

## 64K x 18 Synchronous Cache 3.3V RAM

### Features

- Supports 66-MHz Pentium<sup>™</sup> processor cache systems with zero wait states
- Single 3.3V power supply
- 64K by 18 common I/O
- Fast clock-to-output times  
— 8.5 ns
- Two-bit wraparound counter supporting the Pentium and 486 burst sequence (7C1331)
- Two-bit wraparound counter supporting linear burst sequence (7C1332)
- Separate processor and controller address strobes
- Synchronous self-timed write

- Direct interface with the processor and external cache controller
- Asynchronous output enable
- JEDEC-standard pinout
- 52-pin PLCC and PQFP packaging

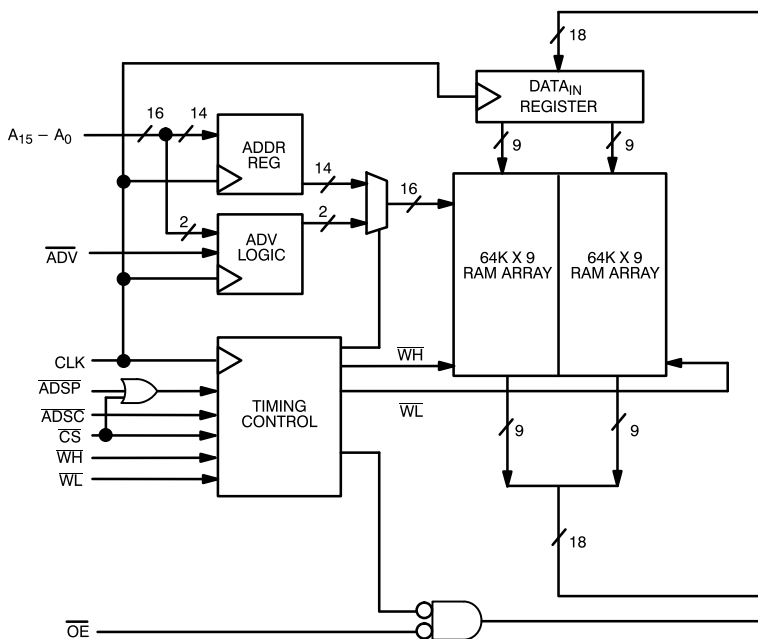
### Functional Description

The CY7C1331 and CY7C1332 are 3.3V 64K by 18 synchronous cache RAMs designed to interface with high-speed microprocessors with minimum glue logic. Maximum access delay from clock rise is 8.5 ns. A 2-bit on-chip counter captures the first address in a burst and increments the address automatically for the rest of the burst access.

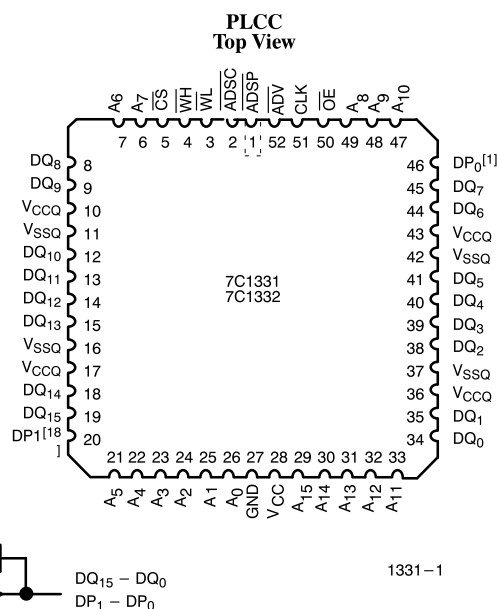
The CY7C1331 is designed for Intel Pentium and i486 CPU-based systems; its counter follows the burst sequence of the Pentium and the i486 processors. The CY7C1332 is architected for processors with linear burst sequences. Burst accesses can be initiated with the processor address strobe (ADSP) or the cache controller address strobe (ADSC) inputs. Address advancement is controlled by the address advancement (ADV) input.

A synchronous self-timed write mechanism is provided to simplify the write interface. A synchronous chip select input and an asynchronous output enable input provide easy control for bank selection and output three-state control.

### Logic Block Diagram



### Pin Configuration



### Selection Guide

		7C1331-8 7C1332-8	7C1331-10 7C1332-10	7C1331-12 7C1332-12
Maximum Access Time (ns)		8.5	10	12
Maximum Operating Current (mA)	Commercial	200	200	170
	Military			200

### Note:

1. DP<sub>0</sub> and DP<sub>1</sub> are functionally equivalent to DQ<sub>x</sub>.

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## Functional Description (continued)

### Single Write Accesses Initiated by $\overline{\text{ADSP}}$

This access is initiated when the following conditions are satisfied at clock rise: (1)  $\overline{\text{CS}}$  is LOW and (2)  $\overline{\text{ADSP}}$  is LOW.  $\overline{\text{ADSP}}$ -triggered write cycles are completed in two clock periods. The address at  $A_0$  through  $A_{15}$  is loaded into the address register and address advancement logic and delivered to the RAM core. The write signal is ignored in this cycle because the cache tag or other external logic uses this clock period to perform address comparisons or protection checks. If the write is allowed to proceed, the write input to the CY7C1331 and CY7C1332 will be pulled LOW before the next clock rise.  $\overline{\text{ADSP}}$  is ignored if  $\overline{\text{CS}}$  is HIGH.

If  $\overline{\text{WH}}$ ,  $\overline{\text{WL}}$ , or both are LOW at the next clock rise, information presented at  $DQ_0 - DQ_{15}$  and  $DP_0 - DP_1$  will be written into the location specified by the address advancement logic.  $\overline{\text{WL}}$  controls the writing of  $DQ_0 - DQ_7$  and  $DP_0$  while  $\overline{\text{WH}}$  controls the writing of  $DQ_8 - DQ_{15}$  and  $DP_1$ . Because the CY7C1331 and CY7C1332 are common-I/O devices, the output enable signal ( $\overline{\text{OE}}$ ) must be deasserted before data from the CPU is delivered to  $DQ_0 - DQ_{15}$  and  $DP_0 - DP_1$ . As a safety precaution, the appropriate data lines are three-stated in the cycle where  $\overline{\text{WH}}$ ,  $\overline{\text{WL}}$ , or both are sampled LOW, regardless of the state of the  $\overline{\text{OE}}$  input.

### Single Write Accesses Initiated by $\overline{\text{ADSC}}$

This write access is initiated when the following conditions are satisfied at rising edge of the clock: (1)  $\overline{\text{CS}}$  is LOW, (2)  $\overline{\text{ADSC}}$  is LOW, and (3)  $\overline{\text{WH}}$  or  $\overline{\text{WL}}$  are LOW.  $\overline{\text{ADSC}}$  triggered accesses are completed in a single clock cycle.

