V53C316165A
3.3 VOLT 1M X 16 EDO PAGE MODE CMOS DYNAMIC RAM

HIGH PERFORMANCE	50	60
Max. $\overline{RAS}$ Access Time, (t_{RAC})	50 ns	60 ns
Max. Column Address Access Time, (t_{CAA})	25 ns	30 ns
Min. Extended Data Out Page Mode Cycle Time, (t_{PC})	20 ns	25 ns
Min. Read/Write Cycle Time, (t_{RC})	84 ns	104 ns

Features

- 1M x 16-bit organization
- EDO Page Mode for a sustained data rate of 50 MHz
- $\overline{RAS}$ access time: 50, 60 ns
- Dual $\overline{CAS}$ Inputs
- Low power dissipation
- Read-Modify-Write, $\overline{RAS}$-Only Refresh, $\overline{CAS}$-Before-$\overline{RAS}$ Refresh, Hidden Refresh, and Self Refresh.
- Refresh Interval: 4096 cycles/64 ms
- Available in 42-pin 400 mil SOJ and 50/44-pin 400 mil TSOP-II Packages
- Single +3.3 V ±0.3 V Power Supply
- LVTTL Interface
- Refresh Interval: 4096 cycles/256ms (L-versions)

Description

The V53C316165A is a 1,048,576 x 16 bit high-performance CMOS dynamic random access memory. The V53C316165A offers Page mode operation with Extended Data Output. The V53C316165A has a symmetric address, 12-bit row and 8-bit column.

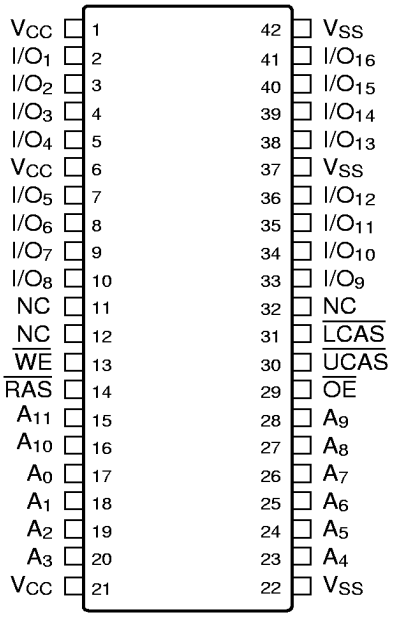
All inputs are LVTTL compatible. EDO Page Mode operation allows random access up to 256 x 16 bits, within a page, with cycle times as short as 20ns.

These features make the V53C316165A ideally suited for a wide variety of high performance computer systems and peripheral applications.

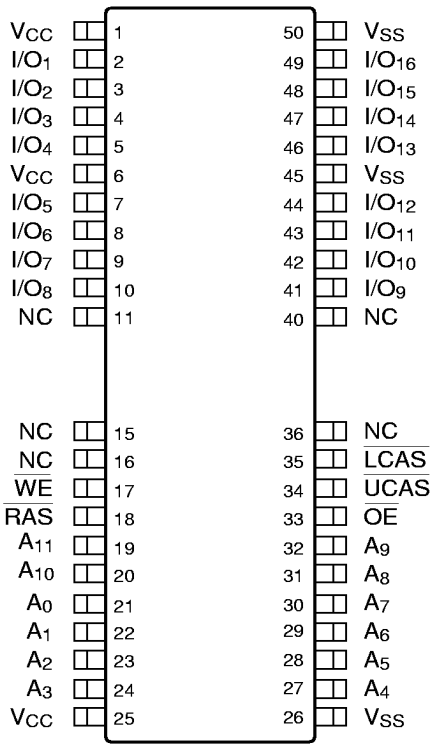
Device Usage Chart

Operating Temperature Range	Package Outline		Access Time (ns)		Power		Temperature Mark
	K	T	50	60	Std.	L	
0°C to 70 °C	•	•	•	•	•	•	Blank

42-Pin Plastic SOJ PIN CONFIGURATION Top View



50/44-Pin Plastic TSOP-II PIN CONFIGURATION Top View



Pin Names

A_0–A_{11}	Row, Column Address Inputs
$\overline{RAS}$	Row Address Strobe
$\overline{UCAS}$	Column Address Strobe/Upper Byte Control
$\overline{LCAS}$	Column Address Strobe/Lower Byte Control
$\overline{WE}$	Write Enable
$\overline{OE}$	Output Enable
I/O_1–I/O_{16}	Data Input, Output
V_{CC}	+3.3V Supply
V_{SS}	0V Supply
NC	No Connect

Description	Pkg.	Pin Count
SOJ	K	42
TSOP-II	T	50/44

Absolute Maximum Ratings*

Operating temperature range .....0 to 70 °C
Storage temperature range ..... -55 to 150 °C
Soldering temperature .....260 °C
Soldering time.....10 s
Input/output voltage .... -0.5 to min (V_{CC}+0.5, 4.6) V
Power supply voltage .....-0.5V to 4.6 V
Power dissipation ..... 1.0 W
Data out current (short circuit) ..... 50 mA

***Note:** Operation above Absolute Maximum Ratings can adversely affect device reliability.

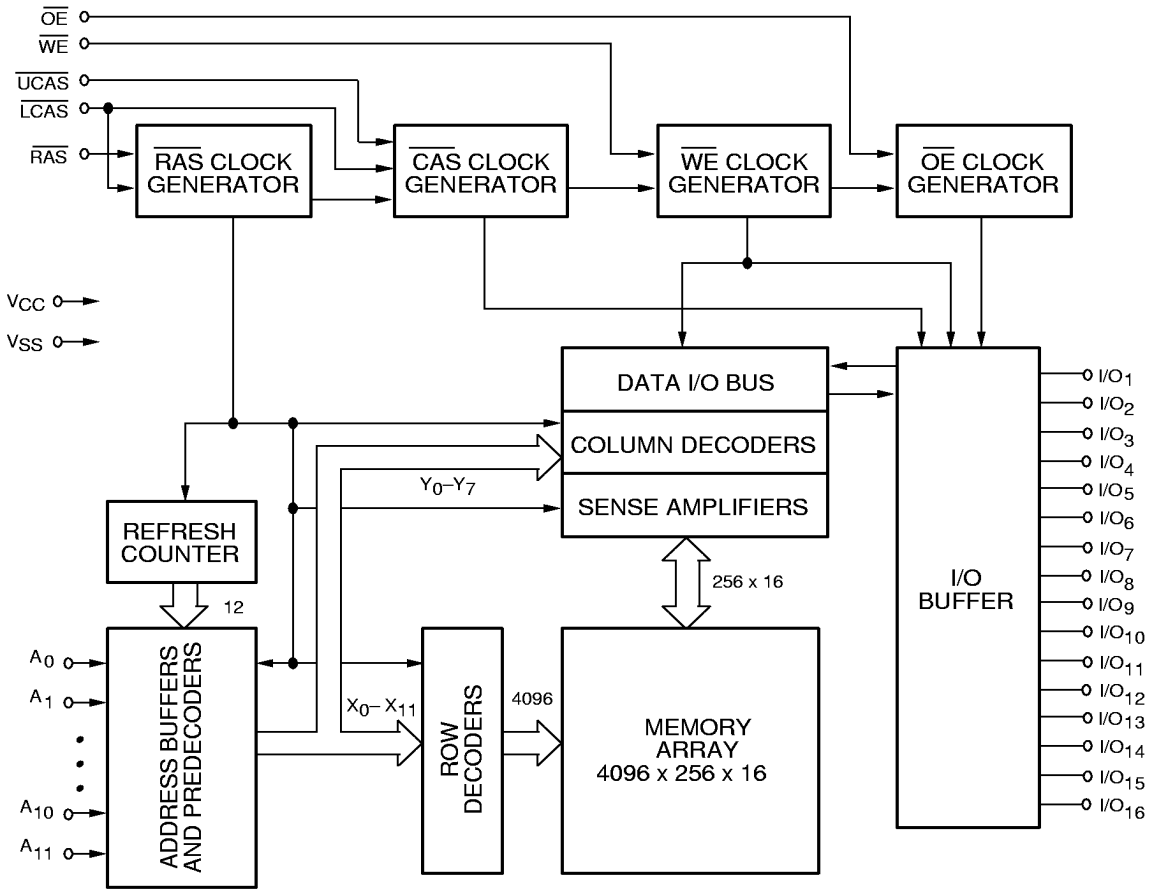
Capacitance*

T_A = 25°C, V_{CC} = 3.3 V ± 0.3 V, V_{SS} = 0 V, f = 1 MHz

Symbol	Parameter	Min.	Max.	Unit
C_{IN1}	Address Input	—	5	pF
C_{IN2}	$\overline{RAS}$, $\overline{UCAS}$, $\overline{LCAS}$, $\overline{WE}$, $\overline{OE}$	—	7	pF
C_{OUT}	Data Input/Output	—	7	pF

***Note:** Capacitance is sampled and not 100% tested.

Block Diagram



DC and Operating Characteristics (1-2)

T_A = 0°C to 70°C, V_{CC} = 3.3 V ± 0.3 V, V_{SS} = 0 V, t_T = 2ns, unless otherwise specified.

Symbol	Parameter	Access Time	V53C316165A			Unit	Test Conditions	Notes
			Min.	Typ.	Max.			
I_{LI}	Input Leakage Current (any input pin)		–10		10	µA	$V_{SS} \le V_{IN} \le V_{CC}$ + 0.3V	1
I_{LO}	Output Leakage Current (for High-Z State)		–10		10	µA	$V_{SS} \le V_{OUT} \le V_{CC}$ + 0.3V $\overline{RAS}$, $\overline{CAS}$ at V_{IH}	1
I_{CC1}	V_{CC} Supply Current, Operating	50			100	mA	$t_{RC} = t_{RC}$ (min.)	2, 3, 4
		60			90			
I_{CC2}	V_{CC} Supply Current, TTL Standby				2	mA	$\overline{RAS}$, $\overline{CAS}$ at V_{IH} other inputs ≥ V_{SS}	
I_{CC3}	V_{CC} Supply Current, $\overline{RAS}$-Only Refresh	50			100	mA	$t_{RC} = t_{RC}$ (min.)	2, 4
		60			90			
I_{CC4}	V_{CC} Supply Current, EDO Page Mode Operation	50			70	mA	Minimum Cycle	2, 3, 4
		60			55			
I_{CC5}	V_{CC} Supply Current, CMOS Standby				1.0	mA	$\overline{RAS} \ge V_{CC} - 0.2$ V, $\overline{CAS} \ge V_{CC} - 0.2$ V	1
I_{CC6}	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 $D_{IN} = V_{CC} - 0.2$V or 0.2V				1.0 250	mA µA	L Version	
I_{CC7}	V_{CC} Supply Current, during $\overline{CAS}$-before-$\overline{RAS}$ Refresh	50			100	mA	$t_{RC} = t_{RC}$ (min)	2, 4
		60			90			
V_{IL}	Input Low Voltage		–0.5		0.8	V		1
V_{IH}	Input High Voltage		2		V_{CC}+0.5	V		1
V_{OL}	Output Low Voltage				0.4	V	I_{OL} = 2 mA	1
V_{OH}	Output High Voltage		2.4			V	I_{OH} = –2 mA	1

