CY7C1010DV33

2-Mbit (256 K × 8) Static RAM

Features

- Pin and function compatible with CY7C1010CV33
- High speed
  - t_{AA} = 10 ns
- Low active power
  - I_{CC} = 90 mA at 10 ns
- Low CMOS standby power
  - I_{SB2} = 10 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

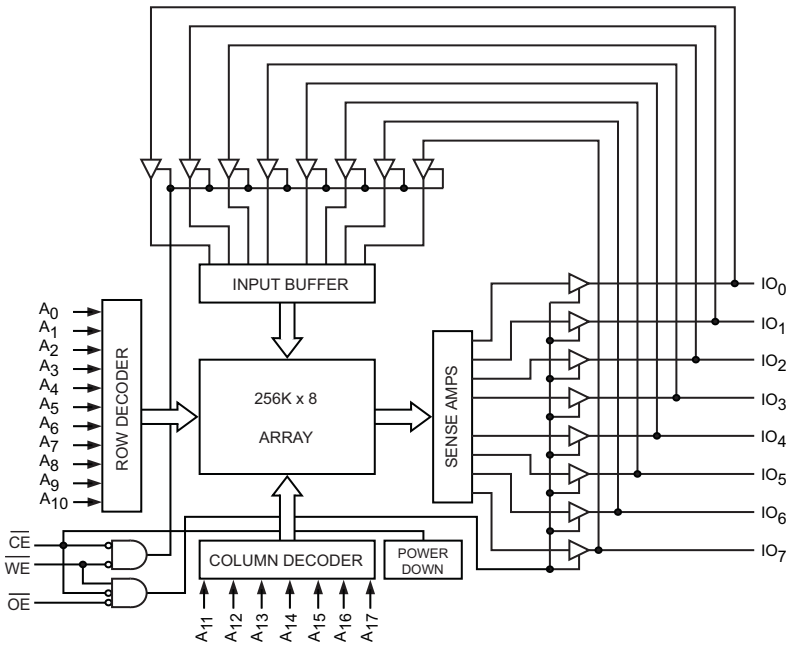
The CY7C1010DV33 is a high performance CMOS Static RAM organized as 256 K words by 8 bits. Easy memory expansion is provided by an active LOW Chip Enable ($\overline{CE}$), an active LOW Output Enable ($\overline{OE}$), and three-state drivers. Writing to the device is accomplished by taking Chip Enable ($\overline{CE}$) 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.

Logic Block Diagram



Contents

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 [1]

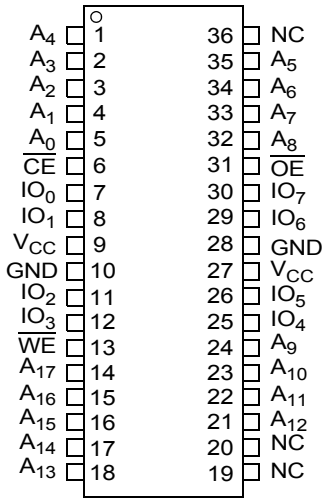
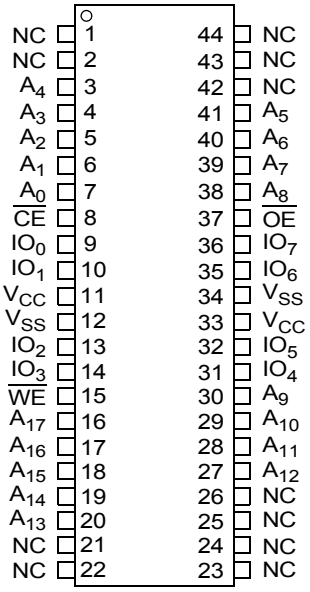


Figure 2. 44-pin TSOP II [1]



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_{CC} 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_{CC} + 0.3 V

