

## 2.7 VOLT 8K X 8 STATIC RAM

**Features**

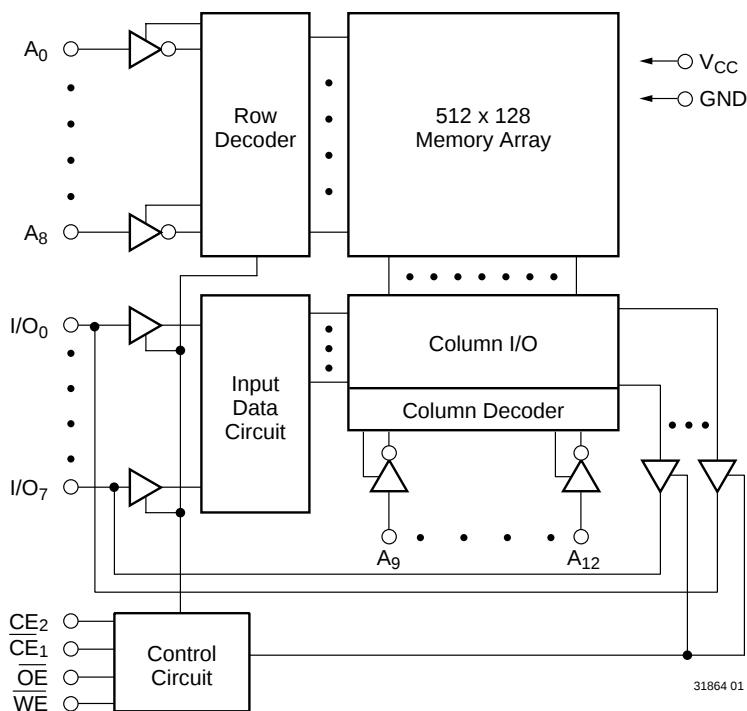
- High-speed: 35, 70 ns
- Ultra low DC operating current of 2mA (Max.)
- Low Power Dissipation:
  - TTL Standby: 1 mA (Max.)
  - CMOS Standby: 10  $\mu$ A (Max.)
- Fully static operation
- All inputs and outputs directly compatible
- Three state outputs
- Ultra low data retention current ( $V_{CC} = 2V$ )
- Extended operating voltage: 2.7V–3.6V

## ■ Packages

- 28-pin TSOP (Standard)
- 28-pin 300 mil SOP (450 mil pin-to-pin)

**Description**

The V62C31864 is a 65,536-bit static random access memory organized as 8,192 words by 8 bits. It is built with MOSEL VITELIC's high performance CMOS process. Inputs and three-state outputs are TTL compatible and allow for direct interfacing with common system bus structures.

**Functional Block Diagram****Device Usage Chart**

| Operating Temperature Range | Package Outline |   | Access Time (ns) |    | Power |    | Temperature Mark |
|-----------------------------|-----------------|---|------------------|----|-------|----|------------------|
|                             | T               | F | 35               | 70 | L     | LL |                  |
| 0°C to 70 °C                | •               | • | •                | •  | •     | •  | Blank            |
| –40°C to +85°C              | •               | • | •                |    |       | •  | I                |

**Pin Descriptions****A<sub>0</sub>–A<sub>12</sub> Address Inputs**

These 13 address inputs select one of the 8,192 x 8 bit segments in the RAM.

 **$\overline{\text{CE}}_1$ , CE<sub>2</sub> Chip Enable Inputs**

$\overline{\text{CE}}_1$  is active LOW and CE<sub>2</sub> is active HIGH. Both chip enables must be active to read from or write to the device. If either chip enable is not active, the device is deselected and is in a standby power mode. The I/O pins will be in the high-impedance state when deselected.

 **$\overline{\text{OE}}$  Output Enable Input**

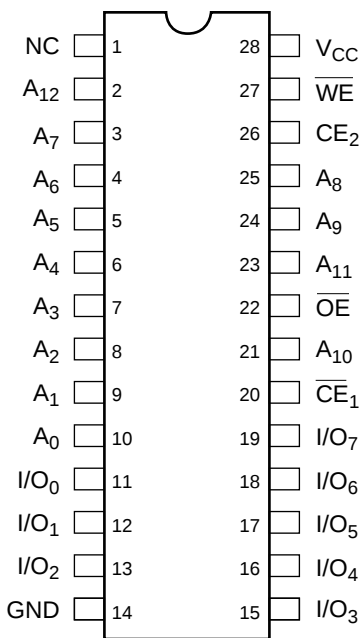
The Output Enable input is active LOW. When  $\overline{\text{OE}}$  is LOW with  $\overline{\text{CE}}_1$  LOW, CE<sub>2</sub> HIGH, and  $\overline{\text{WE}}$  HIGH, data of the selected memory location will be available on the I/O pins. When  $\overline{\text{OE}}$  is HIGH, the I/O pins will be in the high impedance state.

