



Integrated Device Technology, Inc.

### 3.3V CMOS FAST SRAM WITH 2.5V COMPATIBLE INPUTS 256K (32K x 8-BIT)

IDT71V256SB

#### FEATURES

- Ideal for high-performance processor secondary cache
- Fast access times:
  - 12/15/20ns
- Inputs are 2.5V and LVTTTL compatible:  $V_{IH} = 1.8V$
- Outputs are LVTTTL compatible
- Low standby current (maximum):
  - 2mA full standby
- Small packages for space-efficient layouts:
  - 28-pin 300 mil SOJ
  - 28-pin TSOP Type I
- Produced with advanced high-performance CMOS technology
- Single 3.3V( $\pm 0.3V$ ) power supply

#### DESCRIPTION

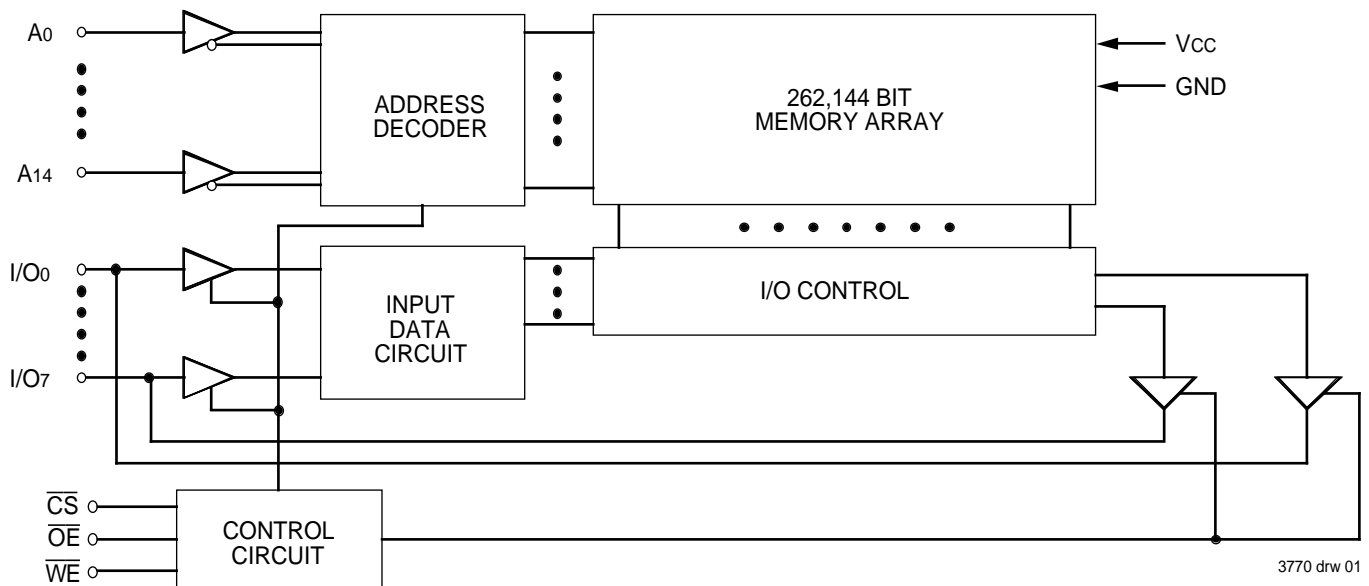
The IDT71V256SB is a 262,144-bit high-speed static RAM organized as 32K x 8. The improved  $V_{IH}$  (1.8V) makes the inputs compatible with 2.5V logic levels. The IDT71V256SB is otherwise identical to the IDT71V256SA.

The IDT71V256SB has outstanding low power characteristics while at the same time maintaining very high performance. Address access times of as fast as 12 ns are ideal for tag SRAM in secondary cache designs.

When power management logic puts the IDT71V256SB in standby mode, its very low power characteristics contribute to extended battery life. By taking  $\overline{CS}$  HIGH, the SRAM will automatically go to a low power standby mode and will remain in standby as long as  $\overline{CS}$  remains HIGH. Furthermore, under full standby mode ( $\overline{CS}$  at CMOS level,  $f=0$ ), power consumption is guaranteed to always be less than 6.6mW and typically will be much smaller.

