



# 3.3V CMOS Static RAM 1 Meg (128K x 8-Bit) Center Power & Ground Pinout

**IDT71V124SA/HSA**

## Features

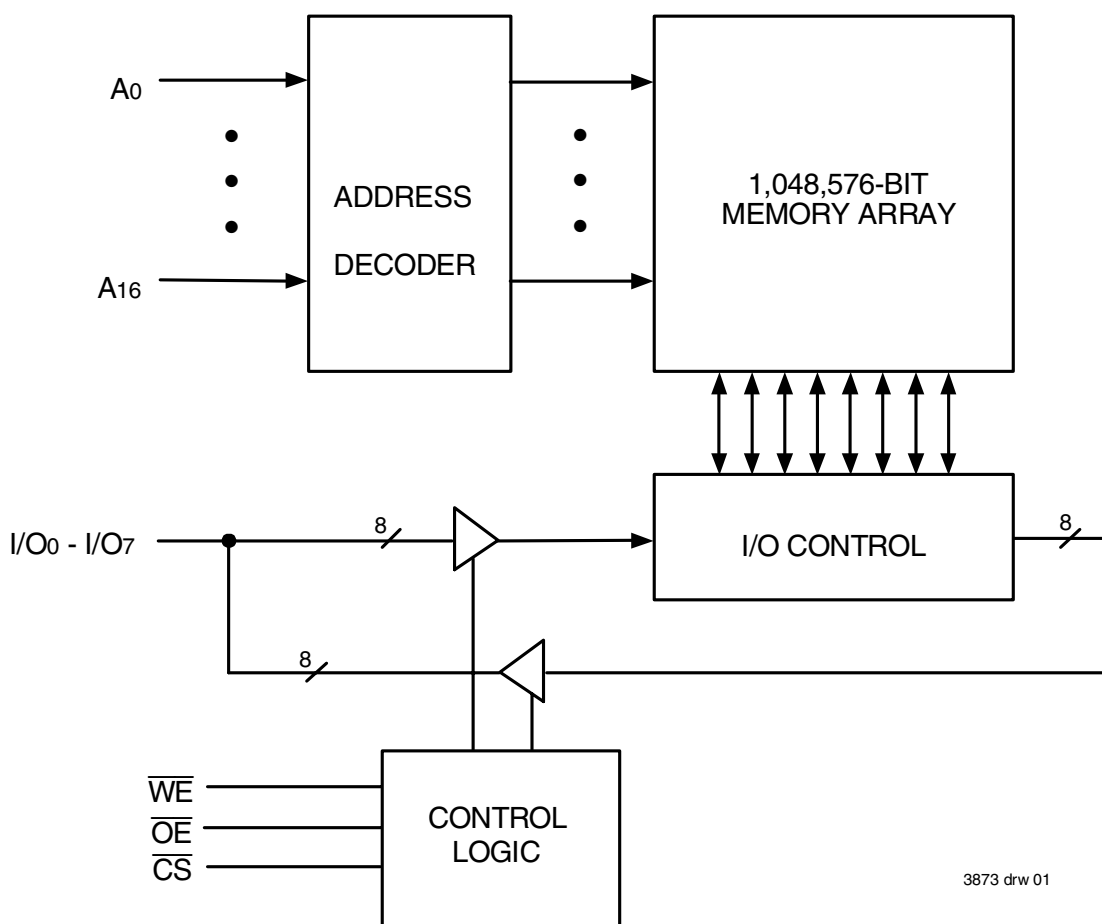
- ♦ 128K x 8 advanced high-speed CMOS static RAM
- ♦ JEDEC revolutionary pinout (center power/GND) for reduced noise
- ♦ Equal access and cycle times
  - Commercial: 10/12/15/20ns
  - Industrial: 10/12/15/20ns
- ♦ One Chip Select plus one Output Enable pin
- ♦ Inputs and outputs are LVTTTL-compatible
- ♦ Single 3.3V supply
- ♦ Low power consumption via chip deselect
- ♦ Available in a 32-pin 300- and 400-mil Plastic SOJ, and 32-pin Type II TSOP packages.

## Description

The IDT71V124 is a 1,048,576-bit high-speed static RAM organized as 128K x 8. It is fabricated using IDT's high-performance, high-reliability CMOS technology. This state-of-the-art technology, combined with innovative circuit design techniques, provides a cost-effective solution for high-speed memory needs. The JEDEC center power/GND pinout reduces noise generation and improves system performance.

