

**256-Kbit (32 K × 8) Static RAM**

**Features**

- Fast access time: 15 ns
- Wide voltage range: 5.0 V ± 10% (4.5 V to 5.5 V)
- complementary metal oxide semiconductor (CMOS) for optimum speed and power
- Transistor transistor logic (TTL) compatible inputs and outputs
- 2.0 V data retention
- Low CMOS standby power
- Automated power-down when deselected
- Available in Pb-free 28-pin molded small outline J-lead (SOJ) and 28-pin DIP packages

**General Description**

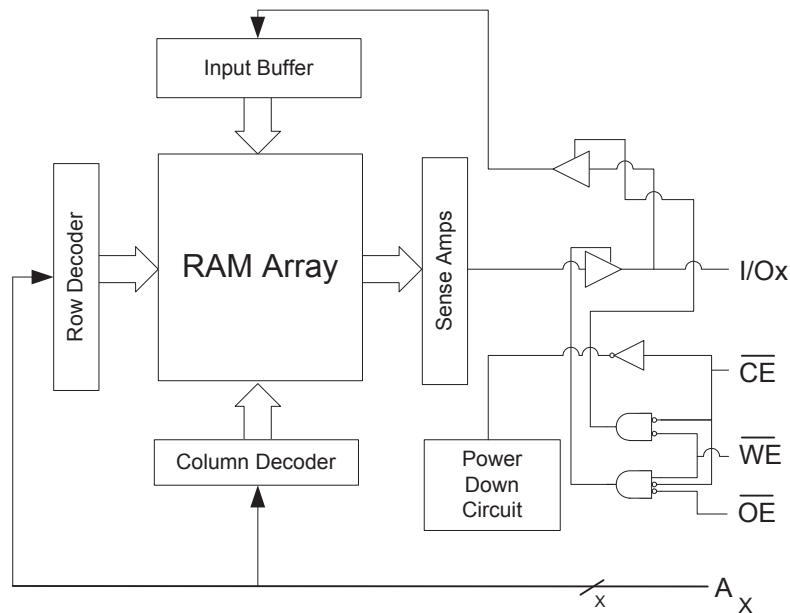
The CY7C199CN<sup>[1]</sup> is a high performance CMOS Asynchronous SRAM organized as 32K by 8 bits that supports an asynchronous memory interface. The device features an automatic power-down feature that reduces power consumption when deselected.

See the [Truth Table on page 4](#) in this data sheet for a complete description of read and write modes.

The CY7C199CN is available in 28-pin molded SOJ and 28-pin DIP package(s).

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

**Logic Block Diagram**



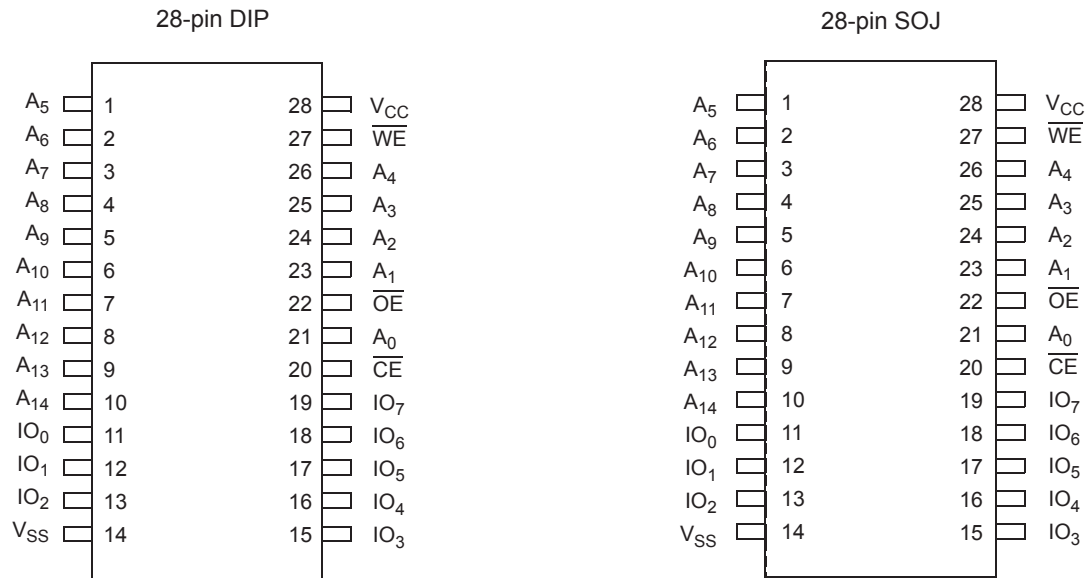
**Product Portfolio**

Description	-15	Unit
Maximum access time	15	ns
Maximum operating current	80	mA
Maximum CMOS standby current (low power)	500	µA

