

## Features

- Pin- and function-compatible with CY7C107B/CY7C1007B
- High speed
  - $t_{AA} = 10 \text{ ns}$
- Low active power
  - $I_{CC} = 80 \text{ mA @ } 10 \text{ ns}$
- Low complementary metal oxide semiconductor (CMOS) standby power
  - $I_{SB2} = 3 \text{ mA}$
- 2.0 V data retention
- Automatic power-down when deselected
- CMOS for optimum speed/power
- Transistor transistor logic (TTL) compatible inputs and outputs
- CY7C107D available in Pb-free 28-pin 400-Mil wide Molded SOJ package. CY7C1007D available in Pb-free 28-pin 300-Mil wide Molded SOJ package

## Functional Description

The CY7C107D [1] and CY7C1007D [1] are high-performance CMOS static RAMs organized as 1,048,576 words by 1 bit. Easy memory expansion is provided by an active LOW Chip Enable ( $\overline{CE}$ ) and tri-state drivers. These devices have an automatic power-down feature that reduces power consumption by more than 65% when deselected. The output pin ( $D_{OUT}$ ) is placed in a high-impedance state when:

- Deselected ( $\overline{CE}$  HIGH)
- When the write operation is active ( $\overline{CE}$  and  $\overline{WE}$  LOW)

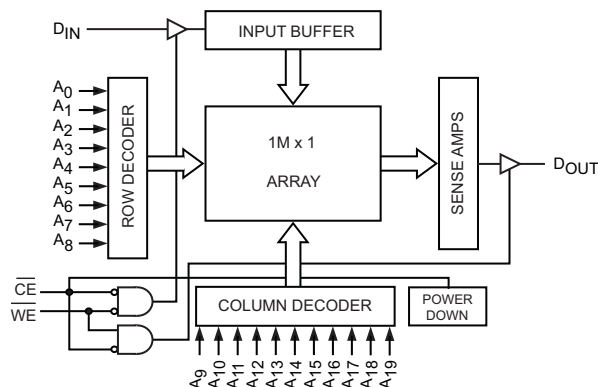
Write to the device by taking Chip Enable ( $\overline{CE}$ ) and Write Enable ( $\overline{WE}$ ) inputs LOW. Data on the input pin ( $D_{IN}$ ) is written into the memory location specified on the address pins ( $A_0$  through  $A_{19}$ ).

Read from the device by taking Chip Enable ( $\overline{CE}$ ) LOW while forcing Write Enable ( $\overline{WE}$ ) HIGH. Under these conditions, the contents of the memory location specified by the address pins appears on the data output ( $D_{OUT}$ ) pin.

The CY7C107D and CY7C1007D devices are suitable for interfacing with processors that have TTL I/P levels. It is not suitable for processors that require CMOS I/P levels. Please see [Electrical Characteristics on page 4](#) for more details and suggested alternatives.

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

## Logic Block Diagram



### Note

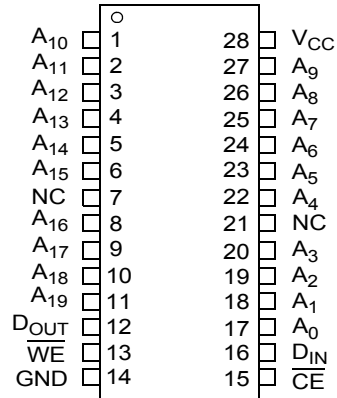
1. For guidelines on SRAM system design, please refer to the 'System Design Guidelines' Cypress application note, available on the internet at [www.cypress.com](http://www.cypress.com).

