

Features

- Very high speed: 45 ns
- Temperature ranges
 - Industrial: -40°C to $+85^{\circ}\text{C}$
 - Automotive-A: -40°C to $+85^{\circ}\text{C}$
 - Automotive-E: -40°C to $+125^{\circ}\text{C}$
- Voltage range: 4.5V to 5.5V
- Pin compatible with CY62128B
- Ultra low standby power
 - Typical standby current: 1 μA
 - Maximum standby current: 4 μA (Industrial)
- Ultra low active power
 - Typical active current: 1.3 mA at $f = 1\text{ MHz}$
- Easy memory expansion with $\overline{\text{CE}}_1$, CE_2 , and $\overline{\text{OE}}$ features
- Automatic power down when deselected
- CMOS for optimum speed and power
- Offered in standard Pb-free 32-pin STSOP, 32-pin SOIC, and 32-pin TSOP I packages

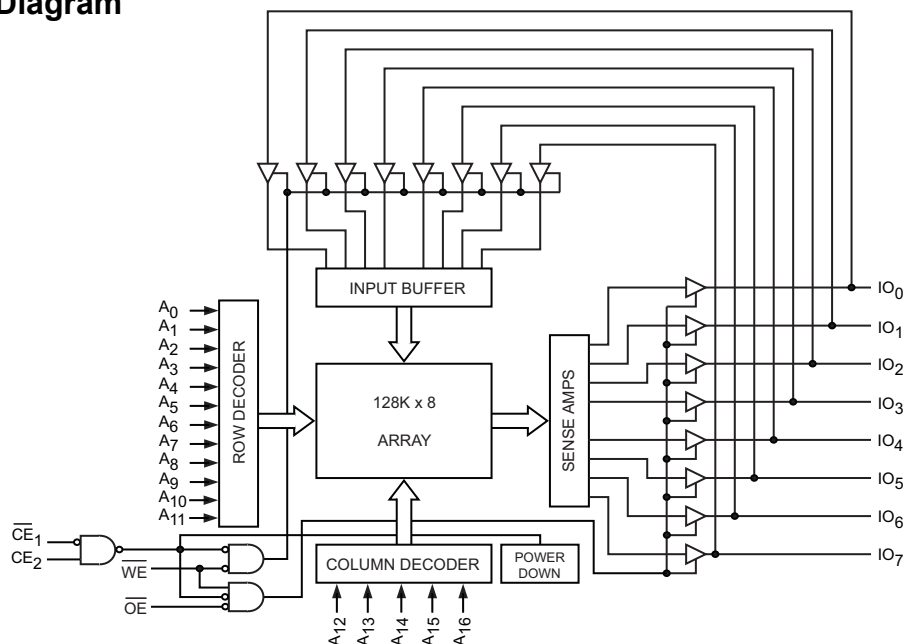
Functional Description

The CY62128E^[1] is a high performance CMOS static RAM organized as 128K words by 8 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 when addresses are not toggling. Placing the device into standby mode reduces power consumption by more than 99 percent when deselected ($\overline{\text{CE}}_1$ HIGH or CE_2 LOW). The eight input and output pins (IO_0 through IO_7) are placed in a high impedance state when the device is deselected ($\overline{\text{CE}}_1$ HIGH or CE_2 LOW), the outputs are disabled ($\overline{\text{OE}}$ HIGH), or a write operation is in progress ($\overline{\text{CE}}_1$ LOW and CE_2 HIGH and $\overline{\text{WE}}$ LOW).

To write to the device, take Chip Enable ($\overline{\text{CE}}_1$ LOW and CE_2 HIGH) and Write Enable ($\overline{\text{WE}}$) inputs LOW. Data on the eight IO pins (IO_0 through IO_7) is then written into the location specified on the address pins (A_0 through A_{16}).

To read from the device, take Chip Enable ($\overline{\text{CE}}_1$ LOW and CE_2 HIGH) and Output Enable ($\overline{\text{OE}}$) LOW while forcing Write Enable ($\overline{\text{WE}}$) HIGH. Under these conditions, the contents of the memory location specified by the address pins appear on the IO pins.

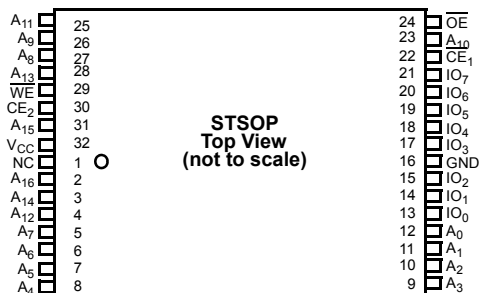
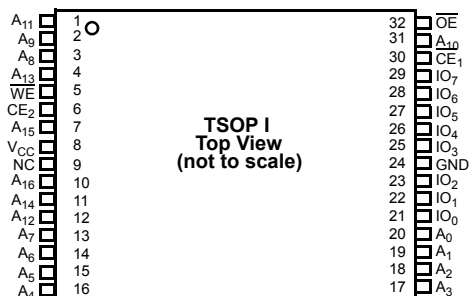
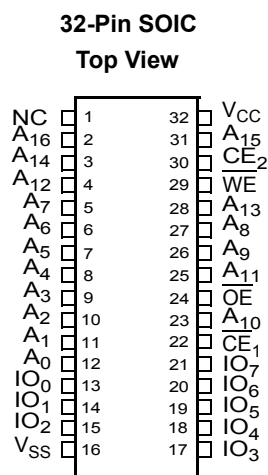
Logic Block Diagram



