

# 128K x 8 Static RAM

## Features

- Pin and function compatible with CY7C1019BV33
- High speed
  - $t_{AA} = 8, 10, 12, 15$  ns
- CMOS for optimum speed/power
- Data retention at 2.0V
- Center power/ground pinout
- Automatic power-down when deselected
- Easy memory expansion with  $\overline{CE}$  and  $\overline{OE}$  options
- Available in 32-pin TSOP II and 400-mil SOJ 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 three-state drivers. This

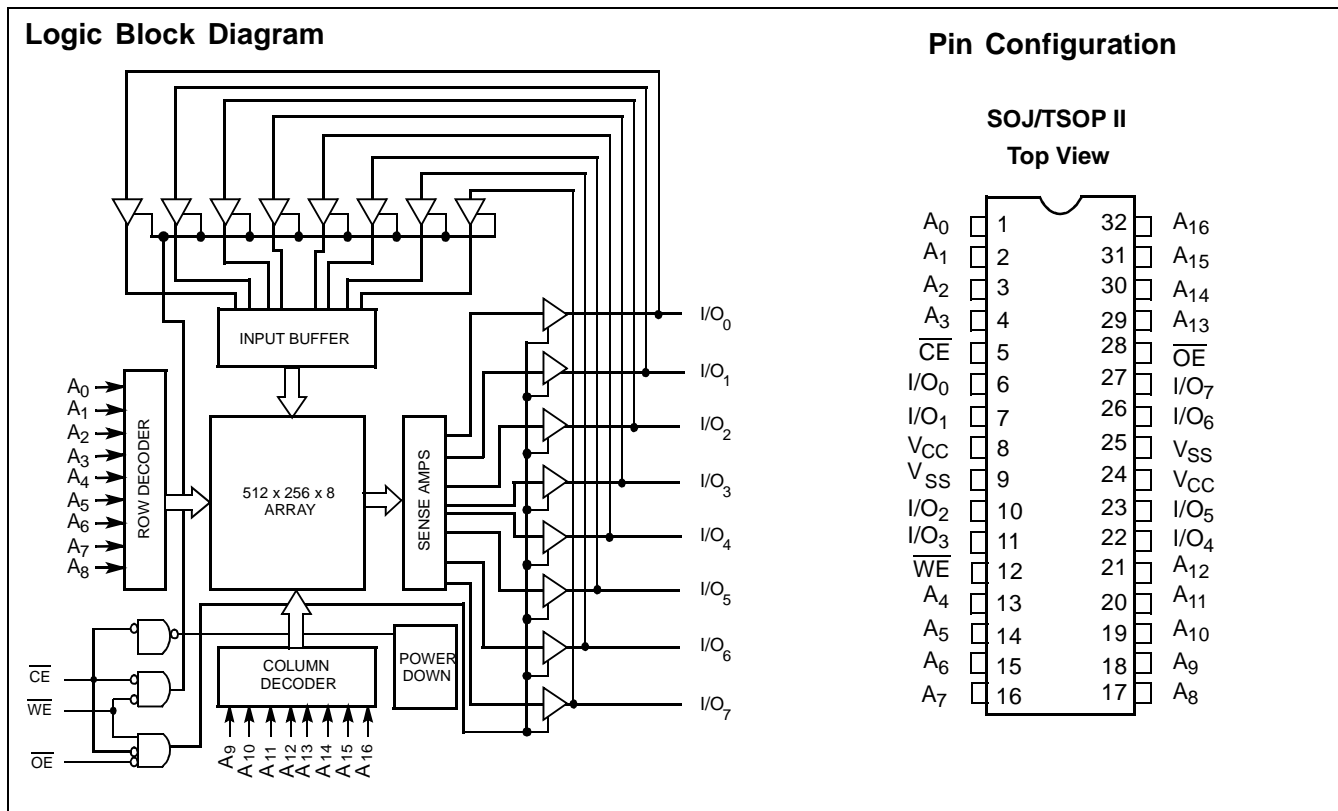
device has an automatic power-down feature that significantly reduces power consumption when deselected.

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).

The CY7C1019CV33 is available in a standard 32-pin TSOP II and 400-mil-wide SOJ.



