

## 4-Mbit (512K x 8) Static RAM

### Features

- **High Speed:** 70 ns
- **4.5V–5.5V operation**
- **Low active power**
  - **Typical active current:** 2.5 mA @  $f = 1$  MHz
  - **Typical active current:** 12.5 mA @  $f = f_{max}$ (70 ns)
- **Low standby current**
- **Automatic power-down when deselected**
- **TTL-compatible inputs and outputs**
- **Easy memory expansion with CE and OE features**
- **CMOS for optimum speed/power**
- **Available in standard 32-lead (450-mil) SOIC, 32-lead TSOP II and 32-lead Reverse TSOP II packages**

### Functional Description

The CY62148B is a high-performance CMOS static RAM organized as 512K words by 8 bits. Easy memory expansion

is provided by an active LOW Chip Enable (CE), an active LOW Output Enable (OE), and three-state drivers. This device has an automatic power-down feature that reduces power consumption by more than 99% when deselected.

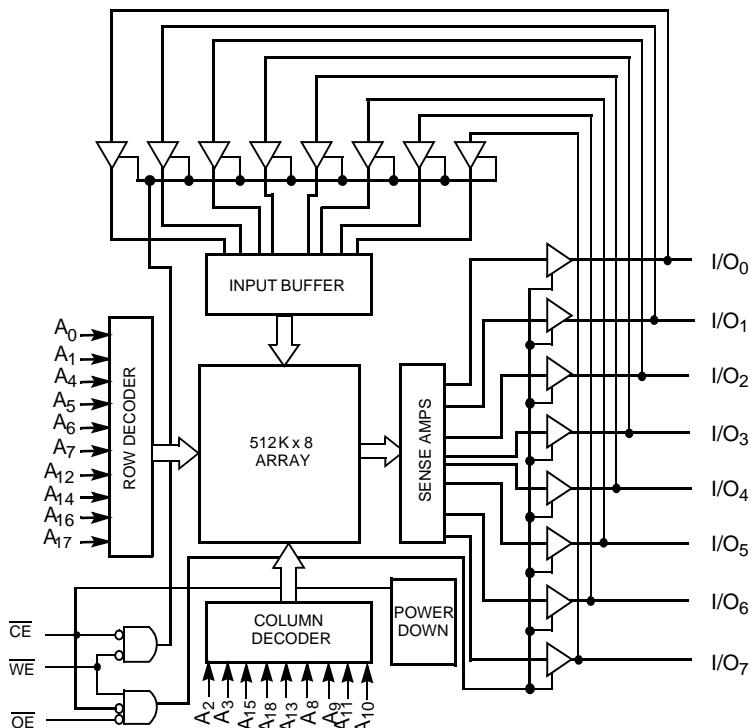
Writing to the device is accomplished by taking Chip Enable (CE) and Write Enable (WE) inputs LOW. Data on the eight I/O pins (I/O<sub>0</sub> through I/O<sub>7</sub>) is then written into the location specified on the address pins (A<sub>0</sub> through A<sub>18</sub>).

Reading from the device is accomplished by taking Chip Enable (CE) and Output Enable (OE) LOW while forcing Write Enable (WE) HIGH for read. 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<sub>0</sub> through I/O<sub>7</sub>) are placed in a high-impedance state when the device is deselected (CE HIGH), the outputs are disabled (OE HIGH), or during a write operation (CE LOW, and WE LOW).

The CY62148B is available in a standard 32-pin 450-mil-wide body width SOIC, 32-pin TSOP II, and 32-pin Reverse TSOP II packages.

### Logic Block Diagram



### Pin Configuration

#### Top View SOIC TSOP II

A <sub>17</sub>	1	32	V <sub>CC</sub>
A <sub>16</sub>	2	31	A <sub>15</sub>
A <sub>14</sub>	3	30	A <sub>18</sub>
A <sub>12</sub>	4	29	WE
A <sub>7</sub>	5	28	A <sub>13</sub>
A <sub>6</sub>	6	27	A <sub>8</sub>
A <sub>5</sub>	7	26	A <sub>9</sub>
A <sub>4</sub>	8	25	A <sub>11</sub>
A <sub>3</sub>	9	24	OE
A <sub>2</sub>	10	23	A <sub>10</sub>
A <sub>1</sub>	11	22	CE
A <sub>0</sub>	12	21	I/O <sub>7</sub>
I/O <sub>0</sub>	13	20	I/O <sub>6</sub>
I/O <sub>1</sub>	14	19	I/O <sub>5</sub>
I/O <sub>2</sub>	15	18	I/O <sub>4</sub>
I/O <sub>3</sub>	16	17	I/O <sub>3</sub>
GND	17		

