

4M (512K x 8) Static RAM

Features

- Wide voltage range: 2.7V–3.6V
- Ultra low active power
- Low standby power
- TTL-compatible inputs and outputs
- Automatic power-down when deselected
- CMOS for optimum speed/power
- Package available in a 32 pin TSOPII and a 32-pin SOIC package

Functional Description^[1]

The CY62148V is a high-performance CMOS static RAM organized as 512K words by eight bits. This device features advanced circuit design to provide ultra-low active current. This is ideal for providing More Battery Life™ (MoBL[®]) in portable applications such as cellular telephones. The device

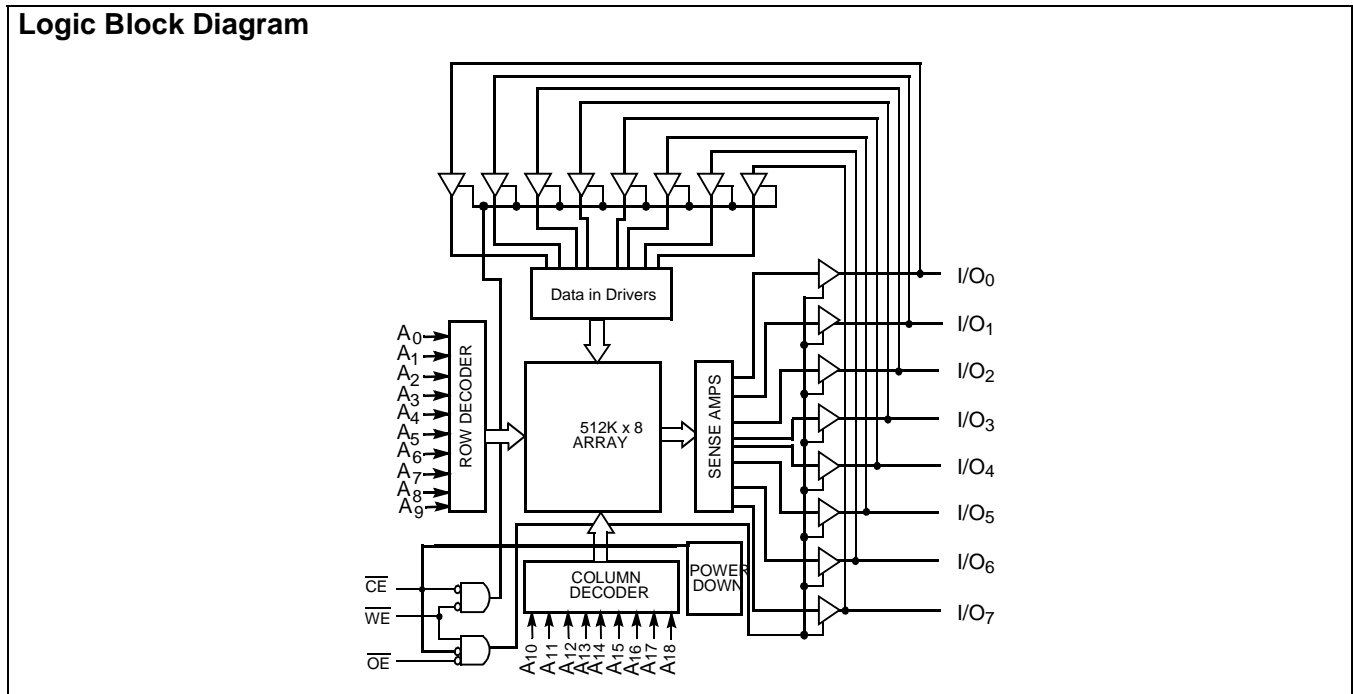
also has an automatic power-down feature that significantly reduces power consumption by 99% when addresses are not toggling. The device can be put into standby mode when deselected (\overline{CE} HIGH).