Note

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

Pin Configuration^[2]



Product Portfolio

Product	Range	V _{CC} Range (V)			Speed (ns)	Power Dissipation					
						Operating I _{CC} (mA)				Standby I _{SB2} (μA)	
						f = 1MHz		f = f _{max}			
		Min	Typ ^[3]	Max		Typ ^[3]	Max	Typ ^[3]	Max	Typ ^[3]	Max
CY62128ELL	Ind'l/Auto-A	4.5	5.0	5.5	45 ^[4]	1.3	2	11	16	1	4
CY62128ELL	Auto-E	4.5	5.0	5.5	55	1.3	4	11	35	1	30

Notes

- NC pins are not connected on the die.
- 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.
- When used with a 100 pF capacitive load and resistive loads as shown on page 4, access times of 55 ns (t_{AA}, t_{ACE}) and 25 ns (t_{DOE}) are guaranteed.

Maximum Ratings

Exceeding 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 to Ground
Potential..... –0.5V to 6.0V ($V_{CC(max)}$ + 0.5V)

DC Voltage Applied to Outputs
in High-Z State^[5, 6] –0.5V to 6.0V ($V_{CC(max)}$ + 0.5V)

DC Input Voltage^[5, 6] –0.5V to 6.0V ($V_{CC(max)}$ + 0.5V)

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

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

Latch up Current..... > 200 mA

Operating Range

Device	Range	Ambient Temperature	V_{CC} ^[7]
CY62128ELL	Ind'I/Auto-A	–40°C to +85°C	4.5V to 5.5V
	Auto-E	–40°C to +125°C	

Electrical Characteristics (Over the Operating Range)

Parameter	Description	Test Conditions	45 ns (Ind'I/Auto-A)			55 ns (Auto-E)			Unit
			Min	Typ ^[3]	Max	Min	Typ ^[3]	Max	
V_{OH}	Output HIGH Voltage	$I_{OH} = -1$ mA	2.4			2.4			V
V_{OL}	Output LOW Voltage	$I_{OL} = 2.1$ mA			0.4			0.4	V
V_{IH}	Input HIGH Voltage	$V_{CC} = 4.5V$ to $5.5V$	2.2		$V_{CC} + 0.5$	2.2		$V_{CC} + 0.5$	V
V_{IL}	Input LOW voltage	$V_{CC} = 4.5V$ to $5.5V$	–0.5		0.8	–0.5		0.8	V
I_{IX}	Input Leakage Current	$GND \leq V_I \leq V_{CC}$	–1		+1	–4		+4	μA
I_{OZ}	Output Leakage Current	$GND \leq V_O \leq V_{CC}$, Output Disabled	–1		+1	–4		+4	μA
I_{CC}	V_{CC} Operating Supply Current	$f = f_{max} = 1/t_{RC}$ $V_{CC} = V_{CC(max)}$		11	16		11	35	mA
		$f = 1$ MHz $I_{OUT} = 0$ mA CMOS levels		1.3	2		1.3	4	
I_{SB2} ^[8]	Automatic CE Power down Current—CMOS Inputs	$\overline{CE}_1 \geq V_{CC} - 0.2V$ or $CE_2 \leq 0.2V$, $V_{IN} \geq V_{CC} - 0.2V$ or $V_{IN} \leq 0.2V$, $f = 0$, $V_{CC} = V_{CC(max)}$		1	4		1	30	μA

Capacitance (For all Packages)^[9]

Parameter	Description	Test Conditions	Max	Unit
C_{IN}	Input Capacitance	$T_A = 25^\circ C$, $f = 1$ MHz, $V_{CC} = V_{CC(typ)}$	10	pF
C_{OUT}	Output Capacitance		10	pF

Notes

5. $V_{IL(min)}$ = –2.0V for pulse durations less than 20 ns.

6. $V_{IH(max)}$ = $V_{CC} + 0.75V$ for pulse durations less than 20 ns.

7. Full device AC operation assumes a 100 μs ramp time from 0 to $V_{CC(min)}$ and 200 μs wait time after V_{CC} stabilization.

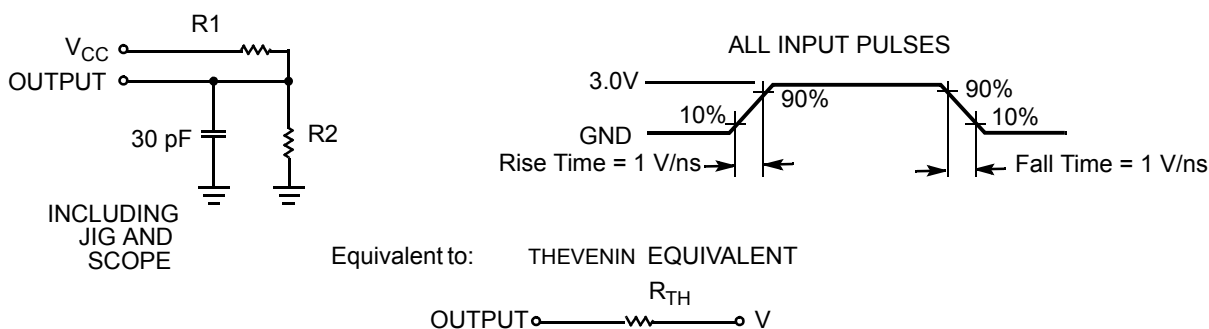
8. Only chip enables (CE_1 and CE_2) must be at CMOS level to meet the I_{SB2} / I_{CCDR} spec. Other inputs can be left floating.

