

## Features

- Temperature Ranges
  - Industrial: -40 °C to 85 °C
  - Automotive-A: -40 °C to 85 °C
- Pin and Function compatible with CY7C1019BV33
- High Speed
  - $t_{AA} = 10 \text{ ns}$
- CMOS for optimum Speed and Power
- Data Retention at 2.0 V
- Center Power/Ground Pinout
- Automatic Power Down when deselected
- Easy Memory Expansion with  $\overline{CE}$  and  $\overline{OE}$  Options
- Available in Pb-free 32-pin TSOP II package

## Functional Description

The CY7C1019CV33 is a high performance CMOS static RAM organized as 131,072 words by 8 bits. Easy memory expansion is provided by an active LOW Chip Enable ( $\overline{CE}$ ), an active LOW Output Enable ( $\overline{OE}$ ), and tristate drivers. This device has an automatic power down feature that significantly reduces power consumption when deselected.

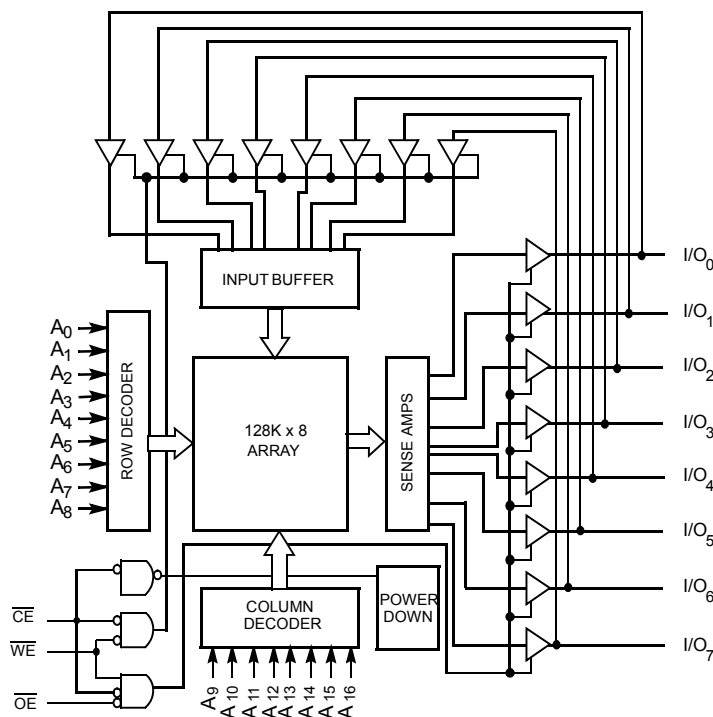
Writing to the device is accomplished by taking Chip Enable ( $\overline{CE}$ ) and Write Enable ( $\overline{WE}$ ) inputs LOW. Data on the eight I/O pins ( $I/O_0$  through  $I/O_7$ ) is then written into the location specified on the address pins ( $A_0$  through  $A_{16}$ ).

Reading from the device is accomplished by taking Chip Enable ( $\overline{CE}$ ) and Output Enable ( $\overline{OE}$ ) LOW while forcing Write Enable ( $\overline{WE}$ ) HIGH. Under these conditions, the contents of the memory location specified by the address pins will appear on the I/O pins.

The eight input/output pins ( $I/O_0$  through  $I/O_7$ ) are placed in a high impedance state when the device is deselected ( $\overline{CE}$  HIGH), the outputs are disabled ( $\overline{OE}$  HIGH), or during a write operation ( $\overline{CE}$  LOW, and  $\overline{WE}$  LOW).

For a complete list of related documentation, [click here](#).

## Logic Block Diagram



**Contents**

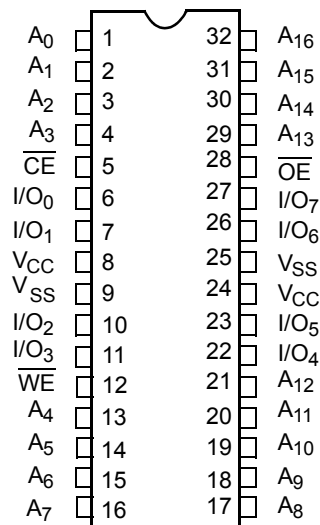
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**Selection Guide**

| Description               | -10 (Industrial/<br>Automotive-A) | Unit |
|---------------------------|-----------------------------------|------|
| Maximum Access Time       | 10                                | ns   |
| Maximum Operating Current | 80                                | mA   |
| Maximum Standby Current   | 5                                 | mA   |

