

## Features

- Pin and function compatible with CY7C1010CV33
- High speed
  - $t_{AA} = 10 \text{ ns}$
- Low active power
  - $I_{CC} = 90 \text{ mA}$  at 10 ns
- Low CMOS standby power
  - $I_{SB2} = 10 \text{ mA}$
- 2.0 V data retention
- Automatic power down when deselected
- TTL-compatible inputs and outputs
- Easy memory expansion with  $\overline{CE}$  and  $\overline{OE}$  features
- Available in Pb-free 36-pin SOJ and 44-pin TSOP II packages

## Functional Description

The CY7C1010DV33 is a high performance CMOS Static RAM organized as 256 K 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. 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  $A_{17}$ ).

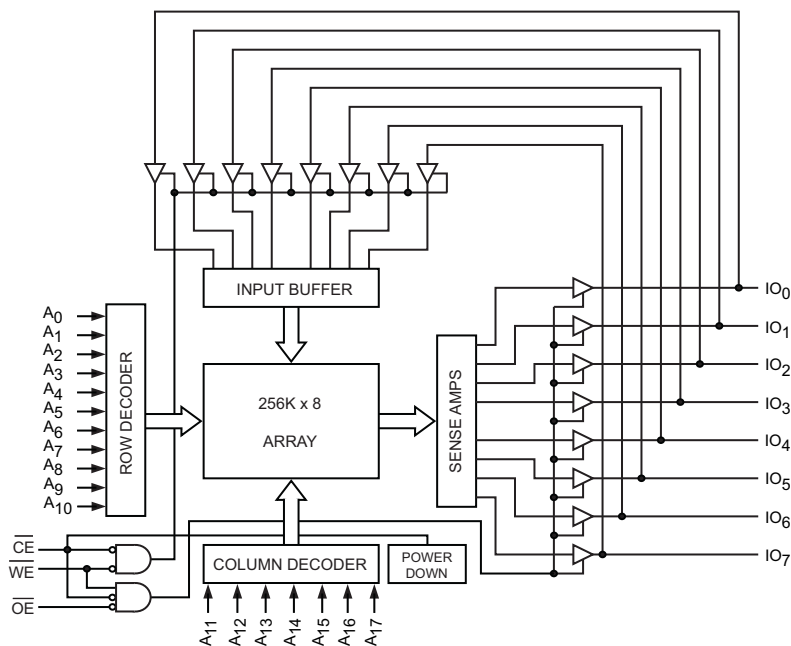
Reading from the device is accomplished by taking Chip Enable ( $\overline{CE}$ ) and Output Enable ( $\overline{OE}$ ) LOW while forcing Write Enable ( $\overline{WE}$ ) HIGH. Under these conditions, the contents of the memory location specified by the address pins will appear on the I/O pins.

The eight input and 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 CY7C1010DV33 is available in 36-pin SOJ and 44-pin TSOP II packages with center power and ground (revolutionary) pinout.

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

## Logic Block Diagram



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### Selection Guide

Description	-10	Unit
Maximum Access Time	10	ns
Maximum Operating Current	90	mA
Maximum CMOS Standby Current	10	mA

### Pin Configuration

Figure 1. 36-pin SOJ pinout [1]

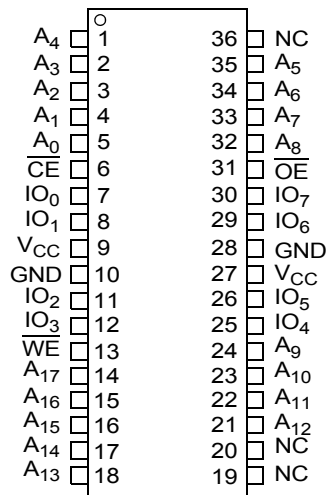
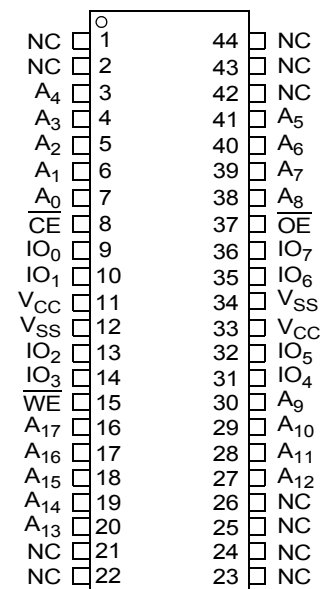


Figure 2. 44-pin TSOP II pinout [1]



**Note**

- 1. NC pins are not connected on the die.

