



Integrated Device Technology, Inc.

CMOS STATIC RAM 1 MEG (256K x 4-BIT)

IDT71028S70

FEATURES:

- 256K x 4 CMOS static RAM
- Equal access and cycle times
 - Commercial: 70ns
- One Chip Select plus one Output Enable pin
- Bidirectional data Inputs and outputs directly TTL-compatible
- Low power consumption via chip deselect
- Available in 400 mil Plastic SOJ package

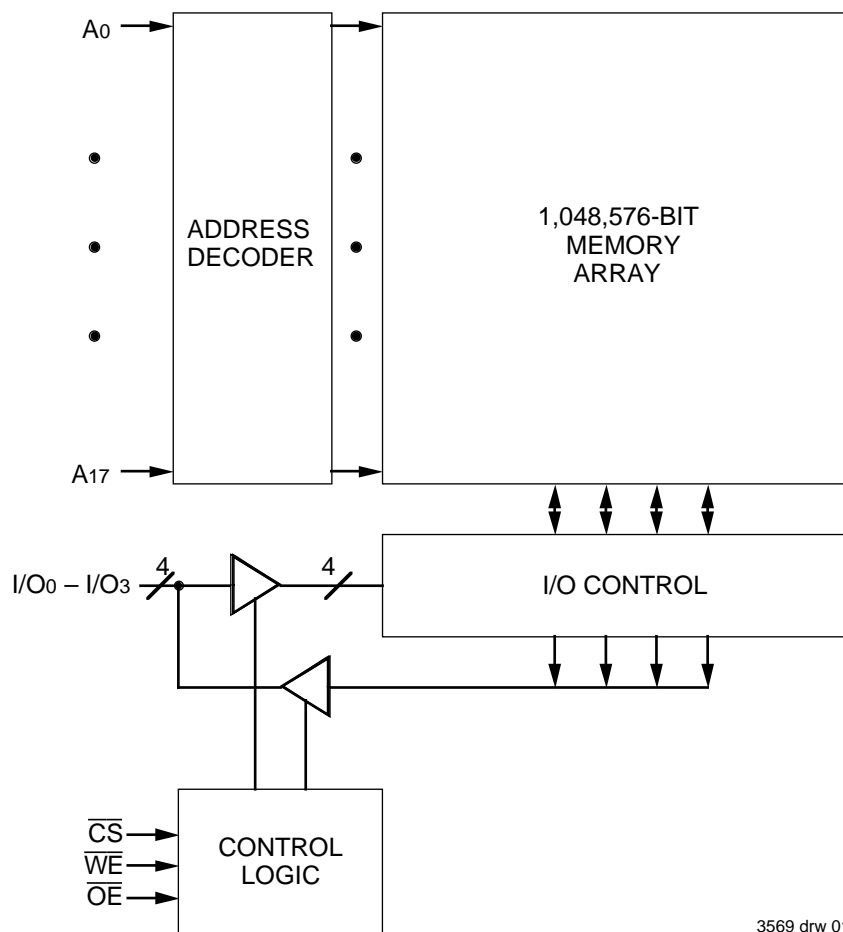
DESCRIPTION:

The IDT71028 is a 1,024,576-bit medium-speed static RAM organized as 256K x 4. 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 your memory needs.

The IDT71028 has an output enable pin which operates as fast as 30ns, with address access times as fast as 70ns. All bidirectional inputs and outputs of the IDT71028 are TTL-compatible and operation is from a single 5V supply. Fully static asynchronous circuitry is used, requiring no clocks or refresh for operation.

The IDT71028 is packaged in 28-pin 400 mil Plastic SOJ package.

FUNCTIONAL BLOCK DIAGRAM



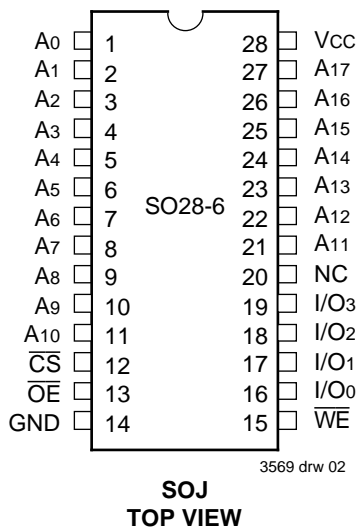
3569 drw 01

The IDT logo is a registered trademark of Integrated Device Technology, Inc.