**Pin Configuration**

Figure 1. 32-pin TSOP II pinout (Top View) <sup>[1]</sup>



**Note**

1. NC pins are not connected on the die.

## Maximum Ratings

Exceeding maximum ratings may impair the useful life of the device. These user guidelines are 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> to Relative GND [2] ..... -0.5 V to +4.6 V

DC Voltage Applied to Outputs  
in High Z State [2] ..... -0.5 V to V<sub>CC</sub> + 0.5 V

DC Input Voltage [2] ..... -0.5 V to V<sub>CC</sub> + 0.5 V

Current into Outputs (LOW) ..... 20 mA

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

Latch up Current ..... >200 mA

## Operating Range

| Range        | Ambient Temperature | V <sub>CC</sub> |
|--------------|---------------------|-----------------|
| Commercial   | 0 °C to +70 °C      | 3.3 V ± 10%     |
| Industrial   | -40 °C to +85 °C    | 3.3 V ± 10%     |
| Automotive-A | -40 °C to +85 °C    | 3.3 V ± 10%     |

## Electrical Characteristics

Over the Operating Range

| Parameter        | Description                                   | Test Conditions  | -10 (Industrial/Auto-A) |                       | Unit |
|------------------|---|--|-------------------------|-----------------------|------|
|                  |   |  | Min                     | Max                   |      |
| V <sub>OH</sub>  | Output HIGH Voltage                           | V <sub>CC</sub> = Min, I <sub>OH</sub> = -4.0 mA   | 2.4                     | -                     | V    |
| V <sub>OL</sub>  | Output LOW Voltage                            | V <sub>CC</sub> = Min, I <sub>OL</sub> = 8.0 mA  | -                       | 0.4                   | V    |
| V <sub>IH</sub>  | Input HIGH Voltage                            |  | 2.0                     | V <sub>CC</sub> + 0.3 | V    |
| V <sub>IL</sub>  | Input LOW Voltage <sup>[2]</sup>              |  | -0.3                    | 0.8                   | V    |
| I <sub>IX</sub>  | Input Leakage Current                         | GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>   | -1                      | +1                    | μA   |
| I <sub>OZ</sub>  | Output Leakage Current                        | GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , Output Disabled   | -1                      | +1                    | μA   |
| 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>RC</sub>   | -                       | 80                    | mA   |
| I <sub>SB1</sub> | Automatic CE Power down Current – TTL Inputs  | Max V <sub>CC</sub> , $\overline{CE} \geq V_{IH}$ ,<br>V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub> | -                       | 15                    | mA   |
| I <sub>SB2</sub> | Automatic CE Power down Current – CMOS Inputs | Max V <sub>CC</sub> , $\overline{CE} \geq V_{CC} - 0.3$ V,<br>V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3 V, or V <sub>IN</sub> ≤ 0.3 V, f = 0           | -                       | 5                     | mA   |

### Note

2. V<sub>IL</sub> (min.) = -2.0 V for pulse durations of less than 20 ns.

### Capacitance

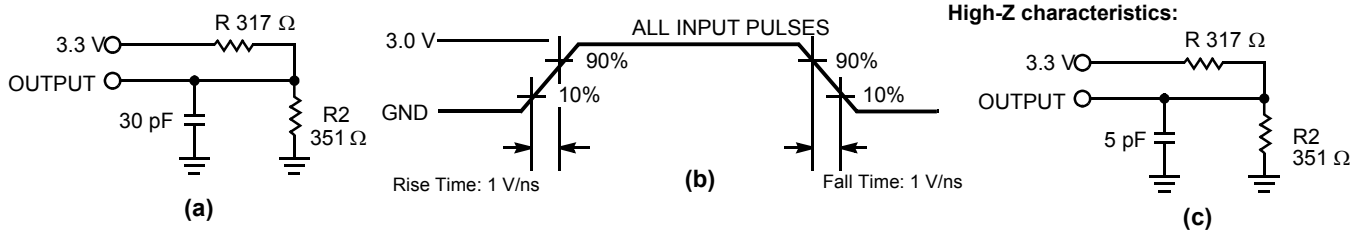
| Parameter <sup>[3]</sup> | Description        | Test Conditions  | Max | Unit |
|--------------------------|--------------------|--|-----|------|
| C <sub>IN</sub>          | Input capacitance  | T <sub>A</sub> = 25 °C, f = 1 MHz, V <sub>CC</sub> = 5.0 V | 8   | pF   |
| C <sub>OUT</sub>         | Output capacitance |  | 8   | pF   |

