CY7C1018DV33
CY7C1019DV33

1-Mbit (128 K × 8) Static RAM

Features

- Pin- and function-compatible with CY7C1018CV33 and CY7C1019CV33
- High speed
  - t_{AA} = 10 ns
- Low Active Power
  - I_{CC} = 60 mA @ 10 ns
- Low CMOS Standby Power
  - I_{SB2} = 3 mA
- 2.0 V Data retention
- Automatic power-down when deselected
- CMOS for optimum speed/power
- Center power/ground pinout
- Easy memory expansion with $\overline{CE}$ and $\overline{OE}$ options
- Available in Pb-free 32-pin 400-Mil wide Molded SOJ, 32-pin TSOP II and 48-ball VFBGA packages

Functional Description

The CY7C1018DV33/CY7C1019DV33 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.

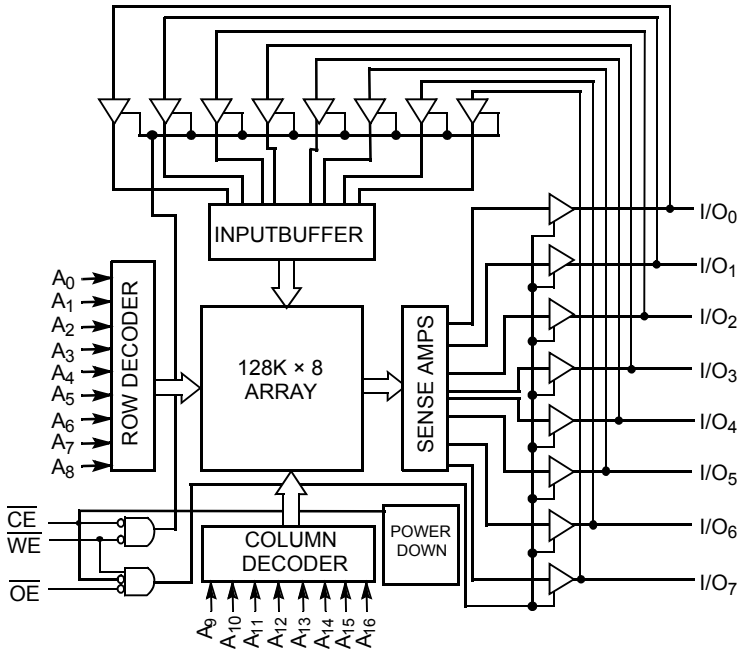
Writing to the device is accomplished by taking Chip Enable ($\overline{CE}$) and Write Enable ($\overline{WE}$) inputs LOW. Data on the eight I/O pins (I/O_0 through I/O_7) is then written into the location specified on the address pins (A_0 through A_{16}).

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 CY7C1018DV33/CY7C1019DV33 are available in Pb-free 32-pin 400-Mil wide Molded SOJ, 32-pin TSOP II and 48-ball VFBGA packages.

Logic Block Diagram



Contents

Selection Guide

Description	-10 (Industrial)	Unit
Maximum Access Time	10	ns
Maximum Operating Current	60	mA
Maximum Standby Current	3	mA

Pin Configurations

Figure 1. 48-ball VFBGA pinout (Top View) [1]

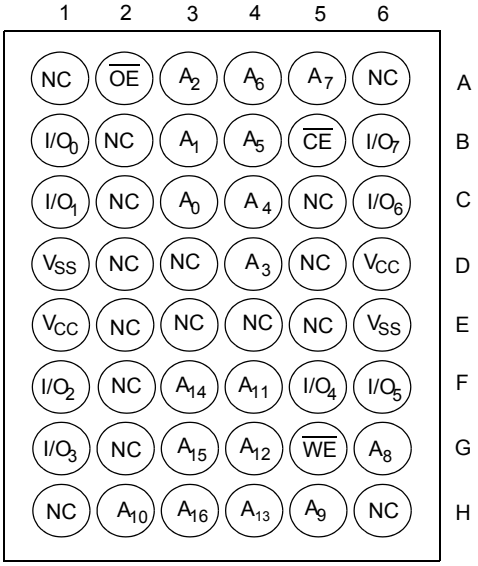
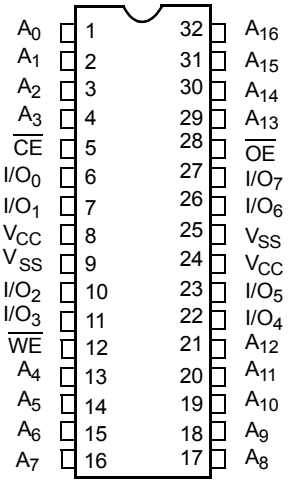


Figure 2. 32-pin SOJ / TSOP II pinout (Top View)



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_{CC} to Relative GND [2] .....–0.3 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 (per MIL-STD-883, Method 3015) ..... > 2001 V

Latch-up Current ..... > 200 mA

Operating Range

Range	Ambient Temperature	V_{CC}	Speed
Industrial	–40 °C to +85 °C	3.3 V ± 0.3 V	10 ns

Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions		-10 (Industrial)		Unit
				Min	Max	
V_{OH}	Output HIGH voltage	Min V_{CC}, I_{OH} = –4.0 mA		2.4	–	V
V_{OL}	Output LOW voltage	Min V_{CC}, 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_{IN} ≤ V_{CC}		–1	+1	µA
I_{OZ}	Output leakage current	GND ≤ V_{IN} ≤ V_{CC}, output disabled		–1	+1	µA
I_{CC}	V_{CC} operating supply current	V_{CC} = Max, I_{OUT} = 0 mA, f = f_{MAX} = $1/t_{RC}$	100 MHz	–	60	mA
			83 MHz	–	55	mA
			66 MHz	–	45	mA
			40 MHz	–	30	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}		–	10	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		–	3	mA

Note
2. $V_{IL(min)}$ = –2.0 V and $V_{IH(max)}$ = V_{CC} + 1 V for pulse durations of less than 5 ns.

Capacitance

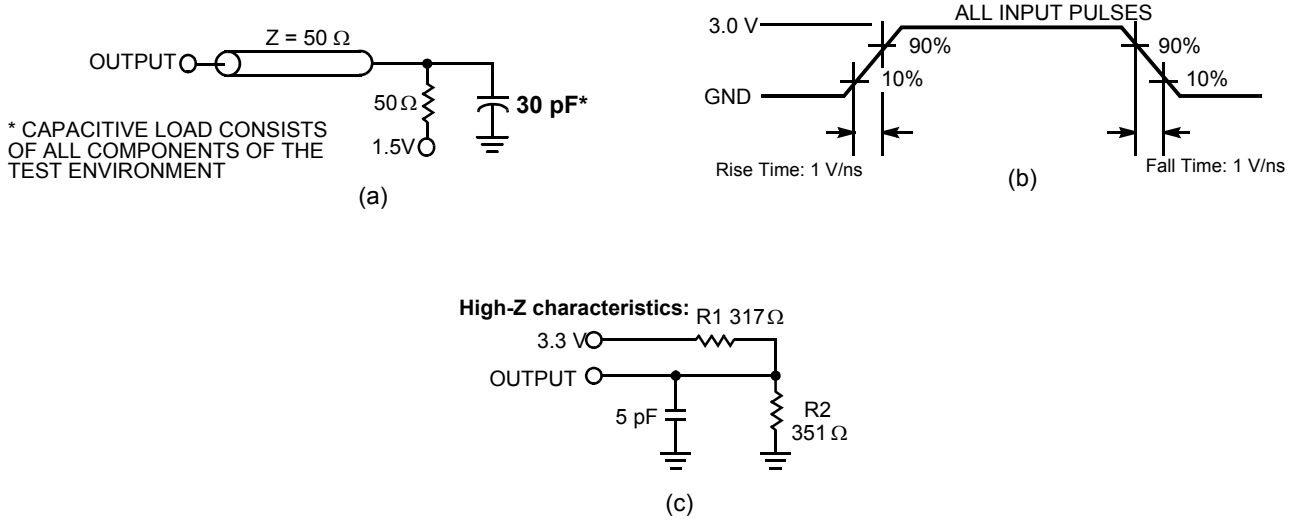
Parameter [3]	Description	Test Conditions	Max	Unit
C_{IN}	Input Capacitance	T_A = 25 °C, f = 1 MHz, V_{CC} = 3.3 V	8	pF
C_{OUT}	Output Capacitance		8	pF

Thermal Resistance

Parameter [3]	Description	Test Conditions	32-pin SOJ	32-pin TSOP II	48-ball VFBGA	Unit
Θ_{JA}	Thermal Resistance (Junction to Ambient)	Still Air, soldered on a 3 × 4.5 inch, four-layer printed circuit board	56.29	62.22	36	°C/W
Θ_{JC}	Thermal Resistance (Junction to Case)		38.14	21.43	9	°C/W

AC Test Loads and Waveforms

Figure 3. AC Test Loads and Waveforms [4]



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).

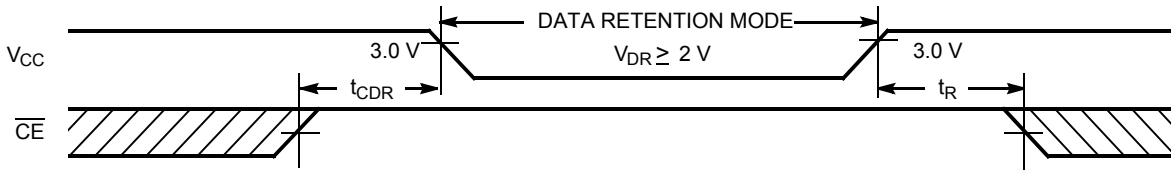
Data Retention Characteristics

Over the Operating Range

Parameter	Description	Conditions	Min	Max	Unit
V_{DR}	V_{CC} for data retention		2.0	–	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	–	3	mA
t_{CDR} [5]	Chip deselect to data retention time		0	–	ns
t_R [6]	Operation recovery time		t_{RC}	–	ns

Data Retention Waveform

Figure 4. Data Retention Waveform



Notes
5. Tested initially and after any design or process changes that may affect these parameters.
6. 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.