 **$\overline{\text{WE}}$  Write Enable Input**

An active LOW input,  $\overline{\text{WE}}$  input controls read and write operations. When  $\overline{\text{CE}}_1$  and  $\overline{\text{WE}}$  inputs are both LOW with CE<sub>2</sub> HIGH, the data present on the I/O pins will be written into the selected memory location.

**I/O<sub>0</sub>–I/O<sub>7</sub> Data Input and Data Output Ports**

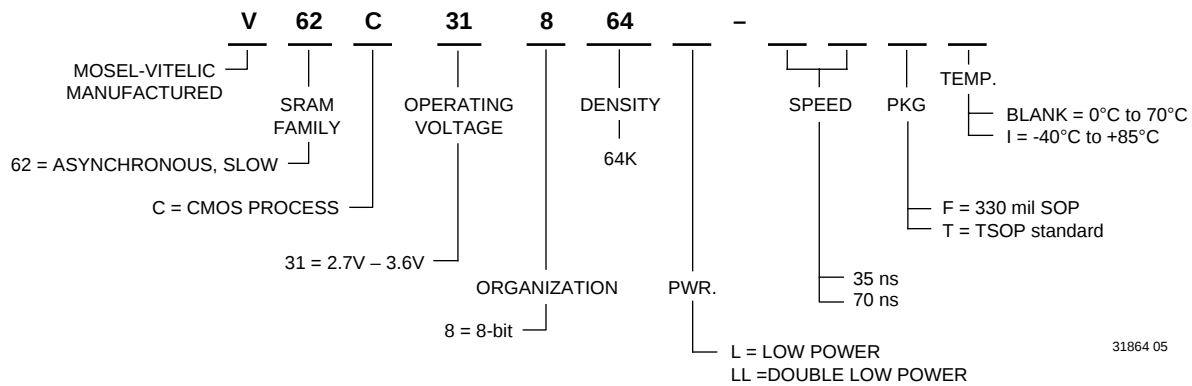
These 8 bidirectional ports are used to read data from and write data into the RAM.

**V<sub>CC</sub> Power Supply****GND Ground****Pin Configurations (Top View)****28-Pin SOP**

51864 02

**28-Pin TSOP (Standard)**

51864 03

**Part Number Information****Absolute Maximum Ratings <sup>(1)</sup>**

| Symbol            | Parameter                    | Commercial                   | Industrial                   | Units |
|-------------------|------------------------------|------------------------------|------------------------------|-------|
| V <sub>CC</sub>   | Supply Voltage               | -0.5 to V <sub>CC</sub> +0.5 | -0.5 to V <sub>CC</sub> +0.5 | V     |
| V <sub>N</sub>    | Input Voltage                | -0.5 to V <sub>CC</sub> +0.5 | -0.5 to V <sub>CC</sub> +0.5 | V     |
| V <sub>DQ</sub>   | Input/Output Voltage Applied | V <sub>CC</sub> + 0.3        | V <sub>CC</sub> + 0.3        | V     |
| T <sub>BIAS</sub> | Temperature Under Bias       | -10 to +125                  | -65 to +135                  | °C    |
| T <sub>STG</sub>  | Storage Temperature          | -55 to +125                  | -65 to +150                  | °C    |

**NOTE:**

- 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.

**Capacitance\***T<sub>A</sub> = 25°C, f = 1.0MHz

| Symbol           | Parameter          | Conditions            | Max. | Unit |
|------------------|--------------------|-----------------------|------|------|
| C <sub>IN</sub>  | Input Capacitance  | V <sub>IN</sub> = 0V  | 6    | pF   |
| C <sub>OUT</sub> | Output Capacitance | V <sub>I/O</sub> = 0V | 8    | pF   |

**NOTE:**

\* This parameter is guaranteed and not tested.

