V53C16256H
256K x 16 FAST PAGE MODE CMOS DYNAMIC RAM

HIGH PERFORMANCE	30	35	40	45	50	60
Max. $\overline{RAS}$ Access Time, (t_{RAC})	30 ns	35 ns	40 ns	45 ns	50 ns	60 ns
Max. Column Address Access Time, (t_{CAA})	16 ns	18 ns	20 ns	22 ns	24 ns	30 ns
Min. Fast Page Mode Cycle Time, (t_{PC})	19 ns	21 ns	23 ns	25 ns	28 ns	35 ns
Min. Read/Write Cycle Time, (t_{RC})	65 ns	70 ns	75 ns	80 ns	90 ns	110 ns

Features

- 256K x 16-bit organization
- Fast Page Mode for a sustained data rate of 53 MHz.
- $\overline{RAS}$ access time: 30, 35, 40, 45, 50, 60 ns
- Dual $\overline{CAS}$ Inputs
- Low power dissipation
- Read-Modify-Write, $\overline{RAS}$-Only Refresh, $\overline{CAS}$-Before-$\overline{RAS}$ Refresh
- Refresh Interval: 512 cycles/8 ms
- Available in 40-pin 400 mil SOJ and 40/44L-pin 400 mil TSOP-II packages
- Single +5V ±10% Power Supply
- TTL Interface

Description

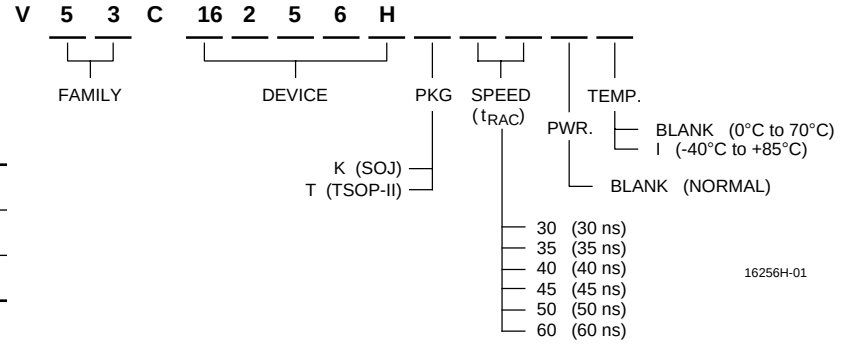
The V53C16256H is a 262,144 x 16 bit high-performance CMOS dynamic random access memory. The V53C16256H offers Fast Page mode with dual $\overline{CAS}$ inputs. An address, $\overline{CAS}$ and $\overline{RAS}$ input capacitances are reduced to one quarter when the x4 DRAM is used to construct the same memory density. The V53C16256H has symmetric address and accepts 512 cycle 8ms interval.

All inputs are TTL compatible. Fast Page Mode operation allows random access up to 512 x 16 bits, within a page, with cycle times as short as 19ns.

The V53C16256H is best suited for graphics, and DSP applications.

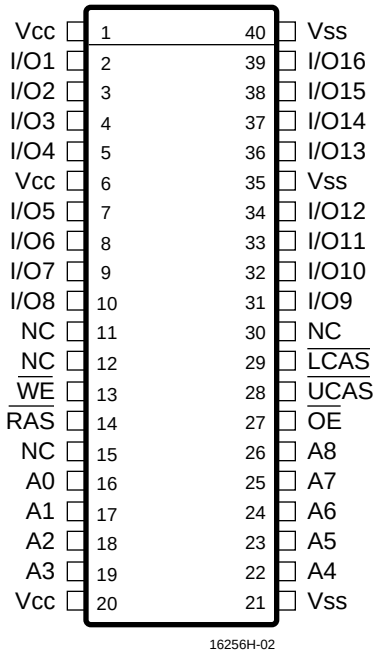
Device Usage Chart

Operating Temperature Range	Package Outline		Access Time (ns)						Power	Temperature Mark
	K	T	30	35	40	45	50	60	Std.	
0°C to 70 °C	•	•	•	•	•	•	•	•	•	Blank
-40°C to +85°C	•	•	•	•	•	•	•	•	•	I

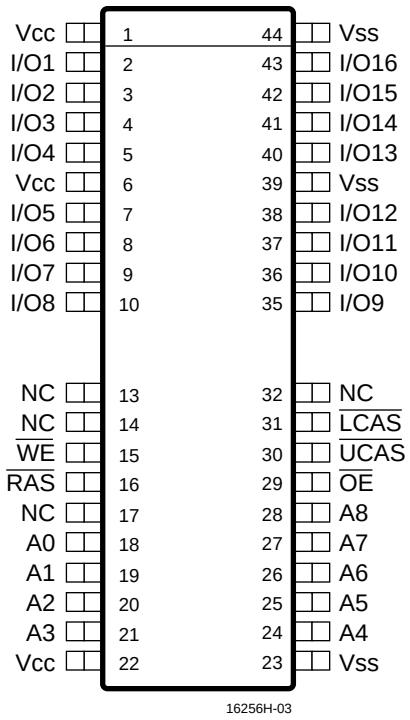


Description	Pkg.	Pin Count
SOJ	K	40
TSOP-II	T	40/44L

40-Pin Plastic SOJ PIN CONFIGURATION Top View



40/44 Pin Plastic TSOP-II PIN CONFIGURATION Top View



Pin Names

A_0–A_8	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}	+5V Supply
V_{SS}	0V Supply
NC	No Connect

*Absolute Maximum Ratings**

Ambient Temperature
Under Bias ..... –10°C to +80°C
Storage Temperature (plastic) ..... –55°C to +125°C
Voltage Relative to V_{SS} .....–1.0 V to +7.0V
Data Output Current ..... 50 mA
Power Dissipation ..... 1.0 W