DC Input Voltage [2] ..... –0.3 V to V_{CC} + 0.3 V

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

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

Latch Up Current ..... > 200 mA

Operating Range

Range	Ambient Temperature	V_{CC}
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_{OH}	Output HIGH Voltage	V_{CC} = Min; I_{OH} = –4.0 mA		2.4	–	V
V_{OL}	Output LOW Voltage	V_{CC} = Min; I_{OL} = 8.0 mA		–	0.4	V
V_{IH}	Input HIGH Voltage			2.0	V_{CC} + 0.3	V
V_{IL}	Input LOW Voltage[2]			–0.3	0.8	V
I_{IX}	Input Leakage Current	GND ≤ V_I ≤ V_{CC}		–1	+1	µA
I_{OZ}	Output Leakage Current	GND ≤ V_{OUT} ≤ V_{CC}, Output Disabled		–1	+1	µA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = Max, f = f_{MAX} = $1/t_{RC}$	100 MHz	–	90	mA
			83 MHz	–	80	
			66 MHz	–	70	
			40 MHz	–	60	
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}		–	20	mA
I_{SB2}	Automatic CE Power-down Current —CMOS Inputs	Max V_{CC}, $\overline{CE}$ ≥ V_{CC} – 0.3 V, V_{IN} ≥ V_{CC} – 0.3 V, or V_{IN} ≤ 0.3 V, f = 0		–	10	mA

Capacitance

Parameter [3]	Description	Test Conditions	36-pin SOJ	44-pin TSOP II	Unit
C_{IN}	Input Capacitance	T_A = 25°C, f = 1 MHz, V_{CC} = 3.3V	8	8	pF
C_{OUT}	IO Capacitance		8	8	pF

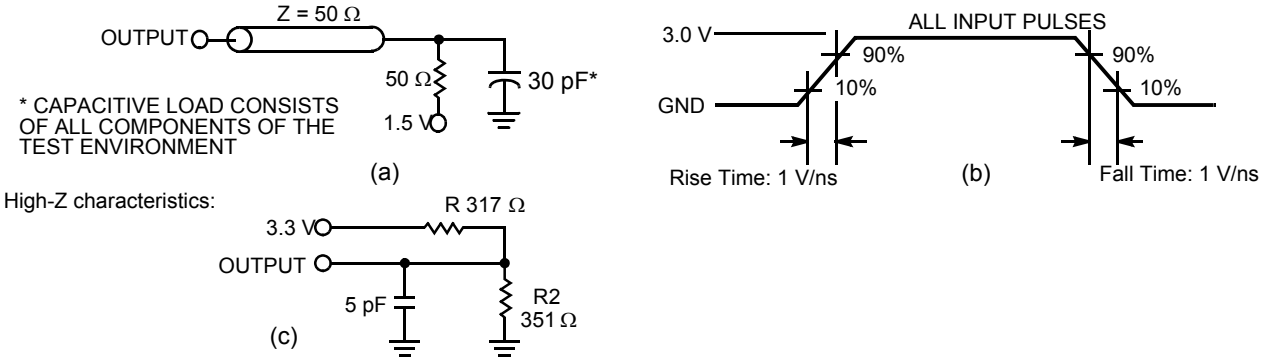
Thermal Resistance

Parameter [3]	Description	Test Conditions	36-pin SOJ	44-pin TSOP II	Unit
Θ_{JA}	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_{JC}	Thermal Resistance (Junction to Case)		32.63	17.77	°C/W

Notes
2. V_{IL} (min.) = –2.0V and V_{IH} (max.) = V_{CC} + 2.0V for pulse durations of less than 20 ns.
3. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms

Figure 3. AC Test Loads and Waveforms[4]



Note

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).

AC Switching Characteristics

Over the Operating Range

Parameter [5]	Description	-10		Unit
		Min	Max	
Read Cycle				
t_{power}[6]	V_{CC}(typical) to the first access	100	–	µs
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 [7]	0	–	ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z[7, 8]	–	5	ns
t_{LZCE}	$\overline{CE}$ LOW to Low Z[7]	3	–	ns
t_{HZCE}	$\overline{CE}$ HIGH to High Z[7, 8]	–	5	ns
t_{PU}	$\overline{CE}$ LOW to Power-up	0	–	ns
t_{PD}	$\overline{CE}$ HIGH to Power-down	–	10	ns
Write Cycle[9, 10]				
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[7]	3	–	ns
t_{HZWE}	$\overline{WE}$ LOW to High Z[7, 8]	–	5	ns