Writing to the device is accomplished by taking Chip Enable (\overline{CE}) and Write Enable (\overline{WE}) inputs LOW. Data on the eight I/O pins (I/O_0 through I/O_7) is then written into the location specified on the address pins (A_0 through A_{18}).

Reading from the device is accomplished by taking Chip Enable (\overline{CE}) and Output Enable (\overline{OE}) LOW while forcing Write Enable (\overline{WE}) HIGH. Under these conditions, the contents of the memory location specified by the address pins will appear on the I/O pins.

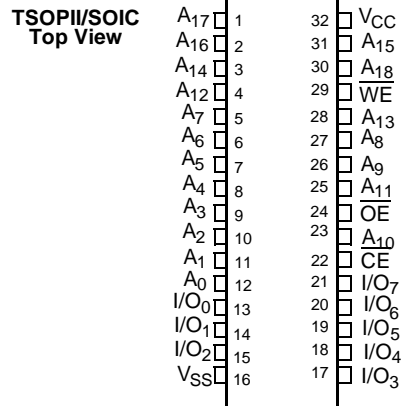
The eight input/output pins (I/O_0 through I/O_7) are placed in a high-impedance state when the device is deselected (\overline{CE} HIGH), the outputs are disabled (\overline{OE} HIGH), or during a write operation (\overline{CE} LOW and \overline{WE} LOW).

Logic Block Diagram



Note:

1. For best practice recommendations, please refer to the Cypress application note "System Design Guidelines" on <http://www.cypress.com>.

Pin Configurations

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 to Ground Potential -0.5V to +4.6V
 DC Voltage Applied to Outputs in High-Z State^[2] -0.5V to V_{CC} + 0.5V

DC Input Voltage^[2] -0.5V to V_{CC} + 0.5V
 Output 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	V _{CC}
Industrial	-40°C to +85°C	2.7V to 3.6V

Product Portfolio

Product	V _{CC} Range (V)			Speed (ns)	Power Dissipation			
	Min.	Typ. ^[3]	Max.		Operating I _{CC} , (mA)		Standby I _{SB2} , (µA)	
					Typ. ^[3]	Maximum	Typ. ^[3]	Maximum
CY62148VLL	2.7	3.0	3.6	70	7	15	2	20

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	CY62148V-70			Unit
			Min.	Typ. ^[3]	Max.	
V _{OH}	Output HIGH Voltage	I _{OH} = -1.0 mA, V _{CC} = 2.7V	2.4			V
V _{OL}	Output LOW Voltage	I _{OL} = 2.1 mA, V _{CC} = 2.7V			0.4	V
V _{IH}	Input HIGH Voltage	V _{CC} = 3.6V	2.2		V _{CC} + 0.5V	V
V _{IL}	Input LOW Voltage	V _{CC} = 2.7V	-0.5		0.8	V
I _{IX}	Input Load Current	GND ≤ V _I ≤ V _{CC}	-1	±1	+1	µA
I _{OZ}	Output Leakage Current	GND ≤ V _O ≤ V _{CC} , Output Disabled	-1	+1	+1	µA
I _{CC}	V _{CC} Operating Supply Current	I _{OUT} = 0 mA, f = f _{MAX} = 1/t _{RC} , V _{CC} = 3.6V		7	15	mA
		I _{OUT} = 0 mA, f = 1 MHz CMOS Levels		1	2	mA
I _{SB1}	Automatic CE Power-down Current—CMOS Inputs	CE ≥ V _{CC} - 0.3V, V _{IN} ≥ V _{CC} - 0.3V or V _{IN} ≤ 0.3V, f = f _{MAX}		2	20	µA
I _{SB2}	Automatic CE Power-down Current—CMOS Inputs	CE ≥ V _{CC} - 0.3V, V _{IN} ≥ V _{CC} - 0.3V or V _{IN} ≤ 0.3V, f = 0, V _{CC} = 3.6V				

Notes:

