

## Features

- Very high-speed: 45 ns
- Temperature ranges:
  - Automotive-A: -40 °C to +85 °C
  - Automotive-E: -40 °C to +125 °C
- Wide voltage range: 2.2 V to 3.6 V
- Pin compatible with CY62128DV30
- Ultra low standby power
  - Typical standby current: 1 μA
  - Maximum standby current: 4 μA
- Ultra low active power
  - Typical active current: 1.3 mA at f = 1 MHz
- Easy memory expansion with  $\overline{CE}_1$ ,  $CE_2$ , and  $\overline{OE}$  features
- Automatic power down when deselected
- Complementary metal oxide semiconductor (CMOS) for optimum speed and power
- Offered in Pb-free 32-pin small outline integrated circuit (SOIC), 32-pin thin small outline package (TSOP) Type I, and 32-pin STSOP packages

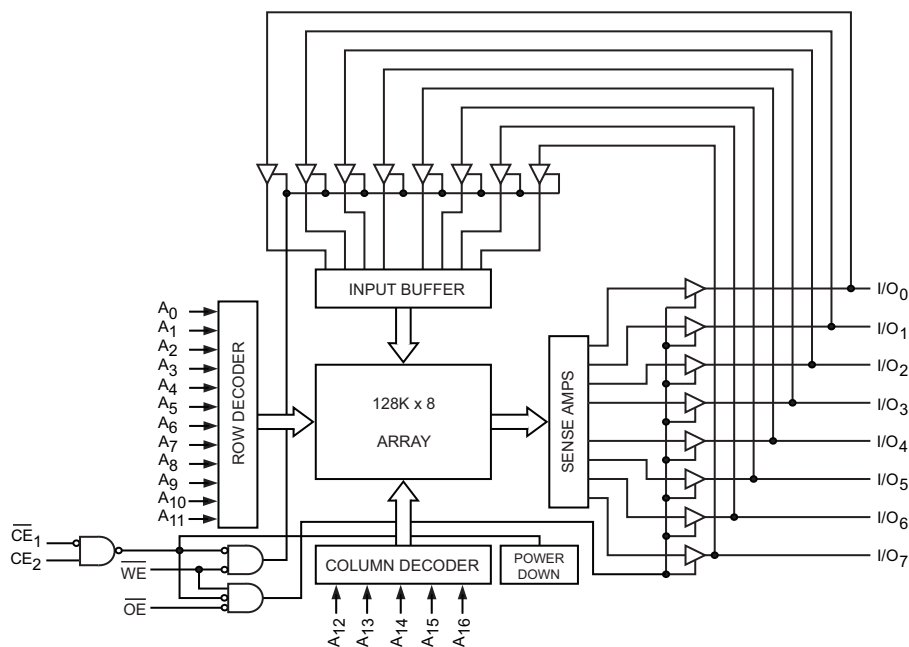
## Functional Description

The CY62128EV30 is a high performance CMOS static RAM module 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<sup>®</sup>) 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 in standby mode reduces power consumption by more than 99 percent when deselected ( $\overline{CE}_1$  HIGH or  $CE_2$  LOW). The eight input and output pins ( $I/O_0$  through  $I/O_7$ ) are placed in a high-impedance state when the device is deselected ( $\overline{CE}_1$  HIGH or  $CE_2$  LOW), the outputs are disabled ( $\overline{OE}$  HIGH), or a write operation is in progress ( $CE_1$  LOW and  $CE_2$  HIGH and  $\overline{WE}$  LOW).

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

To read from the device, take Chip Enable ( $\overline{CE}_1$  LOW and  $CE_2$  HIGH) 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 appear on the I/O pins.

## Logic Block Diagram



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## Pin Configuration

Figure 1. 32-pin STSOP [1]

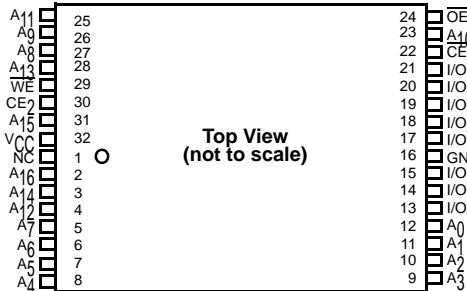


Figure 2. 32-pin TSOP I [1]

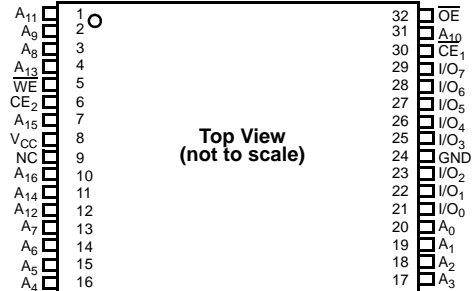
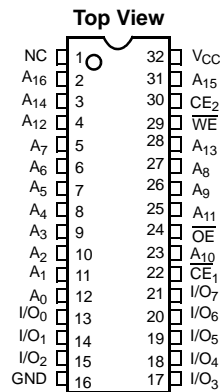


Figure 3. 32-pin SOIC [1]



## Product Portfolio

Product	Range	V <sub>CC</sub> Range (V)			Speed (ns)	Power Dissipation					
						Operating I <sub>CC</sub> (mA)				Standby I <sub>SB2</sub> (μA)	
		Min	Typ <sup>[2]</sup>	Max		f = 1 MHz		f = f <sub>max</sub>			
Typ <sup>[2]</sup>	Max	Typ <sup>[2]</sup>	Max	Typ <sup>[2]</sup>	Max	Typ <sup>[2]</sup>	Max				
CY62128EV30LL	Automotive-A	2.2	3.0	3.6	45	1.3	2.0	11	16	1	4
CY62128EV30LL	Automotive-E	2.2	3.0	3.6	55	1.3	4.0	11	35	1	30

### Notes

1. NC pins are not connected on the die.
2. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V<sub>CC</sub> = V<sub>CC(typ)</sub>, T<sub>A</sub> = 25 °C.