## Maximum Ratings

Exceeding the 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> Relative to GND [2] .....	-0.5 V to +4.6 V
DC Voltage Applied to Outputs in High Z State [2] .....	-0.3 V to V <sub>CC</sub> + 0.3 V

DC Input Voltage [2] .....	-0.3 V to V <sub>CC</sub> + 0.3 V
Current into Outputs (LOW) .....	20 mA
Static Discharge Voltage (MIL-STD-883, Method 3015) .....	> 2001 V
Latch Up Current .....	> 200 mA

## Operating Range

Range	Ambient Temperature	V <sub>CC</sub>
Industrial	-40 °C to +85 °C	3.3V ± 0.3V

## Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions	-10		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 [2]		-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>OUT</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, f = f <sub>MAX</sub> = 1/t <sub>RC</sub>	100 MHz	-	90	mA
			83 MHz	-	80	
			66 MHz	-	70	
			40 MHz	-	60	
I <sub>SB1</sub>	Automatic CE Power-down Current – TTL Inputs	Max V <sub>CC</sub> , $\overline{CE} \geq V_{IH}$ ; V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub>	-	20	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, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3 V, or V <sub>IN</sub> ≤ 0.3 V, f = 0	-	10	mA	

### Note

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

### Capacitance

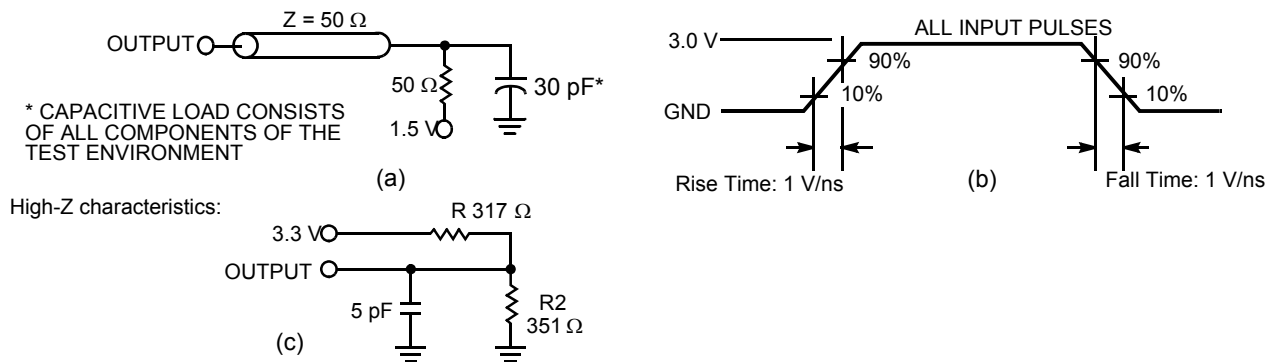
Parameter <sup>[3]</sup>	Description	Test Conditions	36-pin SOJ	44-pin TSOP II	Unit
C <sub>IN</sub>	Input capacitance	T <sub>A</sub> = 25 °C, f = 1 MHz, V <sub>CC</sub> = 3.3 V	8	8	pF
C <sub>OUT</sub>	I/O capacitance		8	8	pF

### Thermal Resistance

Parameter <sup>[3]</sup>	Description	Test Conditions	36-pin SOJ	44-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	59.17	50.66	°C/W
Θ <sub>JC</sub>	Thermal resistance (junction to case)		32.63	17.77	°C/W

### AC Test Loads and Waveforms

Figure 3. 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) are tested using the load conditions shown in Figure 3 (a). High-Z characteristics are tested for all speeds using the test load shown in Figure 3 (c).