Notes

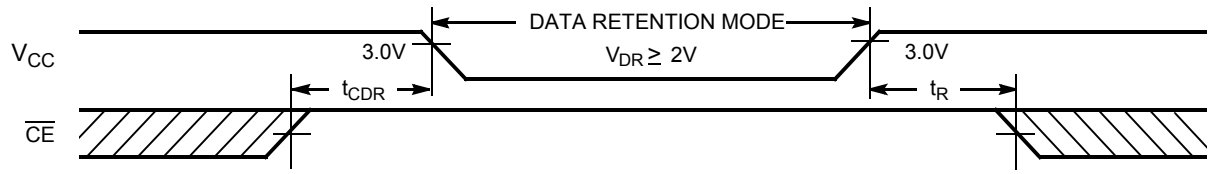
5. Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5 V, input pulse levels of 0 to 3.0 V.
6. t_{POWER} gives the minimum amount of time that the power supply should be at stable, typical V_{CC} values until the first memory access can be performed.
7. At any 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. 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.
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 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.
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}.

Data Retention Characteristics

Over the Operating Range

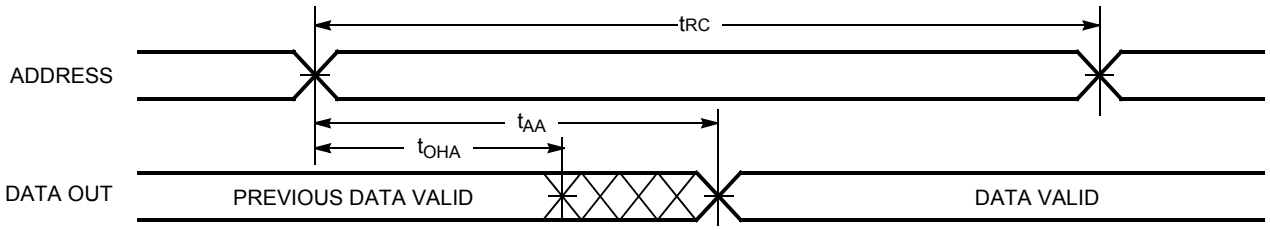
Parameter [11]	Description	Conditions	Min	Max	Unit
V_{DR}	V_{CC} for Data Retention		2	–	V
I_{CCDR}	Data Retention Current	$V_{CC} = V_{DR} = 2.0$ V, $\overline{CE} \geq V_{CC} - 0.3$ V, $V_{IN} \geq V_{CC} - 0.3$ V or $V_{IN} \leq 0.3$ V	–	10	mA
t_{CDR} [12]	Chip Deselect to Data Retention Time		0	–	ns
t_R [13]	Operation Recovery Time		t_{RC}	–	ns

Data Retention Waveform



Switching Waveforms

Figure 4. Read Cycle No. 1 [14, 15]



Notes
11. No inputs may exceed V_{CC} + 0.3 V.
12. Tested initially and after any design or process changes that may affect these parameters.
13. Full device operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(min.)} \geq 50$ µs or stable at $V_{CC(min.)} \geq 50$ µs.
14. The device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}.
15. $\overline{WE}$ is HIGH for read cycle.

Switching Waveforms (continued)

Figure 5. Read Cycle No. 2 ($\overline{OE}$ Controlled) [16, 17]