Switching Characteristics

Over the Operating Range

Parameter [7]	Description	-10 (Industrial)		Unit
		Min	Max	
Read Cycle				
t_{power} [8]	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 [9]	0	–	ns
t_{HZOE}	$\overline{OE}$ HIGH to high Z [9, 10]	–	5	ns
t_{LZCE}	$\overline{CE}$ LOW to low Z [9]	3	–	ns
t_{HZCE}	$\overline{CE}$ HIGH to high Z [9, 10]	–	5	ns
t_{PU} [11]	$\overline{CE}$ LOW to power-up	0	–	ns
t_{PD} [11]	$\overline{CE}$ HIGH to power-down	–	10	ns
Write Cycle [12, 13]				
t_{WC}	Write cycle time	10	–	ns
t_{SCE}	$\overline{CE}$ LOW to write end	8	–	ns
t_{AW}	Address set-up to write end	8	–	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 [9]	3	–	ns
t_{HZWE}	$\overline{WE}$ LOW to high Z [9, 10]	–	5	ns

Notes

7. 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.
8. t_{POWER} gives the minimum amount of time that the power supply should be at typical V_{CC} values until the first memory access can be performed.
9. 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.
10. t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with a load capacitance of 5 pF as in Figure 3 on page 5 (c). Transition is measured when the outputs enter a high impedance state.
11. This parameter is guaranteed by design and is not tested.
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 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.
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 (Address Transition Controlled) [14, 15]

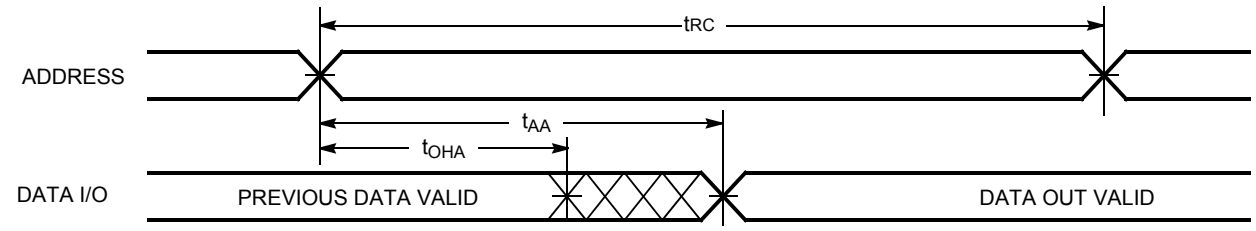
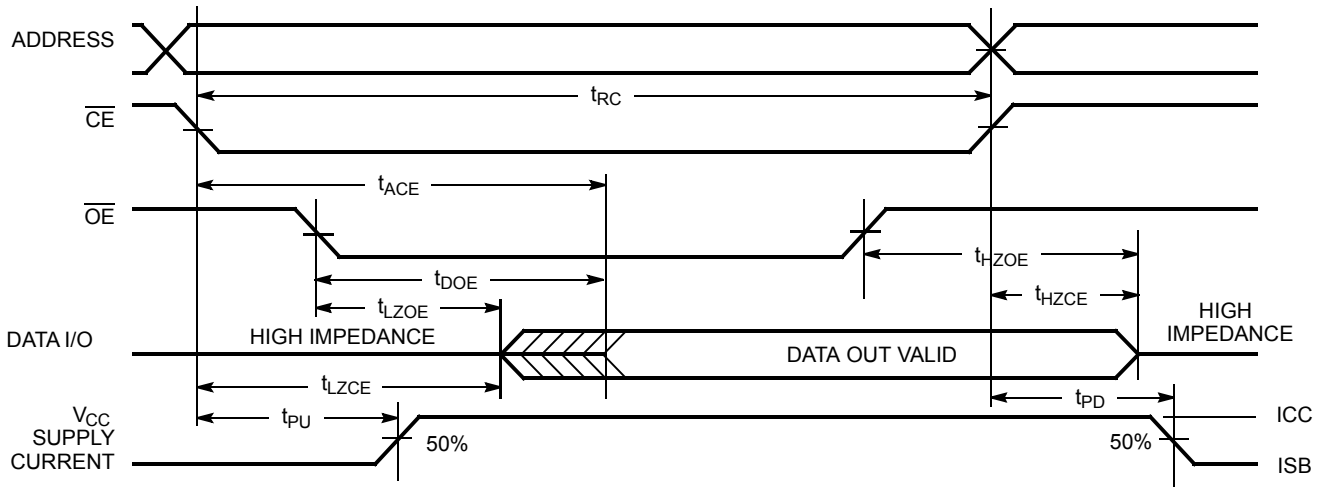


Figure 6. Read Cycle No. 2 ($\overline{OE}$ Controlled) [15, 16]



Notes
14. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}.
15. $\overline{WE}$ is HIGH for Read cycle.
16. Address valid prior to or coincident with $\overline{CE}$ transition LOW.

