CY7C1019CV33

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 48-ball VFBGA, 32-pin TSOP II and 400-mil SOJ package**
- **Also available in lead-free 48-ball VFBGA and 32-pin TSOP II packages**

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.

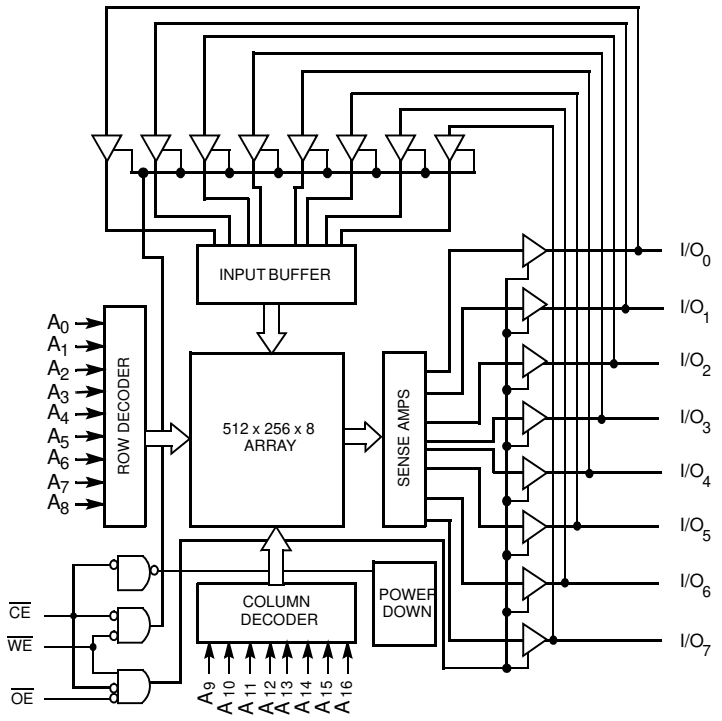
Writing to the device is accomplished by taking Chip Enable ($\overline{CE}$) and Write Enable ($\overline{WE}$) inputs LOW. Data on the eight I/O pins (I/O_0 through I/O_7) is then written into the location specified on the address pins (A_0 through A_{16}).

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 Standard 48-ball FBGA, 32-pin TSOP II and 400-mil-wide SOJ packages.

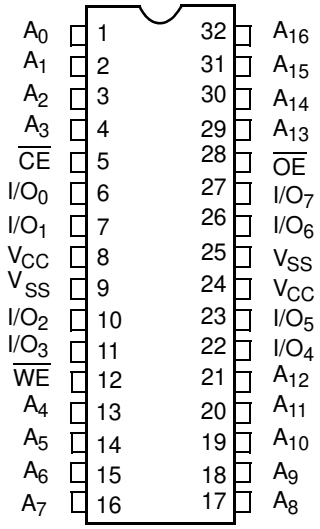
Logic Block Diagram



Pin Configuration

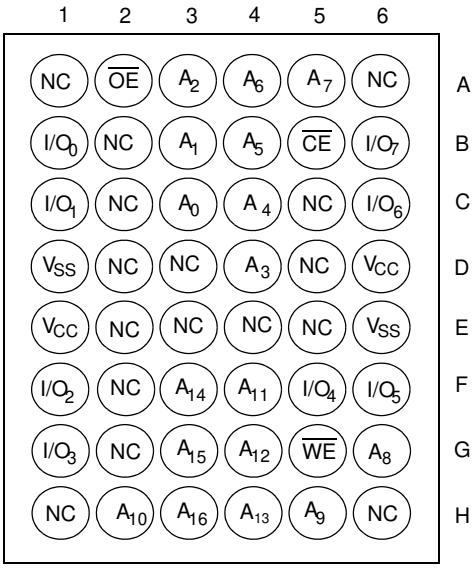
SOJ/TSOP II

Top View



Pin Configuration (continued)