**Truth Table**

| Mode           | $\overline{CE}_1$ | CE <sub>2</sub> | $\overline{OE}$ | $\overline{WE}$ | I/O Operation    |
|----------------|-------------------|-----------------|-----------------|-----------------|------------------|
| Standby        | H                 | X               | X               | X               | High Z           |
| Standby        | X                 | L               | X               | X               | High Z           |
| Output Disable | L                 | H               | H               | H               | High Z           |
| Read           | L                 | H               | L               | H               | D <sub>OUT</sub> |
| Write          | L                 | H               | X               | L               | D <sub>IN</sub>  |

**NOTE:**

X = Don't Care, L = LOW, H = HIGH

**DC Electrical Characteristics** (over all temperature ranges,  $V_{CC} = 2.7V - 3.6V$ )

| Symbol   | Parameter                          | Test Conditions                                                                | Min. | Typ. | Max.         | Units   |
|----------|------------------------------------|--------------------------------------------------------------------------------|------|------|--------------|---------|
| $V_{CC}$ | Power Supply Voltage               |                                                                                | 2.7  | —    | 3.6          | V       |
| $V_{IL}$ | Input LOW Voltage <sup>(1,2)</sup> |                                                                                | -0.3 | —    | 0.4          | V       |
| $V_{IH}$ | Input HIGH Voltage <sup>(1)</sup>  |                                                                                | 2.2  | —    | $V_{CC}+0.3$ | V       |
| $I_{IL}$ | Input Leakage Current              | $V_{CC} = \text{Max}, V_{IN} = 0V \text{ to } V_{CC}$                          | -2   | —    | 2            | $\mu A$ |
| $I_{OL}$ | Output Leakage Current             | $V_{CC} = \text{Max}, \overline{CE} = V_{IH}, V_{OUT} = 0V \text{ to } V_{CC}$ | -2   | —    | 2            | $\mu A$ |
| $V_{OL}$ | Output LOW Voltage                 | $V_{CC} = \text{Min}, I_{OL} = 2.1mA$                                          | —    | —    | 0.4          | V       |
| $V_{OH}$ | Output HIGH Voltage                | $V_{CC} = \text{Min}, I_{OH} = -1mA$                                           | 2.4  | —    | —            | V       |

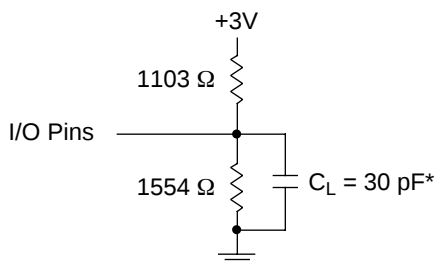
| Symbol    | Parameter                                                                                                                                               | Com. <sup>(4)</sup> | Ind. <sup>(4)</sup> | Units   |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|---------|
| $I_{CC}$  | Operating Power Supply Current, $\overline{CE}_1 = V_{IL}, CE_2 = V_{IH}$ ,<br>Output Open, $V_{CC} = \text{Max.}, f = 0$                               | 2                   | 2                   | mA      |
| $I_{CC1}$ | Average Operating Current, $\overline{CE}_1 = V_{IL}, CE_2 = V_{IH}$ ,<br>Output Open, $V_{CC} = \text{Max.}, f = f_{MAX}$ <sup>(3)</sup>               | 40                  | 40                  | mA      |
| $I_{SB}$  | TTL Standby Current<br>$\overline{CE}_1 \geq V_{IH}, CE_2 \leq V_{IL}, V_{CC} = \text{Max.}$                                                            | L                   | 2                   | mA      |
|           |                                                                                                                                                         | LL                  | 1                   |         |
| $I_{SB1}$ | CMOS Standby Current, $\overline{CE}_1 \geq V_{CC} - 0.2V, CE_2 \leq 0.2V$ ,<br>$V_{IN} \geq V_{CC} - 0.2V$ or $V_{IN} \leq 0.2V, V_{CC} = \text{Max.}$ | L                   | 40                  | $\mu A$ |
|           |                                                                                                                                                         | LL                  | 10                  |         |

**NOTES:**

- These are absolute values with respect to device ground and all overshoots due to system or tester noise are included.
- $V_{IL}$  (Min.) = -3.0V for pulse width < 20ns.
- $f_{MAX} = 1/t_{RC}$ .
- Maximum values.