### Thermal Resistance

| Parameter <sup>[3]</sup> | Description                              | Test Conditions   | 32-pin TSOP II | Unit |
|--------------------------|--|---|----------------|------|
| θ <sub>JA</sub>          | Thermal resistance (junction to ambient) | Still air, soldered on a 3 × 4.5 inch, four-layer printed circuit board | 68.61          | °C/W |
| θ <sub>JC</sub>          | Thermal resistance (junction to case)    |   | 20.59          | °C/W |

### AC Test Loads and Waveforms

Figure 2. AC Test Loads and Waveforms <sup>[4]</sup>



**Notes**

- 3. Tested initially and after any design or process changes that may affect these parameters.
- 4. AC characteristics (except High Z) for all speeds are tested using the Thevenin load shown in section (a) in Figure 2. High Z characteristics are tested for all speeds using the test load shown in section (c) in Figure 2.

## Switching Characteristics

Over the Operating Range

| Parameter <sup>[5]</sup>              | Description                                      | -10 (Industrial/<br>Automotive-A) |     | Unit |
|---------------------------------------|--|-----------------------------------|-----|------|
|                                       |  | Min                               | Max |      |
| <b>Read Cycle</b>                     |  |                                   |     |      |
| $t_{RC}$                              | Read Cycle Time                                  | 10                                | –   | ns   |
| $t_{AA}$                              | Address to Data Valid                            | –                                 | 10  | ns   |
| $t_{OHA}$                             | Data Hold from Address Change                    | 3                                 | –   | ns   |
| $t_{ACE}$                             | $\overline{CE}$ LOW to Data Valid                | –                                 | 10  | ns   |
| $t_{DOE}$                             | $\overline{OE}$ LOW to Data Valid                | –                                 | 5   | ns   |
| $t_{LZOE}$                            | $\overline{OE}$ LOW to Low Z <sup>[6]</sup>      | 0                                 | –   | ns   |
| $t_{HZOE}$                            | $\overline{OE}$ HIGH to High Z <sup>[6, 7]</sup> | –                                 | 5   | ns   |
| $t_{LZCE}$                            | $\overline{CE}$ LOW to Low Z <sup>[6]</sup>      | 3                                 | –   | ns   |
| $t_{HZCE}$                            | $\overline{CE}$ HIGH to High Z <sup>[6, 7]</sup> | –                                 | 5   | ns   |
| $t_{PU}$ <sup>[8]</sup>               | $\overline{CE}$ LOW to Power Up                  | 0                                 | –   | ns   |
| $t_{PD}$ <sup>[8]</sup>               | $\overline{CE}$ HIGH to Power Down               | –                                 | 10  | ns   |
| <b>Write Cycle <sup>[9, 10]</sup></b> |  |                                   |     |      |
| $t_{WC}$                              | Write Cycle Time                                 | 10                                | –   | ns   |
| $t_{SCE}$                             | $\overline{CE}$ LOW to Write End                 | 8                                 | –   | ns   |
| $t_{AW}$                              | Address Setup to Write End                       | 8                                 | –   | ns   |
| $t_{HA}$                              | Address Hold from Write End                      | 0                                 | –   | ns   |
| $t_{SA}$                              | Address Setup to Write Start                     | 0                                 | –   | ns   |
| $t_{PWE}$                             | $\overline{WE}$ Pulse Width                      | 7                                 | –   | ns   |
| $t_{SD}$                              | Data Setup to Write End                          | 5                                 | –   | ns   |
| $t_{HD}$                              | Data Hold from Write End                         | 0                                 | –   | ns   |
| $t_{LZWE}$                            | $\overline{WE}$ HIGH to Low Z <sup>[6]</sup>     | 3                                 | –   | ns   |
| $t_{HZWE}$                            | $\overline{WE}$ LOW to High Z <sup>[6, 7]</sup>  | –                                 | 5   | ns   |

### Notes

- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5 V, input pulse levels of 0 to 3.0 V.
- At any given temperature and voltage condition,  $t_{HZCE}$  is less than  $t_{LZCE}$ ,  $t_{HZOE}$  is less than  $t_{LZOE}$ , and  $t_{HZWE}$  is less than  $t_{LZWE}$  for any given device.
- $t_{HZOE}$ ,  $t_{HZCE}$ , and  $t_{HZWE}$  are specified with a load capacitance of 5 pF as in part (d) of [Figure 2 on page 5](#). Transition is measured  $\pm 500$  mV from steady-state voltage.
- This parameter is guaranteed by design and is not tested.
- The internal write time of the memory is defined by the overlap of  $\overline{CE}$  LOW and  $\overline{WE}$  LOW.  $\overline{CE}$  and  $\overline{WE}$  must be LOW to initiate a write, and the transition of any of these signals can terminate the write. The input data setup and hold timing should be referenced to the leading edge of the signal that terminates the write.
- The minimum write cycle time for Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW) should be equal to the sum of  $t_{HZWE}$  and  $t_{SD}$ .