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

Thermal Resistance^[9]

Parameter	Description	Test Conditions	SOIC Package	STSOP Package	TSOP Package	Unit
Θ_{JA}	Thermal Resistance (Junction to Ambient)	Still Air, soldered on a 3 × 4.5 inch, two-layer printed circuit board	48.67	32.56	33.01	°C/W
Θ_{JC}	Thermal Resistance (Junction to Case)		25.86	3.59	3.42	°C/W

AC Test Loads and Waveform

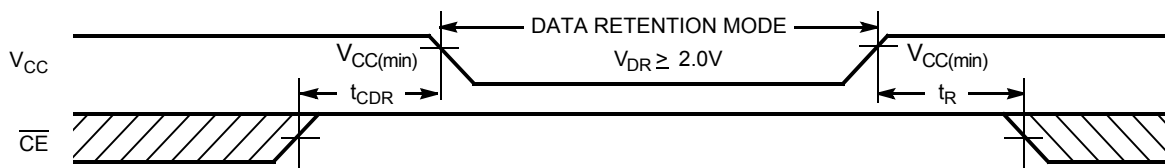


Parameters	Value	Unit
R1	1800	Ω
R2	990	Ω
R _{TH}	639	Ω
V _{TH}	1.77	V

Data Retention Characteristics (Over the Operating Range)

Parameter	Description	Conditions	Min	Typ ^[3]	Max	Unit
V _{DR}	V _{CC} for Data Retention		2			V
I _{CCDR} ^[8]	Data Retention Current	V _{CC} = V _{DR} , $\overline{CE}_1 \geq V_{CC} - 0.2V$ or $CE_2 \leq 0.2V$, V _{IN} ≥ V _{CC} - 0.2V or V _{IN} ≤ 0.2V				
		Ind'l/Auto-A			4	μA
		Auto-E			30	μA
t _{CDR} ^[9]	Chip Deselect to Data Retention Time		0			ns
t _R ^[10]	Operation Recovery Time		t _{RC}			ns

Data Retention Waveform^[11]



Notes

10. Full device AC operation requires linear V_{CC} ramp from V_{DR} to V_{CC(min)} ≥ 100 μs or stable at V_{CC(min)} ≥ 100 μs.

11. $\overline{CE}$ is the logical combination of $\overline{CE}_1$ and CE₂. When $\overline{CE}_1$ is LOW and CE₂ is HIGH, $\overline{CE}$ is LOW; when $\overline{CE}_1$ is HIGH or CE₂ is LOW, $\overline{CE}$ is HIGH.

Switching Characteristics (Over the Operating Range)^[12]

Parameter	Description	45 ns (Ind'l/Auto-A)		55 ns (Auto-E)		Unit
		Min	Max	Min	Max	
Read Cycle						
t _{RC}	Read Cycle Time	45		55		ns
t _{AA}	Address to Data Valid		45		55	ns
t _{OHA}	Data Hold from Address Change	10		10		ns
t _{ACE}	$\overline{CE}_1$ LOW and CE ₂ HIGH to Data Valid		45		55	ns
t _{DOE}	$\overline{OE}$ LOW to Data Valid		22		25	ns
t _{LZOE}	$\overline{OE}$ LOW to Low-Z ^[13]	5		5		ns
t _{HZOE}	$\overline{OE}$ HIGH to High-Z ^[13, 14]		18		20	ns
t _{LZCE}	$\overline{CE}_1$ LOW and CE ₂ HIGH to Low-Z ^[13]	10		10		ns
t _{HZCE}	$\overline{CE}_1$ HIGH or CE ₂ LOW to High-Z ^[13, 14]		18		20	ns
t _{PU}	$\overline{CE}_1$ LOW and CE ₂ HIGH to Power Up	0		0		ns
t _{PD}	$\overline{CE}_1$ HIGH or CE ₂ LOW to Power Down		45		55	ns
Write Cycle ^[15]						
t _{WC}	Write Cycle Time	45		55		ns
t _{SCE}	$\overline{CE}_1$ LOW and CE ₂ HIGH to Write End	35		40		ns
t _{AW}	Address Setup to Write End	35		40		ns
t _{HA}	Address Hold from Write End	0		0		ns
t _{SA}	Address Setup to Write Start	0		0		ns
t _{PWE}	$\overline{WE}$ Pulse Width	35		40		ns
t _{SD}	Data Setup to Write End	25		25		ns
t _{HD}	Data Hold from Write End	0		0		ns
t _{HZWE}	$\overline{WE}$ LOW to High-Z ^[13, 14]		18		20	ns
t _{LZWE}	$\overline{WE}$ HIGH to Low-Z ^[13]	10		10		ns

Notes

12. Test conditions for all parameters other than tri-state parameters assume signal transition time of 3ns (1V/ns) or less, timing reference levels of 1.5V, input pulse levels of 0 to 3V, and output loading of the specified I_{OL}/I_{OH} as shown in the ^{***} on page 4.
13. 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.
14. t_{HZOE} , t_{HZCE} , and t_{HZWE} transitions are measured when the outputs enter a high impedance state.
15. The internal Write time of the memory is defined by the overlap of $\overline{WE}$, $\overline{CE} = V_{IL}$. All signals must be ACTIVE to initiate a write and any of these signals can terminate a write by going INACTIVE. The data input setup and hold timing must be referenced to the edge of the signal that terminates the write.

