



PRELIMINARY

CY7C1022

## 32K x 16 Static RAM

### Features

- 5.0V operation ( $\pm 10\%$ )
- High speed
  - $t_{AA} = 12$  ns
- Low active power
  - 825 mW (max., 10 ns, "L" version)
- Very Low standby power
  - 500  $\mu$ W (max., "L" version)
- Automatic power-down when deselected
- Independent Control of Upper and Lower bytes
- Available in 400-mil SOJ

### Functional Description

The CY7C1022 is a high-performance CMOS static RAM organized as 32,768 words by 16 bits. This device has an automatic power-down feature that significantly reduces power consumption when deselected.

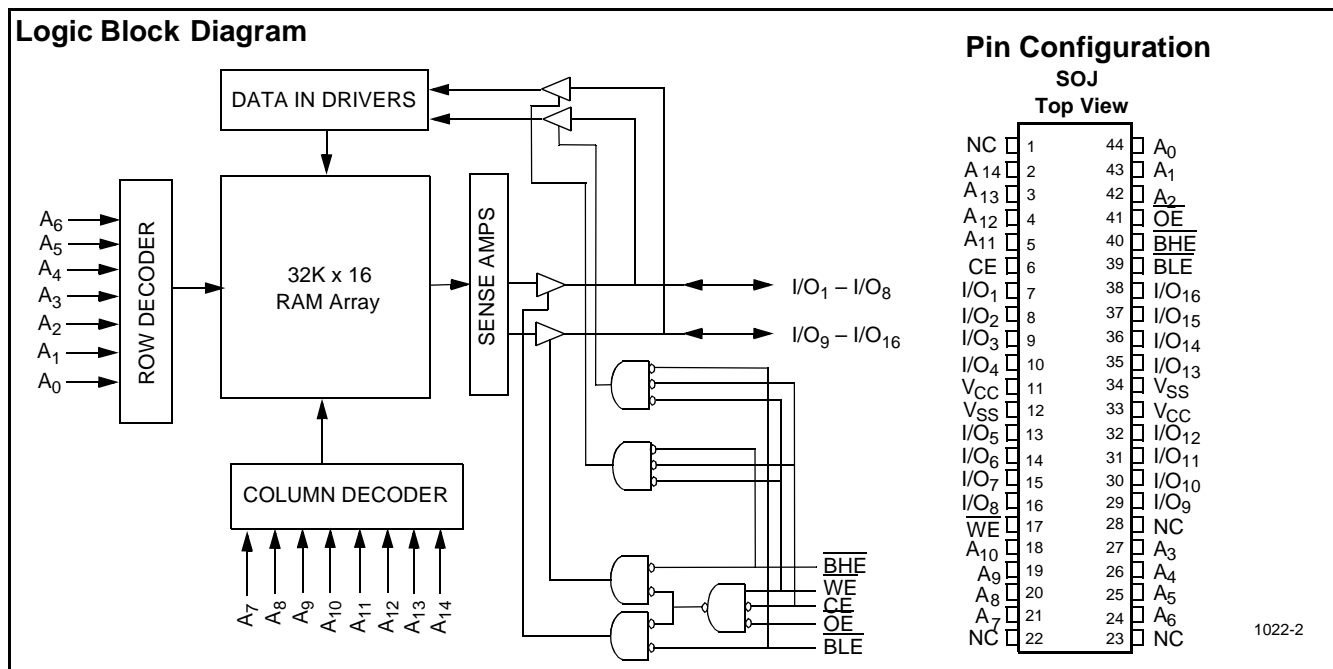
Writing to the device is accomplished by taking chip enable (CE) input HIGH and write enable (WE) input LOW. If byte low

enable ( $\overline{BLE}$ ) is LOW, then data from I/O pins (I/O<sub>1</sub> through I/O<sub>8</sub>), is written into the location specified on the address pins (A<sub>0</sub> through A<sub>14</sub>). If byte high enable (BHE) is LOW, then data from I/O pins (I/O<sub>9</sub> through I/O<sub>16</sub>) is written into the location specified on the address pins (A<sub>0</sub> through A<sub>14</sub>).