AC Characteristics

T_A = 0°C to 70°C, V_{CC} = 3.3 V ±0.3 V, V_{SS} = 0V, t_T = 2ns unless otherwise noted

JEDEC Symbol	Symbol	Parameter	50		60		Unit	Notes
			Min.	Max.	Min.	Max.		
t_{RL1RH1}	t_{RAS}	$\overline{RAS}$ Pulse Width	50	10K	60	10K	ns	
t_{RL2RL2}	t_{RC}	Read or Write Cycle Time	84		104		ns	
t_{RH2RL2}	t_{RP}	$\overline{RAS}$ Precharge Time	30		40		ns	
t_{RL1CH1}	t_{CSH}	$\overline{CAS}$ Hold Time	40		50		ns	
t_{CL1CH1}	t_{CAS}	$\overline{CAS}$ Pulse Width	8	10K	10	10K	ns	
t_{RL1CL1}	t_{RCD}	$\overline{RAS}$ to $\overline{CAS}$ Delay	12	37	14	45	ns	
t_{WH2CL2}	t_{RCS}	Read Command Setup Time	0		0		ns	
t_{AVRL2}	t_{ASR}	Row Address Setup Time	0		0		ns	
t_{RL1AX}	t_{RAH}	Row Address Hold Time	8		10		ns	
t_{AVCL2}	t_{ASC}	Column Address Setup Time	0		0		ns	
t_{CL1AX}	t_{CAH}	Column Address Hold Time	8		10		ns	
$t_{CL1RH1(R)}$	t_{RSH}	$\overline{RAS}$ Hold Time	13		15		ns	
t_{CH2RL2}	t_{CRP}	$\overline{CAS}$ to $\overline{RAS}$ Precharge Time	5		5		ns	
t_{CH2WX}	t_{RCH}	Read Command Hold Time Referenced to $\overline{CAS}$	0		0		ns	9
t_{RH2WX}	t_{RRH}	Read Command Hold Time Referenced to $\overline{RAS}$	0		0		ns	9
t_{CL1}	t_{COH}	Output Hold after $\overline{CAS}$ LOW	5		5		ns	
t_{GL1QV}	t_{OAC}	Access Time from $\overline{OE}$		13		15	ns	
t_{CL1QV}	t_{CAC}	Access Time from $\overline{CAS}$		13		15	ns	7, 12
t_{RL1QV}	t_{RAC}	Access Time from $\overline{RAS}$		50		60	ns	7, 12
t_{AVQV}	t_{CAA}	Access Time from Column Address		25		30	ns	7, 13
t_{CL1QX}	t_{CLZ}	$\overline{CAS}$ to Low-Z Output	0		0		ns	7
t_{CH2QX}	t_{OFF}	Output Buffer Turnoff Delay	0	13	0	15	ns	
t_{CL1QZ}	t_{DZC}	Data to $\overline{CAS}$ Low Delay	0		0		ns	15
t_{RL1AV}	t_{RAD}	$\overline{RAS}$ to Column Address Delay Time	10	25	12	30	ns	
t_{GL2QZ}	t_{OEZ}	Output Buffer Turnoff Delay from $\overline{OE}$	0	13	0	15	ns	8
t_{WL1CH1}	t_{CWL}	Write Command to $\overline{CAS}$ Lead Time	13		15		ns	
t_{WL1CL2}	t_{WCS}	Write Command Setup Time	0		0		ns	11
t_{CL1WH1}	t_{WCH}	Write Command Hold Time	8		10		ns	
t_{WL1WH1}	t_{WP}	Write Pulse Width	8		10		ns	
t_{GL1QZ}	t_{DEO}	Data to $\overline{OE}$ Delay	0		0		ns	15
t_{WL1RH1}	t_{RWL}	Write Command to $\overline{RAS}$ Lead Time	13		15		ns	
t_{DVWL2}	t_{DS}	Data in Setup Time	0		0		ns	10

AC Characteristics (Cont'd)

JEDEC Symbol	Symbol	Parameter	50		60		Unit	Notes
			Min.	Max.	Min.	Max.		
t_{WL1DX}	t_{DH}	Data in Hold Time	8		10		ns	10
t_{WL1GL2}	t_{WOH}	Write to $\overline{OE}$ Hold Time	10		13		ns	10
t_{CH2RH2}	t_{PRWC}	EDO Page Mode Read-Write Cycle Time	58		68		ns	
t_{RL2RL2} (RMW)	t_{RWC}	Read-Modify-Write Cycle Time	113		138		ns	
t_{CL1WL2}	t_{CWD}	$\overline{CAS}$ to $\overline{WE}$ Delay	27		32		ns	10
t_{RL1WL2}	t_{RWD}	$\overline{RAS}$ to $\overline{WE}$ Delay in Read-Modify-Write Cycle	64		77		ns	10
t_{AVWL2}	t_{AWD}	Column Address to $\overline{WE}$ Delay	39		47		ns	10
t_{CL2CL2}	t_{PC}	EDO Page Mode Read or Write Cycle Time	20		25		ns	
t_{CH2CL2}	t_{CP}	$\overline{CAS}$ Precharge Time	8		10		ns	
t_{AVRH1}	t_{CAR}	Column Address to $\overline{RAS}$ Setup Time	25		30		ns	
t_{CH2QV}	t_{CAP}	Access Time from Column Precharge		27		32	ns	6
t_{CL1RL2}	t_{CSR}	$\overline{CAS}$ Setup Time $\overline{CAS}$-before-$\overline{RAS}$ Refresh	10		10		ns	
t_{RH2CL2}	t_{RPC}	$\overline{RAS}$ to $\overline{CAS}$ Precharge Time	5		5		ns	
t_{RL1CH1}	t_{CHR}	$\overline{CAS}$ Hold Time $\overline{CAS}$-before-$\overline{RAS}$ Refresh	10		10		ns	
t_{RH2CL2}	t_{RASP}	$\overline{RAS}$ Pulse Width (EDO Mode)	50	200K	60	200K	ns	
t_{RH2CL2}	t_{RHCP}	$\overline{CAS}$ Precharge Time to $\overline{RAS}$ Delay	27		32		ns	
t_{RH2CL2}	t_{CPWD}	$\overline{CAS}$ Precharge Time to $\overline{WE}$	41		49		ns	
t_{RH2CL2}	t_{CPT}	$\overline{CAS}$ Precharge Time (CBR Counter Test)	35		40		ns	
t_{RH2CL2}	t_{WRP}	Write to $\overline{RAS}$ Precharge time (CRB Cycle)	10		10		ns	
t_{RH2CL2}	t_{WRH}	Write Hold time reference to $\overline{RAS}$ (CRB Cycle)	10		10		ns	
t_{RH2CL2}	t_{CDD}	$\overline{CAS}$ High to Data delay	10		13		ns	16
t_{RH2CL2}	t_{ODD}	$\overline{OE}$ High to Data delay	10		13		ns	16
t_T	t_T	Transition Time (Rise and Fall)	1	50	1	50	ns	
	t_{REF}	Refresh Interval (4096 Cycles)		64		64	ms	

Self Refresh AC Characteristics

	t_{RASS}	$\overline{RAS}$ Pulse Width During Self Refresh	100K		100K		ns	17
	t_{RPS}	$\overline{RAS}$ Precharge Time During Self Refresh	95		110		ns	17
	t_{CHS}	$\overline{CAS}$ Hold Time Width During Self Rerfresh	50		50		ns	17
	t_{REF}	Refresh period for L-Version		256		256	ms	

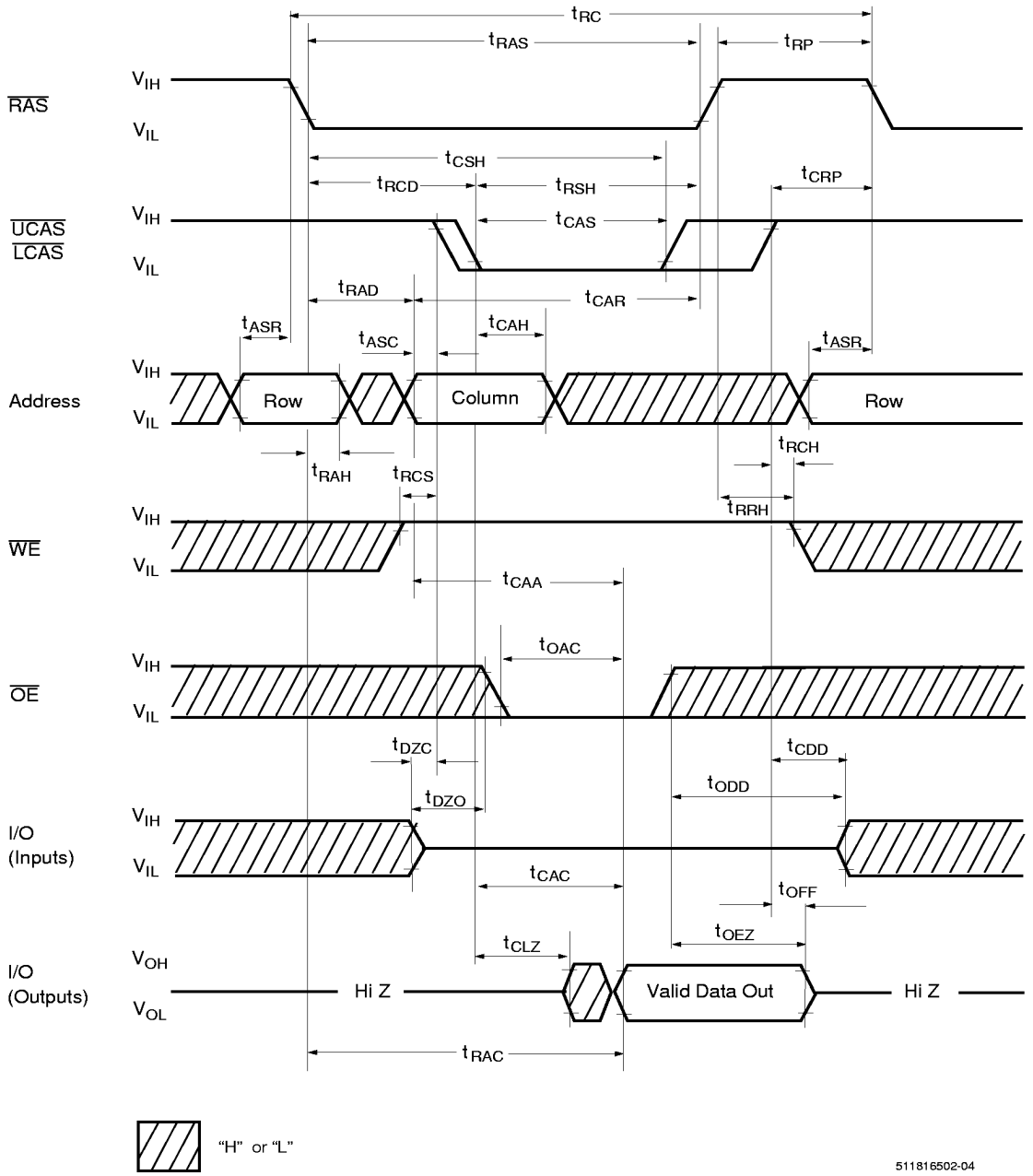
Notes:

1. All voltage are referenced to V_{SS}.
2. I_{CC1}, I_{CC3}, I_{CC4}, and I_{CC7} depend on cycle rate.
3. I_{CC1} and I_{CC4} depend on output loading. Specified values are measured with the output open.
4. Address can be changed once or less while $\overline{RAS}$ = V_{IL}. In the case of I_{CC4} it can be changed once or less during an EDO cycle (t_{HPC}).
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 internal refresh counter, a minimum of 8 $\overline{CAS}$-before-$\overline{RAS}$ initialization cycles instead of 8 RAS cycles are required.
6. 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}.
7. Measured with a load equivalent to 2 TTL gates and 50 pF (V_{OL} = 0.8V and V_{OH} = 2.0V).
8. t_{OFF} (max.) and t_{OEZ} (max.) define the time at which the outputs acheive the open-circuit condition and are not referenced to output voltage levels.
9. Either t_{RCH} or t_{RRH} must be satisfied for a read cycle.
10. These parameters are referenced to the $\overline{CAS}$ leading edge in early write cycles and to the WE leading edge in read-write cycles.
11. 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 $t_{WCS} > t_{WCS}$ (min.), the cycle is an early write cycle and the I/O pin will remain open-circuit (high impedance) through the entire cycle; if $t_{RWD} > t_{RWD}$ (min.), $t_{CWD} > t_{CWD}$ (min.), $t_{AWD} > t_{AWD}$ (min.), and $t_{CPWD} > t_{CPWD}$ (min.), the cycle is a read-write cycle and I/O pins will contain data read from the selected cells. If neither of the above sets of conditions is satisfied, the condition of the I/O pins (at access time) is indeterminate.
12. 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}.
13. 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_{CAA}.
14. AC measurements assume t_T = 2 ns.
15. Either t_{DZC} or t_{DEO} must be satisfied.
16. Either t_{CDD} or t_{ODD} must be satisfied.
17. When using Self Refresh mode, the following refresh operations must be performed to ensure proper DRAM operation:

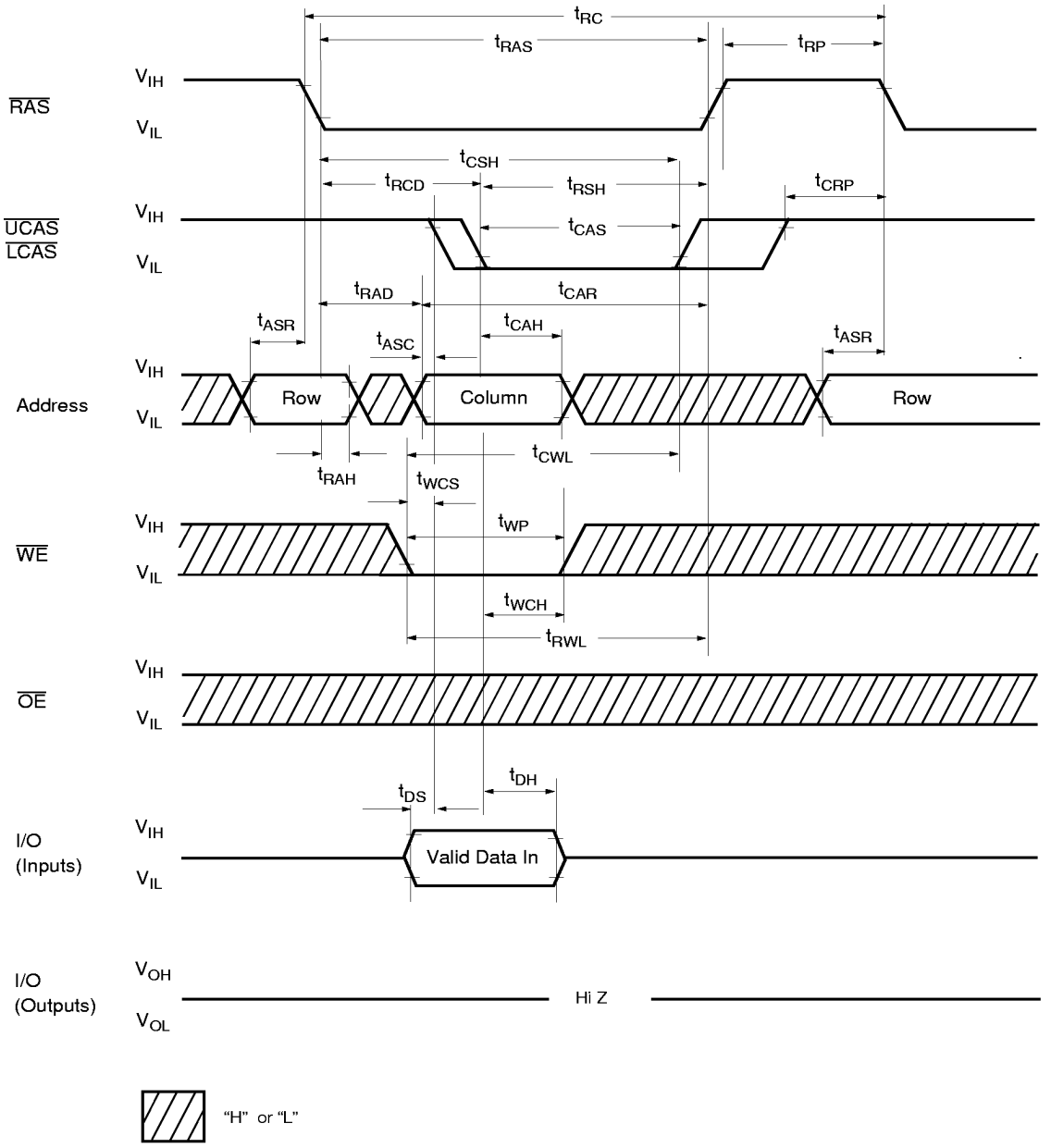
    If row addresses are being refreshed on an evenly distributed manner over the refresh interval using CBR refresh cycles, then only one CBR cycle must be performed immediately after exit from Self Refresh.

    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.
18. t_{OFF} is referenced from the rising edge of $\overline{RAS}$ or $\overline{CAS}$, whichever occurs last.

Waveforms of Read Cycle



Waveforms of Write Cycle (Early Write)