Switching Waveforms

Figure 1. Read Cycle 1 (Address Transition Controlled) [16, 17]

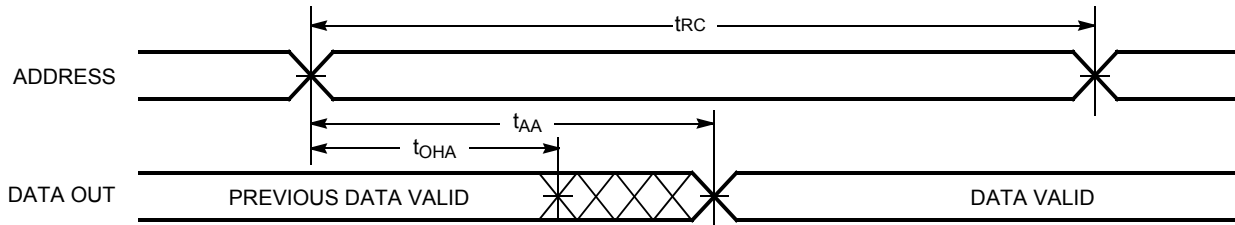


Figure 2. Read Cycle No. 2 ($\overline{OE}$ Controlled) [11, 17, 18]

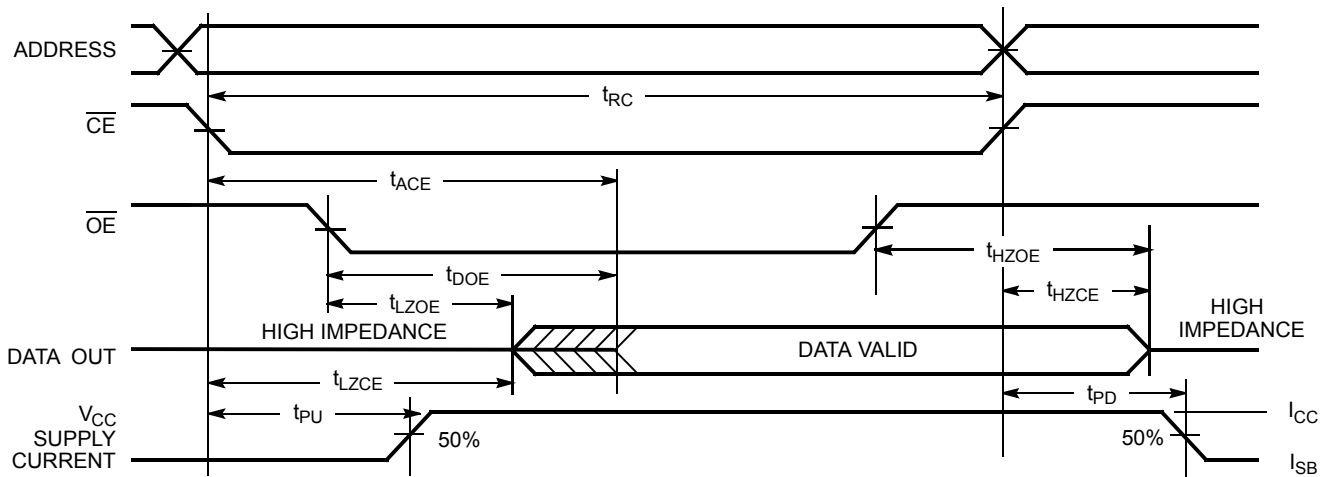
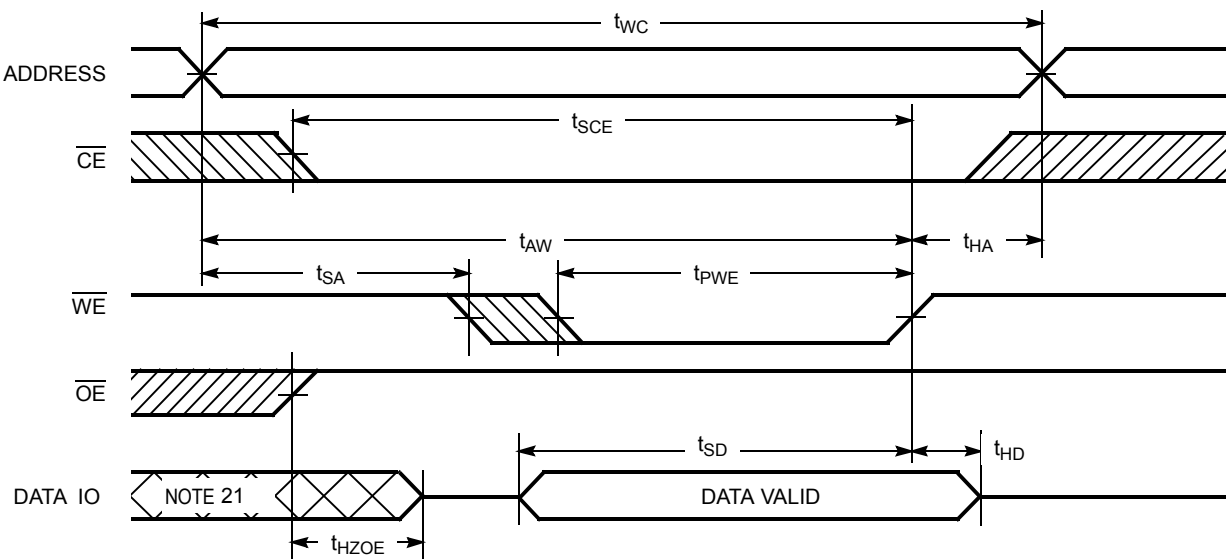


Figure 3. Write Cycle No. 1 ($\overline{WE}$ Controlled) [11, 15, 19, 20]



Notes:

16. The device is continuously selected. $\overline{OE}$, $\overline{CE}_1 = V_{IL}$, $CE_2 = V_{IH}$.
17. WE is HIGH for read cycle.
18. Address valid before or similar to $\overline{CE}_1$ transition LOW and CE_2 transition HIGH.
19. Data IO is high impedance if $\overline{OE} = V_{IH}$.
20. If CE_1 goes HIGH or CE_2 goes LOW simultaneously with $\overline{WE}$ HIGH, the output remains in high impedance state.
21. During this period, the IOs are in output state and input signals must not be applied.