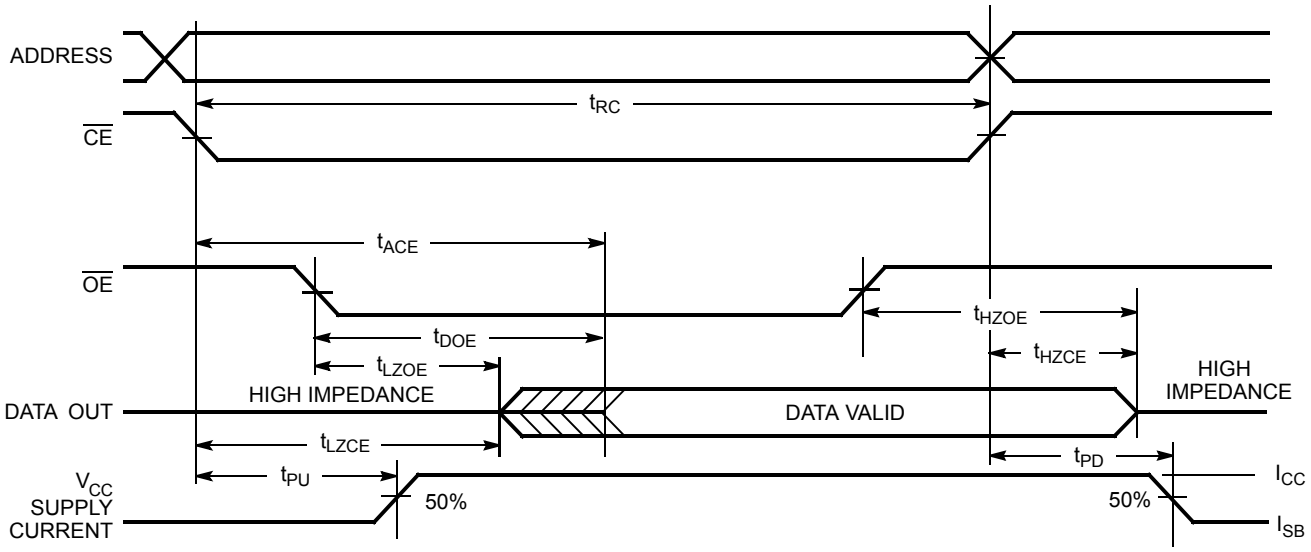
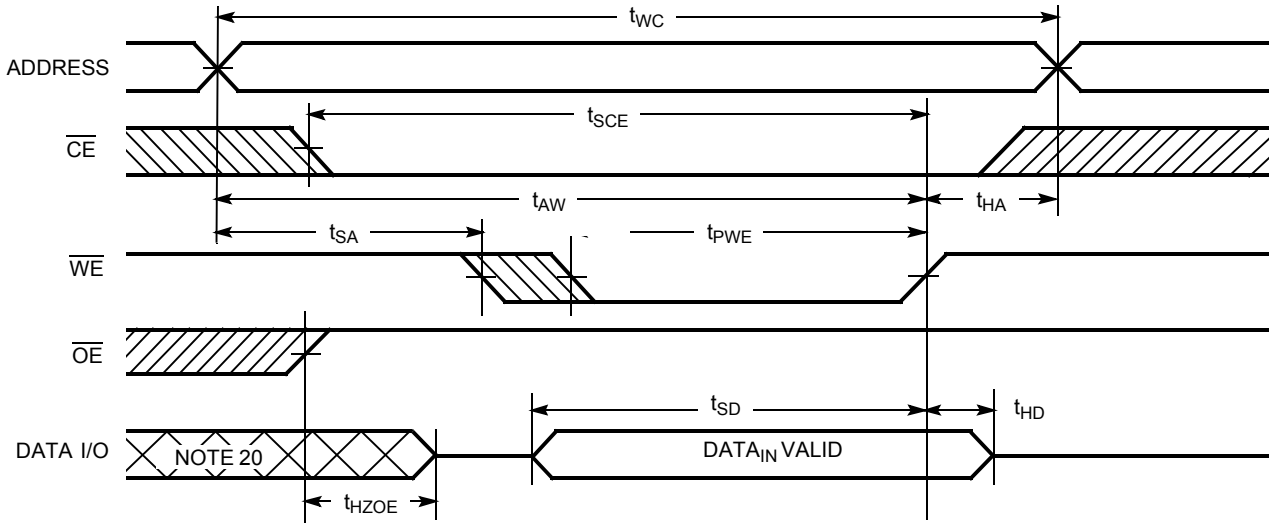