### Switching Waveforms

Figure 3. Read Cycle No. 1 [11, 12]

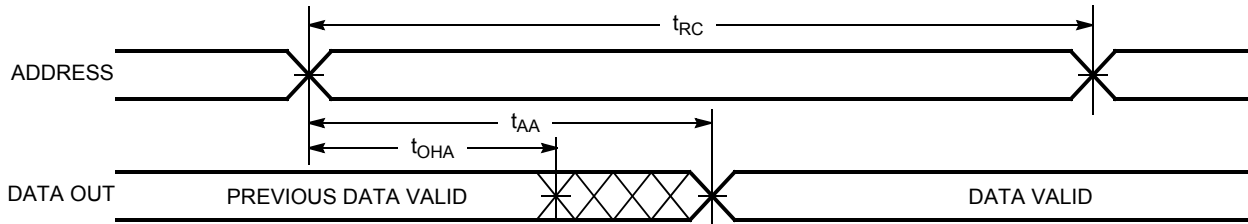


Figure 4. Read Cycle No. 2 ( $\overline{OE}$  Controlled) [12, 13]

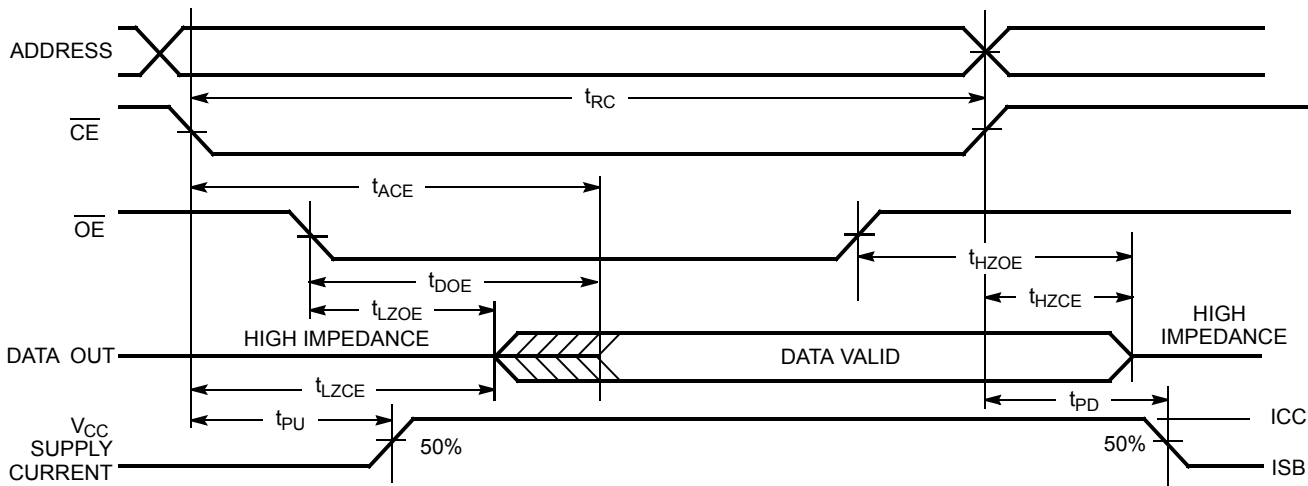
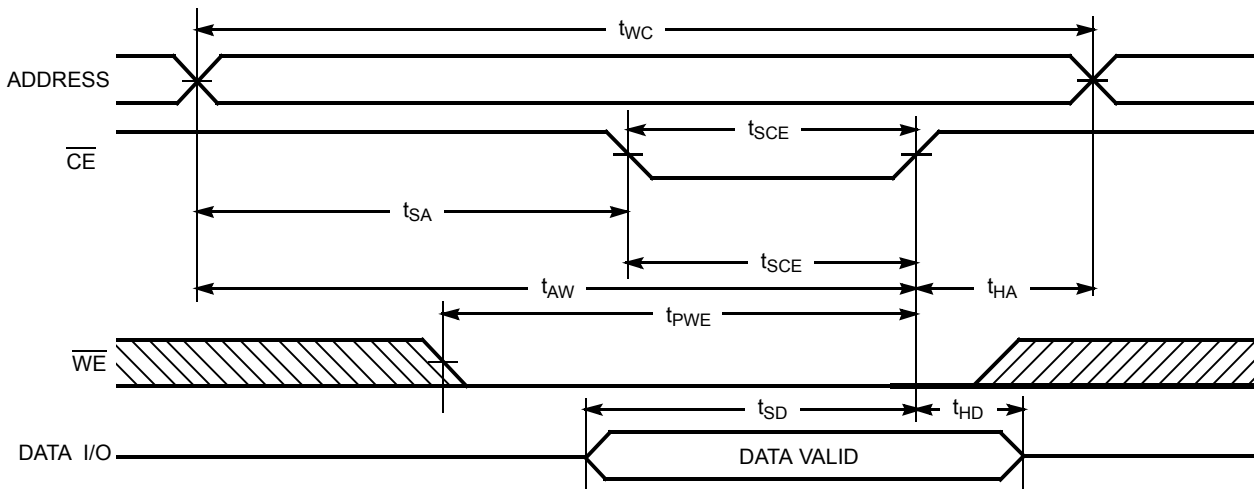


