



## 1M x 1 Static RAM

### Features

- **High speed**  
—  $t_{AA} = 12 \text{ ns}$
- **CMOS for optimum speed/power**
- **Low active power**  
—  $825 \text{ mW}$
- **Low standby power**  
—  $275 \text{ mW}$
- **2.0V data retention (optional)**  
—  $100 \mu\text{W}$
- **Automatic power-down when deselected**
- **TTL-compatible inputs and outputs**

### Functional Description

The CY7C107A is a high-performance CMOS static RAM organized as 1,048,576 words by 1 bit. Easy memory expansion is provided by an active LOW chip enable ( $\overline{CE}$ ) and three-state drivers. The device has an automatic power-down feature that reduces power consumption by more than 65% when deselected.

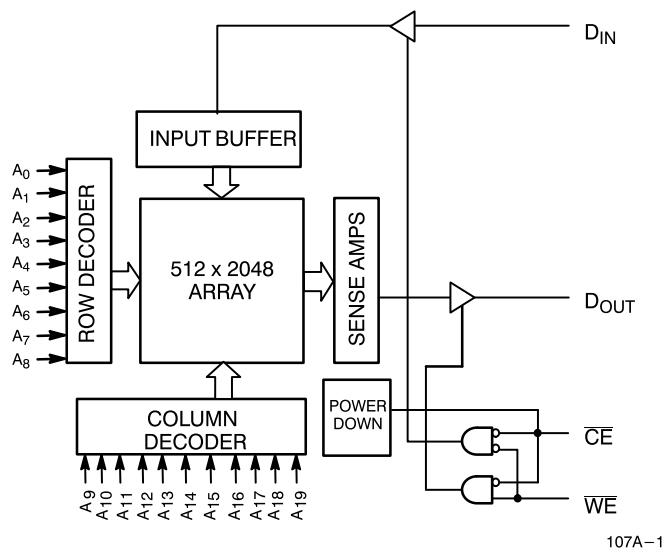
Writing to the device is accomplished by taking chip enable ( $\overline{CE}$ ) and write enable ( $\overline{WE}$ ) inputs LOW. Data on the input pin ( $D_{IN}$ ) is written into the memory location specified on the address pins ( $A_0$  through  $A_{19}$ ).

Reading from the device is accomplished by taking chip enable ( $\overline{CE}$ ) LOW while write enable ( $\overline{WE}$ ) remains HIGH. Under these conditions, the contents of the memory location specified by the address pins will appear on the data output ( $D_{OUT}$ ) pin.

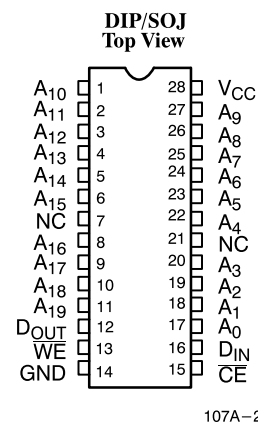
The output pin ( $D_{OUT}$ ) is placed in a high-impedance state when the device is deselected ( $\overline{CE}$  HIGH) or during a write operation ( $\overline{CE}$  and  $\overline{WE}$  LOW).

The CY7C107A is available in standard 400-mil-wide DIPs and SOJs.

### Logic Block Diagram



### Pin Configuration



### Selection Guide

		7C107A-12	7C107A-15	7C107A-20	7C107A-25	7C107A-35
Maximum Access Time (ns)		12	15	20	25	35
Maximum Operating Current (mA)	Commercial	150	135	125	120	110
	Military		145	135	130	120
Maximum Standby Current (mA)	Commercial	50	40	30	30	25
	Military		40	30	30	25



### Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature .....  $-65^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$   
 Ambient Temperature with  
 Power Applied .....  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$   
 Supply Voltage on  $V_{CC}$  Relative to GND<sup>[1]</sup> .  $-0.5\text{V}$  to  $+7.0\text{V}$   
 DC Voltage Applied to Outputs  
 in High Z State<sup>[1]</sup> .....  $-0.5\text{V}$  to  $V_{CC} + 0.5\text{V}$   
 DC Input Voltage<sup>[1]</sup> .....  $-0.5\text{V}$  to  $V_{CC} + 0.5\text{V}$   
 Current into Outputs (LOW) ..... 20 mA  
 Static Discharge Voltage .....  $>2001\text{V}$   
 (per MIL-STD-883, Method 3015)

Latch-Up Current .....  $>200\text{ mA}$

### Operating Range

Range	Ambient Temperature <sup>[2]</sup>	$V_{CC}$
Commercial	$0^{\circ}\text{C}$ to $+70^{\circ}\text{C}$	$5\text{V} \pm 10\%$
Military	$-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$	$5\text{V} \pm 10\%$

#### Notes:

- $V_{IL}$  (min.) =  $-2.0\text{V}$  for pulse durations of less than 20 ns.
- $T_A$  is the “instant on” case temperature.

