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## Features

- TSOP I package configurable as 1M × 16 or 2M × 8 SRAM
- Very high speed: 45 ns
- Temperature ranges
  - Industrial: -40 °C to +85 °C
- Wide voltage range: 2.20 V to 3.60 V
- Ultra-low standby power
  - Typical standby current: 1.5 μA
  - Maximum standby current: 12 μA
- Ultra-low active power
  - Typical active current: 7 mA at f = 1 MHz
- Easy memory expansion with  $\overline{CE}_1$ ,  $CE_2$ , and  $\overline{OE}$  Features
- Automatic power-down when deselected
- CMOS for optimum speed and power
- Offered in Pb-free 48-ball VFBGA and 48-pin TSOP I packages

## Functional Description

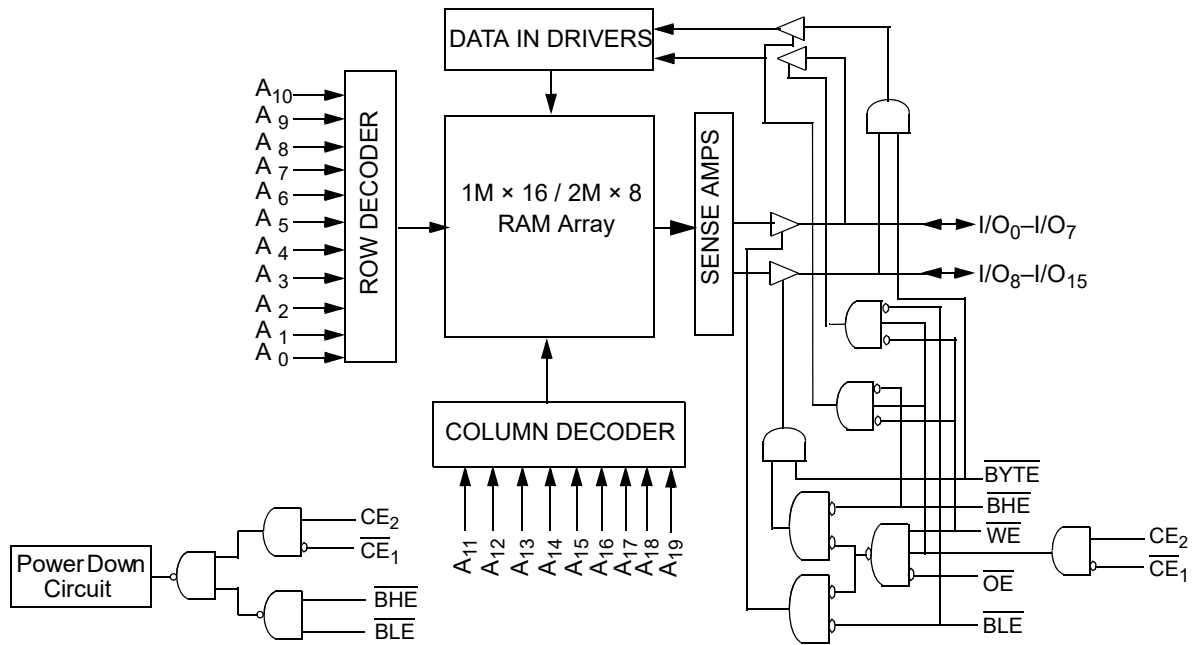
The CY62167EV30 is a high-performance CMOS static RAM organized as 1M words by 16 bits or 2M words by 8 bits. This device features an advanced circuit design that provides an ultra low active current. Ultra low active current is ideal for providing More Battery Life™ (MoBL®) in portable applications such as cellular telephones. The device also has an automatic power down feature that reduces power consumption by 99 percent when addresses are not toggling. Place the device in standby mode when deselected ( $\overline{CE}_1$  HIGH or  $CE_2$  LOW or both  $\overline{BHE}$  and  $\overline{BLE}$  are HIGH). The input and output pins ( $I/O_0$  through  $I/O_{15}$ ) are placed in a high-impedance state when: the device is deselected ( $\overline{CE}_1$  HIGH or  $CE_2$  LOW), outputs are disabled ( $\overline{OE}$  HIGH), both Byte High Enable and Byte Low Enable are disabled ( $\overline{BHE}$ ,  $\overline{BLE}$  HIGH), or a write operation is in progress ( $\overline{CE}_1$  LOW,  $CE_2$  HIGH and  $\overline{WE}$  LOW).

To write to the device, take Chip Enables ( $\overline{CE}_1$  LOW and  $CE_2$  HIGH) and Write Enable ( $\overline{WE}$ ) input LOW. If Byte Low Enable ( $\overline{BLE}$ ) is LOW, then data from I/O pins ( $I/O_0$  through  $I/O_7$ ) is written into the location specified on the address pins ( $A_0$  through  $A_{19}$ ). If Byte High Enable ( $\overline{BHE}$ ) is LOW, then data from the I/O pins ( $I/O_8$  through  $I/O_{15}$ ) is written into the location specified on the address pins ( $A_0$  through  $A_{19}$ ).