## Pin Definitions

I/O Type	Description
Input	<b>A<sub>0</sub>–A<sub>16</sub></b> . Address inputs
Input/output	<b>I/O<sub>0</sub>–I/O<sub>7</sub></b> . Data lines. Used as input or output lines depending on operation.
Input/control	<b><math>\overline{\text{WE}}</math></b> . Write Enable, Active LOW. When selected LOW, a WRITE is conducted. When selected HIGH, a READ is conducted.
Input/control	<b><math>\overline{\text{CE}}_1</math></b> . Chip Enable 1, Active LOW.
Input/control	<b><math>\overline{\text{CE}}_2</math></b> . Chip Enable 2, Active HIGH.
Input/control	<b><math>\overline{\text{OE}}</math></b> . Output Enable, Active LOW. Controls the direction of the I/O pins. When LOW, the I/O pins behave as outputs. When de-asserted HIGH, I/O pins are tri-stated, and act as input data pins.
Ground	<b>GND</b> . Ground for the device.
Power supply	<b>V<sub>CC</sub></b> . Power supply for the device.

## Maximum Ratings

Exceeding maximum ratings may shorten the useful life of the device. 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 .....	-0.3 V to $V_{CC(max)}$ + 0.3 V
DC voltage applied to outputs in High Z state <sup>[3, 4]</sup> .....	-0.3 V to $V_{CC(max)}$ + 0.3 V
DC input voltage <sup>[3, 4]</sup> .....	-0.3 V to $V_{CC(max)}$ + 0.3 V

Output current into outputs (LOW) .....	20 mA
Static discharge voltage .....	> 2001 V (MIL-STD-883, Method 3015)
Latch up current .....	> 200 mA

## Operating Range

Device	Range	Ambient Temperature	$V_{CC}$ <sup>[5]</sup>
CY62128EV30LL	Automotive-A	-40 °C to +85 °C	2.2 V to 3.6 V
	Automotive-E	-40 °C to +125 °C	

## Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions	45 ns (Auto-A)			55 ns (Auto-E)			Unit
			Min	Typ <sup>[6]</sup>	Max	Min	Typ <sup>[6]</sup>	Max	
V <sub>OH</sub>	Output HIGH voltage	I <sub>OH</sub> = -0.1 mA, V <sub>CC</sub> ≤ 2.70 V	2.0	-	-	2.0	-	-	V
		I <sub>OH</sub> = -1.0 mA, V <sub>CC</sub> ≥ 2.70 V	2.4	-	-	2.4	-	-	V
V <sub>OL</sub>	Output LOW voltage	I <sub>OL</sub> = 0.1 mA	-	-	0.4	-	-	0.4	V
		I <sub>OL</sub> = 2.1 mA, V <sub>CC</sub> ≥ 2.70 V	-	-	0.4	-	-	0.4	V
V <sub>IH</sub>	Input HIGH voltage	V <sub>CC</sub> = 2.2 V to 2.7 V	1.8	-	V <sub>CC</sub> + 0.3 V	1.8	-	V <sub>CC</sub> + 0.3 V	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.2	-	V <sub>CC</sub> + 0.3 V	2.2	-	V <sub>CC</sub> + 0.3 V	V
V <sub>IL</sub>	Input LOW voltage	V <sub>CC</sub> = 2.2 V to 2.7 V	-0.3	-	0.6	-0.3	-	0.6	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-0.3	-	0.8	-0.3	-	0.8	V
I <sub>IX</sub>	Input leakage current	GND ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	-1	-	+1	-4	-	+4	μA
I <sub>OZ</sub>	Output leakage current	GND ≤ V <sub>O</sub> ≤ V <sub>CC</sub> , output disabled	-1	-	+1	-4	-	+4	μA
I <sub>CC</sub>	V <sub>CC</sub> operating supply current	f = f <sub>max</sub> = 1/t <sub>RC</sub> , V <sub>CC</sub> = V <sub>CCmax</sub> , I <sub>OUT</sub> = 0 mA, CMOS levels	-	11	16	-	11	35	mA
		f = 1 MHz	-	1.3	2.0	-	1.3	4.0	mA
I <sub>SB1</sub> <sup>[7]</sup>	Automatic CE power-down current — CMOS inputs	$\overline{CE}_1 \geq V_{CC} - 0.2$ V, CE <sub>2</sub> ≤ 0.2 V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V, V <sub>IN</sub> ≤ 0.2 V, f = f <sub>max</sub> (address and data only), f = 0 (OE and WE), V <sub>CC</sub> = 3.60 V	-	1	4	-	1	35	μA
I <sub>SB2</sub> <sup>[7]</sup>	Automatic CE power-down current — CMOS inputs	$\overline{CE}_1 \geq V_{CC} - 0.2$ V, CE <sub>2</sub> ≤ 0.2 V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V or V <sub>IN</sub> < 0.2 V, f = 0, V <sub>CC</sub> = 3.60 V	-	1	4	-	1	30	μA

### Notes

- V<sub>IL(min)</sub> = -2.0 V for pulse durations less than 20 ns.
- V<sub>IH(max)</sub> = V<sub>CC</sub> + 0.75 V for pulse durations less than 20 ns.
- Full device AC operation assumes a 100 μs ramp time from 0 to V<sub>CC(min)</sub> and 200 μs wait time after V<sub>CC</sub> stabilization.
- Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V<sub>CC</sub> = V<sub>CC(typ)</sub>, T<sub>A</sub> = 25 °C.
- Chip enables ( $\overline{CE}_1$  and CE<sub>2</sub>) must be at CMOS level to meet the I<sub>SB1</sub> / I<sub>SB2</sub> / I<sub>CCDR</sub> spec. Other inputs can be left floating.