COMMERCIAL TEMPERATURE RANGE

MAY 1996

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Rating | Com'l. | Unit |
|----------------------------------|--------------------------------------|--------------|------|
| V _{TERM} ⁽²⁾ | Terminal Voltage with Respect to GND | -0.5 to +7.0 | V |
| T _A | Operating Temperature | 0 to +70 | °C |
| T _{BIAS} | Temperature Under Bias | -55 to +125 | °C |
| T _{STG} | Storage Temperature | -55 to +125 | °C |
| P _T | Power Dissipation | 1.25 | W |
| I _{OUT} | DC Output Current | 50 | mA |

NOTES:

3569 tbl 02

- 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.
- V_{TERM} must not exceed V_{CC} + 0.5V.

TRUTH TABLE^(1,2)

| \overline{CS} | \overline{OE} | \overline{WE} | I/O | Function |
|--------------------------------|-----------------|-----------------|---------------------|--|
| L | L | H | DATA _{OUT} | Read Data |
| L | X | L | DATA _{IN} | Write Data |
| L | H | H | High-Z | Output Disabled |
| H | X | X | High-Z | Deselected - Standby (I _{SB}) |
| V _{HC} ⁽³⁾ | X | X | High-Z | Deselected - Standby (I _{SB1}) |

NOTES:

3569 tbl 01

- H = V_{IH}, L = V_{IL}, x = Don't care.
- V_{LC} = 0.2V, V_{HC} = V_{CC} - 0.2V.
- Other inputs ≥ V_{HC} or ≤ V_{LC}.

CAPACITANCE

(T_A = +25°C, f = 1.0MHz, SOJ package)

| Symbol | Parameter ⁽¹⁾ | Conditions | Max. | Unit |
|------------------|--------------------------|------------------------|------|------|
| C _{IN} | Input Capacitance | V _{IN} = 3dV | 8 | pF |
| C _{I/O} | I/O Capacitance | V _{OUT} = 3dV | 8 | pF |

NOTE:

3569 tbl 03

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

RECOMMENDED DC OPERATING CONDITIONS

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|-----------------|--------------------|---------------------|------|----------------------|------|
| V _{CC} | Supply Voltage | 4.5 | 5.0 | 5.5 | V |
| GND | Supply Voltage | 0 | 0 | 0 | V |
| V _{IH} | Input High Voltage | 2.2 | — | V _{CC} +0.5 | V |
| V _{IL} | Input Low Voltage | -0.5 ⁽¹⁾ | — | 0.8 | V |

NOTE:

3569 tbl 04

- V_{IL} (min.) = -1.5V for pulse width less than 10ns, once per cycle.

DC ELECTRICAL CHARACTERISTICS

V_{CC} = 5.0V ± 10%

| Symbol | Parameter | Test Condition | IDT71028 | | Unit |
|-----------------|------------------------|---|----------|------|------|
| | | | Min. | Max. | |
| I _{LI} | Input Leakage Current | V _{CC} = Max., V _{IN} = GND to V _{CC} | — | 5 | μA |
| I _{LO} | Output Leakage Current | V _{CC} = Max., \overline{CS} = V _{IH} , V _{OUT} = GND to V _{CC} | — | 5 | μA |
| V _{OL} | Output Low Voltage | I _{OL} = 8mA, V _{CC} = Min. | — | 0.4 | V |
| V _{OH} | Output High Voltage | I _{OH} = -4mA, V _{CC} = Min. | 2.4 | — | V |