To read from the device, take Chip Enables ( $\overline{CE}_1$  LOW and  $CE_2$  HIGH) and Output Enable ( $\overline{OE}$ ) LOW while forcing the Write Enable ( $\overline{WE}$ ) HIGH. If Byte Low Enable ( $\overline{BLE}$ ) is LOW, then data from the memory location specified by the address pins appears on  $I/O_0$  to  $I/O_7$ . If Byte High Enable ( $\overline{BHE}$ ) is LOW, then data from memory appears on  $I/O_8$  to  $I/O_{15}$ . See [Truth Table on page 13](#) for a complete description of read and write modes.

For a complete list of related documentation, [click here](#).

## Logic Block Diagram

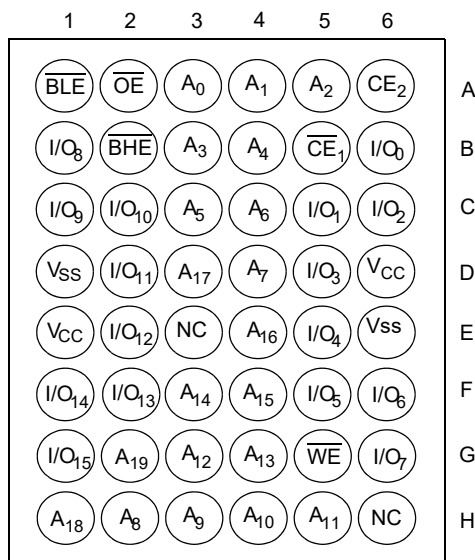


## Contents

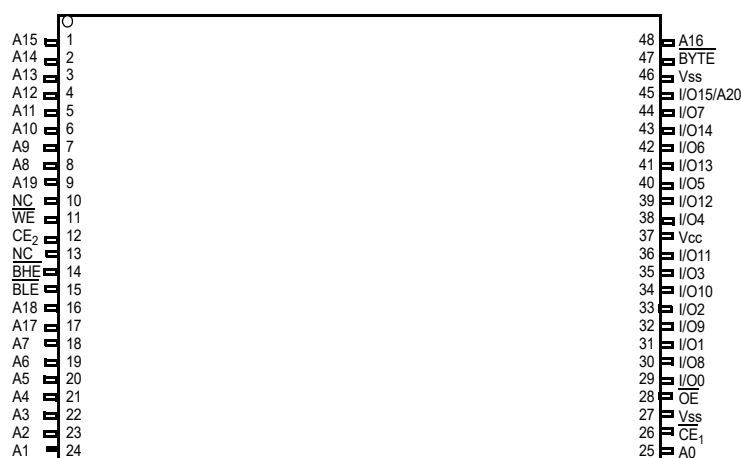
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## Pin Configuration

**Figure 1. 48-ball VFBGA Pinout (Top View)<sup>[1, 2]</sup>**



**Figure 2. 48-pin TSOP I Pinout (Top View)<sup>[2, 3]</sup>**



## 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)	
		f = 1 MHz		f = f <sub>max</sub>		Typ <sup>[4]</sup>	Max				
		Min	Typ <sup>[4]</sup>	Max				Typ <sup>[4]</sup>	Max	Typ <sup>[4, 5]</sup>	Max <sup>[5]</sup>
CY62167EV30LL	Industrial	2.2	3.0	3.6	45	7	9	29	35	1.5	12

### Notes

- Ball H6 for the VFBGA package can be used to upgrade to a 32M density.
- NC pins are not connected on the die.
- The **BYTE** pin in the 48-pin TSOP I package has to be tied to V<sub>CC</sub> to use the device as a 1M × 16 SRAM. The 48-pin TSOP I package can also be used as a 2M × 8 SRAM by tying the **BYTE** signal to V<sub>SS</sub>. In the 2M × 8 configuration, Pin 45 is A20, while **BHE**, **BLE** and I/O<sub>8</sub> to I/O<sub>14</sub> pins are not used.
- 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.
- Refer to PIN#183401 for details of changes.

## 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 [6, 7] ... -0.3 V to 3.9 V ( $V_{CC(max)}$  + 0.3 V)

DC voltage applied to outputs  
in High Z state [6, 7] ..... -0.3 V to 3.9 V ( $V_{CC(max)}$  + 0.3 V)

DC input voltage [6, 7] ..... -0.3 V to 3.9 V ( $V_{CC(max)}$  + 0.3 V)

Output current into outputs (LOW) ..... 20 mA

Static discharge voltage  
(MIL-STD-883, Method 3015) ..... >2001 V

Latch-up current ..... >140 mA

## Operating Range

Device	Range	Ambient Temperature	$V_{CC}$ [8]
CY62167EV30LL	Industrial	-40 °C to +85 °C	2.2 V to 3.6 V

## Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions	45 ns (Industrial)			Unit
			Min	Typ [9]	Max	
$V_{OH}$	Output HIGH voltage	$2.2 \leq V_{CC} \leq 2.7$	2.0	—	—	V
		$2.7 \leq V_{CC} \leq 3.6$	2.4	—	—	V
$V_{OL}$	Output LOW voltage	$2.2 \leq V_{CC} \leq 2.7$	—	—	0.4	V
		$2.7 \leq V_{CC} \leq 3.6$	—	—	0.4	V
$V_{IH}$	Input HIGH voltage	$2.2 \leq V_{CC} \leq 2.7$	1.8	—	$V_{CC} + 0.3$	V
		$2.7 \leq V_{CC} \leq 3.6$	2.2	—	$V_{CC} + 0.3$	V
$V_{IL}$	Input LOW voltage	$2.2 \leq V_{CC} \leq 2.7$	-0.3	—	0.6	V
		$2.7 \leq V_{CC} \leq 3.6$ For VFBGA package	-0.3	—	0.8	V
		$2.7 \leq V_{CC} \leq 3.6$ For TSOP I package	-0.3	—	0.7 [10]	V
$I_{IX}$	Input leakage current	$GND \leq V_I \leq V_{CC}$	-1	—	+1	μA
$I_{OZ}$	Output leakage current	$GND \leq V_O \leq V_{CC}$ , Output disabled	-1	—	+1	μA
$I_{CC}$ [11]	$V_{CC}$ operating supply current	$f = f_{max} = 1/t_{RC}$	—	29	35	mA
		$f = 1 \text{ MHz}$	—	7.0	9.0	mA
$I_{SB1}$ [12]	Automatic power down current – CMOS inputs	$\overline{CE_1} \geq V_{CC} - 0.2 \text{ V}$ or $CE_2 \leq 0.2 \text{ V}$ or ( $\overline{BHE}$ and $\overline{BLE}$ ) $\geq V_{CC} - 0.2 \text{ V}$ , $V_{IN} \geq V_{CC} - 0.2 \text{ V}$ , $V_{IN} \leq 0.2 \text{ V}$ , $f = f_{max}$ (address and data only), $f = 0$ ( $\overline{OE}$ , and $\overline{WE}$ ), $V_{CC} = V_{CC(max)}$	—	1.5	12	μA
$I_{SB2}$ [12]	Automatic power down current – CMOS inputs	$\overline{CE_1} \geq V_{CC} - 0.2 \text{ V}$ or $CE_2 \leq 0.2 \text{ V}$ or	—	1.5	3.0 [13]	μA
		$(\overline{BHE}$ and $\overline{BLE}) \geq V_{CC} - 0.2 \text{ V}$ , $V_{IN} \geq V_{CC} - 0.2 \text{ V}$ or $V_{IN} \leq 0.2 \text{ V}$ , $f = 0$	—	—	3.5 [13]	μA
		$V_{CC} = V_{CC(max)}$ Temperature = 25 °C	—	—	12	μA

### Notes

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

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

8. 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.

9. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at  $V_{CC} = V_{CC(typ)}$ ,  $T_A = 25 \text{ °C}$ .

10. Under DC conditions the device meets a  $V_{IL}$  of 0.8 V. However, in dynamic conditions Input LOW Voltage applied to the device must not be higher than 0.7 V. This is applicable to TSOP I package only.

11. Refer to PIN#183401 for details of changes.

12. Chip enables ( $\overline{CE_1}$  and  $CE_2$ ), byte enables ( $\overline{BHE}$  and  $\overline{BLE}$ ) and  $\overline{BYTE}$  must be tied to CMOS levels to meet the  $I_{SB1}/I_{SB2}/I_{CCDR}$  spec. Other inputs can be left floating

13. This parameter is guaranteed by design.

## Capacitance

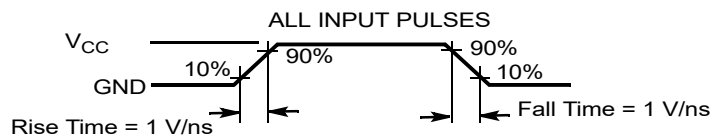
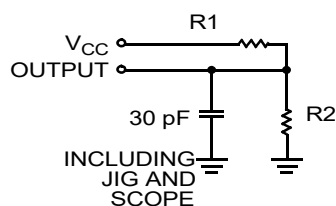
Parameter <sup>[14]</sup>	Description	Test Conditions	Max	Unit
$C_{IN}$	Input capacitance	$T_A = 25\text{ }^{\circ}\text{C}$ , $f = 1\text{ MHz}$ , $V_{CC} = V_{CC(typ)}$	10	pF
$C_{OUT}$	Output capacitance		10	pF

## Thermal Resistance

Parameter <sup>[14, 15]</sup>	Description	Test Conditions	48-ball VFBGA	48-pin TSOP I	Unit
$\Theta_{JA}$	Thermal resistance (junction to ambient)	Still air, soldered on a 3 × 4.5 inch, two-layer printed circuit board	31.50	57.99	$^{\circ}\text{C/W}$
$\Theta_{JC}$	Thermal resistance (junction to case)		15.75	13.42	$^{\circ}\text{C/W}$

## AC Test Loads and Waveforms

Figure 3. AC Test Loads and Waveforms



Equivalent to: THÉVENIN EQUIVALENT



Parameters	2.2 V to 2.7 V	2.7 V to 3.6 V	Unit
R1	16667	1103	$\Omega$
R2	15385	1554	$\Omega$
$R_{TH}$	8000	645	$\Omega$
$V_{TH}$	1.20	1.75	V

### Note

14. Tested initially and after any design or process changes that may affect these parameters.  
 15. Refer to PIN#183401 for details of changes.