The address at  $A_0$  through  $A_{15}$  is loaded into the address register and address advancement logic and delivered to the RAM core. Information presented at  $DQ_0 - DQ_{15}$  and  $DP_0 - DP_1$  will be written into the location specified by the address advancement logic.  $\overline{\text{WL}}$  controls the writing of  $DQ_0 - DQ_7$  and  $DP_0$  while  $\overline{\text{WH}}$  controls the writing of  $DQ_8 - DQ_{15}$  and  $DP_1$ . Since the CY7C1331 and the CY7C1332 are common-I/O devices, the output enable signal ( $\overline{\text{OE}}$ ) must be deasserted before data from the cache controller is delivered to the data lines. As a safety precaution, the appropriate data lines are three-stated in the cycle where  $\overline{\text{WH}}$ ,  $\overline{\text{WL}}$ , or both are sampled LOW, regardless of the state of the  $\overline{\text{OE}}$  input.

### Single Read Accesses

A single read access is initiated when the following conditions are satisfied at clock rise: (1)  $\overline{\text{CS}}$  is LOW, (2)  $\overline{\text{ADSP}}$  or  $\overline{\text{ADSC}}$  is LOW, and (3)  $\overline{\text{WH}}$  and  $\overline{\text{WL}}$  are HIGH. The address at  $A_0$  through  $A_{15}$  is stored into the address advancement logic and delivered to the RAM core. If the output enable ( $\overline{\text{OE}}$ ) signal is asserted (LOW), data will be available at the data outputs a maximum of 8.5 ns after clock rise.

### Burst Sequences

The CY7C1331 provides a 2-bit wraparound counter, fed by pins  $A_0 - A_1$ , that implements the Intel 80486 and Pentium processor address burst sequence (see Table 1). Note that the burst sequence depends on the first burst address.

**Table 1. Counter Implementation for the Intel Pentium/80486 Processor's Sequence**

First Address	Second Address	Third Address	Fourth Address
$A_X + 1, A_X$	$A_X + 1, A_X$	$A_X + 1, A_X$	$A_X + 1, A_X$
00	01	10	11
01	00	11	10
10	11	00	01
11	10	01	00

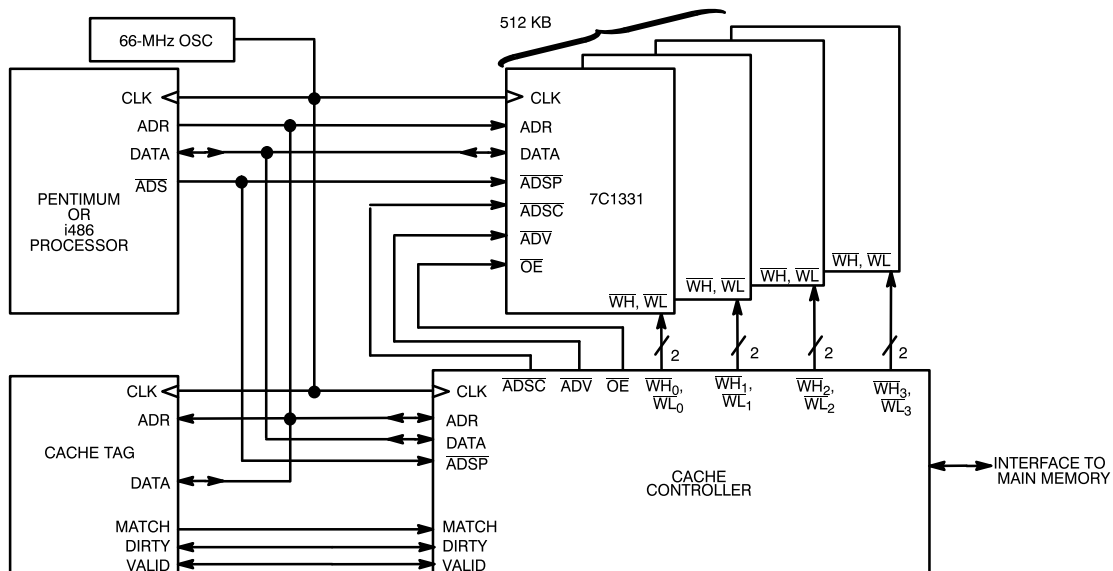
The CY7C1332 provides a two-bit wraparound counter, fed by pins  $A_0 - A_1$ , that implements a linear address burst sequence (see Table 2).

**Table 2. Counter Implementation for a Linear Sequence**

First Address	Second Address	Third Address	Fourth Address
$A_X + 1, A_X$	$A_X + 1, A_X$	$A_X + 1, A_X$	$A_X + 1, A_X$
00	01	10	11
01	10	11	00
10	11	00	01
11	00	01	10

### Application Example

Figure 1 shows a 512-Kbyte secondary cache for a hypothetical 3.3V, 66-MHz Pentium or i486 processor using four CY7C1331 cache RAMs.



**Figure 1. Cache Using Four CY7C1331s**

1331-3

**Pin Definitions**

Signal Name	Type	# of Pins	Description
V <sub>CC</sub>	Input	1	+ 3.3V Power
V <sub>CCQ</sub>	Input	4	+ 3.3V (Outputs)
GND	Input	1	Ground
V <sub>SSQ</sub>	Input	4	Ground (Outputs)
CLK	Input	1	Clock
A <sub>15</sub> – A <sub>0</sub>	Input	16	Address
$\overline{\text{ADSP}}$	Input	1	Address Strobe from Processor
$\overline{\text{ADSC}}$	Input	1	Address Strobe from Cache Controller
WH	Input	1	Write Enable – High Byte
$\overline{\text{WL}}$	Input	1	Write Enable – Low Byte
$\overline{\text{ADV}}$	Input	1	Advance
$\overline{\text{OE}}$	Input	1	Output Enable
$\overline{\text{CS}}$	Input	1	Chip Select
DQ <sub>15</sub> –DQ <sub>0</sub>	Input/Output	16	Regular Data
DP <sub>1</sub> –DP <sub>0</sub>	Input/Output	2	Parity Data

**Pin Descriptions**

Signal Name	I/O	Description
<b>Input Signals</b>		
CLK	I	Clock signal. It is used to capture the address, the data to be written, and the following control signals: ADSP, ADSC, WH, WL, CS, and ADV. It is also used to advance the on-chip auto-address-increment logic (when the appropriate control signals have been set).
A <sub>15</sub> –A <sub>0</sub>	I	Sixteen address lines used to select one of 64K locations. They are captured in an on-chip register on the rising edge of CLK if ADSP or ADSC is LOW. The rising edge of the clock also loads the lower two address lines, A <sub>1</sub> – A <sub>0</sub> , into the on-chip auto-address-increment logic if ADSP or ADSC is LOW.
$\overline{\text{ADSP}}$	I	Address strobe from processor. This signal is sampled at the rising edge of CLK. When this input and/or $\overline{\text{ADSC}}$ is asserted, A <sub>0</sub> –A <sub>15</sub> will be captured in the on-chip address register. It also allows the lower two address bits to be loaded into the on-chip auto-address-increment logic. If both $\overline{\text{ADSP}}$ and $\overline{\text{ADSC}}$ are asserted at the rising edge of CLK, only $\overline{\text{ADSP}}$ will be recognized. The ADSP input should be connected to the $\overline{\text{ADS}}$ output of the processor. ADSP is ignored when CS is HIGH.
$\overline{\text{ADSC}}$	I	Address strobe from cache controller. This signal is sampled at the rising edge of CLK. When this input and/or $\overline{\text{ADSP}}$ is asserted, A <sub>0</sub> –A <sub>15</sub> will be captured in the on-chip address register. It also allows the lower two address bits to be loaded into the on-chip auto-address-increment logic. The ADSC input should <i>not</i> be connected to the $\overline{\text{ADS}}$ output of the processor.