3569 tbl 05

DC ELECTRICAL CHARACTERISTICS⁽¹⁾

($V_{CC} = 5.0V \pm 10\%$, $V_{LC} = 0.2V$, $V_{HC} = V_{CC} - 0.2V$)

| Symbol | Parameter | 71028S70 | | Unit |
|------------------|--|----------|------|------|
| | | Com'l. | Mil. | |
| I _{CC} | Dynamic Operating Current, $CS2 \geq V_{IH}$ and $CS2 \geq V_{IH}$ and $CS1 \leq V_{IL}$, Outputs Open, $V_{CC} = Max.$, $f = f_{MAX}^{(2)}$ | 140 | — | mA |
| I _{SB} | Standby Power Supply Current (TTL Level) $CS1 \geq V_{IH}$ or $CS2 \leq V_{IL}$, Outputs Open, $V_{CC} = Max.$, $f = f_{MAX}^{(2)}$ | 35 | — | mA |
| I _{SB1} | Full Standby Power Supply Current (CMOS Level) $CS1 \geq V_{HC}$, or $CS2 \leq V_{LC}$ Outputs Open, $V_{CC} = Max.$, $f = 0^{(2)}$, $V_{IN} \leq V_{LC}$ or $V_{IN} \geq V_{HC}$ | 10 | — | mA |

NOTES:

- All values are maximum guaranteed values.
- $f_{MAX} = 1/trc$ (all address inputs are cycling at f_{MAX}); $f = 0$ means no address input lines are changing.

3569 tbl 06

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 |

3569 tbl 07

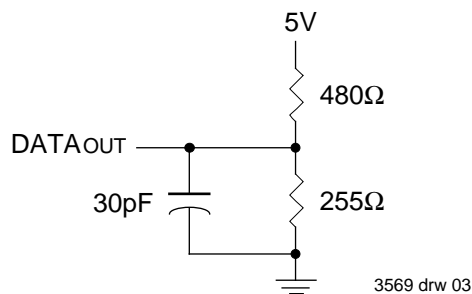
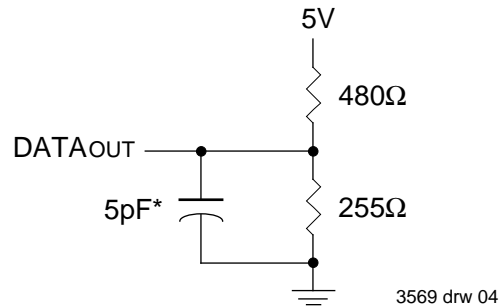


Figure 1. AC Test Load



*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 ($V_{CC} = 5.0V \pm 10\%$, Commercial Temperature Range)