48-ball FBGA
(Top View)



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_{CC} to Relative GND[1] ... –0.5V to + 4.6V

DC Voltage Applied to Outputs in High-Z State[1].....–0.5V to V_{CC} + 0.5V

DC Input Voltage[1].....–0.5V to V_{CC} + 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_{CC}
Commercial	0°C to +70°C	3.3V ± 10%
Industrial	–40°C to +85°C	3.3V ± 10%

Electrical Characteristics Over the Operating Range

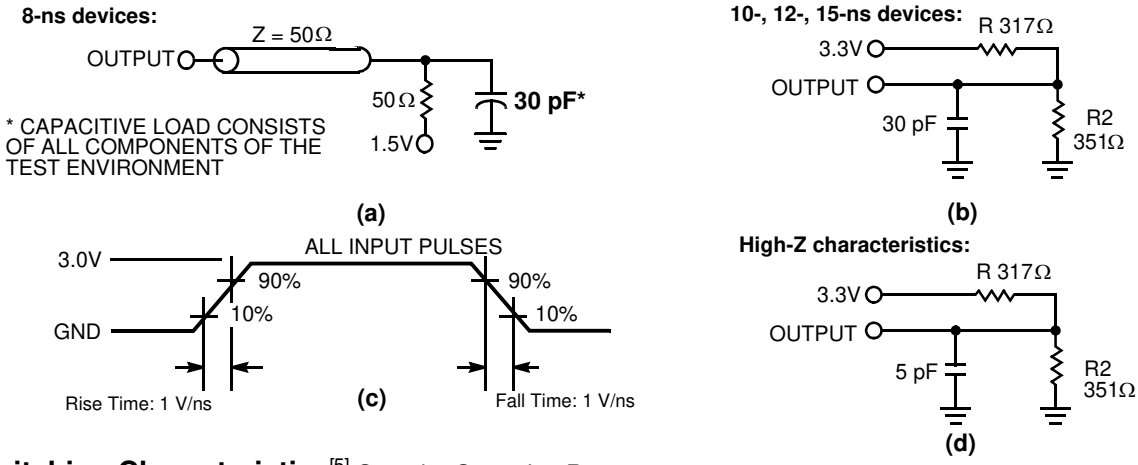
Parameter	Description	Test Conditions	7C1019CV33 -8		7C1019CV33 -10		7C1019CV33 -12		7C1019CV33 -15		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = –4.0 mA	2.4		2.4		2.4		2.4		V
V_{OL}	Output LOW Voltage	V_{CC} = Min., I_{OL} = 8.0 mA		0.4		0.4		0.4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

Capacitance[3]

Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	T_A = 25°C, f = 1 MHz, V_{CC} = 5.0V	8	pF
C_{OUT}	Output Capacitance		8	pF

Notes:
1. V_{IL} (min.) = –2.0V for pulse durations of less than 20 ns.
2. Not more than one output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
3. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms[4]