### Electrical Characteristics Over the Operating Range<sup>[3]</sup>

Parameter	Description	Test Conditions	7C107A–12		7C107A–15		7C107A–20		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -4.0\text{ mA}$	2.4		2.4		2.4		V
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 8.0\text{ mA}$		0.4		0.4		0.4	V
$V_{IH}$	Input HIGH Voltage		2.2	$V_{CC} + 0.3$	2.2	$V_{CC} + 0.3$	2.2	$V_{CC} + 0.3$	V
$V_{IL}$	Input LOW Voltage <sup>[1]</sup>		$-0.3$	0.8	$-0.3$	0.8	$-0.3$	0.8	V
$I_{IX}$	Input Load Current	$\text{GND} \leq V_I \leq V_{CC}$	$-1$	$+1$	$-1$	$+1$	$-1$	$+1$	$\mu\text{A}$
$I_{OZ}$	Output Leakage Current	$\text{GND} \leq V_I \leq V_{CC}$ , Output Disabled	$-5$	$+5$	$-5$	$+5$	$-5$	$+5$	$\mu\text{A}$
$I_{OS}$	Output Short Circuit Current <sup>[4]</sup>	$V_{CC} = \text{Max.}, V_{OUT} = \text{GND}$		$-300$		$-300$		$-300$	mA
$I_{CC}$	$V_{CC}$ Operating Supply Current	$V_{CC} = \text{Max.},$ $I_{OUT} = 0\text{mA},$ $f = f_{\text{MAX}} = 1/\text{trc}$	Com'l	150		135		125	mA
			Mil			145		135	
$I_{SB1}$	Automatic $\overline{\text{CE}}$ Power-Down Current – TTL Inputs	Max. $V_{CC}$ , $\overline{\text{CE}} \geq V_{IH}$ , $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$ , $f = f_{\text{MAX}}$	Com'l	50		40		30	mA
			Mil			40		30	
$I_{SB2}$	Automatic $\overline{\text{CE}}$ Power-Down Current – CMOS Inputs	Max. $V_{CC}$ , $\overline{\text{CE}} \geq V_{CC} - 0.3\text{V}$ , $V_{IN} \geq V_{CC} - 0.3\text{V}$ or $V_{IN} \leq 0.3\text{V}, f=0$	Com'l	2		2		2	mA
			Mil			2		2	

**Electrical Characteristics** Over the Operating Range<sup>[3]</sup> (continued)

Parameter	Description	Test Conditions	7C107A-25		7C107A-35		Unit
			Min.	Max.	Min.	Max.	
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., I <sub>OH</sub> = - 4.0 mA	2.4		2.4		V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 8.0 mA		0.4		0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.2	V <sub>CC</sub> + 0.3	2.2	V <sub>CC</sub> + 0.3	V
V <sub>IL</sub>	Input LOW Voltage <sup>[1]</sup>		-0.3	0.8	-0.3	0.8	V
I <sub>IX</sub>	Input Load Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>	-1	+1	-1	+1	μA
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , Output Disabled	-5	+5	-5	+5	μA
I <sub>OS</sub>	Output Short Circuit Current <sup>[4]</sup>	V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND		-300		-300	mA
I <sub>CC</sub>	V <sub>CC</sub> Operating Supply Current	V <sub>CC</sub> = Max., I <sub>OUT</sub> = 0mA, f = f <sub>MAX</sub> = 1/t <sub>RC</sub>	Com'l	120		110	mA
			Mil	130		120	
I <sub>SB1</sub>	Automatic $\overline{\text{CE}}$ Power-Down Current - TTL Inputs	Max. V <sub>CC</sub> , $\overline{\text{CE}} \geq V_{IH}$ , V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub>	Com'l	30		25	mA
			Mil	30		25	
I <sub>SB2</sub>	Automatic $\overline{\text{CE}}$ Power-Down Current - CMOS Inputs	Max. V <sub>CC</sub> , $\overline{\text{CE}} \geq V_{CC} - 0.3\text{V}$ , V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V or V <sub>IN</sub> ≤ 0.3V, f=0	Com'l	2		2	mA
			Mil	2		2	