Figure 5. Write Cycle No. 1 ( $\overline{CE}$  Controlled) [14, 15]



**Notes**

- 11. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE}$  =  $V_{IL}$ .
- 12.  $\overline{WE}$  is HIGH for read cycle.
- 13. Address valid prior to or coincident with  $\overline{CE}$  transition LOW.
- 14. Data I/O is high impedance if  $\overline{OE}$  =  $V_{IH}$ .
- 15. If  $\overline{CE}$  goes HIGH simultaneously with  $\overline{WE}$  going HIGH, the output remains in a high impedance state.

Switching Waveforms (continued)

Figure 6. Write Cycle No. 2 ( $\overline{WE}$  Controlled,  $\overline{OE}$  HIGH During Write) [16, 17]

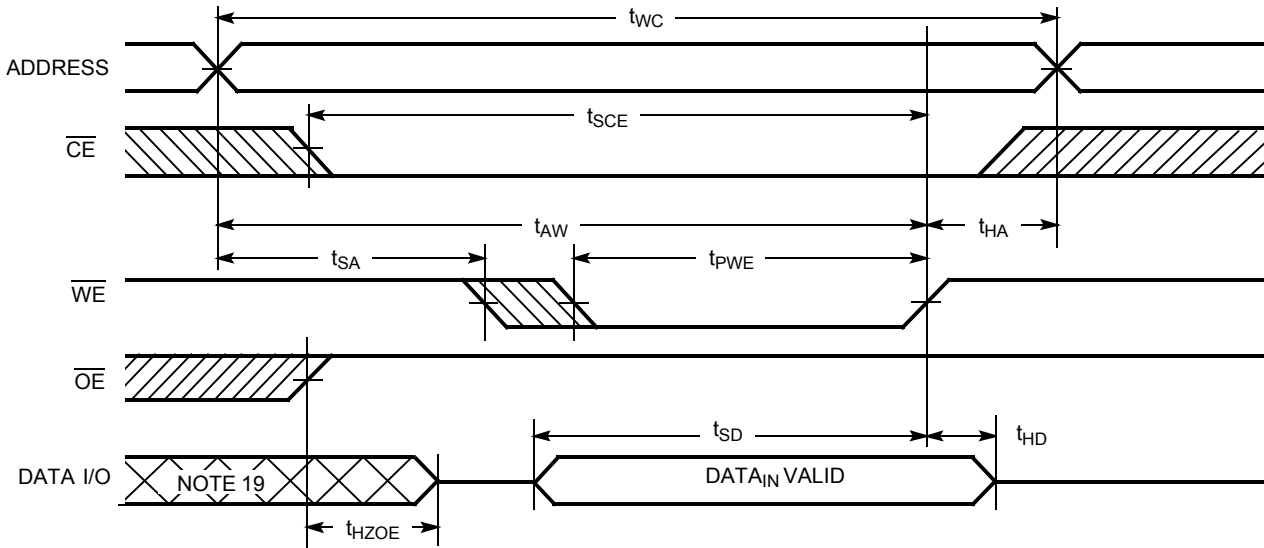
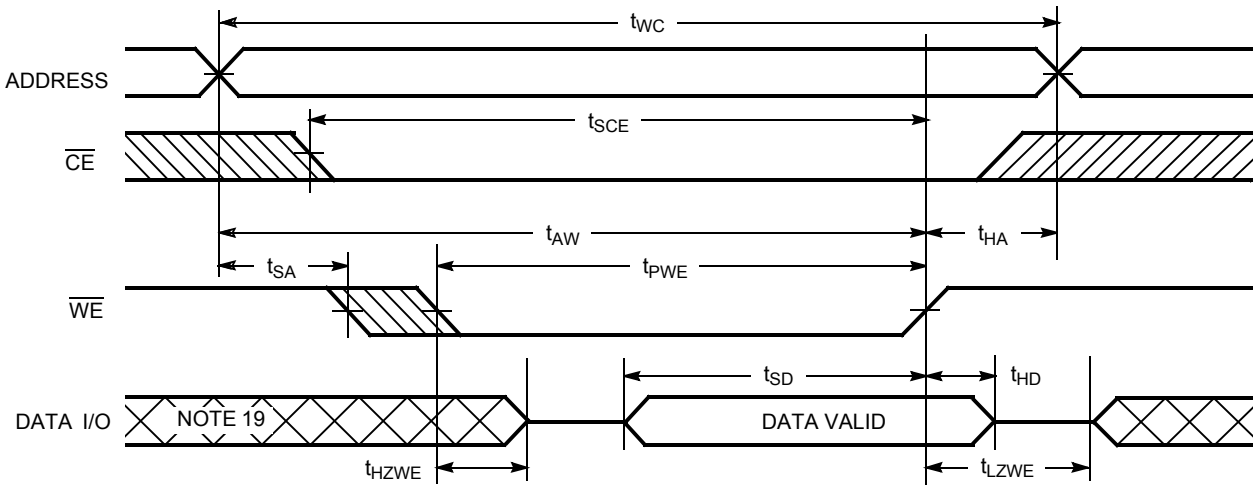