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

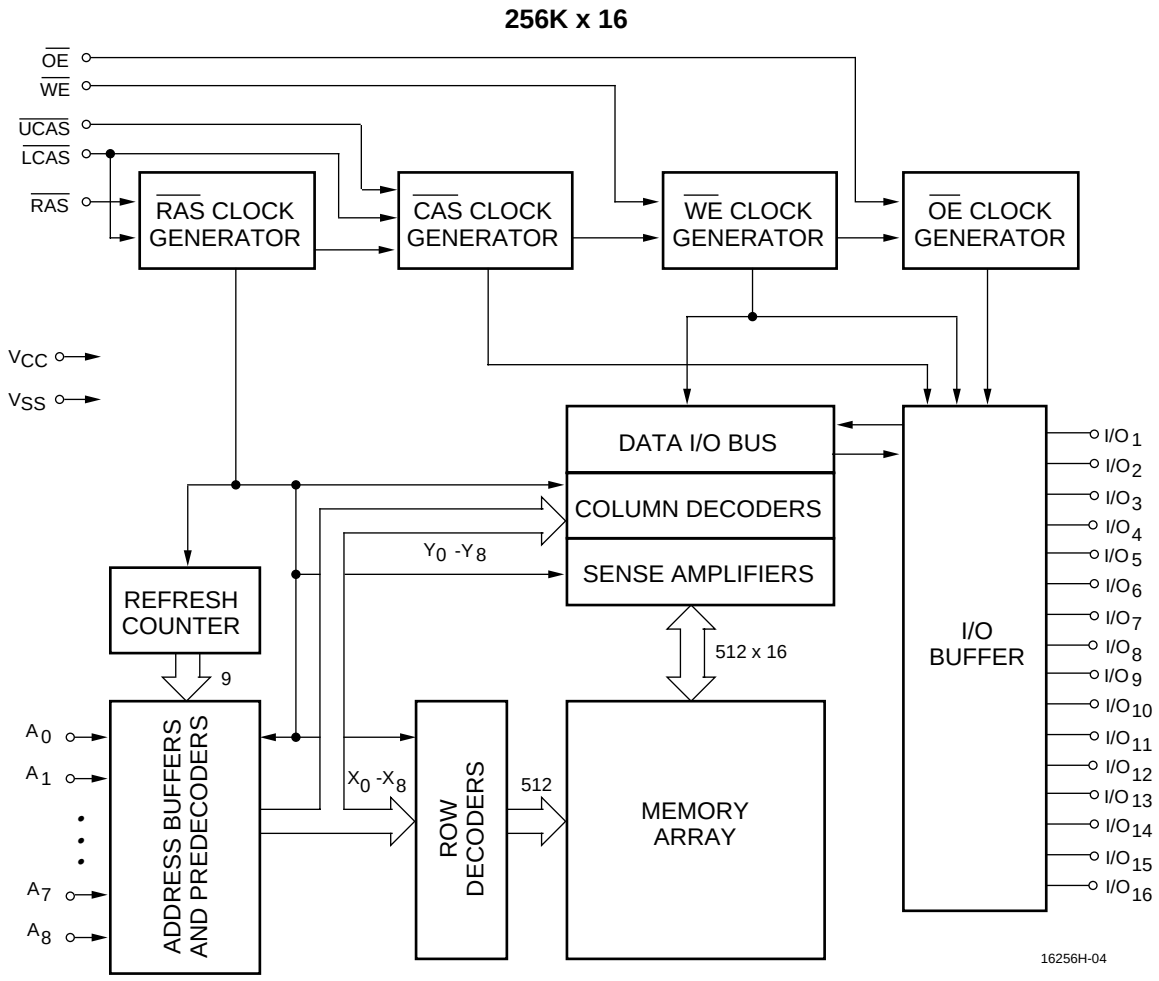
*Capacitance**

T_A = 25°C, V_{CC} = 5V ± 10%, V_{SS} = 0 V

Symbol	Parameter	Typ.	Max.	Unit
C_{IN1}	Address Input	3	4	pF
C_{IN2}	$\overline{RAS}$, $\overline{UCAS}$, $\overline{LCAS}$, $\overline{WE}$, $\overline{OE}$	4	5	pF
C_{OUT}	Data Input/Output	5	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} = 5V ± 5%, V_{SS} = 0 V, unless otherwise specified.

Symbol	Parameter	Access Time	V53C16256H			Unit	Test Conditions	Notes
			Min.	Typ.	Max.			
I_{LI}	Input Leakage Current (any input pin)		–10		10	µA	$V_{SS} \le V_{IN} \le V_{CC}$	
I_{LO}	Output Leakage Current (for High-Z State)		–10		10	µA	$V_{SS} \le V_{OUT} \le V_{CC}$ $\overline{RAS}$, $\overline{CAS}$ at V_{IH}	
I_{CC1}	V_{CC} Supply Current, Operating	30			200	mA	$t_{RC} = t_{RC}$ (min.)	1, 2
		35			190			
		40			180			
		45			170			
		50			160			
		60			150			
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	30			200	mA	$t_{RC} = t_{RC}$ (min.)	2
		35			190			
		40			180			
		45			170			
		50			160			
		60			150			
I_{CC4}	V_{CC} Supply Current, Fast Page Mode Operation	30			190	mA	Minimum Cycle	1, 2
		35			180			
		40			170			
		45			160			
		50			150			
		60			140			
I_{CC5}	V_{CC} Supply Current, Standby, Output Enabled other inputs ≥ V_{SS}				2	mA	$\overline{RAS} = V_{IH}$, $\overline{CAS} = V_{IL}$	1
I_{CC6}	V_{CC} Supply Current, CMOS Standby				1	mA	$\overline{RAS} \ge V_{CC} - 0.2$ V, $\overline{CAS} \ge V_{CC} - 0.2$ V, All other inputs ≥ V_{SS}	
V_{IL}	Input Low Voltage		–1		0.8	V		3
V_{IH}	Input High Voltage		2.0		V_{CC} + 1	V		3
V_{OL}	Output Low Voltage				0.4	V	I_{OL} = 2.0 mA	
V_{OH}	Output High Voltage		2.4			V	I_{OH} = –2.0 mA	

AC Characteristics

Over all temperature range, V_{CC} = 5 V ±10%, V_{SS} = 0V unless otherwise noted
AC Test conditions, input pulse levels 0 to 3V

#	JEDEC Symbol	Symbol	Parameter	30		35		40		45		50		60		Unit	Notes
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
1	t_{RL1RH1}	t_{RAS}	$\overline{RAS}$ Pulse Width	30	75K	35	75K	40	75	45	75K	50	75K	60	75K	ns	
2	t_{RL2RL2}	t_{RC}	Read or Write Cycle Time	65		70		75		80		90		110		ns	
3	t_{RH2RL2}	t_{RP}	$\overline{RAS}$ Precharge Time	25		25		25		25		30		40		ns	
4	t_{RL1CH1}	t_{CSH}	$\overline{CAS}$ Hold Time	30		35		40		45		50		60		ns	
5	t_{CL1CH1}	t_{CAS}	$\overline{CAS}$ Pulse Width	5		6		12		13		14		15		ns	
6	t_{RL1CL1}	t_{RCD}	$\overline{RAS}$ to $\overline{CAS}$ Delay	15	20	16	24	17	28	18	32	19	36	20	45	ns	
7	t_{WH2CL2}	t_{RCS}	Read Command Setup Time	0		0		0		0		0		0		ns	4
8	t_{AVRL2}	t_{ASR}	Row Address Setup Time	0		0		0		0		0		0		ns	
9	t_{RL1AX}	t_{RAH}	Row Address Hold Time	5		6		7		8		9		10		ns	
10	t_{AVCL2}	t_{ASC}	Column Address Setup Time	0		0		0		0		0		0		ns	
11	t_{CL1AX}	t_{CAH}	Column Address Hold Time	5		5		5		6		7		10		ns	
12	$t_{CL1RH1(R)}$	$t_{RSH\ (R)}$	$\overline{RAS}$ Hold Time (Read Cycle)	10		10		12		13		14		15		ns	
13	t_{CH2RL2}	t_{CRP}	$\overline{CAS}$ to $\overline{RAS}$ Precharge Time	5		5		5		5		5		5		ns	
14	t_{CH2WX}	t_{RCH}	Read Command Hold Time Referenced to $\overline{CAS}$	0		0		0		0		0		0		ns	5
15	t_{RH2WX}	t_{RRH}	Read Command Hold Time Referenced to $\overline{RAS}$	0		0		0		0		0		0		ns	5
16	$t_{OEL1RH2}$	t_{ROH}	$\overline{RAS}$ Hold Time Referenced to $\overline{OE}$	6		7		8		9		10		10		ns	
17	t_{GL1QV}	t_{OAC}	Access Time from $\overline{OE}$		10		11		12		13		14		15	ns	
18	t_{CL1QV}	t_{CAC}	Access Time from $\overline{CAS}$		10		11		12		13		14		15	ns	6, 7
19	t_{RL1QV}	t_{RAC}	Access Time from $\overline{RAS}$		30		35		45		50		55		60	ns	6, 8, 9
20	t_{AVQV}	t_{CAA}	Access Time from Column Address		16		18		20		22		24		30	ns	6, 7, 10

AC Characteristics (Cont'd)

#	JEDEC Symbol	Symbol	Parameter	30		35		40		45		50		60		Unit	Notes
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
21	t_{CL1QX}	t_{LZ}	$\overline{OE}$ or $\overline{CAS}$ to Low-Z Output	0		0		0		0		0		0		ns	16
22	t_{CH2QZ}	t_{HZ}	$\overline{OE}$ or $\overline{CAS}$ to High-Z Output	0	5	0	6	0	6	0	7	0	8	0	10	ns	16
23	t_{RL1AX}	t_{AR}	Column Address Hold Time from $\overline{RAS}$	26		28		30		35		40		50		ns	
24	t_{RL1AV}	t_{RAD}	$\overline{RAS}$ to Column Address Delay Time	10	14	11	17	12	20	13	23	14	26	15	30	ns	11
25	$t_{CL1RH1(W)}$	$t_{RSH\ (W)}$	$\overline{RAS}$ or $\overline{CAS}$ Hold Time in Write Cycle	10		10		12		13		14		15		ns	
26	t_{WL1CH1}	t_{CWL}	Write Command to $\overline{CAS}$ Lead Time	10		11		12		13		14		15		ns	
27	t_{WL1CL2}	t_{WCS}	Write Command Setup Time	0		0		0		0		0		0		ns	12, 13
28	t_{CL1WH1}	t_{WCH}	Write Command Hold Time	5		5		5		6		7		10		ns	
29	t_{WL1WH1}	t_{WP}	Write Pulse Width	5		5		5		6		7		10		ns	
30	t_{RL1WH1}	t_{WCR}	Write Command Hold Time from $\overline{RAS}$	26		28		30		35		40		50		ns	
31	t_{WL1RH1}	t_{RWL}	Write Command to $\overline{RAS}$ Lead Time	10		11		12		13		14		15		ns	
32	t_{DVWL2}	t_{DS}	Data in Setup Time	0		0		0		0		0		0		ns	14
33	t_{WL1DX}	t_{DH}	Data in Hold Time	5		5		5		6		7		10		ns	14
34	t_{WL1GL2}	t_{WOH}	Write to $\overline{OE}$ Hold Time	5		5		6		7		8		10		ns	14
35	t_{GH2DX}	t_{OED}	$\overline{OE}$ to Data Delay Time	5		5		6		7		8		10		ns	14
36	t_{RL2RL2} (RMW)	t_{RWC}	Read-Modify-Write Cycle Time	100		105		110		115		130		170		ns	
37	t_{RL1RH1} (RMW)	t_{RRW}	Read-Modify-Write Cycle $\overline{RAS}$ Pulse Width	65		70		75		80		87		105		ns	
38	t_{CL1WL2}	t_{CWD}	$\overline{CAS}$ to $\overline{WE}$ Delay	26		28		30		32		34		40		ns	12
39	t_{RL1WL2}	t_{RWD}	$\overline{RAS}$ to $\overline{WE}$ Delay in Read-Modify-Write Cycle	50		54		58		62		68		85		ns	12
40	t_{CL1CH1}	t_{CRW}	$\overline{CAS}$ Pulse Width (RMW)	44		46		48		50		52		65		ns	