### Capacitance

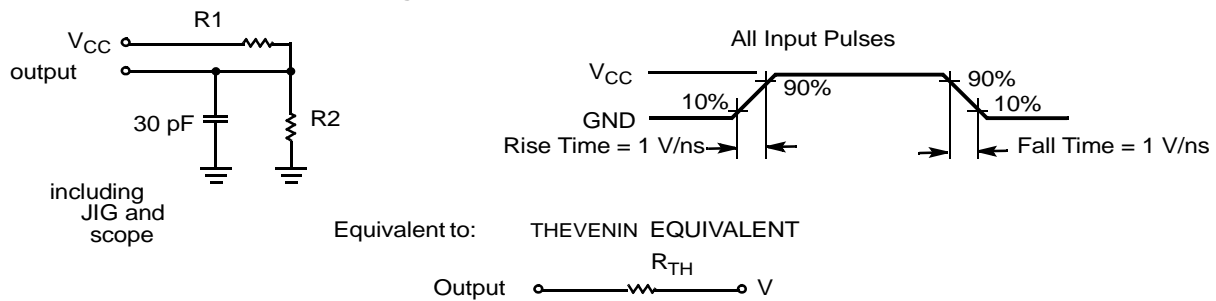
Parameter <sup>[8]</sup>	Description	Test Conditions	Max	Unit
$C_{IN}$	Input capacitance	$T_A = 25\text{ }^\circ\text{C}$ , $f = 1\text{ MHz}$ , $V_{CC} = V_{CC(typ)}$	10	pF
$C_{OUT}$	Output capacitance		10	pF

### Thermal Resistance

Parameter <sup>[8]</sup>	Description	Test Conditions	32-pin TSOP I	32-pin SOIC	32-pin STSOP	Unit
$\Theta_{JA}$	Thermal resistance (Junction to ambient)	Still Air, soldered on a 3 x 4.5 inch, two-layer printed circuit board	33.01	48.67	32.56	$^\circ\text{C/W}$
$\Theta_{JC}$	Thermal resistance (Junction to case)		3.42	25.86	3.59	$^\circ\text{C/W}$

### AC Test Loads and Waveforms

Figure 4. AC Test Loads and Waveforms



Parameters	2.50 V	3.0 V	Unit
R1	16667	1103	$\Omega$
R2	15385	1554	$\Omega$
$R_{TH}$	8000	645	$\Omega$
$V_{TH}$	1.20	1.75	V

**Note**

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

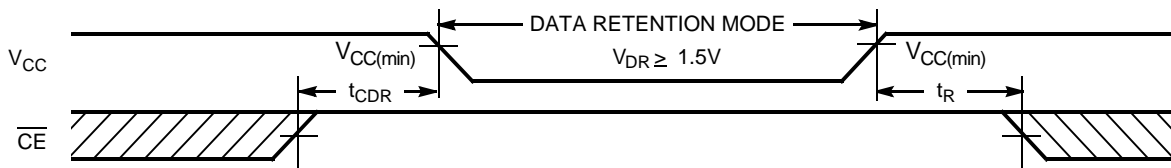
### Data Retention Characteristics

Over the Operating Range

Parameter	Description	Conditions	Min	Typ <sup>[9]</sup>	Max	Unit
V <sub>DR</sub>	V <sub>CC</sub> for data retention		1.5	–	–	V
I <sub>CCDR</sub> <sup>[10]</sup>	Data retention current	V <sub>CC</sub> = 1.5 V, CE <sub>1</sub> ≥ V <sub>CC</sub> – 0.2 V or CE <sub>2</sub> ≤ 0.2 V, V <sub>IN</sub> ≥ V <sub>CC</sub> – 0.2 V or V <sub>IN</sub> ≤ 0.2 V				
		Automotive-A	–	–	3	μA
		Automotive-E	–	–	30	μA
t <sub>CDR</sub> <sup>[11]</sup>	Chip deselect to data retention time		0	–	–	ns
t <sub>R</sub> <sup>[12]</sup>	Operation recovery time					
		CY62128EV30LL-45	45	–	–	ns
		CY62128EV30LL-55	55	–	–	

### Data Retention Waveform

Figure 5. Data Retention Waveform<sup>[13]</sup>



**Notes**

- 9. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V<sub>CC</sub> = V<sub>CC(typ)</sub>, T<sub>A</sub> = 25 °C.
- 10. Chip enables (CE<sub>1</sub> and CE<sub>2</sub>) must be at CMOS level to meet the I<sub>SB1</sub> / I<sub>SB2</sub> / I<sub>CCDR</sub> spec. Other inputs can be left floating.
- 11. Tested initially and after any design or process changes that may affect these parameters.
- 12. Full device AC operation requires linear V<sub>CC</sub> ramp from V<sub>DR</sub> to V<sub>CC(min)</sub> ≥ 100 μs or stable at V<sub>CC(min)</sub> ≥ 100 μs.
- 13. CE is the logical combination of CE<sub>1</sub> and CE<sub>2</sub>. When CE<sub>1</sub> is LOW and CE<sub>2</sub> is HIGH, CE is LOW; when CE<sub>1</sub> is HIGH or CE<sub>2</sub> is LOW, CE is HIGH.