**AC Test Conditions**

|                           |           |
|---------------------------|-----------|
| Input Pulse Levels        | 0 to 3V   |
| Input Rise and Fall Times | 5 ns      |
| Timing Reference Levels   | 1.5V      |
| Output Load               | see below |

**AC Test Loads and Waveforms**

\* Includes scope and jig capacitance

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**Key to Switching Waveforms**

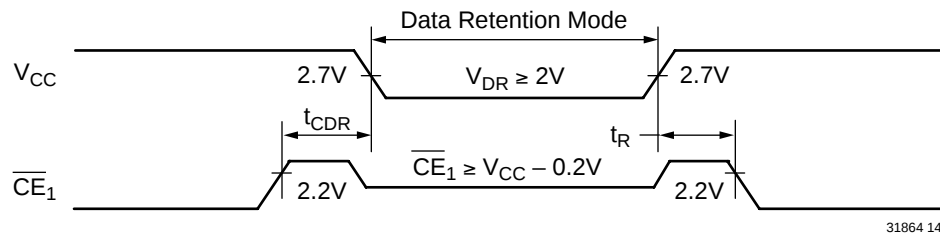
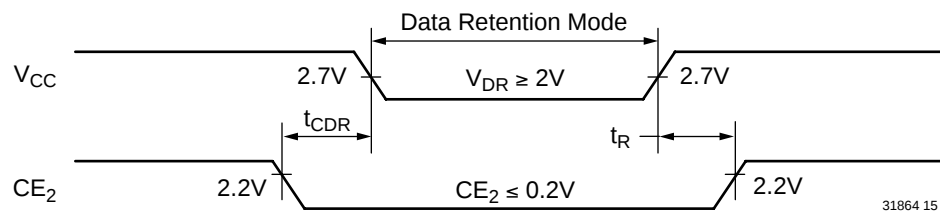
| WAVEFORM | INPUTS                           | OUTPUTS                                   |
|----------|----------------------------------|-------------------------------------------|
|          | MUST BE STEADY                   | WILL BE STEADY                            |
|          | MAY CHANGE FROM H TO L           | WILL BE CHANGING FROM H TO L              |
|          | MAY CHANGE FROM L TO H           | WILL BE CHANGING FROM L TO H              |
|          | DON'T CARE: ANY CHANGE PERMITTED | CHANGING: STATE UNKNOWN                   |
|          | DOES NOT APPLY                   | CENTER LINE IS HIGH IMPEDANCE "OFF" STATE |

**Data Retention Characteristics**

| Symbol            | Parameter                                                                                                                                              |       |    | Min. | Typ. <sup>(2)</sup>            | Max. | Units |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|------|--------------------------------|------|-------|
| V <sub>DR</sub>   | V <sub>CC</sub> for Data Retention<br>$\overline{CE}_1 \geq V_{CC} - 0.2V$ , $CE_2 \leq 0.2V$ ,<br>$V_{IN} \geq V_{CC} - 0.2V$ , or $V_{IN} \leq 0.2V$ |       |    | 2.0  | —                              | 3.6  | V     |
| I <sub>CCDR</sub> | Data Retention Current<br>$CE_1 \geq V_{DR} - 0.2V$ , $CE_2 \leq 0.2V$ ,<br>$V_{IN} \geq V_{CC} - 0.2V$ , or $V_{IN} \leq 0.2V$                        | Com'l | L  | —    | 0.5                            | 40   | μA    |
|                   |                                                                                                                                                        |       | LL | —    | 0.5                            | 10   |       |
|                   |                                                                                                                                                        | Ind.  | L  | —    | —                              | 45   |       |
|                   |                                                                                                                                                        |       | LL | —    | —                              | 15   |       |
| t <sub>CDR</sub>  | Chip Deselect to Data Retention Time                                                                                                                   |       |    |      | 0                              | —    | ns    |
| t <sub>R</sub>    | Operation Recovery Time (see Retention Waveform)                                                                                                       |       |    |      | t <sub>RC</sub> <sup>(1)</sup> | —    | ns    |

**NOTES:**

- $t_{RC}$  = Read Cycle Time
- $T_A = +25^\circ C$ .

