for a read cycle.
- 12) $t_{OFF (max.)}$, $t_{OEZ (max.)}$ define the time at which the output achieves the open-circuit conditions and are not referenced to output voltage levels. t_{OFF} is referenced from the rising edge of RAS or CAS, whichever occurs last.
- 13) Either t_{DZC} or t_{DZO} must be satisfied.
- 14) Either t_{CDD} or t_{OOD} must be satisfied.
- 15) t_{WCS} , t_{RWD} , t_{CWD} and t_{AWD} are not restrictive operating parameters. They are included in the data sheet as electrical characteristics only. If $t_{WCS} > t_{WCS (min.)}$, the cycle is an early write cycle and data out pin will remain open-circuit (high impedance) through the entire cycle; if $t_{RWD} > t_{RWD (min.)}$, $t_{CWD} > t_{CWD (min.)}$ and $t_{AWD} > t_{AWD (min.)}$, the cycle is a read-write cycle and I/O will contain data read from the selected cells. If neither of the above sets of conditions is satisfied, the condition of I/O (at access time) is indeterminate.
- 16) These parameters are referenced to the \overline{CAS} leading edge in early write cycles and to the \overline{WE} leading edge in read-write cycles.
- 17) When using Self Refresh mode, the following refresh operations must be performed to ensure proper DRAM operation:

If row addresses are being refreshed on an evenly distributed manner over the refresh interval using CBR refresh cycles, then only one CBR cycle must be performed immediately after exit from Self Refresh.

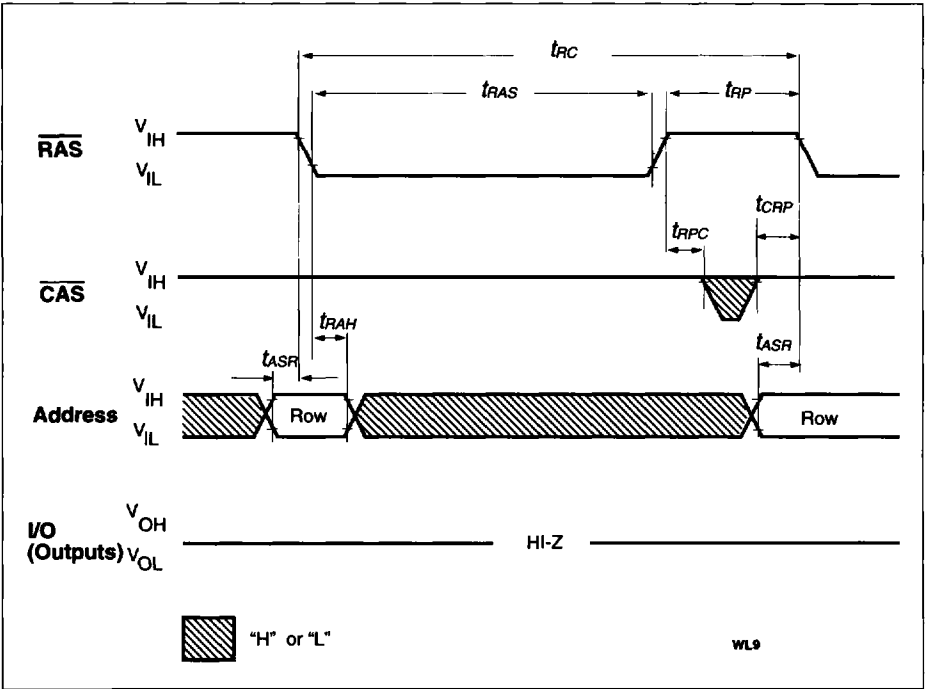
If row addresses are being refreshed in any other manner (ROR - Distributed/Burst; or CBR-Burst) over the refresh interval, then a full set of row refreshes must be performed immediately before entry to and immediately after exit from Self Refresh