Switching Characteristics[5] Over the Operating Range

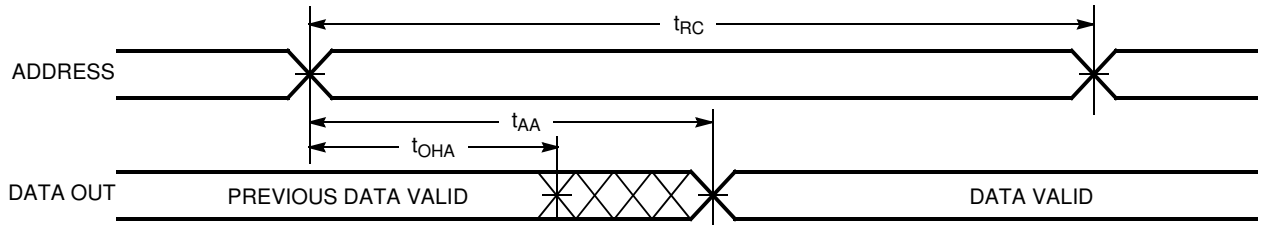
Parameter	Description	7C1019CV33-8		7C1019CV33-10		7C1019CV33-12		7C1019CV33-15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle										
t_{RC}	Read Cycle Time	8		10		12		15		ns
t_{AA}	Address to Data Valid		8		10		12		15	ns
t_{OHA}	Data Hold from Address Change	3		3		3		3		ns
t_{ACE}	$\overline{CE}$ LOW to Data Valid		8		10		12		15	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		5		5		6		7	ns
t_{LZOE}	$\overline{OE}$ LOW to Low Z	0		0		0		0		ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z[6, 7]		4		5		6		7	ns
t_{LZCE}	$\overline{CE}$ LOW to Low Z[7]	3		3		3		3		ns
t_{HZCE}	$\overline{CE}$ HIGH to High Z[6, 7]		4		5		6		7	ns
t_{PU}[8]	$\overline{CE}$ LOW to Power-Up	0		0		0		0		ns
t_{PD}[8]	$\overline{CE}$ HIGH to Power-Down		8		10		12		15	ns
Write Cycle[9, 10]										
t_{WC}	Write Cycle Time	8		10		12		15		ns
t_{SCE}	$\overline{CE}$ 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}	$\overline{WE}$ 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}	$\overline{WE}$ HIGH to Low Z[7]	3		3		3		3		ns
t_{HZWE}	$\overline{WE}$ LOW to High Z[6, 7]		4		5		6		7	ns

Notes:

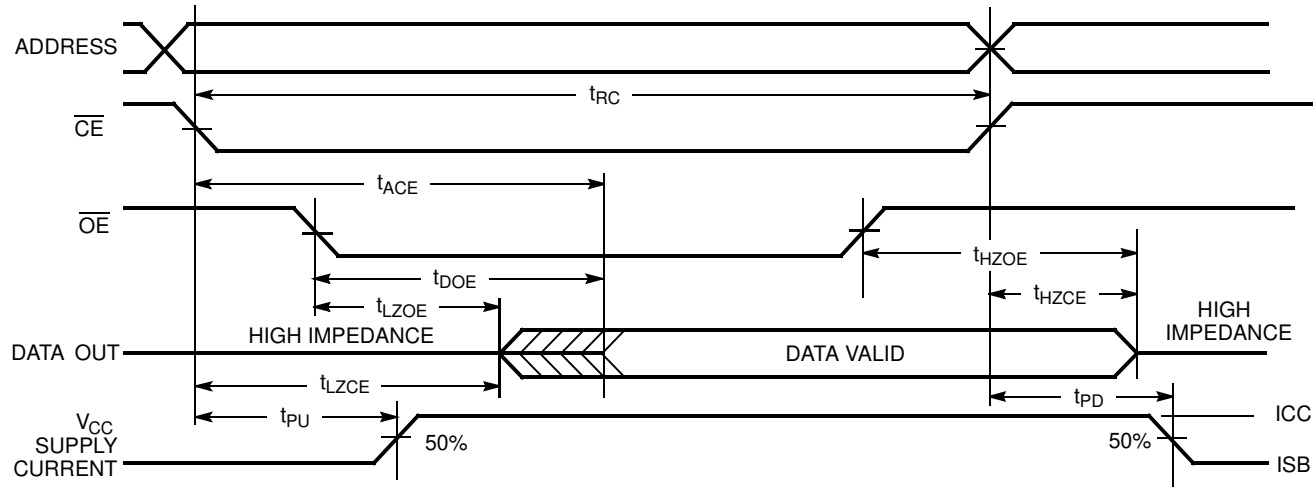
4. AC characteristics (except High-Z) for all 8-ns parts are tested using the load conditions shown in Figure (a). All other speeds are tested using the Thevenin load shown in Figure (b). High-Z characteristics are tested for all speeds using the test load shown in Figure (d).
5. Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V.
6. 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 ±500 mV from steady-state voltage.
7. 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.
8. This parameter is guaranteed by design and is not tested.
9. 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.
10. The minimum write cycle time for Write Cycle no. 3 ($\overline{WE}$ controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD}.