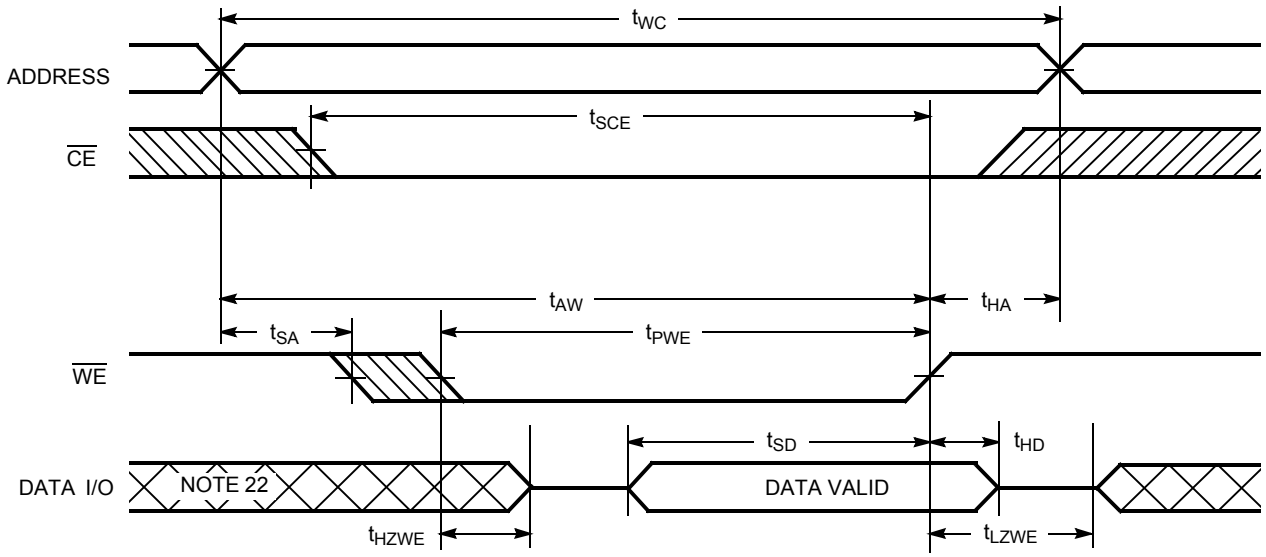
Figure 6. Write Cycle No. 1 ($\overline{WE}$ Controlled, $\overline{OE}$ HIGH During Write) [18, 19]



Notes
16. $\overline{WE}$ is HIGH for read cycle.
17. Address valid before or similar to $\overline{CE}$ transition LOW.
18. Data IO is high impedance if $\overline{OE}$ = V_{IH}.
19. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ going HIGH, the output remains in a high impedance state.
20. During this period, the I/Os are in output state and input signals should not be applied.

Switching Waveforms (continued)

Figure 7. Write Cycle No. 2 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW) [21]



Truth Table

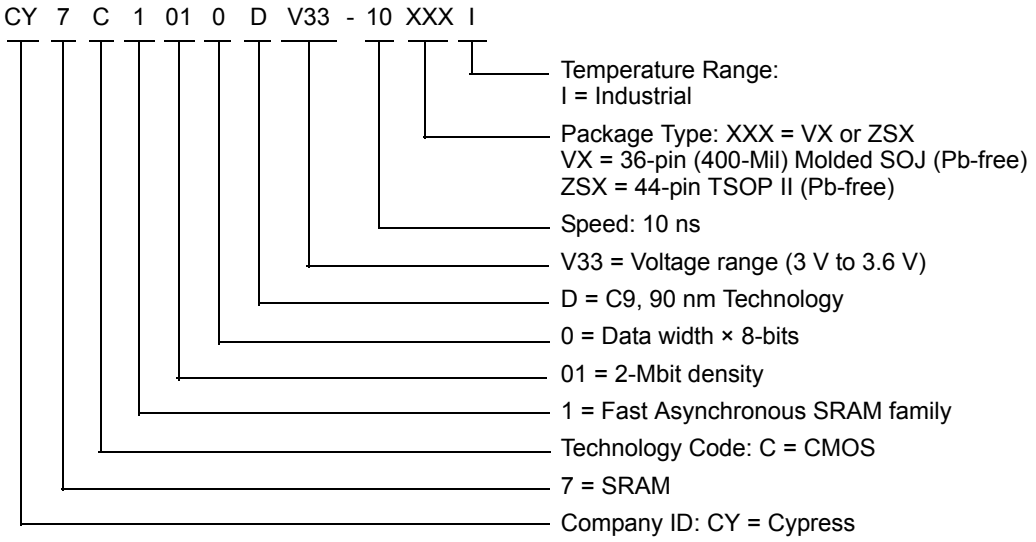
$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	IO_0–IO_7	IO_8–IO_{15}	Mode	Power
H	X	X	High Z	High Z	Power Down	Standby (I_{SB})
L	L	H	Data Out	Data Out	Read All Bits	Active (I_{CC})
L	X	L	Data In	Data In	Write All Bits	Active (I_{CC})
L	H	H	High Z	High Z	Selected, Outputs Disabled	Active (I_{CC})