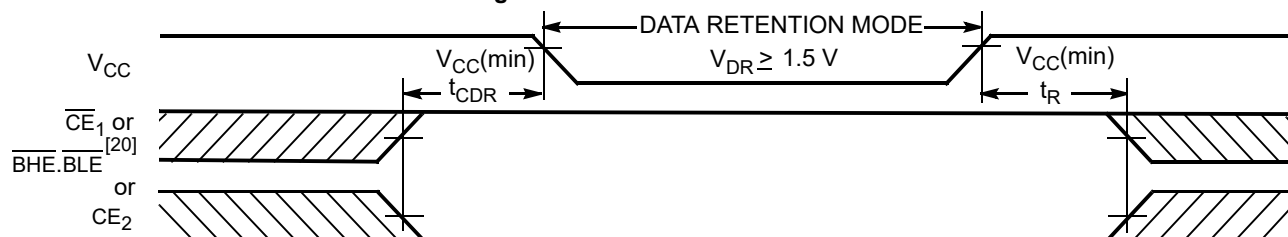
## Data Retention Characteristics

Over the Operating Range

Parameter	Description	Conditions	Min	Typ <sup>[16]</sup>	Max	Unit
$V_{DR}$	$V_{CC}$ for data retention		1.5	–	–	V
$I_{CCDR}^{[17]}$	Data retention current	$V_{CC} = 1.5\text{ V to }3.0\text{ V}$ , $\overline{CE}_1 \geq V_{CC} - 0.2\text{ V}$ or $CE_2 \leq 0.2\text{ V}$ or $(\overline{BHE} \text{ and } \overline{BLE}) \geq V_{CC} - 0.2\text{ V}$ , $V_{IN} \geq V_{CC} - 0.2\text{ V}$ or $V_{IN} \leq 0.2\text{ V}$	–	–	10	$\mu\text{A}$
$t_{CDR}^{[18]}$	Chip deselect to data retention time	–	0	–	–	–
$t_R^{[19]}$	Operation recovery time	–	45	–	–	ns

## Data Retention Waveform

Figure 4. Data Retention Waveform



### Notes

16. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at  $V_{CC} = V_{CC(typ)}$ ,  $T_A = 25\text{ }^\circ\text{C}$ .
17. Chip enables ( $\overline{CE}_1$  and  $CE_2$ ), byte enables ( $\overline{BHE}$  and  $\overline{BLE}$ ) and  $\overline{BYTE}$  must be tied to CMOS levels to meet the  $I_{SB1}$  /  $I_{SB2}$  /  $I_{CCDR}$  spec. Other inputs can be left floating.
18. Tested initially and after any design or process changes that may affect these parameters.
19. Full device operation requires linear  $V_{CC}$  ramp from  $V_{DR}$  to  $V_{CC(min)}$   $\geq 100\text{ }\mu\text{s}$  or stable at  $V_{CC(min)}$   $\geq 100\text{ }\mu\text{s}$ .
20.  $\overline{BHE.BLE}$  is the AND of both  $\overline{BHE}$  and  $\overline{BLE}$ . Deselect the chip by either disabling the chip enable signals or by disabling both  $\overline{BHE}$  and  $\overline{BLE}$ .



## Switching Characteristics

Parameter <sup>[21, 22]</sup>	Description	45 ns (Industrial/ Automotive-A)		Unit
		Min	Max	
Read Cycle				
t <sub>RC</sub>	Read cycle time	45	–	ns
t <sub>AA</sub>	Address to data valid	–	45	ns
t <sub>OHA</sub>	Data hold from address change	10	–	ns
t <sub>ACE</sub>	$\overline{CE}_1$ LOW and CE <sub>2</sub> HIGH to data valid	–	45	ns
t <sub>DOE</sub>	$\overline{OE}$ LOW to data valid	–	22	ns
t <sub>LZOE</sub>	$\overline{OE}$ LOW to Low Z <sup>[22]</sup>	5	–	ns
t <sub>HZOE</sub>	$\overline{OE}$ HIGH to High Z <sup>[22, 23]</sup>	–	18	ns
t <sub>LZCE</sub>	$\overline{CE}_1$ LOW and CE <sub>2</sub> HIGH to Low Z <sup>[22]</sup>	10	–	ns
t <sub>HZCE</sub>	$\overline{CE}_1$ HIGH and CE <sub>2</sub> LOW to High Z <sup>[22, 23]</sup>	–	18	ns
t <sub>PU</sub>	$\overline{CE}_1$ LOW and CE <sub>2</sub> HIGH to power-up	0	–	ns
t <sub>PD</sub>	$\overline{CE}_1$ HIGH and CE <sub>2</sub> LOW to power-down	–	45	ns
t <sub>DBE</sub>	BLE / BHE LOW to data valid	–	45	ns
t <sub>LZBE</sub>	$\overline{BLE}$ / $\overline{BHE}$ LOW to Low Z <sup>[22]</sup>	10	–	ns
t <sub>HZBE</sub>	$\overline{BLE}$ / $\overline{BHE}$ HIGH to High Z <sup>[22, 23]</sup>	–	18	ns
Write Cycle <sup>[24, 25]</sup>				
t <sub>WC</sub>	Write cycle time	45	–	ns
t <sub>SCE</sub>	$\overline{CE}_1$ LOW and CE <sub>2</sub> HIGH to write end	35	–	ns
t <sub>AW</sub>	Address setup to write end	35	–	ns
t <sub>HA</sub>	Address hold from write end	0	–	ns
t <sub>SA</sub>	Address setup to write start	0	–	ns
t <sub>PWE</sub>	$\overline{WE}$ pulse width	35	–	ns
t <sub>BW</sub>	$\overline{BLE}$ / $\overline{BHE}$ LOW to write end	35	–	ns
t <sub>SD</sub>	Data setup to write end	25	–	ns
t <sub>HD</sub>	Data hold from write end	0	–	ns
t <sub>HZWE</sub>	$\overline{WE}$ LOW to High Z <sup>[22, 23]</sup>	–	18	ns
t <sub>LZWE</sub>	$\overline{WE}$ HIGH to Low Z <sup>[22]</sup>	10	–	ns