Signal Name	I/O	Description
WH	I	Write signal for the high-order half of the RAM array. This signal is sampled by the rising edge of CLK. If WH is sampled as LOW, i.e., asserted, the control logic will perform a self-timed write of DQ <sub>15</sub> – DQ <sub>8</sub> and DP <sub>1</sub> from the on-chip data register into the selected RAM location. There is one exception to this. If $\overline{\text{ADSP}}$ , WH, and $\overline{\text{CS}}$ are asserted (LOW) at the rising edge of CLK, the write signal, WH, is ignored. Note that ADSP has no effect on WH if CS is HIGH.
$\overline{\text{WL}}$	I	Write signal for the low-order half of the RAM array. This signal is sampled by the rising edge of CLK. If WL is sampled as LOW, i.e., asserted, the control logic will perform a self-timed write of DQ <sub>7</sub> – DQ <sub>0</sub> and DP <sub>0</sub> from the on-chip data register into the selected RAM location. There is one exception to this. If $\overline{\text{ADSP}}$ , $\overline{\text{WL}}$ , and $\overline{\text{CS}}$ are asserted (LOW) at the rising edge of CLK, the write signal, $\overline{\text{WL}}$ , is ignored. Note that ADSP has no effect on $\overline{\text{WL}}$ if CS is HIGH.
$\overline{\text{ADV}}$	I	Advance. This signal is sampled by the rising edge of CLK. When it is asserted, it automatically increments the two-bit on-chip auto-address-increment counter. In the CY7C1332, the address will be incremented linearly. In the CY7C1331, the address will be incremented according to the Pentium/486 burst sequence. This signal is ignored if $\overline{\text{ADSP}}$ or $\overline{\text{ADSC}}$ is asserted concurrently with $\overline{\text{CS}}$ . Note that ADSP has no effect on ADV if CS is HIGH.
$\overline{\text{CS}}$	I	Chip select. This signal is sampled by the rising edge of CLK. If CS is HIGH and ADSC is LOW, the SRAM is deselected. If CS is LOW and ADSC or $\overline{\text{ADSP}}$ is LOW, a new address is captured by the address register. If CS is HIGH, $\overline{\text{ADSP}}$ is ignored.



## Pin Descriptions (continued)

Signal Name	I/O	Description
$\overline{OE}$	I	Output enable. This signal is an asynchronous input that controls the direction of the data I/O pins. If $\overline{OE}$ is asserted (LOW), the data pins are outputs, and the SRAM can be read (as long as $\overline{CS}$ was asserted when it was sampled at the beginning of the cycle). If $\overline{OE}$ is deasserted (HIGH), the data I/O pins will be three-stated, functioning as inputs, and the SRAM can be written.

## Bidirectional Signals

**DQ<sub>15</sub>–DQ<sub>0</sub>** I/O Sixteen bidirectional data I/O lines. DQ<sub>15</sub> – DQ<sub>8</sub> are inputs to and outputs from the high-order half of the RAM array, while DQ<sub>7</sub> – DQ<sub>0</sub> are inputs to and outputs from the low-order half of the RAM array. As inputs, they feed into an on-chip data register that is triggered by the rising edge of CLK. As outputs, they carry the data read from the selected location in the RAM array. The direction of the data pins is controlled by  $\overline{OE}$ : when  $\overline{OE}$  is high, the data pins are three-stated and can be used as inputs; when  $\overline{OE}$  is low, the data pins are driven by the output buffers and are outputs. DQ<sub>15</sub> – DQ<sub>8</sub> and DQ<sub>7</sub> – DQ<sub>0</sub> are also three-stated when  $\overline{WH}$  and  $\overline{WL}$ , respectively, are sampled LOW at clock rise.

Signal Name	I/O	Description
DP <sub>1</sub> –DP <sub>0</sub>	I/O	Two bidirectional data I/O lines. These operate in exactly the same manner as DQ <sub>15</sub> – DQ <sub>0</sub> , but are named differently because their primary purpose is to store parity bits, while the DQs' primary purpose is to store ordinary data bits. DP <sub>1</sub> is an input to and an output from the high-order half of the RAM array, while DP <sub>0</sub> is an input to and an output from the lower-order half of the RAM array.

## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature ..... –65°C to +150°C  
 Ambient Temperature with  
 Power Applied ..... –55°C to +125°C  
 Supply Voltage on V<sub>CC</sub> Relative to GND .... –0.5V to +3.6V  
 DC Voltage Applied to Outputs  
 in High Z State<sup>[2]</sup> ..... –0.5V to V<sub>CC</sub> + 0.3V  
 DC Input Voltage<sup>[2]</sup> ..... –0.5V to V<sub>CC</sub> + 0.3V  
 Current into Outputs (LOW) ..... 20 mA

Static Discharge Voltage ..... >2001V  
 (per MIL-STD-883, Method 3015)

Latch-Up Current ..... >200 mA

## Operating Range

Range	Ambient Temperature <sup>[3]</sup>	V <sub>CC</sub> , V <sub>CCQ</sub>
Com'l	0°C to +70°C	3.3V ± 0.3V
Mil	–55°C to +125°C	3.3V ± 0.3V

Electrical Characteristics Over the Operating Range<sup>[4]</sup>

Parameter	Description	Test Conditions	7C1331–8 7C1332–8		7C1331–10 7C1332–10		7C1331–12 7C1332–12		Unit
			Min.	Max.	Min.	Max.	Min.	Min.	
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., I <sub>OH</sub> = –2.0 mA	2.4		2.4		2.4		V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 2.0 mA		0.4		0.4		0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.0	V <sub>CC</sub> + 0.3V	2.0	V <sub>CC</sub> + 0.3V	2.0	V <sub>CC</sub> + 0.3V	V
V <sub>IL</sub>	Input LOW Voltage <sup>[2]</sup>		–0.3	0.8	–0.3	0.8	–0.3	0.8	V
I <sub>X</sub>	Input Load Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>	–1	+1	–1	+1	–1	+1	μA
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , Output Disabled	–5	+5	–5	+5	–5	+5	μA
I <sub>OS</sub>	Output Short Circuit Current <sup>[5]</sup>	V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND		–300		–300		–300	mA
I <sub>CC</sub>	V <sub>CC</sub> Operating Supply Current	V <sub>CC</sub> = Max., I <sub>out</sub> = 0 mA, f = f <sub>MAX</sub> = 1/t <sub>CYC</sub>	Com'l	200		200		170	mA
			Mil					200	

## Notes:

- Minimum voltage equals –2.0V for pulse durations of less than 20 ns.
- T<sub>A</sub> is the “instant on” case temperature.
- See the last page of this specification for Group A subgroup testing information.
- Not more than one output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.