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## Pin Layout and Specifications



## Pin Description

Pin	Type	Description	DIP	SOJ
A <sub>X</sub>	Input	Address inputs	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 21, 23, 24, 25, 26	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 21, 23, 24, 25, 26
$\overline{\text{CE}}$	Control	Chip Enable	20	20
IO <sub>X</sub>	Input or Output	Data input outputs	11, 12, 13, 15, 16, 17, 18, 19	11, 12, 13, 15, 16, 17, 18, 19
$\overline{\text{OE}}$	Control	Output enable	22	22
V <sub>CC</sub>	Supply	Power (5.0 V)	28	28
V <sub>SS</sub>	Supply	Ground	14	14
$\overline{\text{WE}}$	Control	Write Enable	27	27

### Note

- For best practices recommendations, refer to the Cypress application note *System Design Guidelines* on [www.cypress.com](http://www.cypress.com).

**Truth Table**

$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	IOx	Mode	Power
H	X	X	High-Z	Deselect/Power-down	Stand by ( $I_{SB}$ )
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 ( $I_{CC}$ )

## Maximum Ratings

Exceeding maximum ratings may shorten the useful life of the device. User guidelines are not tested.

Parameter <sup>[2]</sup>	Description	Value	Unit
T <sub>STG</sub>	Storage temperature	-65 to +150	°C
T <sub>AMB</sub>	Ambient temperature with power applied (that is, case temperature)	-55 to +125	°C
V <sub>CC</sub>	Core Supply voltage relative to V <sub>SS</sub>	-0.5 to +7.0	V
V <sub>IN</sub> , V <sub>OUT</sub>	DC voltage applied to any pin relative to V <sub>SS</sub>	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>OUT</sub>	Output short-circuit current	20	mA
V <sub>ESD</sub>	Static discharge voltage (in accordance with MIL-STD-883, Method 3015)	> 2001	V
I <sub>LU</sub>	Latch-up current	> 200	mA

## Operating Range

Range	Ambient Temperature (T <sub>A</sub> )	Voltage Range (V <sub>CC</sub> )
Commercial	0 °C to 70 °C	5.0 V ± 10%
Industrial	-40 °C to 85 °C	5.0 V ± 10%

## DC Electrical Characteristics

Over the Operating Range

Parameter <sup>[2]</sup>	Description	Condition	-15		Unit	
			Min	Max		
V <sub>IH</sub>	Input HIGH voltage		2.2	V <sub>CC</sub> + 0.3	V	
V <sub>IL</sub>	Input LOW voltage		-0.5	0.8	V	
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	
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>	-	80	mA	
I <sub>SB1</sub>	Automatic $\overline{CE}$ 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>		-	30	mA
			L	-	10	mA
I <sub>SB2</sub>	Automatic $\overline{CE}$ 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
			L	-	500	μA
I <sub>OZ</sub>	Output leakage current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , output disabled	-5	+5	μA	
I <sub>IX</sub>	Input leakage current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>	-5	+5	μA	

### Note

- V<sub>IL</sub> (min) = -2.0 V for pulse durations of less than 20 ns.

### Capacitance

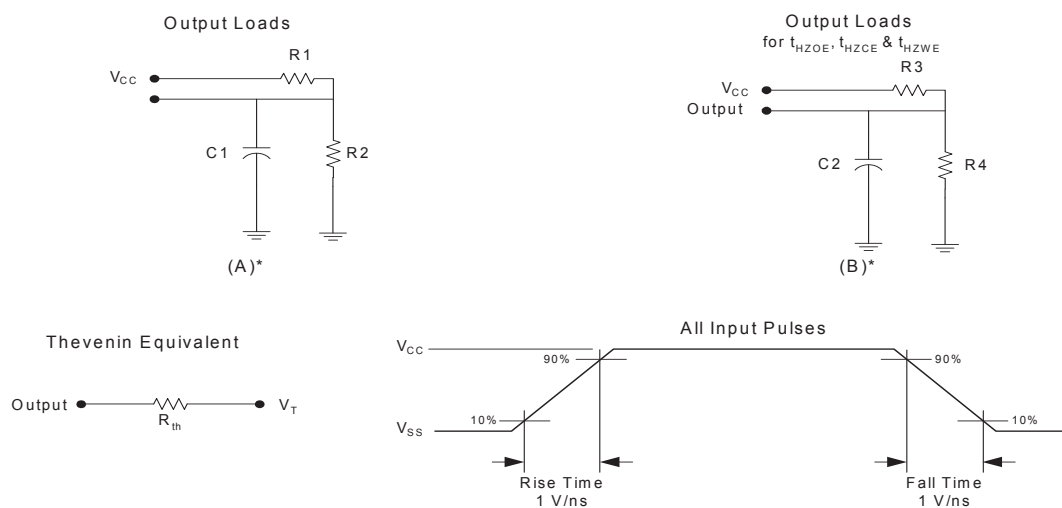
Parameter <sup>[3]</sup>	Description	Conditions	Max	Unit
C <sub>IN</sub>	Input capacitance	T <sub>A</sub> = 25 °C, f = 1 MHz, V <sub>CC</sub> = 5.0 V	8	pF
C <sub>OUT</sub>	Output capacitance		8	