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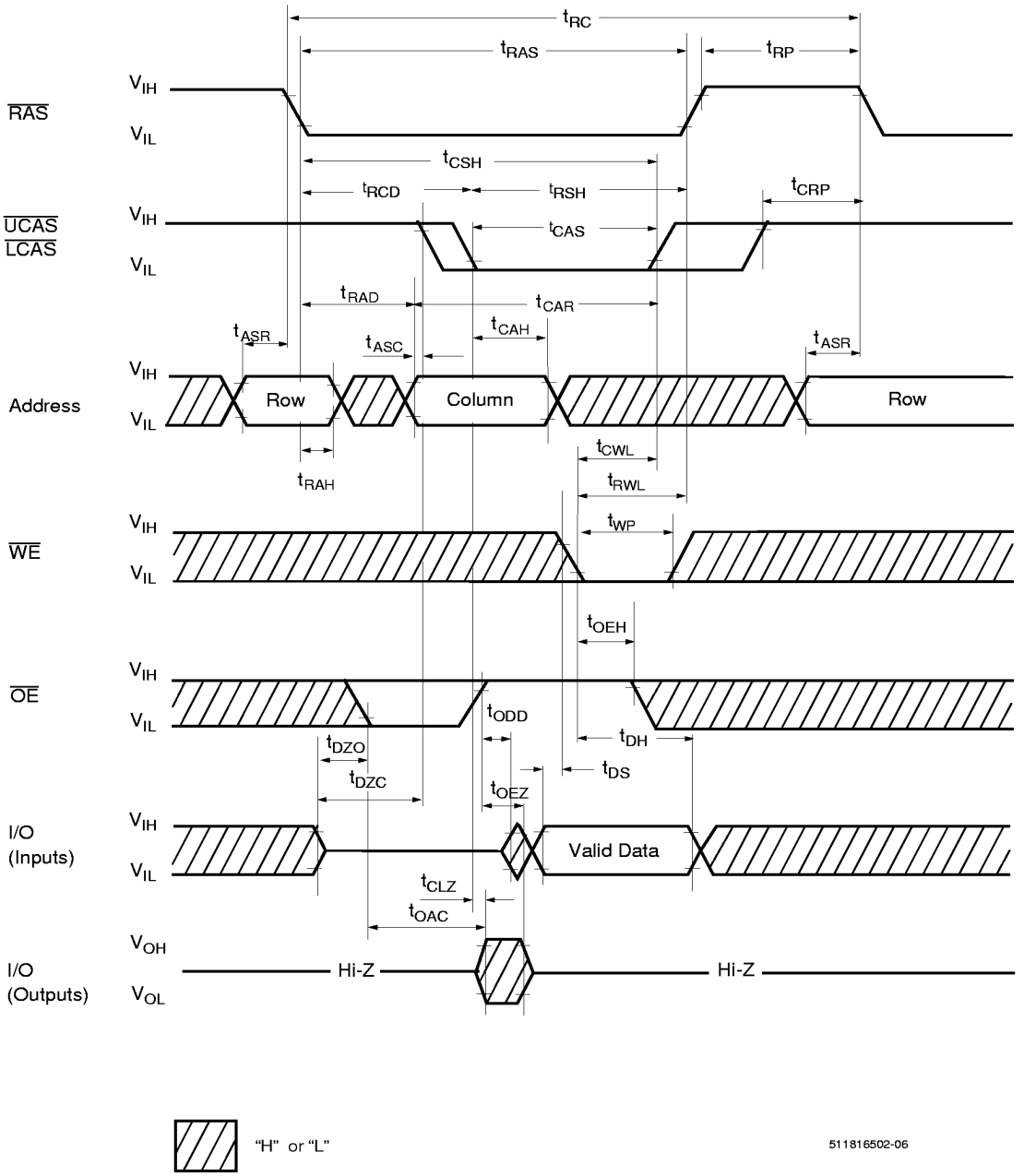
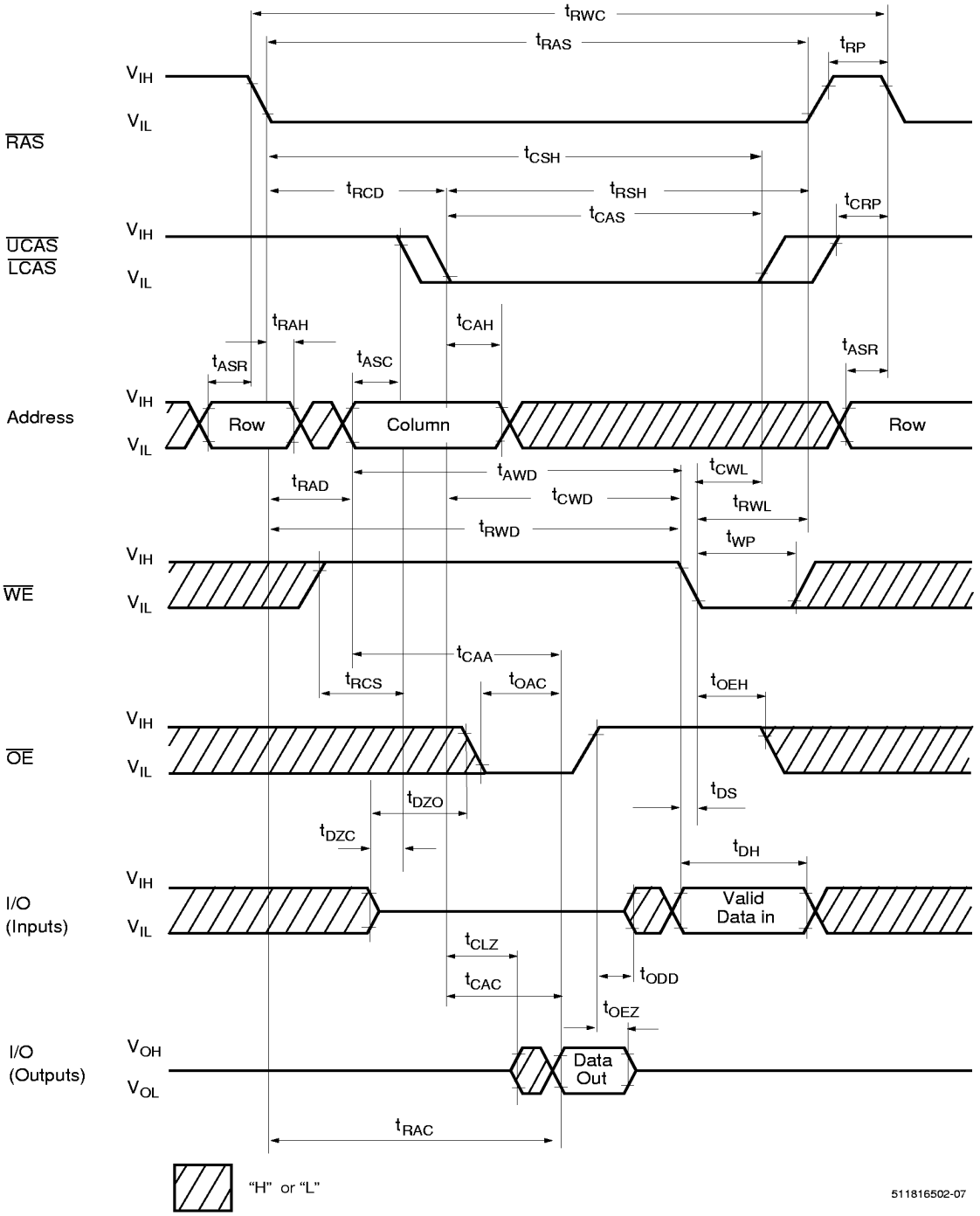
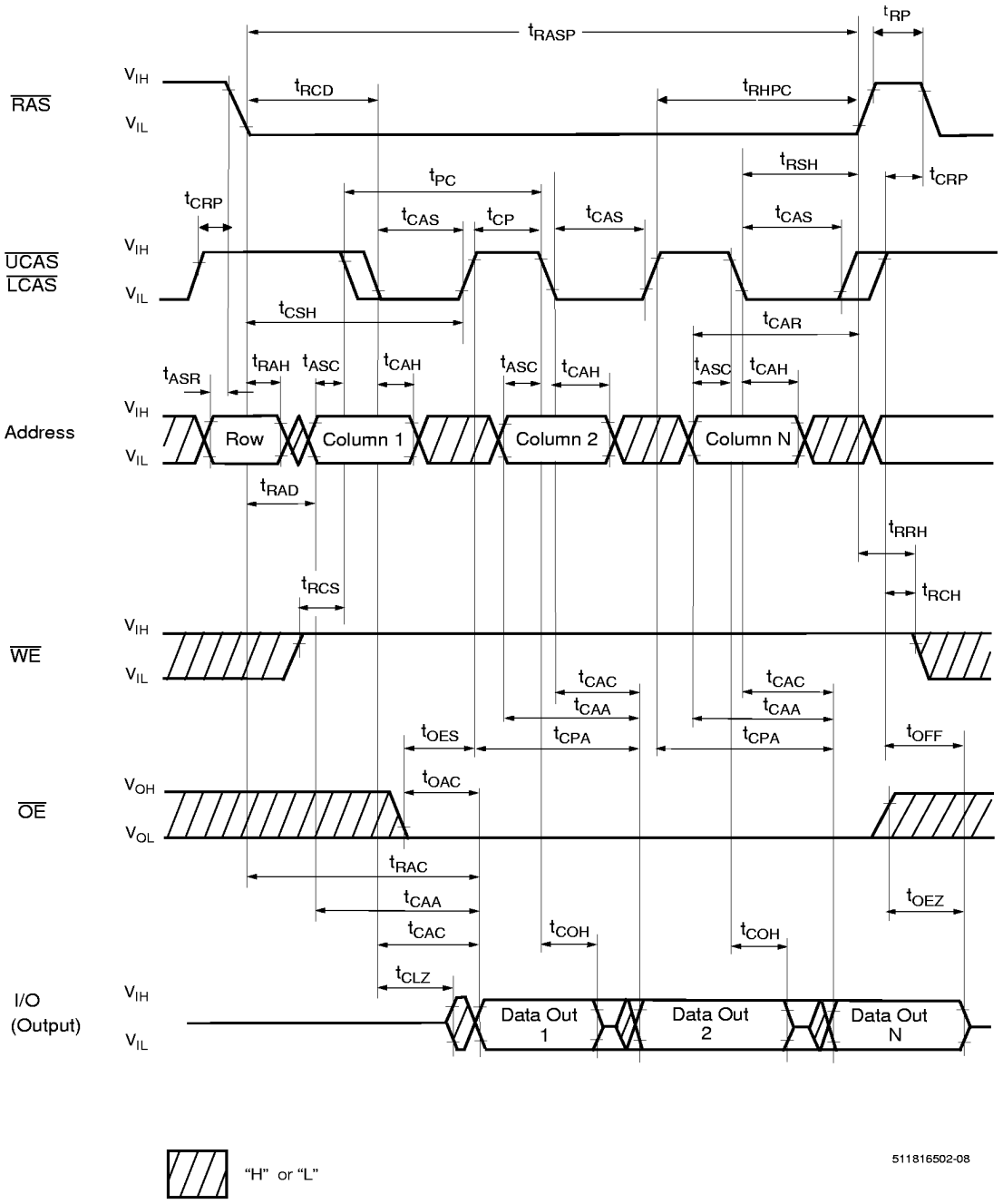
Waveforms of Write Cycle ($\overline{OE}$ Controlled Write)



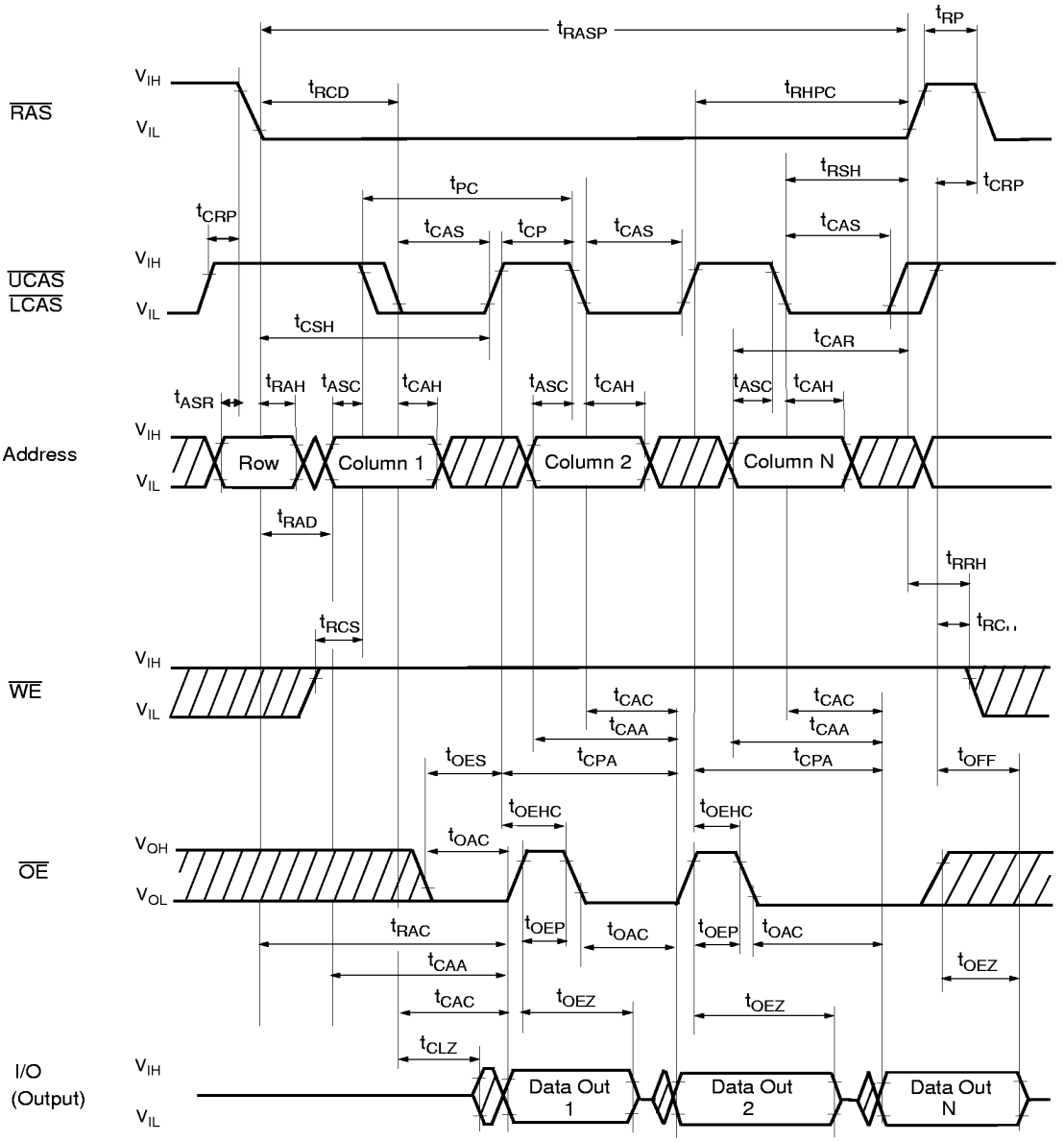
Waveforms of Read-Write (Read-Modify-Write) Cycle