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## Pin Configuration

Figure 1. 28-pin SOJ pinout (Top View) [2]



## Selection Guide

Description	CY7C107D-10 CY7C1007D-10	Unit
Maximum access time	10	ns
Maximum operating current	80	mA
Maximum CMOS standby current, I <sub>SB2</sub>	3	mA

**Note**

2. 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 [3] .....	-0.5 V to +6.0 V
DC voltage applied to outputs in High-Z state [3] .....	-0.5 V to V <sub>CC</sub> + 0.5 V

DC input voltage [3] .....	-0.5 V to V <sub>CC</sub> + 0.5 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 <sub>CC</sub>	Speed
Industrial	-40 °C to +85 °C	5 V ± 0.5 V	10 ns

## Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions	7C107D-10 7C1007D-10		Unit	
			Min	Max		
V <sub>OH</sub>	Output HIGH voltage	I <sub>OH</sub> = -4.0 mA	2.4	-	V	
		I <sub>OH</sub> = -0.1 mA	-	3.4 [4]		
V <sub>OL</sub>	Output LOW voltage	I <sub>OL</sub> = 8.0 mA	-	0.4	V	
V <sub>IH</sub>	Input HIGH voltage		2.2	V <sub>CC</sub> + 0.5	V	
V <sub>IL</sub>	Input LOW voltage [3]		-0.5	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>I</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, I <sub>OUT</sub> = 0 mA, f = f <sub>max</sub> = 1/t <sub>RC</sub>	100 MHz	-	80	mA
			83 MHz	-	72	mA
			66 MHz	-	58	mA
			40 MHz	-	37	mA
I <sub>SB1</sub>	Automatic CE Power-down current – TTL Inputs	Max V <sub>CC</sub> , CE ≥ V <sub>IH</sub> , V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>max</sub>	-	10	mA	
I <sub>SB2</sub>	Automatic CE Power-down current – CMOS Inputs	Max V <sub>CC</sub> , CE ≥ V <sub>CC</sub> - 0.3V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V or V <sub>IN</sub> ≤ 0.3V, f = 0	-	3	mA	

### Note

- V<sub>IL</sub> (min) = -2.0 V and V<sub>IH</sub> (max) = V<sub>CC</sub> + 1 V for pulse durations of less than 5 ns.
- Please note that the maximum V<sub>OH</sub> limit does not exceed minimum CMOS V<sub>IH</sub> of 3.5V. If you are interfacing this SRAM with 5 V legacy processors that require a minimum V<sub>IH</sub> of 3.5 V, please refer to Application Note [AN6081](#) for technical details and options you may consider.

## Capacitance

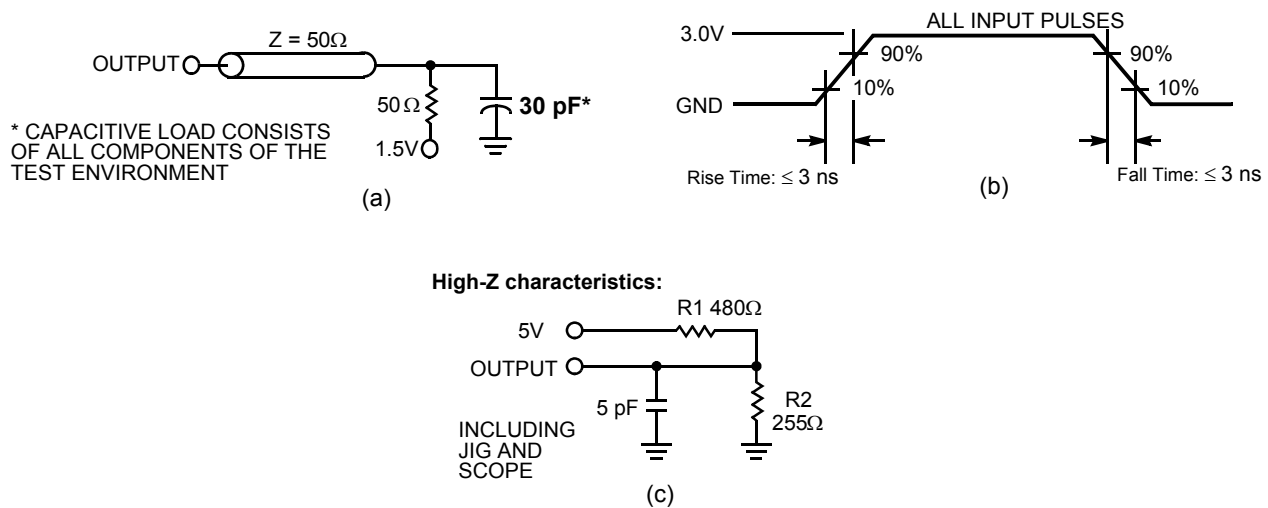
Parameter <sup>[5]</sup>	Description	Test Conditions	Max	Unit
C <sub>IN</sub> : Addresses	Input capacitance	T <sub>A</sub> = 25 °C, f = 1 MHz, V <sub>CC</sub> = 5.0 V	7	pF
C <sub>IN</sub> : Controls			10	pF
C <sub>OUT</sub>	Output capacitance		10	pF