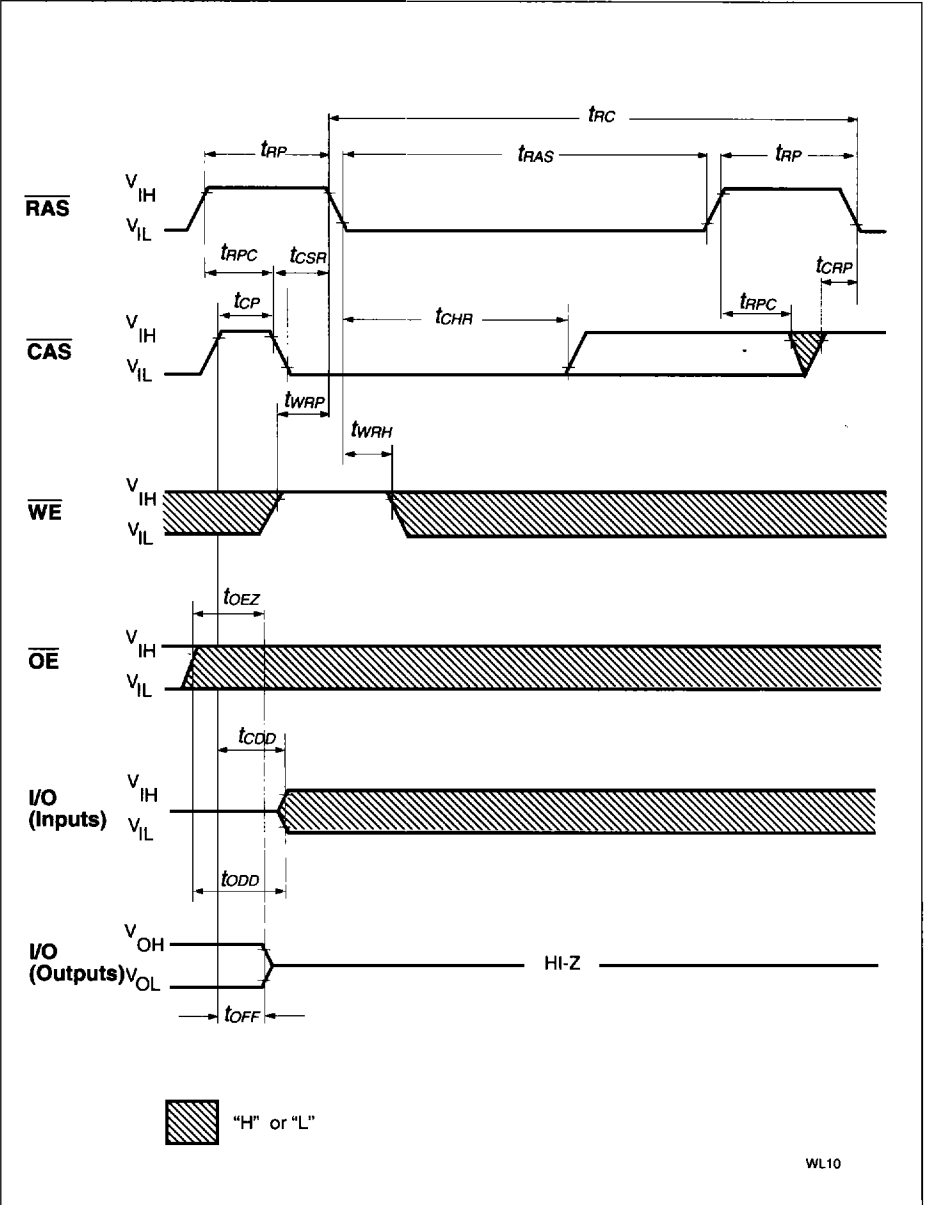
Read Cycle



Write Cycle (Early Write)