Reading from the device is accomplished by taking chip enable (CE) HIGH and output enable ( $\overline{OE}$ ) LOW while forcing the write enable (WE) HIGH. If byte low enable (BLE) is LOW, then data from the memory location specified by the address pins will appear on I/O<sub>1</sub> to I/O<sub>8</sub>. If byte high enable (BHE) is LOW, then data from memory will appear on I/O<sub>9</sub> to I/O<sub>16</sub>. See the truth table at the back of this data sheet for a complete description of read and write modes.

The input/output pins (I/O<sub>1</sub> through I/O<sub>16</sub>) are placed in a high-impedance state when the device is deselected (CE LOW), the outputs are disabled ( $\overline{OE}$  HIGH), the BHE and BLE are disabled (BHE, BLE HIGH), or during a write operation (CE HIGH, and WE LOW).

The CY7C1022 is available in standard 400-mil-wide SOJ packages.



### Selection Guide

		7C1022-12	7C1022-15
Maximum Access Time (ns)		12	15
Maximum Operating Current (mA)		170	160
	L	140	130
Maximum CMOS Standby Current (mA)		3	3
	L	0.1	0.1

Shaded areas contain advance information.

## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, 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<sup>[1]</sup> .... -0.5V to +7.0V

DC Voltage Applied to Outputs  
in High Z State<sup>[1]</sup> ..... -0.5V to  $V_{CC} + 0.5V$

DC Input Voltage<sup>[1]</sup> ..... -0.5V to  $V_{CC} + 0.5V$

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

## Operating Range

Range	Ambient Temperature <sup>[2]</sup>	$V_{CC}$
Commercial	0°C to +70°C	4.5V–5.5V

## Electrical Characteristics Over the Operating Range

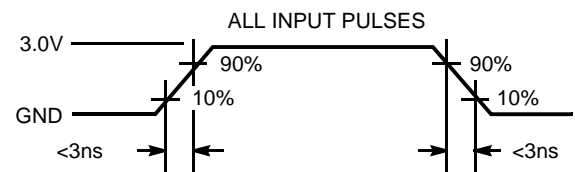
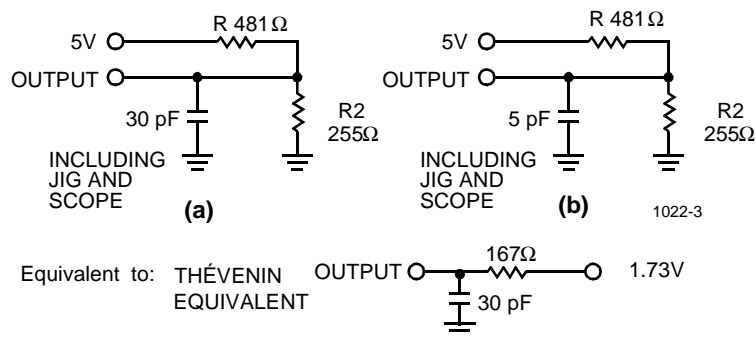
Parameter	Description	Test Conditions	7C1022-12		7C1022-15		Unit
			Min.	Max.	Min.	Max.	
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -4.0 \text{ mA}$	2.4		2.4		V
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 8.0 \text{ mA}$		0.4		0.4	V
$V_{IH}$	Input HIGH Voltage		2.2	6.0	2.2	6.0	V
$V_{IL}$	Input LOW Voltage <sup>[1]</sup>		-0.5	0.8	-0.5	0.8	V
$I_{IX}$	Input Load Current	$GND \leq V_I \leq V_{CC}$	-1	+1	-1	+1	μA
$I_{OZ}$	Output Leakage Current	$GND \leq V_I \leq V_{CC}$ , Output Disabled	-2	+2	-2	+2	μA
$I_{CC}$	$V_{CC}$ Operating Supply Current	$V_{CC} = \text{Max.}$ $I_{OUT} = 0 \text{ mA}$ , $f = f_{MAX} = 1/t_{RC}$		170		160	mA
			L	140		130	
$I_{SB1}$	Automatic CE Power-Down Current —TTL Inputs	Max. $V_{CC}$ , CE $\geq V_{IH}$ $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$ , $f = f_{MAX}$		20		20	mA
			L	10		10	
$I_{SB2}$	Automatic CE Power-Down Current —CMOS Inputs	Max. $V_{CC}$ , CE $\geq V_{CC} - 0.3V$ , $V_{IN} \geq V_{CC} - 0.3V$ , or $V_{IN} \leq 0.3V$ , $f=0$		3		3	mA
			L	0.1		0.1	

Shaded area contains advance information.