Figure 7. Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW) [17, 18]



Notes

- 16. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .
- 17. If  $\overline{CE}$  goes HIGH simultaneously with  $\overline{WE}$  going HIGH, the output remains in a high impedance state.
- 18. The minimum write cycle pulse width should be equal to the sum of  $t_{SD}$  and  $t_{HZWE}$ .
- 19. During this period the I/Os are in the output state and input signals should not be applied.

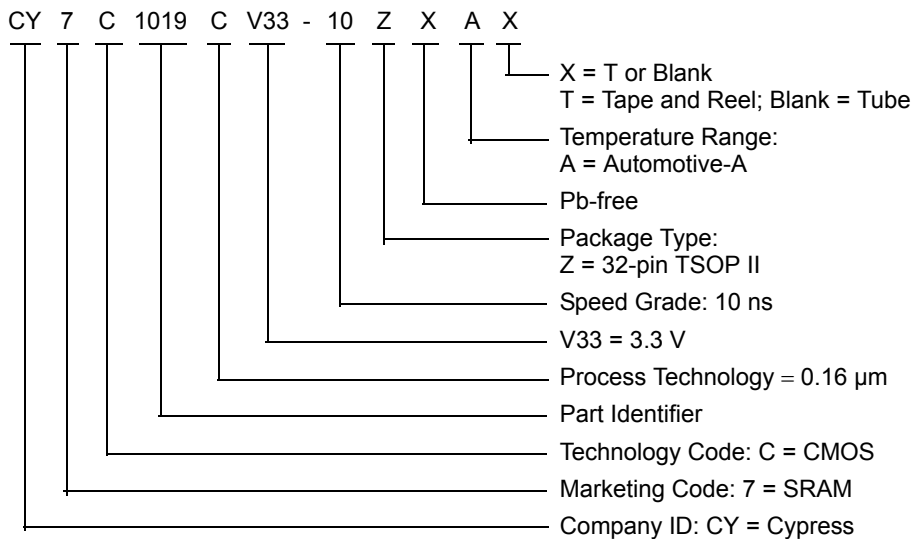


**Truth Table**

| $\overline{CE}$ | $\overline{OE}$ | $\overline{WE}$ | I/O <sub>0</sub> -I/O <sub>7</sub> | Mode                       | Power                      |
|-----------------|-----------------|-----------------|------------------------------------|----------------------------|----------------------------|
| H               | X               | X               | High Z                             | Power Down                 | Standby (I <sub>SB</sub> ) |
| L               | L               | H               | Data Out                           | Read                       | Active (I <sub>CC</sub> )  |
| L               | X               | L               | Data In                            | Write                      | Active (I <sub>CC</sub> )  |
| L               | H               | H               | High Z                             | Selected, Outputs Disabled | Active (I <sub>CC</sub> )  |