Switching Waveforms (continued)

Figure 4. Write Cycle No. 2 ($\overline{\text{CE}}_1$ or CE2 Controlled) [11, 15, 19, 20]

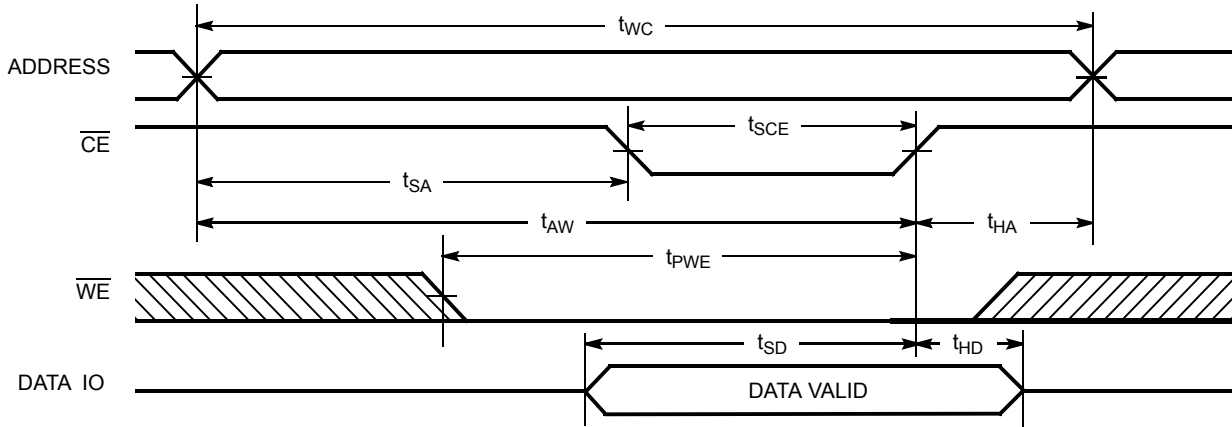
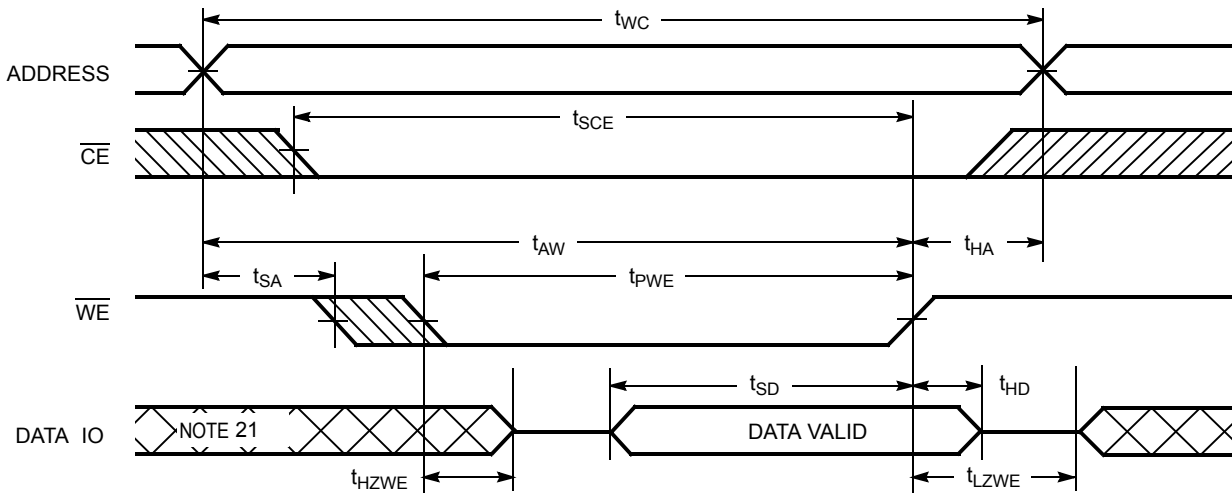


Figure 5. Write Cycle No. 3 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW) [11, 20]



Truth Table

CE_1	CE_2	WE	OE	Inputs/Outputs	Mode	Power
H	X	X	X	High-Z	Deselect/Power down	Standby (I_{SB})
X	L	X	X	High-Z	Deselect/Power down	Standby (I_{SB})
L	H	H	L	Data Out	Read	Active (I_{CC})
L	H	L	X	Data In	Write	Active (I_{CC})
L	H	H	H	High-Z	Selected, Outputs Disabled	Active (I_{CC})

Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
45	CY62128ELL-45SXI	51-85081	32-pin 450-Mil SOIC (Pb-free)	Industrial
	CY62128ELL-45ZAXI	51-85094	32-pin STSOP (Pb-free)	
	CY62128ELL-45ZXI	51-85056	32-pin TSOP Type I (Pb-free)	
45	CY62128ELL-45SXA	51-85081	32-pin 450-Mil SOIC (Pb-free)	Automotive-A
	CY62128ELL-45ZXA	51-85056	32-pin TSOP Type I (Pb-free)	
55	CY62128ELL-55SXE	51-85081	32-pin 450-Mil SOIC (Pb-free)	Automotive-E
	CY62128ELL-55ZAXE	51-85094	32-pin STSOP (Pb-free)	

Contact your local Cypress sales representative for availability of these parts.