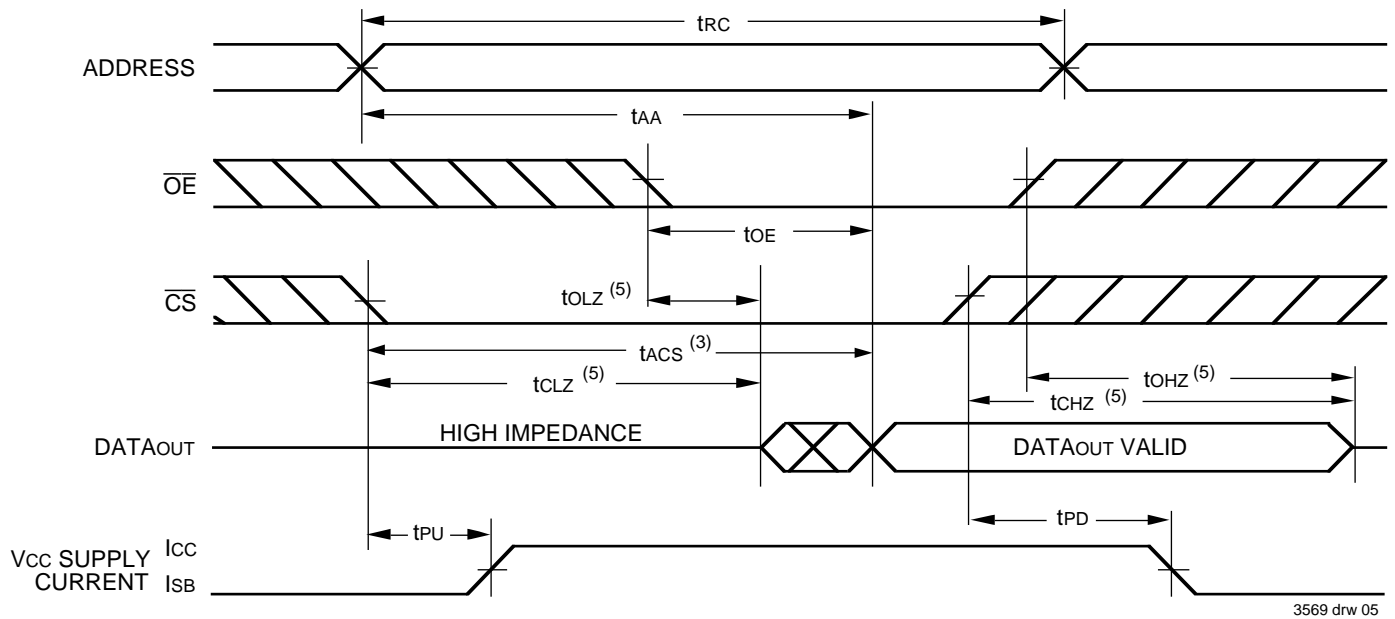
| Symbol | Parameter | 71028S70 | | Unit |
|---------------------------------|------------------------------------|----------|------|------|
| | | Min. | Max. | |
| Read Cycle | | | | |
| t _{RC} | Read Cycle Time | 70 | — | ns |
| t _{AA} | Address Access Time | — | 70 | ns |
| t _{ACS} | Chip Select Access Time | — | 70 | ns |
| t _{CLZ} ⁽²⁾ | Chip Select to Output in Low-Z | 3 | — | ns |
| t _{CHZ} ⁽²⁾ | Chip Deselect to Output in High-Z | 0 | 30 | ns |
| t _{OE} | Output Enable to Output Valid | — | 30 | ns |
| t _{OLZ} ⁽²⁾ | Output Enable to Output in Low-Z | 0 | — | ns |
| t _{OHZ} ⁽²⁾ | Output Disable to Output in High-Z | 0 | 30 | ns |
| t _{OH} | Output Hold from Address Change | 4 | — | ns |
| t _{PU} ⁽²⁾ | Chip Select to Power-Up Time | 0 | — | ns |
| t _{PD} ⁽²⁾ | Chip Deselect to Power-Down Time | — | 70 | ns |
| Write Cycle | | | | |
| t _{WC} | Write Cycle Time | 70 | — | ns |
| t _{AW} | Address Valid to End-of-Write | 60 | — | ns |
| t _{CW} | Chip Select to End-of-Write | 60 | — | ns |
| t _{AS} | Address Set-up Time | 0 | — | ns |
| t _{WP} | Write Pulse Width | 45 | — | ns |
| t _{WR} | Write Recovery Time | 0 | — | ns |
| t _{DW} | Data Valid to End-of-Write | 30 | — | ns |
| t _{DH} | Data Hold Time | 0 | — | ns |
| t _{OW} ⁽²⁾ | Output Active from End-of-Write | 5 | — | ns |
| t _{WHZ} ⁽²⁾ | Write Enable to Output in High-Z | 0 | 30 | ns |

NOTES:

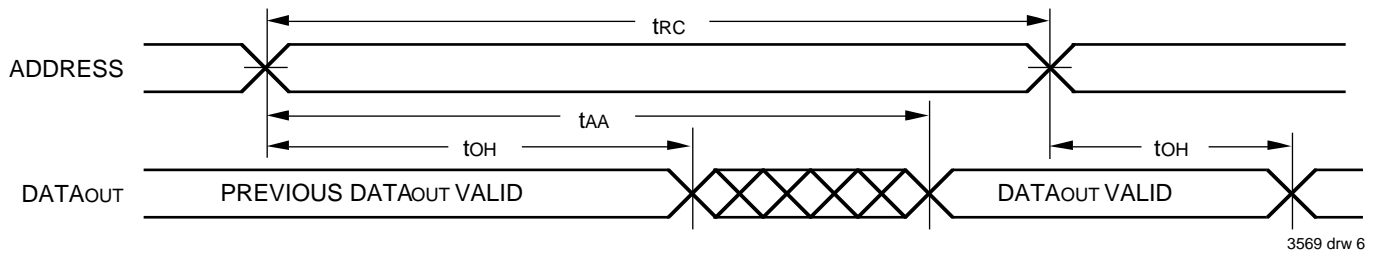
- 0°C to +70°C temperature range only.
- This parameter guaranteed with the AC load (Figure 2) by device characterization, but is not production tested.