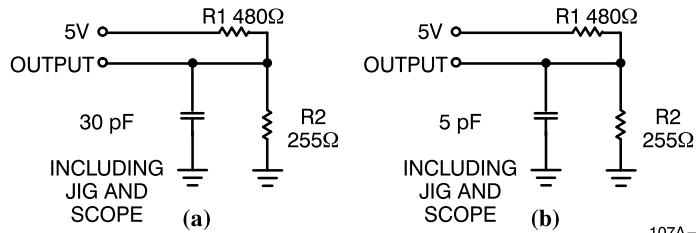
**Capacitance<sup>[5]</sup>**

Parameter	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> = 5.0V	7	pF
C <sub>IN</sub> : Controls			10	pF
C <sub>OUT</sub>	Output Capacitance		10	pF

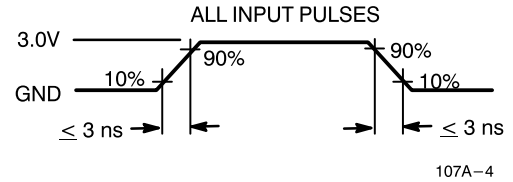
**Notes:**

- See the last page of this specification for Group A subgroup testing information.
- Not more than 1 output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
- Tested initially and after any design or process changes that may affect these parameters.

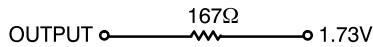
## AC Test Loads and Waveforms



107A-3



Equivalent to: THÉVENIN EQUIVALENT



## Switching Characteristics<sup>[3, 6]</sup> Over the Operating Range

Parameter	Description	7C107A–12		7C107A–15		7C107A–20		7C107A–25		7C107A–35		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE												
t <sub>RC</sub>	Read Cycle Time	12		15		20		25		35		ns
t <sub>AA</sub>	Address to Data Valid		12		15		20		25		35	ns
t <sub>OHA</sub>	Data Hold from Address Change	3		3		3		3		3		ns
t <sub>ACE</sub>	$\overline{\text{CE}}$ LOW to Data Valid		12		15		20		25		35	ns
t <sub>LZCE</sub>	$\overline{\text{CE}}$ LOW to Low Z <sup>[7]</sup>	3		3		3		3		3		ns
t <sub>HZCE</sub>	$\overline{\text{CE}}$ HIGH to High Z <sup>[7, 8]</sup>		6		7		8		10		10	ns
t <sub>PU</sub>	$\overline{\text{CE}}$ LOW to Power-Up	0		0		0		0		0		ns
t <sub>PD</sub>	$\overline{\text{CE}}$ HIGH to Power-Down		12		15		20		25		35	ns
WRITE CYCLE <sup>[9]</sup>												
t <sub>WC</sub>	Write Cycle Time	12		15		20		25		35		ns
t <sub>SCE</sub>	$\overline{\text{CE}}$ LOW to Write End	10		12		15		20		25		ns
t <sub>AW</sub>	Address Set-Up to Write End	10		12		15		20		25		ns
t <sub>HA</sub>	Address Hold from Write End	0		0		0		0		0		ns
t <sub>SA</sub>	Address Set-Up to Write Start	0		0		0		0		0		ns
t <sub>PWE</sub>	$\overline{\text{WE}}$ Pulse Width	10		12		15		20		25		ns
t <sub>SD</sub>	Data Set-Up to Write End	7		8		10		15		20		ns
t <sub>HD</sub>	Data Hold from Write End	0		0		0		0		0		ns
t <sub>LZWE</sub>	$\overline{\text{WE}}$ HIGH to Low Z <sup>[7]</sup>	3		3		3		3		3		ns
t <sub>HZWE</sub>	$\overline{\text{WE}}$ LOW to High Z <sup>[7, 8]</sup>		6		7		8		10		10	ns