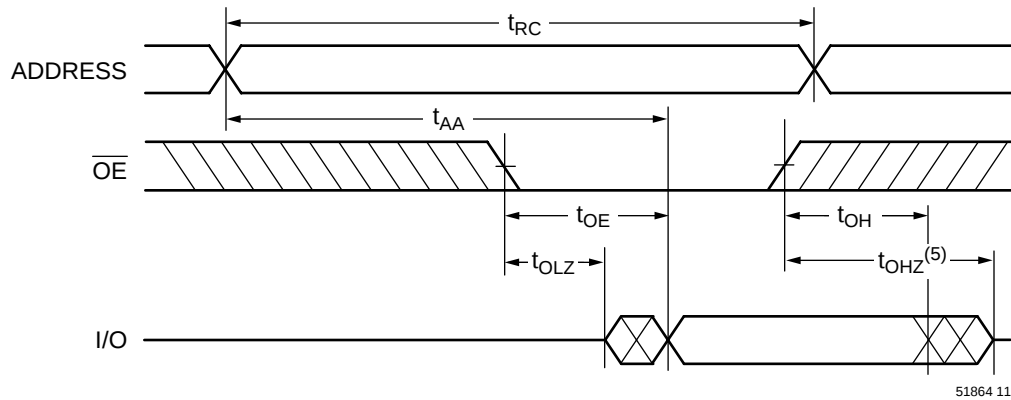
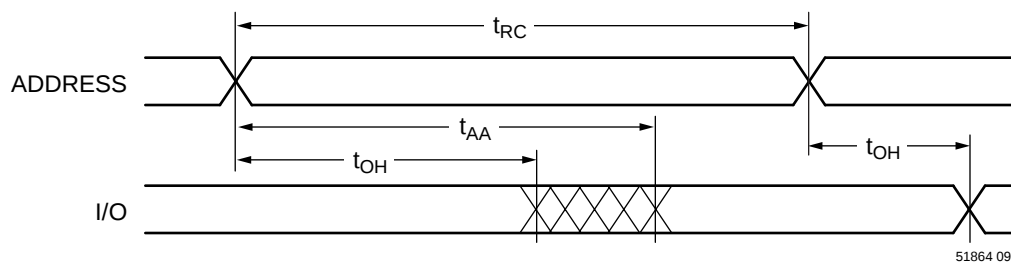
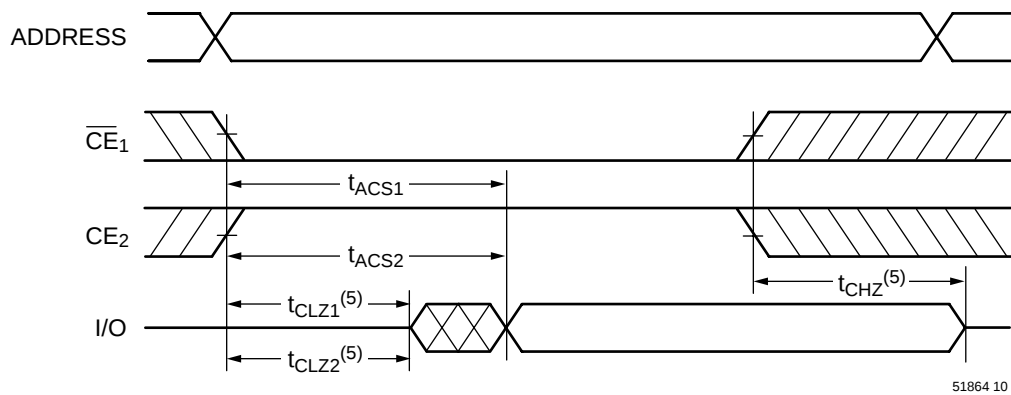
**Low  $V_{CC}$  Data Retention Waveform (1) ( $\overline{CE}_1$  Controlled)****Low  $V_{CC}$  Data Retention Waveform (2) ( $CE_2$  Controlled)**