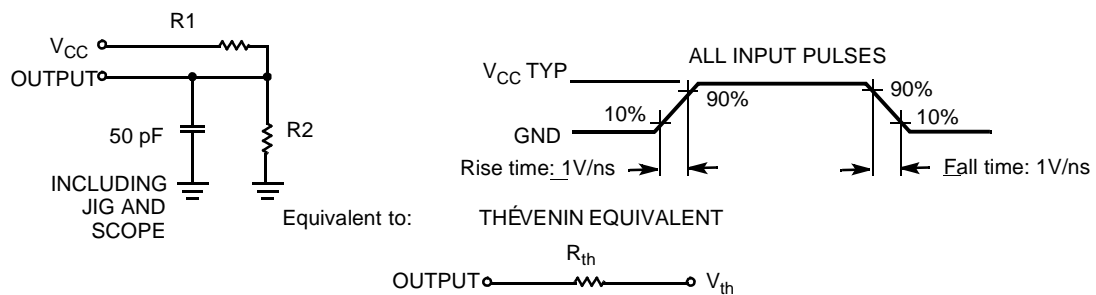
- V_{IL(min.)} = -2.0V for pulse durations less than 20 ns.
- Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V_{CC} = V_{CC(typ.)}, T_A = 25°C.

Capacitance^[4]

Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	$T_A = 25^\circ\text{C}$, $f = 1\text{ MHz}$, $V_{CC} = 3.0\text{V}$	6	pF
C_{OUT}	Output Capacitance		8	pF

Thermal Resistance

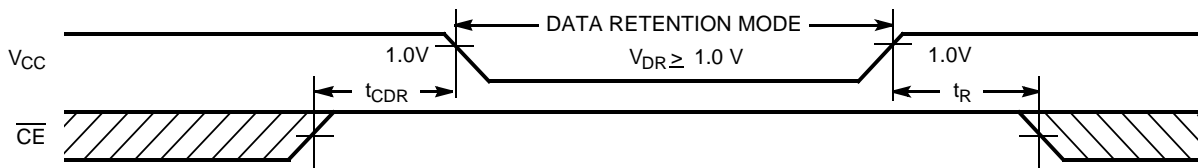
Parameter	Description	Test Conditions	Others	BGA	Units
Θ_{JA}	Thermal Resistance ^[4] (Junction to Ambient)	Still Air, soldered on a 4.25 x 1.125 inch, 4-layer printed circuit board	TBD	TBD	$^\circ\text{C/W}$
Θ_{JC}	Thermal Resistance ^[4] (Junction to Case)		TBD	TBD	$^\circ\text{C/W}$

AC Test Loads and Waveforms


Parameters	3.0V	Unit
R1	1105	Ohms
R2	1550	Ohms
R_{TH}	645	Ohms
V_{TH}	1.75V	Volts

Data Retention Characteristics (Over the Operating Range)

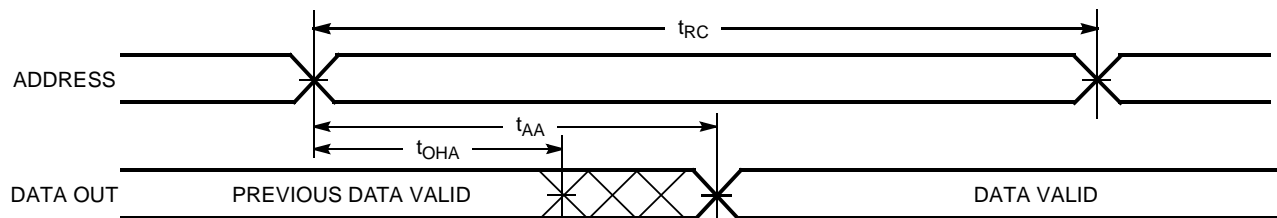
Parameter	Description	Conditions	Min.	Typ. ^[3]	Max.	Unit
V_{DR}	V_{CC} for Data Retention		1.0		3.6	V
I_{CCDR}	Data Retention Current	$V_{CC} = 1.0\text{V}$, $CE \geq V_{CC} - 0.3\text{V}$, $V_{IN} \geq V_{CC} - 0.3\text{V}$ or $V_{IN} \leq 0.3\text{V}$; No input may exceed $V_{CC} + 0.3\text{V}$		0.2	5.5	μA
t_{CDR} ^[4]	Chip Deselect to Data Retention Time		0			ns
t_R ^[5]	Operation Recovery Time		t_{RC}			ns