## Thermal Resistance

Parameter <sup>[5]</sup>	Description	Test Conditions	300-Mil Wide SOJ	400-Mil Wide SOJ	Unit
θ <sub>JA</sub>	Thermal resistance (junction to ambient)	Still Air, soldered on a 3 × 4.5 inch, four-layer printed circuit board	59.16	58.76	°C/W
θ <sub>JC</sub>	Thermal resistance (junction to case)		40.84	40.54	°C/W

## AC Test Loads and Waveforms

Figure 2. AC Test Loads and Waveforms <sup>[6]</sup>



### Notes

5. Tested initially and after any design or process changes that may affect these parameters.
6. AC characteristics (except High-Z) are tested using the load conditions shown in Figure 2 (a). High-Z characteristics are tested for all speeds using the test load shown in Figure 2 (c).

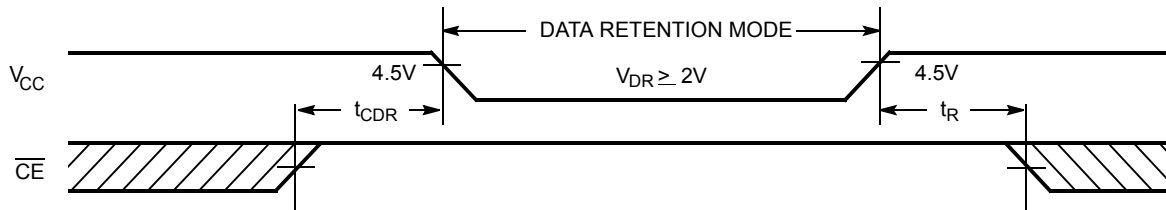
## Data Retention Characteristics

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	$V_{CC} = V_{DR} = 2.0\text{ V}$ , $\overline{CE} \geq V_{CC} - 0.3\text{ V}$ , $V_{IN} \geq V_{CC} - 0.3\text{ V}$ or $V_{IN} \leq 0.3\text{ V}$	–	3	mA
$t_{CDR}^{[7]}$	Chip deselect to data retention time		0	–	ns
$t_R^{[8]}$	Operation recovery time		$t_{RC}$	–	ns

## Data Retention Waveform

Figure 3. Data Retention Waveform



### Notes

- AC characteristics (except High-Z) are tested using the load conditions shown in Figure 2 (a). High-Z characteristics are tested for all speeds using the test load shown in Figure 2 (c).
- Full device operation requires linear  $V_{CC}$  ramp from  $V_{DR}$  to  $V_{CC(min)} \geq 50\ \mu\text{s}$  or stable at  $V_{CC(min)} \geq 50\ \mu\text{s}$ .