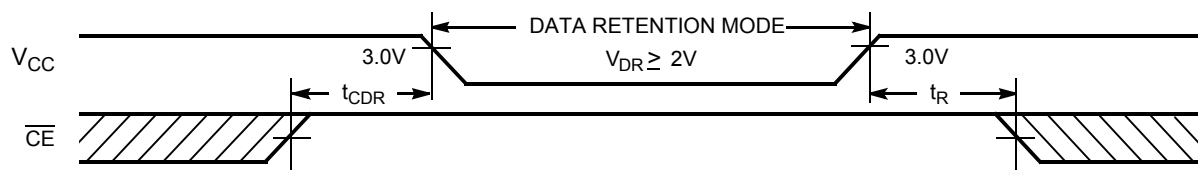
## Data Retention Characteristics

Over the Operating Range

Parameter <sup>[5]</sup>	Description	Conditions	Min	Max	Unit
$V_{DR}$	$V_{CC}$ for Data Retention		2	–	V
$I_{CCDR}$	Data Retention Current	$V_{CC} = V_{DR} = 2.0\text{ V}$ , $\overline{CE} \geq V_{CC} - 0.3\text{ V}$ , $V_{IN} \geq V_{CC} - 0.3\text{ V}$ or $V_{IN} \leq 0.3\text{ V}$	–	10	mA
$t_{CDR}$ <sup>[6]</sup>	Chip Deselect to Data Retention Time		0	–	ns
$t_R$ <sup>[7]</sup>	Operation Recovery Time		$t_{RC}$	–	ns

## Data Retention Waveform

Figure 4. Data Retention Waveform



### Notes

5. No inputs may exceed  $V_{CC} + 0.3\text{ V}$ .
6. Tested initially and after any design or process changes that may affect these parameters.
7. Full device operation requires linear  $V_{CC}$  ramp from  $V_{DR}$  to  $V_{CC(\text{min.})} \geq 50\ \mu\text{s}$  or stable at  $V_{CC(\text{min.})} \geq 50\ \mu\text{s}$ .

## AC Switching Characteristics

Over the Operating Range

Parameter <sup>[8]</sup>	Description	-10		Unit
		Min	Max	
<b>Read Cycle</b>				
$t_{power}^{[9]}$	$V_{CC}$ (typical) to the first access	100	–	$\mu$ s
$t_{RC}$	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>[10]</sup>	0	–	ns
$t_{HZOE}$	$\overline{OE}$ HIGH to High Z <sup>[10, 11]</sup>	–	5	ns
$t_{LZCE}$	$\overline{CE}$ LOW to Low Z <sup>[10]</sup>	3	–	ns
$t_{HZCE}$	$\overline{CE}$ HIGH to High Z <sup>[10, 11]</sup>	–	5	ns
$t_{PU}$	$\overline{CE}$ LOW to Power-up	0	–	ns
$t_{PD}$	$\overline{CE}$ HIGH to Power-down	–	10	ns
<b>Write Cycle<sup>[12, 13]</sup></b>				
$t_{WC}$	Write Cycle Time	10	–	ns
$t_{SCE}$	$\overline{CE}$ LOW to Write End	7	–	ns
$t_{AW}$	Address Set-up to Write End	7	–	ns
$t_{HA}$	Address Hold from Write End	0	–	ns
$t_{SA}$	Address Set-up to Write Start	0	–	ns
$t_{PWE}$	$\overline{WE}$ Pulse Width	7	–	ns
$t_{SD}$	Data Set-up to Write End	5	–	ns
$t_{HD}$	Data Hold from Write End	0	–	ns
$t_{LZWE}$	$\overline{WE}$ HIGH to Low Z <sup>[10]</sup>	3	–	ns
$t_{HZWE}$	$\overline{WE}$ LOW to High Z <sup>[10, 11]</sup>	–	5	ns