Switching Waveforms (continued)

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

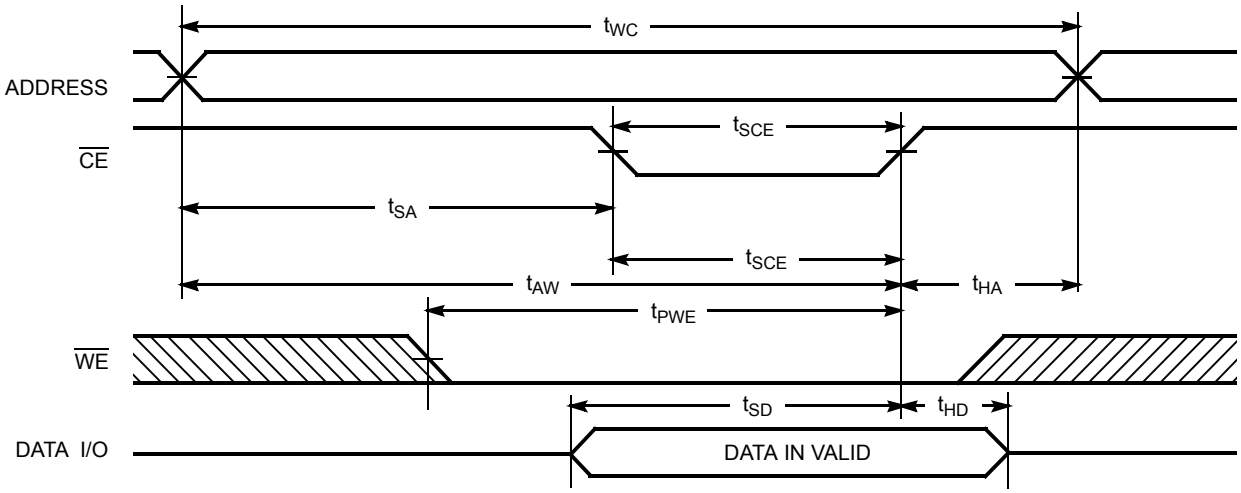
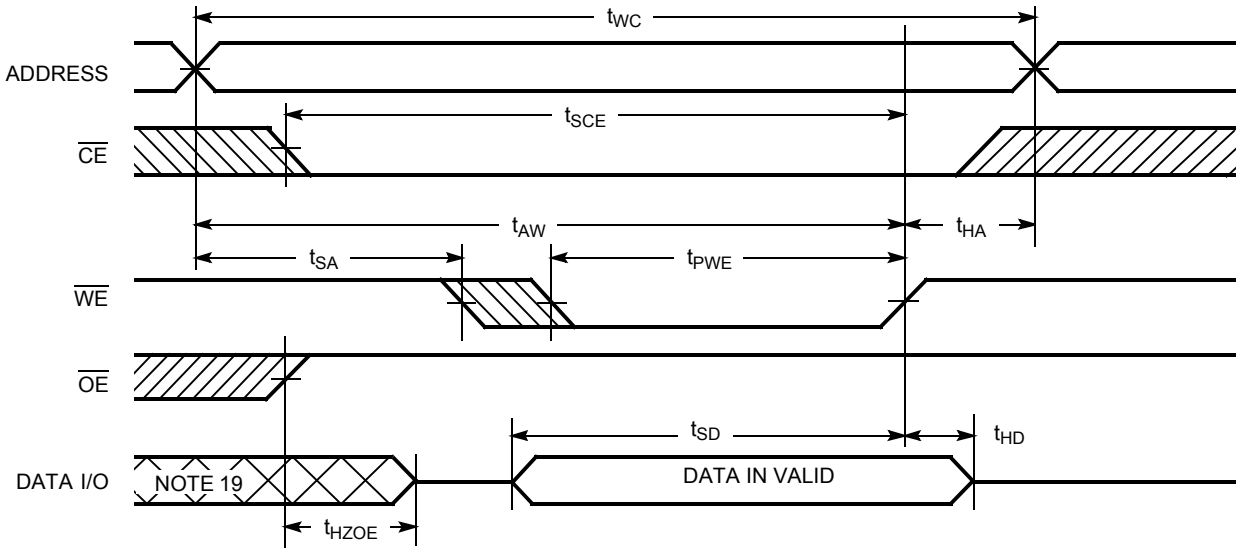