Switching Waveforms

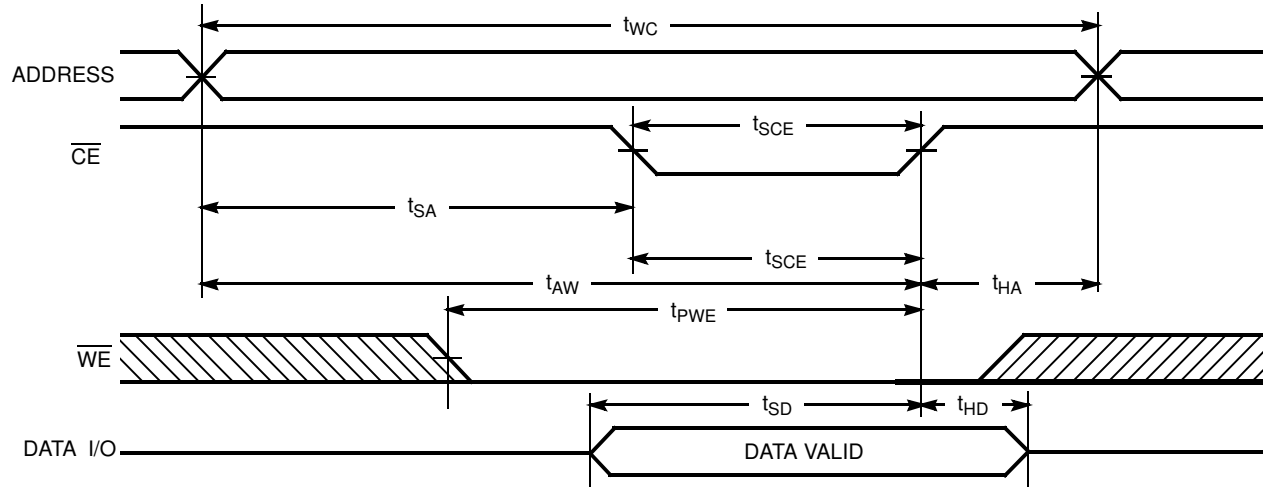
Read Cycle No. 1[11, 12]



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



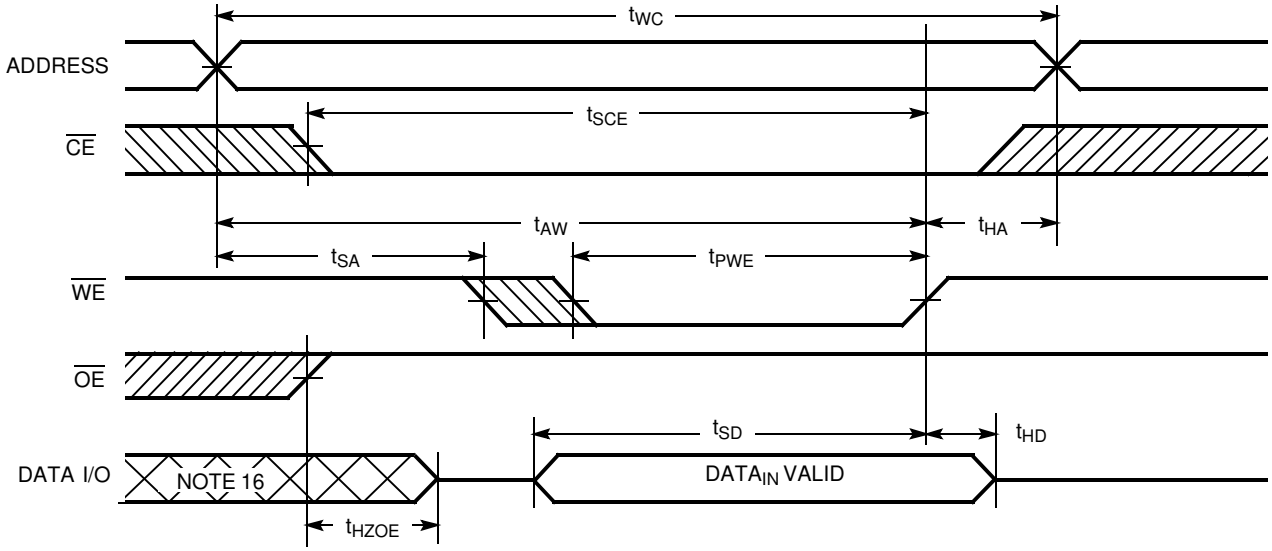
Write Cycle No. 1 ($\overline{CE}$ Controlled)[14, 15]