The IDT71V124 has an output enable pin which operates as fast as 5ns, with address access times as fast as 9ns available. All bidirectional inputs and outputs of the IDT71V124 are LVTTTL-compatible and operation is from a single 3.3V supply. Fully static asynchronous circuitry is used; no clocks or refreshes are required for operation.

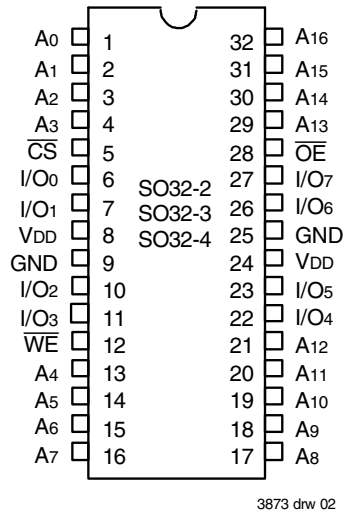
## Functional Block Diagram



3873 drw 01

OCTOBER 2008

## Pin Configuration



## SOJ and TSOP Top View

## Truth Table<sup>(1)</sup>

| $\overline{CS}$ | $\overline{OE}$ | $\overline{WE}$ | I/O     | Function             |
|-----------------|-----------------|-----------------|---------|----------------------|
| L               | L               | H               | DATAOUT | Read Data            |
| L               | X               | L               | DATAIN  | Write Data           |
| L               | H               | H               | High-Z  | Output Disabled      |
| H               | X               | X               | High-Z  | Deselected – Standby |

### NOTE:

1. H =  $V_{IH}$ , L =  $V_{IL}$ , X = Don't care.

3873 tbl 01

## Capacitance

( $T_A = +25^\circ\text{C}$ ,  $f = 1.0\text{MHz}$ , SOJ package)

| Symbol    | Parameter <sup>(1)</sup> | Conditions             | Max. | Unit |
|-----------|--------------------------|------------------------|------|------|
| $C_{IN}$  | Input Capacitance        | $V_{IN} = 3\text{dV}$  | 6    | pF   |
| $C_{I/O}$ | I/O Capacitance          | $V_{OUT} = 3\text{dV}$ | 7    | pF   |

### NOTE:

1. This parameter is guaranteed by device characterization, but is not production tested.

3873 tbl 03

## DC Electrical Characteristics

( $V_{DD} = \text{Min. to Max.}$ , Commercial and Industrial Temperature Ranges)

| Symbol     | Parameter              | Test Conditions                                                                       | Min. | Max. | Unit          |
|------------|------------------------|---------------------------------------------------------------------------------------|------|------|---------------|
| $ I_{L} $  | Input Leakage Current  | $V_{DD} = \text{Max.}$ , $V_{IN} = \text{GND to } V_{DD}$                             | —    | 5    | $\mu\text{A}$ |
| $ I_{LO} $ | Output Leakage Current | $V_{DD} = \text{Max.}$ , $\overline{CS} = V_{IH}$ , $V_{OUT} = \text{GND to } V_{DD}$ | —    | 5    | $\mu\text{A}$ |
| $V_{OL}$   | Output Low Voltage     | $I_{OL} = 8\text{mA}$ , $V_{DD} = \text{Min.}$                                        | —    | 0.4  | V             |
| $V_{OH}$   | Output High Voltage    | $I_{OH} = -4\text{mA}$ , $V_{DD} = \text{Min.}$                                       | 2.4  | —    | V             |

3873 tbl 05

## Absolute Maximum Ratings<sup>(1)</sup>

| Symbol               | Rating                           | Value                | Unit             |
|----------------------|----------------------------------|----------------------|------------------|
| $V_{DD}$             | Supply Voltage Relative to GND   | -0.5 to +4.6         | V                |
| $V_{IN}$ , $V_{OUT}$ | Terminal Voltage Relative to GND | -0.5 to $V_{DD}+0.5$ | V                |
| $T_A$                | Commercial Operating Temperature | -0 to +70            | $^\circ\text{C}$ |
|                      | Industrial Operating Temperature | -40 to +85           |                  |
| $T_{BIAS}$           | Temperature Under Bias           | -55 to +125          | $^\circ\text{C}$ |
| $T_{STG}$            | Storage Temperature              | -55 to +125          | $^\circ\text{C}$ |
| $P_T$                | Power Dissipation                | 1.25                 | W                |
| $I_{OUT}$            | DC Output Current                | 50                   | mA               |

### NOTE:

1. 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.