## Selection Guide

	7C1019CV33-8	7C1019CV33-10	7C1019CV33-12	7C1019CV33-15	Unit
Maximum Access Time	8	10	12	15	ns
Maximum Operating Current	85	80	75	70	mA
Maximum Standby Current	5	5	5	5	mA

**Maximum Ratings**

(Above which the useful life may be impaired. For user guidelines, 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<sup>[1]</sup> ... -0.5V to + 4.6V  
 DC Voltage Applied to Outputs in High-Z State<sup>[1]</sup> ..... -0.5V to V<sub>CC</sub> + 0.5V  
 DC Input Voltage<sup>[1]</sup>..... -0.5V to V<sub>CC</sub> + 0.5V

Current into Outputs (LOW)..... 20 mA  
 Static Discharge Voltage..... >2001V (per MIL-STD-883, Method 3015)  
 Latch-up Current..... >200 mA

**Operating Range**

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

**Electrical Characteristics Over the Operating Range**

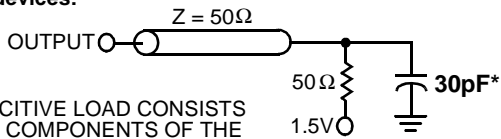
Parameter	Description	Test Conditions	7C1019CV33 -8		7C1019CV33 -10		7C1019CV33 -12		7C1019CV33 -15		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., I <sub>OH</sub> = -4.0 mA	2.4		2.4		2.4		2.4		V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 8.0 mA		0.4		0.4		0.4		0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.0	V <sub>CC</sub> + 0.3	2.0	V <sub>CC</sub> + 0.3	2.0	V <sub>CC</sub> + 0.3	2.0	V <sub>CC</sub> + 0.3	V
V <sub>IL</sub>	Input LOW Voltage <sup>[1]</sup>		-0.3	0.8	-0.3	0.8	-0.3	0.8	-0.3	0.8	V
I <sub>IX</sub>	Input Load Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>	-1	+1	-1	+1	-1	+1	-1	+1	μA
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , Output Disabled	-1	+1	-1	+1	-1	+1	-1	+1	μA
I <sub>OS</sub> <sup>[2]</sup>	Output Short Circuit Current	V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND		-300		-300		-300		-300	mA
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>		85		80		75		70	mA
I <sub>SB1</sub>	Automatic CE Power-down Current —TTL Inputs	Max. V <sub>CC</sub> , CE ≥ V <sub>IH</sub> , V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub>		15		15		15		15	mA
I <sub>SB2</sub>	Automatic CE Power-down Current —CMOS Inputs	Max. V <sub>CC</sub> , CE ≥ V <sub>CC</sub> - 0.3V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V, or V <sub>IN</sub> ≤ 0.3V, f = 0		5		5		5		5	mA

**Capacitance<sup>[3]</sup>**

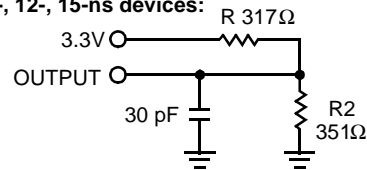
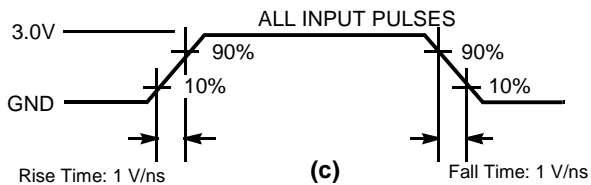
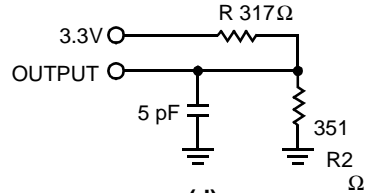
Parameter	Description	Test Conditions	Max.	Unit
C <sub>IN</sub>	Input Capacitance	T <sub>A</sub> = 25°C, f = 1 MHz, V <sub>CC</sub> = 5.0V	8	pF
C <sub>OUT</sub>	Output Capacitance		8	pF

**Notes:**

- V<sub>IL</sub> (min.) = -2.0V for pulse durations of less than 20 ns.
- Not more than one output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
- Tested initially and after any design or process changes that may affect these parameters.