The IDT71V256SB is packaged in 28-pin 300 mil SOJ and 28-pin 300 mil TSOP Type I packaging.

#### FUNCTIONAL BLOCK DIAGRAM

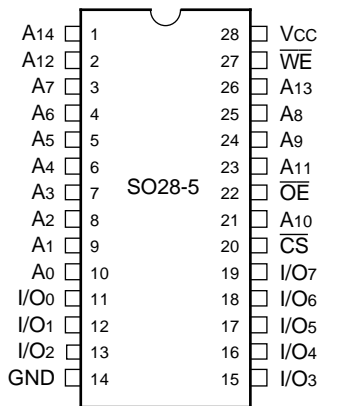


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COMMERCIAL TEMPERATURE RANGES

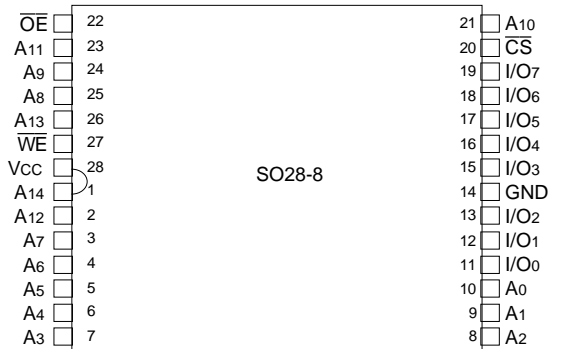
JANUARY 1997

## PIN CONFIGURATIONS



SOJ  
TOP VIEW

3770 drw 02



TSOP  
TOP VIEW

3770 drw 03

## PIN DESCRIPTIONS

Name	Description
A0–A14	Addresses
I/O0–I/O7	Data Input/Output
$\overline{CS}$	Chip Select
$\overline{WE}$	Write Enable
$\overline{OE}$	Output Enable
GND	Ground
Vcc	Power

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## TRUTH TABLE<sup>(1)</sup>

$\overline{WE}$	$\overline{CS}$	$\overline{OE}$	I/O	Function
X	H	X	High-Z	Standby (ISB)
X	VHC	X	High-Z	Standby (ISB1)
H	L	H	High-Z	Output Disable
H	L	L	DOUT	Read
L	L	X	DIN	Write

**NOTE:**

1. H = V<sub>IH</sub>, L = V<sub>IL</sub>, X = Don't Care

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## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Rating	Com'l.	Unit
VTERM <sup>(2)</sup>	Terminal Voltage with Respect to GND	–0.5 to +4.6	V
VTERM <sup>(3)</sup>	Terminal Voltage with Respect to GND	–0.5 to VCC+0.5	V
T <sub>A</sub>	Operating Temperature	0 to +70	°C
T <sub>BIAS</sub>	Temperature Under Bias	–55 to +125	°C
T <sub>STG</sub>	Storage Temperature	–55 to +125	°C
P <sub>T</sub>	Power Dissipation	1.0	W
I <sub>OUT</sub>	DC Output Current	50	mA

**NOTES:**

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- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- Vcc terminals only.
- Input, Output, and I/O terminals; 4.6V maximum.

## CAPACITANCE

(T<sub>A</sub> = +25°C, f = 1.0MHz, SOJ package)

Symbol	Parameter <sup>(1)</sup>	Conditions	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 3dV	6	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 3dV	7	pF

**NOTE:**

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- This parameter is determined by device characterization, but is not production tested.

## RECOMMENDED OPERATING TEMPERATURE AND SUPPLY VOLTAGE

Grade	Temperature	GND	Vcc
Commercial	0°C to +70°C	0V	3.3V ± 0.3V

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## RECOMMENDED DC OPERATING CONDITIONS

Symbol	Parameter	Min.	Typ.	Max.	Unit
Vcc	Supply Voltage	3.0	3.3	3.6	V
GND	Supply Voltage	0	0	0	V
V <sub>IH</sub>	Input High Voltage - Inputs	1.8	—	5.0	V
V <sub>IH</sub>	Input High Voltage - I/O	1.8	—	Vcc+0.3	V
V <sub>IL</sub>	Input Low Voltage	–0.5 <sup>(1)</sup>	—	0.8	V

**NOTE:**

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- V<sub>IL</sub> (min.) = –1.0V for pulse width less than 5ns, once per cycle.