## Switching Characteristics

Over the Operating Range

Parameter [14, 15]	Description	45 ns (Automotive-A)		55 ns (Automotive-E)		Unit
		Min	Max	Min	Max	
<b>Read Cycle</b>						
$t_{RC}$	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
$t_{ACE}$	$\overline{CE}$ LOW 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 [16]	5	–	5	–	ns
$t_{HZOE}$	$\overline{OE}$ HIGH to High Z [16, 17]	–	18	–	20	ns
$t_{LZCE}$	$\overline{CE}$ LOW to Low Z [16]	10	–	10	–	ns
$t_{HZCE}$	$\overline{CE}$ HIGH to High Z [16, 17]	–	18	–	20	ns
$t_{PU}$	$\overline{CE}$ LOW to Power-up	0	–	0	–	ns
$t_{PD}$	$\overline{CE}$ HIGH to Power-down	–	45	–	55	ns
<b>Write Cycle [18]</b>						
$t_{WC}$	Write cycle time	45	–	55	–	ns
$t_{SCE}$	$\overline{CE}$ LOW 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 [16, 17]	–	18	–	20	ns
$t_{LZWE}$	$\overline{WE}$ HIGH to Low Z [16]	10	–	10	–	ns

### Notes

14.  $\overline{CE}$  is the logical combination of  $\overline{CE}_1$  and  $CE_2$ . When  $\overline{CE}_1$  is LOW and  $CE_2$  is HIGH,  $\overline{CE}$  is LOW; when  $\overline{CE}_1$  is HIGH or  $CE_2$  is LOW,  $\overline{CE}$  is HIGH.
15. Test Conditions for all parameters other than tri-state parameters assume signal transition time of 3 ns or less (1 V/ns), timing reference levels of  $V_{CC(typ)}/2$ , input pulse levels of 0 to  $V_{CC(typ)}$ , and output loading of the specified  $I_{OL}/I_{OH}$  as shown in the [Figure 4 on page 6](#).
16. 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.
17.  $t_{HZOE}$ ,  $t_{HZCE}$ , and  $t_{HZWE}$  transitions are measured when the output enter a high impedance state.
18. 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 should be referenced to the edge of the signal that terminates the write.



### Switching Waveforms

Figure 6. Read Cycle 1 (Address Transition Controlled) [20, 21]

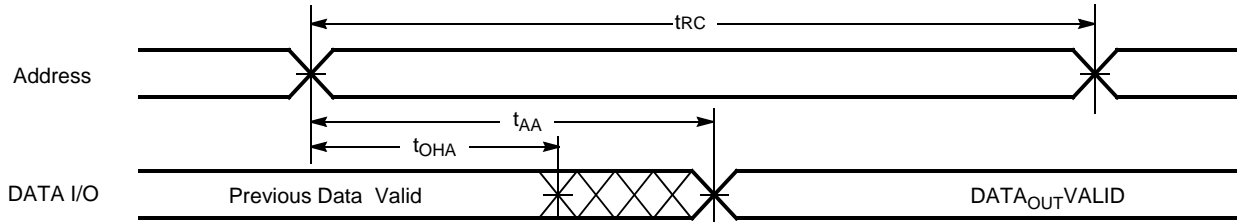


Figure 7. Read Cycle No. 2 (OE Controlled) [21, 22, 23]