3569 tbl 08

TIMING WAVEFORM OF READ CYCLE NO. 1⁽¹⁾



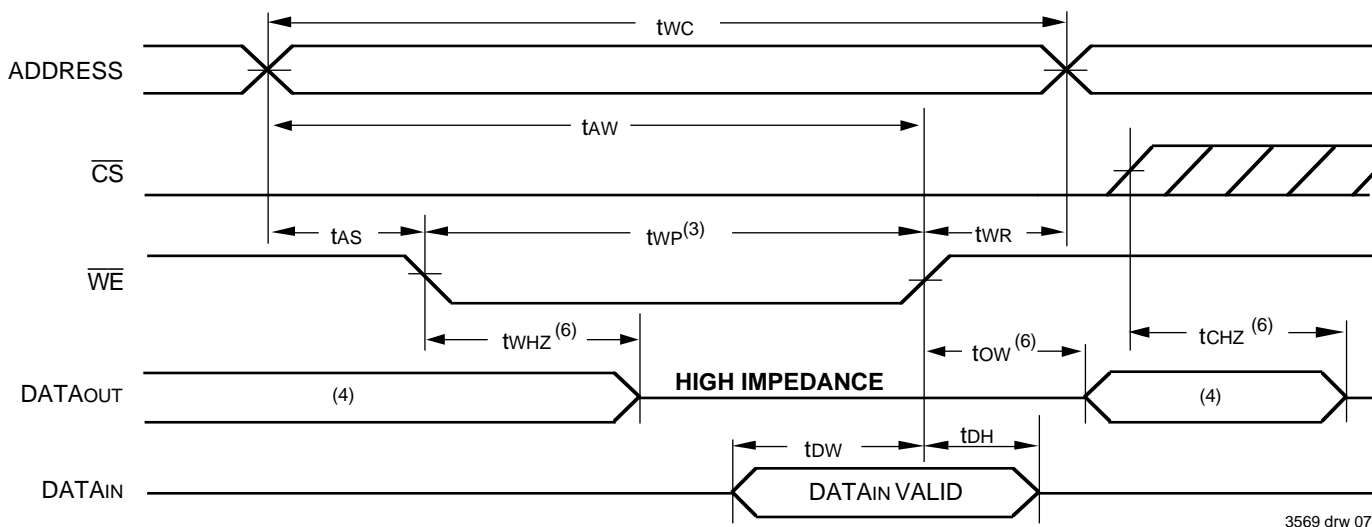
TIMING WAVEFORM OF READ CYCLE NO. 2^(1,2,4)



NOTES:

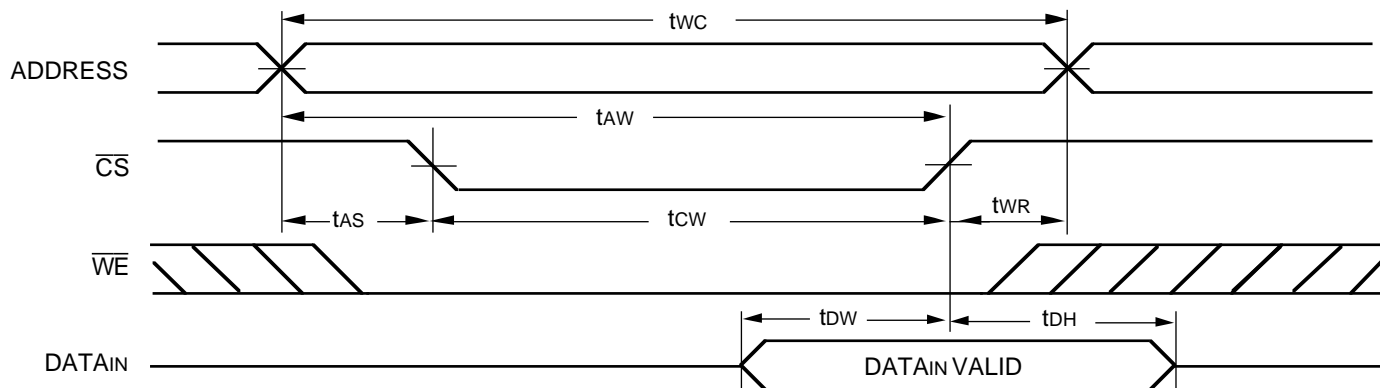
1. \overline{WE} is HIGH for Read Cycle.
2. Device is continuously selected, \overline{CS} is LOW.
3. Address must be valid prior to or coincident with the later of \overline{CS} transition LOW; otherwise t_{AA} is the limiting parameter.
4. \overline{OE} is LOW.
5. Transition is measured $\pm 200\text{mV}$ from steady state.