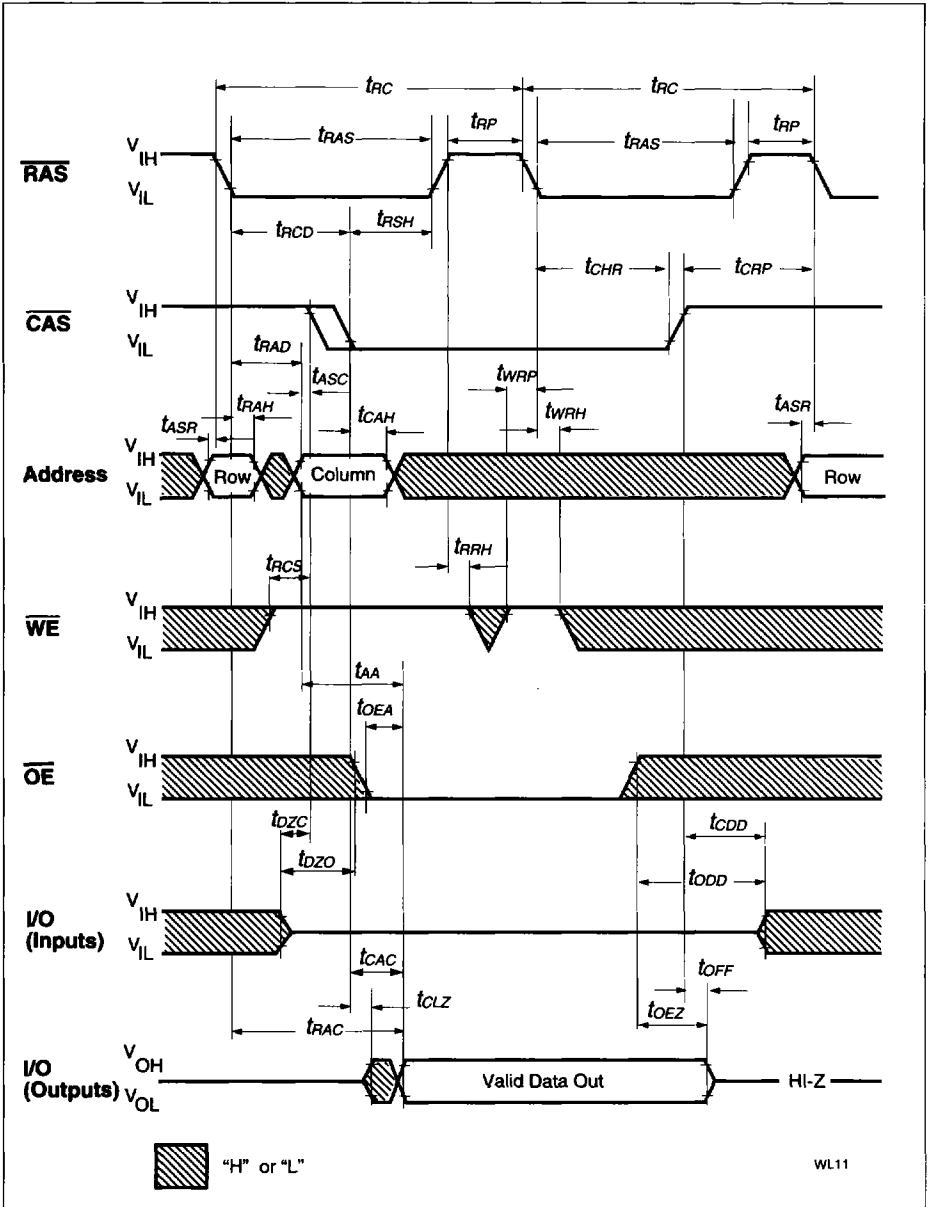


RAS-Only Refresh Cycle

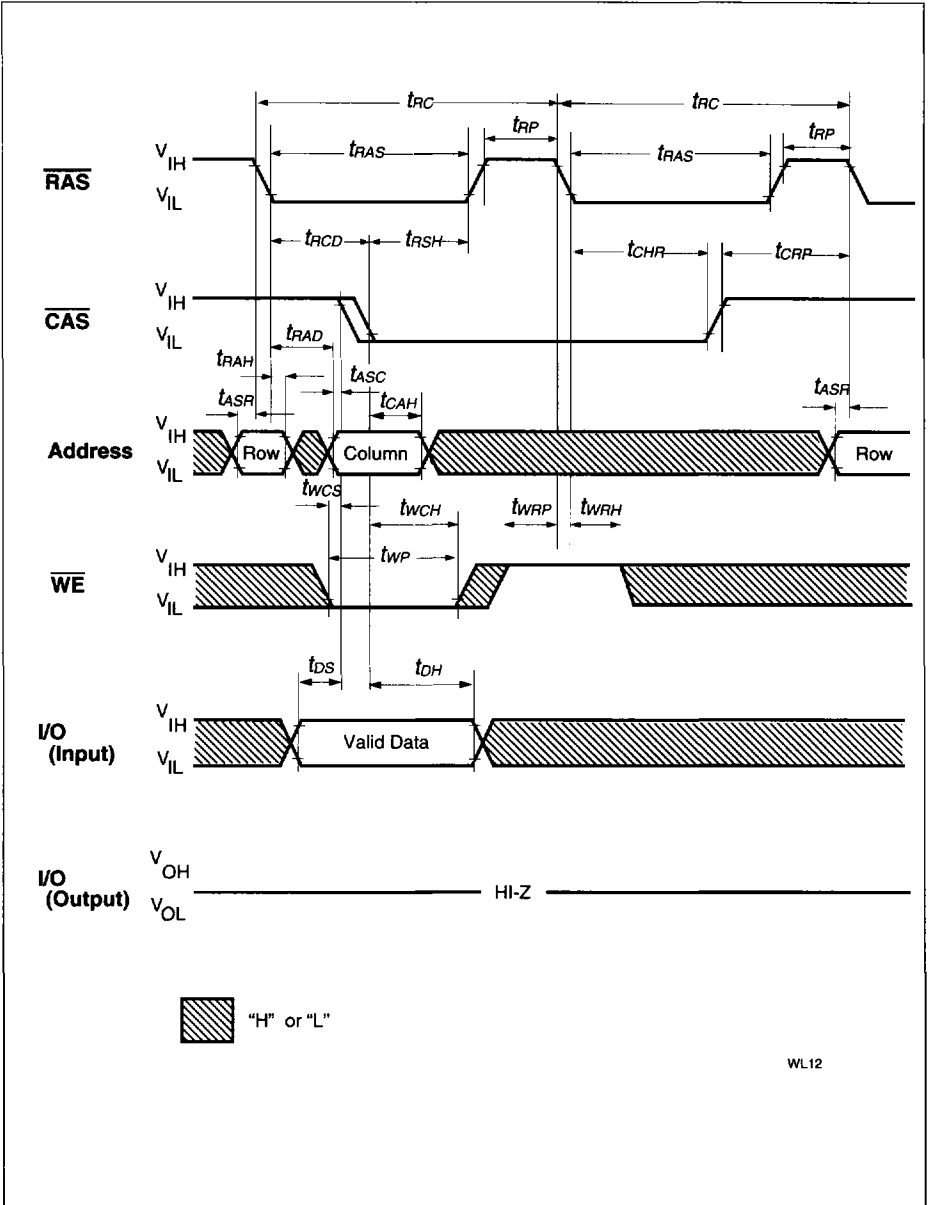


WL10

CAS-Before-RAS Refresh Cycle