**AC Electrical Characteristics**(over all temperature ranges,  $V_{CC} = 2.7V - 3.6V$ )**Read Cycle**

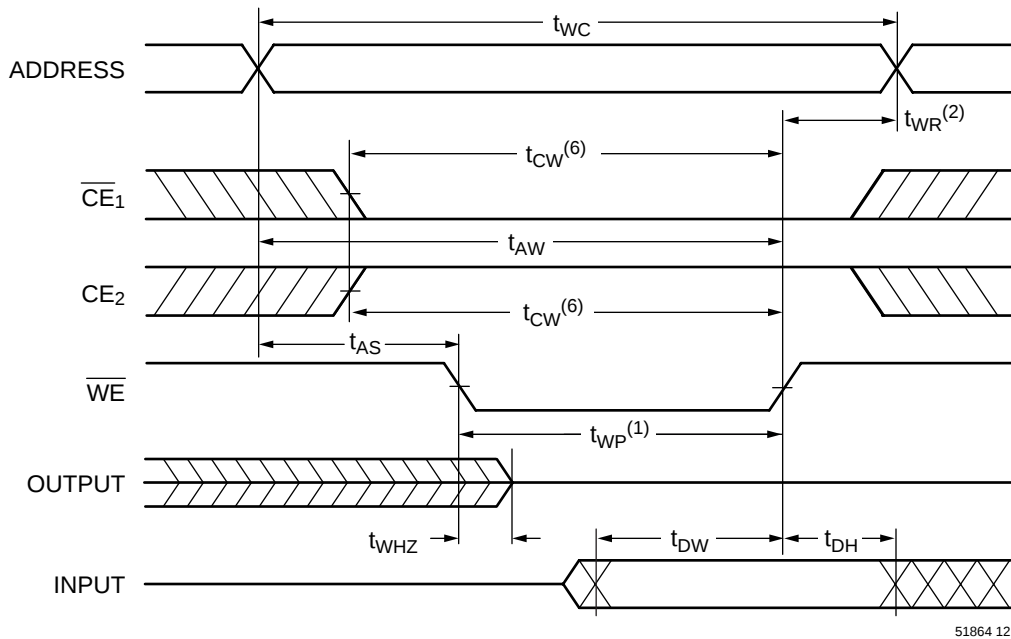
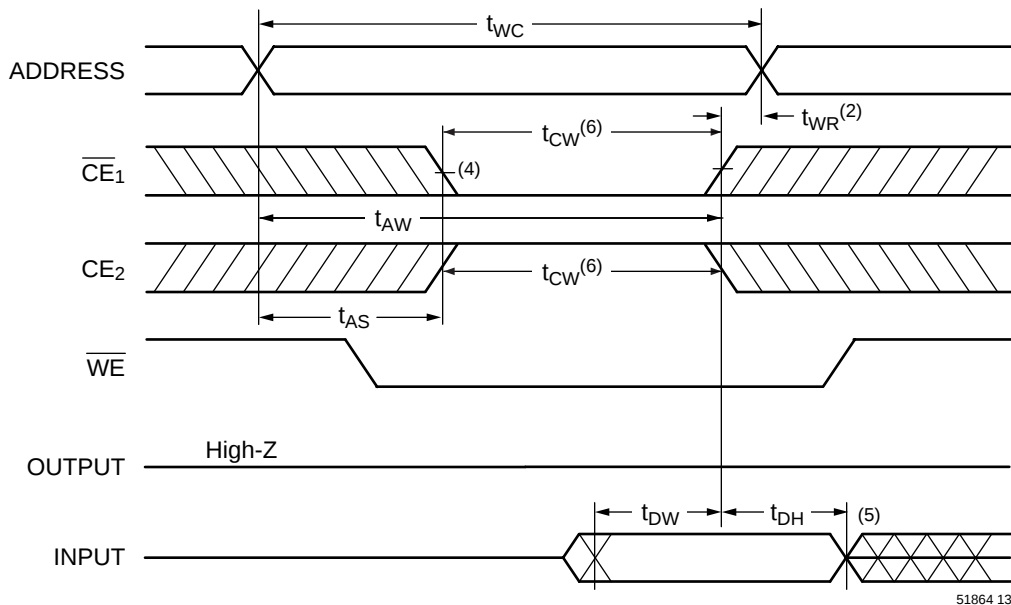
| Parameter Name | Parameter                          | -35  |      | -70  |      | Unit |
|----------------|------------------------------------|------|------|------|------|------|
|                |                                    | Min. | Max. | Min. | Max. |      |
| $t_{RC}$       | Read Cycle Time                    | 35   | —    | 70   | —    | ns   |
| $t_{AA}$       | Address Access Time                | —    | 35   | —    | 70   | ns   |
| $t_{ACS1}$     | Chip Enable Access Time            | —    | 35   | —    | 70   | ns   |
| $t_{ACS2}$     | Chip Enable Access Time            | —    | 35   | —    | 70   | ns   |
| $t_{OE}$       | Output Enable to Output Valid      | —    | 15   | —    | 30   | ns   |
| $t_{CLZ1}$     | Chip Enable to Output in Low Z     | 5    | —    | 5    | —    | ns   |
| $t_{CLZ2}$     | Chip Enable to Output in Low Z     | 5    | —    | 5    | —    | ns   |
| $t_{OLZ}$      | Output Enable to Output in Low Z   | 5    | —    | 5    | —    | ns   |
| $t_{CHZ}$      | Chip Disable to Output in High Z   | 0    | 20   | 0    | 20   | ns   |
| $t_{OHZ}$      | Output Disable to Output in High Z | 0    | 20   | 0    | 20   | ns   |
| $t_{OH}$       | Output Hold from Address Change    | 5    | —    | 5    | —    | ns   |