**AC Test Loads and Waveforms<sup>[4]</sup>**
**8-ns devices:**


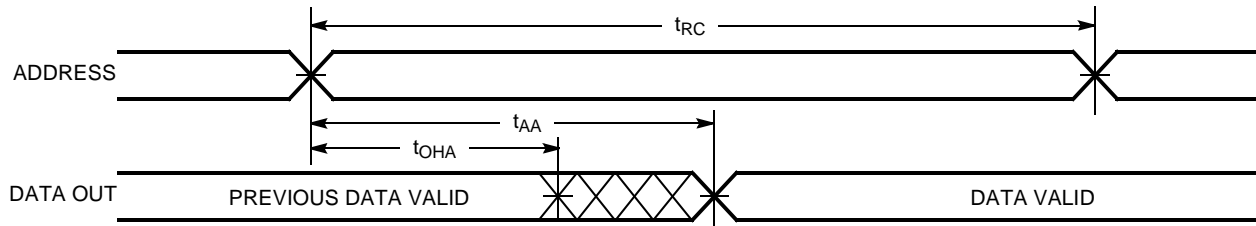
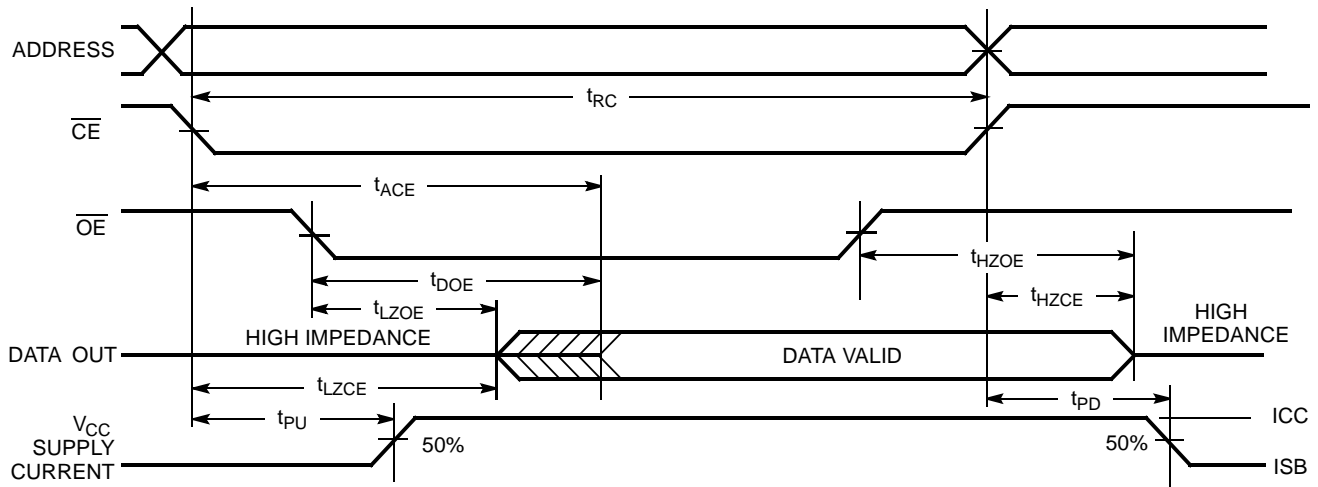
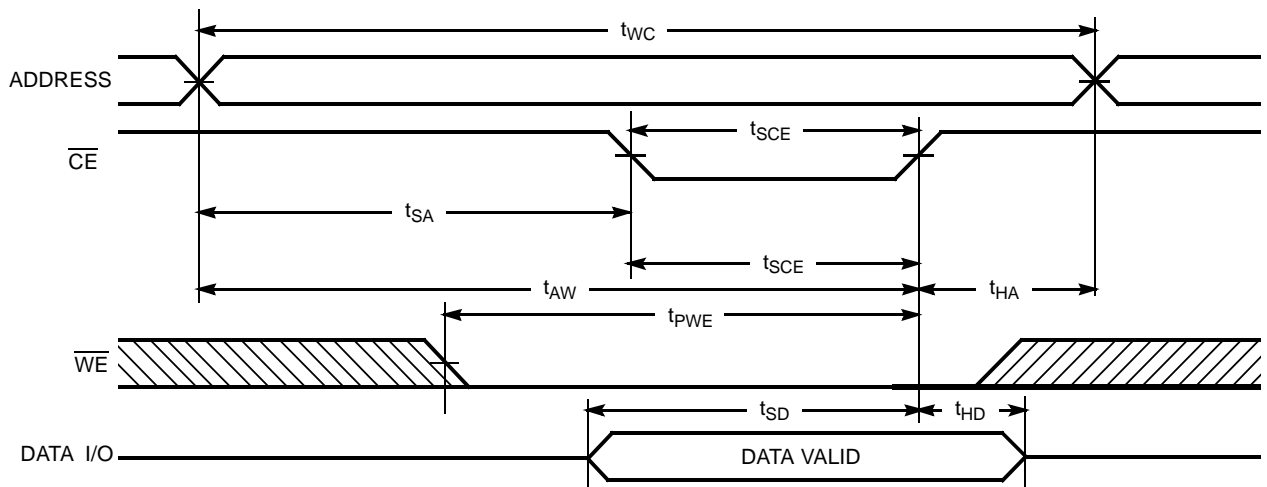
\* CAPACITIVE LOAD CONSISTS OF ALL COMPONENTS OF THE TEST ENVIRONMENT