### Thermal Resistance

Parameter <sup>[3]</sup>	Description	Conditions	SOJ	DIP	Unit
θ <sub>JA</sub>	Thermal resistance (junction to ambient)	Still air, soldered on a 3 × 4.5 square inch, two-layer printed circuit board	79	69.33	°C/W
θ <sub>JC</sub>	Thermal resistance (junction to case)		41.42	31.62	

### AC Test Loads

Figure 1. AC Test Loads



\* including scope and jig capacitance

### AC Test Conditions

Parameter	Description	Nom	Unit
C1	Capacitor 1	30	pF
C2	Capacitor 2	5	
R1	Resistor 1	480	Ω
R2	Resistor 2	255	
R3	Resistor 3	480	
R4	Resistor 4	255	
R <sub>TH</sub>	Resistor Thevenin	167	
V <sub>TH</sub>	Voltage Thevenin	1.73	V

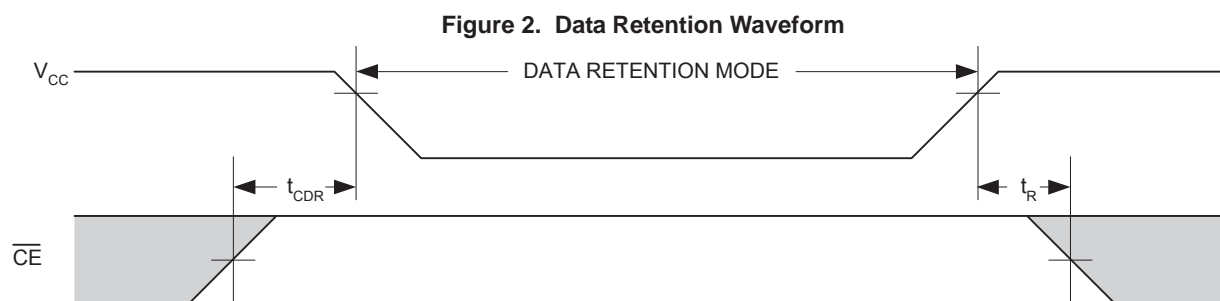
**Note**

3. Tested initially and after any design or process change that may affect these parameters.

## Data Retention Characteristics

Parameter <sup>[4]</sup>	Description	Condition	Min	Max	Unit
$V_{DR}$	$V_{CC}$ for data retention		2.0	–	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 $V_{IN} \leq 0.3\text{ V}$	–	150	$\mu\text{A}$
$t_{CDR}$	Chip deselect to data retention time		0	–	ns
$t_R$	Operation recovery time		200	–	$\mu\text{s}$

## Data Retention Waveform



**Note**

4. L-version only.

**AC Electrical Characteristics**

Parameter [5, 6]	Description	-15		Unit
		Min	Max	
$t_{RC}$	Read cycle time	15	–	ns
$t_{AA}$	Address to data valid	–	15	ns
$t_{OHA}$	Data hold from address change	3	–	ns
$t_{ACE}$	$\overline{CE}$ to data valid	–	15	ns
$t_{DOE}$	$\overline{OE}$ to data valid	–	7	ns
$t_{LZOE}$	$\overline{OE}$ to Low-Z [7]	0	–	ns
$t_{HZOE}$	$\overline{OE}$ to High-Z [7, 8]	–	7	ns
$t_{LZCE}$	$\overline{CE}$ to Low-Z [7]	3	–	ns
$t_{HZCE}$	$\overline{CE}$ to High-Z [7, 8]	–	7	ns
$t_{PU}$	$\overline{CE}$ to Power-up	0	–	ns
$t_{PD}$	$\overline{CE}$ to Power-down	–	15	ns
$t_{WC}$	Write Cycle Time [9]	15	–	ns
$t_{SCE}$	$\overline{CE}$ to write end	10	–	ns
$t_{AW}$	Address setup to write end	10	–	ns
$t_{HA}$	Address hold from write end	0	–	ns
$t_{SA}$	Address setup to write start	0	–	ns
$t_{PWE}$	$\overline{WE}$ pulse width	9	–	ns
$t_{SD}$	Data setup to write end	9	–	ns
$t_{HD}$	Data hold from write end	0	–	ns
$t_{HZWE}$	$\overline{WE}$ LOW to High-Z [7, 8]	–	7	ns
$t_{LZWE}$	$\overline{WE}$ HIGH to Low-Z [7]	3	–	ns

**Notes**

5. Test Conditions are based on a transition time of 3 ns or less and timing reference levels of 1.5 V, and input pulse levels of 0 to 3.0 V.
6. The minimum write cycle pulse width for Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW) should be equal to sum of  $t_{SD}$  and  $t_{HZWE}$ .
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.  $t_{HZOE}$ ,  $t_{HZCE}$ ,  $t_{HZWE}$  are specified as in part (b) of the Figure 1 on page 6. Transitions are measured  $\pm 200$  mV from steady state voltage.
9. The internal memory write time 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 setup and hold timing must be referenced to the leading edge of the signal that terminates the write.