AC Characteristics (Cont'd)

#	JEDEC Symbol	Symbol	Parameter	30		35		40		45		50		60		Unit	Notes
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
41	t_{AVWL2}	t_{AWD}	Col. Address to $\overline{WE}$ Delay	32		35		38		41		42		58		ns	12
42	t_{CL2CL2}	t_{PC}	Fast Page Mode Read or Write Cycle Time	19		21		23		25		28		35		ns	
43	t_{CH2CL2}	t_{CP}	$\overline{CAS}$ Precharge Time	3		4		5		6		7		10		ns	
44	t_{AVRH1}	t_{CAR}	Column Address to $\overline{RAS}$ Setup Time	16		18		20		22		24		30		ns	
45	t_{CH2QV}	t_{CAP}	Access Time from Column Precharge		19		21		22		24		27		34	ns	7
46	t_{RL1DX}	t_{DHR}	Data in Hold Time Referenced to $\overline{RAS}$	26		28		30		35		40		50		ns	
47	t_{CL1RL2}	t_{CSR}	$\overline{CAS}$ Setup Time $\overline{CAS}$-before-$\overline{RAS}$ Refresh	10		10		10		10		10		10		ns	
48	t_{RH2CL2}	t_{RPC}	$\overline{RAS}$ to $\overline{CAS}$ Precharge Time	0		0		0		0		0		0		ns	
49	t_{RL1CH1}	t_{CHR}	$\overline{CAS}$ Hold Time $\overline{CAS}$-before-$\overline{RAS}$ Refresh	7		8		8		10		12		15		ns	
50	t_{CL2CL2} (RMW)	t_{PCM}	Fast Page Mode Read-Modify-Write Cycle Time	56		58		60		65		70		85		ns	
51	t_T	t_T	Transition Time (Rise and Fall)	1.5	50	1.5	50	3	50	3	50	3	50	3	50	ns	15
52		t_{REF}	Refresh Interval (512 Cycles)		8		8	8			8		8		8	ms	17

Notes:

1. I_{CC} is dependent on output loading when the device output is selected. Specified I_{CC} (max.) is measured with the output open.
2. I_{CC} is dependent upon the number of address transitions. Specified I_{CC} (max.) is measured with a maximum of two transitions per address cycle in Fast Page Mode.
3. Specified V_{IL} (min.) is steady state operating. During transitions, V_{IL} (min.) may undershoot to –1.0 V for a period not to exceed 20 ns. All AC parameters are measured with V_{IL} (min.) ≥ V_{SS} and V_{IH} (max.) ≤ V_{CC}.
4. t_{RCD} (max.) is specified for reference only. Operation within t_{RCD} (max.) limits insures that t_{RAC} (max.) and t_{CAA} (max.) can be met. If t_{RCD} is greater than the specified t_{RCD} (max.), the access time is controlled by t_{CAA} and t_{CAC}.
5. Either t_{RRH} or t_{RCH} must be satisified for a Read Cycle to occur.
6. Measured with a load equivalent to one TTL input and 50 pF.
7. Access time is determined by the longest of t_{CAA}, t_{CAC} and t_{CAP}.
8. Assumes that $t_{RAD} \leq t_{RAD}$ (max.). If t_{RAD} is greater than t_{RAD} (max.), t_{RAC} will increase by the amount that t_{RAD} exceeds t_{RAD} (max.).
9. Assumes that $t_{RCD} \leq t_{RCD}$ (max.). If t_{RCD} is greater than t_{RCD} (max.), t_{RAC} will increase by the amount that t_{RCD} exceeds t_{RCD} (max.).
10. Assumes that $t_{RAD} \geq t_{RAD}$ (max.).
11. 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, the access time is controlled by t_{CAA} and t_{CAC}.
12. t_{WCS}, t_{RWD}, t_{AWD} and t_{CWD} are not restrictive operating parameters.
13. t_{WCS} (min.) must be satisfied in an Early Write Cycle.
14. t_{DS} and t_{DH} are referenced to the latter occurrence of $\overline{CAS}$ or $\overline{WE}$.
15. t_T is measured between V_{IH} (min.) and V_{IL} (max.). AC-measurements assume t_T = 3 ns.
16. Assumes a three-state test load (5 pF and a 380 Ohm Thevenin equivalent).
17. An initial 200 μs pause and 8 $\overline{RAS}$-containing cycles are required when exiting an extended period of bias without clocks. An extended period of time without clocks is defined as one that exceeds the specified Refresh Interval.