### Notes

21. Test conditions for all parameters other than tristate parameters assume signal transition time of 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 Figure 3 on page 6.

22. At any temperature and voltage condition,  $t_{HZCE}$  is less than  $t_{LZCE}$ ,  $t_{HZBE}$  is less than  $t_{LZBE}$ ,  $t_{HZOE}$  is less than  $t_{LZOE}$ , and  $t_{HZWE}$  is less than  $t_{LZWE}$  for any device.

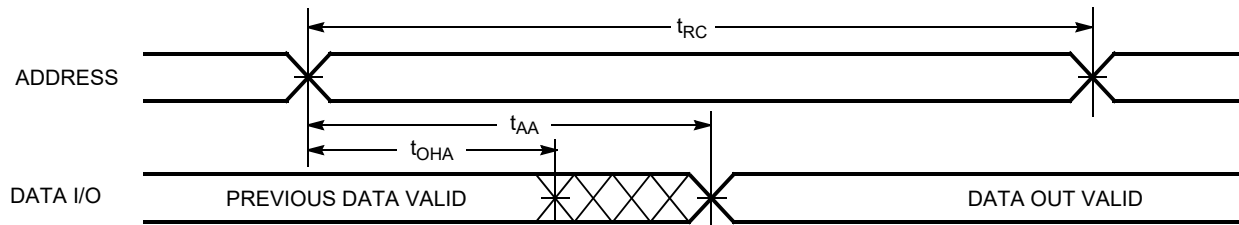
23.  $t_{HZOE}$ ,  $t_{HZCE}$ ,  $t_{HZBE}$ , and  $t_{HZWE}$  transitions are measured when the outputs enter a high impedance state.

24. The internal write time of the memory is defined by the overlap of  $\overline{WE}$ ,  $\overline{CE}_1 = V_{IL}$ ,  $\overline{BHE}$  or  $\overline{BLE}$  or both =  $V_{IL}$ , and  $CE_2 = V_{IH}$ . 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 refer to the edge of the signal that terminates the write.

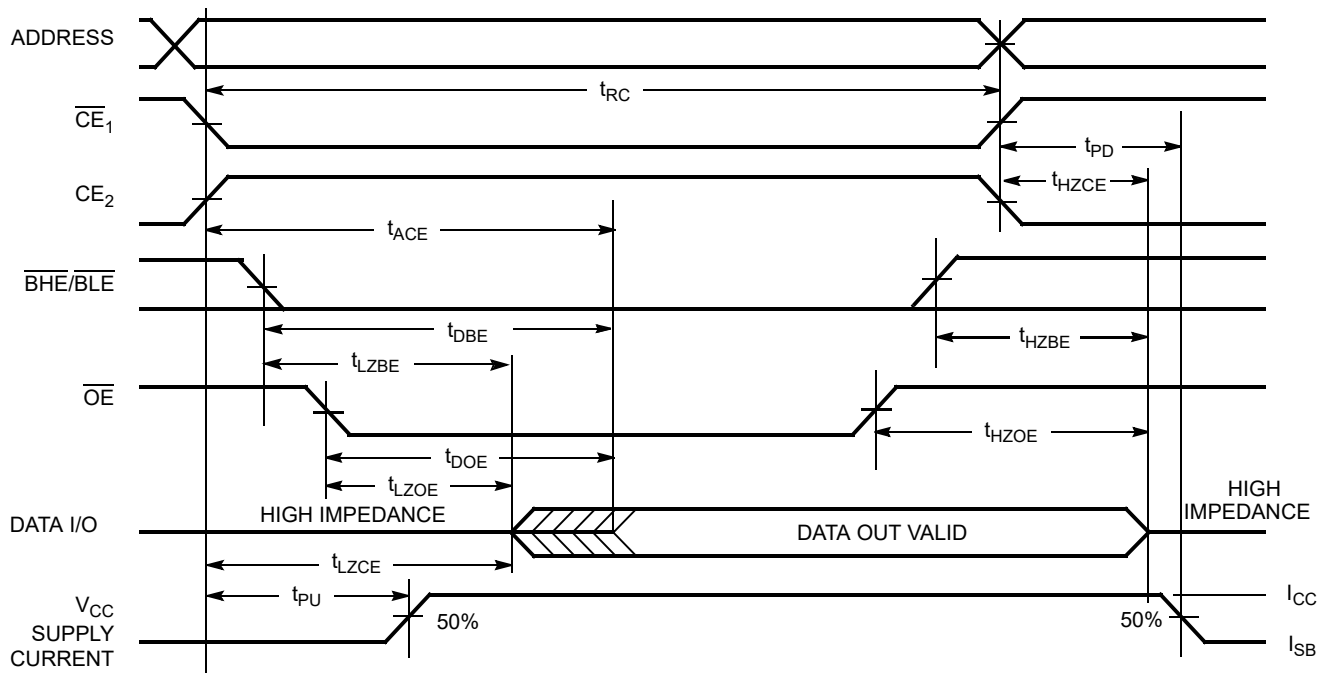
25. The minimum pulse width for Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW) should be equal to the sum of  $t_{SD}$  and  $t_{HZWE}$ .