### Notes

8. 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.
9.  $t_{POWER}$  gives the minimum amount of time that the power supply should be at stable, typical  $V_{CC}$  values until the first memory access can be performed.
10. 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.
11.  $t_{HZOE}$ ,  $t_{HZCE}$ , and  $t_{HZWE}$  are specified with a load capacitance of 5 pF as in part (d) of Figure 3 on page 5. Transition is measured when the outputs enter a high impedance state.
12. 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 either 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.
13. 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

Figure 5. Read Cycle No. 1 [14, 15]

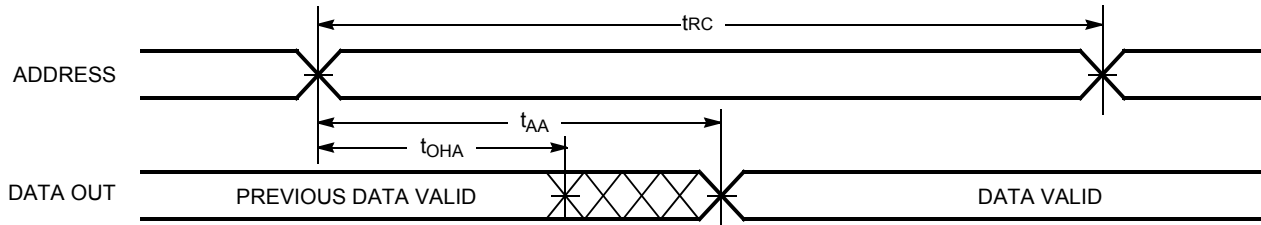
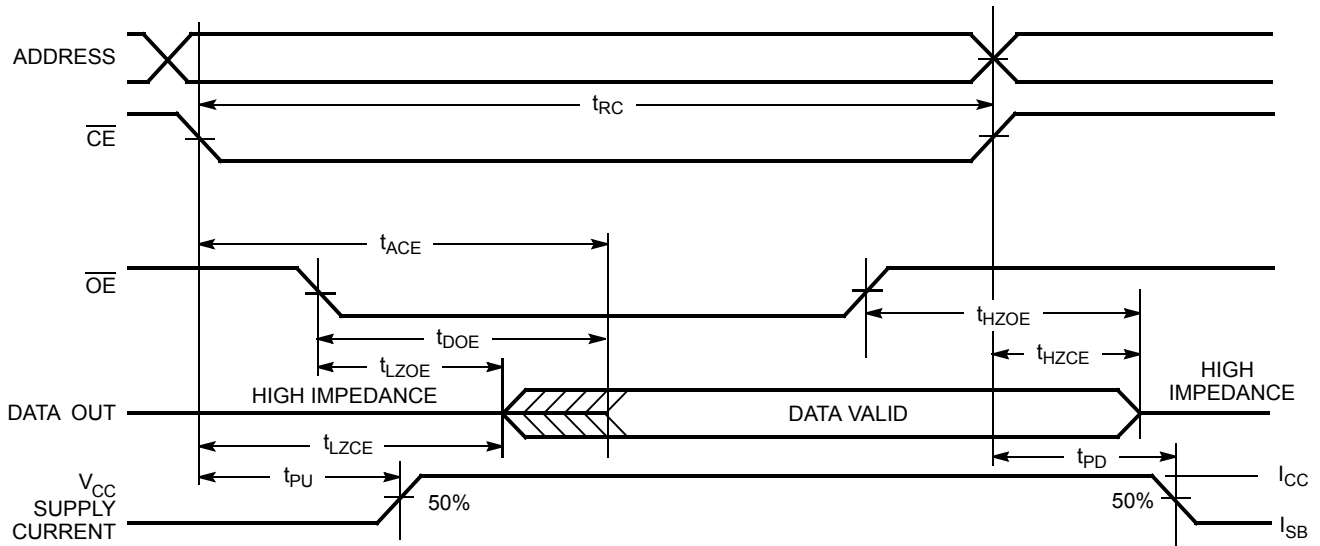


Figure 6. Read Cycle No. 2 ( $\overline{OE}$  Controlled) [15, 16]



**Notes**

- 14. The device is continuously selected.  $\overline{OE}, \overline{CE} = V_{IL}$ .
- 15.  $\overline{WE}$  is HIGH for read cycle.
- 16. Address valid before or similar to  $\overline{CE}$  transition LOW.