## Switching Characteristics

Over the Operating Range

Parameter <sup>[9]</sup>	Description	7C107D-10 7C1007D-10		Unit
		Min	Max	
<b>Read Cycle</b>				
$t_{power}^{[10]}$	$V_{CC}$ (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
$t_{LZCE}$	$\overline{CE}$ LOW to Low Z <sup>[11]</sup>	3	–	ns
$t_{HZCE}$	$\overline{CE}$ HIGH to High Z <sup>[11, 12]</sup>	–	5	ns
$t_{PU}^{[13]}$	$\overline{CE}$ LOW to power-up	0	–	ns
$t_{PD}^{[13]}$	$\overline{CE}$ HIGH to power-down	–	10	ns
<b>Write Cycle <sup>[14]</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	6	–	ns
$t_{HD}$	Data hold from write end	0	–	ns
$t_{LZWE}$	$\overline{WE}$ HIGH to Low Z <sup>[11]</sup>	3	–	ns
$t_{HZWE}$	$\overline{WE}$ LOW to High Z <sup>[11, 12]</sup>	–	6	ns

### Notes

- 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, and output loading of the specified  $I_{OL}/I_{OH}$  and 30-pF load capacitance.
- $t_{POWER}$  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.
- At any given temperature and voltage condition,  $t_{HZCE}$  is less than  $t_{LZCE}$  and  $t_{HZWE}$  is less than  $t_{LZWE}$  for any given device.
- $t_{HZCE}$  and  $t_{HZWE}$  are specified with a load capacitance of 5 pF as in part (c) of [Figure 2 on page 5](#). Transition is measured when the outputs enter a high impedance state.
- This parameter is guaranteed by design and is not tested.
- 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.

## Switching Waveforms

Figure 4. Read Cycle No. 1 (Address Transition Controlled) [15, 16]

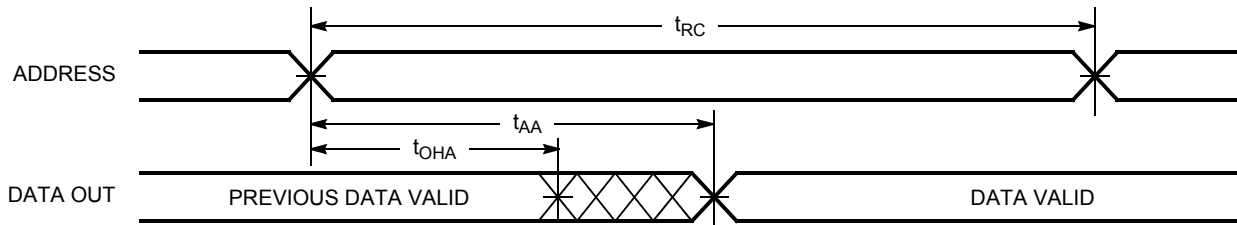
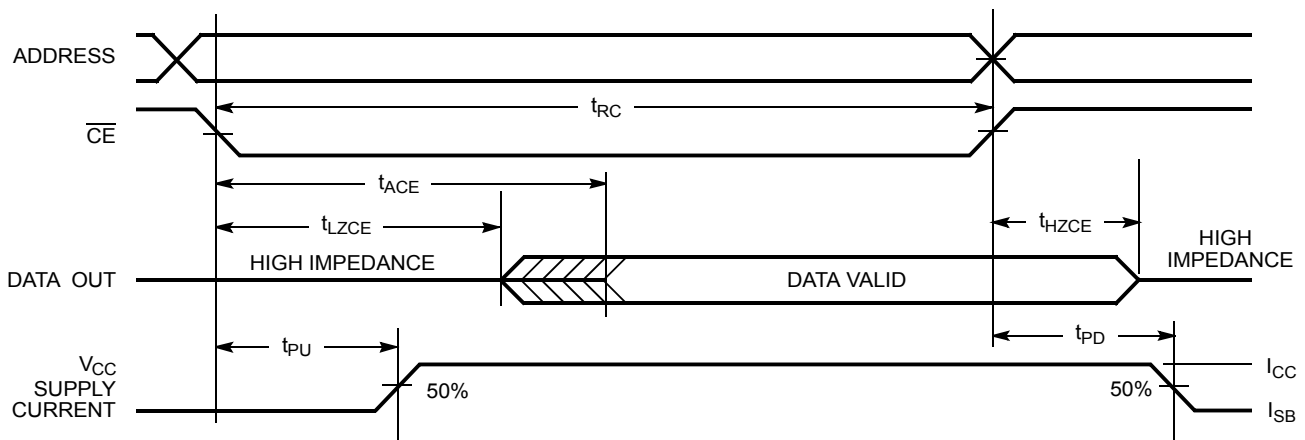