## DC ELECTRICAL CHARACTERISTICS<sup>(1, 2)</sup>

( $V_{CC} = 3.3V \pm 0.3V$ ,  $V_{LC} = 0.2V$ ,  $V_{HC} = V_{CC} - 0.2V$ )

Symbol	Parameter	71V256SB12	71V256SB15	71V256SB20	Unit
		Com'l	Com'l.	Com'l.	
I <sub>CC</sub>	Dynamic Operating Current $\overline{CS} \leq V_{IL}$ , Outputs Open, $V_{CC} = \text{Max.}$ , $f = f_{\text{MAX}}^{(2)}$	90	85	85	mA
I <sub>SB</sub>	Standby Power Supply Current (TTL Level) $\overline{CS} = V_{IH}$ , $V_{CC} = \text{Max.}$ , Outputs Open, $f = f_{\text{MAX}}^{(2)}$	20	20	20	mA
I <sub>SB1</sub>	Full Standby Power Supply Current (CMOS Level) $\overline{CS} \geq V_{HC}$ , $V_{CC} = \text{Max.}$ , Outputs Open, $f = 0^{(2)}$ , $V_{IN} \leq V_{LC}$ or $V_{IN} \geq V_{HC}$	2	2	2	mA

**NOTES:**

- All values are maximum guaranteed values.
- $f_{\text{MAX}} = 1/\text{trc}$ , only address inputs cycling at  $f_{\text{max}}$ ;  $f = 0$  means that no inputs are cycling.

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## DC ELECTRICAL CHARACTERISTICS

$V_{CC} = 3.3V \pm 0.3V$

Symbol	Parameter	Test Condition	IDT71V256SB			Unit
			Min.	Typ.	Max.	
I <sub>LI</sub>	Input Leakage Current	$V_{CC} = \text{Max.}$ , $V_{IN} = \text{GND to } V_{CC}$	—	—	2	μA
I <sub>LO</sub>	Output Leakage Current	$V_{CC} = \text{Max.}$ , $\overline{CS} = V_{IH}$ , $V_{OUT} = \text{GND to } V_{CC}$	—	—	2	μA
V <sub>OL</sub>	Output Low Voltage	$I_{OL} = 8\text{mA}$ , $V_{CC} = \text{Min.}$	—	—	0.4	V
V <sub>OH</sub>	Output High Voltage	$I_{OH} = -4\text{mA}$ , $V_{CC} = \text{Min.}$	2.4	—	—	V

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## AC TEST CONDITIONS

Input Pulse Levels	GND to 3.0V
Input Rise/Fall Times	3ns
Input Timing Reference Levels	1.5V
Output Reference Levels	1.5V
AC Test Load	See Figures 1 and 2

3770 tbl 09

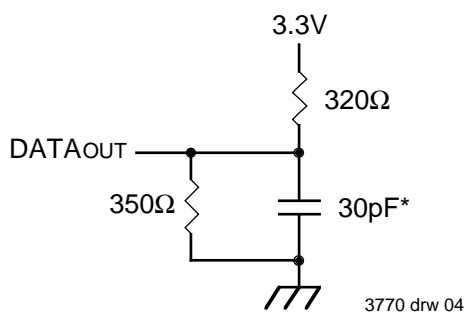


Figure 1. AC Test Load

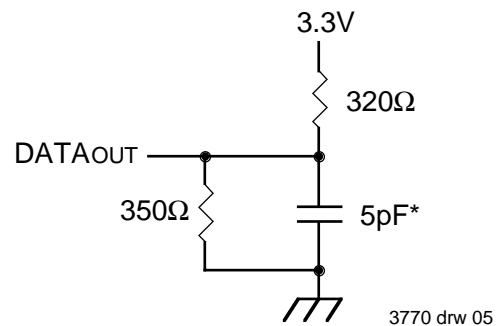


Figure 2. AC Test Load  
(for t<sub>CLZ</sub>, t<sub>OLZ</sub>, t<sub>CHZ</sub>, t<sub>OHZ</sub>, t<sub>OW</sub>, t<sub>WHZ</sub>)