## Capacitance<sup>[3]</sup>

Parameter	Description	Test Conditions	Max.	Unit
$C_{IN}$	Input Capacitance	$T_A = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$ , $V_{CC} = 5.0V$	8	pF
$C_{OUT}$	Output Capacitance		8	pF

## AC Test Loads and Waveforms



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### Notes:

- $V_{IL}(\text{min.}) = -2.0V$  for pulse durations of less than 20 ns.
- $T_A$  is the "instant on" case temperature.
- Tested initially and after any design or process changes that may affect these parameters.

**Switching Characteristics<sup>[4]</sup> Over the Operating Range**

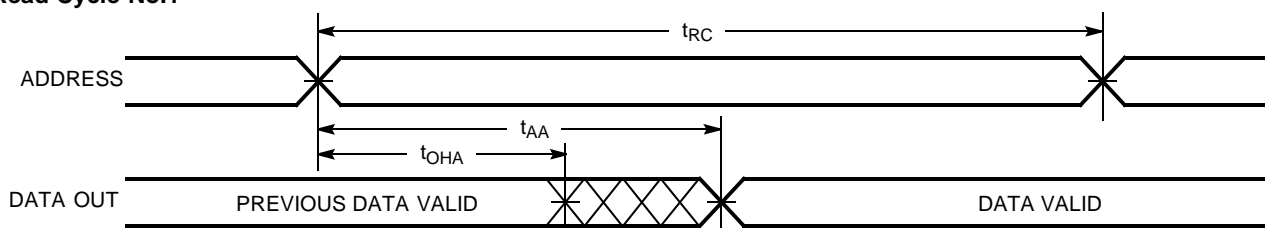
Parameter	Description	7C1022-12		7C1022-15		Unit
		Min.	Max.	Min.	Max.	
READ CYCLE						
t <sub>RC</sub>	Read Cycle Time	12		15		ns
t <sub>AA</sub>	Address to Data Valid		12		15	ns
t <sub>OHA</sub>	Data Hold from Address Change	3		3		ns
t <sub>ACE</sub>	CE HIGH to Data Valid		12		15	ns
t <sub>DOE</sub>	$\overline{OE}$ LOW to Data Valid		6		7	ns
t <sub>LZOE</sub>	$\overline{OE}$ LOW to Low Z	0		0		ns
t <sub>HZOE</sub>	$\overline{OE}$ HIGH to High Z <sup>[5, 6]</sup>		6		7	ns
t <sub>LZCE</sub>	CE HIGH to Low Z <sup>[6]</sup>	3		3		ns
t <sub>HZCE</sub>	CE LOW to High Z <sup>[5, 6]</sup>		6		7	ns
t <sub>PU</sub>	CE HIGH to Power-Up	0		0		ns
t <sub>PD</sub>	CE LOW to Power-Down		12		15	ns
t <sub>DBE</sub>	Byte enable to Data Valid		6		7	ns
t <sub>LZBE</sub>	Byte enable to Low Z	0		0		ns
t <sub>HZBE</sub>	Byte disable to High Z		6		7	ns
WRITE CYCLE <sup>[7]</sup>						
t <sub>WC</sub>	Write Cycle Time	12		15		ns
t <sub>SCE</sub>	CE HIGH to Write End	9		10		ns
t <sub>AW</sub>	Address Set-Up to Write End	8		10		ns
t <sub>HA</sub>	Address Hold from Write End	0		0		ns
t <sub>SA</sub>	Address Set-Up to Write Start	0		0		ns
t <sub>PWE</sub>	$\overline{WE}$ Pulse Width	8		10		ns
t <sub>SD</sub>	Data Set-Up to Write End	6		10		ns
t <sub>HD</sub>	Data Hold from Write End	0		0		ns
t <sub>LZWE</sub>	$\overline{WE}$ HIGH to Low Z <sup>[6]</sup>	3		3		ns
t <sub>HZWE</sub>	$\overline{WE}$ LOW to High Z <sup>[5, 6]</sup>		6		7	ns
t <sub>BW</sub>	Byte enable to end of write	8		9		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.
- $t_{HZOE}$ ,  $t_{HZBE}$ ,  $t_{HZCE}$ , and  $t_{HZWE}$  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.
- 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.
- The internal write time of the memory is defined by the overlap of CE HIGH,  $\overline{WE}$  LOW and BHE / BLE LOW. CE HIGH,  $\overline{WE}$  and BHE / BLE must be LOW to initiate a write, and the transition 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.