Package Diagrams

Figure 6. 32-pin (450 Mil) Molded SOIC (51-85081)

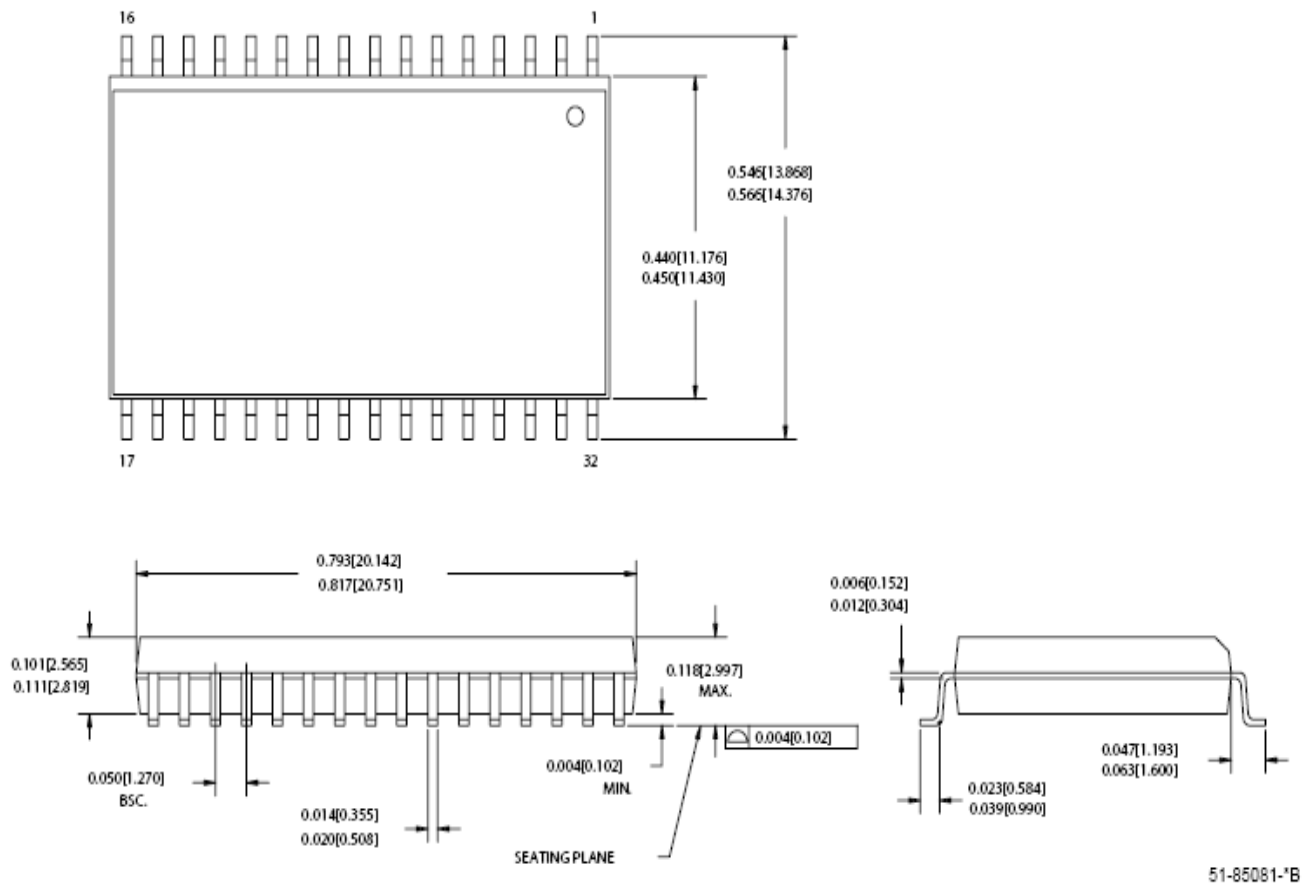