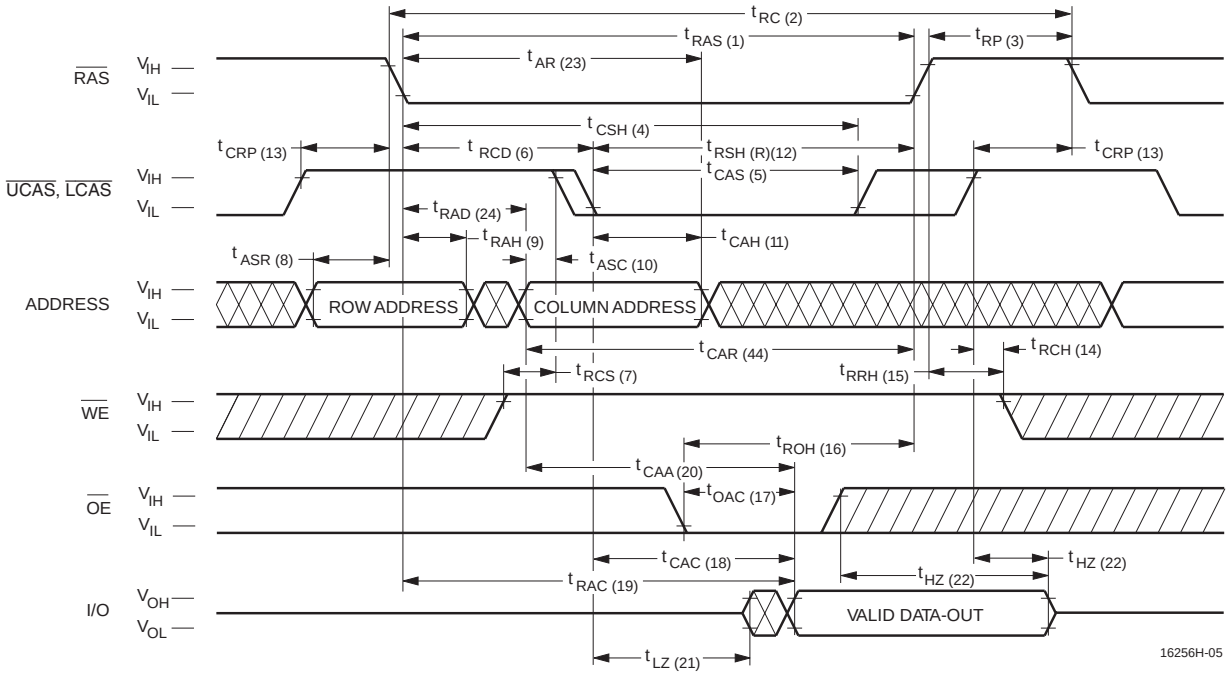
Truth Table

Function	$\overline{RAS}$	$\overline{LCAS}$	$\overline{UCAS}$	$\overline{WE}$	$\overline{OE}$	ADDRESS	I/O	Notes
Standby	H	H	H	X	X		High-Z	
Read: Word	L	L	L	H	L	ROW/COL	Data Out	
Read: Lower Byte	L	L	H	H	L	ROW/COL	Lower Byte, Data-Out Upper Byte, High-Z	
Read: Upper Byte	L	H	L	H	L	ROW/COL	Lower Byte, High-Z Upper Byte, Data-Out	
Write: Word (Early-Write)	L	L	L	L	X	ROW/COL	Data-In	
Write: Lower Byte (Early)	L	L	H	L	X	ROW/COL	Lower Byte, Data-In Upper Byte, High-Z	
Read: Upper Byte (Early)	L	H	L	L	X	ROW/COL	Lower Byte, High-Z Upper Byte, Data-In	
Read-Write	L	L	L	H→L	L→H	ROW/COL	Data-Out, Data-In	1, 2
Page-Mode Read	L	H→L	H→L	H	L	COL	Data-Out	2
Page-Mode Write	L	H→L	H→L	L	X	COL	Data-In	2
Page-Mode Read-Write	L	H→L	H→L	H→L	L→H	COL	Data-Out, Data-In	1, 2
Hidden Refresh Read	L→H→L	L	L	H	L	ROW/COL	Data-Out	2
$\overline{RAS}$-Only Refresh	L	H	H	X	X	ROW	High-Z	
CBR Refresh	H→L	L	L	X	X		High-Z	3

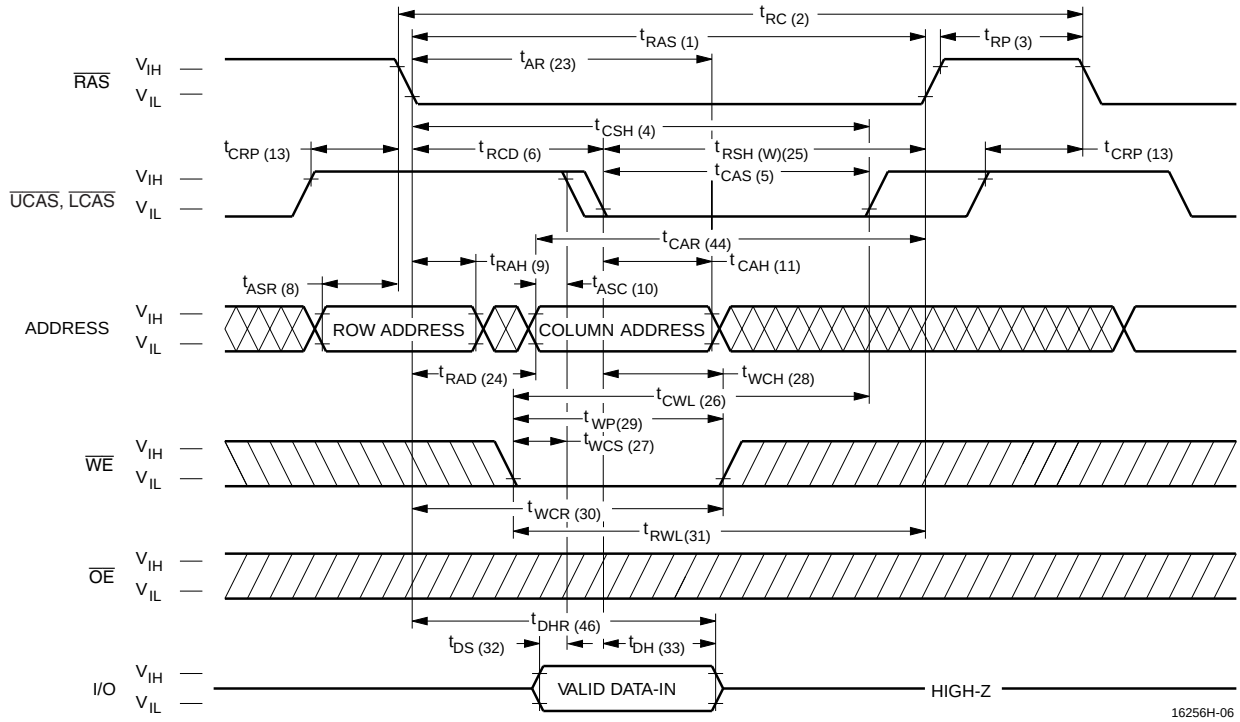
Notes:

1. Byte Write cycles $\overline{LCAS}$ or $\overline{UCAS}$ active.
2. Byte Read cycles $\overline{LCAS}$ or $\overline{UCAS}$ active.
3. Only one of the two $\overline{CAS}$ must be active ($\overline{LCAS}$ or $\overline{UCAS}$).