Data Retention Waveform

Notes:

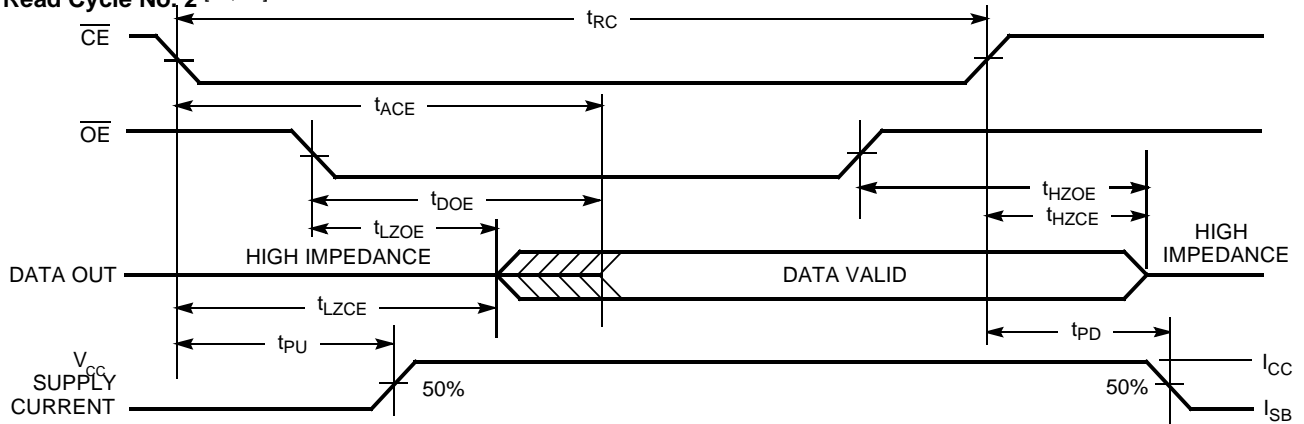
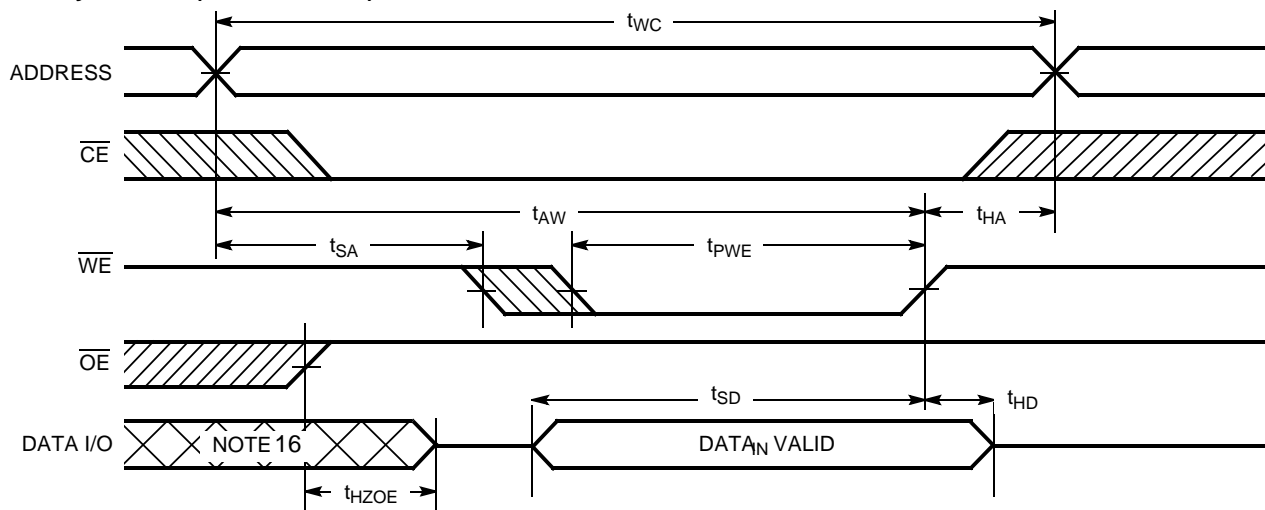
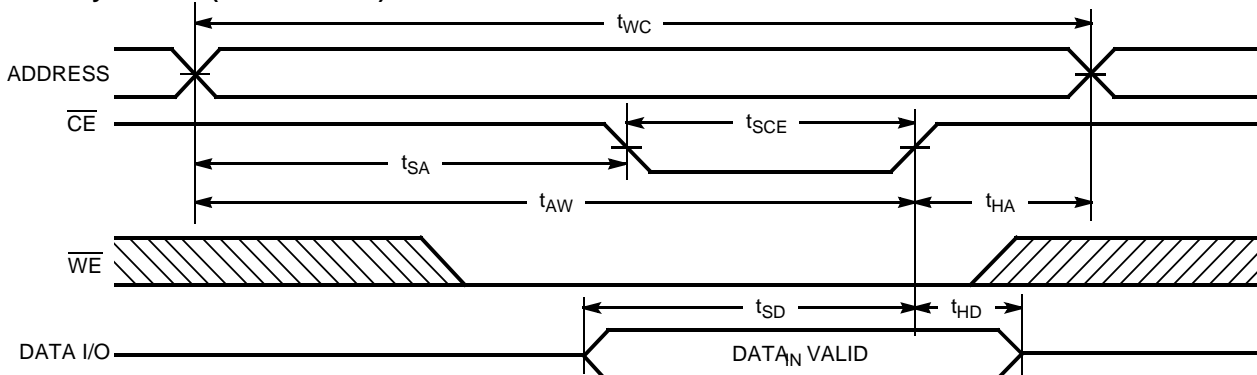
4. Tested initially and after any design or process changes that may affect these parameters.
5. Full-device AC operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(\text{min.})} \geq 10\ \mu\text{s}$ or stable at $V_{CC(\text{min.})} \geq 10\ \mu\text{s}$.