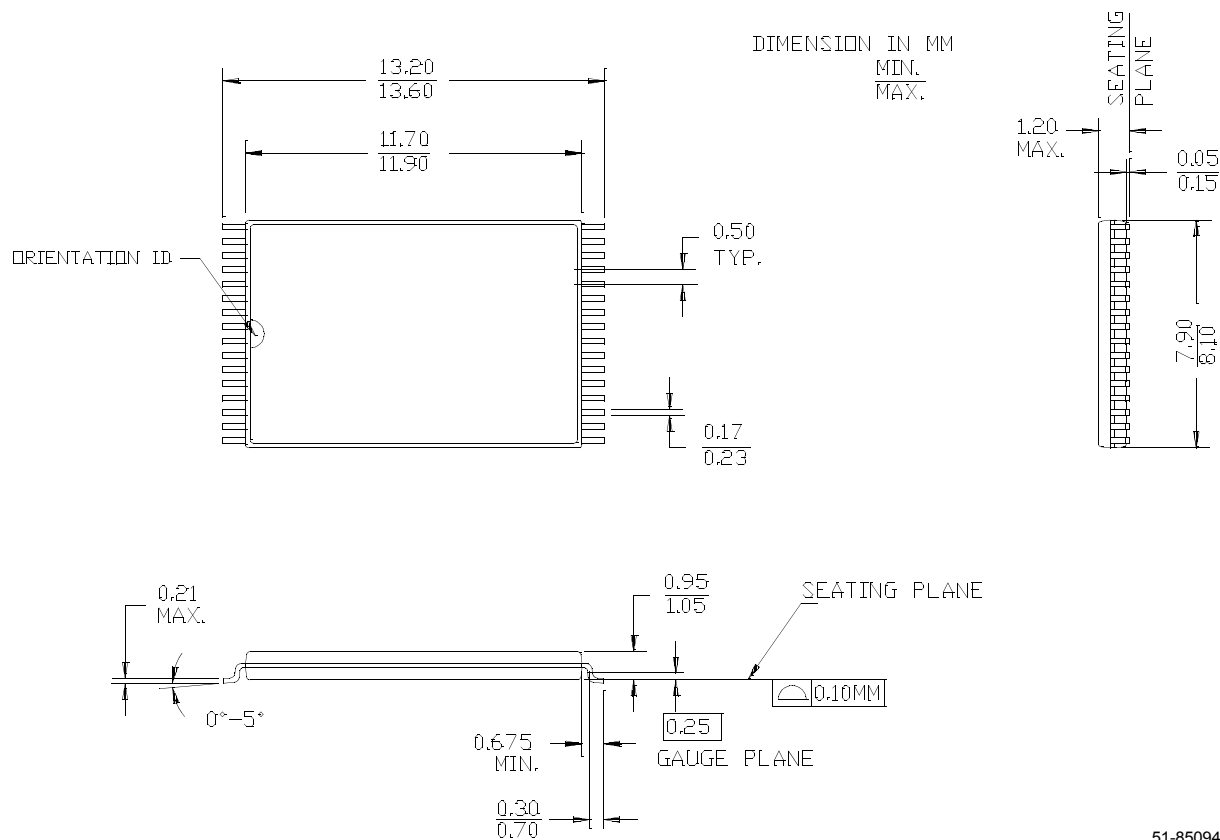
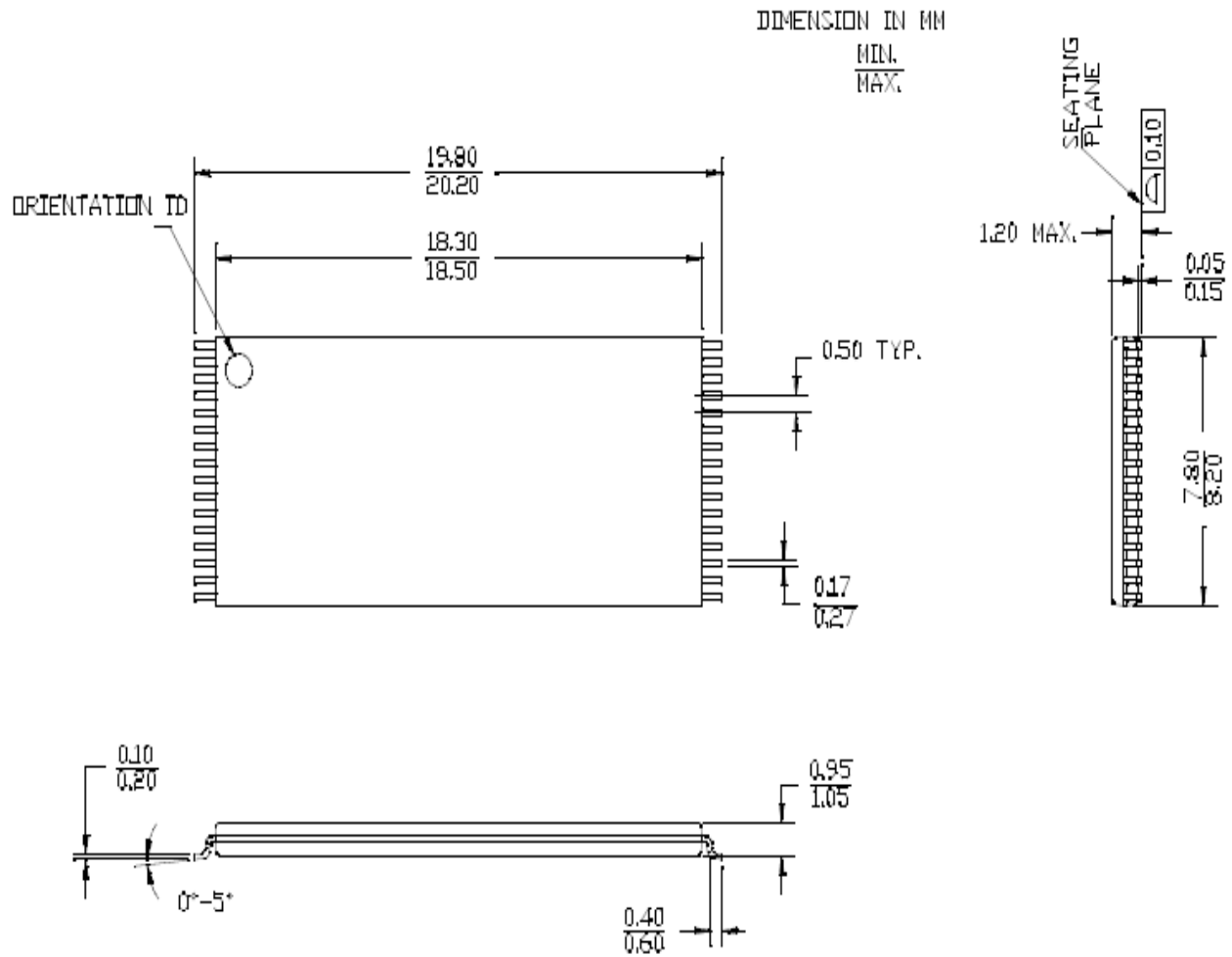