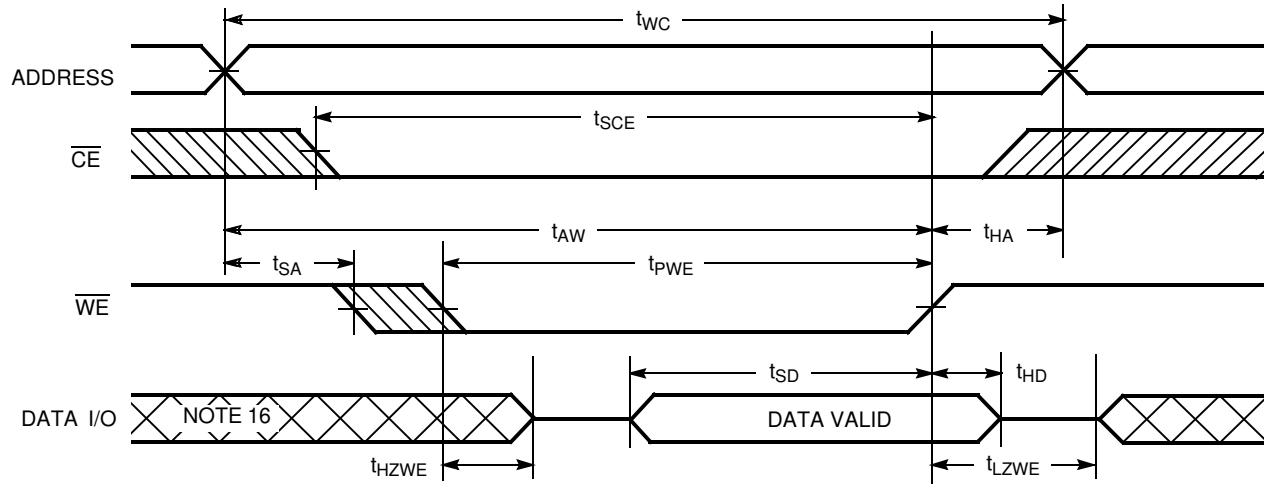
Notes:
11. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}.
12. $\overline{WE}$ is HIGH for read cycle.
13. Address valid prior to or coincident with $\overline{CE}$ transition LOW.
14. Data I/O is high impedance if $\overline{OE}$ = V_{IH}.
15. If $\overline{CE}$ goes HIGH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

Switching Waveforms (continued)

Write Cycle No. 2 ($\overline{WE}$ Controlled, $\overline{OE}$ HIGH During Write)[14, 15]



Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW)[15]



Truth Table

$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	I/O_0–I/O_7	Mode	Power
H	X	X	High Z	Power-Down	Standby (I_{SB})
L	L	H	Data Out	Read	Active (I_{CC})
L	X	L	Data In	Write	Active (I_{CC})
L	H	H	High Z	Selected, Outputs Disabled	Active (I_{CC})