Waveforms of Read Cycle

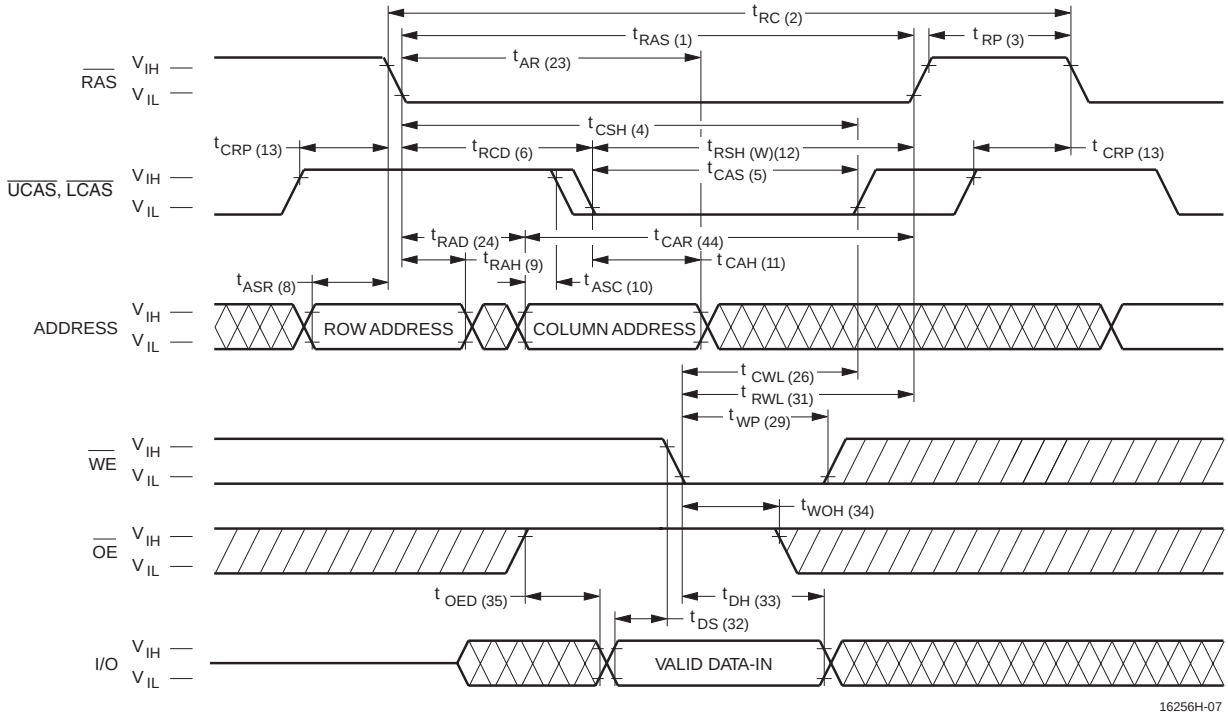


Waveforms of Early Write Cycle

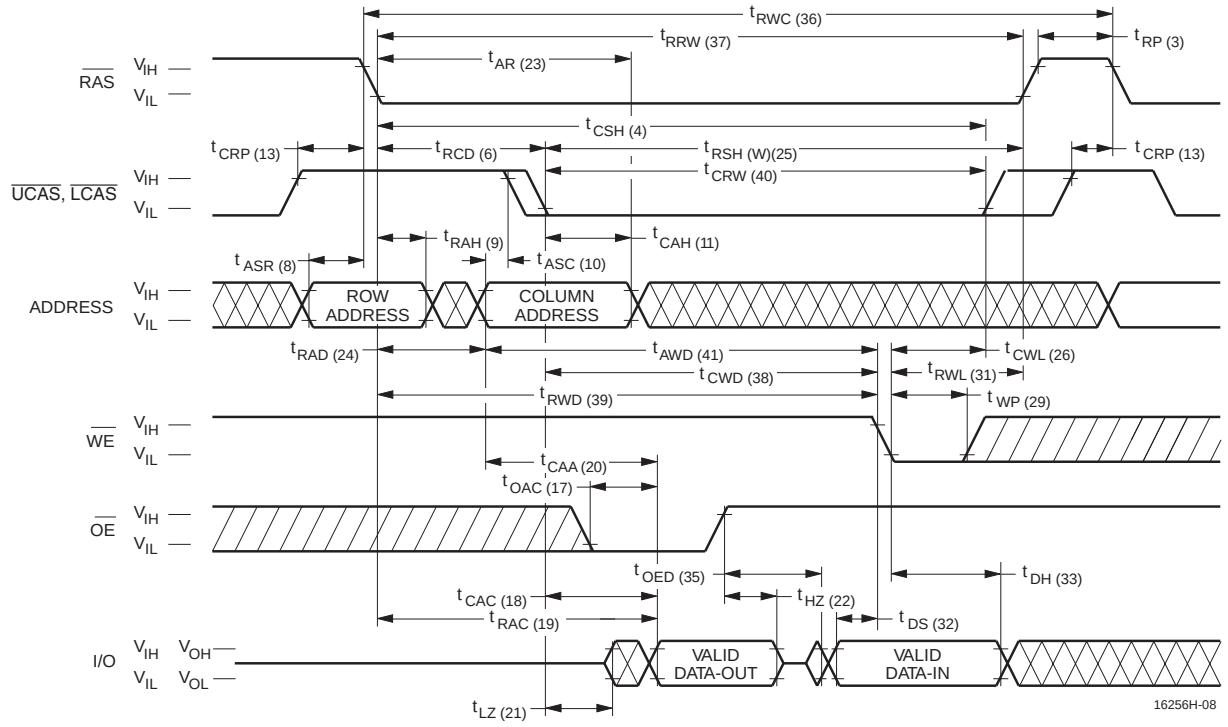


Don't Care Undefined

Waveforms of $\overline{OE}$-Controlled Write Cycle

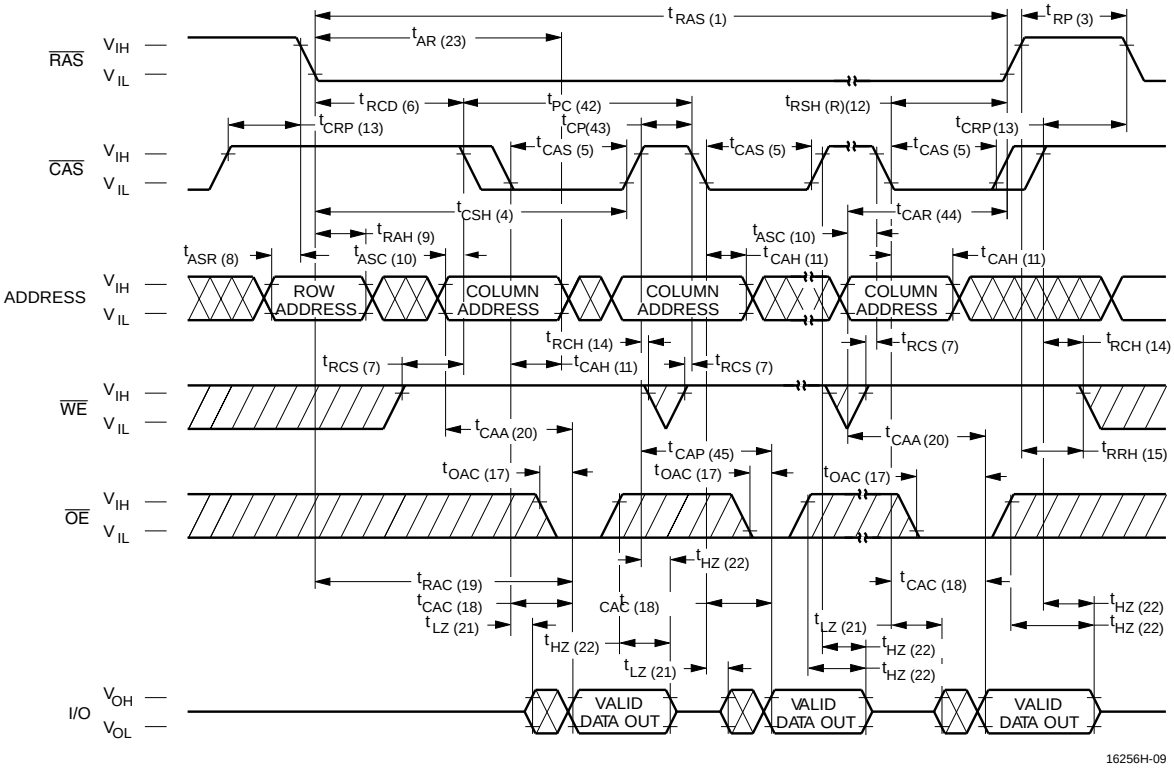


Waveforms of Read-Modify-Write Cycle

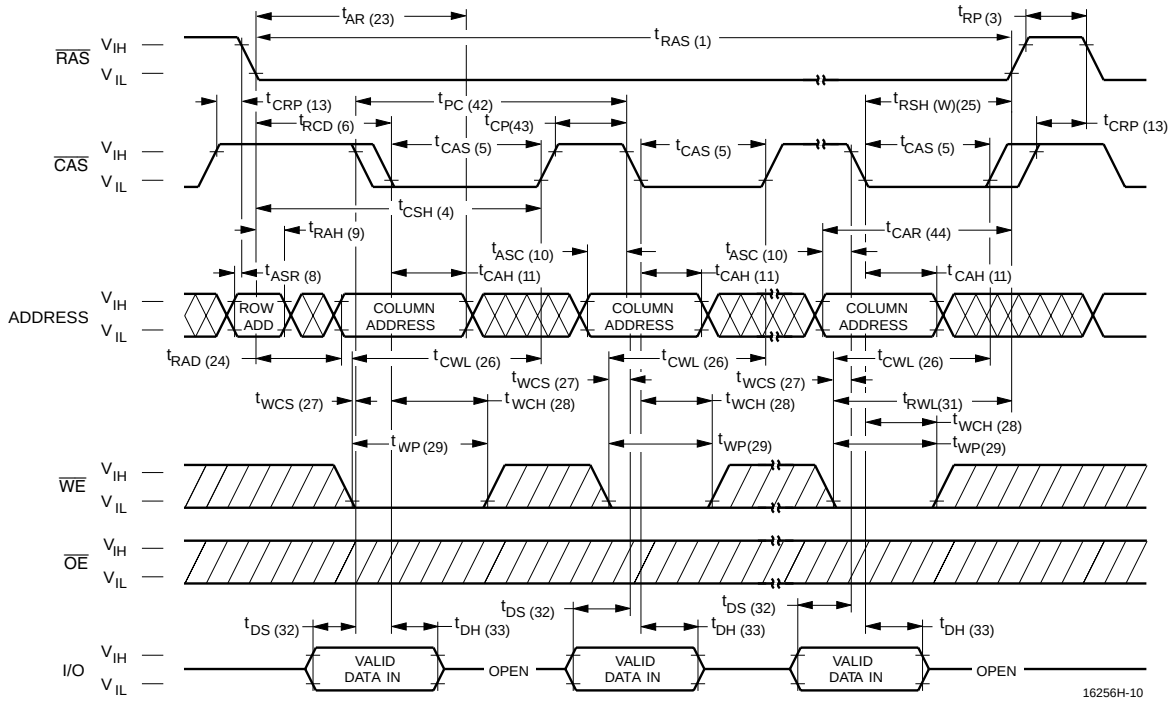


Don't Care Undefined

Waveforms of Fast Page Mode Read Cycle

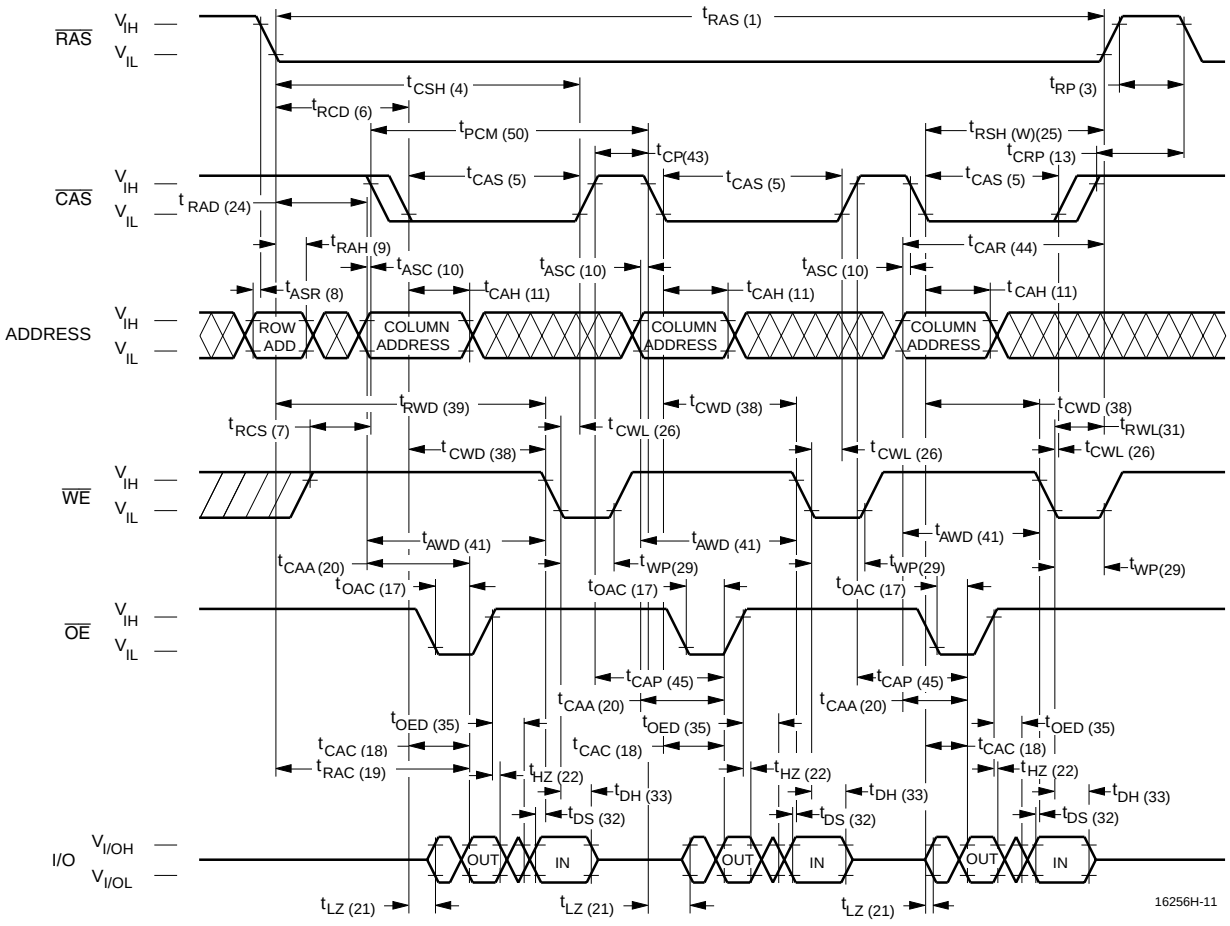


Waveforms of Fast Page Mode Write Cycle

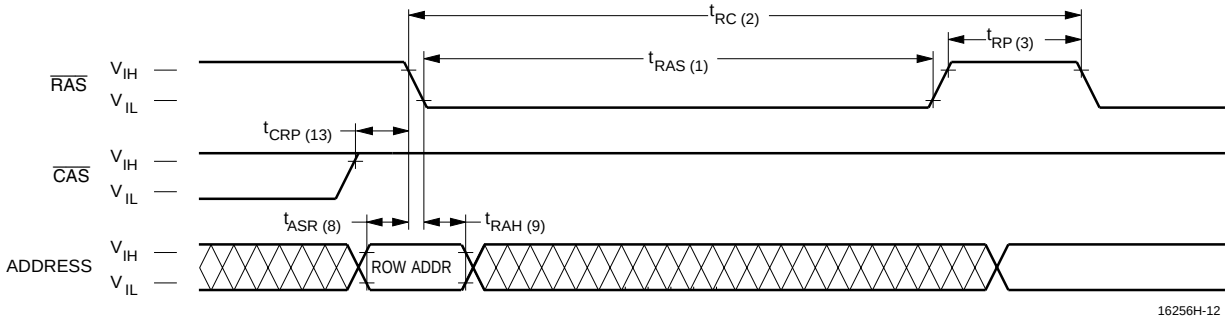


Don't Care Undefined

Waveforms of Fast Page Mode Read-Write Cycle



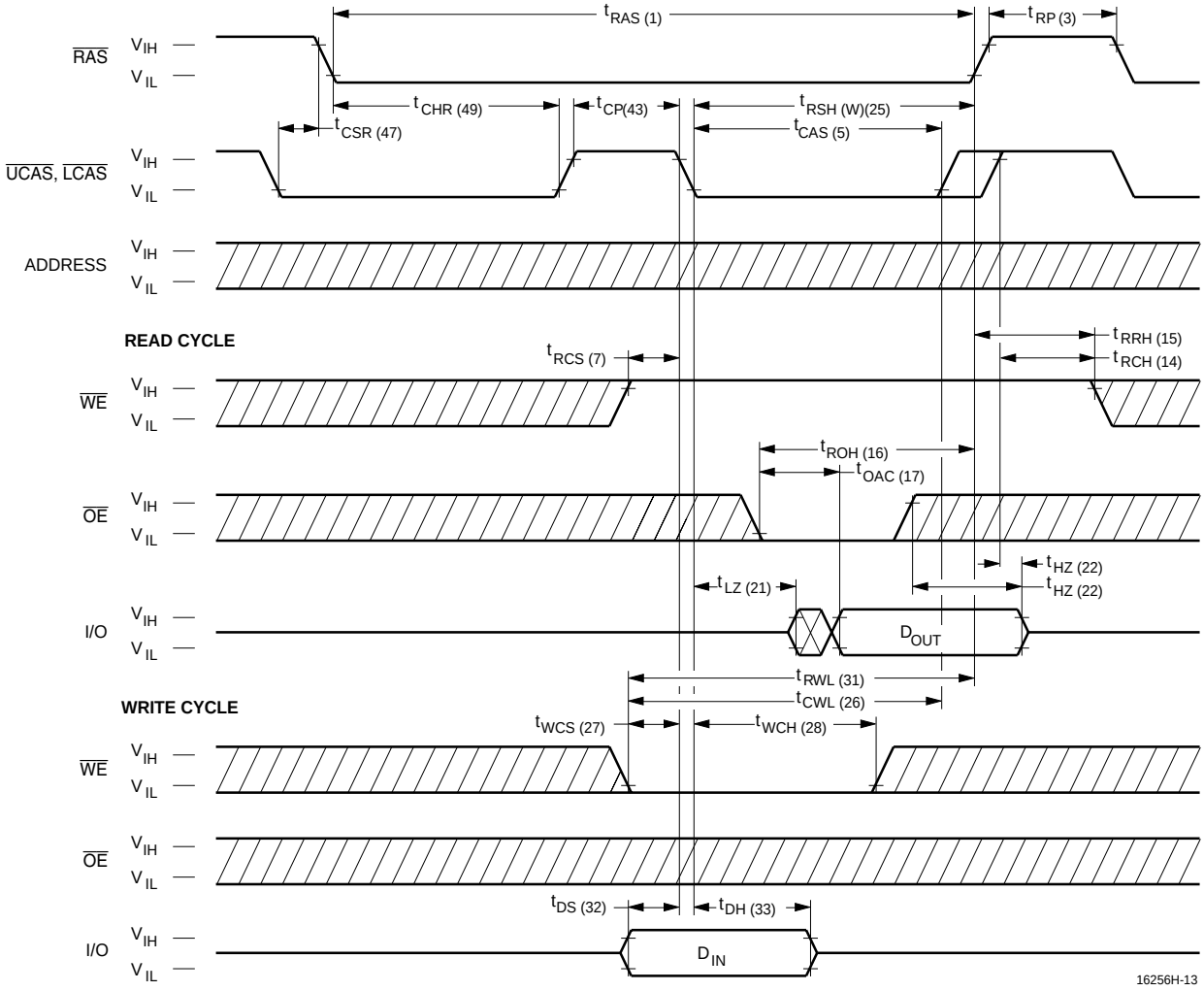
Waveforms of RAS-Only Refresh Cycle



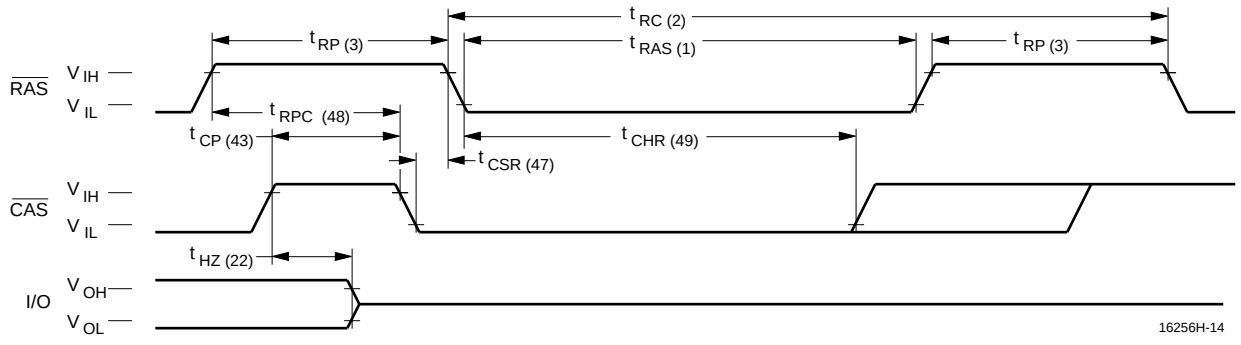