#### Top View Reverse TSOP II

GND	16	17	I/O <sub>3</sub>
I/O <sub>2</sub>	15	18	I/O <sub>4</sub>
I/O <sub>1</sub>	14	19	I/O <sub>5</sub>
I/O <sub>0</sub>	13	20	I/O <sub>6</sub>
A <sub>0</sub>	12	21	I/O <sub>7</sub>
A <sub>1</sub>	11	22	CE
A <sub>2</sub>	10	23	A <sub>10</sub>
A <sub>3</sub>	9	24	OE
A <sub>4</sub>	8	25	A <sub>11</sub>
A <sub>5</sub>	7	26	A <sub>9</sub>
A <sub>6</sub>	6	27	A <sub>8</sub>
A <sub>7</sub>	5	28	A <sub>13</sub>
A <sub>12</sub>	4	29	WE
A <sub>14</sub>	3	30	A <sub>18</sub>
A <sub>16</sub>	2	31	A <sub>15</sub>
A <sub>17</sub>	1	32	V <sub>CC</sub>

**Product Portfolio**

Product	V <sub>CC</sub> Range			Speed	Temp.	Power Dissipation						
						Operating, I <sub>cc</sub>		Standby (I <sub>SB2</sub> )				
	f = f <sub>max</sub>		Typ. <sup>[3]</sup>	Max.		Typ. <sup>[3]</sup>	Max.					
	Min.	Typ.	Max.									
CY62148BLL	4.5 V	5.0V	5.5V	70 ns	Com'l	12.5 mA	20 mA	4 $\mu$ A	20 $\mu$ A			
					Ind'l							

**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<sub>CC</sub> to Relative GND ..... -0.5V to +7.0V

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

DC Input Voltage<sup>[1]</sup> ..... -0.5V to V<sub>CC</sub> +0.5V

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

Static Discharge Voltage ..... 2001V  
(per MIL-STD-883, Method 3015)

Latch-Up Current ..... >200 mA

**Operating Range**

Range	Ambient Temperature <sup>[2]</sup>	V <sub>CC</sub>
Commercial	0°C to +70°C	4.5V–5.5V
Industrial	-40°C to +85°C	

**Electrical Characteristics** Over the Operating Range

Parameter	Description	Test Conditions	CY62148B-70			Unit
			Min.	Typ. <sup>[3]</sup>	Max.	
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., I <sub>OH</sub> = -1 mA	2.4			V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 2.1 mA			0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.2		V <sub>CC</sub> +0.3	V
V <sub>IL</sub>	Input LOW Voltage		-0.3		0.8	V
I <sub>IX</sub>	Input Leakage Current	GND $\leq$ V <sub>I</sub> $\leq$ V <sub>CC</sub>	-1		+1	$\mu$ A
I <sub>OZ</sub>	Output Leakage Current	GND $\leq$ V <sub>I</sub> $\leq$ V <sub>CC</sub> , Output Disabled	-1		+1	$\mu$ A
I <sub>CC</sub>	V <sub>CC</sub> Operating Supply Current	f = f <sub>MAX</sub> = 1/t <sub>RC</sub>	Com/Ind'l	12.5	20	mA
		f = 1 MHz	I <sub>OUT</sub> = 0 mA V <sub>CC</sub> = Max.,	2.5		mA
I <sub>SB1</sub>	Automatic CE Power-Down Current —TTL Inputs	Max. V <sub>CC</sub> , CE $\geq$ V <sub>IH</sub> V <sub>IN</sub> $\geq$ V <sub>IH</sub> or V <sub>IN</sub> $\leq$ V <sub>IL</sub> , f = f <sub>MAX</sub>	Com/Ind'l		1.5	mA
I <sub>SB2</sub>	Automatic CE Power-Down Current —CMOS Inputs	Max. V <sub>CC</sub> , CE $\geq$ V <sub>CC</sub> - 0.3V, V <sub>IN</sub> $\geq$ V <sub>CC</sub> - 0.3V, or V <sub>IN</sub> $\leq$ 0.3V, f = 0	Com/Ind'l	4	20	$\mu$ A