### Timing Waveforms

Figure 3. Read Cycle No. 1 [10, 11]

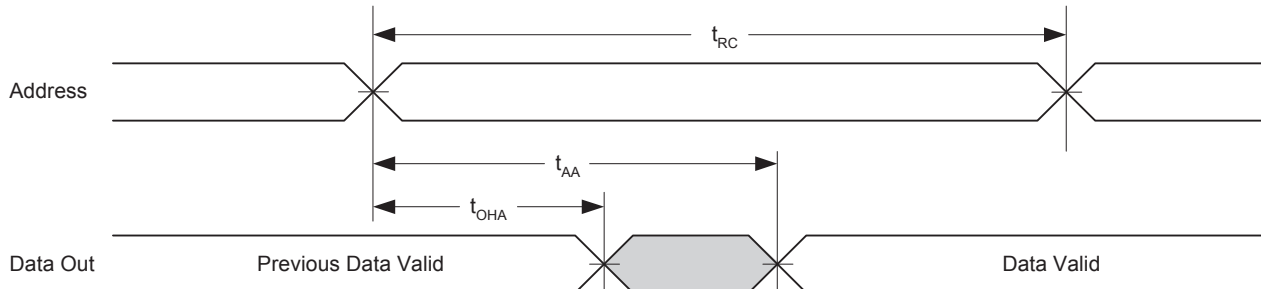
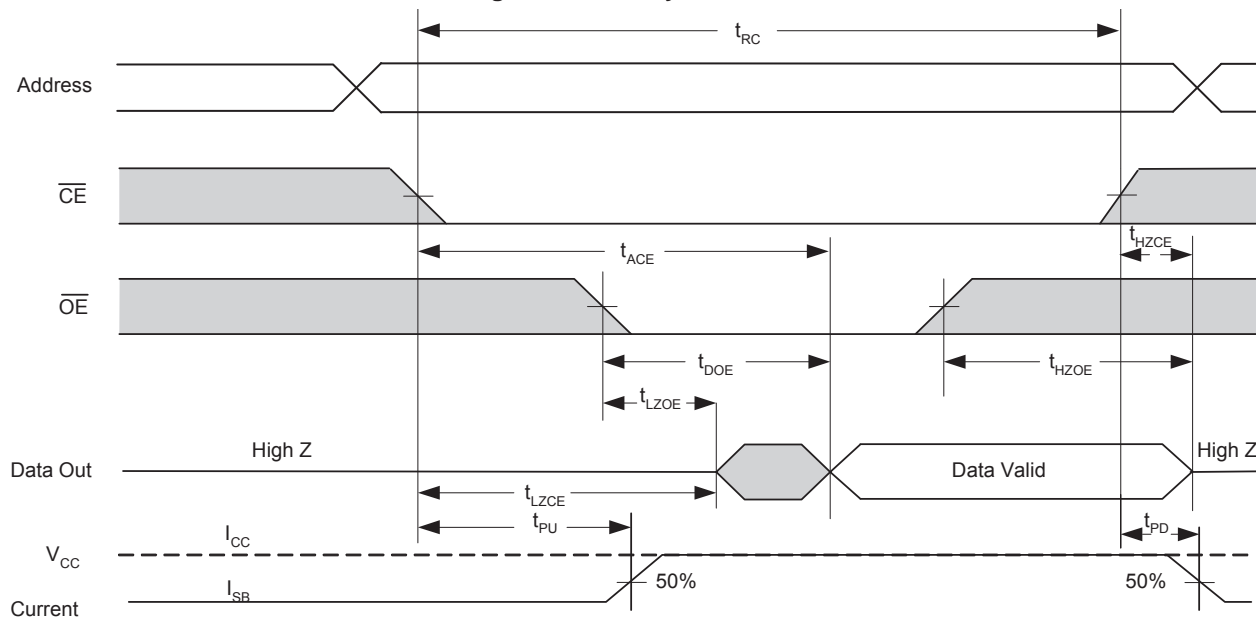


Figure 4. Read Cycle No. 2 [12, 13]



**Notes**

- 10. Device is continuously selected.  $\overline{OE} = V_{IL} = \overline{CE}$ .
- 11.  $\overline{WE}$  is HIGH for read cycle.
- 12. This cycle is  $\overline{OE}$  controlled and  $\overline{WE}$  is HIGH read cycle.
- 13. Address valid before or similar with  $\overline{CE}$  transition LOW.