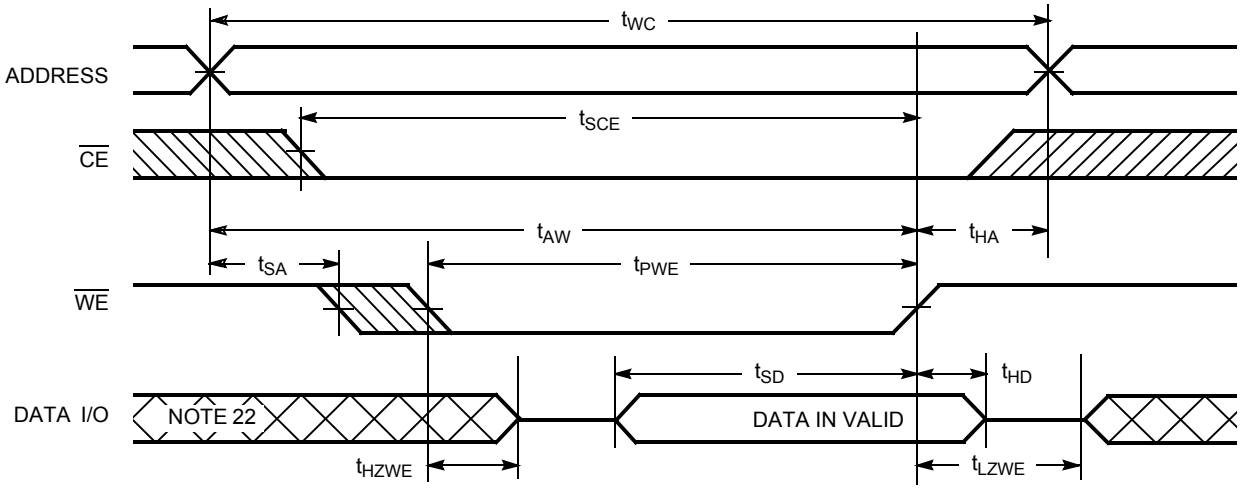
Figure 8. Write Cycle No. 2 ($\overline{WE}$ Controlled, $\overline{OE}$ HIGH During Write) [17, 18]



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 the output state and input signals should not be applied.

Switching Waveforms (continued)

Figure 9. Write Cycle No. 3 (WE Controlled, OE LOW) [20, 21]



Notes
20. If CE goes HIGH simultaneously with WE going HIGH, the output remains in a high-impedance state.
21. The minimum write cycle time for Write Cycle no. 3 (WE controlled, OE LOW) is the sum of t_{HZWE} and t_{SD}.
22. During this period the I/Os are in the output state and input signals should not be applied.

Truth Table

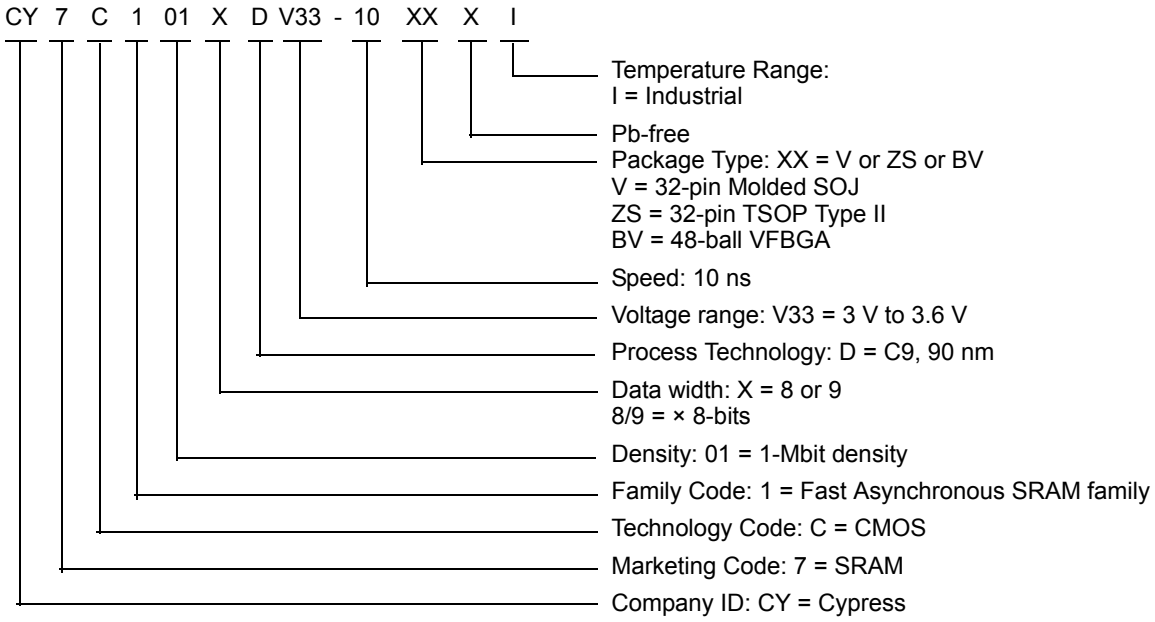
$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	I/O_0–I/O_7	Mode	Power
H	X	X	High Z	Power-Down	Standby (I_{SB})
L	L	H	Data Out	Read	Active (I_{CC})
L	X	L	Data In	Write	Active (I_{CC})
L	H	H	High Z	Selected, Outputs Disabled	Active (I_{CC})

Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
10	CY7C1018DV33-10VXI	51-85041	32-pin (300-Mil) Molded SOJ (Pb-free)	Industrial
	CY7C1019DV33-10VXI	51-85033	32-pin (400-Mil) Molded SOJ (Pb-free)	
	CY7C1019DV33-10ZSXI	51-85095	32-pin TSOP Type II (Pb-free)	
	CY7C1019DV33-10BVXI	51-85150	48-ball VFBGA (Pb-free)	

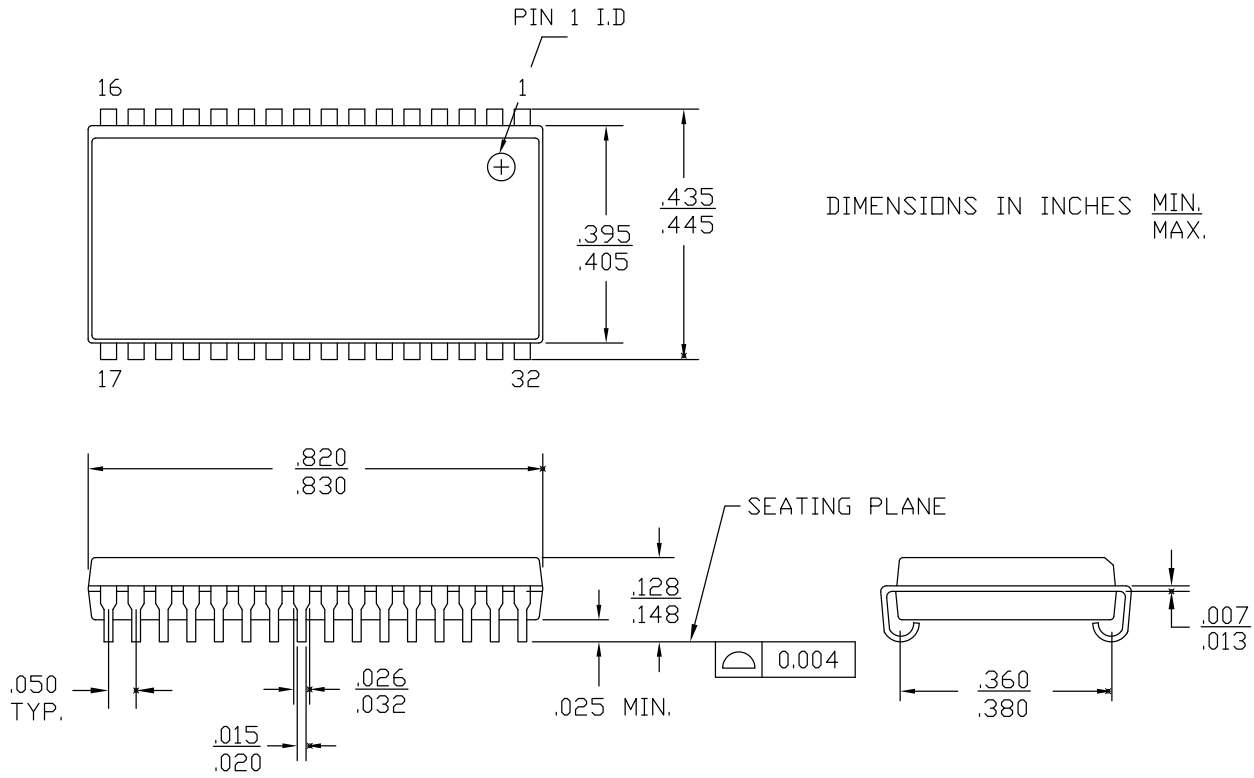
Please contact your local Cypress sales representative for availability of these parts.