**Notes:**

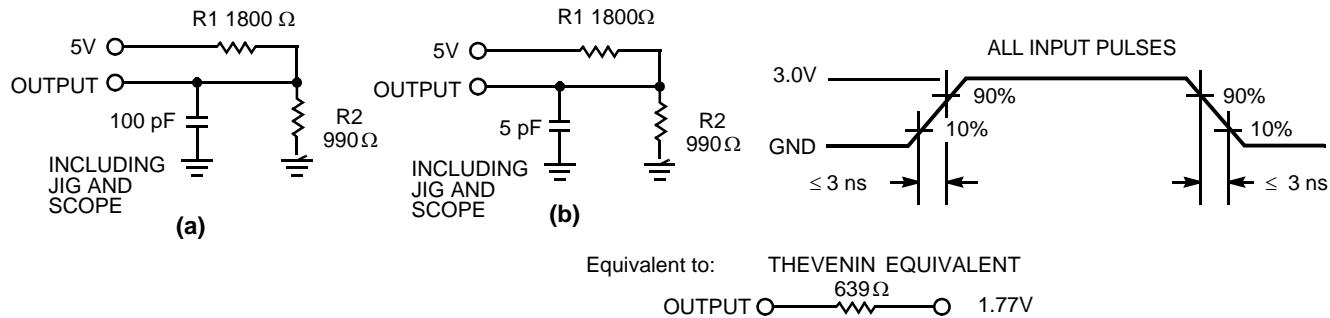
1. V<sub>IL</sub> (min.) = -2.0V for pulse durations of less than 20 ns.

2. T<sub>A</sub> is the "Instant On" case temperature.

3. Typical values are measured at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C, and are included for reference only and are not tested or guaranteed.

**Capacitance<sup>[4]</sup>**

Parameter	Description	Test Conditions	Max.	Unit
$C_{IN}$	Input Capacitance	$T_A = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$ , $V_{CC} = 5.0\text{V}$	6	pF
$C_{OUT}$	Output Capacitance		8	pF