## Switching Waveforms

**Figure 5. Read Cycle No. 1 (Address Transition Controlled)**<sup>[26, 27]</sup>



**Figure 6. Read Cycle No. 2 ( $\overline{OE}$  Controlled)**<sup>[27, 28]</sup>



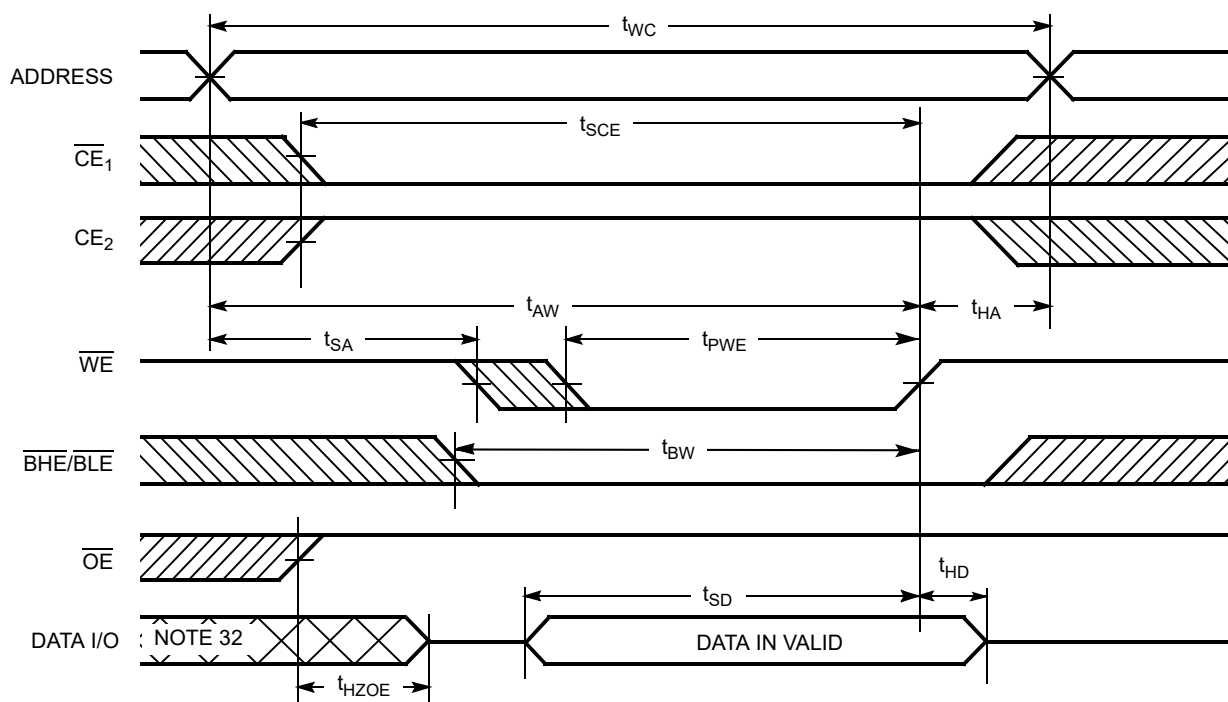
### Notes

26. The device is continuously selected.  $\overline{OE}$ ,  $\overline{CE}_1 = V_{IL}$ ,  $\overline{BHE}$ ,  $\overline{BLE}$  or both =  $V_{IL}$ , and  $CE_2 = V_{IH}$ .

27.  $\overline{WE}$  is HIGH for read cycle.

28. Address valid before or similar to  $\overline{CE}_1$ ,  $\overline{BHE}$ ,  $\overline{BLE}$  transition LOW and  $CE_2$  transition HIGH.