TIMING WAVEFORM OF WRITE CYCLE NO.1 (\overline{WE} CONTROLLED TIMING)^(1,2,3,5)



3569 drw 07

TIMING WAVEFORM OF WRITE CYCLE NO.2 (\overline{CS} CONTROLLED TIMING)^(1,2,5)

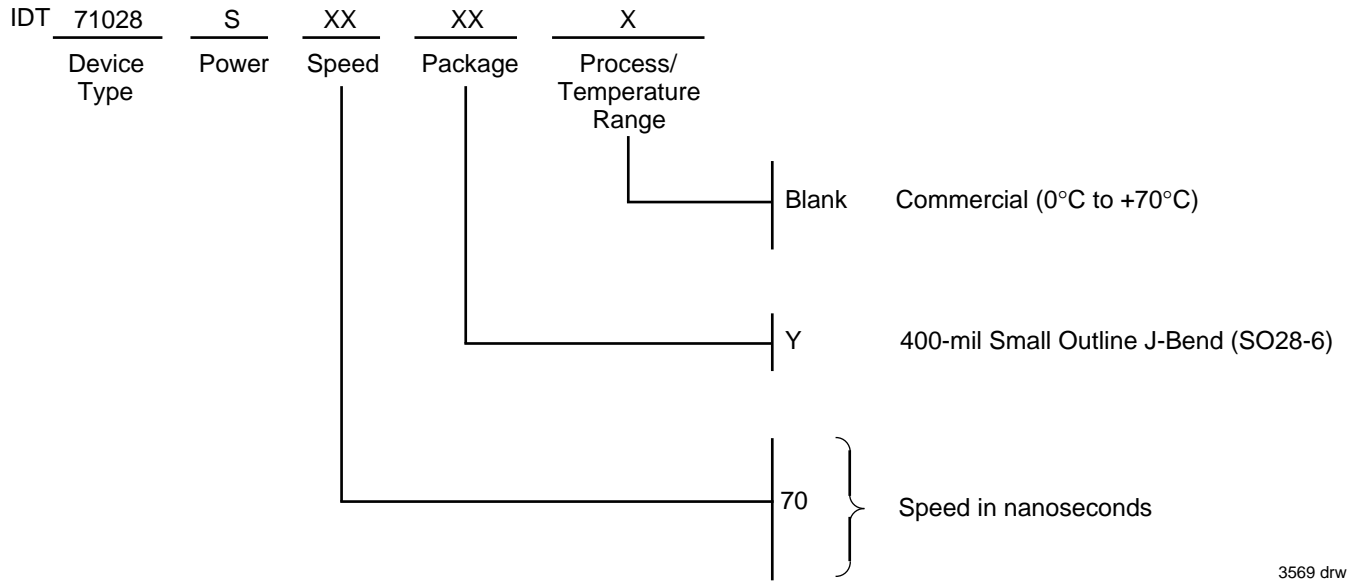


3569 drw 08

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. \overline{OE} is continuously HIGH. If during a \overline{WE} controlled write cycle \overline{OE} is 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_{DW} . If \overline{OE} is HIGH during a \overline{WE} controlled write cycle, this requirement does not apply and the minimum write pulse is as short as the specified t_{WP} .
4. During this period, I/O pins are in the output state, and 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.

ORDERING INFORMATION



3569 drw 09