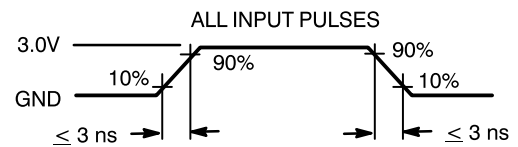
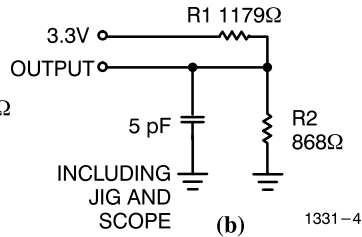
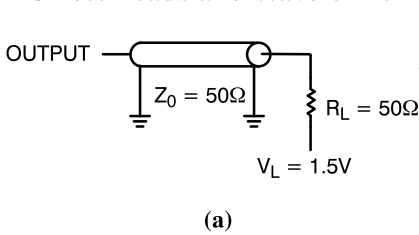
### Electrical Characteristics Over the Operating Range<sup>[4]</sup>(continued)

Parameter	Description	Test Conditions		7C1331-8 7C1332-8		7C1331-10 7C1332-10		7C1331-12 7C1332-12		Unit
				Min.	Max.	Min.	Max.	Min.	Min.	
I <sub>SB1</sub>	Automatic CE Power-Down Current – TTL Inputs	Max. V <sub>CC</sub> , $\overline{CS} \geq V_{IH}$ , V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub>	Com'l		60		60		40	mA
			Mil						40	
I <sub>SB2</sub>	Automatic CE Power-Down Current – CMOS Inputs	Max. V <sub>CC</sub> , $\overline{CS} \geq V_{CC} - 0.3V$ , V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V or V <sub>IN</sub> ≤ 0.3V, f = f <sub>MAX</sub> <sup>[6]</sup>	Com'l		20		20		20	mA
			Mil						20	

### Capacitance<sup>[7]</sup>

Parameter	Description	Test Conditions		Max.	Unit
C <sub>IN</sub> : Addresses	Input Capacitance	T <sub>A</sub> = 25°C, f = 1 MHz, V <sub>CC</sub> = 3.3V	Com'l	5	pF
			Mil	6	
C <sub>IN</sub> : Other Inputs	Input Capacitance		Com'l	5	pF
			Mil	8	
C <sub>OUT</sub>	Output Capacitance		Com'l	8	pF
			Mil	16	

### AC Test Loads and Waveforms



1331-5

#### Notes:

- Inputs are disabled, clock is allowed to run at speed.
- Tested initially and after any design or process changes that may affect these parameters.

## Switching Characteristics Over the Operating Range<sup>[8]</sup>

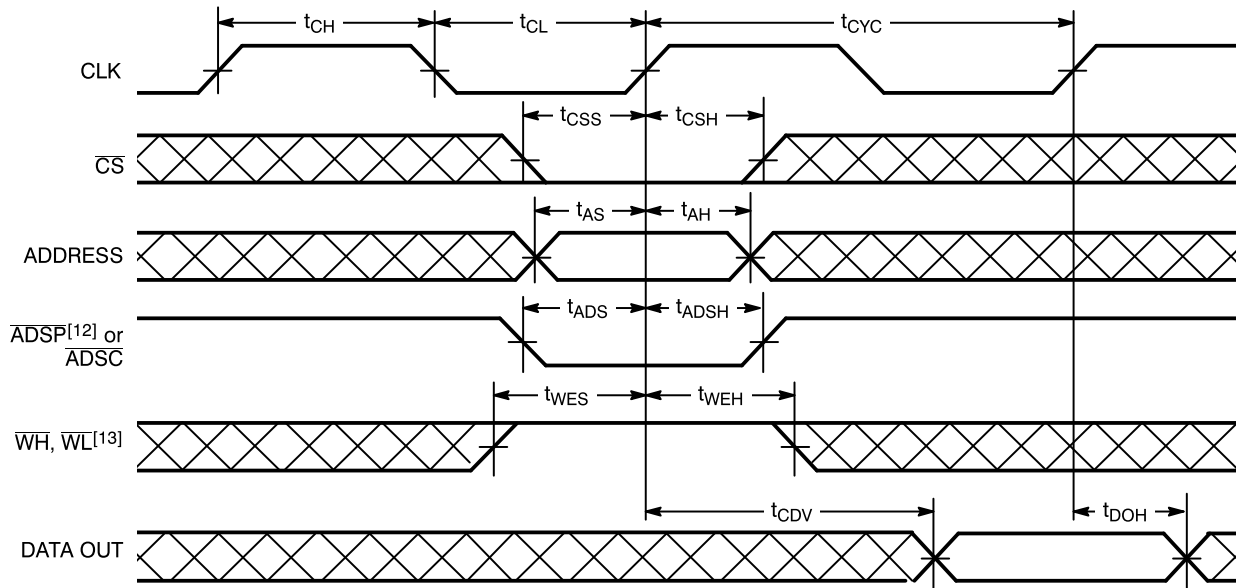
Parameter	Description	7C1331-8 7C1332-8		7C1331-10 7C1332-10		7C1331-12 7C1332-12		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
t <sub>CYC</sub>	Clock Cycle Time	15		15		20		ns
t <sub>CH</sub>	Clock HIGH	5		6		8		ns
t <sub>CL</sub>	Clock LOW	5		6		8		ns
t <sub>AS</sub>	Address Set-Up Before CLK Rise	2.5		2.5		2.5		ns
t <sub>AH</sub>	Address Hold After CLK Rise	0.5		0.5		0.5		ns
t <sub>CDV</sub>	Data Output Valid After CLK Rise		8.5		10		12	
t <sub>DOH</sub>	Data Output Hold After CLK Rise	3		3		3		ns
t <sub>ADS</sub>	$\overline{\text{ADSP}}$ , $\overline{\text{ADSC}}$ Set-Up Before CLK Rise	2.5		2.5		2.5		ns
t <sub>ADSH</sub>	$\overline{\text{ADSP}}$ , $\overline{\text{ADSC}}$ Hold After CLK Rise	0.5		0.5		0.5		ns
t <sub>WES</sub>	$\overline{\text{WH}}$ , $\overline{\text{WL}}$ Set-Up Before CLK Rise	2.5		2.5		2.5		ns
t <sub>WEH</sub>	$\overline{\text{WH}}$ , $\overline{\text{WL}}$ Hold After CLK Rise	0.5		0.5		0.5		ns
t <sub>ADVS</sub>	$\overline{\text{ADV}}$ Set-Up Before CLK Rise	2.5		2.5		2.5		ns
t <sub>ADVH</sub>	$\overline{\text{ADV}}$ Hold After CLK Rise	0.5		0.5		0.5		ns
t <sub>DS</sub>	Data Input Set-Up Before CLK Rise	2.5		2.5		2.5		ns
t <sub>DH</sub>	Data Input Hold After CLK Rise	0.5		0.5		0.5		ns
t <sub>CSS</sub>	Chip Select Set-Up	2.5		2.5		2.5		ns
t <sub>CSH</sub>	Chip Select Hold After CLK Rise	0.5		0.5		0.5		ns
t <sub>CSOZ</sub>	Chip Select Sampled to Output High Z <sup>[9]</sup>	2	6	2	6	2	7	ns
t <sub>EOZ</sub>	$\overline{\text{OE}}$ HIGH to Output High Z <sup>[9]</sup>	2	6	2	6	2	7	ns
t <sub>EOV</sub>	$\overline{\text{OE}}$ LOW to Output Valid		5		5		6	ns
t <sub>WEOZ</sub>	$\overline{\text{WH}}$ or $\overline{\text{WL}}$ Sampled LOW to Output High Z <sup>[9,10]</sup>		5		6		7	ns
t <sub>WEOV</sub>	$\overline{\text{WH}}$ or $\overline{\text{WL}}$ Sampled HIGH to Output Valid <sup>[10]</sup>		8.5		10		12	ns