**(a)**
**10-, 12-, 15-ns devices:**

**(b)**

**(c)**
**High-Z characteristics:**

**(d)**
**Switching Characteristics<sup>[5]</sup> Over the Operating Range**

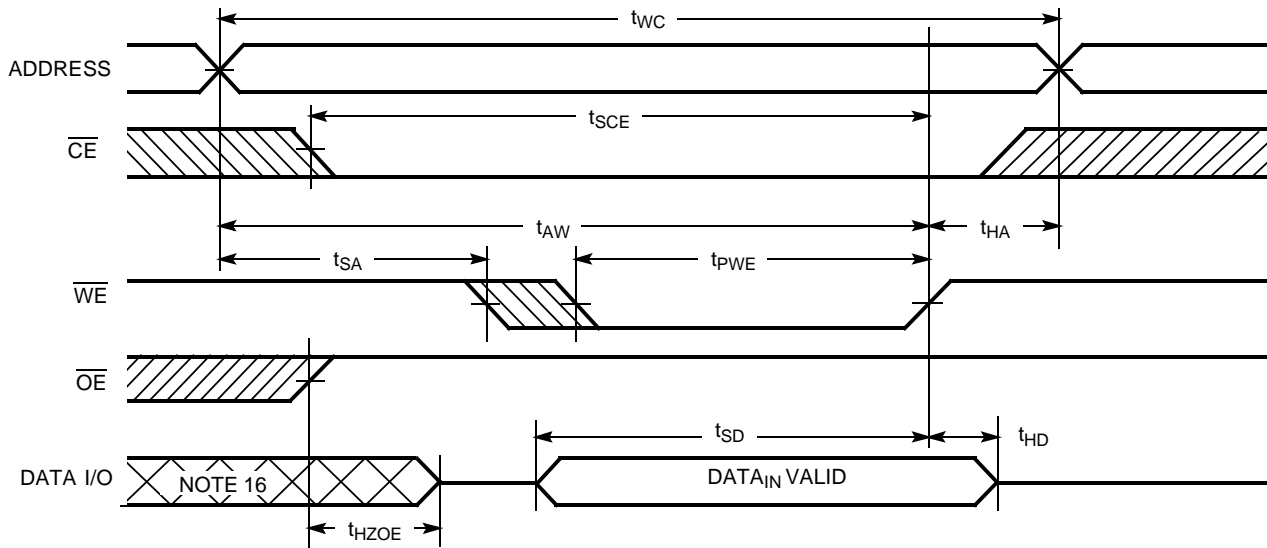
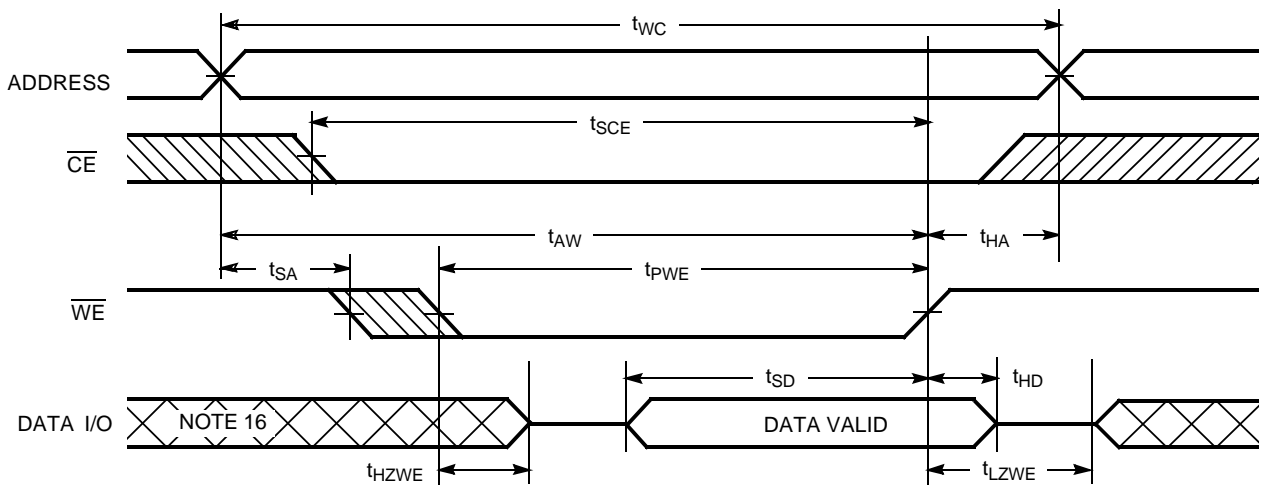
Parameter	Description	7C1019CV33-8		7C1019CV33-10		7C1019CV33-12		7C1019CV33-15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
<b>Read Cycle</b>										
$t_{RC}$	Read Cycle Time	8		10		12		15		ns
$t_{AA}$	Address to Data Valid		8		10		12		15	ns
$t_{OHA}$	Data Hold from Address Change	3		3		3		3		ns
$t_{ACE}$	CE LOW to Data Valid		8		10		12		15	ns
$t_{DOE}$	OE LOW to Data Valid		5		5		6		7	ns
$t_{LZOE}$	OE LOW to Low Z	0		0		0		0		ns
$t_{HZOE}$	OE HIGH to High Z <sup>[6, 7]</sup>		4		5		6		7	ns
$t_{LZCE}$	CE LOW to Low Z <sup>[7]</sup>	3		3		3		3		ns
$t_{HZCE}$	CE HIGH to High Z <sup>[6, 7]</sup>		4		5		6		7	ns
$t_{PU}$ <sup>[8]</sup>	CE LOW to Power-Up	0		0		0		0		ns
$t_{PD}$ <sup>[8]</sup>	CE HIGH to Power-Down		8		10		12		15	ns
<b>Write Cycle<sup>[9, 10]</sup></b>										
$t_{WC}$	Write Cycle Time	8		10		12		15		ns
$t_{SCE}$	CE LOW to Write End	7		8		9		10		ns
$t_{AW}$	Address Set-Up to Write End	7		8		9		10		ns
$t_{HA}$	Address Hold from Write End	0		0		0		0		ns
$t_{SA}$	Address Set-Up to Write Start	0		0		0		0		ns
$t_{PWE}$	WE Pulse Width	6		7		8		10		ns
$t_{SD}$	Data Set-Up to Write End	5		5		6		8		ns
$t_{HD}$	Data Hold from Write End	0		0		0		0		ns
$t_{LZWE}$	WE HIGH to Low Z <sup>[7]</sup>	3		3		3		3		ns
$t_{HZWE}$	WE LOW to High Z <sup>[6, 7]</sup>		4		5		6		7	ns

**Notes:**

- AC characteristics (except High-Z) for all 8-ns parts are tested using the load conditions shown in Figure (a). All other speeds are tested using the Thevenin load shown in Figure (b). High-Z characteristics are tested for all speeds using the test load shown in Figure (d).
- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V.
- $t_{HZOE}$ ,  $t_{HZCE}$ , and  $t_{HZWE}$  are specified with a load capacitance of 5 pF as in part (d) of AC Test Loads. Transition is measured  $\pm 500$  mV from steady-state voltage.
- 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.
- 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 set-up 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 (WE controlled, OE LOW) is the sum of  $t_{HZWE}$  and  $t_{SD}$ .