3873 tbl 02

## Recommended Operating Temperature and Supply Voltage

| Grade      | Temperature                                | GND | $V_{DD}$  |
|------------|--------------------------------------------|-----|-----------|
| Commercial | $0^\circ\text{C}$ to $+70^\circ\text{C}$   | 0V  | See Below |
| Industrial | $-40^\circ\text{C}$ to $+85^\circ\text{C}$ | 0V  | See Below |

3873 tbl 02a

## Recommended DC Operating Conditions

| Symbol         | Parameter          | Min.                | Typ. | Max.               | Unit |
|----------------|--------------------|---------------------|------|--------------------|------|
| $V_{DD}^{(1)}$ | Supply Voltage     | 3.15                | 3.3  | 3.6                | V    |
| $V_{DD}^{(2)}$ | Supply Voltage     | 3.0                 | 3.3  | 3.6                | V    |
| $V_{SS}$       | Ground             | 0                   | 0    | 0                  | V    |
| $V_{IH}$       | Input High Voltage | 2.0                 | —    | $V_{DD}+0.3^{(3)}$ | V    |
| $V_{IL}$       | Input Low Voltage  | -0.5 <sup>(1)</sup> | —    | 0.8                | V    |

### NOTES:

1. For 71V124SA10 only.  
2. For all speed grades except 71V124SA10.  
3.  $V_{IH}(\text{max.}) = V_{DD}+2\text{V}$  for pulse width less than 5ns, once per cycle.  
4.  $V_{IL}(\text{min.}) = -2\text{V}$  for pulse width less than 5ns, once per cycle.

3873 tbl 04

## DC Electrical Characteristics<sup>(1, 2)</sup>

( $V_{DD} = \text{Min. to Max.}$ ,  $V_{LC} = 0.2V$ ,  $V_{HC} = V_{DD} - 0.2V$ )

| Symbol    | Parameter                                                                                                             | 71V124SA10 |     | 71V124SA12 |     | 71V124SA15 |     | 71V124SA20 |     | Unit |
|-----------|-----------------------------------------------------------------------------------------------------------------------|------------|-----|------------|-----|------------|-----|------------|-----|------|
|           |                                                                                                                       | Com'l      | Ind | Com'l      | Ind | Com'l      | Ind | Com'l      | Ind |      |
| $I_{CC}$  | Dynamic Operating Current<br>$CS \leq V_{LC}$ , Outputs Open, $V_{DD} = \text{Max.}$ , $f = f_{MAX}^{(3)}$            | 145        | 150 | 130        | 140 | 100        | 120 | 95         | 115 | mA   |
| $I_{SB}$  | Dynamic Standby Power Supply Current<br>$CS \geq V_{HC}$ , Outputs Open, $V_{DD} = \text{Max.}$ , $f = f_{MAX}^{(3)}$ | 45         | 50  | 40         | 40  | 35         | 40  | 30         | 35  | mA   |
| $I_{SB1}$ | Full Standby Power Supply Current (static)<br>$CS \geq V_{HC}$ , Outputs Open, $V_{DD} = \text{Max.}$ , $f = 0^{(3)}$ | 10         | 10  | 10         | 10  | 10         | 10  | 10         | 10  | mA   |

3873 tbl 06

### NOTES:

1. All values are maximum guaranteed values.
2. All inputs switch between 0.2V (Low) and  $V_{DD}-0.2V$  (High).
3.  $f_{MAX} = 1/t_{RC}$  (all address inputs are cycling at  $f_{MAX}$ );  $f = 0$  means no address input lines are changing.

## 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 Figure 1 and 2 |

3873 tbl 07

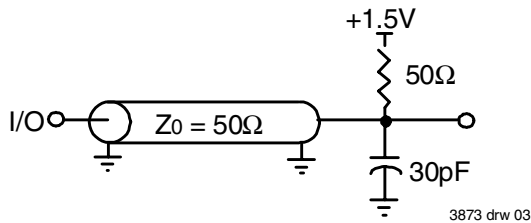
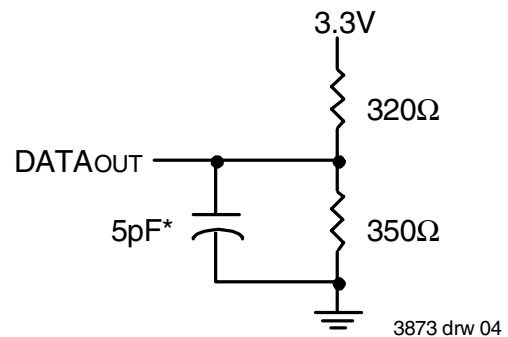


Figure 1. AC Test Load



\*Including jig and scope capacitance.