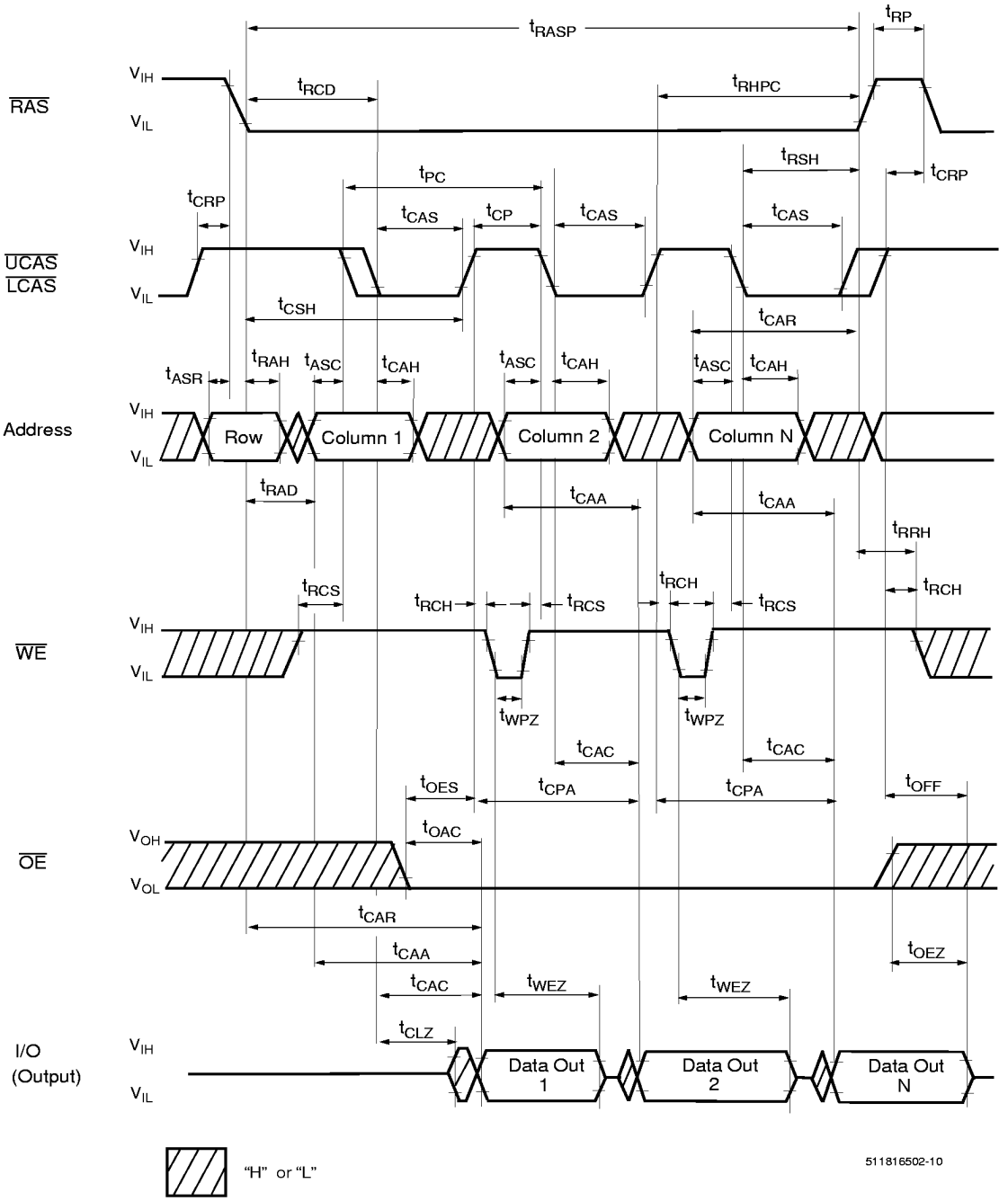
Waveforms of EDO Page Mode Read Cycle



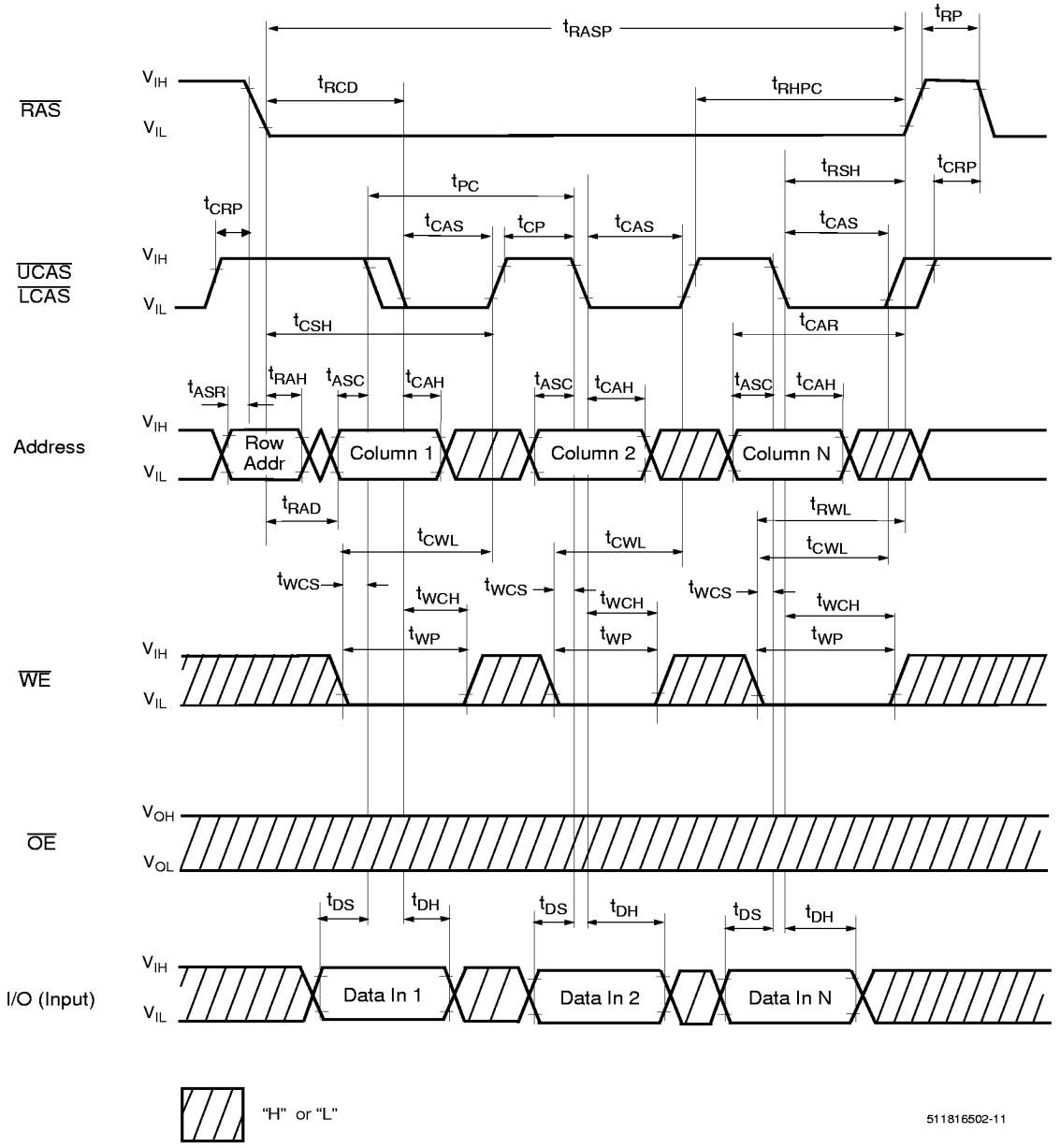
Waveforms of EDO Page Mode Read Cycle ($\overline{OE}$ Control)



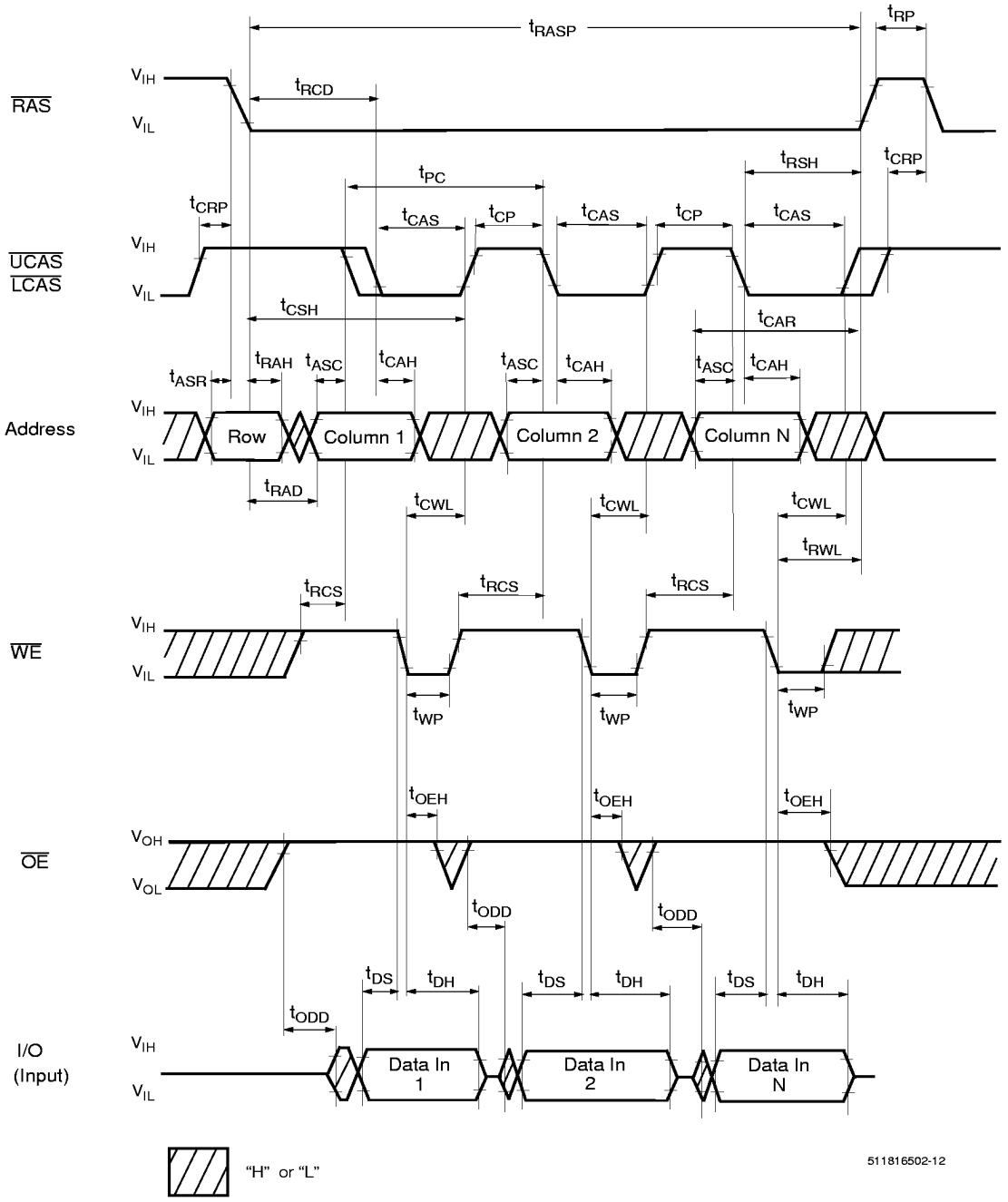
Waveforms of EDO Page Mode Read Cycle ($\overline{WE}$ Control)