Switching Waveforms (continued)

Figure 7. Write Cycle No. 1 ( $\overline{WE}$  Controlled,  $\overline{OE}$  HIGH During Write) [17, 18]

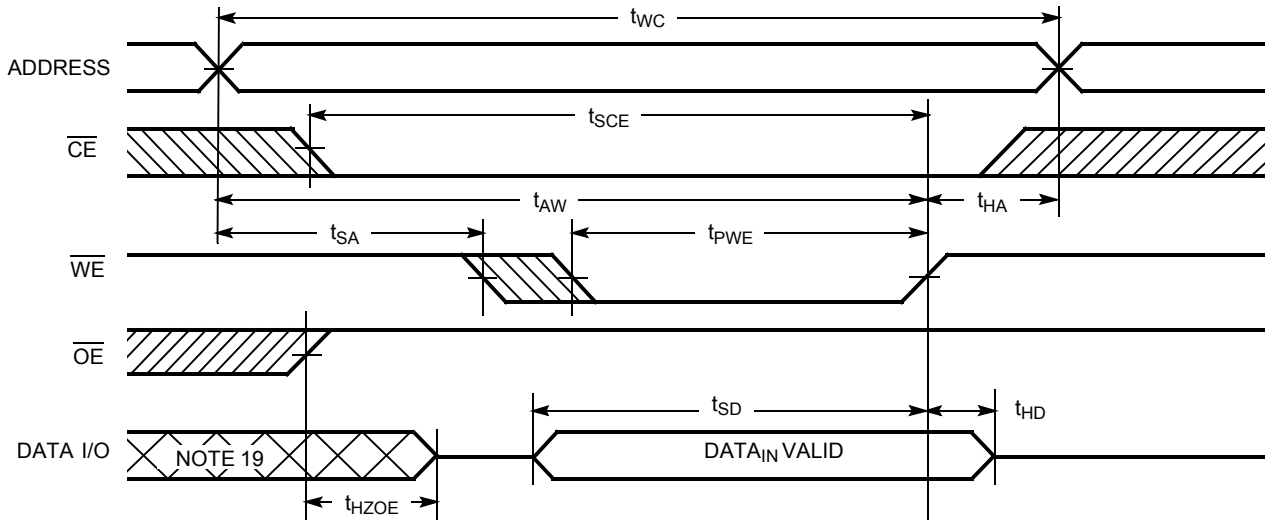
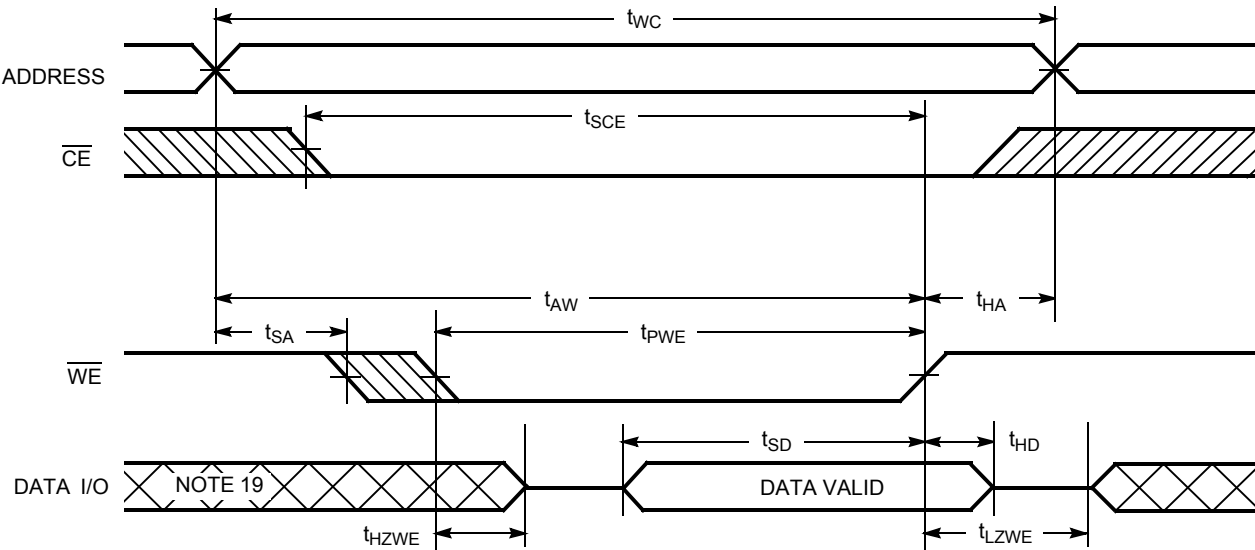