**Switching Waveforms** (continued)

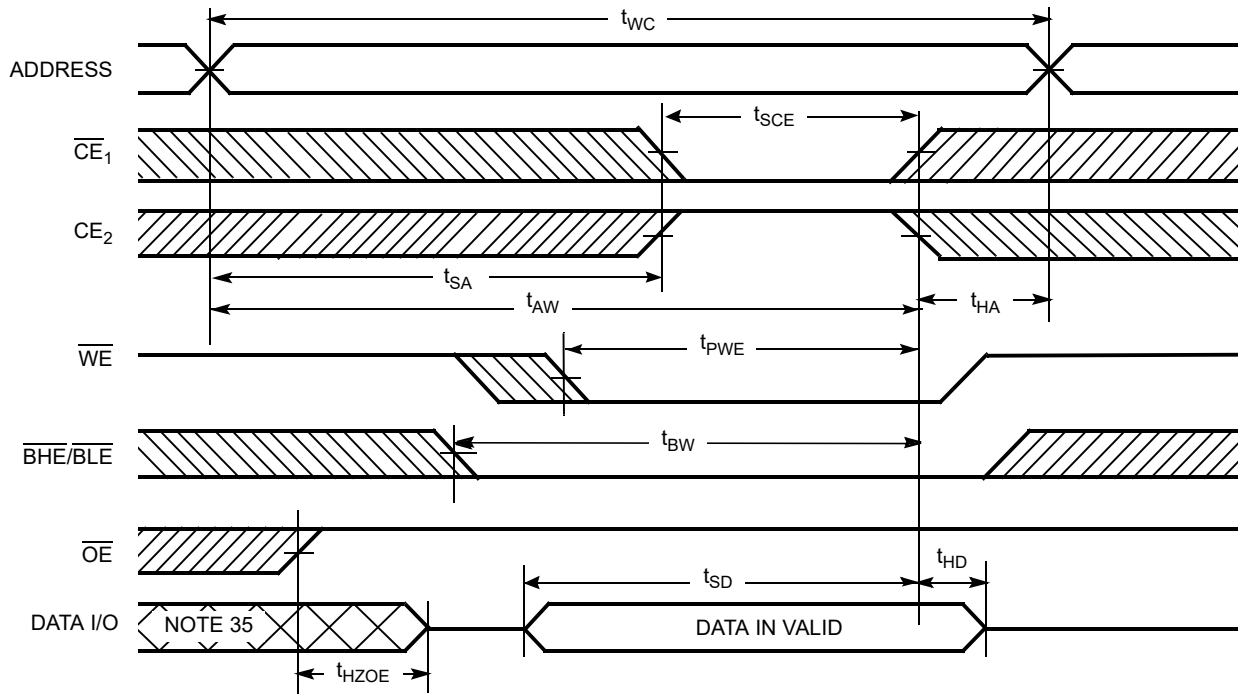
**Figure 7. Write Cycle No. 1 ( $\overline{WE}$  Controlled)**<sup>[29, 30, 31]</sup>

**Notes**

29. The internal write time of the memory is defined by the overlap of  $\overline{WE}$ ,  $\overline{CE}_1 = V_{IL}$ ,  $\overline{BHE}$  or  $\overline{BLE}$  or both =  $V_{IL}$ , and  $\overline{CE}_2 = V_{IH}$ . 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 refer to the edge of the signal that terminates the write.