NOTE: $\overline{WE}$, $\overline{OE}$ = Don't care

Don't Care Undefined

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



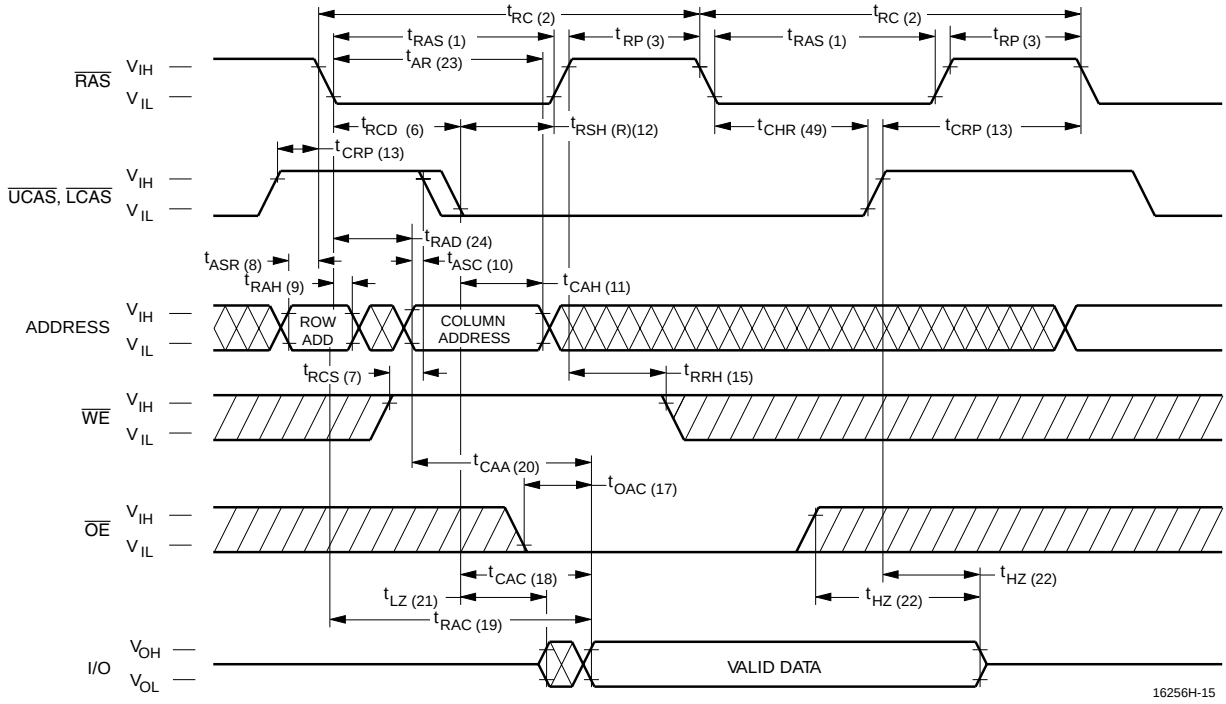
Waveforms of $\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle



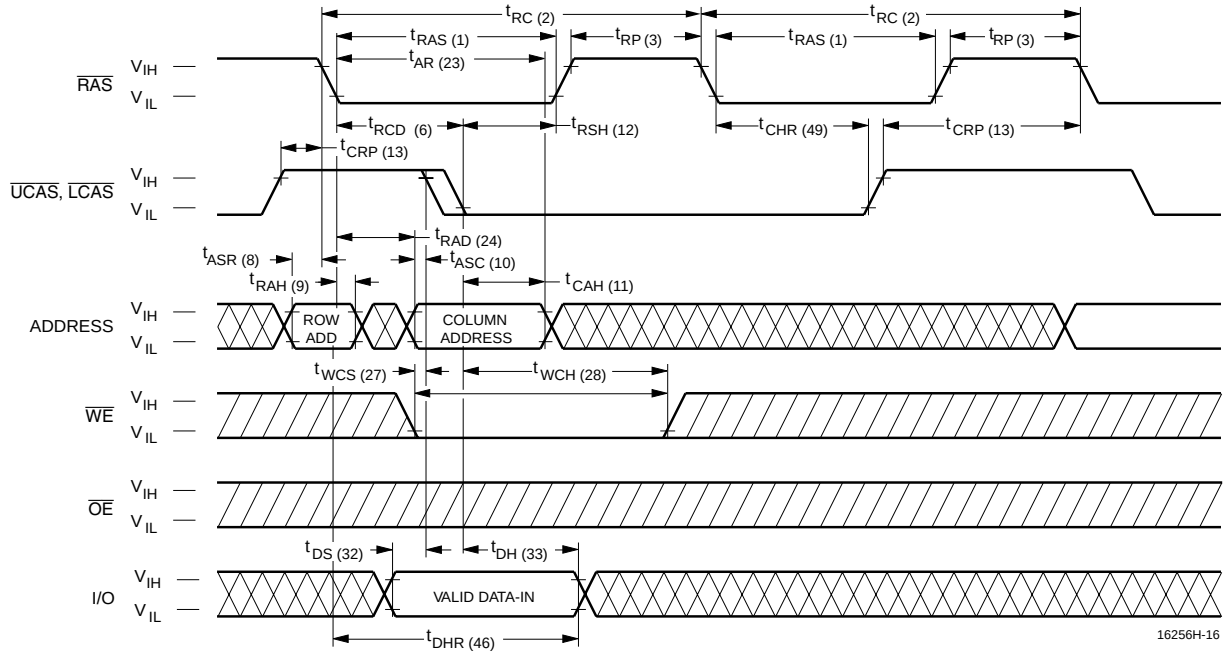
NOTE: $\overline{WE}$, $\overline{OE}$, A_0–A_8 = Don't care

Don't Care Undefined

Waveforms of Hidden Refresh Cycle (Read)



Waveforms of Hidden Refresh Cycle (Write)



Don't Care Undefined

Functional Description

The V53C16256H is a CMOS dynamic RAM optimized for high data bandwidth, low power applications. It is functionally similar to a traditional dynamic RAM. The V53C16256H reads and writes data by multiplexing an 18-bit address into a 9-bit row and a 9-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.

Fast Page Mode Operation

Fast Page Mode operation permits all 512 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 and acts as an output enable. During Fast Page Mode 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 Fast Page 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.

Fast Page Mode provides a sustained data rate of 53 MHz for applications that require high data rates such as bit-mapped graphics or high-speed signal processing. The following equation can be used to calculate the maximum data rate:

$$\text{Data Rate} = \frac{512}{t_{RC} + 511 \times t_{PC}}$$

Data Output Operation

The V53C16256H 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).