Timing Waveforms (continued)

Figure 5. Write Cycle No. 1 ( $\overline{WE}$  Controlled) [14, 15, 16]

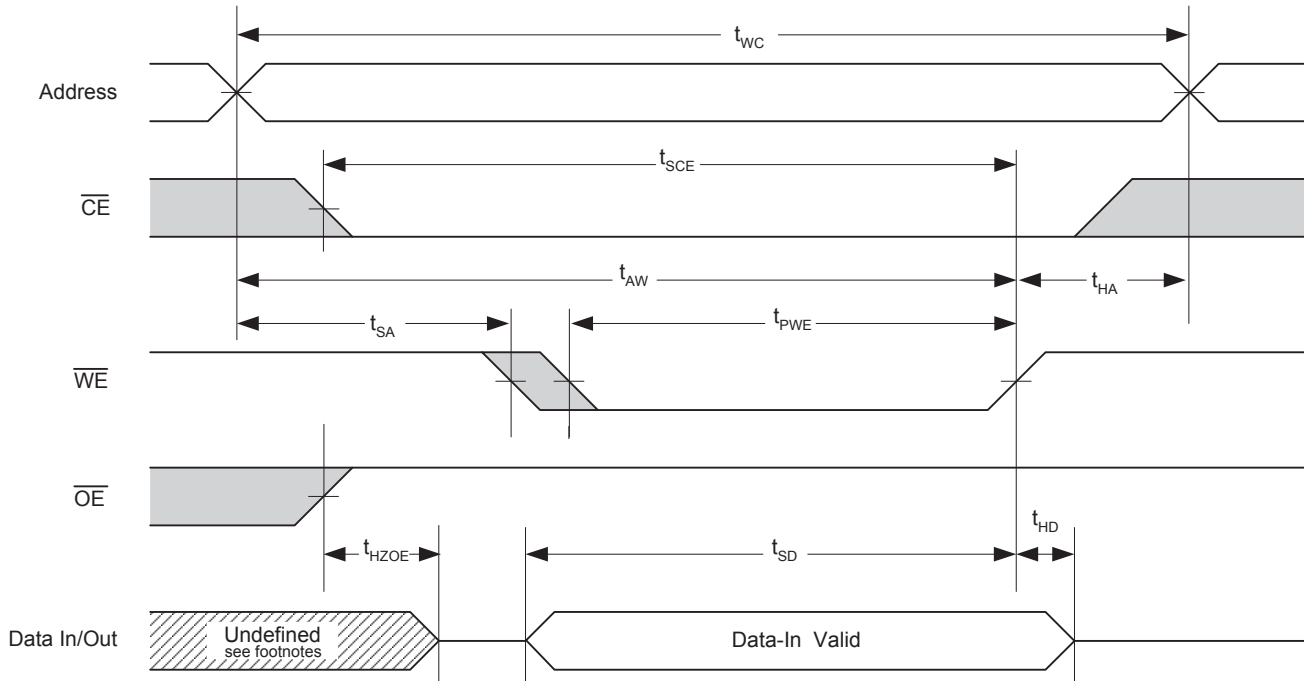
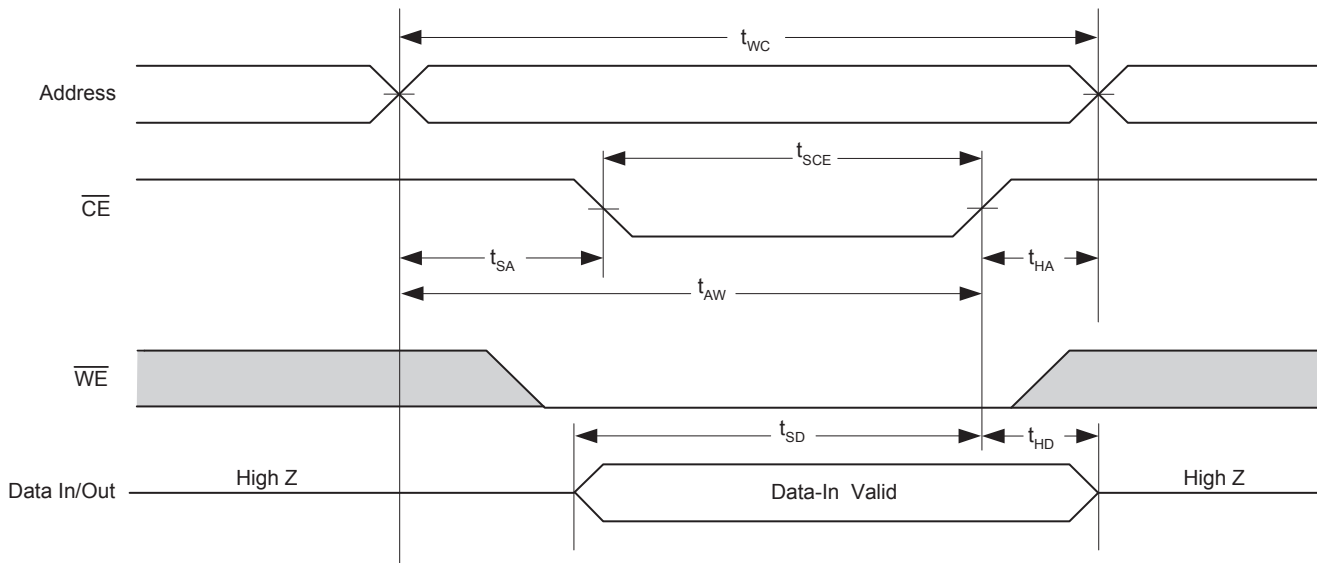