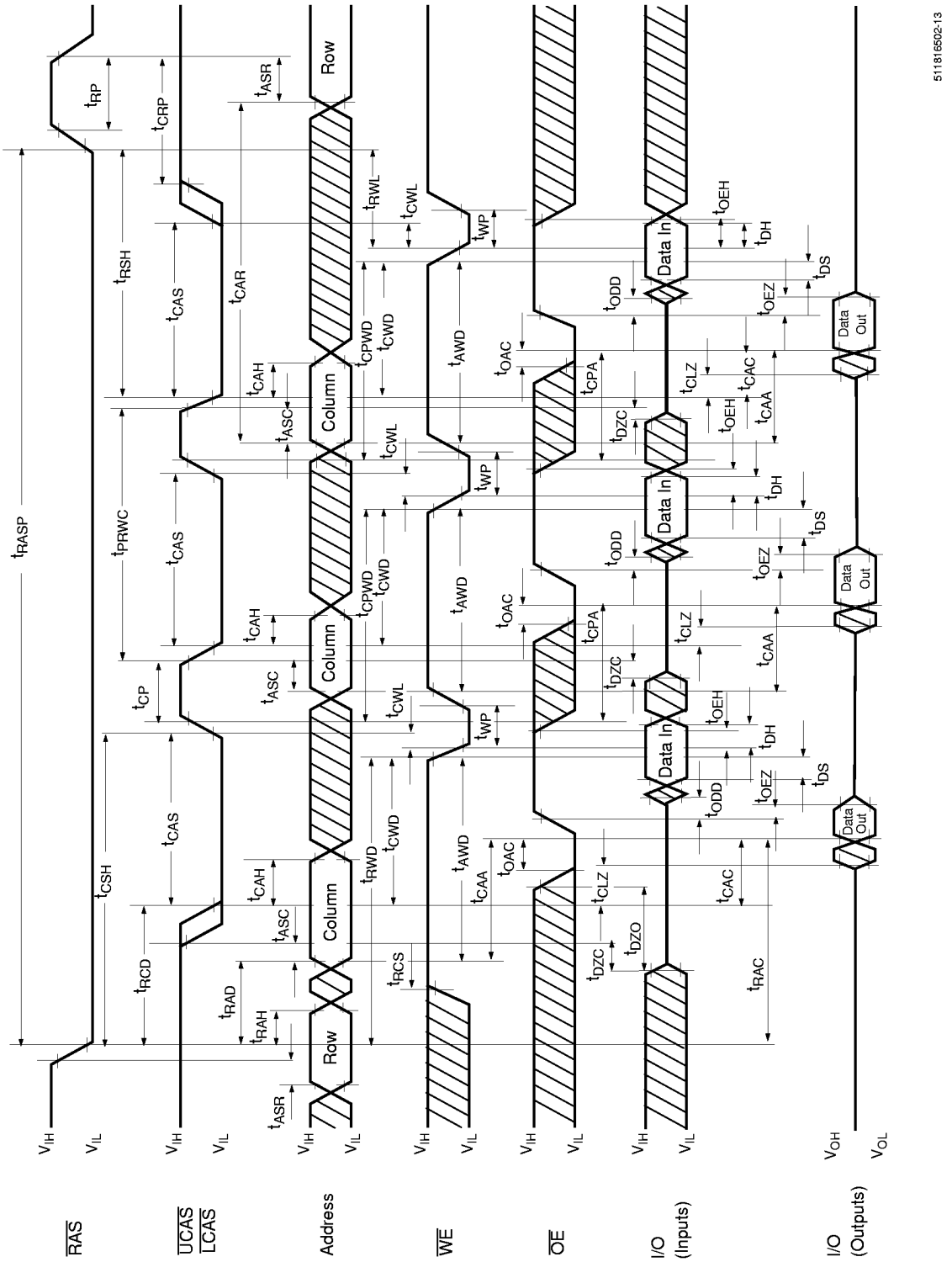
Waveforms of EDO Page Mode Early Write Cycle



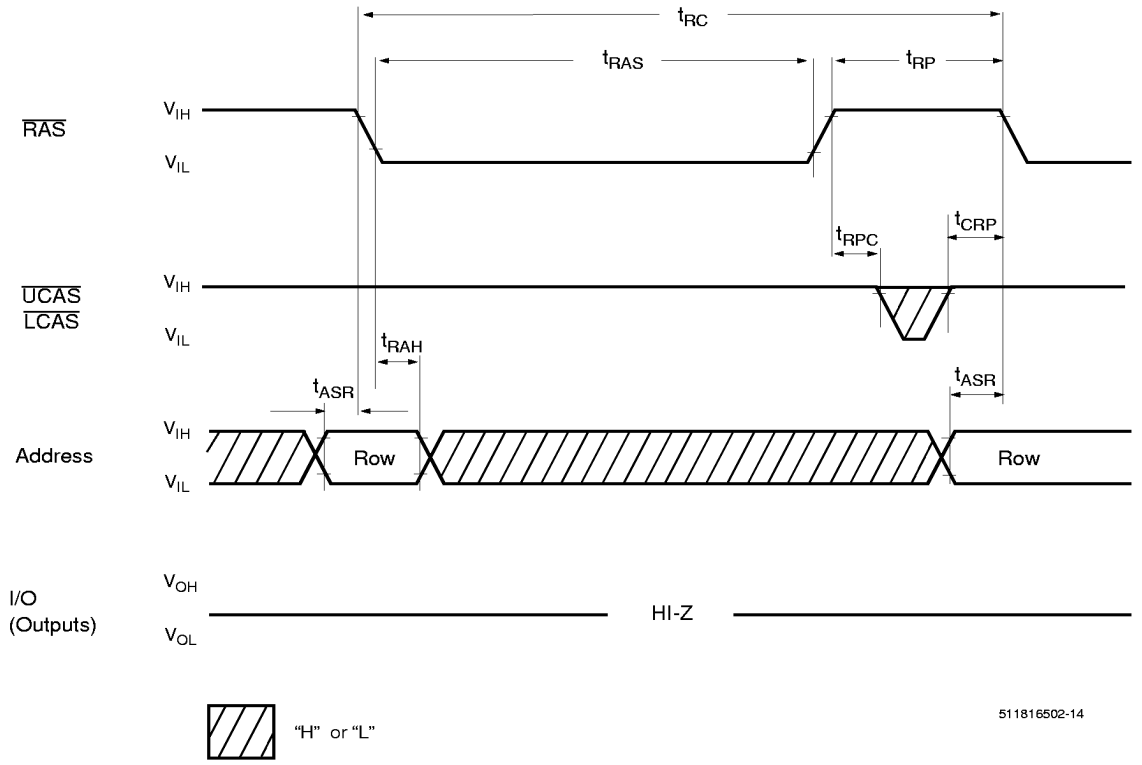
Waveforms of EDO Page Mode Late Write Cycle



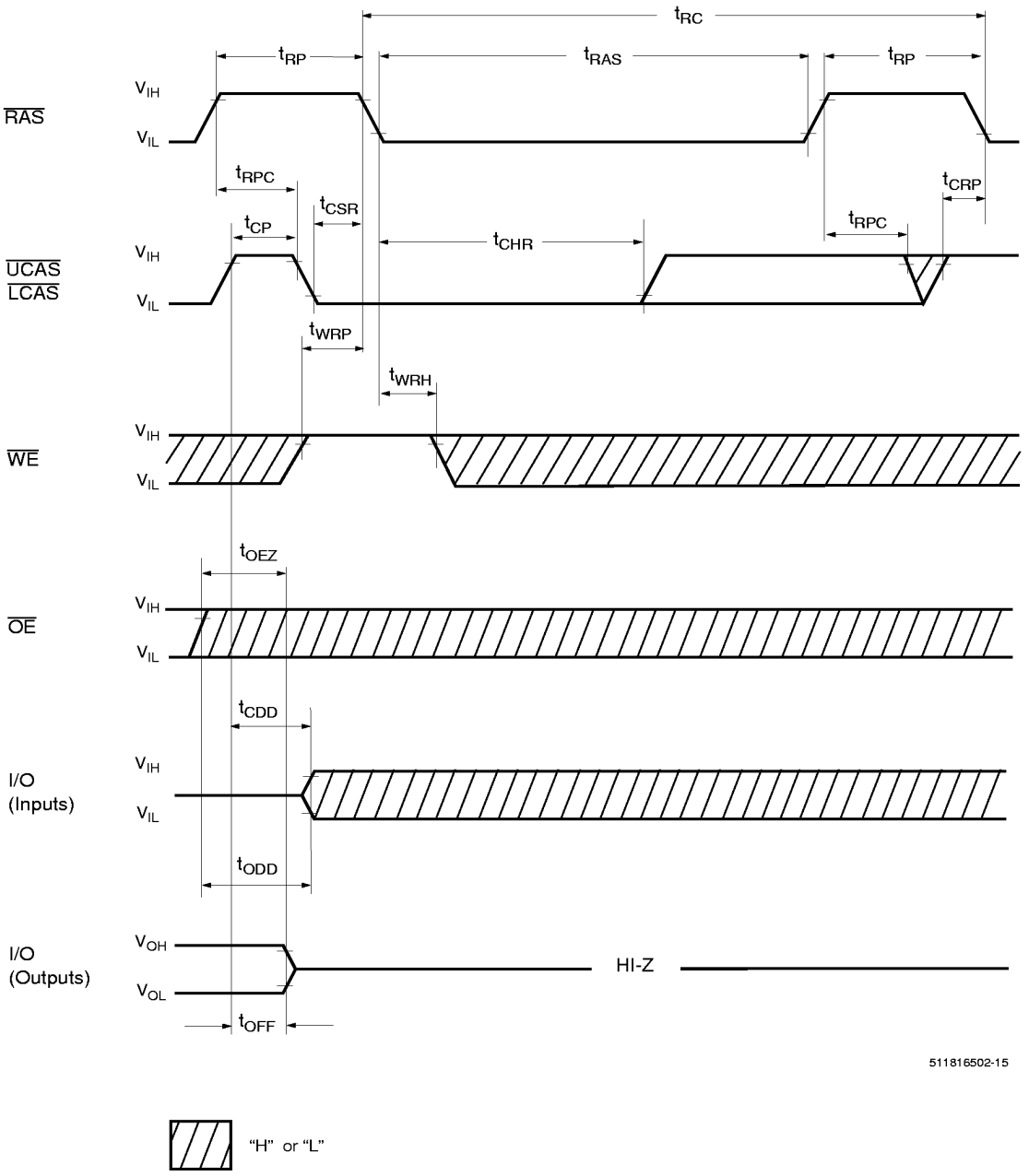
Waveforms of EDO Page Mode Read-Modify-Write Cycle