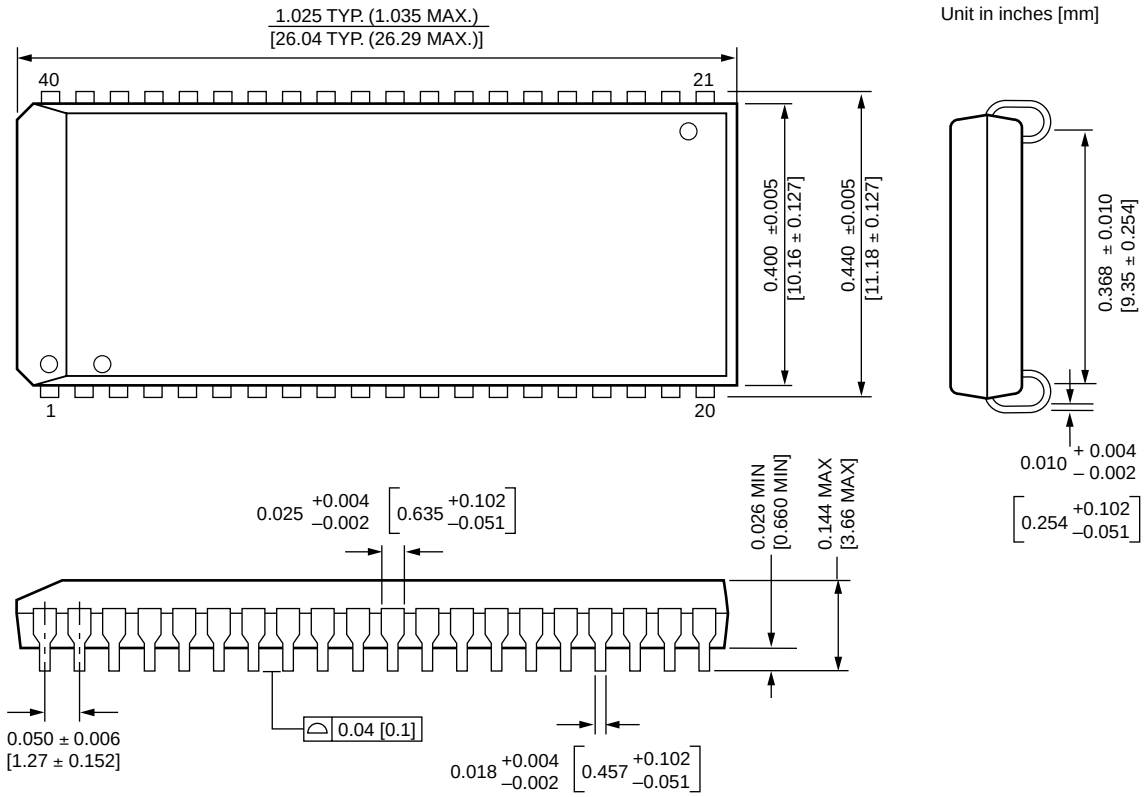
During Power-On, the V_{CC} current requirement of the V53C16256H is dependent on the input levels of $\overline{RAS}$ and $\overline{CAS}$. If $\overline{RAS}$ is low during Power-On, the device will go into an active cycle and I_{CC} will exhibit current transients. It is recommended that $\overline{RAS}$ and $\overline{CAS}$ track with V_{CC} or be held at a valid V_{IH} during Power-On to avoid current surges.

Table 1. V53C16256H Data Output
Operation for Various Cycle Types

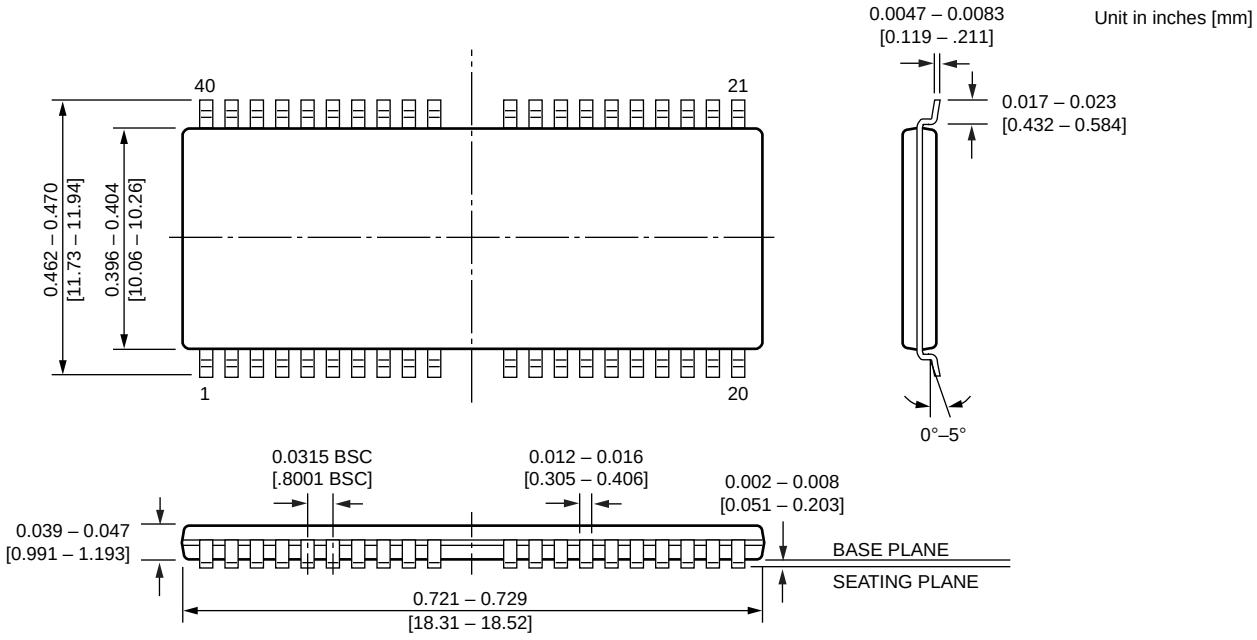
Cycle Type	I/O State
Read Cycles	Data from Addressed Memory Cell
$\overline{CAS}$-Controlled Write Cycle (Early Write)	High-Z
$\overline{WE}$-Controlled Write Cycle (Late Write)	$\overline{OE}$ Controlled. High $\overline{OE}$ = High-Z I/Os
Read-Modify-Write Cycles	Data from Addressed Memory Cell
Fast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

Package Diagram

40-Pin Plastic SOJ



40/44L-Pin TSOP-II



U.S.A.
3910 NORTH FIRST STREET
SAN JOSE, CA 95134
PHONE: 408-433-6000
FAX: 408-433-0185

HONG KONG
19 DAI FU STREET
TAIPO INDUSTRIAL ESTATE
TAIPO, NT, HONG KONG
PHONE: 852-2665-4883
FAX: 852-2664-7535

TAIWAN
7F, NO. 102
MIN-CHUAN E. ROAD, SEC. 3
TAIPEI
PHONE: 886-2-2545-1213
FAX: 886-2-2545-1209

1 CREATION ROAD I
SCIENCE BASED IND. PARK
HSIN CHU, TAIWAN, R.O.C.
PHONE: 886-3-578-3344
FAX: 886-3-579-2838

JAPAN
WBG MARINE WEST 25F
6, NAKASE 2-CHOME
MIHAMA-KU, CHIBA-SHI
CHIBA 261-71
PHONE: 81-43-299-6000
FAX: 81-43-299-6555

IRELAND & UK
BLOCK A UNIT 2
BROOMFIELD BUSINESS PARK
MALAHIDE
CO. DUBLIN, IRELAND
PHONE: +353 1 8038020
FAX: +353 1 8038049

GERMANY (CONTINENTAL EUROPE & ISRAEL)
71083 HERRENBERG
BENZSTR. 32
GERMANY
PHONE: +49 7032 2796-0
FAX: +49 7032 2796 22

U.S. SALES OFFICES

NORTHWESTERN
3910 NORTH FIRST STREET
SAN JOSE, CA 95134
PHONE: 408-433-6000
FAX: 408-433-0185

NORTHEASTERN
SUITE 436
20 TRAFALGAR SQUARE
NASHUA, NH 03063
PHONE: 603-889-4393
FAX: 603-889-9347

SOUTHWESTERN
SUITE 200
5150 E. PACIFIC COAST HWY.
LONG BEACH, CA 90804
PHONE: 562-498-3314
FAX: 562-597-2174

CENTRAL & SOUTHEASTERN
604 FIELDWOOD CIRCLE
RICHARDSON, TX 75081
PHONE: 972-690-1402
FAX: 972-690-0341

6/98
Printed in U.S.A.