Figure 6. Write Cycle No. 2 ( $\overline{CE}$  Controlled) [15, 17, 18]

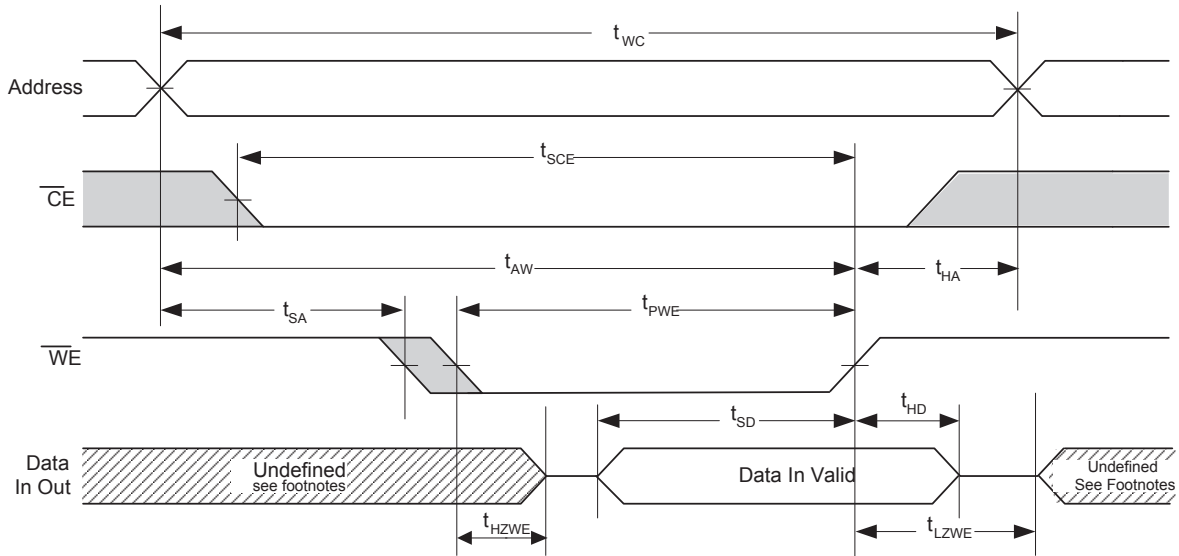


Notes

- 14. This cycle is  $\overline{WE}$  controlled,  $\overline{OE}$  is HIGH during write.
- 15. Data in and/or out is high impedance if  $\overline{OE} = V_{IH}$ .
- 16. During this period the IOs are in output state and input signals must not be applied.
- 17. This cycle is  $\overline{CE}$  controlled.
- 18. If  $\overline{CE}$  goes HIGH simultaneously with  $\overline{WE}$  going HIGH, the output remains in a high impedance state.

Timing Waveforms (continued)