Figure 8. Write Cycle No. 2 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW) [18]



Notes

- 17. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .
- 18. If  $\overline{CE}$  goes HIGH simultaneously with  $\overline{WE}$  going HIGH, the output remains in a high impedance state.
- 19. During this period, the I/Os are in output state and input signals should not be applied.

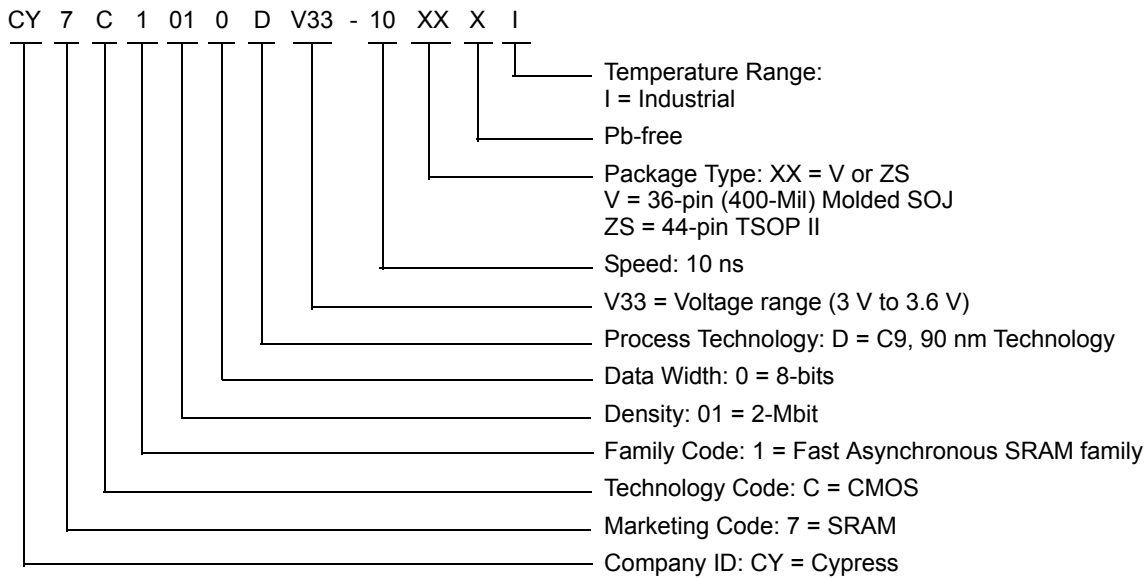
**Truth Table**

$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	I/O <sub>0</sub> -I/O <sub>7</sub>	I/O <sub>8</sub> -I/O <sub>15</sub>	Mode	Power
H	X	X	High Z	High Z	Power Down	Standby (I <sub>SB</sub> )
L	L	H	Data Out	Data Out	Read All Bits	Active (I <sub>CC</sub> )
L	X	L	Data In	Data In	Write All Bits	Active (I <sub>CC</sub> )
L	H	H	High Z	High Z	Selected, Outputs Disabled	Active (I <sub>CC</sub> )