Notes
21. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ going HIGH, the output remains in a high impedance state.
22. During this period, the I/Os are in output state and input signals should not be applied.

Ordering Information

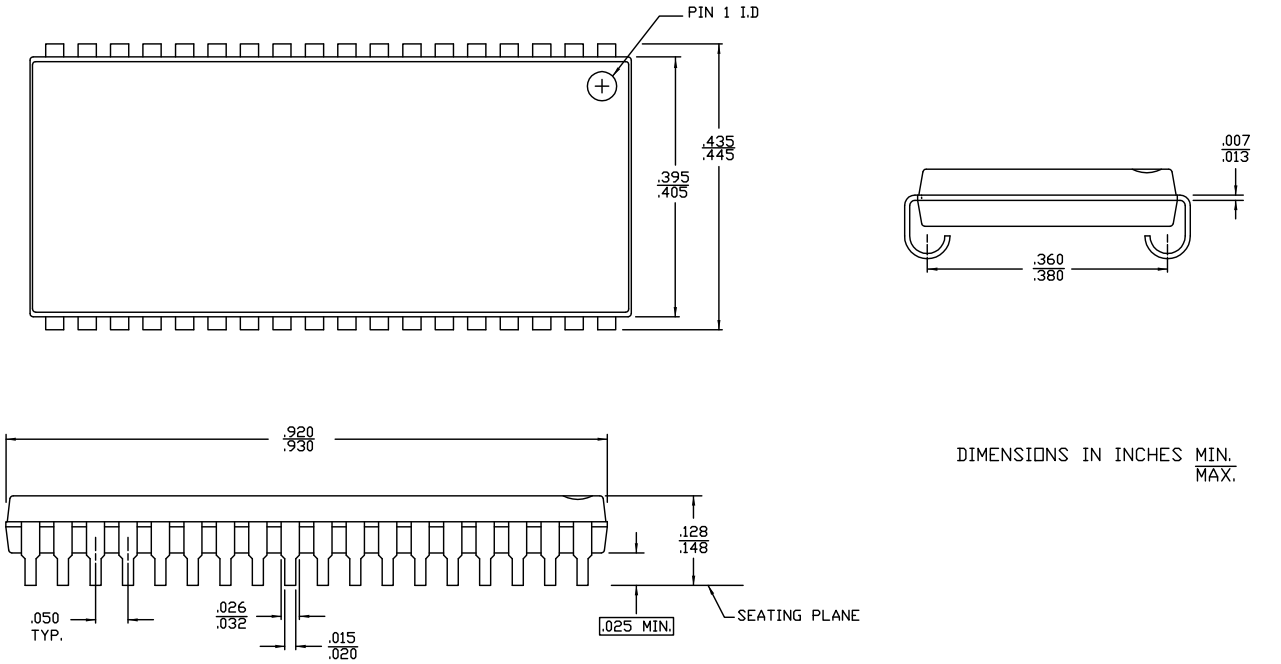
Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
10	CY7C1010DV33-10VXI	51-85090	36-pin (400-Mil) Molded SOJ (Pb-free)	Industrial
	CY7C1010DV33-10ZSXI	51-85087	44-pin TSOP II (Pb-free)	