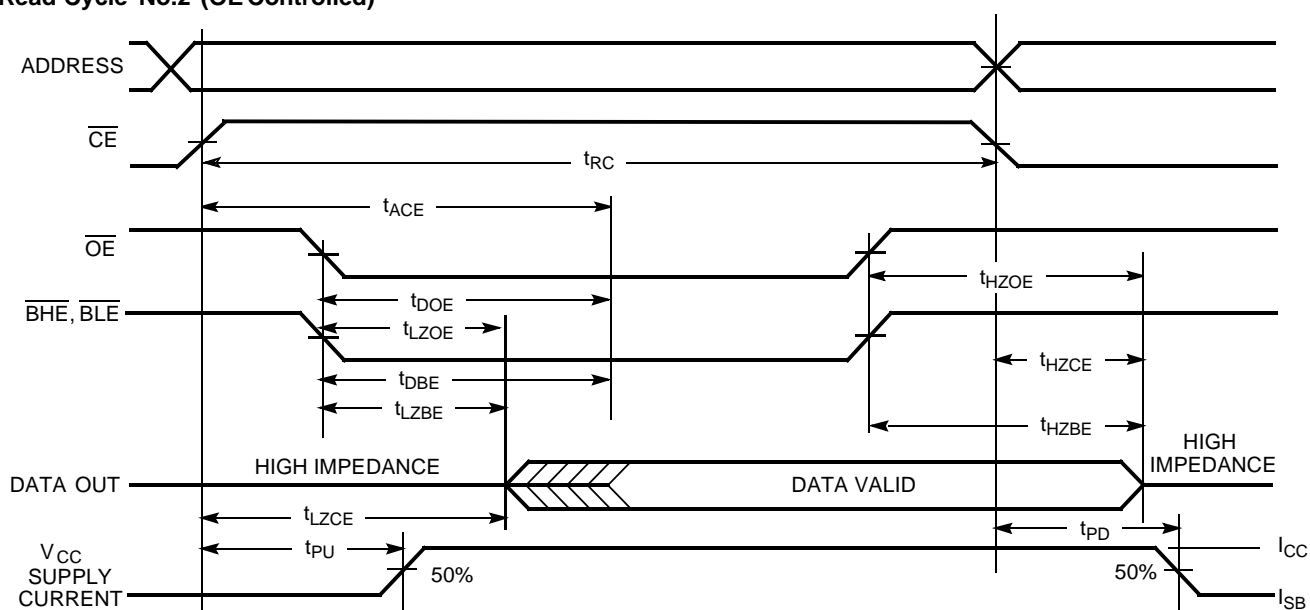
## Switching Waveforms

**Read Cycle No.1** <sup>[8, 9]</sup>



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