Switching Characteristics Over the Operating Range ^[6]

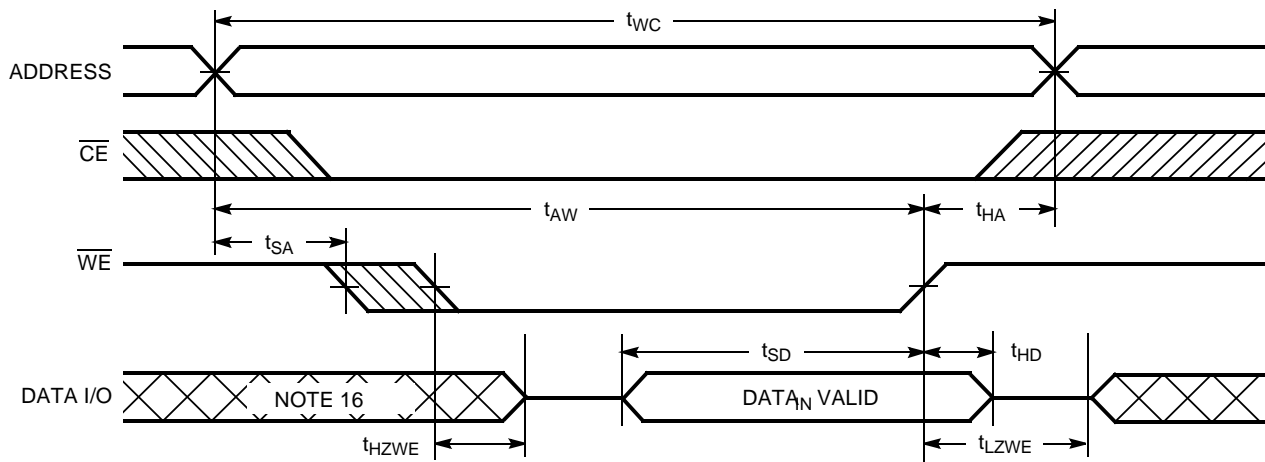
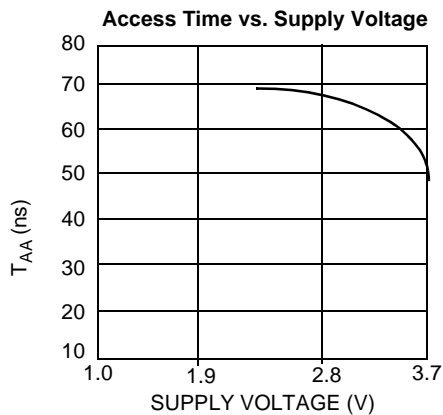
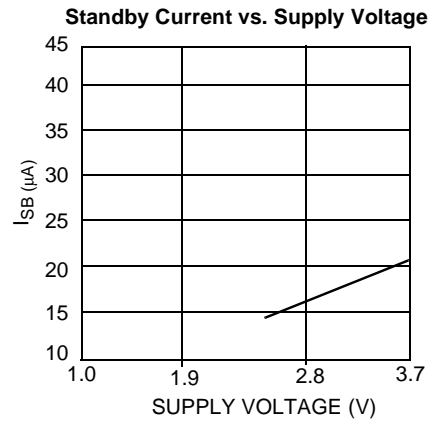
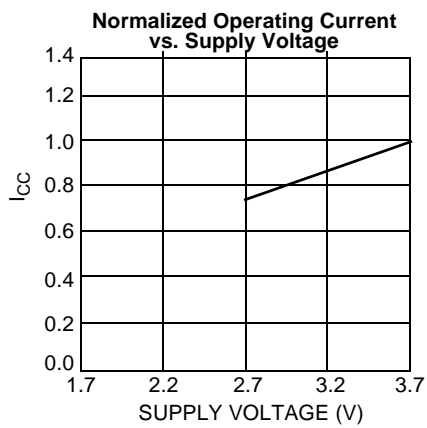
Parameter	Description	CY62148V-70		Unit
		Min.	Max.	
Read Cycle				
t_{RC}	Read Cycle Time	70		ns
t_{AA}	Address to Data Valid		70	ns
t_{OHA}	Data Hold from Address Change	10		ns
t_{ACE}	\overline{CE} LOW to Data Valid		70	ns
t_{DOE}	\overline{OE} LOW to Data Valid		35	ns
t_{LZOE}	\overline{OE} LOW to Low-Z ^[7]	5		ns
t_{HZOE}	\overline{OE} HIGH to High-Z ^[8]		25	ns
t_{LZCE}	\overline{CE} LOW to Low-Z ^[7]	10		ns
t_{HZCE}	\overline{CE} HIGH to High-Z ^[7, 8]		25	ns
t_{PU}	\overline{CE} LOW to Power-up	0		ns
t_{PD}	\overline{CE} HIGH to Power-down		70	ns
Write Cycle^[9, 10]				
t_{WC}	Write Cycle Time	70		ns
t_{SCE}	\overline{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}	\overline{WE} Pulse Width	50		ns
t_{SD}	Data Set-up to Write End	30		ns
t_{HD}	Data Hold from Write End	0		ns
t_{HZWE}	\overline{WE} LOW to High-Z ^[7, 8]		25	ns
t_{LZWE}	\overline{WE} HIGH to Low-Z ^[7]	10		ns

Switching Waveforms
Read Cycle No. 1^[11, 12]

Notes:

- Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to $V_{CC(typ.)}$, and output loading of the specified I_{OL}/I_{OH} and 30 pF load capacitance.
- 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.
- t_{HZOE} , t_{HZCE} , and t_{HZWE} are specified with $C_L = 5$ pF as in (b) of AC Test Loads. Transition is measured ± 200 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. Both signals must be LOW to initiate a write and either signal can terminate a write by going HIGH. The data input set-up and hold timing should be referenced to the rising edge of the signal that terminates the write.
- The minimum write cycle time for Write Cycle #3 (\overline{WE} controlled, \overline{OE} LOW) is the sum of t_{HZWE} and t_{SD} .

Switching Waveforms (continued)
Read Cycle No. 2 [12, 13]

Write Cycle No. 1 (WE Controlled) [9, 14, 15]

Write Cycle No. 2 (CE Controlled) [9, 14, 15]

Notes:

11. Device is continuously selected. $\overline{OE}, \overline{CE} = V_{IL}$.
12. WE is HIGH for read cycle.
13. Address valid prior to or coincident with \overline{CE} transition LOW.
14. Data I/O is high impedance if $\overline{OE} = V_{IH}$.
15. If \overline{CE} goes HIGH simultaneously with WE HIGH, the output remains in a high-impedance state.
16. During this period, the I/Os are in output state and input signals should not be applied.

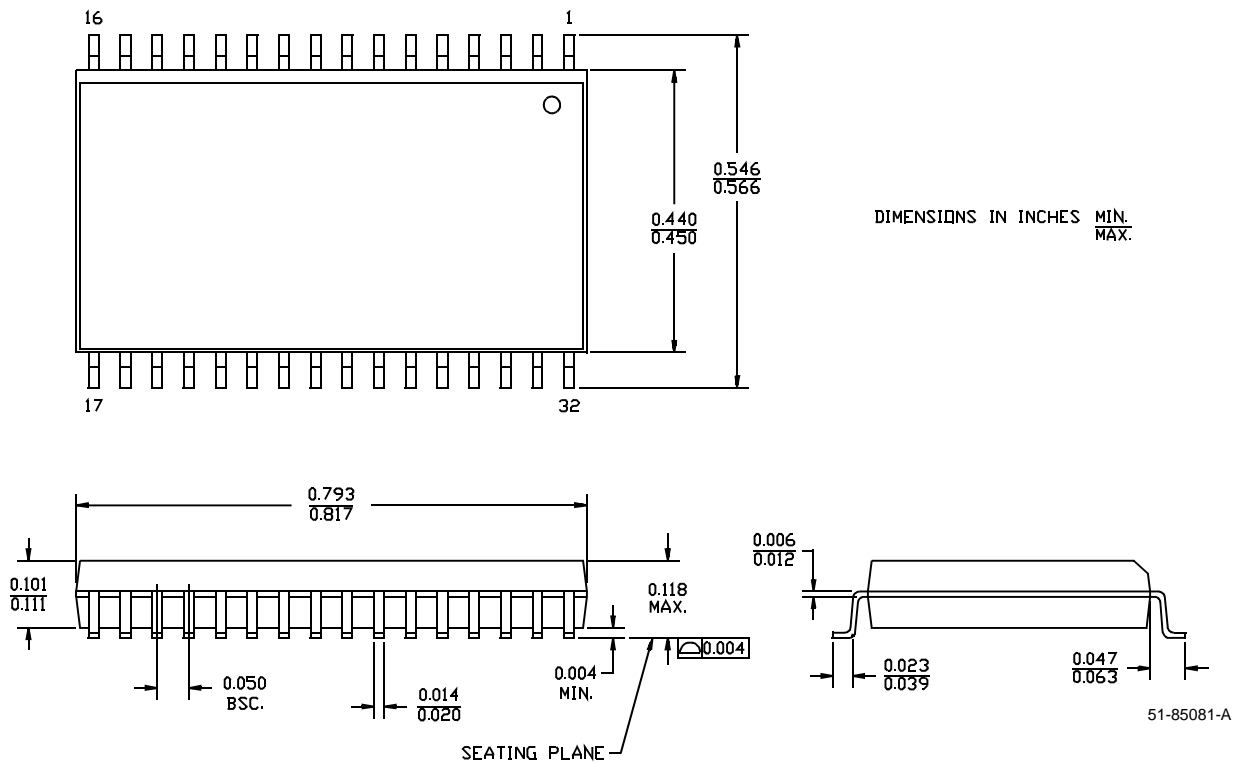
Switching Waveforms (continued)
Write Cycle No. 3 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW) [10, 15]