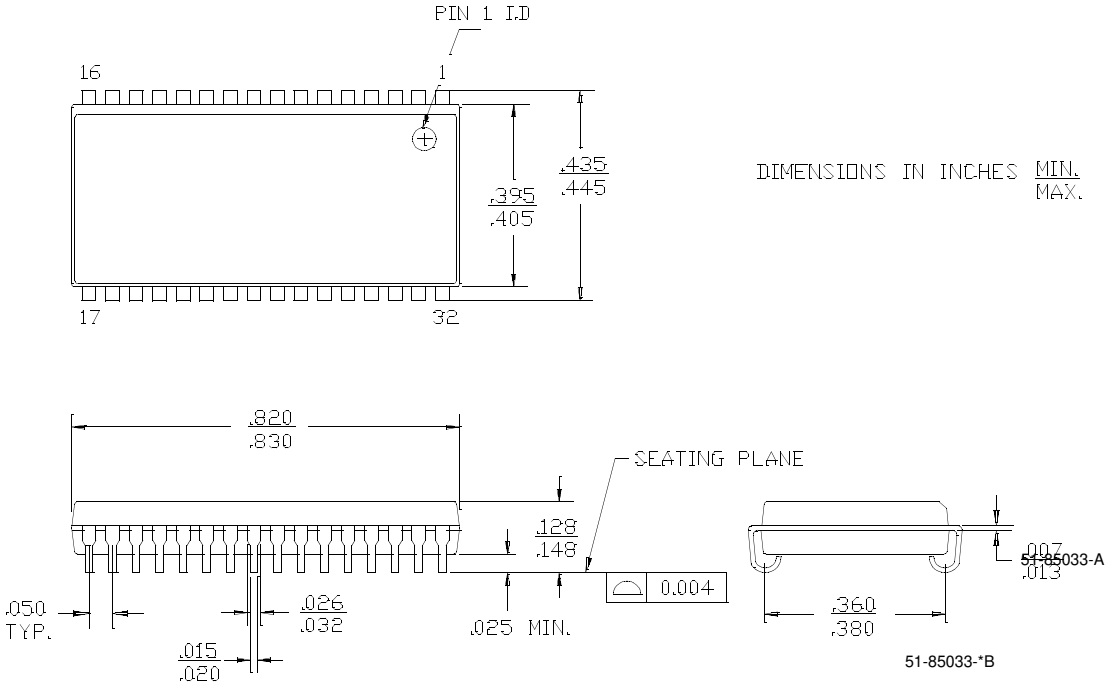
Note:
16. During this period the I/Os are in the output state and input signals should not be applied.

Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
8	CY7C1019CV33-8VC	51-85033	32-pin 400-Mil Molded SOJ	Commercial
	CY7C1019CV33-8VI	51-85033	32-pin 400-Mil Molded SOJ	Industrial
10	CY7C1019CV33-10VC	51-85033	32-pin 400-Mil Molded SOJ	Commercial
	CY7C1019CV33-10ZC	51-85095	32-pin TSOP II	
	CY7C1019CV33-10ZXC	51-85095	32-pin TSOP II (Pb-Free)	
	CY7C1019CV33-10VI	51-85033	32-pin 400-Mil Molded SOJ	Industrial
	CY7C1019CV33-10ZI	51-85095	32-pin TSOP II	
	CY7C1019CV33-10ZXI	51-85095	32-pin TSOP II (Pb-Free)	
12	CY7C1019CV33-12VC	51-85033	32-pin 400-Mil Molded SOJ	Commercial
	CY7C1019CV33-12ZC	51-85095	32-pin TSOP II	
	CY7C1019CV33-12ZXC	51-85095	32-pin TSOP II (Pb-Free)	
	CY7C1019CV33-12VI	51-85033	32-pin 400-Mil Molded SOJ	Industrial
	CY7C1019CV33-12ZI	51-85095	32-pin TSOP II	
	CY7C1019CV33-12BVI	51-85150	48-ball VFBGA	
	CY7C1019CV33-12BVXI	51-85150	48-ball VFBGA (Pb-Free)	
15	CY7C1019CV33-15VC	51-85033	32-pin 400-Mil Molded SOJ	Commercial
	CY7C1019CV33-15ZC	51-85095	32-pin TSOP II	
	CY7C1019CV33-15ZXC	51-85095	32-pin TSOP II (Pb-Free)	
	CY7C1019CV33-15VI	51-85033	32-pin 400-Mil Molded SOJ	Industrial
	CY7C1019CV33-15ZI	51-85095	32-pin TSOP II	
	CY7C1019CV33-15ZXI	51-85095	32-pin TSOP II (Pb-Free)	