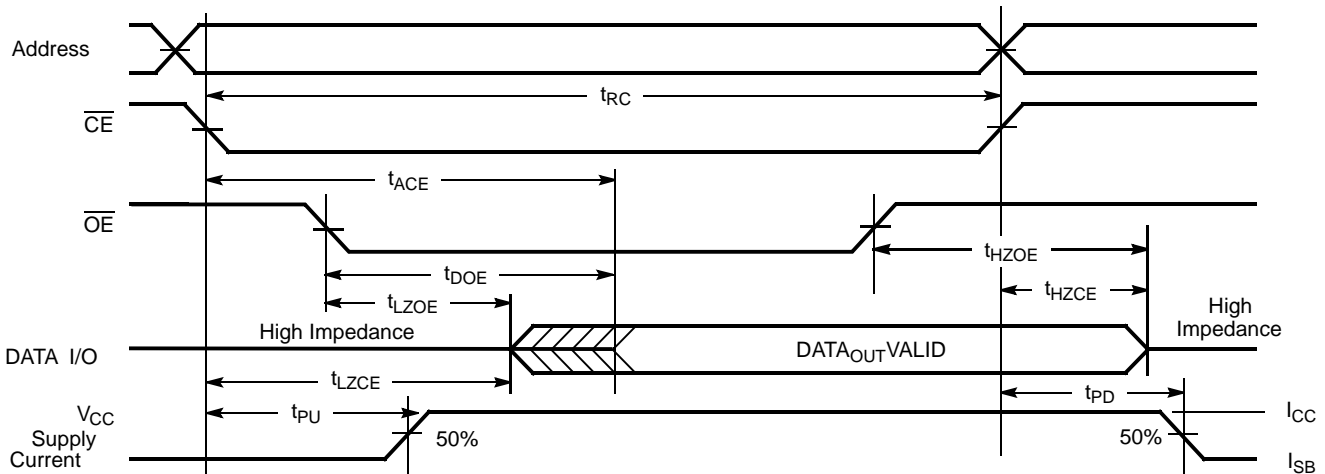
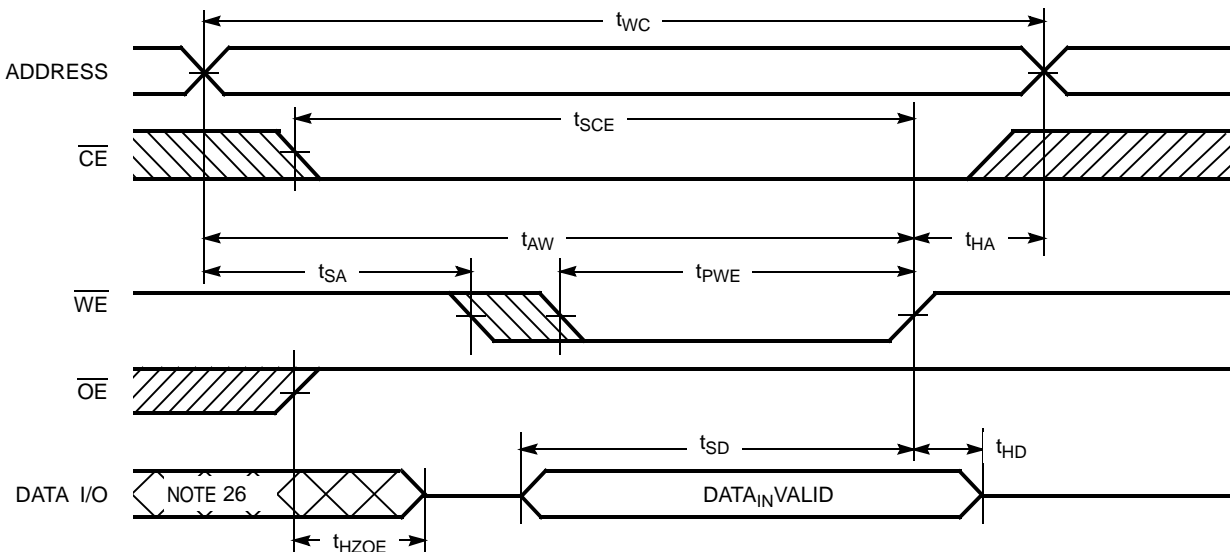


Figure 8. Write Cycle No. 1 (WE Controlled) [19, 22, 24, 25]



**Notes**

- 19. 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 should be referenced to the edge of the signal that terminates the write.
- 20. The device is continuously selected.  $\overline{OE}$ ,  $\overline{CE}_1 = V_{IL}$ ,  $\overline{CE}_2 = V_{IH}$ .
- 21.  $\overline{WE}$  is HIGH for read cycle.
- 22.  $\overline{CE}$  is the logical combination of  $\overline{CE}_1$  and  $\overline{CE}_2$ . When  $\overline{CE}_1$  is LOW and  $\overline{CE}_2$  is HIGH,  $\overline{CE}$  is LOW; when  $\overline{CE}_1$  is HIGH or  $\overline{CE}_2$  is LOW,  $\overline{CE}$  is HIGH.
- 23. Address valid before or similar to  $\overline{CE}_1$  transition LOW and  $\overline{CE}_2$  transition HIGH.
- 24. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .
- 25. If  $\overline{CE}_1$  goes HIGH or  $\overline{CE}_2$  goes LOW simultaneously with  $\overline{WE}$  HIGH, the output remains in high impedance state.
- 26. During this period, the I/Os are in output state. Do not apply input signals.

Switching Waveforms (continued)

Figure 9. Write Cycle No. 2 ( $\overline{CE}_1$  or  $CE_2$  Controlled) [27, 28, 29, 30]