### Notes:

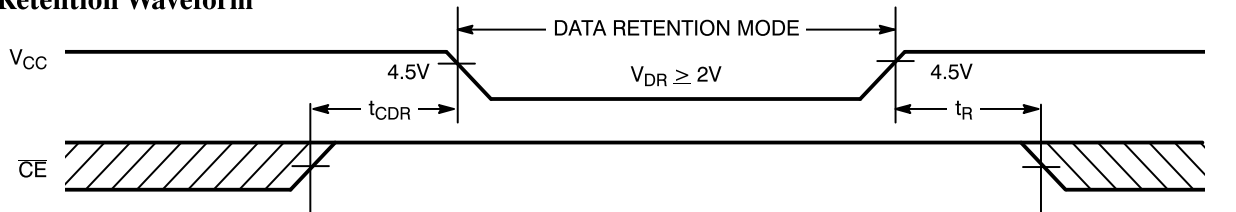
- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I<sub>OL</sub>/I<sub>OH</sub> and 30-pF load capacitance.
- At any given temperature and voltage condition, t<sub>HZCE</sub> is less than t<sub>LZCE</sub> and t<sub>HZWE</sub> is less than t<sub>LZWE</sub> for any given device.
- t<sub>HZCE</sub> and t<sub>HZWE</sub> are specified with a load capacitance of 5 pF as in part (b) of AC Test Loads. Transition is measured  $\pm 500$  mV from steady-state voltage.
- 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.

**Data Retention Characteristics** Over the Operating Range (L Version Only)

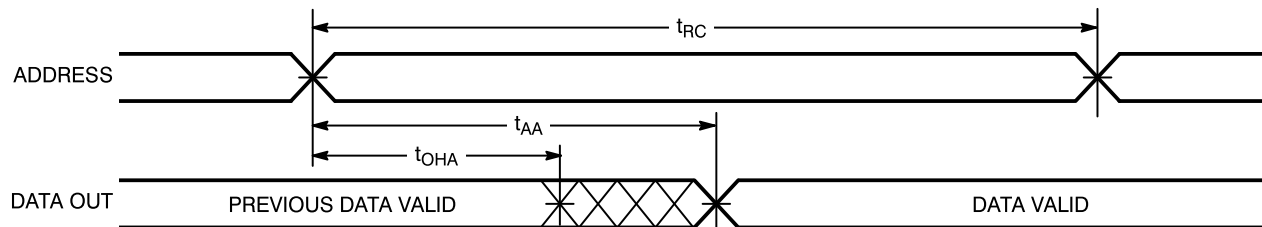
Parameter	Description	Conditions <sup>[10]</sup>	Commercial		Military		Unit
			Min.	Max.	Min.	Max.	
V <sub>DR</sub>	V <sub>CC</sub> for Data Retention		2.0		2.0		V
I <sub>CCDR</sub>	Data Retention Current	V <sub>CC</sub> = V <sub>DR</sub> = 2.0V, CE ≥ V <sub>CC</sub> - 0.3V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3 or V <sub>IN</sub> ≤ 0.3V		50		70	μA
t <sub>CDR</sub> <sup>[5]</sup>	Chip Deselect to Data Retention Time		0		0		ns
t <sub>R</sub> <sup>[5]</sup>	Operation Recovery Time		t <sub>RC</sub>		t <sub>RC</sub>		ns