**Write Cycle**

| Parameter Name | Parameter                       | -35  |      | -70  |      | Unit |
|----------------|---------------------------------|------|------|------|------|------|
|                |                                 | Min. | Max. | Min. | Max. |      |
| $t_{WC}$       | Write Cycle Time                | 35   | —    | 70   | —    | ns   |
| $t_{CW1}$      | Chip Enable to End of Write     | 35   | —    | 70   | —    | ns   |
| $t_{CW2}$      | Chip Enable to End of Write     | 35   | —    | 70   | —    | ns   |
| $t_{AS}$       | Address Setup Time              | 0    | —    | 0    | —    | ns   |
| $t_{AW}$       | Address Valid to End of Write   | 35   | —    | 70   | —    | ns   |
| $t_{WP}$       | Write Pulse Width               | 25   | —    | 50   | —    | ns   |
| $t_{WR}$       | Write Recovery Time             | 0    | —    | 0    | —    | ns   |
| $t_{WHZ}$      | Write to Output High-Z          | 0    | 20   | 0    | 25   | ns   |
| $t_{DW}$       | Data Setup to End of Write      | 25   | —    | 30   | —    | ns   |
| $t_{DH}$       | Data Hold from End of Write     | 0    | —    | 0    | —    | ns   |
| $t_{OW}$       | Output Active from End of Write | 5    | —    | 5    | —    | ns   |

**Switching Waveforms (Read Cycle)****Read Cycle 1<sup>(1, 2)</sup>****Read Cycle 2<sup>(1, 2, 4)</sup>****Read Cycle 3<sup>(1, 3, 4)</sup>****NOTES:**

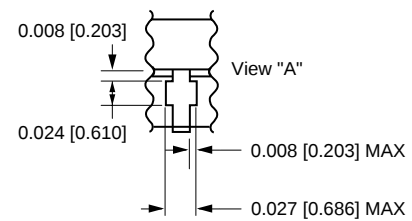
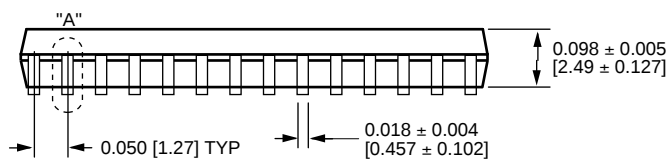
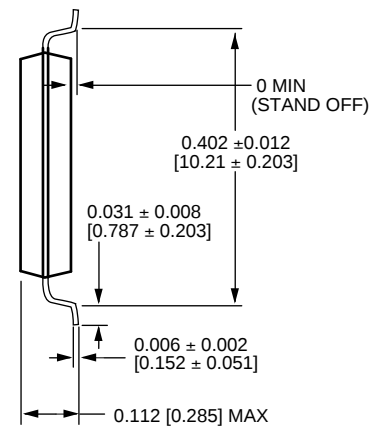
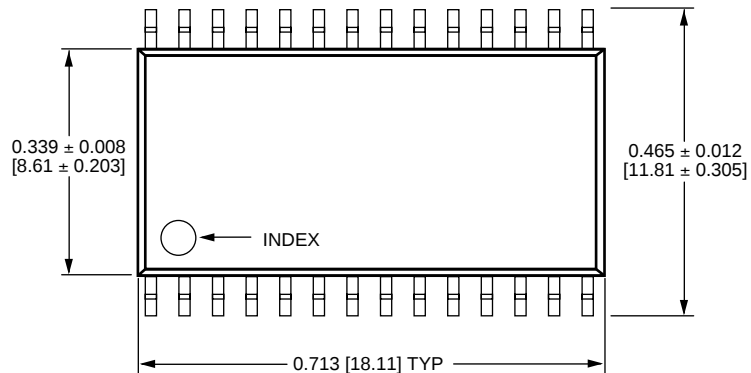
1.  $\overline{WE} = V_{IH}$ .
2.  $\overline{CE}_1 = V_{IL}$  and  $CE_2 = V_{IH}$ .
3. Address valid prior to or coincident with  $\overline{CE}_1$  transition LOW and/or  $CE_2$  transition HIGH.
4.  $\overline{OE} = V_{IL}$ .
5. Transition is measured  $\pm 500\text{mV}$  from steady state with  $C_L = 5\text{pF}$ . This parameter is guaranteed and not 100% tested.