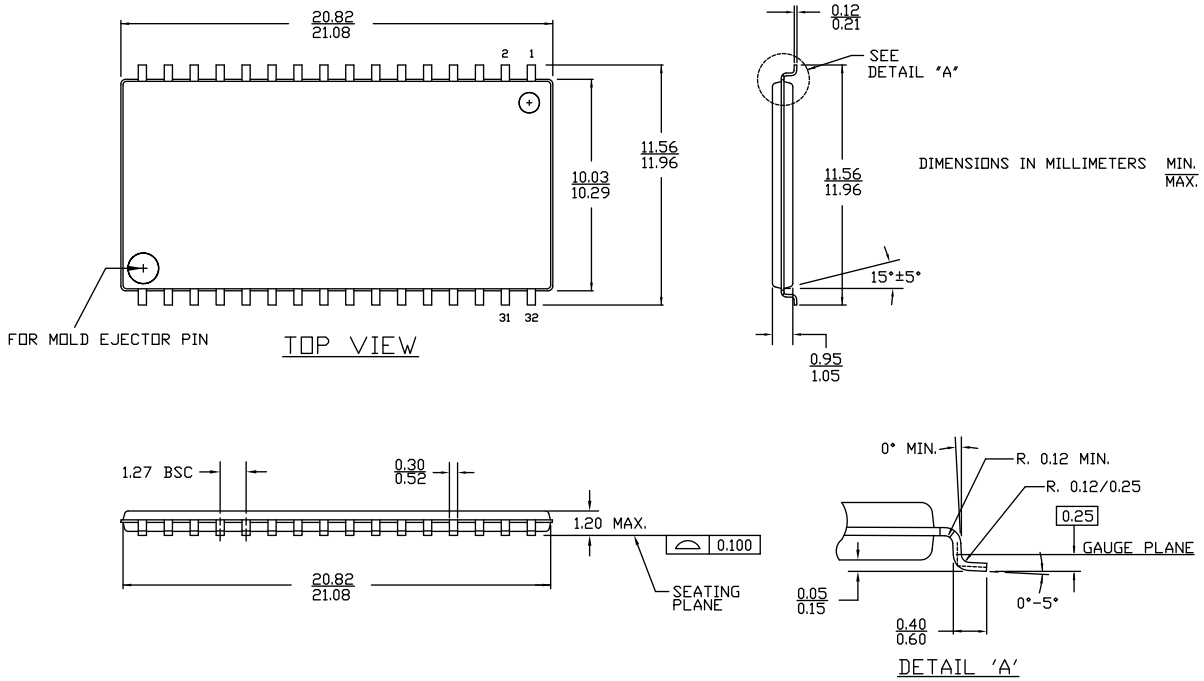
**Ordering Information**

| Speed (ns) | Ordering Code       | Package Diagram | Package Type             | Operating Range |
|------------|---------------------|-----------------|--------------------------|-----------------|
| 10         | CY7C1019CV33-10ZX A | 51-85095        | 32-pin TSOP II (Pb-free) | Automotive-A    |
|            | CY7C1019CV33-10ZXAT | 51-85095        | 32-pin TSOP II (Pb-free) |                 |

**Ordering Code Definitions**


Package Diagram

Figure 8. 32-pin TSOP II (20.95 × 11.76 × 1.0 mm) ZS32 Package Outline, 51-85095



51-85095 \*D

## Acronyms

| Acronym                | Description                             |
|------------------------|---|
| CMOS                   | Complementary Metal Oxide Semiconductor |
| $\overline{\text{CE}}$ | Chip Enable                             |
| I/O                    | Input/Output                            |
| $\overline{\text{OE}}$ | Output Enable                           |
| SRAM                   | Static Random Access Memory             |
| TSOP                   | Thin Small Outline Package              |
| TTL                    | Transistor-Transistor Logic             |
| $\overline{\text{WE}}$ | Write Enable                            |

## Document Conventions

### Units of Measure

| Symbol | Unit of Measure |
|--------|-----------------|
| °C     | degree Celsius  |
| MHz    | megahertz       |
| μA     | microampere     |
| mA     | milliampere     |
| mm     | millimeter      |
| ms     | millisecond     |
| ns     | nanosecond      |
| %      | percent         |
| pF     | picofarad       |
| V      | volt            |
| W      | watt            |