### Notes:

8. Unless otherwise noted, test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I<sub>OL</sub>/I<sub>OH</sub> and load capacitance as shown in (a) and (b) of AC Test Loads.
9. t<sub>CSOZ</sub>, t<sub>EOZ</sub>, and t<sub>WEOZ</sub> are specified with a load capacitance of 5 pF as in part (b) of AC Test Loads. Transition is measured  $\pm$  500 mV from steady-state voltage.
10. At any given voltage and temperature, t<sub>WEOZ</sub> min. is less than t<sub>WEOV</sub> min.

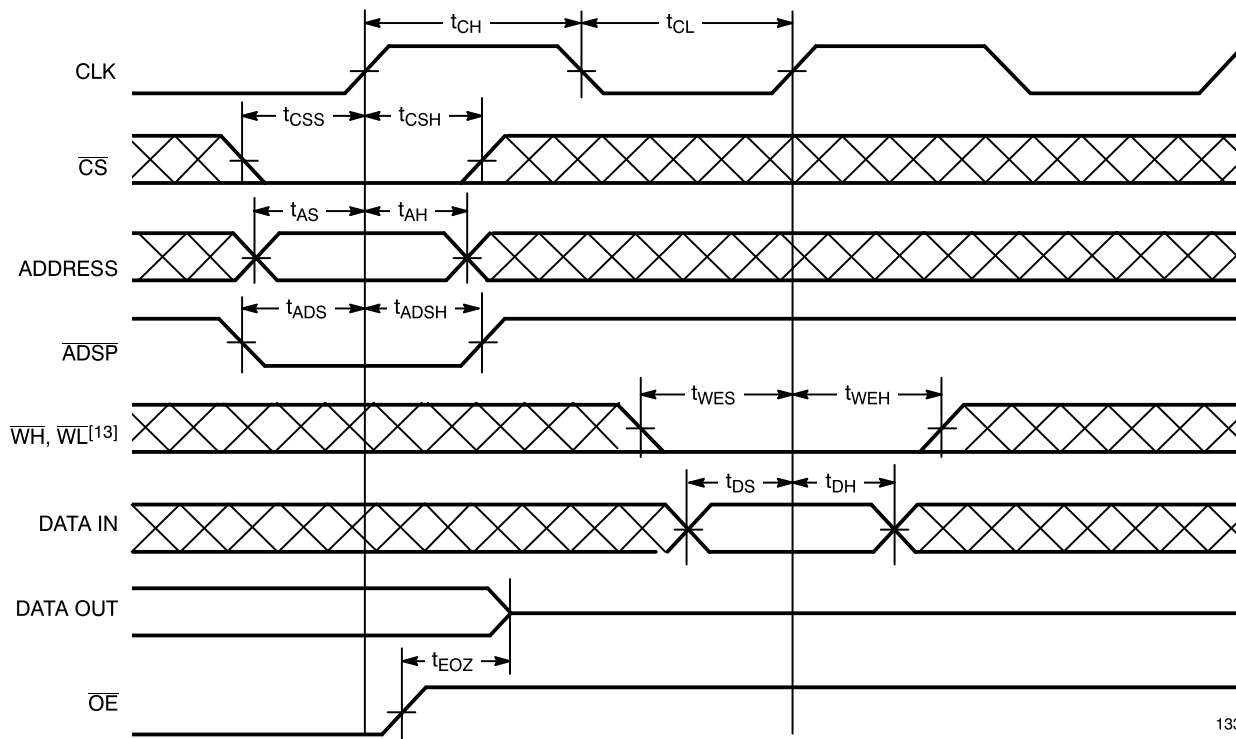
## Switching Waveforms

### Single Read<sup>[11]</sup>



1331-7