Figure 7. Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW)<sup>[19]</sup>



Note

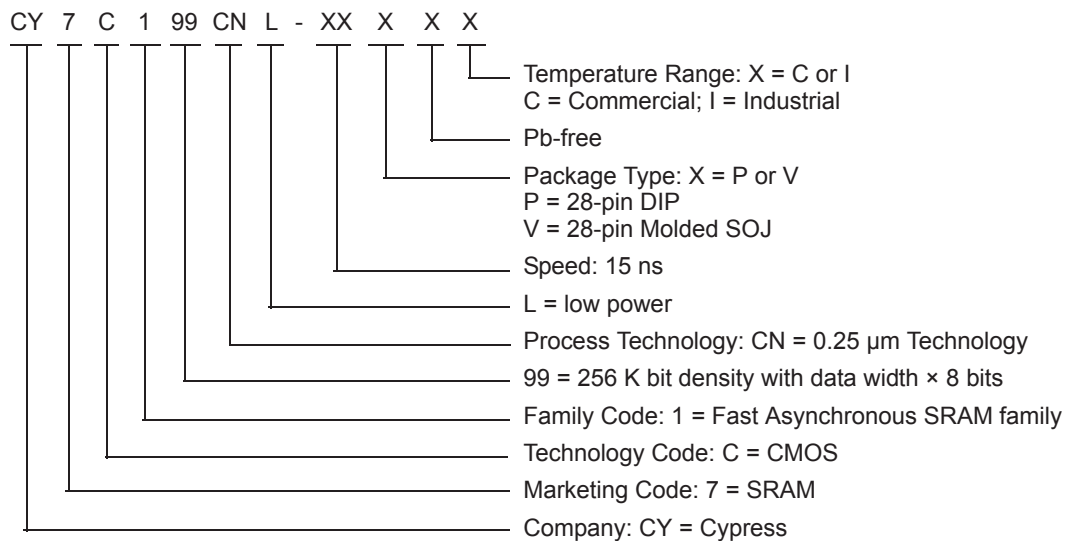
19. The cycle is  $\overline{WE}$  Controlled,  $\overline{OE}$  LOW. The minimum write cycle time is the sum of  $t_{HZWE}$  and  $t_{SD}$ .

## Ordering Information

Contact local sales representative regarding availability of these parts.

Speed (ns)	Ordering Code	Package Diagram	Package Type	Power Option	Operating Range
15	CY7C199CN-15PXC	51-85014	28-pin DIP (6.9 × 35.6 × 3.5 mm), Pb-free	Standard	Commercial
	CY7C199CNL-15VXI	51-85031	28-pin (300-Mil) Molded SOJ, Pb-free	Low Power	Industrial

## Ordering Code Definitions



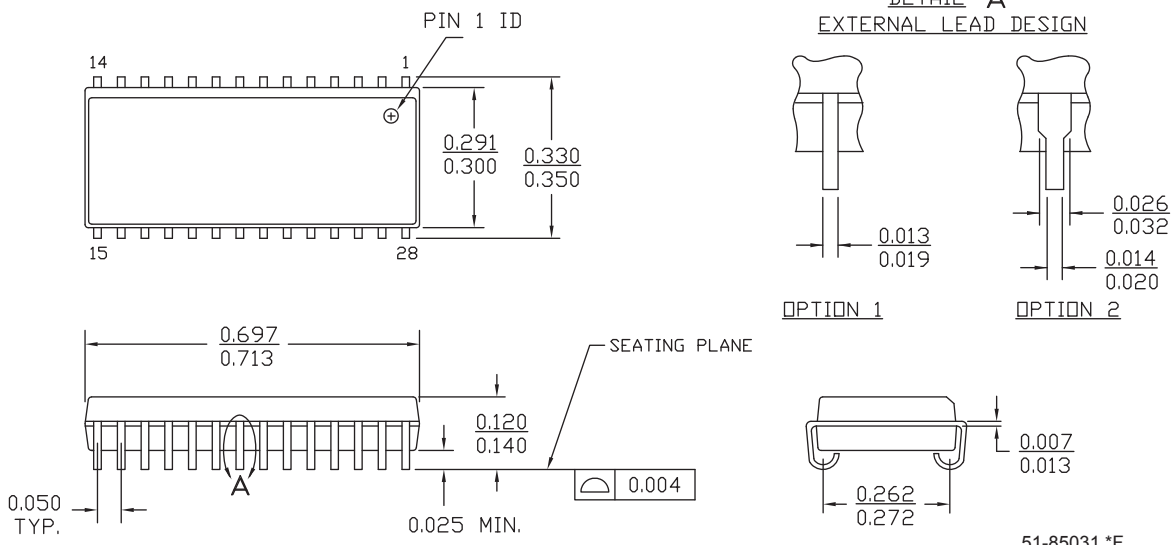
Package Diagrams

Figure 8. 28-pin SOJ (300 Mils) V28.3 Package Outline, 51-85031

28 Lead (300 Mil) Molded SOJ V21

NOTE :