Document History Page

| Document Title: CY7C1019CV33, 1-Mbit (128 K × 8) Static RAM |         |                 |                 |  |
|---|---------|-----------------|-----------------|--|
| Document Number: 38-05130                                   |         |                 |                 |  |
| Rev.  | ECN No. | Submission Date | Orig. of Change | Description of Change  |
| **  | 109245  | 12/16/01        | HGK             | New data sheet.  |
| *A  | 113431  | 04/10/02        | NSL             | Updated <a href="#">AC Test Loads and Waveforms</a> :<br>AC Test Loads split based on speed.   |
| *B  | 115047  | 08/01/02        | HGK             | Added TSOP II Package related information in all instances across the document.<br>Added Industrial Temperature related information in all instances across the document.<br>Improved I <sub>CC</sub> limits in all instances across the document.   |
| *C  | 119796  | 10/11/02        | DFP             | Updated <a href="#">Selection Guide</a> (Changed value of maximum standby current from 5 nA to 5 mA).  |
| *D  | 123030  | 12/17/02        | DFP             | Updated <a href="#">Truth Table</a> (To reflect single Chip Enable option).  |
| *E  | 419983  | See ECN         | NXR             | Added 48-ball VFPGA Package related information in all instances across the document.<br>Updated <a href="#">Ordering Information</a> :<br>Added lead-free parts.<br>Replaced "Package Name" with "Package Diagram" in column heading and updated details in the column.   |
| *F  | 493543  | See ECN         | NXR             | Removed 8 ns speed bin related information in all instances across the document.<br>Updated <a href="#">Pin Configuration</a> :<br>Added Note 1 and referred the same note in <a href="#">Figure 1</a> .<br>Updated <a href="#">Electrical Characteristics</a> :<br>Changed the description of I <sub>LX</sub> parameter from "Input Load Current" to "Input Leakage Current".<br>Removed I <sub>OS</sub> parameter and its details.<br>Updated <a href="#">Ordering Information</a> . |
| *G  | 2761448 | 09/09/2009      | VKN             | Added Automotive-A Temperature Range related information in all instances across the document.   |
| *H  | 2897691 | 03/23/2010      | RAME            | Updated <a href="#">Ordering Information</a> .<br>Updated <a href="#">Package Diagram</a> .  |
| *I  | 3057593 | 10/13/2010      | PRAS            | Updated <a href="#">Ordering Information</a> and added <a href="#">Ordering Code Definitions</a> .<br>Updated <a href="#">Package Diagram</a> .  |
| *J  | 3072834 | 11/11/2010      | PRAS            | Updated <a href="#">Ordering Information</a> :<br>Removed obsolete parts.<br>Updated <a href="#">Package Diagram</a> .   |
| *K  | 3277371 | 06/08/2011      | AJU             | Updated <a href="#">Features</a> .<br>Updated <a href="#">Selection Guide</a> (Removed -12 (Industrial) and -15 (Industrial) columns).<br>Updated <a href="#">Electrical Characteristics</a> (Removed -12 (Industrial) and -15 (Industrial) columns).<br>Updated <a href="#">Switching Characteristics</a> (Removed -12 (Industrial) and -15 (Industrial) columns).<br>Updated <a href="#">Package Diagram</a> .<br>Updated to new template.   |
| *L  | 4146968 | 10/04/2013      | VINI            | Updated to new template.<br>Completing Sunset Review.  |

Document History Page (continued)

| Document Title: CY7C1019CV33, 1-Mbit (128 K × 8) Static RAM<br>Document Number: 38-05130 |         |                 |                 |  |
|--|---------|-----------------|-----------------|--|
| Rev.   | ECN No. | Submission Date | Orig. of Change | Description of Change  |
| *M   | 4578508 | 11/24/2014      | VINI            | Updated <a href="#">Functional Description</a> :<br>Added "For a complete list of related documentation, <a href="#">click here.</a> " at the end.<br>Updated <a href="#">Switching Characteristics</a> :<br>Added Note 10 and referred the same note in "Write Cycle".<br>Updated <a href="#">Switching Waveforms</a> :<br>Added Note 18 and referred the same note in <a href="#">Figure 7</a> . |
| *N   | 4802185 | 06/18/2015      | NILE            | Updated <a href="#">Package Diagram</a> :<br>spec 51-85095 – Changed revision from *B to *D.<br>Updated to new template.   |
| *O   | 5017466 | 11/17/2015      | VINI            | Added <a href="#">Thermal Resistance</a> .<br>Completing Sunset Review.  |

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