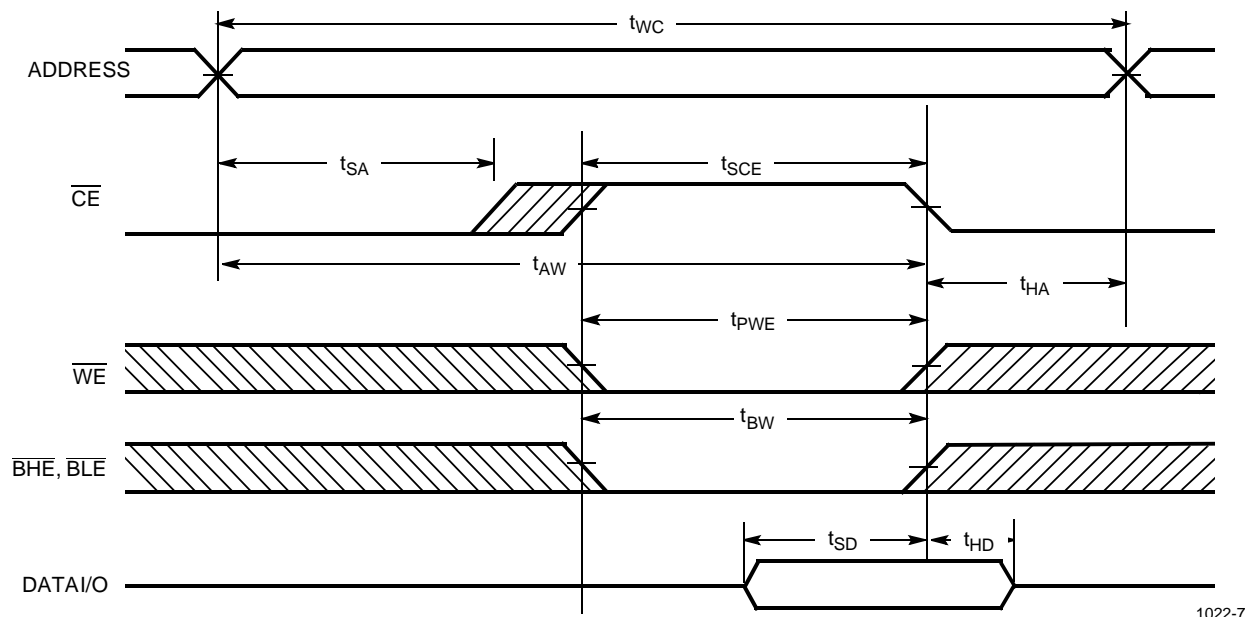
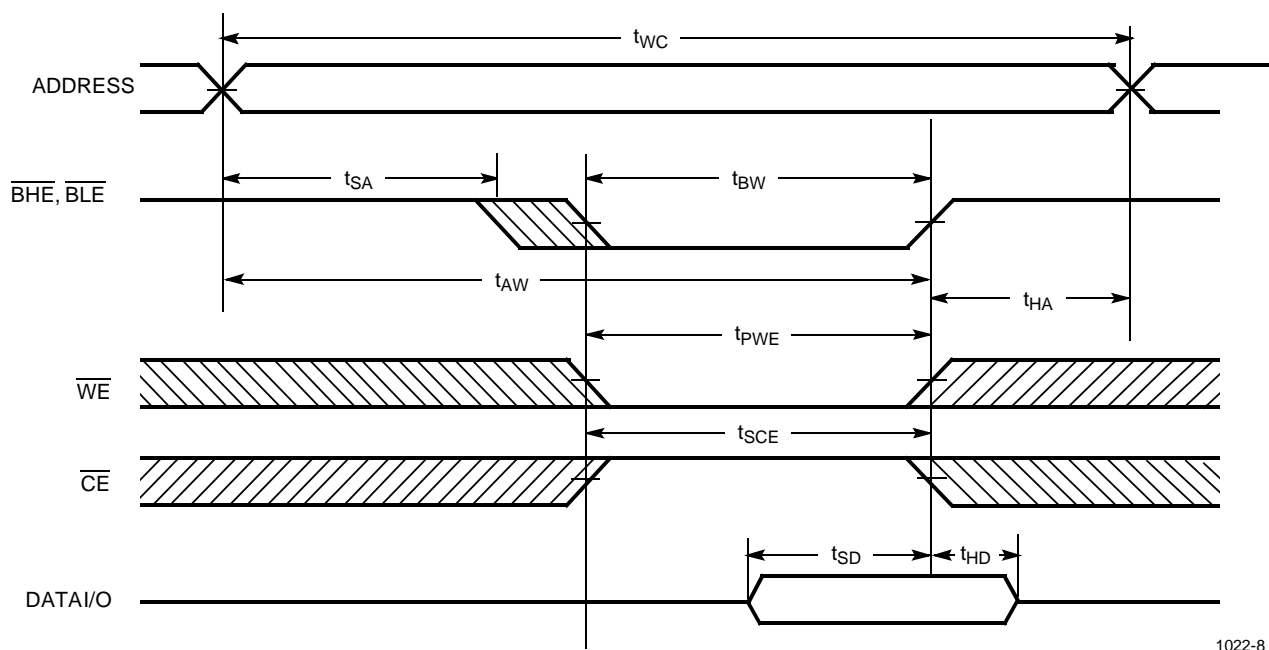
**Read Cycle No.2 ( $\overline{OE}$  Controlled)** <sup>[9, 10]</sup>