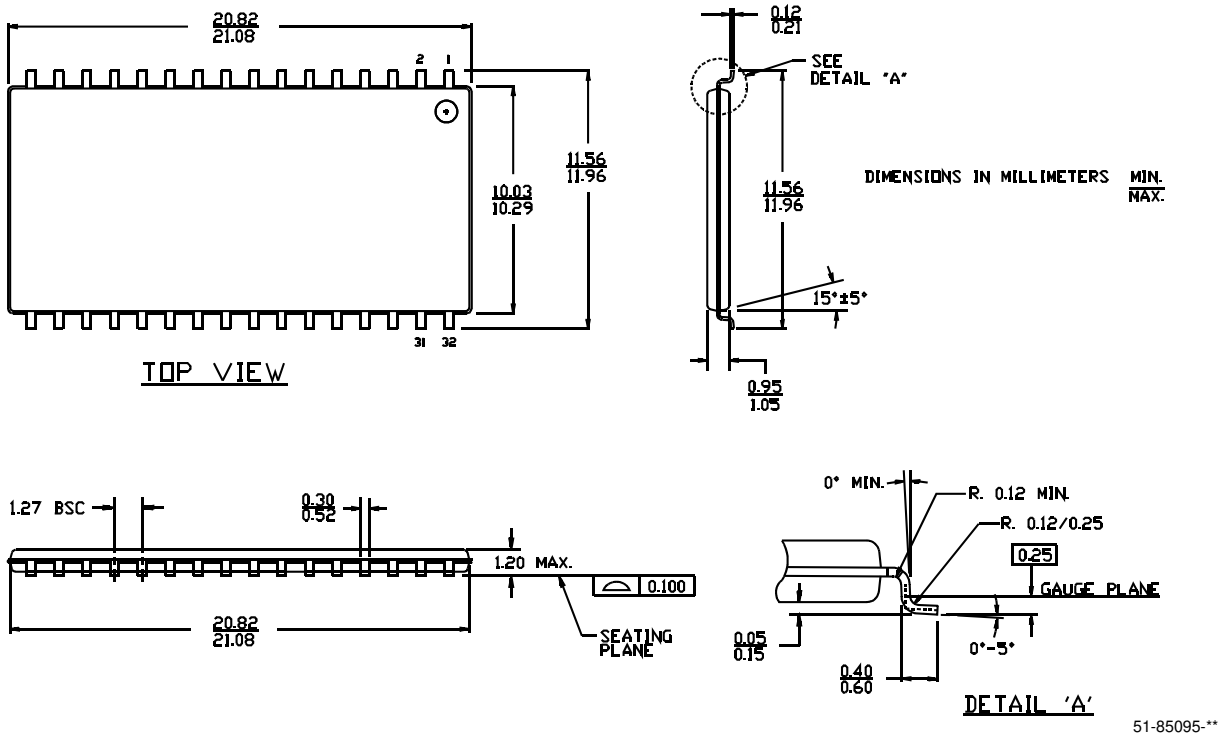
Package Diagrams

32-pin (400-Mil) Molded SOJ (51-85033)