**AC Test Loads and Waveforms**

**Note:**

4. Tested initially and after any design or process changes that may affect these parameters.

**Switching Characteristics<sup>[5]</sup> Over the Operating Range**

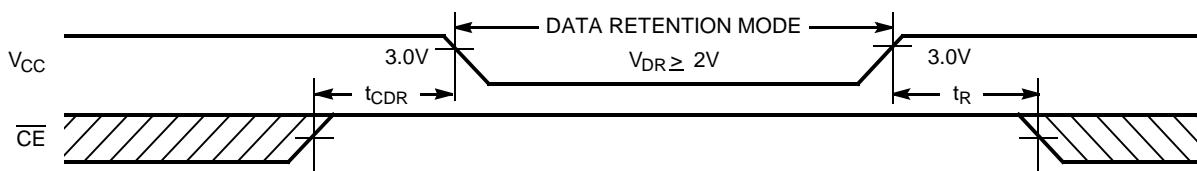
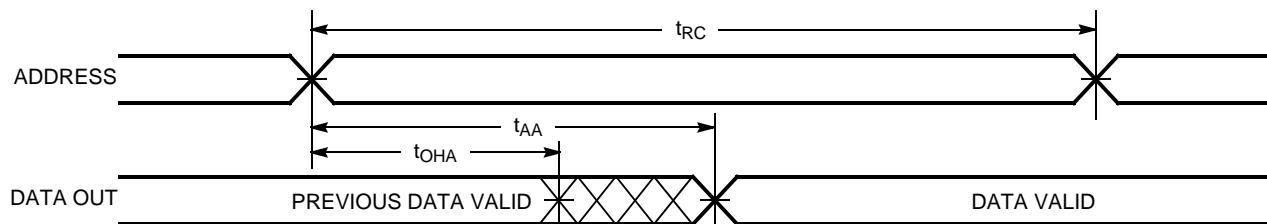
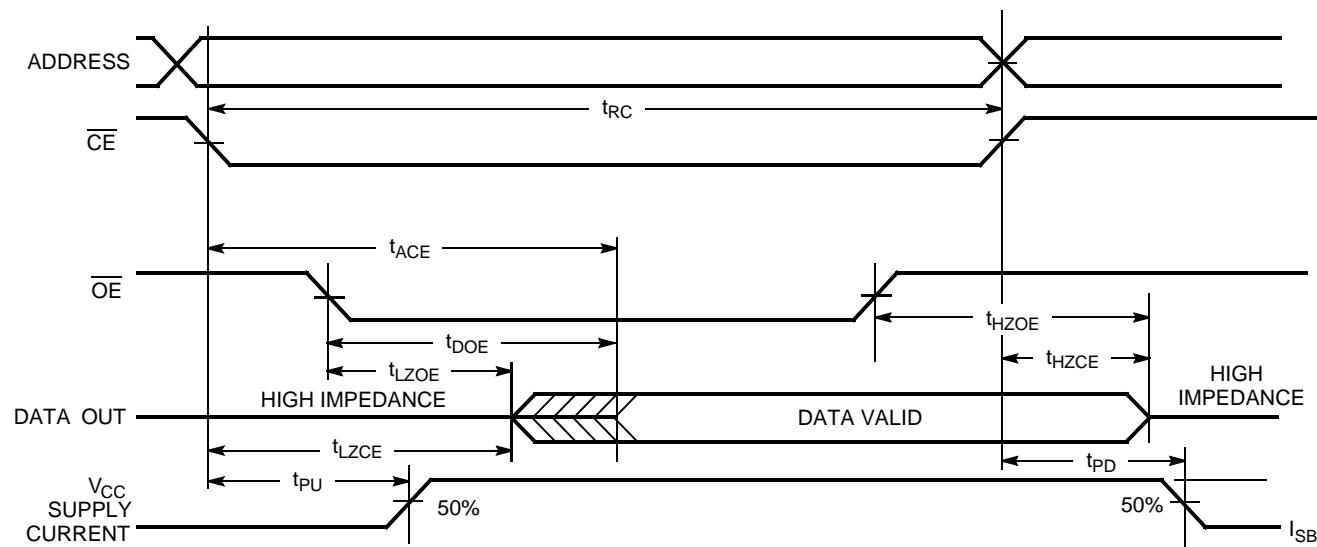
Parameter	Description	62148BLL-70		Unit
		Min.	Max.	
<b>READ CYCLE</b>				
$t_{RC}$	Read Cycle Time	70		ns
$t_{AA}$	Address to Data Valid		70	ns
$t_{OHA}$	Data Hold from Address Change	10		ns
$t_{ACE}$	CE LOW to Data Valid		70	ns
$t_{DOE}$	OE LOW to Data Valid		35	ns
$t_{LZOE}$	OE LOW to Low Z <sup>[6]</sup>	5		ns
$t_{HZOE}$	OE HIGH to High Z <sup>[6, 7]</sup>		25	ns
$t_{LZCE}$	CE LOW to Low Z <sup>[6]</sup>	10		ns
$t_{HZCE}$	CE HIGH to High Z <sup>[6, 7]</sup>		25	ns
$t_{PU}$	CE LOW to Power-Up	0		ns
$t_{PD}$	CE HIGH to Power-Down		70	ns
<b>WRITE CYCLE<sup>[8]</sup></b>				
$t_{WC}$	Write Cycle Time	70		ns
$t_{SCE}$	CE LOW to Write End	60		ns
$t_{AW}$	Address Set-Up to Write End	60		ns
$t_{HA}$	Address Hold from Write End	0		ns
$t_{SA}$	Address Set-Up to Write Start	0		ns
$t_{PWE}$	WE Pulse Width	55		ns
$t_{SD}$	Data Set-Up to Write End	30		ns
$t_{HD}$	Data Hold from Write End	0		ns
$t_{LZWE}$	WE HIGH to Low Z <sup>[6]</sup>	5		ns
$t_{HZWE}$	WE LOW to High Z <sup>[6, 7]</sup>		25	ns

**Notes:**

5. Test conditions assume signal transition time of 5 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 100-pF load capacitance.
6. 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.
7.  $t_{HZOE}$ ,  $t_{HZCE}$ , 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.
8. The internal write time of the memory is defined by the overlap of CE LOW, and WE LOW. CE and 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)

Parameter	Description			Conditions	Min.	Typ. <sup>[3]</sup>	Max.	Unit
$V_{DR}$	$V_{CC}$ for Data Retention				2.0			V
$I_{CCDR}$	Data Retention Current	Com'l	LL	No input may exceed $V_{CC} + 0.3V$ $V_{CC} = V_{DR} = 3.0V$ $CE > V_{CC} - 0.3V$ $V_{IN} > V_{CC} - 0.3V$ or $V_{IN} < 0.3V$		20		$\mu A$
		Ind'l	LL			20		$\mu A$
$t_{CDR}$ <sup>[4]</sup>	Chip Deselect to Data Retention Time				0			ns
$t_R$ <sup>[9]</sup>	Operation Recovery Time				$t_{RC}$			ns