### Ordering Information

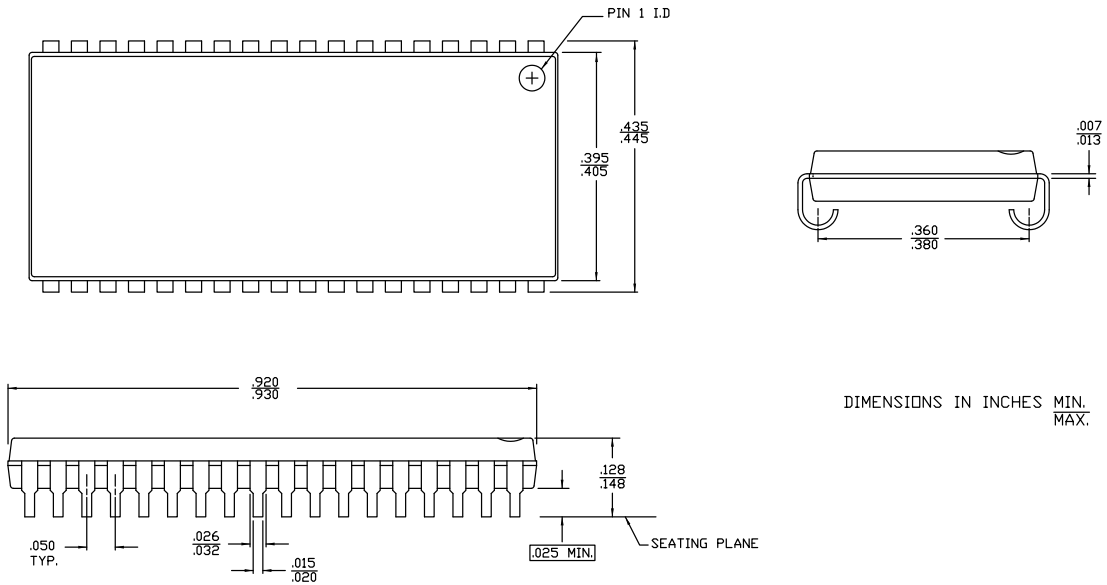
Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
10	CY7C1010DV33-10VXI	51-85090	36-pin (400-Mil) Molded SOJ (Pb-free)	Industrial
	CY7C1010DV33-10ZSXI	51-85087	44-pin TSOP II (Pb-free)	