**Note:**

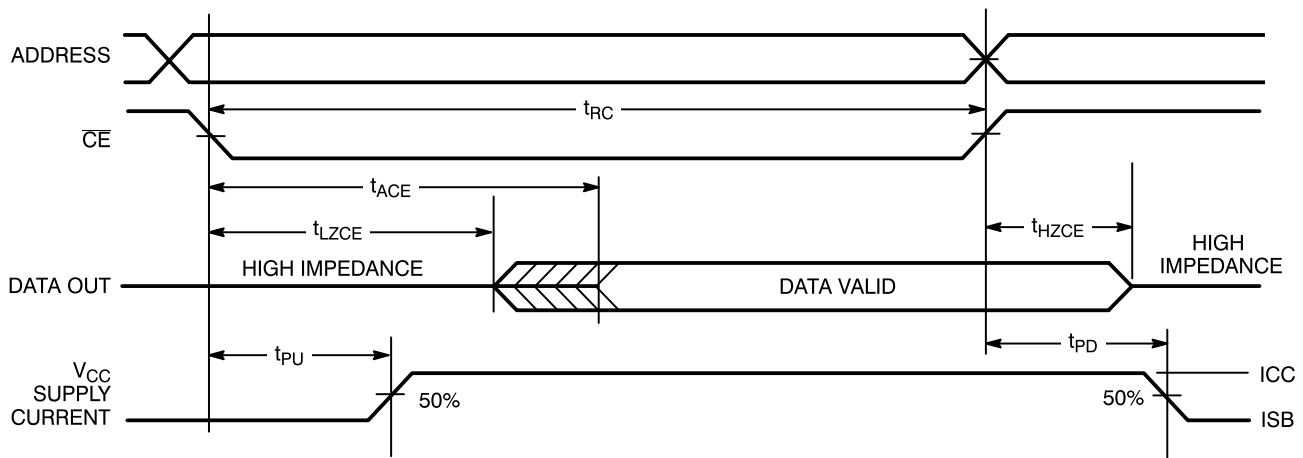
 10. No input may exceed V<sub>CC</sub> + 0.5V.

**Data Retention Waveform**


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**Switching Waveforms**
**Read Cycle No. 1<sup>[11, 12]</sup>**