### Single Write Timing: Write Initiated by $\overline{\text{ADSP}}$



1331-6

#### Notes:

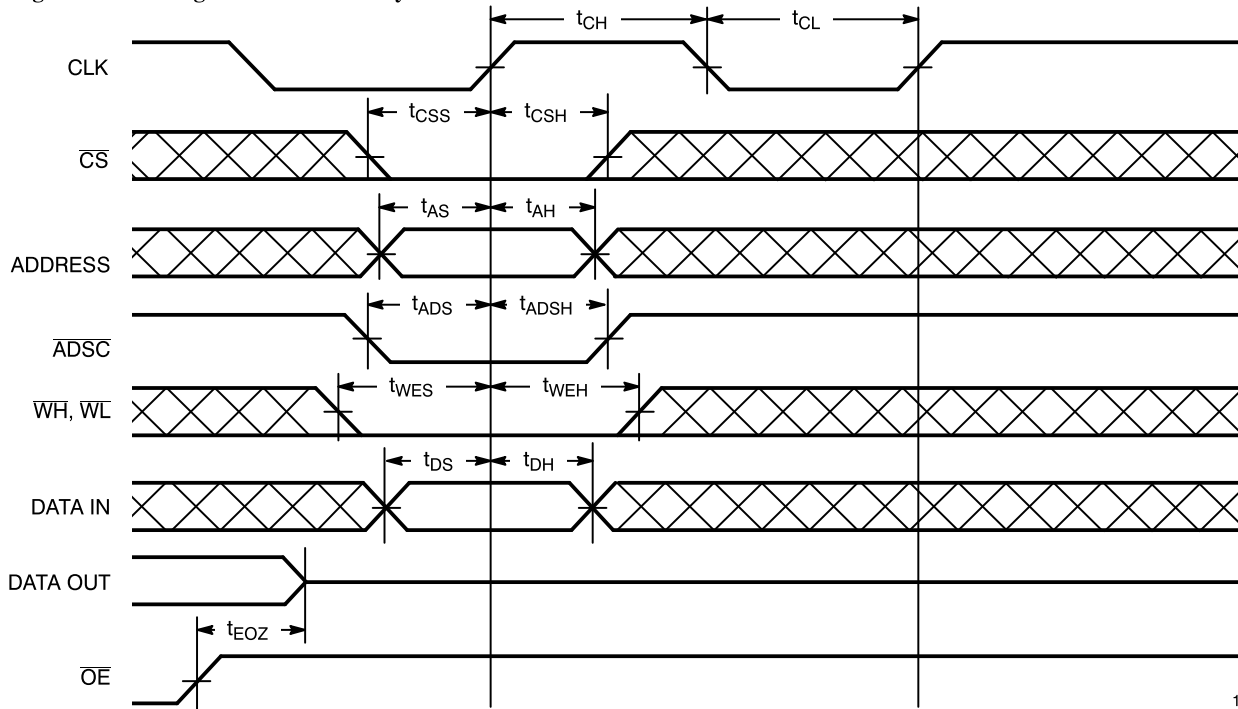
11.  $\overline{\text{OE}}$  is LOW throughout.

12. If  $\overline{\text{ADSP}}$  is asserted while  $\overline{\text{CS}}$  is HIGH,  $\overline{\text{ADSP}}$  will be ignored.

13.  $\overline{\text{ADSP}}$  has no effect on  $\overline{\text{ADV}}$ ,  $\overline{\text{WH}}$ , and  $\overline{\text{WL}}$  if  $\overline{\text{CS}}$  is HIGH.

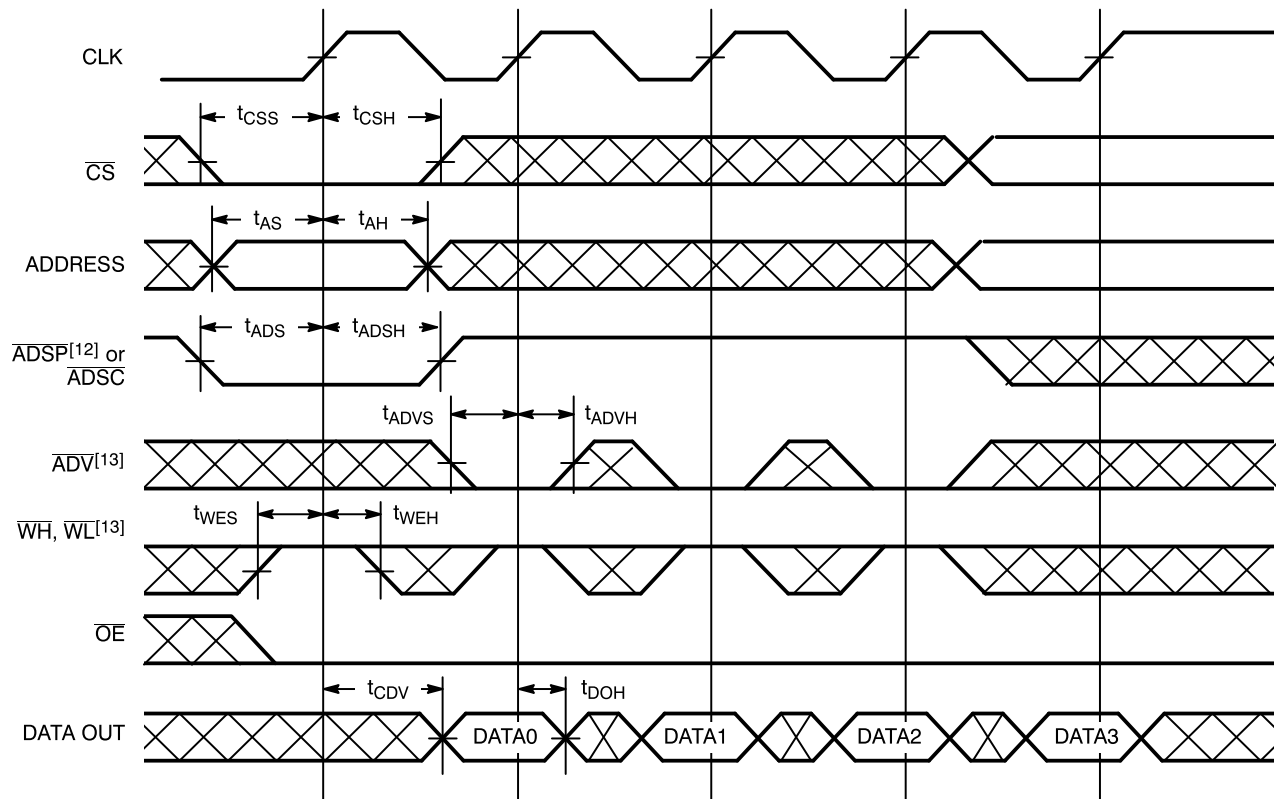
## Switching Waveforms (continued)