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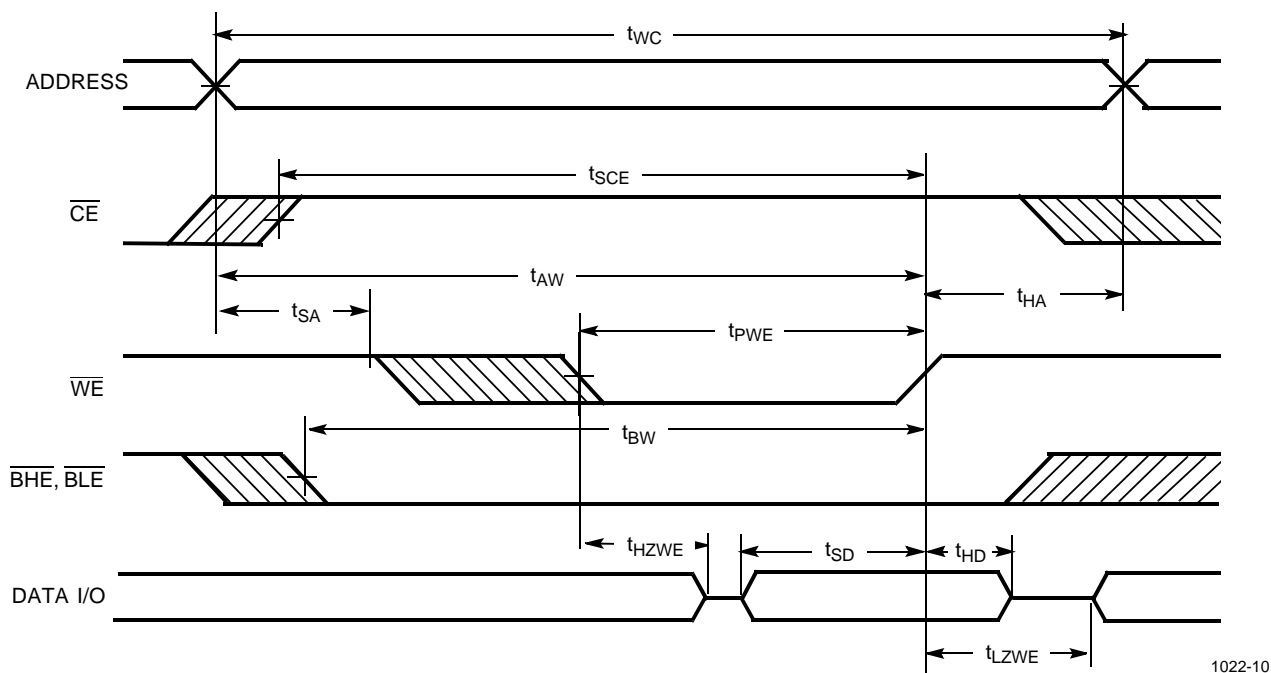
**Notes:**

8. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE}$ ,  $\overline{BHE}$  and/or  $\overline{BLE} = V_{IL}$
9.  $\overline{WE}$  is HIGH for read cycle.
10. Address valid prior to or coincident with  $\overline{CE}$  transition HIGH.

**Switching Waveforms (continued)**
**Write Cycle No. 1 ( $\overline{\text{CE}}$  Controlled)** <sup>[11, 12]</sup>

**Write Cycle No. 2 ( $\overline{\text{BLE}}$  or  $\overline{\text{BHE}}$  Controlled)**

**Notes:**

11. Data I/O is high impedance if  $\overline{\text{OE}}$  or  $\overline{\text{BHE}}$  and/or  $\overline{\text{BLE}} = V_{IH}$ .
12. If CE goes LOW simultaneously with WE going HIGH, the output remains in a high-impedance state.