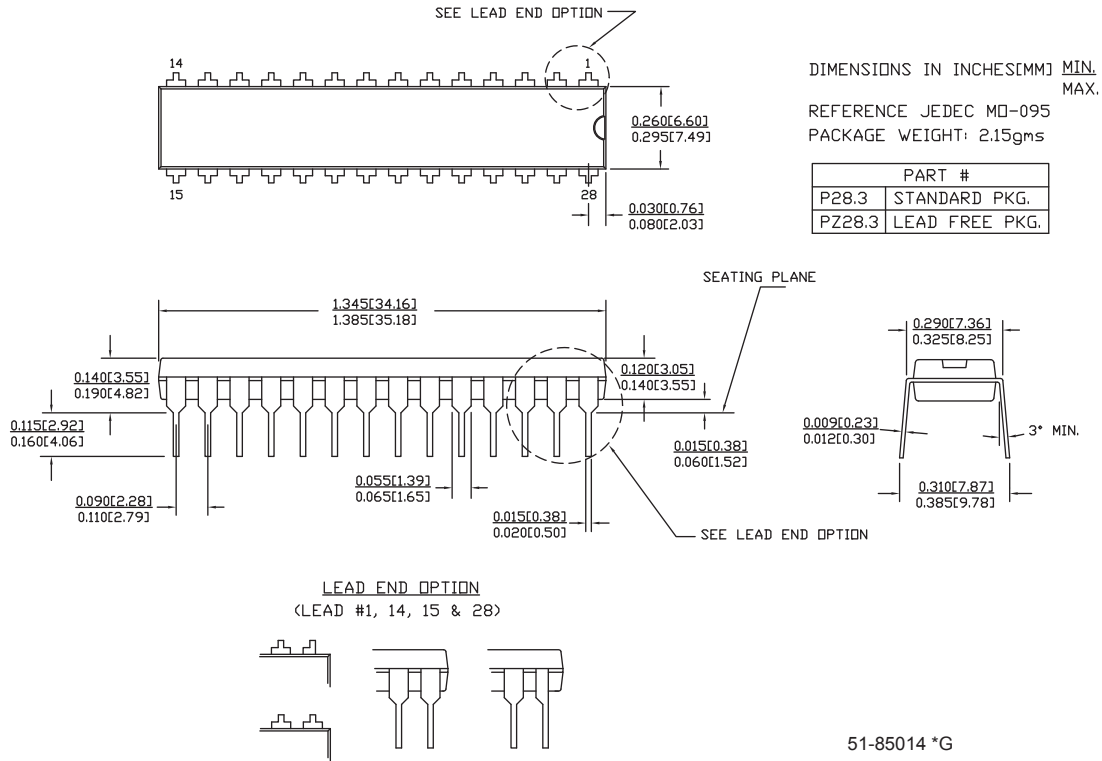
1. JEDEC STD REF MO088
2. BODY LENGTH DIMENSION DOES NOT INCLUDE MOLD PROTRUSION/END FLASH  
MOLD PROTRUSION/END FLASH SHALL NOT EXCEED 0.006 in (0.152 mm) PER SIDE
3. DIMENSIONS IN INCHES MIN.  
MAX.



51-85031 \*F

Package Diagrams (continued)

Figure 9. 28-pin PDIP (300 Mils) Package Outline, 51-85014



## Acronyms

Acronym	Description
$\overline{CE}$	Chip Enable
CMOS	Complementary Metal Oxide Semiconductor
I/O	Input/Output
$\overline{OE}$	Output Enable
SRAM	Static Random Access Memory
SOJ	Small Outline J-lead
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
mA	milliampere
mV	millivolt
mW	milliwatt
ns	nanosecond
pF	picofarad
V	volt
W	watt

Document History Page

Document Title: CY7C199CN, 256-Kbit (32 K × 8) Static RAM				
Document Number: 001-06435				
Revision	ECN	Submission Date	Orig. of Change	Description of Change
**	430363	See ECN	NXR	New data sheet.
*A	684342	See ECN	VKN	Added Automotive-A Information Updated Ordering Information Table
*B	839904	See ECN	VKN	Added t <sub>DOE</sub> spec for Automotive-A part in AC Electrical characteristics table
*C	2896044	03/19/2010	NXR	Updated Ordering Information Table Updated Package Diagram
*D	3108898	12/13/2010	PRAS	Added <a href="#">Ordering Code Definitions</a> .
*E	3198636	03/17/11	PRAS	Dislodged Automotive device information to 001-67737 Updated template and styles.
*F	3246329	05/04/2011	PRAS	Additional information on ISB1, ISB2 with respect to L parts
*G	3302830	08/02/2011	RAME	Removed all information related to 28-pin TSOP 1. Removed all information related to 20 ns speed bin. Removed the following parts from ordering information table. CY7C199CN-15VXC CY7C199CN-20ZXI Removed spec 51-85071.
*H	4318563	03/25/2014	VINI	Updated <a href="#">Package Diagrams</a> : spec 51-85014 – Changed revision from *F to *G. Updated to new template. Completing Sunset Review.
*I	4546472	10/28/2014	VINI	Updated <a href="#">Maximum Ratings</a> : Referred Note 2 in “Parameter” column. Updated <a href="#">AC Electrical Characteristics</a> : Added Note 6 and referred the same note in “Parameter” column.
*J	4576406	01/16/2015	VINI	Added related documentation hyperlink in page 1. Updated <a href="#">Figure 8</a> in <a href="#">Package Diagrams</a> (spec 51-85031 *E to *F).



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