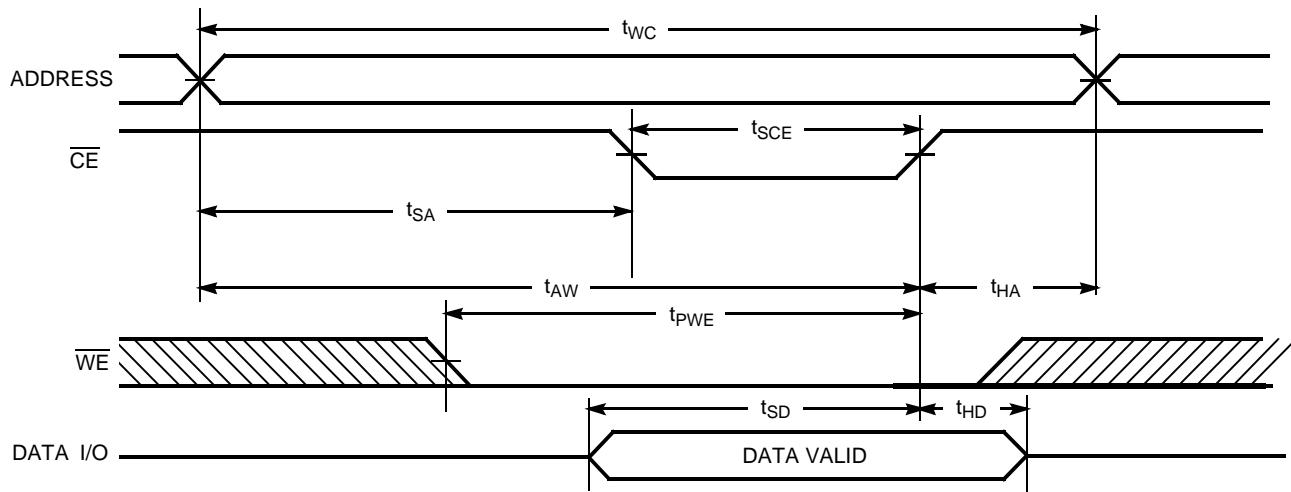
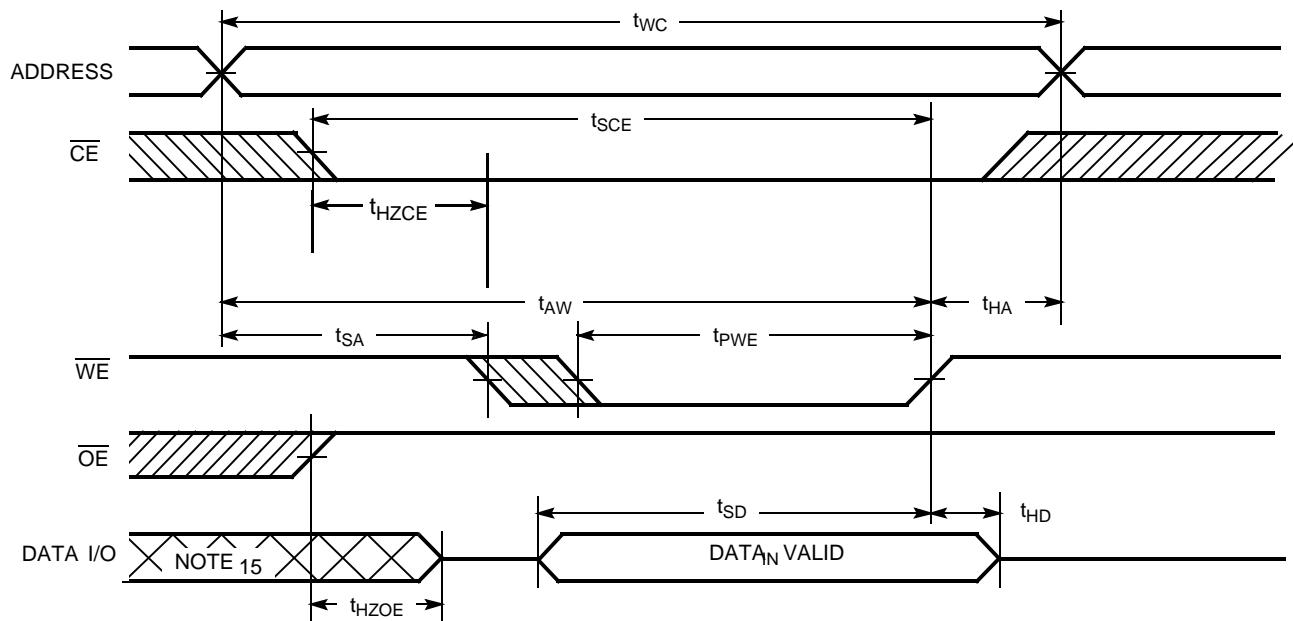
**Data Retention Waveform**

**Switching Waveforms**
**Read Cycle No.1**<sup>[10, 11]</sup>

**Read Cycle No. 2 ( $\overline{OE}$  Controlled)**<sup>[11, 12]</sup>

**Notes:**

 9. Full Device operation requires linear  $V_{CC}$  ramp from  $V_{DR}$  to  $V_{CC(\min)} \geq 100 \mu s$  or stable at  $V_{CC(\min)} \geq 100 \mu s$ .