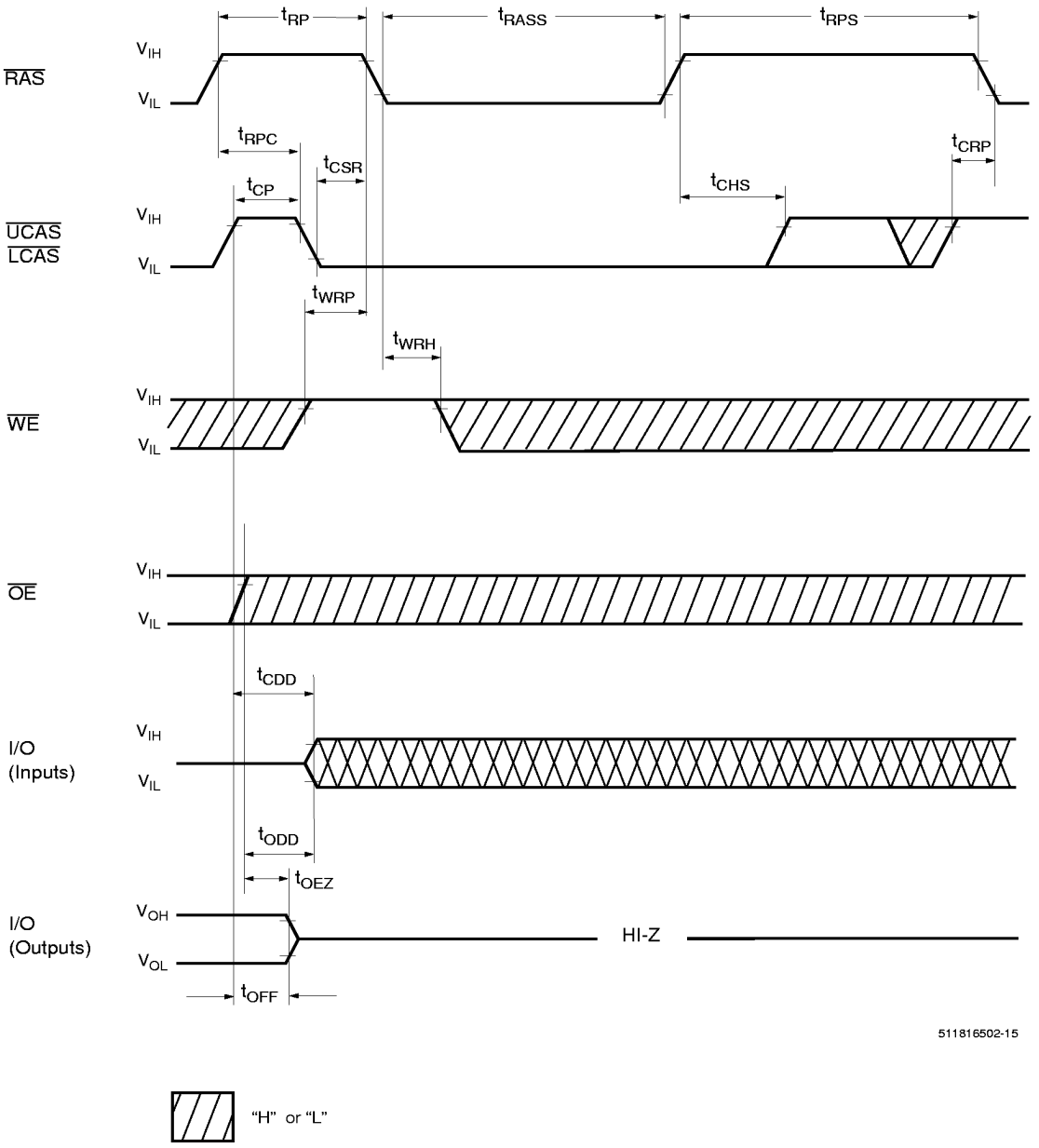
Waveforms of $\overline{RAS}$ Only Refresh Cycle



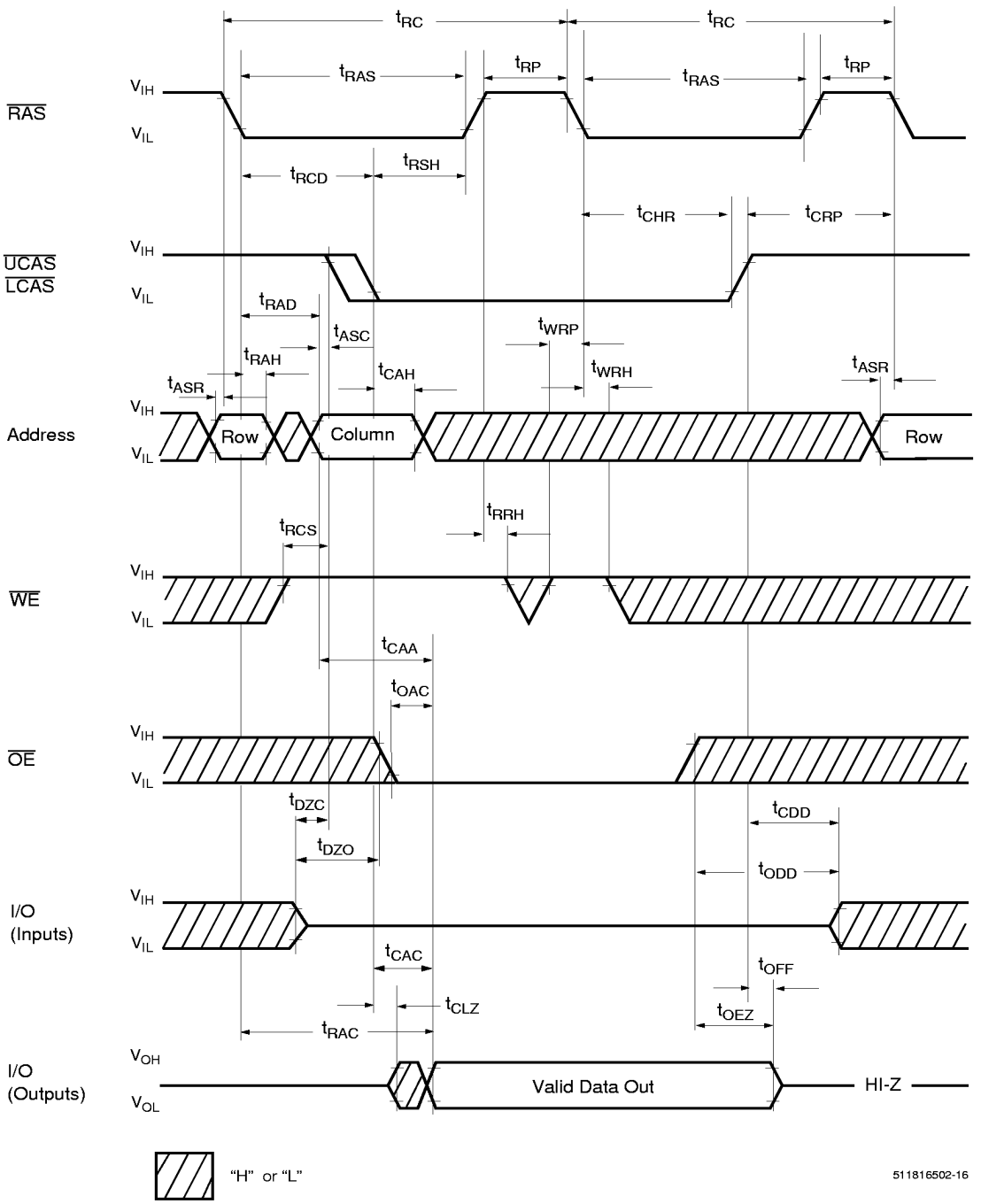
Waveforms of $\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle



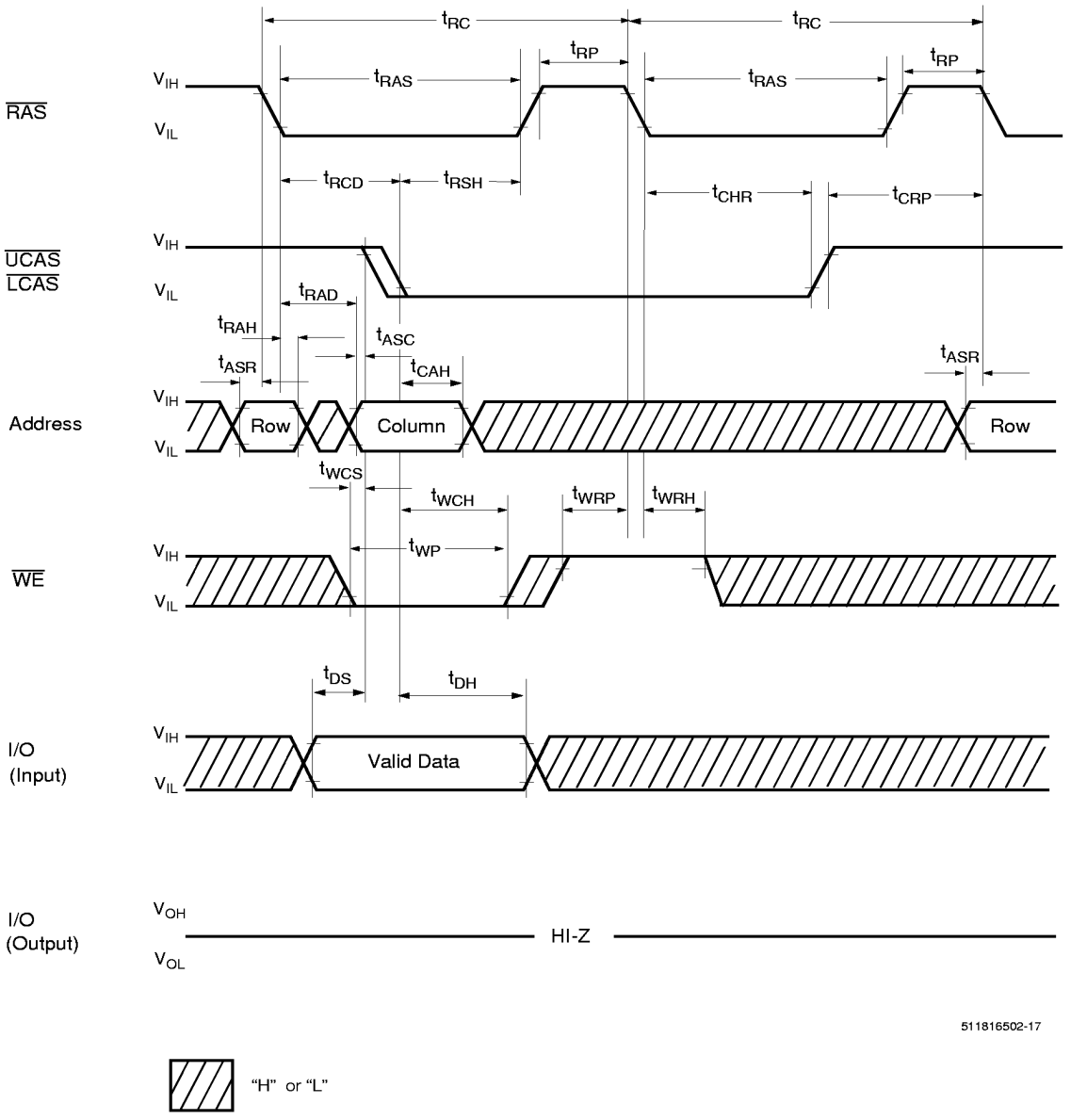
Waveforms of $\overline{CAS}$-before-$\overline{RAS}$ Self Refresh Cycle (Optional)



Waveforms of Hidden Refresh Read Cycle



Waveforms of Hidden Refresh Early Write Cycle



Functional Description

The V53C316165A is a CMOS dynamic RAM optimized for high data bandwidth, low power applications. It is functionally similar to a traditional dynamic RAM. The V53C316165A reads and writes data by multiplexing an 20-bit address into a 12-bit row and a 8-bit column address. The row address is latched by the Row Address Strobe ($\overline{RAS}$). The column address "flows through" an internal address buffer and is latched by the Column Address Strobe ($\overline{CAS}$). Because access time is primarily dependent on a valid column address rather than the precise time that the $\overline{CAS}$ edge occurs, the delay time from $\overline{RAS}$ to $\overline{CAS}$ has little effect on the access time.

Memory Cycle

A memory cycle is initiated by bringing $\overline{RAS}$ low. Any memory cycle, once initiated, must not be ended or aborted before the minimum t_{RAS} time has expired. This ensures proper device operation and data integrity. A new cycle must not be initiated until the minimum precharge time t_{RP}/t_{CP} has elapsed.