**Switching Waveforms**
**Read Cycle No. 1<sup>[11, 12]</sup>**

**Read Cycle No. 2 ( $\overline{OE}$  Controlled)<sup>[12, 13]</sup>**

**Write Cycle No. 1 ( $\overline{CE}$  Controlled)<sup>[14, 15]</sup>**

**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)**
**Write Cycle No. 2 ( $\overline{\text{WE}}$  Controlled,  $\overline{\text{OE}}$  HIGH During Write)<sup>[14, 15]</sup>**

**Write Cycle No. 3 ( $\overline{\text{WE}}$  Controlled,  $\overline{\text{OE}}$  LOW)<sup>[15]</sup>**

**Truth Table**

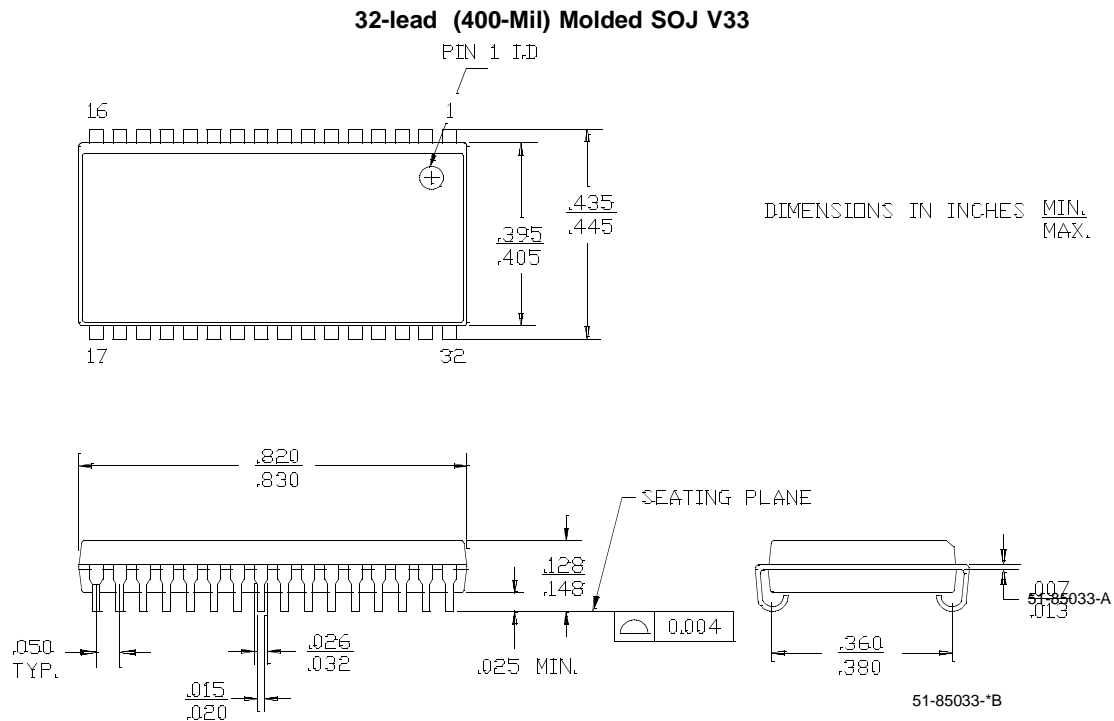
$\overline{\text{CE}}$	$\overline{\text{OE}}$	$\overline{\text{WE}}$	$\text{I/O}_0\text{-I/O}_7$	Mode	Power
H	X	X	High Z	Power-Down	Standby ( $I_{\text{SB}}$ )
L	L	H	Data Out	Read	Active ( $I_{\text{CC}}$ )
L	X	L	Data In	Write	Active ( $I_{\text{CC}}$ )
L	H	H	High Z	Selected, Outputs Disabled	Active ( $I_{\text{CC}}$ )