Ordering Code Definitions



Package Diagrams

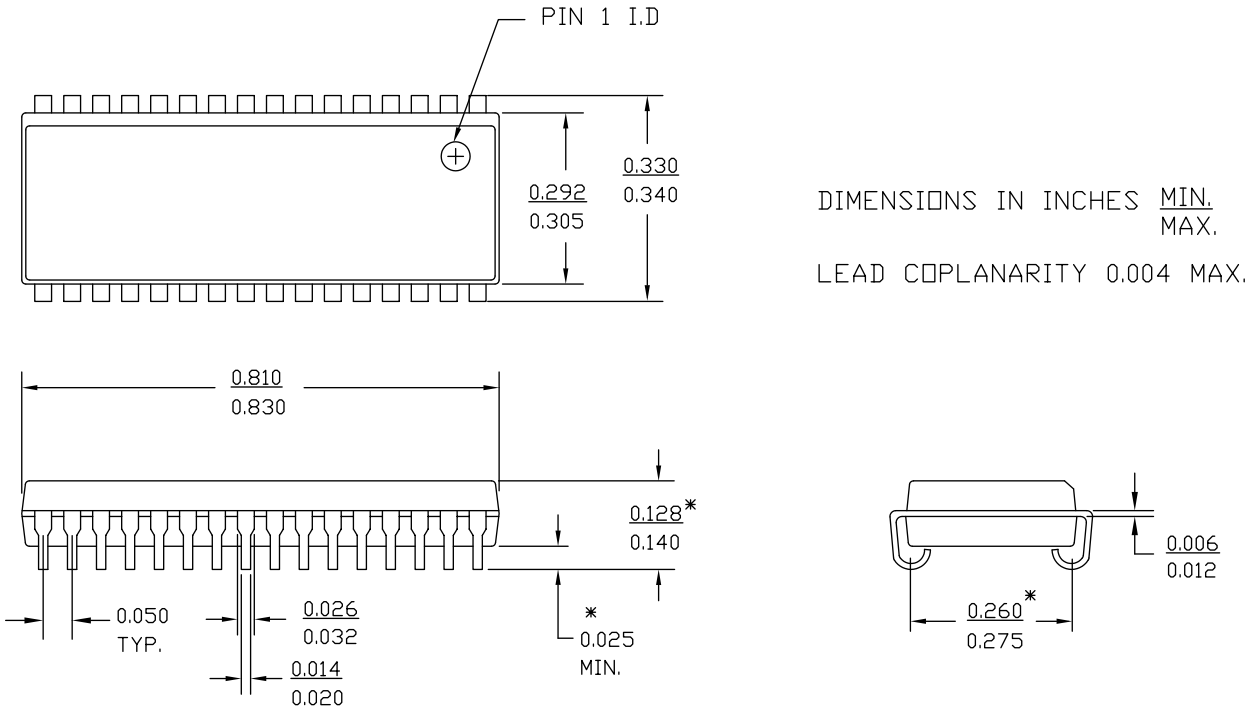
Figure 10. 32-pin SOJ (400 Mils) V32.4 (Molded SOJ V33) Package Outline, 51-85033



51-85033 *E

Package Diagrams (continued)

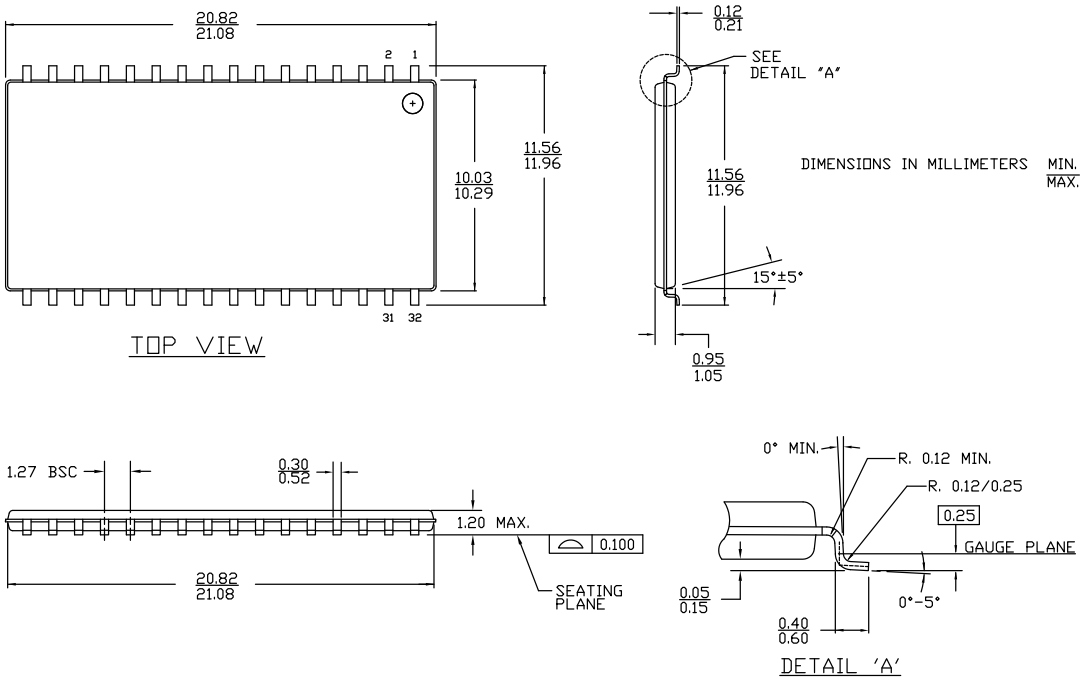
Figure 11. 32-pin SOJ (300 Mils) V32.3 (Catalog 32.3 Molded SOJ) Package Outline, 51-85041



51-85041 Rev. *C

Package Diagrams (continued)