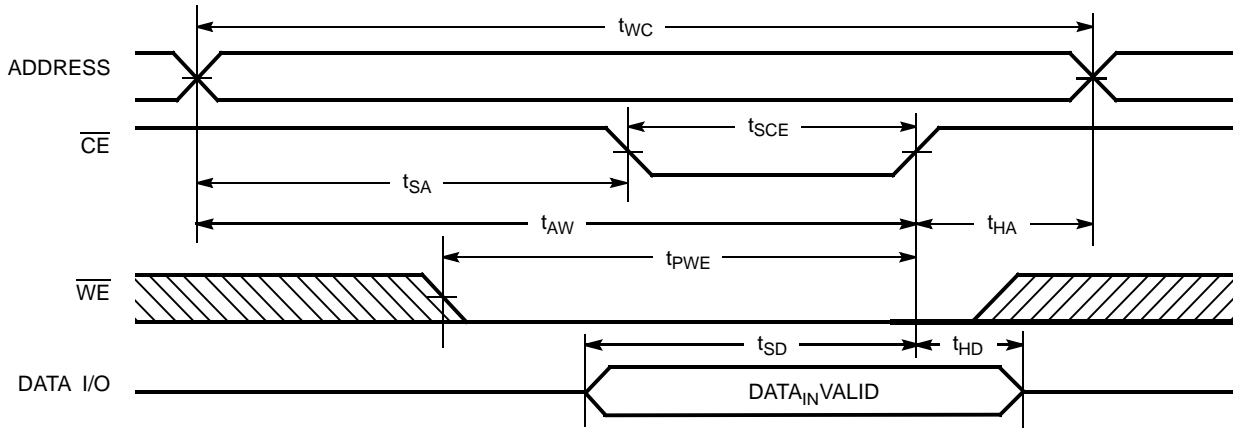
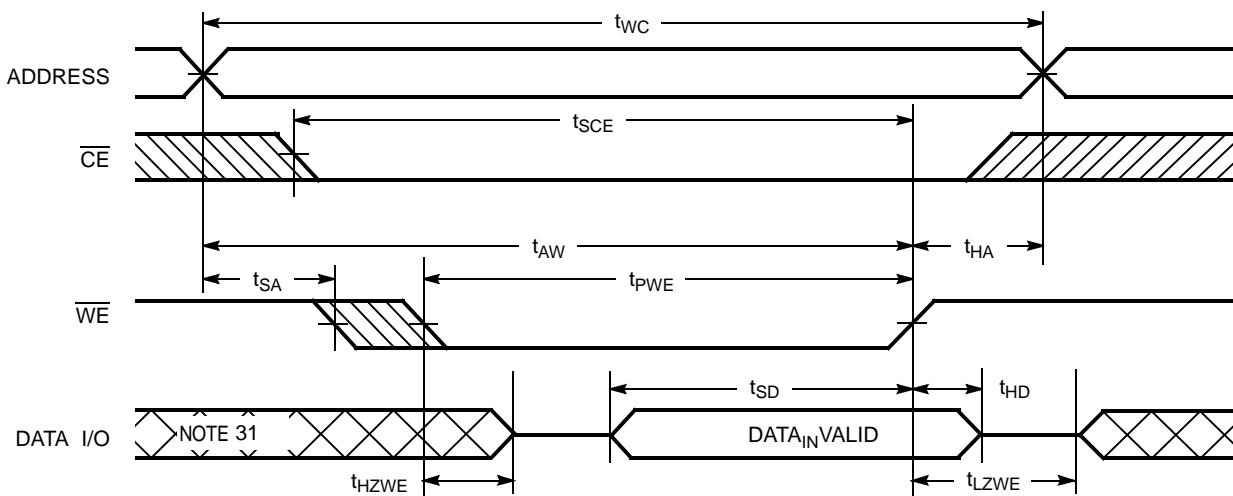


Figure 10. Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW) [27, 30]



Notes

- 27.  $\overline{CE}$  is the logical combination of  $\overline{CE}_1$  and  $CE_2$ . When  $\overline{CE}_1$  is LOW and  $CE_2$  is HIGH,  $\overline{CE}$  is LOW; when  $\overline{CE}_1$  is HIGH or  $CE_2$  is LOW,  $\overline{CE}$  is HIGH
- 28. 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 should be referenced to the edge of the signal that terminates the write.
- 29. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .
- 30. If  $\overline{CE}_1$  goes HIGH or  $CE_2$  goes LOW simultaneously with  $\overline{WE}$  HIGH, the output remains in high impedance state.
- 31. During this period, the I/Os are in output state. Do not apply input signals.

**Truth Table**

$\overline{CE}_1$	$\overline{CE}_2$	$\overline{WE}$	$\overline{OE}$	Inputs/Outputs	Mode	Power
H	X <sup>[32]</sup>	X	X	High Z	Deselect/Power-down	Standby ( $I_{SB}$ )
X <sup>[32]</sup>	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 ( $I_{CC}$ )

**Note**

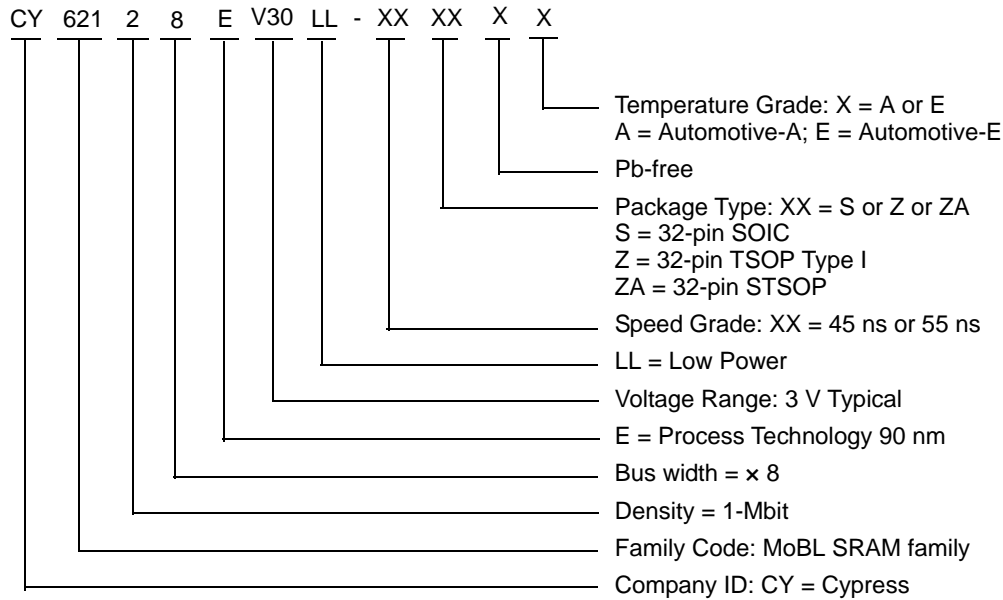
32. The 'X' (Don't care) state for the Chip enables in the truth table refer to the logic state (either HIGH or LOW). Intermediate voltage levels on these pins is not permitted.