Figure 2. AC Test Load  
(for  $t_{CLZ}$ ,  $t_{OLZ}$ ,  $t_{CHZ}$ ,  $t_{OHZ}$ ,  $t_{OW}$ , and  $t_{WHZ}$ )

## AC Electrical Characteristics

(V<sub>DD</sub> = Min. to Max., Commercial and Industrial Temperature Ranges)

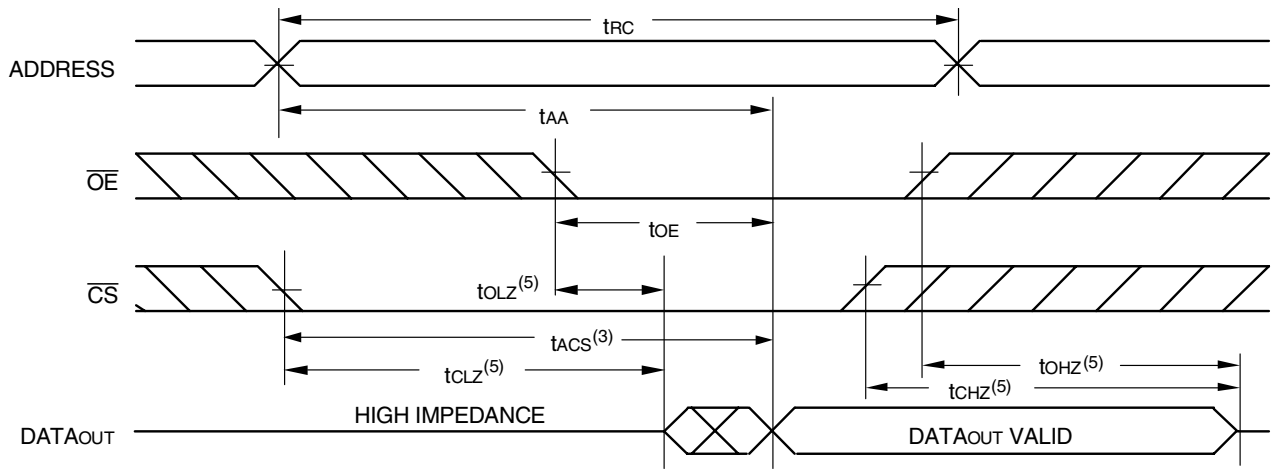
| Symbol                          | Parameter                          | 71V124SA10 |      | 71V124SA12 |      | 71V124SA15 |      | 71V124SA20 |      | Unit |
|---------------------------------|------------------------------------|------------|------|------------|------|------------|------|------------|------|------|
|                                 |                                    | Min.       | Max. | Min.       | Max. | Min.       | Max. | Min.       | Max. |      |
| READ CYCLE                      |                                    |            |      |            |      |            |      |            |      |      |
| t <sub>RC</sub>                 | Read Cycle Time                    | 10         | —    | 12         | —    | 15         | —    | 20         | —    | ns   |
| t <sub>AA</sub>                 | Address Access Time                | —          | 10   | —          | 12   | —          | 15   | —          | 20   | ns   |
| t <sub>ACS</sub>                | Chip Select Access Time            | —          | 10   | —          | 12   | —          | 15   | —          | 20   | ns   |
| t <sub>OLZ</sub> <sup>(1)</sup> | Chip Select to Output in Low-Z     | 4          | —    | 4          | —    | 4          | —    | 4          | —    | ns   |
| t <sub>CHZ</sub> <sup>(1)</sup> | Chip Deselect to Output in High-Z  | 0          | 5    | 0          | 6    | 0          | 7    | 0          | 8    | ns   |
| t <sub>OE</sub>                 | Output Enable to Output Valid      | —          | 5    | —          | 6    | —          | 7    | —          | 8    | ns   |
| t <sub>OLZ</sub> <sup>(1)</sup> | Output Enable to Output in Low-Z   | 0          | —    | 0          | —    | 0          | —    | 0          | —    | ns   |