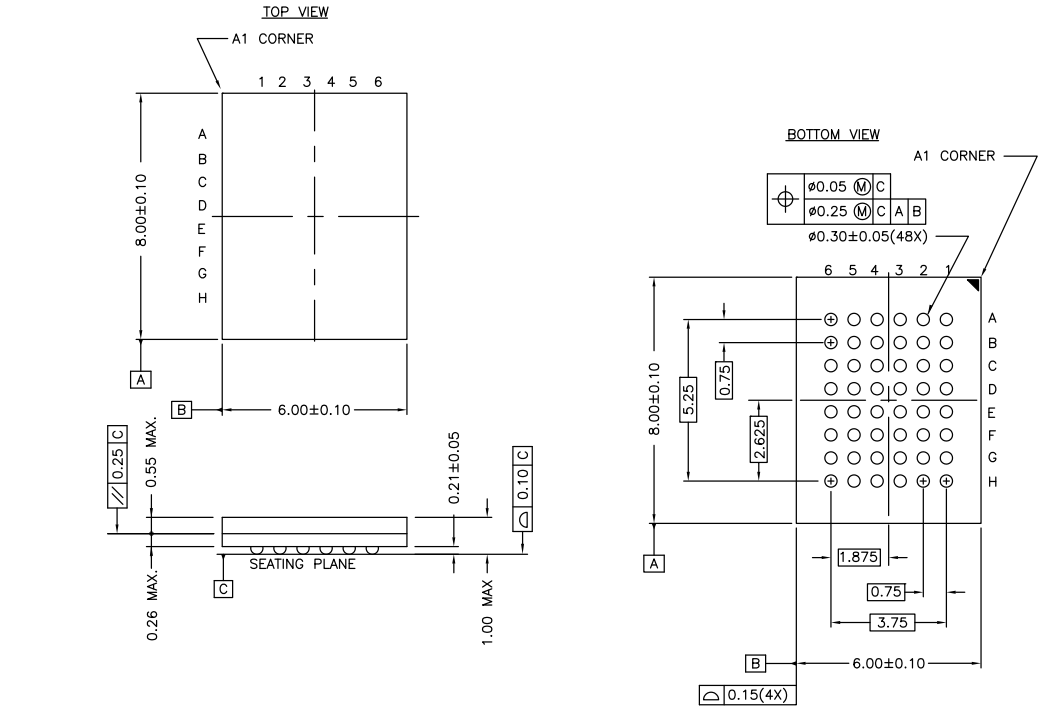
Figure 12. 32-pin TSOP II (20.95 × 11.76 × 1.0 mm) ZS32 Package Outline, 51-85095



51-85095 *B

Package Diagrams (continued)

Figure 13. 48-ball VFBGA (6 × 8 × 1.0 mm) BV48/BZ48 Package Outline, 51-85150



NOTE:
PACKAGE WEIGHT: See Cypress Package Material Declaration Datasheet (PMDD) posted on the Cypress web.

51-85150 *H

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
VFBGA	Very Fine-Pitch Ball Grid Array
$\overline{WE}$	Write Enable

Document Conventions

Units of Measure

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

Document History Page

Document Title: CY7C1018DV33/CY7C1019DV33, 1-Mbit (128 K × 8) Static RAM Document Number: 38-05481				
Rev.	**ECN No.**	**Issue Date**	**Orig. of Change**	**Description of Change**
**	201560	See ECN	SWI	Advance Information data sheet for C9 IPP
*A	233750	See ECN	RKF	DC parameters modified as per EROS (Spec # 01-02165 Rev *A) Pb-free Offering in Ordering Information
*B	262950	See ECN	RKF	Added Data Retention Characteristics table Added T_{power} Spec in Switching Characteristics table Shaded Ordering Information
*C	307598	See ECN	RKF	Reduced Speed bins to -8 and -10 ns
*D	520652	See ECN	VKN	Changed status from Preliminary to Final Removed Commercial Operating range Removed 8 ns speed bin Added I_{CC} values for the frequencies 83 MHz, 66 MHz and 40 MHz Added 48-ball VFBGA package Updated Thermal Resistance table Updated Ordering Information table Changed Overshoot spec from V_{CC} + 2 V to V_{CC} + 1 V in footnote #3
*E	3110052	12/14/2010	AJU	Added Ordering Code Definitions. Updated Package Diagrams.
*F	3416342	10/20/2011	TAVA	Updated Functional Description (Removed the Note “For guidelines on SRAM system design, please refer to the ‘System Design Guidelines’ Cypress application note, available on the internet at www.cypress.com.” and its reference in Functional Description). Updated Electrical Characteristics. Updated Switching Waveforms. Updated Package Diagrams. Added Acronyms and Units of Measure. Updated in new template.
*G	4324792	03/28/2014	VINI	Added CY7C1018DV33 related information across the document. Updated Ordering Information (Updated part numbers). Updated Package Diagrams: spec 51-85033 – Changed revision from *D to *E. spec 51-85150 – Changed revision from *G to *H. Updated in new template.
*H	4531367	10/10/2014	NILE	Corrected the package diagram reference for CY7C1018DV33 in Ordering Information (Updated part numbers). Added 51-85041: 32-pin (300 Mil) Molded SOJ in Package Diagrams:

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