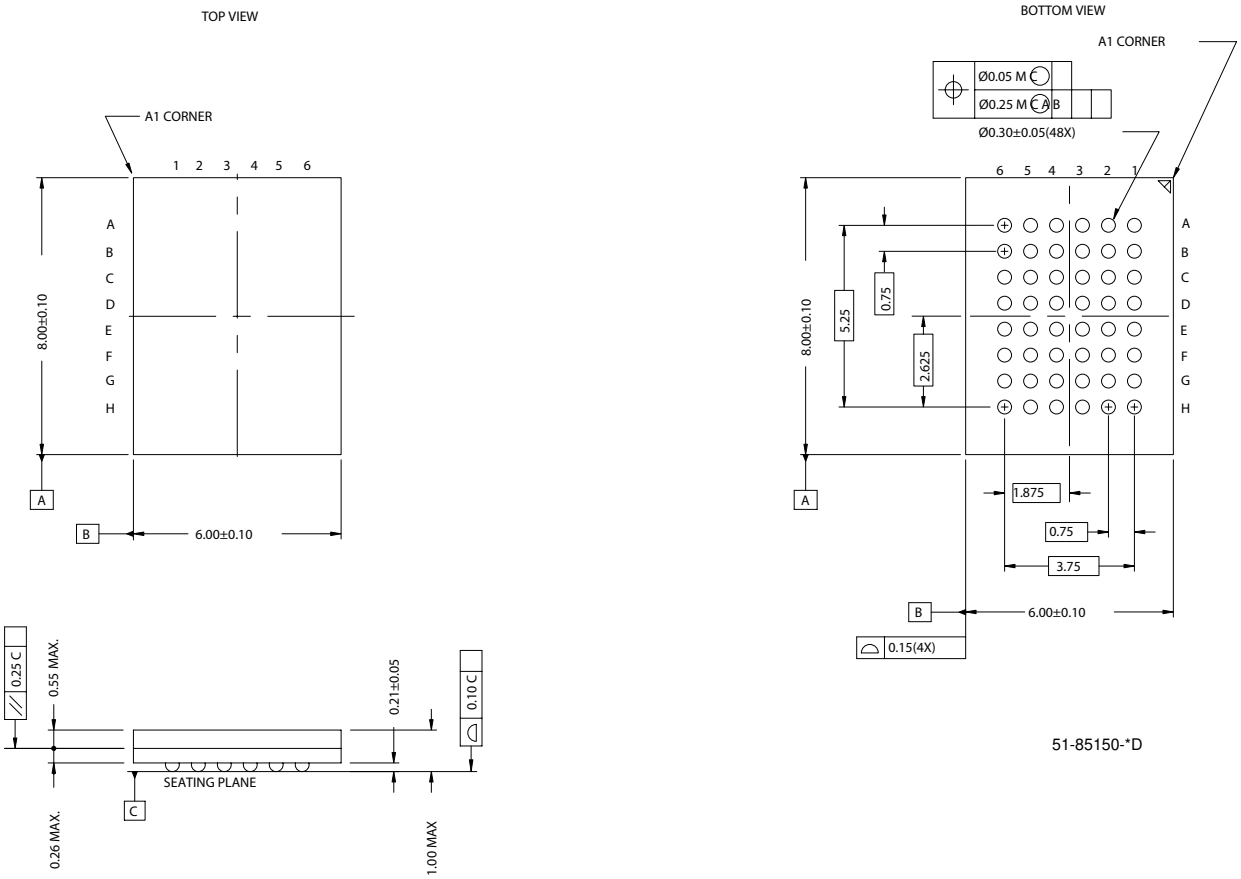
Package Diagrams (continued)

32-pin TSOP II ZS32 (51-85095)



Package Diagrams (continued)

48-ball VFBGA (6 x 8 x 1 mm) (51-85150)



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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_{CC} 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.
*E	419983	See ECN	NXR	Added 48-ball VFBGA Package Added lead-free parts in Ordering Information Table Replaced Package Name column with Package Diagram in the Ordering Information table.