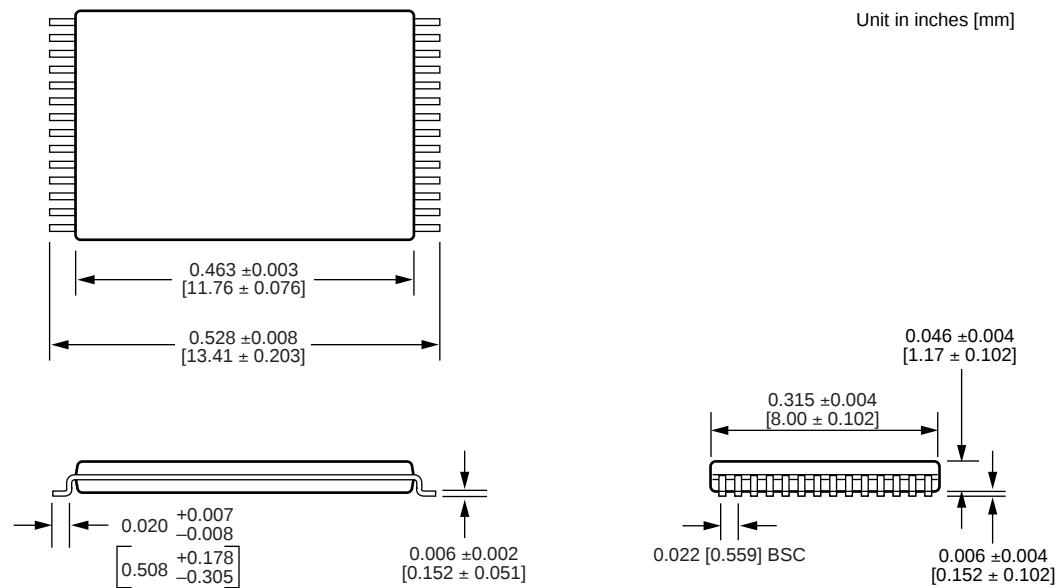
**Switching Waveforms (Write Cycle)****Write Cycle 1 ( $\overline{WE}$  Controlled)<sup>(4)</sup>****Write Cycle 2 ( $\overline{CE}$  Controlled)<sup>(4)</sup>****NOTES:**

1. The internal write time of the memory is defined by the overlap of  $\overline{CE}_1$  and  $CE_2$  active and  $\overline{WE}$  low. Both signals must be active to initiate and any one signal can terminate a write by going inactive. The data input setup and hold timing should be referenced to the second transition edge of the signal that terminates the write.
2.  $t_{WR}$  is measured from the earlier of  $\overline{CE}_1$  or  $\overline{WE}$  going HIGH, or  $CE_2$  going LOW at the end of the write cycle.
3. During this period, I/O pins are in the output state so that the input signals of opposite phase to the outputs must not be applied.
4.  $\overline{OE} = V_{IL}$  or  $V_{IH}$ . However it is recommended to keep  $\overline{OE}$  at  $V_{IH}$  during write cycle to avoid bus contention.
5. If  $\overline{CE}_1$  is LOW and  $CE_2$  is HIGH during this period, I/O pins are in the output state. Then the data input signals of opposite phase to the outputs must not be applied to them.
6.  $t_{CW}$  is measured from  $\overline{CE}_1$  going LOW or  $CE_2$  going HIGH to the end of write.

**Package Diagrams****28-pin 330 mil SOP**

Units in inches [mm]



**Package Diagrams** (Cont'd)**28-Pin TSOP**

**Notes**

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