**Switching Waveforms** (continued)

**Write Cycle No.3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW)**


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**Truth Table**

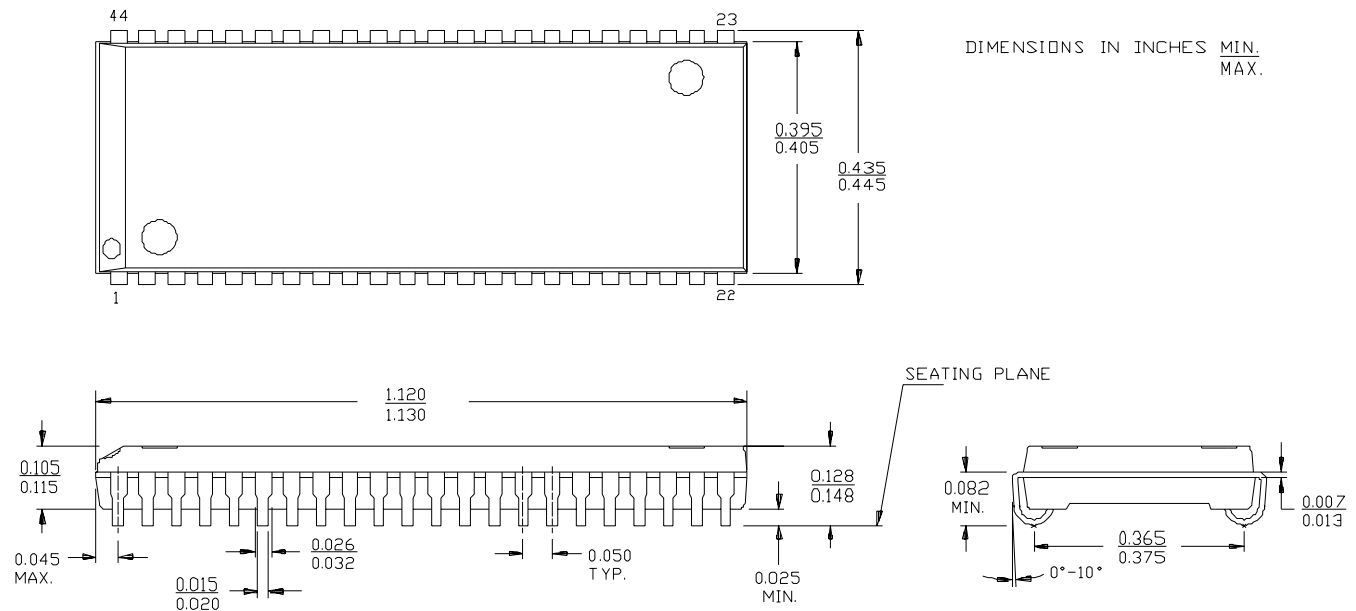
CE	OE	WE	BLE	BHE	I/O <sub>1</sub> - I/O <sub>8</sub>	I/O <sub>9</sub> - I/O <sub>16</sub>	Mode	Power
L	X	X	X	X	High Z	High Z	Power-Down	Standby ( $I_{SB}$ )
H	L	H	L	L	Data Out	Data Out	Read - All bits	Active ( $I_{CC}$ )
			L	H	Data Out	High Z	Read - Lower bits only	Active ( $I_{CC}$ )
			H	L	High Z	Data Out	Read - Upper bits only	Active ( $I_{CC}$ )
H	X	L	L	L	Data In	Data In	Write - All bits	Active ( $I_{CC}$ )
			L	H	Data In	High Z	Write - Lower bits only	Active ( $I_{CC}$ )
			H	L	High Z	Data In	Write - Upper bits only	Active ( $I_{CC}$ )
H	H	H	X	X	High Z	High Z	Selected, Outputs Disabled	Active ( $I_{CC}$ )
H	X	X	H	H	High Z	High Z	Selected, Outputs Disabled	Active ( $I_{CC}$ )

**Ordering Information**

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
12	CY7C1022-12VC	V34	44-Lead (400-Mil) Molded SOJ	Commercial

## Package Diagram

### 44-Lead (400-Mil) Molded SOJ V34





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<b>REV.</b>	<b>ECN NO.</b>	<b>Issue Date</b>	<b>Orig. of Change</b>	<b>Description of Change</b>
**	110184	09/29/01	SZV	Change from Spec number: 38-00636 to 38-05090