Figure 5. Read Cycle No. 2 [16, 17]



### Notes

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



Switching Waveforms(continued)

Figure 6. Write Cycle No. 1 ( $\overline{\text{CE}}$  Controlled) [18]

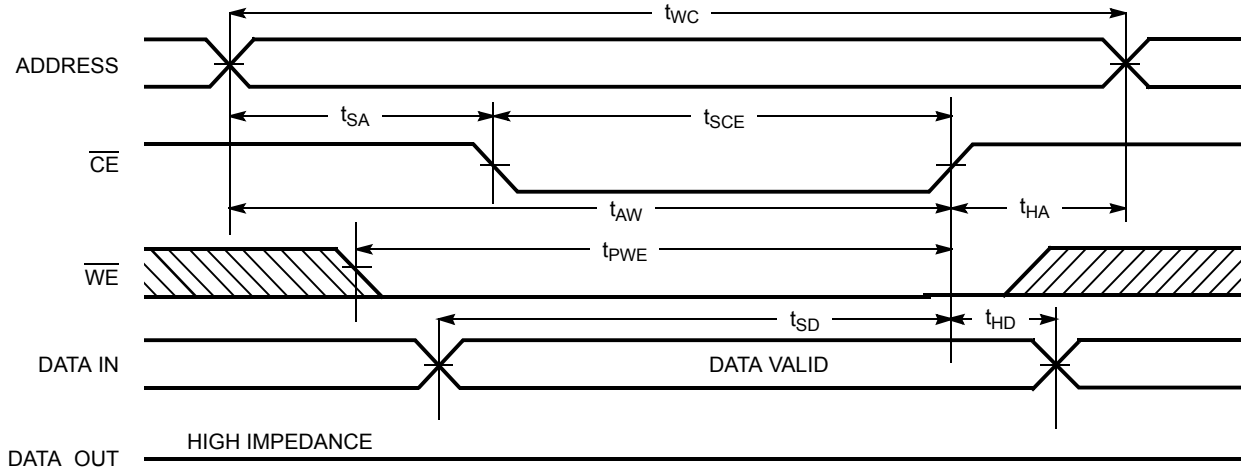
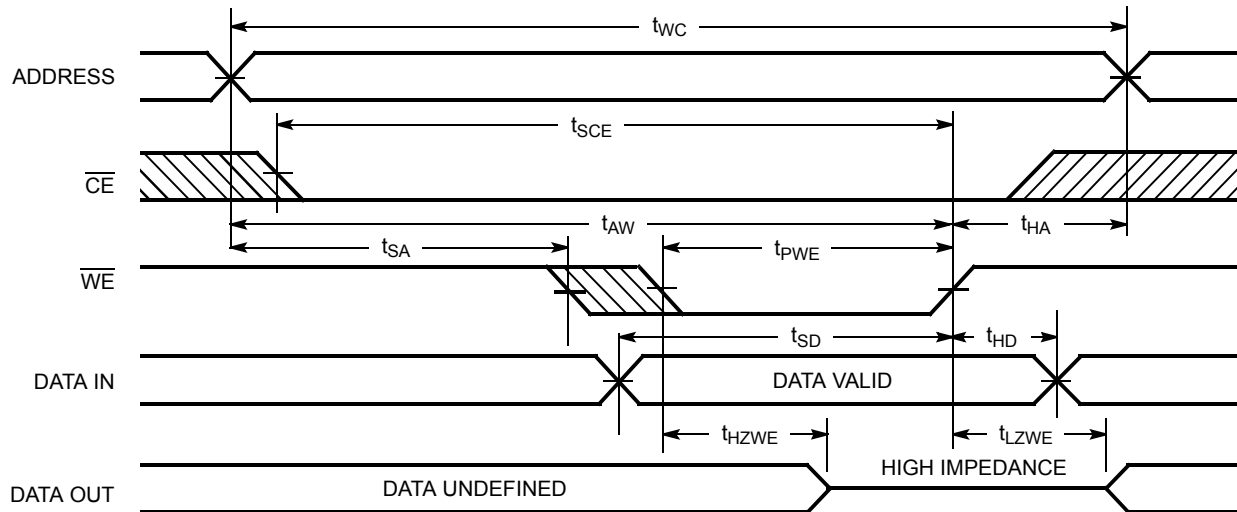