107A-6

**Read Cycle No. 2<sup>[12, 13]</sup>**


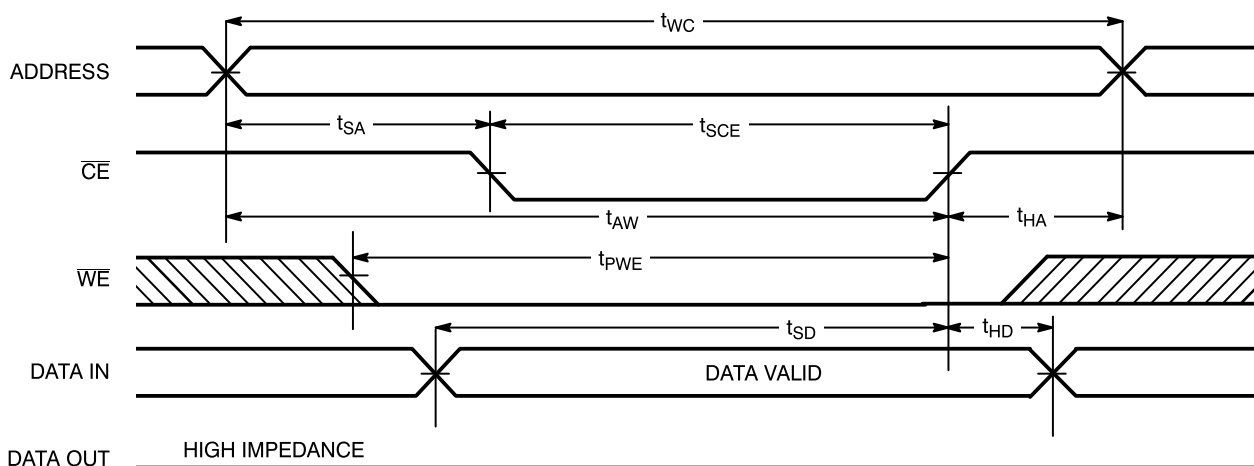
107A-7

**Notes:**

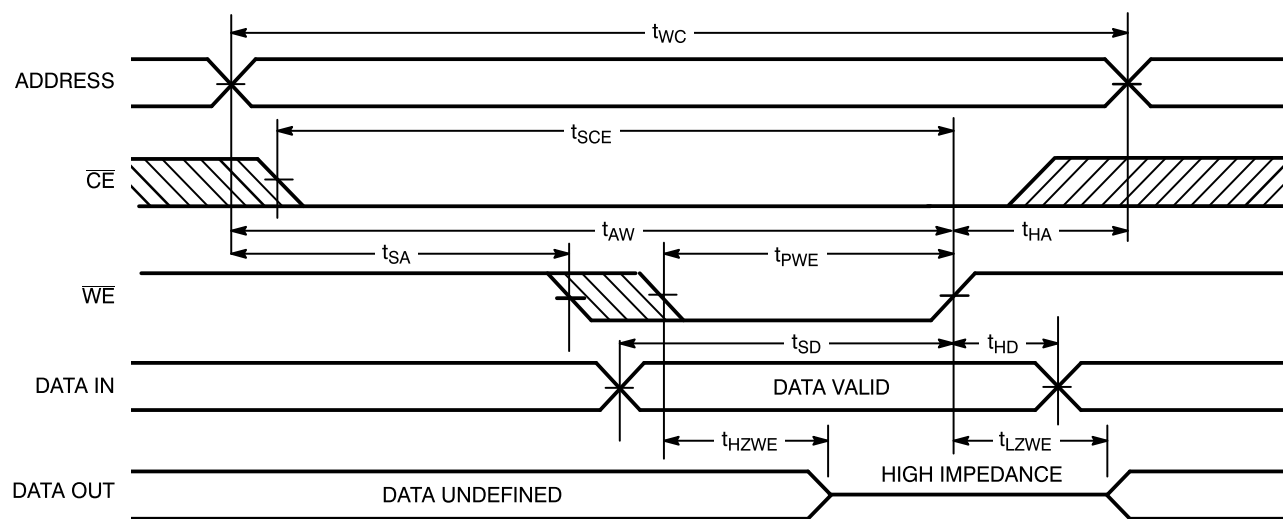
 11. Device is continuously selected, CE = V<sub>IL</sub>.

12. WE is HIGH for read cycle.

13. Address valid prior to or coincident with CE transition LOW.

**Switching Waveforms (continued)**
**Write Cycle No. 1 ( $\overline{\text{CE}}$  Controlled)<sup>[14]</sup>**


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**Write Cycle No. 2 ( $\overline{\text{WE}}$  Controlled)<sup>[14]</sup>**


107A-9

**Note:**

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

**Truth Table**

$\overline{\text{CE}}$	$\overline{\text{WE}}$	$\text{D}_{\text{OUT}}$	Mode	Power
H	X	High Z	Power-Down	Standby ( $I_{\text{SB}}$ )
L	H	Data Out	Read	Active ( $I_{\text{CC}}$ )
L	L	High Z	Write	Active ( $I_{\text{CC}}$ )



## Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
12	CY7C107A-12PC	P41	28-Lead (400-Mil) Molded DIP	Commercial
	CY7C107A-12VC	V28	28-Lead (400-Mil) Molded SOJ	
15	CY7C107A-15PC	P41	28-Lead (400-Mil) Molded DIP	Commercial
	CY7C107A-15VC	V28	28-Lead (400-Mil) Molded SOJ	
	CY7C107A-15DMB	D42	28-Lead (400-Mil) CerDIP	Military
20	CY7C107A-20PC	P41	28-Lead (400-Mil) Molded DIP	Commercial
	CY7C107A-20VC	V28	28-Lead (400-Mil) Molded SOJ	
	CY7C107A-20DMB	D42	28-Lead (400-Mil) CerDIP	Military
25	CY7C107A-25PC	P41	28-Lead (400-Mil) Molded DIP	Commercial
	CY7C107A-25VC	V28	28-Lead (400-Mil) Molded SOJ	
	CY7C107A-25DMB	D42	28-Lead (400-Mil) CerDIP	Military
35	CY7C107A-35PC	P41	28-Lead (400-Mil) Molded DIP	Commercial
	CY7C107A-35VC	V28	28-Lead (400-Mil) Molded SOJ	
	CY7C107A-35DMB	D42	28-Lead (400-Mil) CerDIP	Military

Contact factory for “L” version availability.

## MILITARY SPECIFICATIONS

### Group A Subgroup Testing

#### DC Characteristics

Parameter	Subgroups
V <sub>OH</sub>	1, 2, 3
V <sub>OL</sub>	1, 2, 3
V <sub>IH</sub>	1, 2, 3
V <sub>IL</sub> Max.	1, 2, 3
I <sub>IX</sub>	1, 2, 3
I <sub>OZ</sub>	1, 2, 3
I <sub>CC</sub>	1, 2, 3
I <sub>SB1</sub>	1, 2, 3
I <sub>SB2</sub>	1, 2, 3