**Ordering Information**

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
45	CY62128EV30LL-45SXA	51-85081	32-pin 450-Mil SOIC (Pb-free)	Automotive-A
	CY62128EV30LL-45ZXA	51-85056	32-pin TSOP Type I (Pb-free)	
	CY62128EV30LL-45ZAXA	51-85094	32-pin STSOP (Pb-free)	
55	CY62128EV30LL-55ZXE	51-85056	32-pin TSOP Type I (Pb-free)	Automotive-E
	CY62128EV30LL-55SXE	51-85081	32-pin 450-Mil SOIC (Pb-free)	

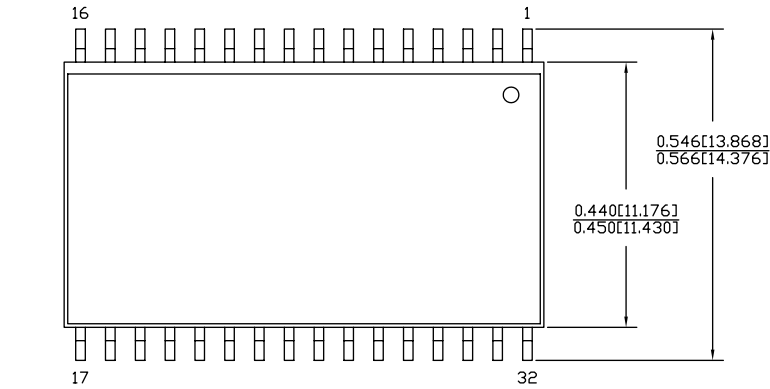
Contact your local Cypress sales representative for availability of these parts.

**Ordering Code Definitions**



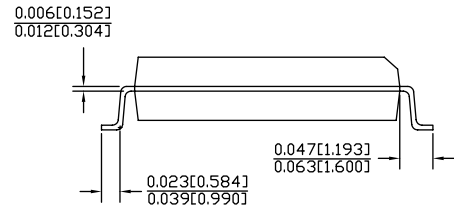
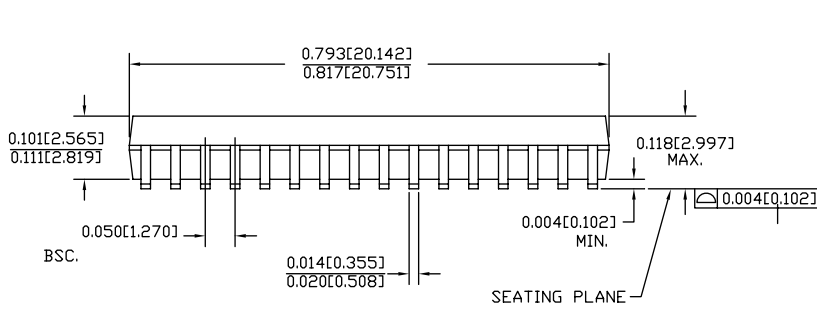
Package Diagrams

Figure 11. 32-pin Molded SOIC (450 Mil) S32.45/SZ32.45, 51-85081



DIMENSIONS IN INCHES[MM] MIN.  
MAX.  
PACKAGE WEIGHT 1.42gms

PART #	
S32.45	STANDARD PKG.
SZ32.45	LEAD FREE PKG.