### Single Write Timing: Write Initiated by $\overline{\text{ADSC}}$



1331-8

### Burst Read Sequence with Four Accesses

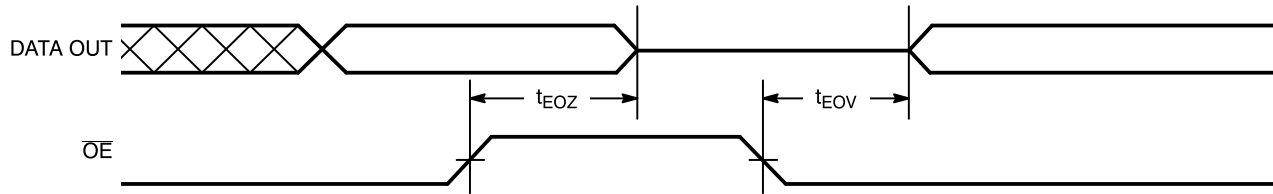


1331-9



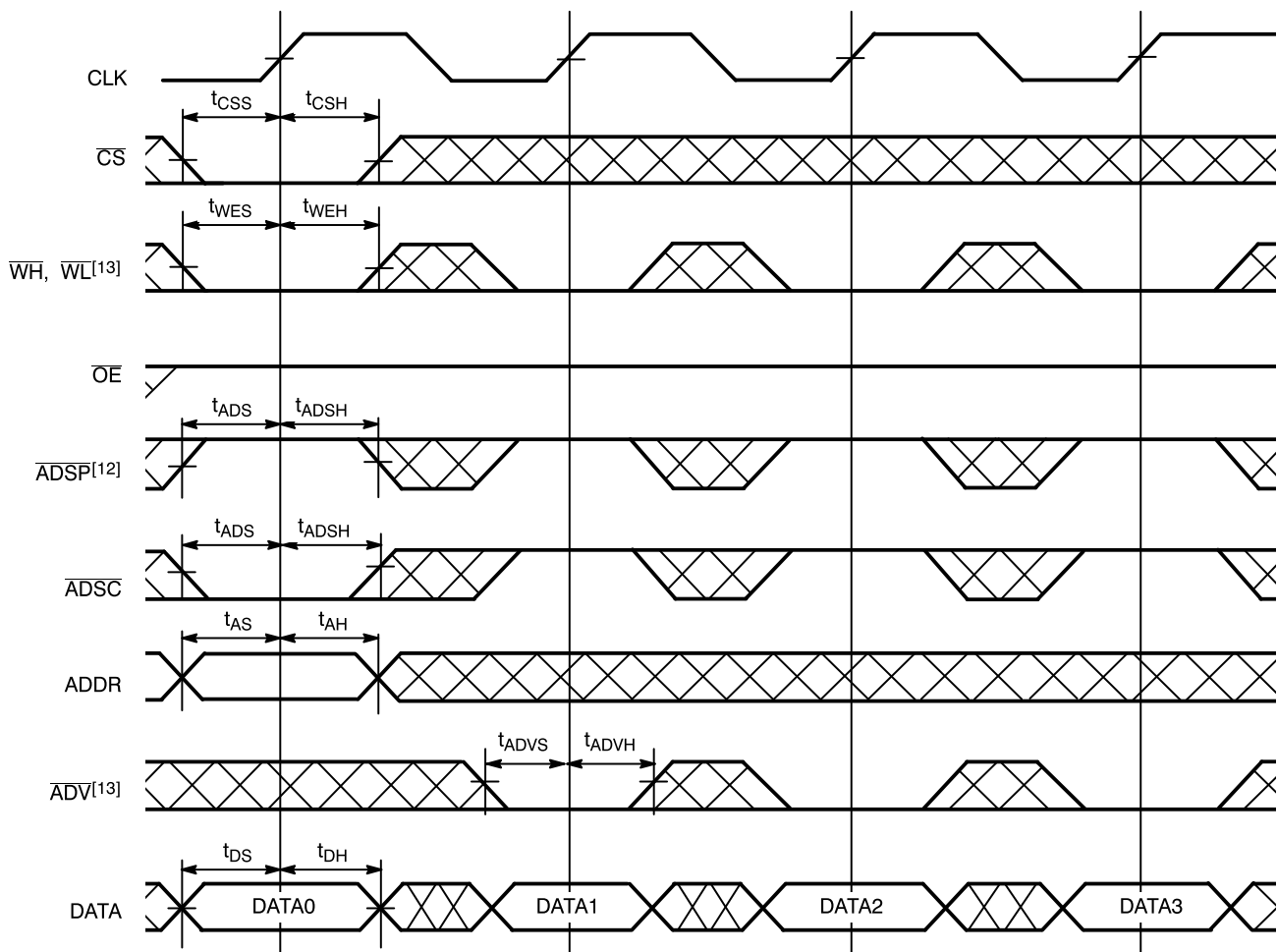
## Switching Waveforms (continued)

### Output (Controlled by $\overline{OE}$ )



1331-10

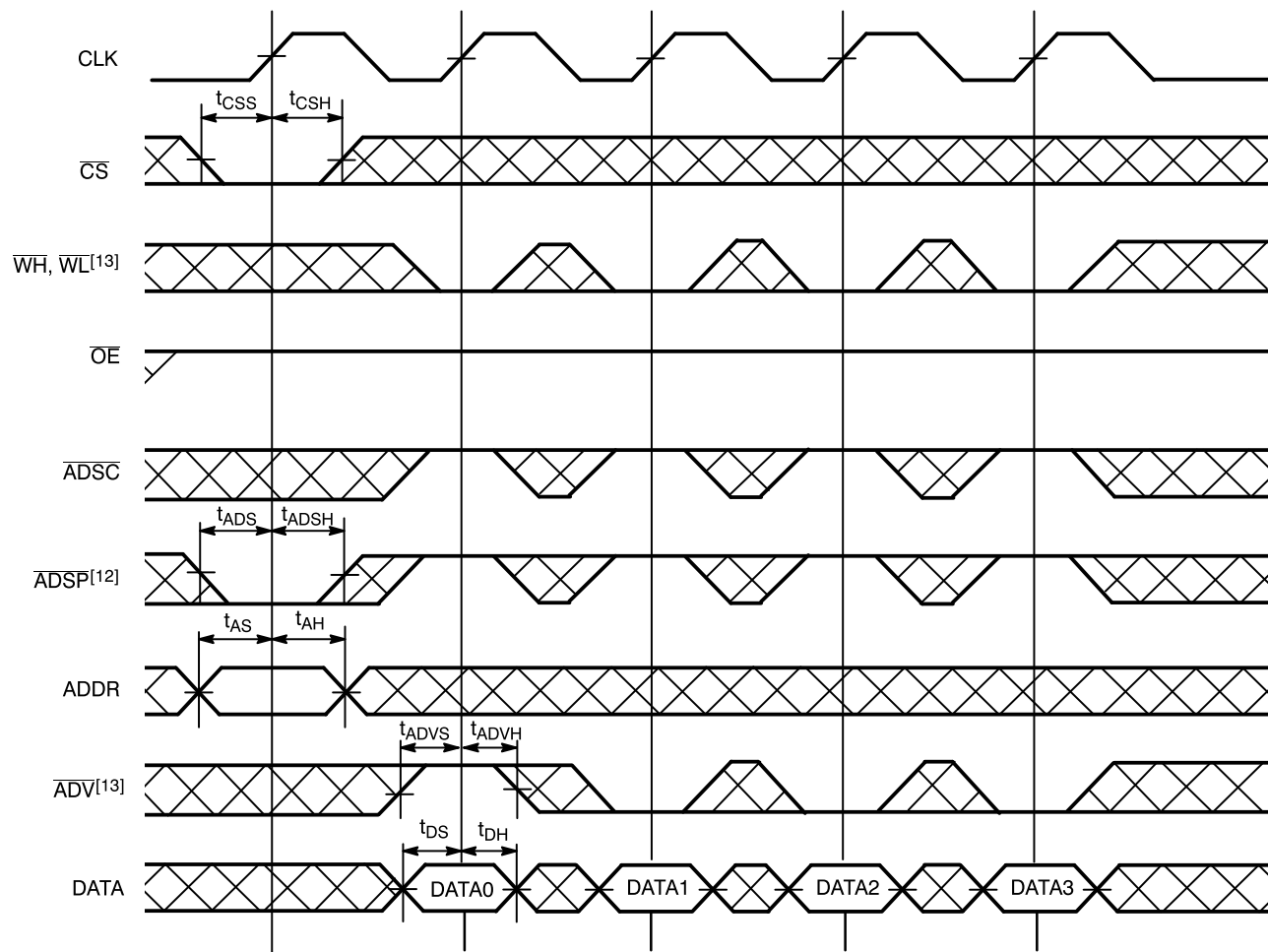
### Write Burst Timing: Write Initiated by $\overline{ADSC}$