| t <sub>OHZ</sub> <sup>(1)</sup> | Output Disable to Output in High-Z | 0          | 5    | 0          | 5    | 0          | 5    | 0          | 7    | ns   |
| t <sub>OH</sub>                 | Output Hold from Address Change    | 4          | —    | 4          | —    | 4          | —    | 4          | —    | ns   |
| WRITE CYCLE                     |                                    |            |      |            |      |            |      |            |      |      |
| t <sub>WC</sub>                 | Write Cycle Time                   | 10         | —    | 12         | —    | 15         | —    | 20         | —    | ns   |
| t <sub>AW</sub>                 | Address Valid to End-of-Write      | 7          | —    | 8          | —    | 10         | —    | 12         | —    | ns   |
| t <sub>CW</sub>                 | Chip Select to End-of-Write        | 7          | —    | 8          | —    | 10         | —    | 12         | —    | ns   |
| t <sub>AS</sub>                 | Address Set-up Time                | 0          | —    | 0          | —    | 0          | —    | 0          | —    | ns   |
| t <sub>WP</sub>                 | Write Pulse Width                  | 7          | —    | 8          | —    | 10         | —    | 12         | —    | ns   |
| t <sub>WR</sub>                 | Write Recovery Time                | 0          | —    | 0          | —    | 0          | —    | 0          | —    | ns   |
| t <sub>DW</sub>                 | Data Valid to End-of-Write         | 5          | —    | 6          | —    | 7          | —    | 9          | —    | ns   |
| t <sub>DH</sub>                 | Data Hold Time                     | 0          | —    | 0          | —    | 0          | —    | 0          | —    | ns   |
| t <sub>OW</sub> <sup>(2)</sup>  | Output Active from End-of-Write    | 3          | —    | 3          | —    | 3          | —    | 4          | —    | ns   |
| t <sub>WHZ</sub> <sup>(2)</sup> | Write Enable to Output in High-Z   | 0          | 5    | 0          | 5    | 0          | 5    | 0          | 8    | ns   |