\*Includes scope and jig capacitances

**AC ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 3.3V \pm 0.3V$ , Commercial Temperature Range)

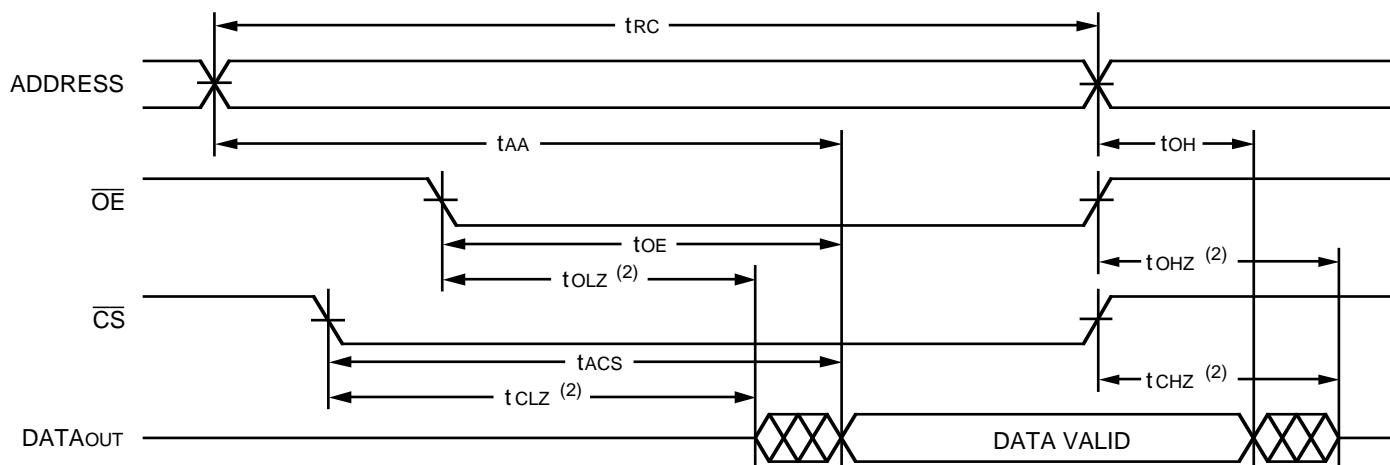
Symbol	Parameter	71V256SA12		71V256SA15		71V256SA20		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
<b>Read Cycle</b>								
t <sub>RC</sub>	Read Cycle Time	12	—	15	—	20	—	ns
t <sub>AA</sub>	Address Access Time	—	12	—	15	—	20	ns
t <sub>ACS</sub>	Chip Select Access Time	—	12	—	15	—	20	ns
t <sub>CLZ</sub> <sup>(1)</sup>	Chip Select to Output in Low-Z	5	—	5	—	5	—	ns
t <sub>CHZ</sub> <sup>(1)</sup>	Chip Select to Output in High-Z	0	8	0	9	0	10	ns
t <sub>OE</sub>	Output Enable to Output Valid	—	6	—	7	—	8	ns
t <sub>OLZ</sub> <sup>(1)</sup>	Output Enable to Output in Low-Z	3	—	0	—	0	—	ns
t <sub>OHZ</sub> <sup>(1)</sup>	Output Disable to Output in High-Z	2	6	0	7	0	8	ns
t <sub>OH</sub>	Output Hold from Address Change	3	—	3	—	3	—	ns
<b>Write Cycle</b>								
t <sub>WC</sub>	Write Cycle Time	12	—	15	—	20	—	ns
t <sub>AW</sub>	Address Valid to End-of-Write	9	—	10	—	15	—	ns
t <sub>CW</sub>	Chip Select to End-of-Write	9	—	10	—	15	—	ns
t <sub>AS</sub>	Address Set-up Time	0	—	0	—	0	—	ns
t <sub>WP</sub>	Write Pulse Width	9	—	10	—	15	—	ns
t <sub>WR</sub>	Write Recovery Time	0	—	0	—	0	—	ns
t <sub>DW</sub>	Data to Write Time Overlap	6	—	7	—	8	—	ns
t <sub>DH</sub>	Data Hold from Write Time	0	—	0	—	0	—	ns
t <sub>OW</sub> <sup>(1)</sup>	Output Active from End-of-Write	4	—	4	—	4	—	ns
t <sub>WHZ</sub> <sup>(1)</sup>	Write Enable to Output in High-Z	1	8	1	9	1	10	ns