**Note:**

16. During this period the I/Os are in the output state and input signals should not be applied.

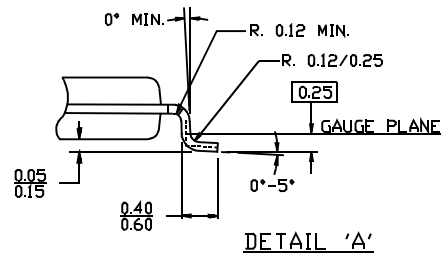
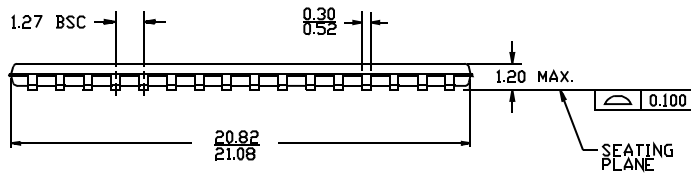
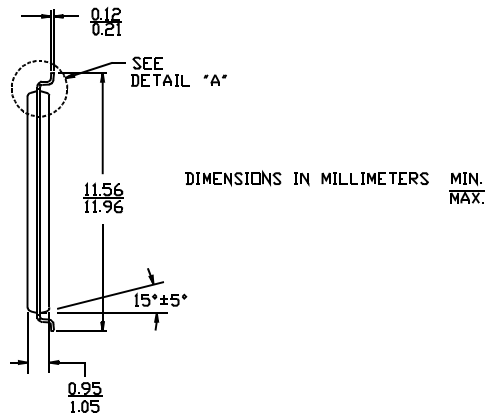
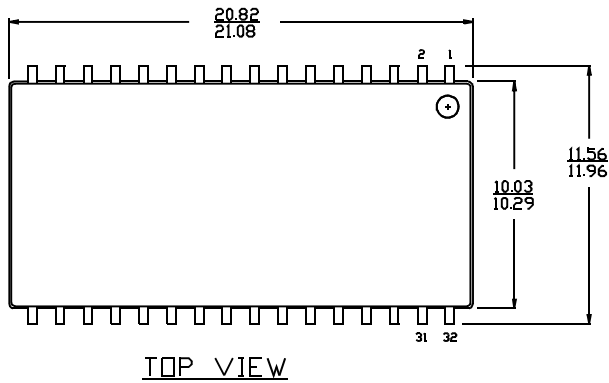
**Ordering Information**

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
8	CY7C1019CV33-8VC	V33	32-Lead 400-Mil Molded SOJ	Commercial
	CY7C1019CV33-8VI	V33	32-Lead 400-Mil Molded SOJ	Industrial
10	CY7C1019CV33-10VC	V33	32-Lead 400-Mil Molded SOJ	Commercial
	CY7C1019CV33-10ZC	ZS32	32-Lead TSOP II	
	CY7C1019CV33-10VI	V33	32-Lead 400-Mil Molded SOJ	Industrial
	CY7C1019CV33-10ZI	ZS32	32-Lead TSOP II	
12	CY7C1019CV33-12VC	V33	32-Lead 400-Mil Molded SOJ	Commercial
	CY7C1019CV33-12ZC	ZS32	32-Lead TSOP II	
	CY7C1019CV33-12VI	V33	32-Lead 400-Mil Molded SOJ	Industrial
	CY7C1019CV33-12ZI	ZS32	32-Lead TSOP II	
15	CY7C1019CV33-15VC	V33	32-Lead 400-Mil Molded SOJ	Commercial
	CY7C1019CV33-15ZC	ZS32	32-Lead TSOP II	
	CY7C1019CV33-15VI	V33	32-Lead 400-Mil Molded SOJ	Industrial
	CY7C1019CV33-15ZI	ZS32	32-Lead TSOP II	

**Package Diagram**


Package Diagram (continued)

32-lead TSOP II ZS32



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## Document History Page

Document Title: CY7C1019CV33 128K x 8 Static RAM Document Number: 38-05130				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	109245	12/16/01	HGK	New Data Sheet
*A	113431	04/10/02	NSL	AC Test Loads split based on speed.
*B	115047	08/01/02	HGK	Added TSOP II Package and I Temp. Improved I <sub>CC</sub> limits.
*C	119796	10/11/02	DFP	Updated standby current from 5 nA to 5 mA.
*D	123030	12/17/02	DFP	Updated Truth Table to reflect single Chip Enable option.