1331-11

## Switching Waveforms (continued)

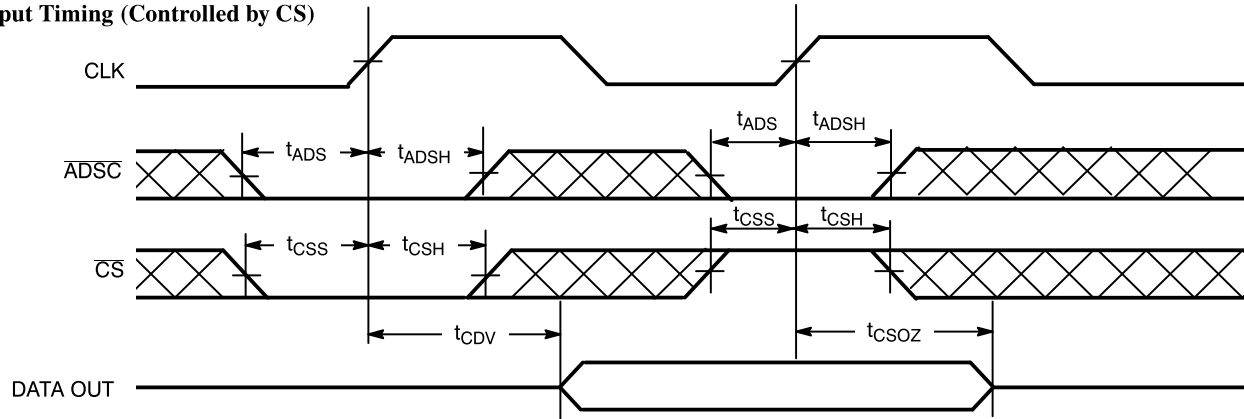
### Write Burst Timing: Write Initiated by $\overline{\text{ADSP}}$



1331-12

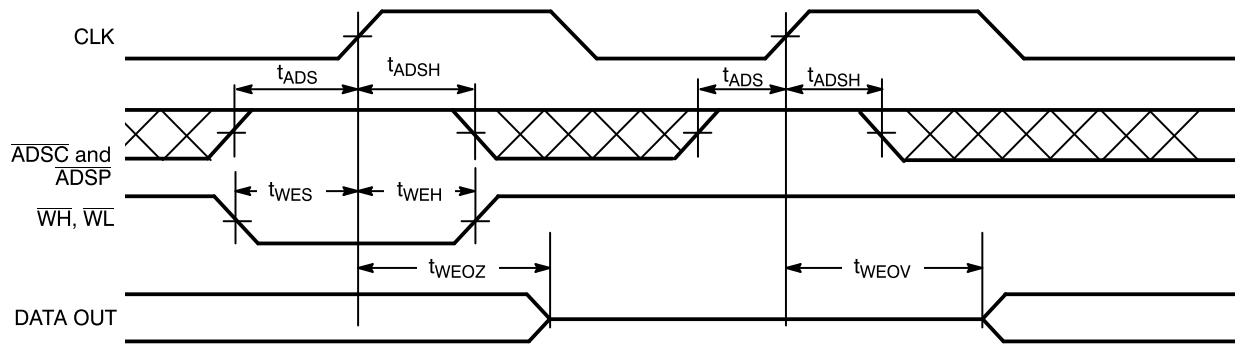
## Switching Waveforms (continued)

### Output Timing (Controlled by CS)



1331-13

### Output Timing (Controlled by $\overline{WH}/\overline{WL}$ )



1331-14

## Truth Table

Inputs						Address	Operation
$\overline{CS}$	$\overline{ADSP}$	$\overline{ADSC}$	$\overline{ADV}$	$\overline{WH}$ or $\overline{WL}$	CLK		
H	X	L	X	X	L→H	N/A	Chip deselected
H	L	H	H	H	L→H	Same address as previous cycle	Read cycle ( $\overline{ADSP}$ ignored)
H	L	H	L	H	L→H	Incremented burst address	Read cycle, in burst sequence ( $\overline{ADSP}$ ignored)
H	L	H	H	L	L→H	Same address as previous cycle	Write cycle ( $\overline{ADSP}$ ignored)
H	L	H	L	L	L→H	Incremented burst address	Write cycle, in burst sequence ( $\overline{ADSP}$ ignored)
L	L	X	X	X	L→H	External	Read cycle, begin burst
L	H	L	X	H	L→H	External	Read cycle, begin burst
L	H	L	X	L	L→H	External	Write cycle, begin burst
X	H	H	L	L	L→H	Incremented burst address	Write cycle, begin burst
X	H	H	L	H	L→H	Incremented burst address	Read cycle, begin burst
X	H	H	H	L	L→H	Same address as previous cycle	Write cycle
X	H	H	H	H	L→H	Same address as previous cycle	Read cycle

**Ordering Information**

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
8.5	CY7C1331-8JC	J69	52-Lead Plastic Leaded Chip Carrier	Commercial
	CY7C1331-8NC	N52	52-Lead Plastic Quad Flatpack	
10	CY7C1331-10JC	J69	52-Lead Plastic Leaded Chip Carrier	Commercial
	CY7C1331-10NC	N52	52-Lead Plastic Quad Flatpack	
12	CY7C1331-12JC	J69	52-Lead Plastic Leaded Chip Carrier	Commercial
	CY7C1331-12NC	N52	52-Lead Plastic Quad Flatpack	

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
8.5	CY7C1332-8JC	J69	52-Lead Plastic Leaded Chip Carrier	Commercial
	CY7C1332-8NC	N52	52-Lead Plastic Quad Flatpack	
10	CY7C1332-10JC	J69	52-Lead Plastic Leaded Chip Carrier	Commercial
	CY7C1332-10NC	N52	52-Lead Plastic Quad Flatpack	
12	CY7C1332-12JC	J69	52-Lead Plastic Leaded Chip Carrier	Commercial
	CY7C1332-12NC	N52	52-Lead Plastic Quad Flatpack	

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