**NOTE:**

1. This parameter guaranteed with the AC test load (Figure 2) by device characterization, but is not production tested.

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**TIMING WAVEFORM OF READ CYCLE NO. 1<sup>(1)</sup>**

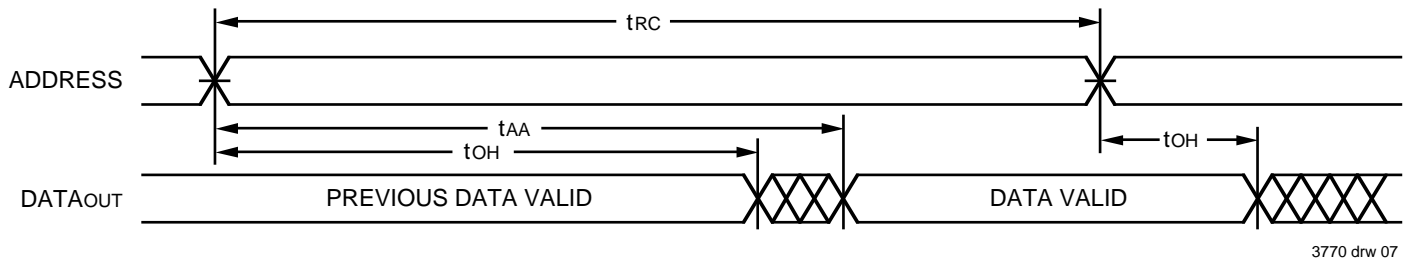


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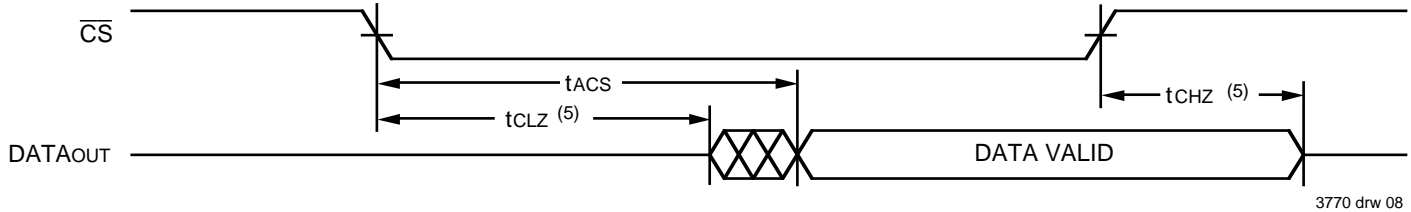
**NOTES:**