 10. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE} = V_{IL}$ .

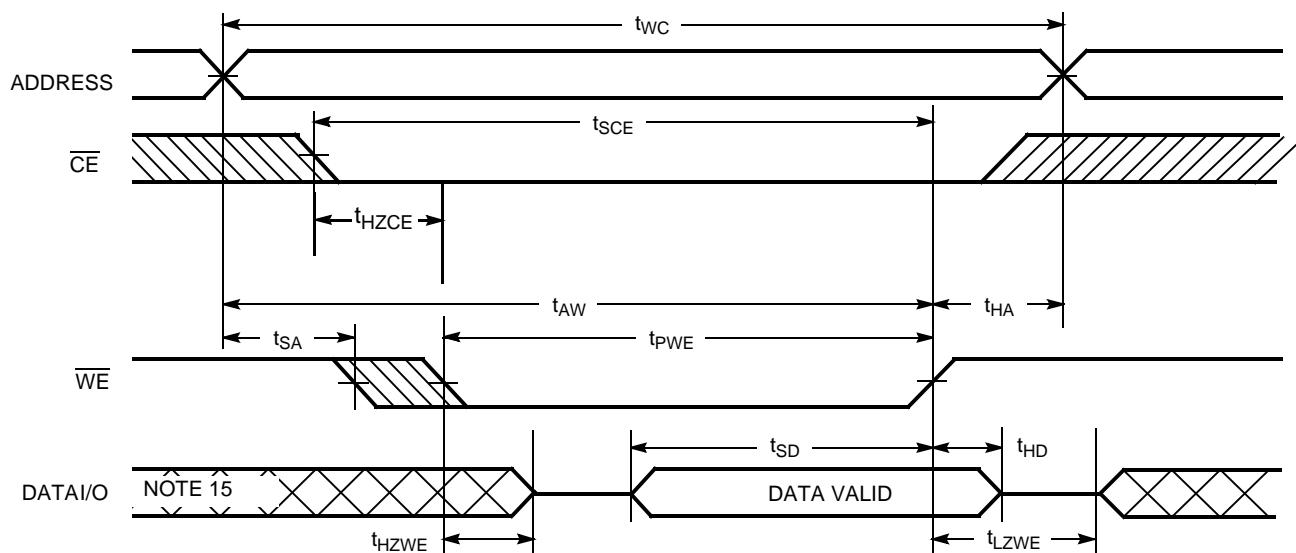
11. WE is HIGH for read cycle.

 12. Address valid prior to or coincident with  $\overline{CE}$  transition LOW.

**Switching Waveforms (continued)**
**Write Cycle No. 1 (CE Controlled)<sup>[13]</sup>**

**Write Cycle No. 2 (WE Controlled, OE HIGH During Write)<sup>[13, 14]</sup>**

**Notes:**

13. If CE goes HIGH simultaneously with WE going HIGH, the output remains in a high-impedance state.
14. Data I/O is high-impedance if OE = V<sub>IH</sub>.
15. During this period the I/Os are in the output state and input signals should not be applied.

**Switching Waveforms (continued)**

 Write Cycle No.3 (**WE Controlled, OE Low**)<sup>[13, 14]</sup>

**Truth Table**

<b>CE</b>	<b>OE</b>	<b>WE</b>	<b>I/O<sub>0</sub> – I/O<sub>7</sub></b>	<b>Mode</b>	<b>Power</b>
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 ( $I_{CC}$ )