Read Cycle

A Read cycle is performed by holding the Write Enable ($\overline{WE}$) signal High during a $\overline{RAS}/\overline{CAS}$ operation. The column address must be held for a minimum specified by t_{AR}. Data Out becomes valid only when t_{OAC}, t_{RAC}, t_{CAA} and t_{CAC} are all satisifed. As a result, the access time is dependent on the timing relationships between these parameters. For example, the access time is limited by t_{CAA} when t_{RAC}, t_{CAC} and t_{OAC} are all satisfied.

Write Cycle

A Write Cycle is performed by taking $\overline{WE}$ and $\overline{CAS}$ low during a $\overline{RAS}$ operation. The column address is latched by $\overline{CAS}$. The Write Cycle can be $\overline{WE}$ controlled or $\overline{CAS}$ controlled depending on whether $\overline{WE}$ or $\overline{CAS}$ falls later. Consequently, the input data must be valid at or before the falling edge of $\overline{WE}$ or $\overline{CAS}$, whichever occurs last. In the $\overline{CAS}$-controlled Write Cycle, when the leading edge of $\overline{WE}$ occurs prior to the $\overline{CAS}$ low transition, the I/O data pins will be in the High-Z state at the beginning of the Write function. Ending the Write with $\overline{RAS}$ or $\overline{CAS}$ will maintain the output in the High-Z state.

In the $\overline{WE}$ controlled Write Cycle, $\overline{OE}$ must be in the high state and t_{OED} must be satisfied.

Extended Data Output Page Mode

EDO Page operation permits all 4096 columns within a selected row of the device to be randomly accessed at a high data rate. Maintaining $\overline{RAS}$ low while performing successive $\overline{CAS}$ cycles retains the row address internally and eliminates the need to reapply it for each cycle. The column address buffer acts as a transparent or flow-through latch while $\overline{CAS}$ is high. Thus, access begins from the occurrence of a valid column address rather than from the falling edge of $\overline{CAS}$, eliminating t_{ASC} and t_T from the critical timing path. $\overline{CAS}$ latches the address into the column address buffer. During EDO operation, Read, Write, Read-Modify-Write or Read-Write-Read cycles are possible at random addresses within a row. Following the initial entry cycle into EDO Mode, access is t_{CAA} or t_{CAP} controlled. If the column address is valid prior to the rising edge of $\overline{CAS}$, the access time is referenced to the $\overline{CAS}$ rising edge and is specified by t_{CAP}. If the column address is valid after the rising $\overline{CAS}$ edge, access is timed from the occurrence of a valid address and is specified by t_{CAA}. In both cases, the falling edge of $\overline{CAS}$ latches the address and enables the output.

EDO provides a sustained data rate of 50 MHz for applications that require high bandwidth such as bit-mapped graphics or high-speed signal processing. The following equation can be used to calculate the maximum data rate:

$$\text{Data Rate} = \frac{4096}{t_{RC} + 4095 \times t_{PC}}$$

Self Refresh

Self Refresh mode provides internal refresh control signals to the DRAM during extended periods of inactivity. Device operation in this mode provides additional power savings and design ease by elimination of external refresh control signals. Self Refresh mode is initialed with a $\overline{CAS}$ before $\overline{RAS}$ (CBR) Refresh cycle, holding both $\overline{RAS}$ low (t_{RASS}) and $\overline{CAS}$ low (t_{CHD}) for a specified period. Both of these parameters are specified with minimum values to guarantee entry into Self Refresh operation. Once the device has been placed in to Self Refresh mode the $\overline{CAS}$ clock is no longer required to maintain Self Refresh operation.

The Self Refresh mode is terminated by returning the $\overline{RAS}$ clock to a high level for a specified (t_{RPS}) minimum time. After termination of the Self Refresh cycle normal accesses to the device may be initiated immediately, poviding that subsequest refresh cycles utilize the $\overline{CAS}$ before $\overline{RAS}$ (CBR) mode of operation.

Data Output Operation

The V53C316165A Input/Output is controlled by $\overline{OE}$, $\overline{CAS}$, $\overline{WE}$ and $\overline{RAS}$. A $\overline{RAS}$ low transition enables the transfer of data to and from the selected row address in the Memory Array. A $\overline{RAS}$ high transition disables data transfer and latches the output data if the output is enabled. After a memory cycle is initiated with a $\overline{RAS}$ low transition, a $\overline{CAS}$ low transition or $\overline{CAS}$ low level enables the internal I/O path. A $\overline{CAS}$ high transition or a $\overline{CAS}$ high level disables the I/O path and the output driver if it is enabled. A $\overline{CAS}$ low transition while $\overline{RAS}$ is high has no effect on the I/O data path or on the output drivers. The output drivers, when otherwise enabled, can be disabled by holding $\overline{OE}$ high. The $\overline{OE}$ signal has no effect on any data stored in the output latches. A $\overline{WE}$ low level can also disable the output drivers when $\overline{CAS}$ is low. During a Write cycle, if $\overline{WE}$ goes low at a time in relationship to $\overline{CAS}$ that would normally cause the outputs to be active, it is necessary to use $\overline{OE}$ to disable the output drivers prior to the $\overline{WE}$ low transition to allow Data In Setup Time (t_{DS}) to be satisfied.

Power-On

After application of the V_{CC} supply, an initial pause of 200 μs is required followed by a minimum of 8 initialization cycles (any combination of cycles containing a $\overline{RAS}$ clock). Eight initialization cycles are required after extended periods of bias without clocks (greater than the Refresh Interval).

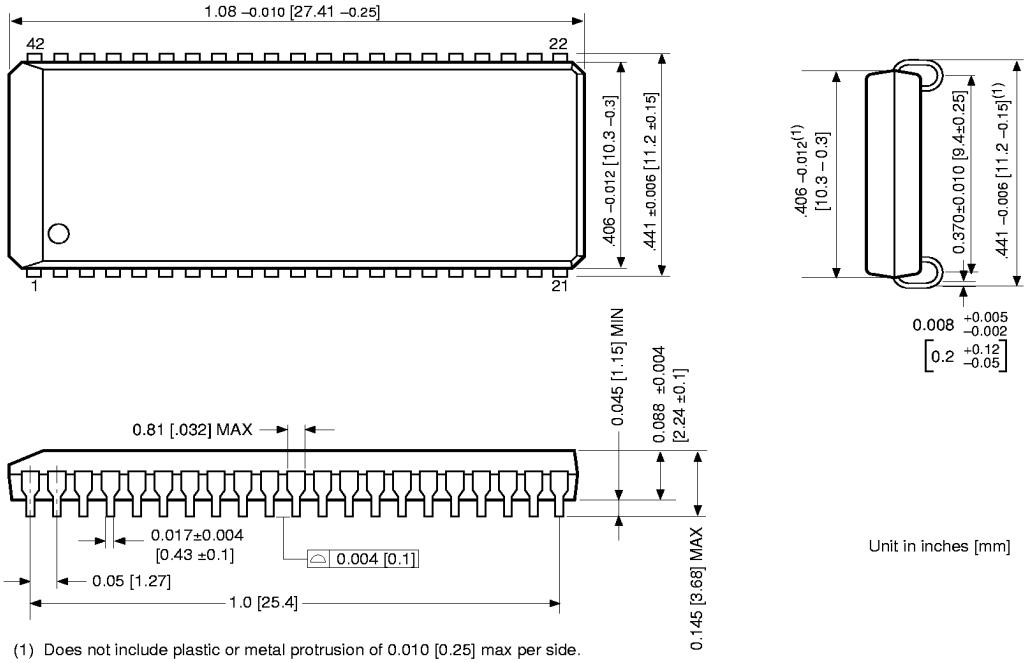
During Power-On, the V_{CC} current requirement of the V53C316165A is dependent on the input levels of $\overline{RAS}$ and $\overline{CAS}$. If $\overline{RAS}$ is low during Power-On, the device will go into an active cycle and I_{CC} will exhibit current transients. It is recommended that $\overline{RAS}$ and $\overline{CAS}$ track with V_{CC} or be held at a valid V_{IH} during Power-On to avoid current surges.

Table 1. V53C316165A Data Output
Operation for Various Cycle Types

Cycle Type	I/O State
Read Cycles	Data from Addressed Memory Cell
CAS-Controlled Write Cycle (Early Write)	High-Z
$\overline{WE}$-Controlled Write Cycle (Late Write)	$\overline{OE}$ Controlled. High $\overline{OE}$ = High-Z I/Os
Read-Modify-Write Cycles	Data from Addressed Memory Cell
EDO Read Cycle	Data from Addressed Memory Cell
EDO Write Cycle (Early Write)	High-Z
EDO Read-Modify-Write Cycle	Data from Addressed Memory Cell
$\overline{RAS}$-only Refresh	High-Z
$\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle	High-Z
$\overline{CAS}$-only Cycles	High-Z

Package Diagrams

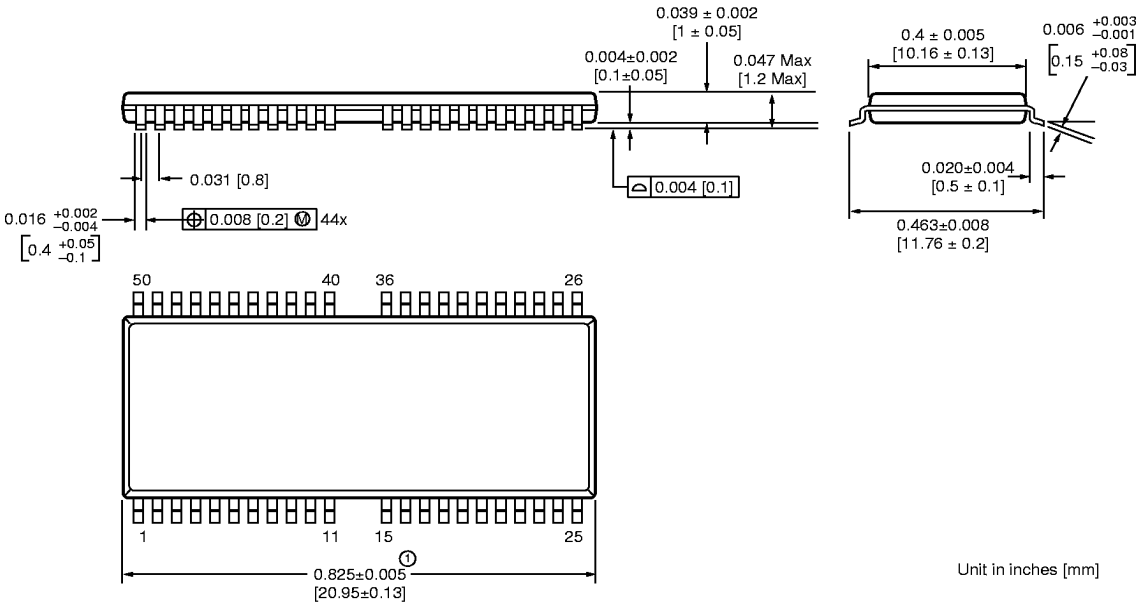
42-Pin 400 mil SOJ



Unit in inches [mm]

(1) Does not include plastic or metal protrusion of 0.010 [0.25] max per side.

50/44-Pin 400 mil TSOP-II



Unit in inches [mm]

① Does not include plastic or metal protrusion of 0.010 [0.25] max. per side