3873 tbl 08

### NOTES:

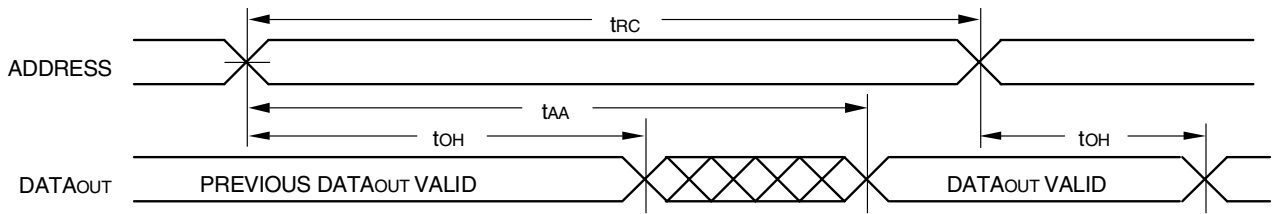
1. This parameter guaranteed with the AC load (Figure 2) by device characterization, but is not production tested.

## Timing Waveform of Read Cycle No. 1<sup>(1)</sup>



3873 drw 05

## Timing Waveform of Read Cycle No. 2<sup>(1, 2, 4)</sup>

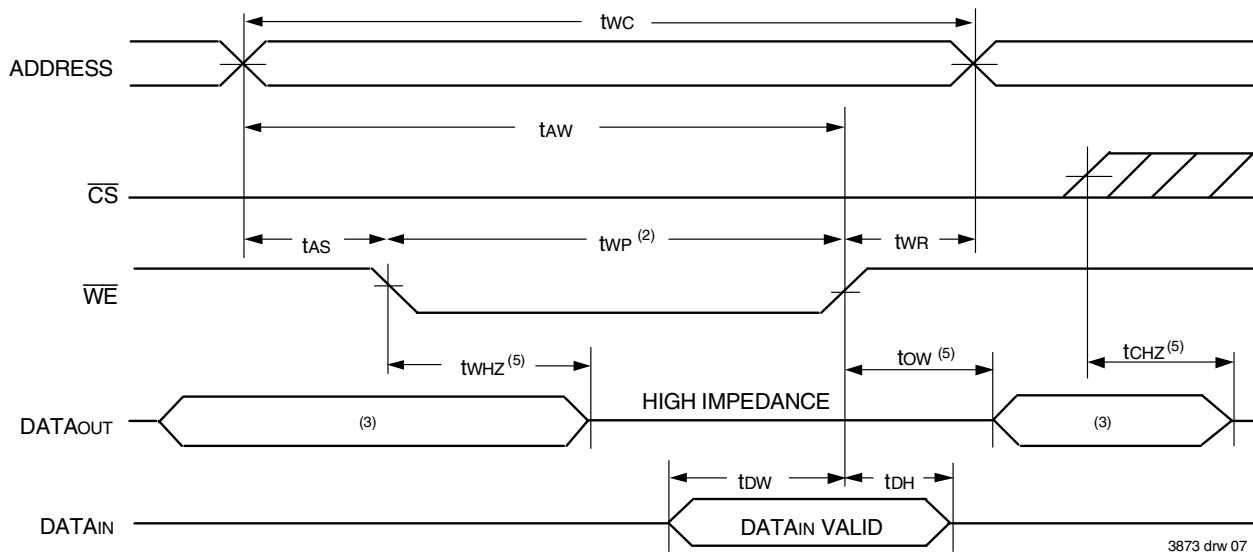


3873 drw 06

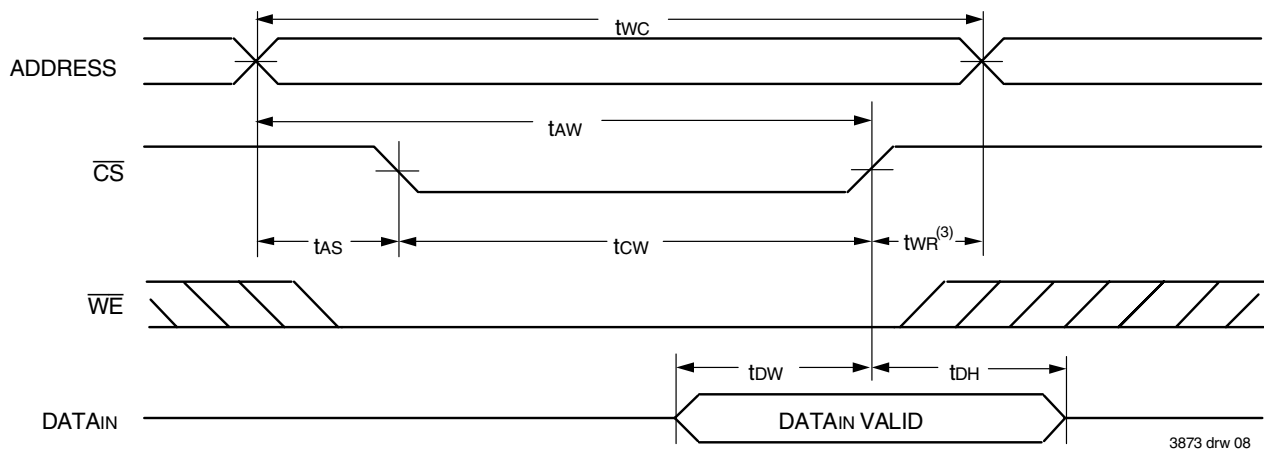
### NOTES:

1.  $\overline{WE}$  is HIGH for Read Cycle.
2. Device is continuously selected,  $\overline{CS}$  is LOW.
3. Address must be valid prior to or coincident with the later of  $\overline{CS}$  transition LOW; otherwise  $t_{AA}$  is the limiting parameter.
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>(1,2,4)</sup>