1. WE is HIGH for Read cycle.
2. Transition is measured  $\pm 200mV$  from steady state.

### TIMING WAVEFORM OF READ CYCLE NO. 2<sup>(1, 2, 4)</sup>



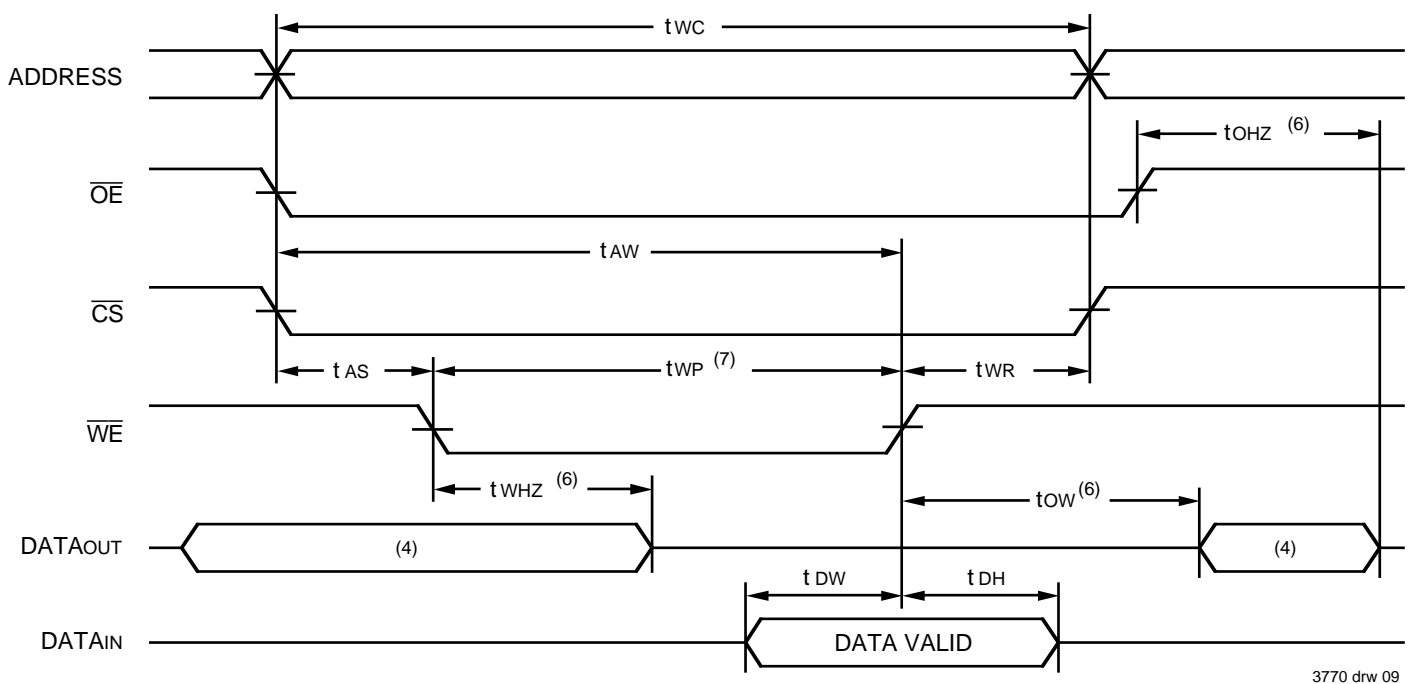
### TIMING WAVEFORM OF READ CYCLE NO. 3<sup>(1, 3, 4)</sup>



**NOTES:**

1.  $\overline{WE}$  is HIGH for Read cycle.
2. Device is continuously selected,  $\overline{CS}$  is LOW.
3. Address valid prior to or coincident with  $\overline{CS}$  transition LOW.
4.  $\overline{OE}$  is LOW.
5. Transition is measured  $\pm 200\text{mV}$  from steady state.