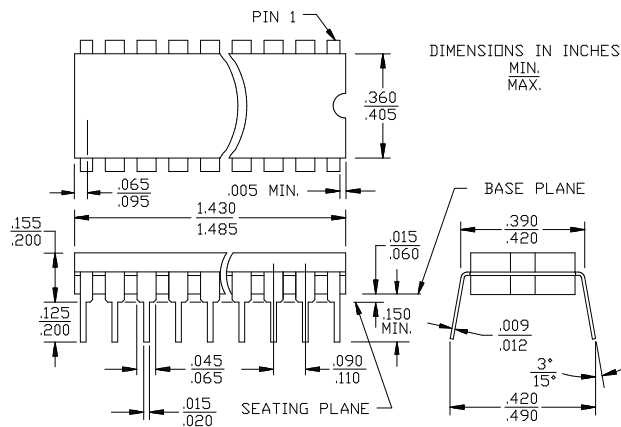
#### Switching Characteristics

Parameter	Subgroups
<b>READ CYCLE</b>	
t <sub>RC</sub>	7, 8, 9, 10, 11
t <sub>AA</sub>	7, 8, 9, 10, 11
t <sub>OHA</sub>	7, 8, 9, 10, 11
t <sub>ACE</sub>	7, 8, 9, 10, 11
<b>WRITE CYCLE</b>	
t <sub>WC</sub>	7, 8, 9, 10, 11
t <sub>SCE</sub>	7, 8, 9, 10, 11
t <sub>AW</sub>	7, 8, 9, 10, 11
t <sub>HA</sub>	7, 8, 9, 10, 11
t <sub>SA</sub>	7, 8, 9, 10, 11
t <sub>PWE</sub>	7, 8, 9, 10, 11
t <sub>SD</sub>	7, 8, 9, 10, 11
t <sub>HD</sub>	7, 8, 9, 10, 11

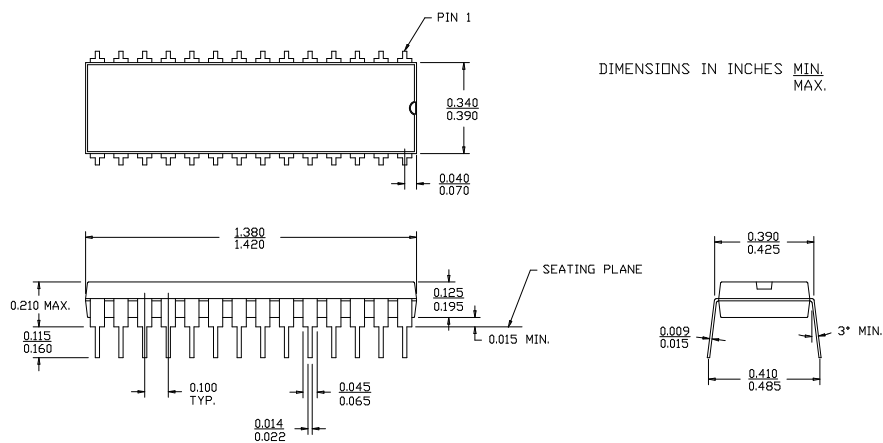
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## Package Diagrams

### 28-Lead (400-Mil) CerDIP D42



### 28-Lead (400-Mil) Molded DIP P41



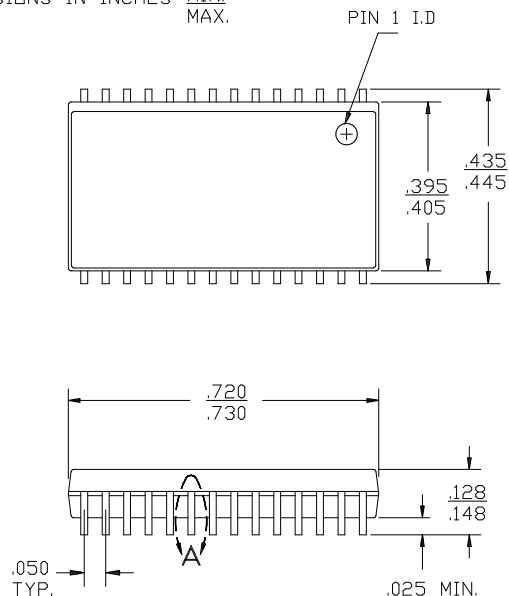




Package Diagrams (continued)

28-Lead (400-Mil) Molded SOJ V28

DIMENSIONS IN INCHES  $\frac{\text{MIN.}}{\text{MAX.}}$



DETAIL A  
EXTERNAL LEAD DESIGN