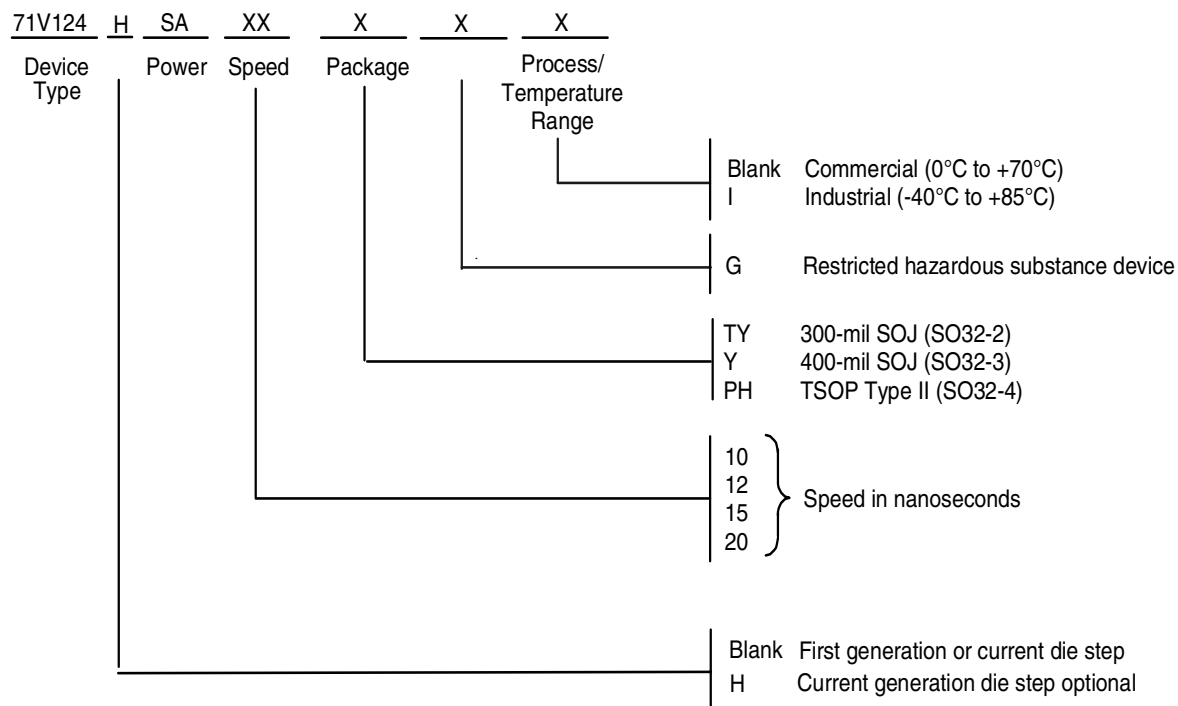
## Timing Waveform of Write Cycle No. 2 ( $\overline{CS}$ Controlled Timing)<sup>(1, 4)</sup>



### NOTES:

1. A write occurs during the overlap of a LOW  $\overline{CS}$  and a LOW  $\overline{WE}$ .
2.  $\overline{OE}$  is continuously HIGH. During a  $\overline{WE}$  controlled write cycle with  $\overline{OE}$  LOW,  $t_{WP}$  must be greater than or equal to  $t_{WHZ} + t_{OW}$  to allow the I/O drivers to turn off and data to be placed on the bus for the required  $t_{OW}$ . If  $\overline{OE}$  is HIGH during a  $\overline{WE}$  controlled write cycle, this requirement does not apply and the minimum write pulse is the specified  $t_{WP}$ .
3. During this period, I/O pins are in the output state, and input signals must not be applied.
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.  $\overline{CS}$  must be active during the  $t_{CW}$  write period.
5. Transition is measured  $\pm 200\text{mV}$  from steady state.

## Ordering Information



3873 drw 09

## Datasheet Document History

|          |            |                                                                                  |
|----------|------------|----------------------------------------------------------------------------------|
| 11/22/99 |            | Updated to new format                                                            |
|          | Pg. 1-4, 7 | Added Industrial Temperature range offerings                                     |
|          | Pg. 2      | Added Recommended Operating Temperature and Supply Voltage table                 |
|          | Pg. 6      | Revised footnotes on Write Cycle No. 1 diagram                                   |
|          | Pg. 8      | Added Datasheet Document History                                                 |
| 08/30/00 | Pg. 3      | Tighten ICC and ISB                                                              |
|          | Pg. 4      | Tighten AC Characteristics tOHZ, tOW and tWHZ                                    |
| 08/22/01 | Pg. 7      | Removed footnote "400-mil SOJ package only offered in 10ns and 12ns speed grade" |
| 11/30/03 | Pg. 1,3,7  | Added Industrial temperature offering 10ns speed grade                           |
| 01/30/04 | Pg. 7      | Added "Restricted hazardous substance device" to ordering information.           |
| 2/14/07  | Pg. 7      | Added H generation die step to data sheet ordering information.                  |
| 10/13/08 | Pg. 7      | removed "IDT" form the orderable part number                                     |



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