Figure 7. 32-pin Shrunk Thin Small Outline Package (8 x 13.4 mm) (51-85094)



51-85094-*D

Figure 8. 32-pin Thin Small Outline Package Type I (8 x 20 mm) (51-85056)



51-85056-1U

Document History Page

Document Title: CY62128E MoBL® 1-Mbit (128K x 8) Static RAM Document Number: 38-05485				
Revision	ECN	Submission Date	Orig. of Change	Description of Change
**	203120	See ECN	AJU	New data sheet
*A	299472	See ECN	SYT	Converted from Advance Information to Preliminary Changed t_{OHA} from 6 ns to 10 ns for both 35 ns and 45 ns, respectively Changed t_{DOE} from 15 ns to 18 ns for 35 ns speed bin Changed t_{HZOE} , t_{HZWE} from 12 and 15 ns to 15 and 18 ns for the 35 and 45 ns speed bins, respectively Changed t_{HZCE} from 12 and 15 ns to 18 and 22 ns for the 35 and 45 ns speed bins, respectively Changed t_{SCE} from 25 and 40 ns to 30 and 35 ns for the 35 and 45 ns speed bins, respectively Changed t_{SD} from 15 and 20 ns to 18 and 22 ns for the 35 and 45 ns speed bins, respectively Added Pb-free package information Added footnote #9 Changed operating range for SOIC package from Commercial to Industrial Modified signal transition time from 5 ns to 3 ns in footnote #11 Changed max of I_{SB1} , I_{SB2} and I_{CCDR} from 1.0 μA to 1.5 μA
*B	461631	See ECN	NXR	Converted from Preliminary to Final Included Automotive Range and 55 ns speed bin Removed 35 ns speed bin Removed "L" version of CY62128E Removed Reverse TSOP I package from Product offering Changed $I_{CC (Typ)}$ from 8 mA to 11 mA and $I_{CC (max)}$ from 12 mA to 16 mA for $f = f_{max}$ Changed $I_{CC (max)}$ from 1.5 mA to 2.0 mA for $f = 1$ MHz Removed I_{SB1} DC Specs from Electrical characteristics table Changed $I_{SB2 (max)}$ from 1.5 μA to 4 μA Changed $I_{SB2 (Typ)}$ from 0.5 μA to 1 μA Changed $I_{CCDR (max)}$ from 1.5 μA to 4 μA Changed the AC Test load Capacitance value from 100 pF to 30 pF Changed t_{LZOE} from 3 to 5 ns Changed t_{LZCE} from 6 to 10 ns Changed t_{HZCE} from 22 to 18 ns Changed t_{PWE} from 30 to 35 ns Changed t_{SD} from 22 to 25 ns Changed t_{LZWE} from 6 to 10 ns Updated the Ordering Information Table
*C	464721	See ECN	NXR	Updated the Block Diagram on page # 1
*D	563144	See ECN	AJU	Added footnote 4 on page 2
*E	1024520	See ECN	VKN	Added Automotive-A information Converted Automotive-E specs to final Added footnote #9 related to I_{SB2} and I_{CCDR} Updated Ordering Information table
*F	2548575	08/05/08	NXR	Corrected typo error in Ordering Information table

Sales, Solutions, and Legal Information

Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at cypress.com/sales.

Products

PSoC	psoc.cypress.com
Clocks & Buffers	clocks.cypress.com
Wireless	wireless.cypress.com
Memories	memory.cypress.com
Image Sensors	image.cypress.com

PSoC Solutions

General	psoc.cypress.com/solutions
Low Power/Low Voltage	psoc.cypress.com/low-power
Precision Analog	psoc.cypress.com/precision-analog
LCD Drive	psoc.cypress.com/lcd-drive
CAN 2.0b	psoc.cypress.com/can
USB	psoc.cypress.com/usb

© Cypress Semiconductor Corporation, 2004-2008. The information contained herein is subject to change without notice. Cypress Semiconductor Corporation assumes no responsibility for the use of any circuitry other than circuitry embodied in a Cypress product. Nor does it convey or imply any license under patent or other rights. Cypress products are not warranted nor intended to be used for medical, life support, life saving, critical control or safety applications, unless pursuant to an express written agreement with Cypress. Furthermore, Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress products in life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Any Source Code (software and/or firmware) is owned by Cypress Semiconductor Corporation (Cypress) and is protected by and subject to worldwide patent protection (United States and foreign), United States copyright laws and international treaty provisions. Cypress hereby grants to licensee a personal, non-exclusive, non-transferable license to copy, use, modify, create derivative works of, and compile the Cypress Source Code and derivative works for the sole purpose of creating custom software and or firmware in support of licensee product to be used only in conjunction with a Cypress integrated circuit as specified in the applicable agreement. Any reproduction, modification, translation, compilation, or representation of this Source Code except as specified above is prohibited without the express written permission of Cypress.

Disclaimer: CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Cypress reserves the right to make changes without further notice to the materials described herein. Cypress does not assume any liability arising out of the application or use of any product or circuit described herein. Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress' product in a life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Use may be limited by and subject to the applicable Cypress software license agreement.