Figure 7. Write Cycle No. 2 ( $\overline{\text{WE}}$  Controlled) [18]



Note

18. If  $\overline{\text{CE}}$  goes HIGH simultaneously with  $\overline{\text{WE}}$  going HIGH, the output remains in a high-impedance state.

### Truth Table

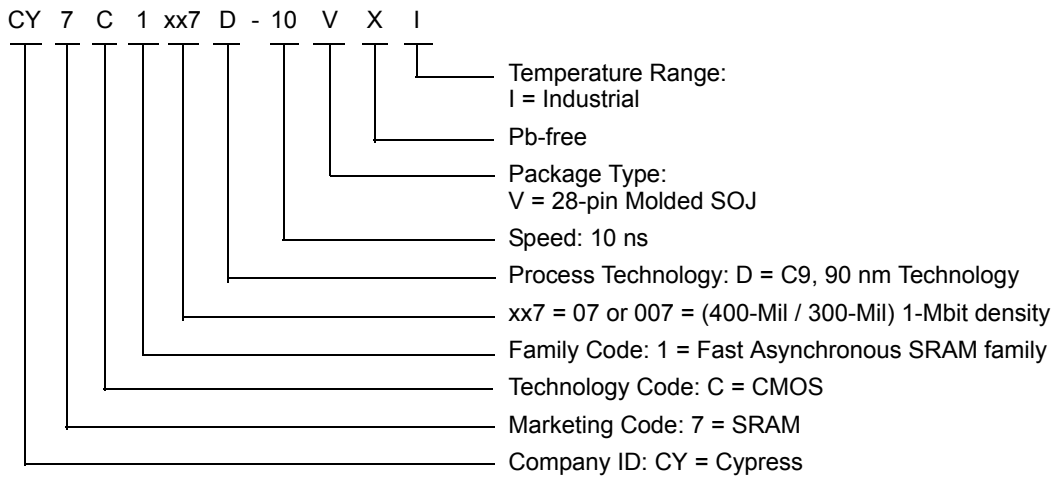
$\overline{CE}$	$\overline{WE}$	D <sub>OUT</sub>	Mode	Power
H	X	High Z	Power-down	Standby (I <sub>SB</sub> )
L	H	Data out	Read	Active (I <sub>CC</sub> )
L	L	High Z	Write	Active (I <sub>CC</sub> )

### Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
10	CY7C107D-10VXI	51-85032	28-pin (400-Mil) Molded SOJ (Pb-free)	Industrial
	CY7C1007D-10VXI	51-85031	28-pin (300-Mil) Molded SOJ (Pb-free)	