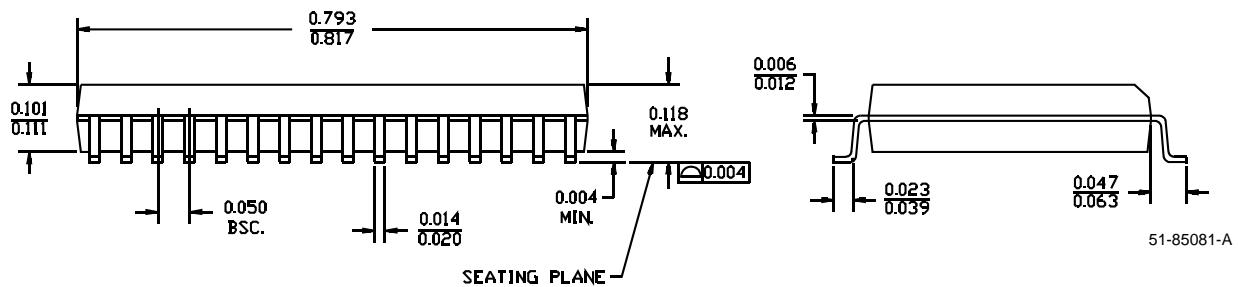
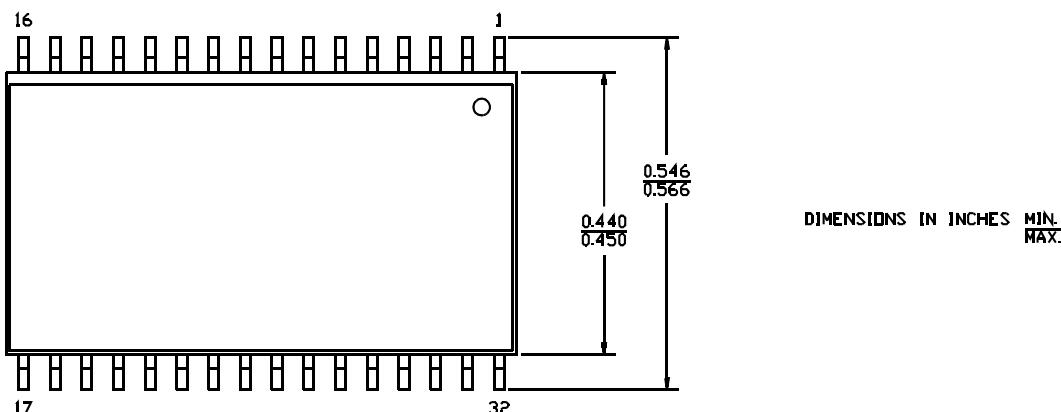
**Ordering Information**

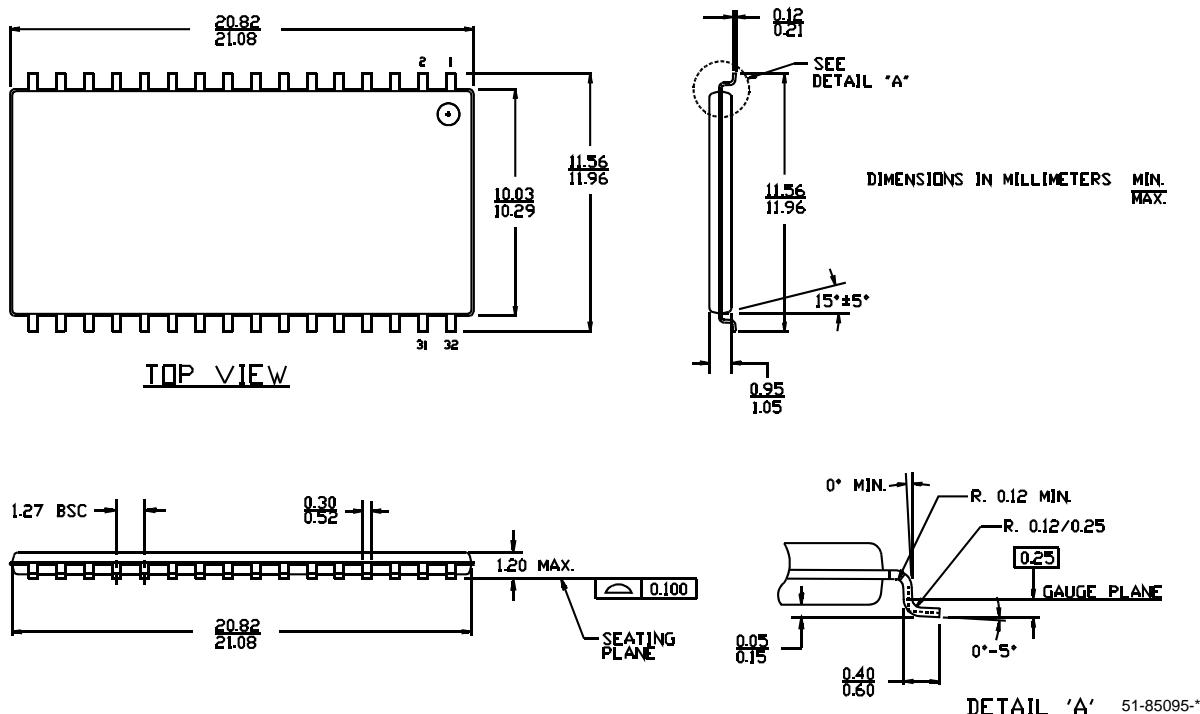
<b>Speed (ns)</b>	<b>Ordering Code</b>	<b>Package Diagram</b>	<b>Package Type</b>	<b>Operating Range</b>
70	CY62148BLL-70SC	51-85081	32-lead (450-Mil) Molded SOIC	Commercial
	CY62148BLL-70ZC	51-85095	32-lead TSOP II	
	CY62148BLL-70ZRC	51-85138	32-lead RTSOP II	
	CY62148BLL-70SI	51-85081	32-lead (450-Mil) Molded SOIC	Industrial
	CY62148BLL-70ZI	51-85095	32-lead TSOP II	
	CY62148BLL-70ZRI	51-85138	32-lead RTSOP II	