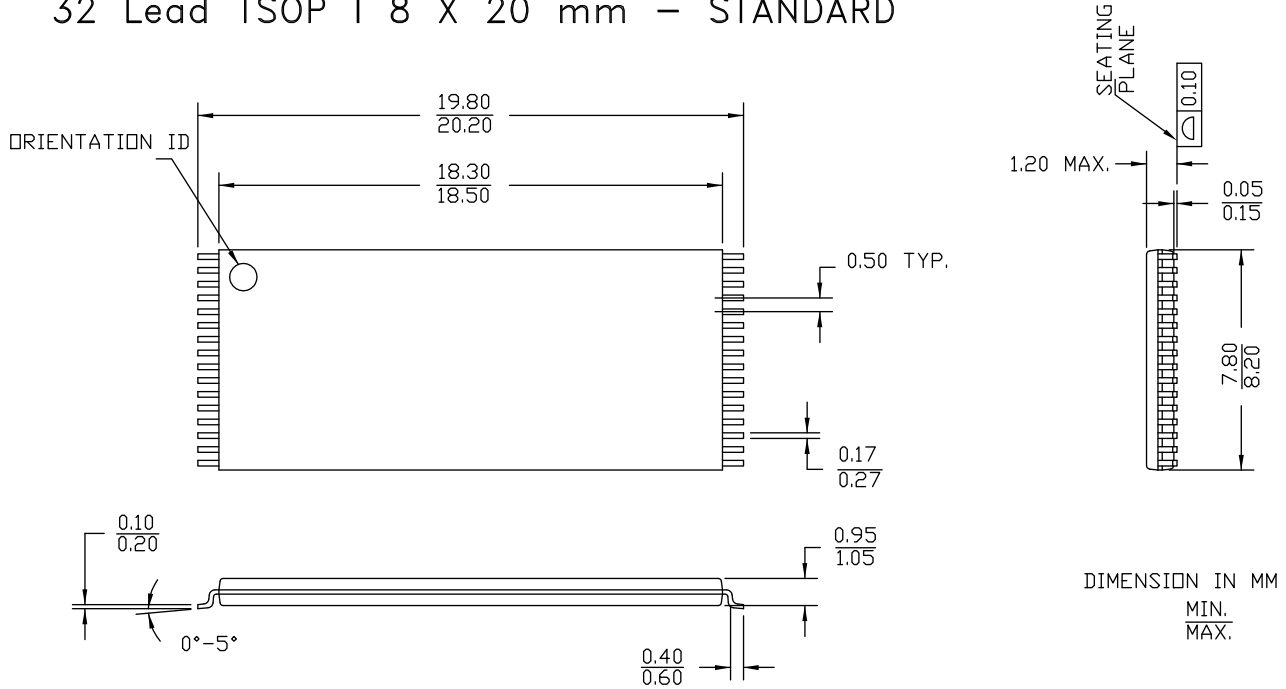


51-85081 \*D

Package Diagrams (continued)

Figure 12. 32-pin TSOP I (8 x 20 x 1.0 mm) Z32, 51-85056

32 Lead TSOP I 8 X 20 mm – STANDARD

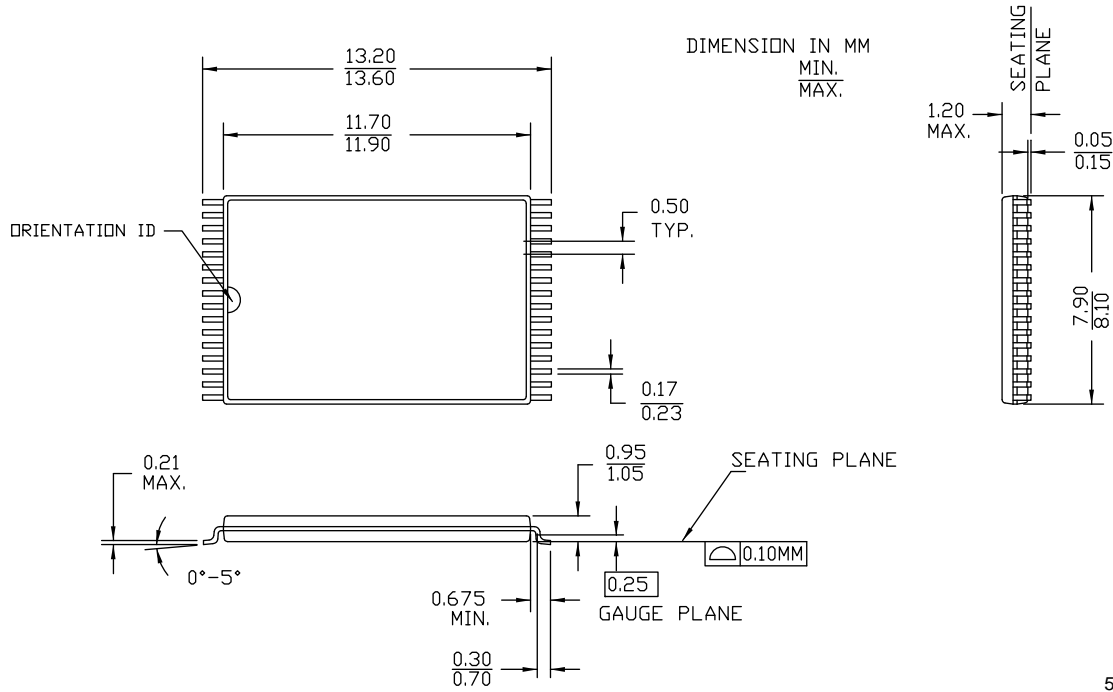


DIMENSION IN MM  
MIN.  
MAX.

51-85056 \*F

Package Diagrams (continued)

Figure 13. 32-pin Small TSOP (8 x 13.4 x 1.2 mm) ZA32, 51-85094



**Acronyms**

Acronym	Description
CE	chip enable
CMOS	complementary metal oxide semiconductor
I/O	input/output
OE	output enable
SOIC	small outline integrated circuit
SRAM	static random access memory
STSOP	small thin small outline package
TSOP	thin small outline package
WE	write enable

**Document Conventions**

**Units of Measure**

Symbol	Unit of Measure
°C	degree Celsius
MHz	megahertz
μA	microamperes
μs	microseconds
mA	milliamperes
ns	nanoseconds
Ω	ohms
%	percent
pF	picofarad
V	Volts
W	Watts



**Document History Page**

Document Title: CY62128EV30 MoBL <sup>®</sup> Automotive, 1-Mbit (128 K x 8) Static RAM				
Document Number: 001-65528				
Rev.	ECN No.	Submission Date	Orig. of Change	Description of Change
**	3115909	01/06/2011	RAME	New Datasheet for Automotive SRAM parts. Created separate datasheet for Automotive SRAM parts from Document no. 38-05579 Rev. *H
*A	3288690	06/21/2011	RAME	Removed the Note "For best practice recommendations, refer to the Cypress application note "System Design Guidelines" at <a href="http://www.cypress.com">http://www.cypress.com</a> ." and its reference in <a href="#">Functional Description</a> . Updated <a href="#">Electrical Characteristics</a> (Test Conditions of I <sub>SB1</sub> and I <sub>SB2</sub> parameters). Updated <a href="#">Package Diagrams</a> . Updated in new template.
*B	3543173	03/06/2012	TAVA	Updated <a href="#">Electrical Characteristics</a> Table Updated <a href="#">Switching Waveforms</a> Updated <a href="#">Package Diagrams</a>

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