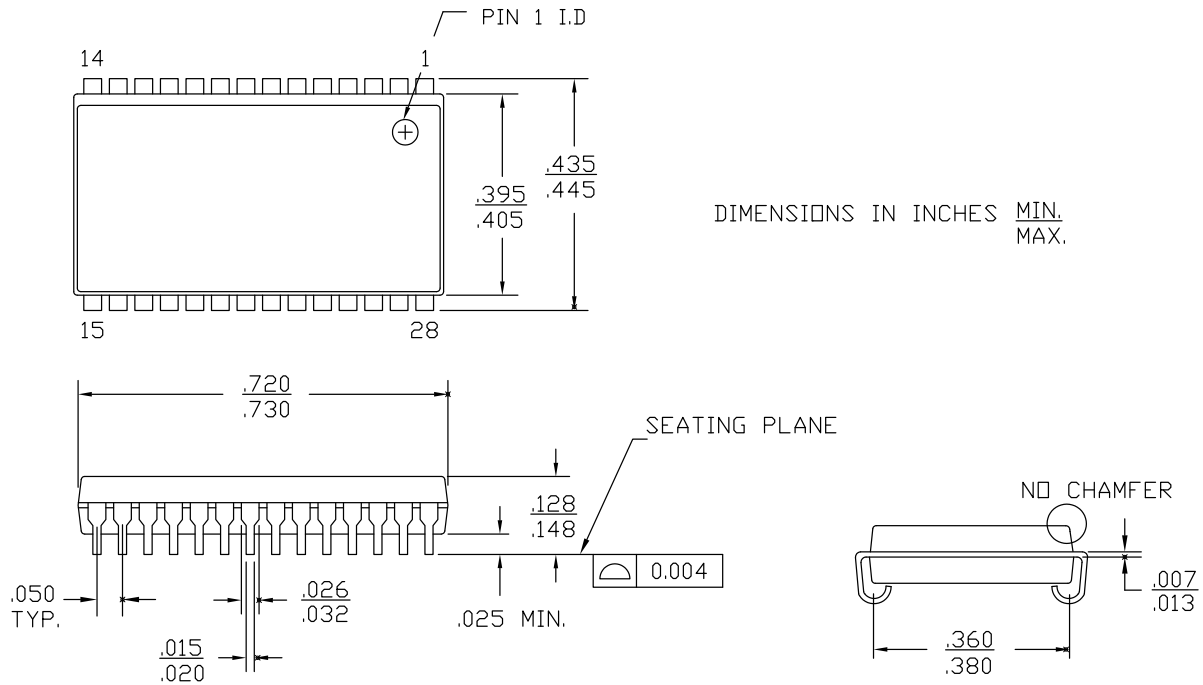
Please contact your local Cypress sales representative for availability of these parts.

### Ordering Code Definitions



**Package Diagrams**

**Figure 8. 28-pin SOJ (400 Mils) V28.4 (Molded SOJ V28) Package Outline, 51-85032**



NOTES :

1. PACKAGE WEIGHT : 1.24g
2. JEDEC REFERENCE : MS-027

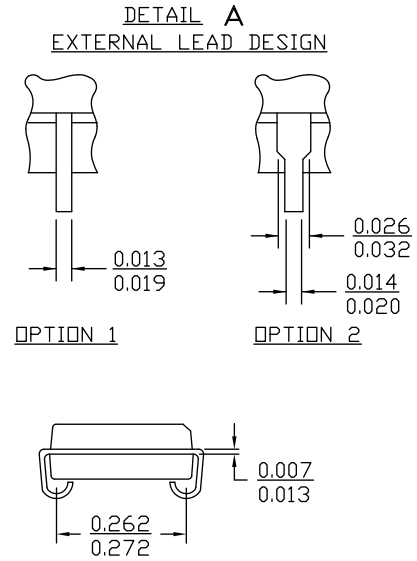
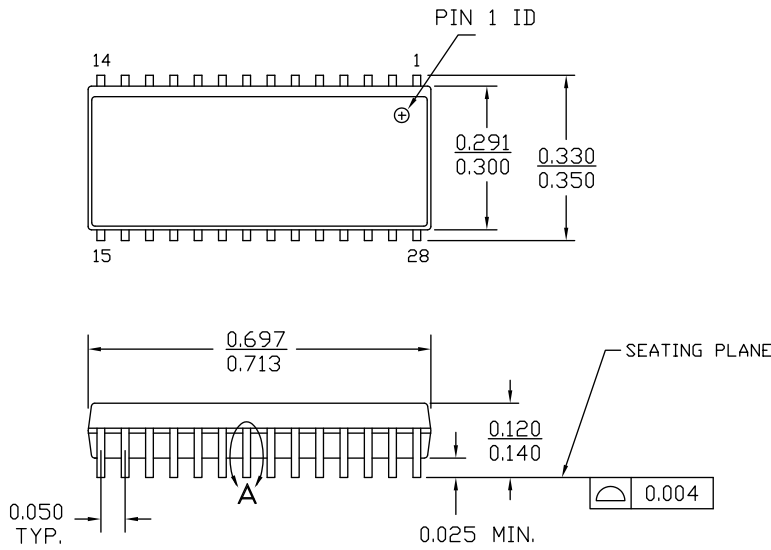
51-85032 \*F