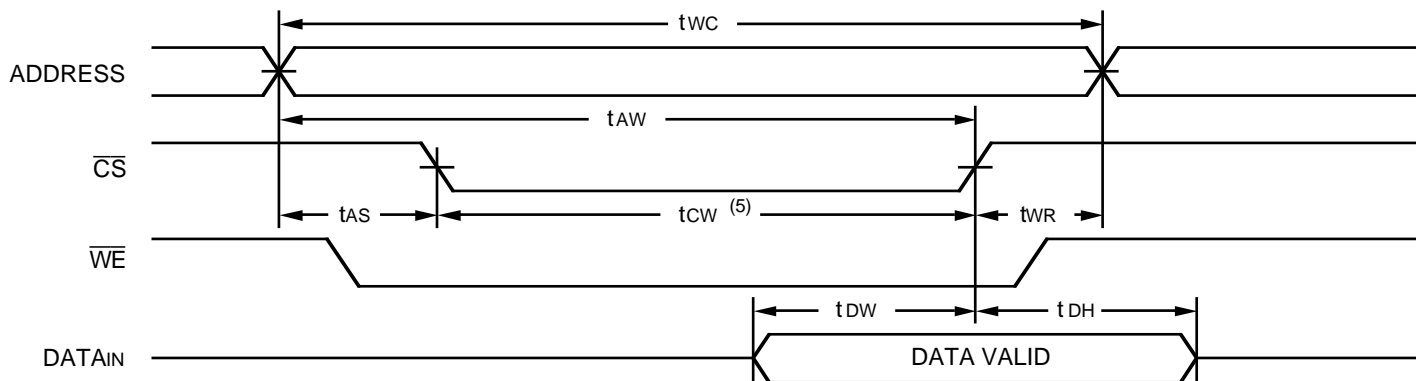
### TIMING WAVEFORM OF WRITE CYCLE NO. 1 ( $\overline{WE}$ CONTROLLED TIMING)<sup>(1, 2, 3, 5, 7)</sup>



**NOTES:**

1.  $\overline{WE}$  or  $\overline{CS}$  must be HIGH during all address transitions.
2. A write occurs during the overlap of a LOW  $\overline{CS}$  and a LOW  $\overline{WE}$ .
3.  $t_{WR}$  is measured from the earlier of  $\overline{CS}$  or  $\overline{WE}$  going HIGH to the end of the write cycle.
4. During this period, I/O pins are in the output state so that the input signals must not be applied.
5. If the  $\overline{CS}$  LOW transition occurs simultaneously with or after the  $\overline{WE}$  LOW transition, the outputs remain in a high-impedance state.
6. Transition is measured  $\pm 200\text{mV}$  from steady state.
7. If  $\overline{OE}$  is LOW during a  $\overline{WE}$  controlled write cycle, the write pulse width must be the larger of  $t_{WP}$  or  $(t_{WHZ} + t_{DW})$  to allow the I/O drivers to turn off and data to be placed on the bus for the required  $t_{DW}$ . If  $\overline{OE}$  is HIGH during a  $\overline{WE}$  controlled write cycle, this requirement does not apply and the write pulse can be as short as the specified  $t_{WP}$ .

**TIMING WAVEFORM OF WRITE CYCLE NO. 2 ( $\overline{CS}$  CONTROLLED TIMING)<sup>(1, 2, 3, 4)</sup>**



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**NOTES:**

1.  $\overline{WE}$  or  $\overline{CS}$  must be HIGH during all address transitions.
2. A write occurs during the overlap of a LOW  $\overline{CS}$  and a LOW  $\overline{WE}$ .
3.  $t_{WR}$  is measured from the earlier of  $\overline{CS}$  or  $\overline{WE}$  going HIGH to the end of the write cycle.
4. If the  $\overline{CS}$  LOW transition occurs simultaneously with or after the  $\overline{WE}$  LOW transition, the outputs remain in a high-impedance state.
5. If  $\overline{OE}$  is LOW during a  $\overline{WE}$  controlled write cycle, the write pulse width must be the larger of  $t_{WP}$  or  $(t_{WHZ} + t_{DW})$  to allow the I/O drivers to turn off and data to be placed on the bus for the required  $t_{DW}$ . If  $\overline{OE}$  is HIGH during a  $\overline{WE}$  controlled write cycle, this requirement does not apply and the write pulse can be as short as the specified  $t_{WP}$ .

**ORDERING INFORMATION**

IDT	<u>71V256</u>	<u>SB</u>	<u>XX</u>	<u>Y</u>	<u>X</u>	
	Device Type	Power/Rev	Speed	Package	Process/Temperature Range	
					Blank	Commercial (0°C to +70°C)
					Y PZ	} 300 mil SOJ (SO28-5) TSOP Type I (SO28-8)
					12 15 20	} Speed in nanoseconds
					SB	Standard Power, 2.5V Compatible Inputs

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