### Ordering Code Definitions



Package Diagrams

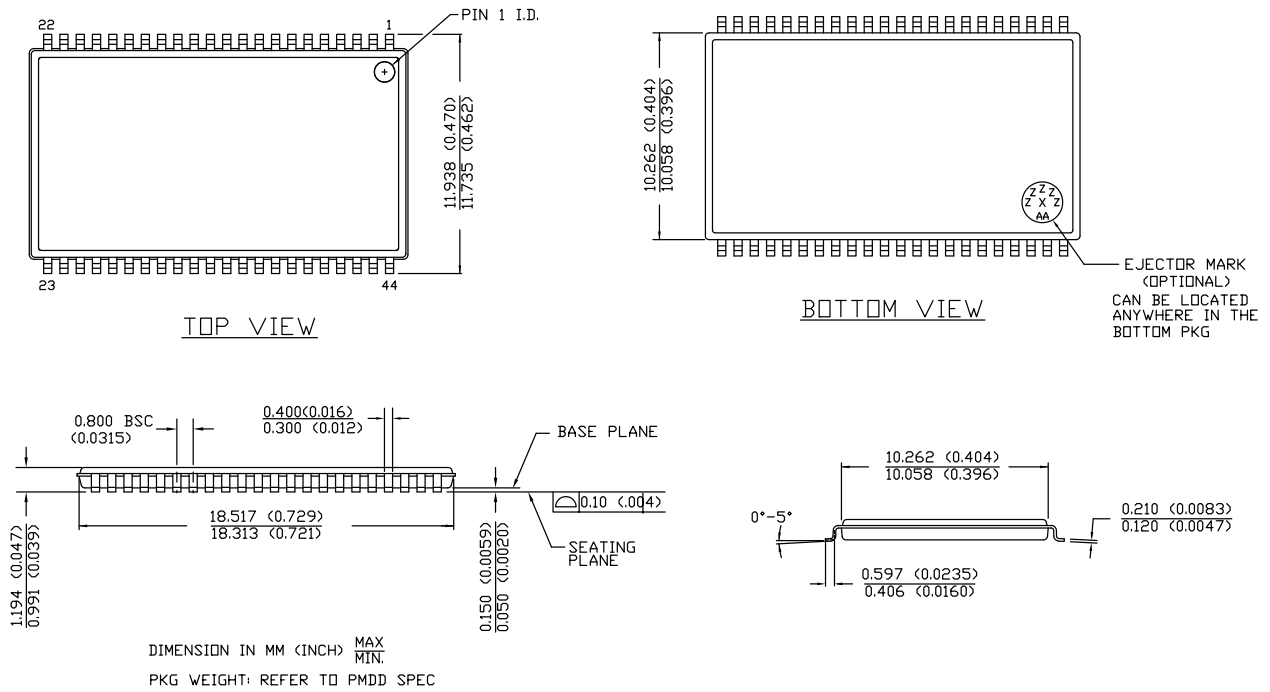
Figure 9. 36-pin SOJ V36.4 (Molded) Package Outline, 51-85090



51-85090 \*F

Package Diagrams (continued)

Figure 10. 44-pin TSOP Z44-II Package Outline, 51-85087



51-85087 \*E

### Acronyms

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

### Document Conventions

#### Units of Measure

Symbol	Unit of Measure
°C	degree Celsius
MHz	megahertz
μA	microampere
μs	microsecond
mA	milliampere
mm	millimeter
mW	milliwatt
ns	nanosecond
Ω	ohm
%	percent
pF	picofarad
V	volt
W	watt

Document History Page

Document Title: CY7C1010DV33, 2-Mbit (256 K × 8) Static RAM Document Number: 001-00062				
Rev.	ECN No.	Submission Date	Orig. of Change	Description of Change
**	342195	See ECN	PCI	New data sheet.
*A	459073	See ECN	NXR	Converted Preliminary to Final. Removed Commercial Operating Range from product offering. Removed -8 ns and -12 speed bin Removed the Pin definitions table. Modified Maximum Ratings for DC input voltage from -0.5V to -0.3V and V <sub>CC</sub> + 0.5V to V <sub>CC</sub> + 0.3V Changed I <sub>CC</sub> max from 65 mA to 90 mA Changed the description of I <sub>LX</sub> from "Input Load Current" to "Input Leakage Current" Updated the Thermal Resistance table. Updated footnote #7 on High-Z parameter measurement Added footnote #12 Updated the Ordering Information and replaced Package Name column with Package Diagram in the Ordering Information table.
*B	2602853	11/07/08	VKN / PYRS	Added 36-pin SOJ package and its related information
*C	3059211	10/14/2010	PRAS	Added <a href="#">Ordering Code Definitions</a> . Updated <a href="#">Package Diagrams</a> .
*D	3272897	06/07/2011	AJU	Updated <a href="#">Functional Description</a> (Removed "Refer to the Cypress application note AN1064, SRAM System Guidelines for best practice recommendations."). Added <a href="#">Acronyms</a> and <a href="#">Units of Measure</a> . Updated in new template.
*E	4207615	12/02/2013	MEMJ	Updated <a href="#">Package Diagrams</a> : spec 51-85090 – Changed revision from *E to *F. spec 51-85087 – Changed revision from *C to *E. Updated in new template. Completing Sunset Review.
*F	4574311	11/19/2014	MEMJ	Added related documentation hyperlink in page 1.

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