Typical DC and AC Characteristics


Truth Table

\overline{CE}	\overline{WE}	\overline{OE}	Inputs/Outputs	Mode	Power
H	X	X	High-Z	Deselect/Power-down	Standby (I_{SB})
L	H	L	Data Out	Read	Active (I_{CC})
L	L	X	Data In	Write	Active (I_{CC})
L	H	H	High-Z	Output Disabled	Active (I_{CC})

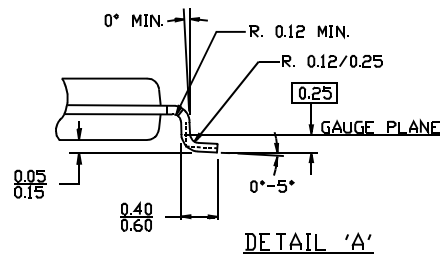
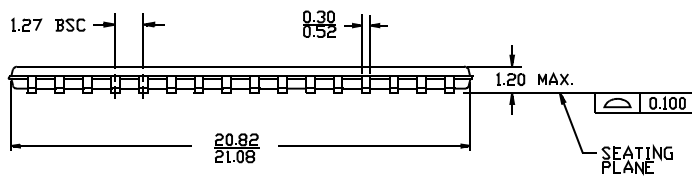
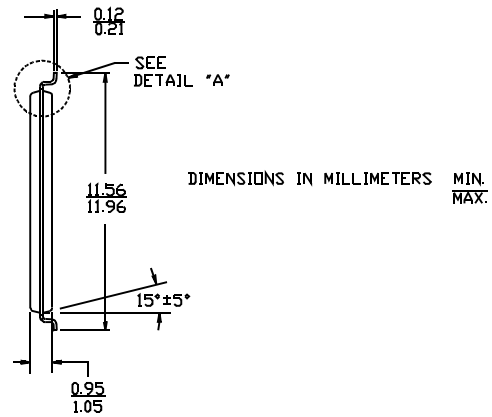
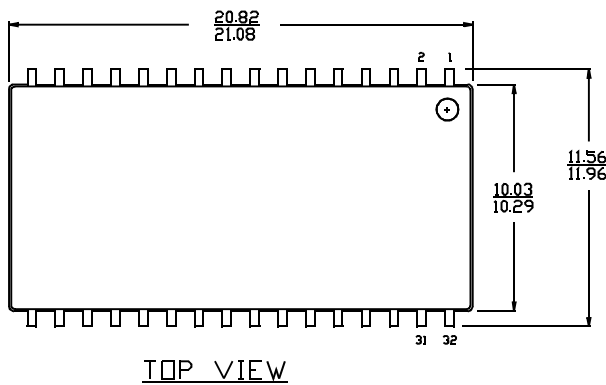
Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
70	CY62148VLL-70ZI	ZS32	32-lead TSOPII	Industrial
	CY62148VLL-70SI	S34	32-lead 450-mil. molded SOIC	

Package Diagrams
32-Lead (450-mil) Molded SOIC S34


Package Diagrams (continued)

32-lead TSOP II ZS32



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Document Number: 38-05070				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	107263	09/15/01	SZV	Changed from Spec number: 38-00646 to 38-05070
*A	116515	09/04/02	GBI	Added footnote 1. Deleted fBGA package. Removed fBGA package (replacement fBGA package is available in CY62148CV30)