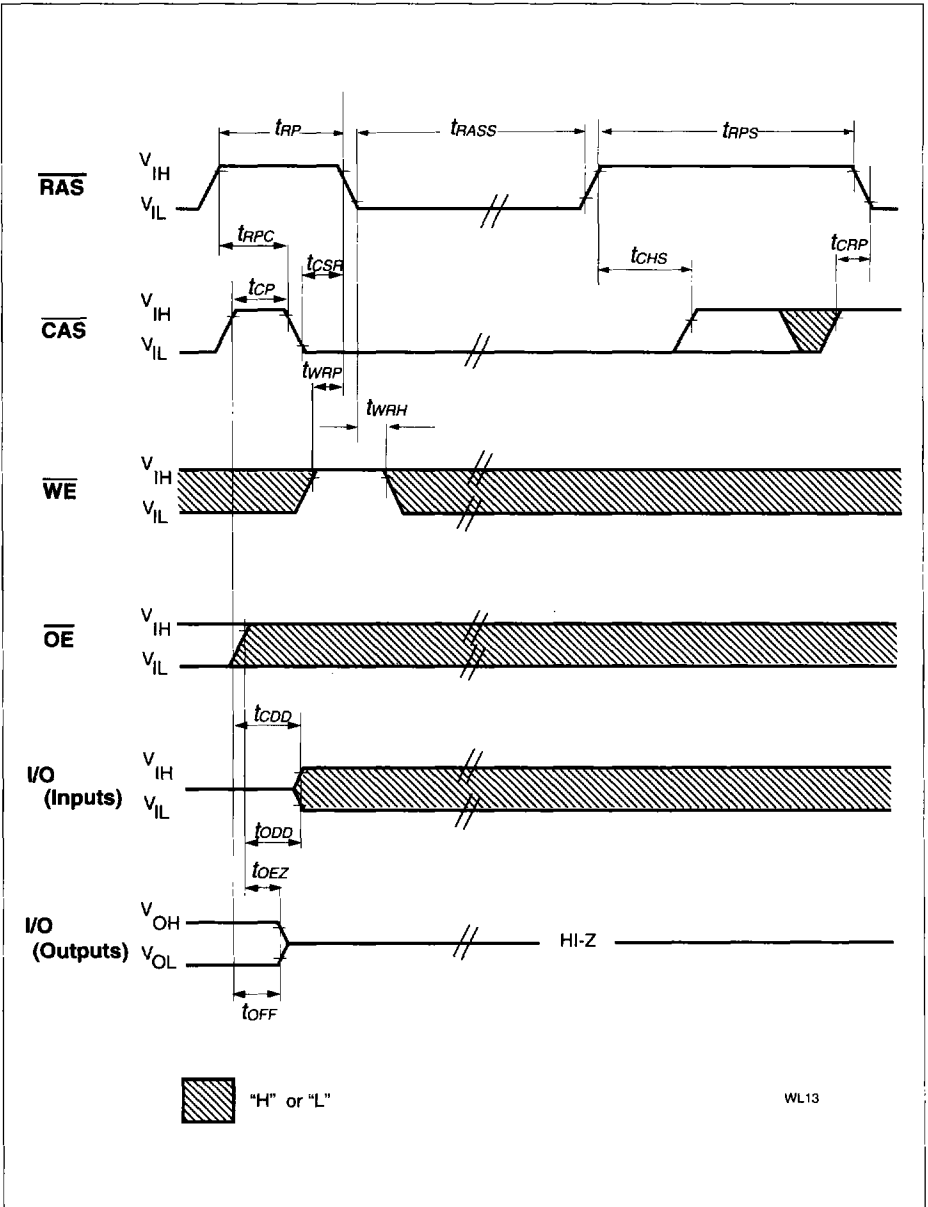


Hidden Refresh Cycle (Read) Cycle

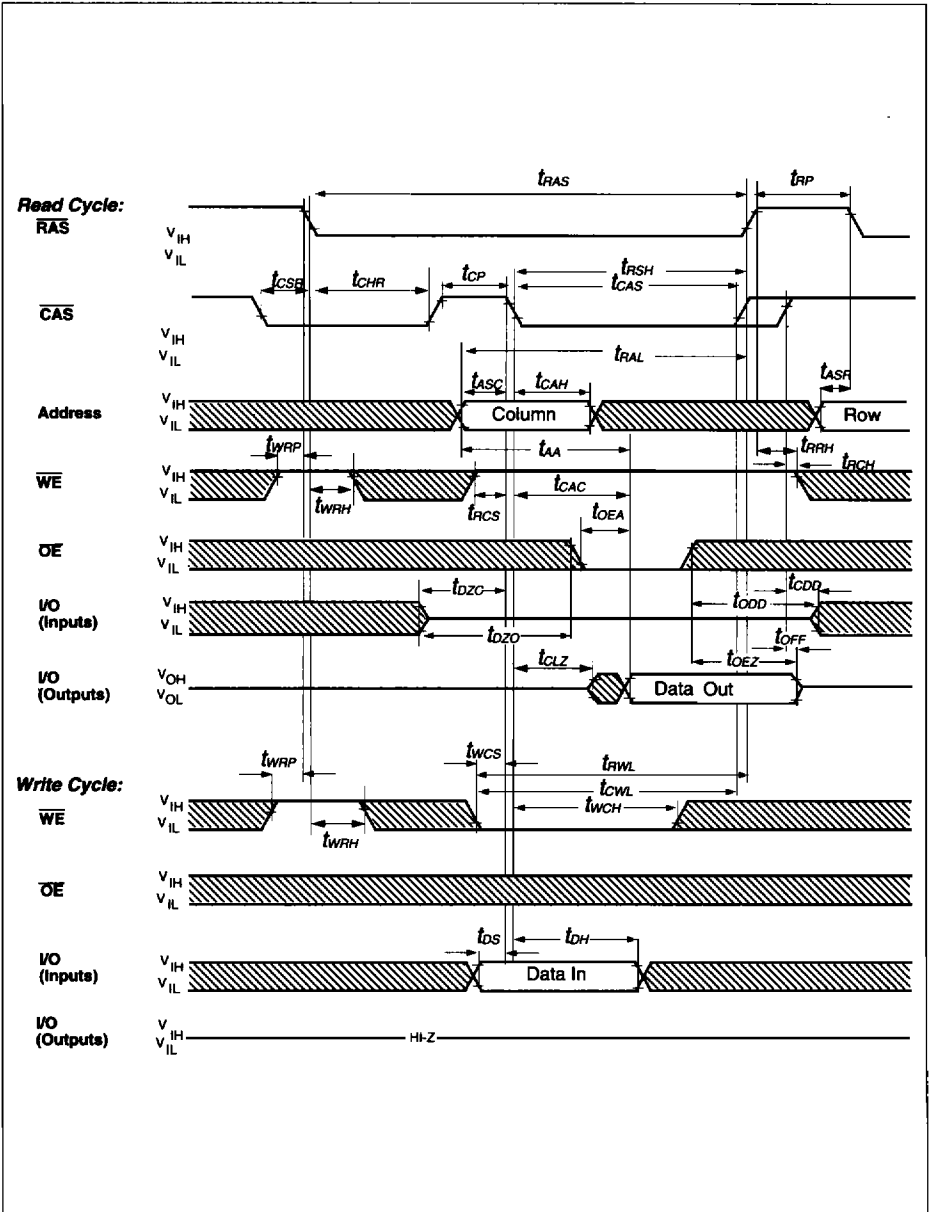


WL12

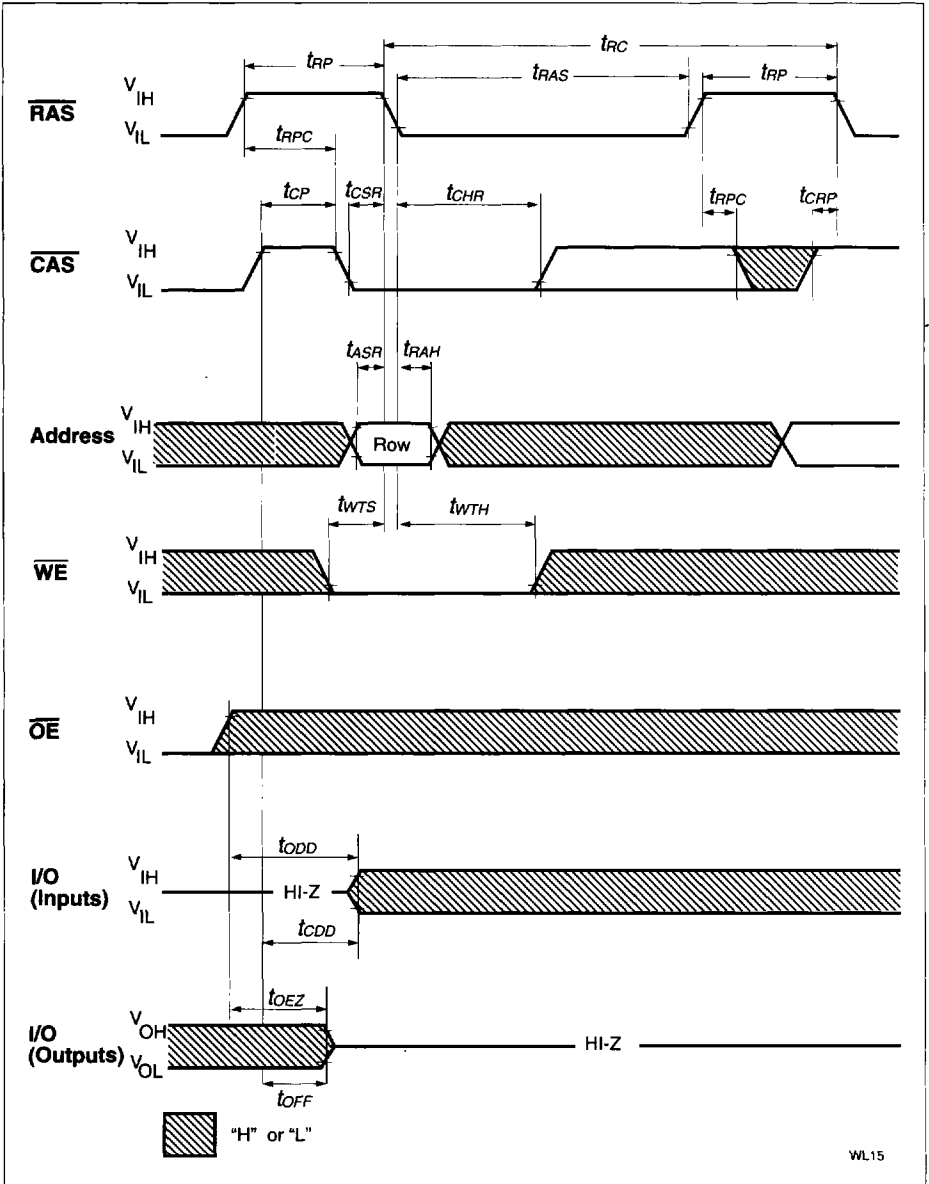