**Package Diagrams(continued)**

**Figure 9. 28-pin SOJ (300 Mils) V28.3 (Molded SOJ V21) Package Outline, 51-85031**

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 \*E

## Acronyms

Acronym	Description
BGA	Ball Grid Array
$\overline{\text{BHE}}$	Byte High Enable
$\overline{\text{BLE}}$	Byte Low Enable
$\overline{\text{CE}}$	Chip Enable
CMOS	Complementary Metal Oxide Semiconductor
FBGA	Very Fine-Pitch Ball Grid Array
I/O	Input/Output
JTAG	Joint Test Action Group
SRAM	Static Random Access Memory
TTL	Transistor-Transistor Logic
$\overline{\text{WE}}$	Write Enable

## Document Conventions

### Units of Measure

Symbol	Unit of Measure
°C	degrees Celsius
MHz	megahertz
μA	microampere
mA	milliampere
ns	nanosecond
Ω	ohm
pF	picofarad
V	volt
W	watt

## Document History Page

Document Title: CY7C107D/CY7C1007D, 1-Mbit (1 M × 1) Static RAM				
Document Number: 38-05469				
Rev.	ECN No.	Issue Date	Orig. of Change	Description of Change
**	201560	See ECN	SWI	Advance Information data sheet for C9 IPP
*A	233722	See ECN	RKF	DC parameters modified as per EROS (Spec # 01-02165) Pb-free offering in Ordering Information
*B	263769	See ECN	RKF	Added Data Retention Characteristics table Added T <sub>power</sub> Spec in Switching Characteristics Table Shaded Ordering Information
*C	307601	See ECN	RKF	Reduced Speed bins to –10 and –12 ns
*D	560995	See ECN	VKN	Converted from Preliminary to Final Removed Commercial Operating range Removed 12 ns speed bin Added I <sub>CC</sub> values for the frequencies 83MHz, 66MHz and 40MHz Updated Thermal Resistance table Updated Ordering Information Table Changed Overshoot spec from V <sub>CC</sub> +2V to V <sub>CC</sub> +1V in footnote #3
*E	802877	See ECN	VKN	Changed I <sub>CC</sub> specs from 60 mA to 80 mA for 100MHz, 55 mA to 72 mA for 83MHz, 45 mA to 58 mA for 66MHz, 30 mA to 37 mA for 40MHz
*F	2898399	03/24/2010	AJU	Updated Package Diagrams
*G	3104943	12/08/2010	AJU	Added <a href="#">Ordering Code Definitions</a> .
*H	3218989	04/07/2011	PRAS	Added TOC Added Acronyms and Units of Measure table. Updated Package diagrams from *C to *D (51-85032)
*I	4040950	06/26/2013	MEMJ	Updated <a href="#">Functional Description</a> . Updated <a href="#">Electrical Characteristics</a> Added one more Test Condition “I <sub>OH</sub> = –0.1mA” for V <sub>OH</sub> parameter and added maximum value corresponding to that Test Condition. Added Note 4 and referred the same note in maximum value for V <sub>OH</sub> parameter corresponding to Test Condition “I <sub>OH</sub> = –0.1mA”. Updated <a href="#">Package Diagrams</a> : spec 51-85031 – Changed revision from *D to *E. Updated in new template.
*J	4385003	05/23/2014	MEMJ	Updated <a href="#">Package Diagrams</a> : spec 51-85032 – Changed revision from *E to *F. Completing Sunset Review.
*K	4578500	11/24/2014	MEMJ	Added related documentation hyperlink in page 1.

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