Ordering Code Definitions



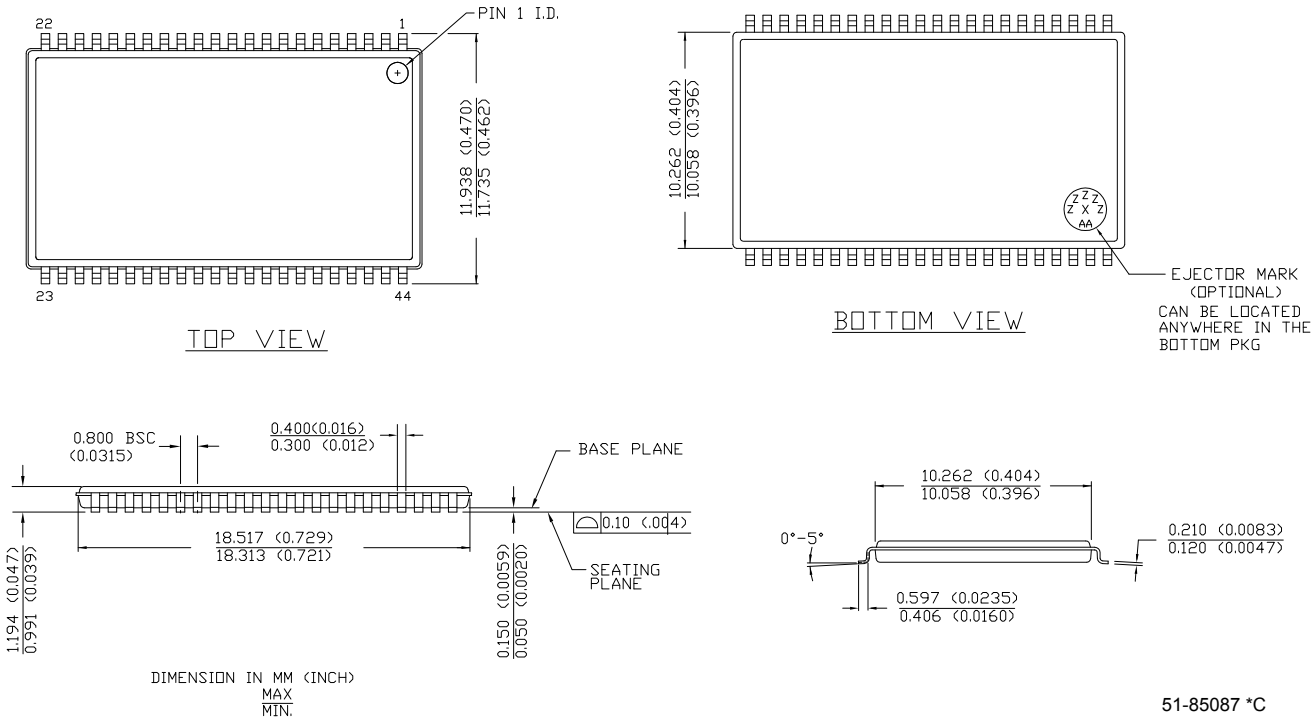
Package Diagrams

Figure 8. 36-pin (400-Mil) SOJ V36.4 (Molded), 51-85090



Package Diagrams (continued)

Figure 9. 44-pin TSOP Z44-II, 51-85087



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	Mega Hertz
µA	micro Amperes
µs	micro seconds
mA	milli Amperes
mm	milli meter
mW	milli Watts
ns	nano seconds
Ω	ohms
%	percent
pF	pico Farad
V	Volts
W	Watts

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_{CC} + 0.5V to V_{CC} + 0.3V Changed I_{CC} max from 65 mA to 90 mA Changed the description of I_{IX} 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 Ordering Code Definitions. Updated Package Diagrams.
*D	3272897	06/07/2011	AJU	Updated Functional Description (Removed “Refer to the Cypress application note AN1064, SRAM System Guidelines for best practice recommendations.”). Added Acronyms and Units of Measure. Updated in new template.

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