Hidden Refresh Early Write Cycle



Self Refresh



CAS-Before-RAS Refresh Counter Test Cycle

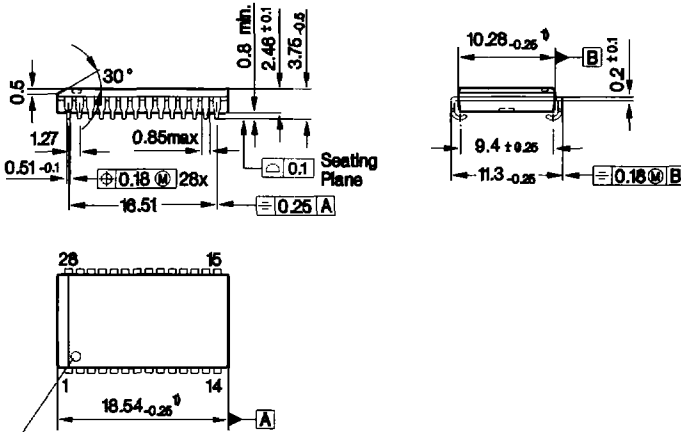


WL15

Test Mode Entry

Package Outlines

P-SOJ-28-3 (400 mil)
(Small Outline J-leaded Package)



Index Marking

- 1) Does not include plastic or metal protrusion of 0.15 max. per side

GPJ056899

Sorts of Packing

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

SMD = Surface Mounted Device

Dimensions in mm