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

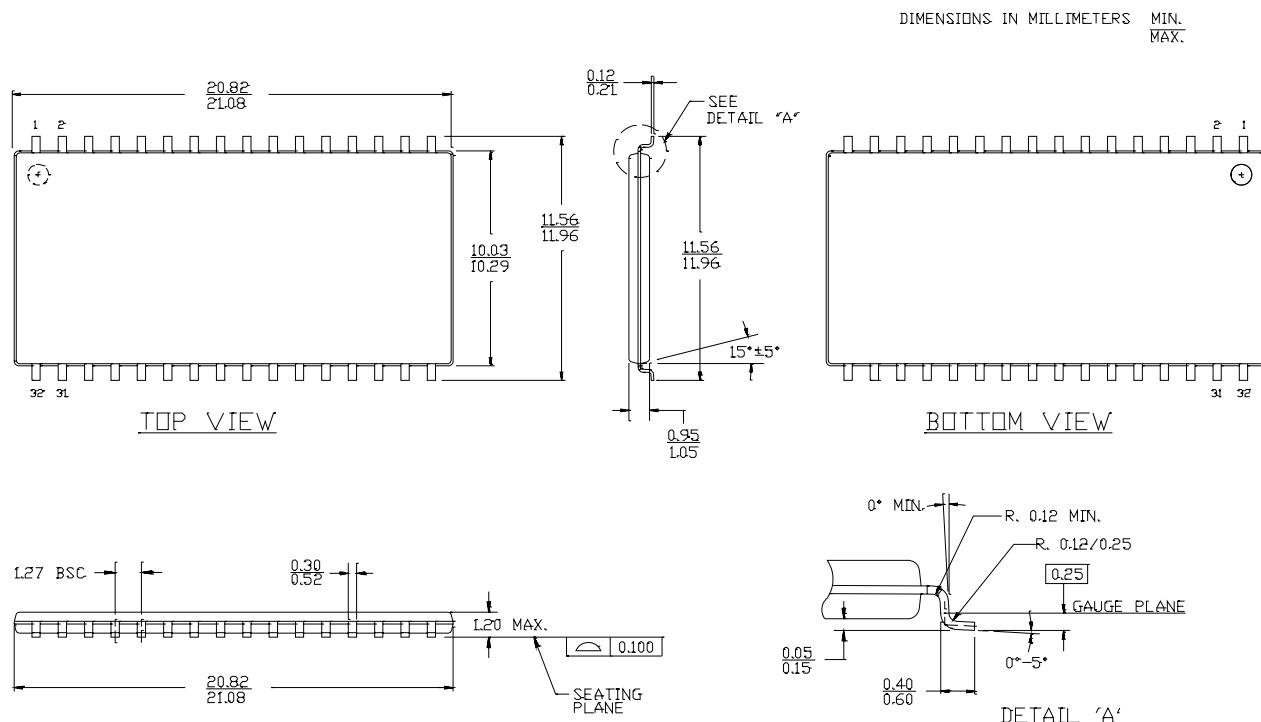
## Package Diagrams

32-lead (450 MIL) Molded SOIC (51-85081)



**Package Diagrams (continued)**
**32-lead Thin Small Outline Package Type II (51-85095)**


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**Package Diagrams (continued)**
**32-lead Reverse Thin Small Outline Package Type II (51-85138)**


51-85138-\*\*

## Document History Page

Document Title: CY62148B 4-Mbit (512K x 8) Static RAM  
Document Number: 38-05039

REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	106833	05/01/01	SZV	Change from Spec number 38-01104 to 38-05039
*A	106970	07/16/01	GAV	Modified annotations on Pin Configurations; $t_{SD} = 30$ ns
*B	109766	10/09/01	MGN	Remove 55-ns devices
*C	485639	See ECN	VKN	Changed address of Cypress Semiconductor Corporation on Page# 1 from "3901 North First Street" to "198 Champion Court" Corrected the typo in the Array size in the Logic Block Diagram on page# 1 Renamed Package Name column with Package Diagram in the Ordering Information Table