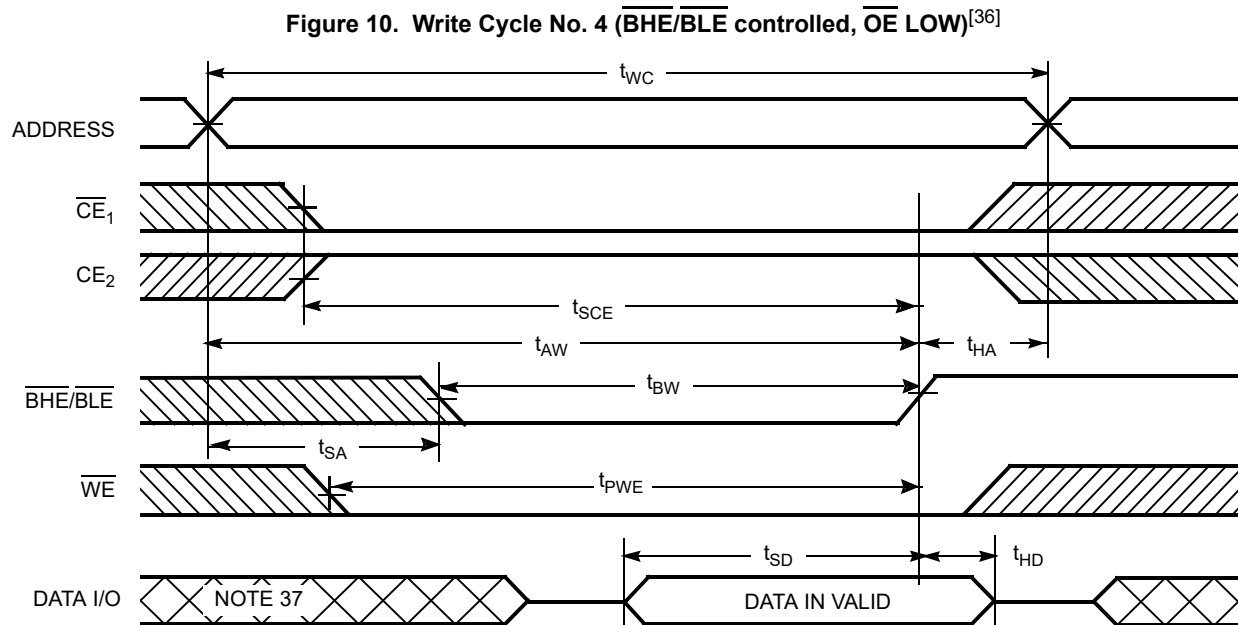
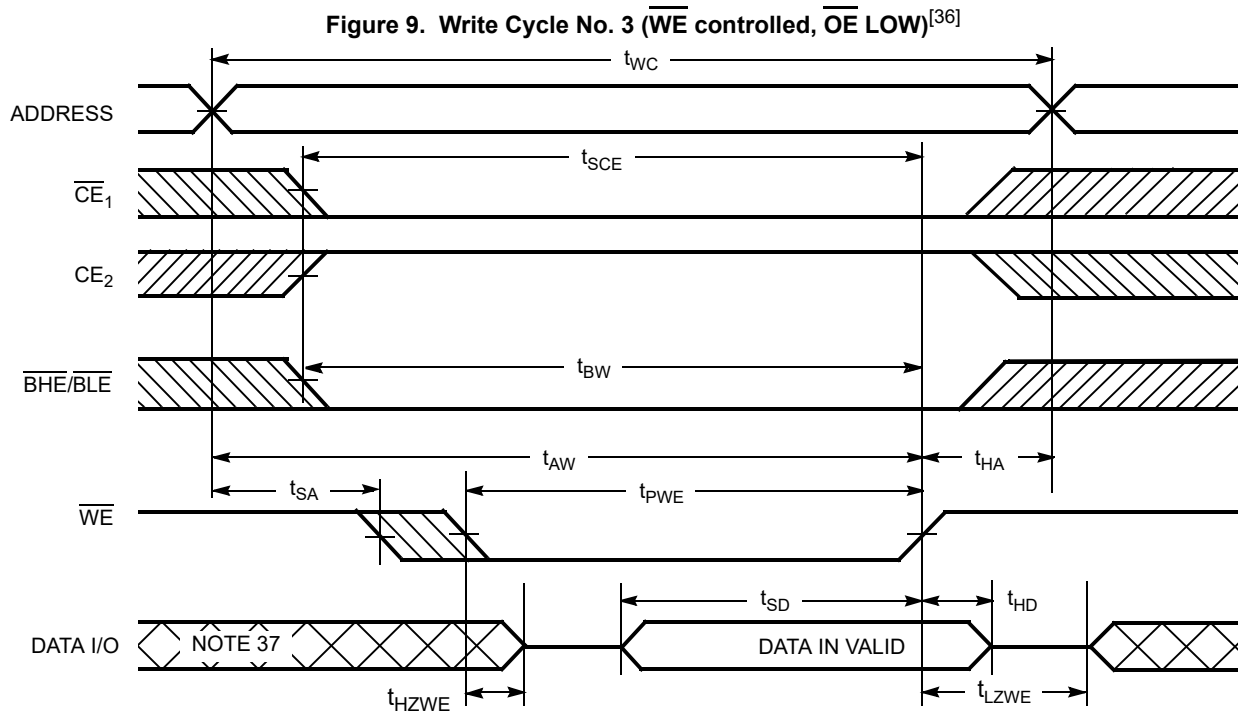
30. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .

31. If  $\overline{CE}_1$  goes HIGH and  $\overline{CE}_2$  goes LOW simultaneously with  $\overline{WE} = V_{IH}$ , the output remains in a high impedance state.

32. During this period the I/Os are in output state. Do not apply input signals.

**Switching Waveforms (continued)**
**Figure 8. Write Cycle No. 2 ( $\overline{CE}_1$  or  $CE_2$  Controlled)<sup>[33, 34]</sup>**

**Notes**

33. The internal write time of the memory is defined by the overlap of  $\overline{WE}$ ,  $\overline{CE}_1 = V_{IL}$ ,  $\overline{BHE}$  or  $\overline{BLE}$  or both =  $V_{IL}$ , and  $CE_2 = V_{IH}$ . 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 refer to the edge of the signal that terminates the write.
34. If  $\overline{CE}_1$  goes HIGH and  $CE_2$  goes LOW simultaneously with  $\overline{WE} = V_{IH}$ , the output remains in a high impedance state.
35. During this period the I/Os are in output state. Do not apply input signals.

**Switching Waveforms (continued)**

**Notes**

36. If  $\overline{CE}_1$  goes HIGH and  $\overline{CE}_2$  goes LOW simultaneously with  $\overline{WE} = V_{IH}$ , the output remains in a high impedance state.

37. During this period the I/Os are in output state. Do not apply input signals.

**Truth Table**

$\overline{CE}_1$	$CE_2$	$\overline{WE}$	$\overline{OE}$	$\overline{BHE}$	$\overline{BLE}$	Inputs/Outputs	Mode	Power
H	X <sup>[38]</sup>	X	X	X <sup>[38]</sup>	X <sup>[38]</sup>	High Z	Deselect/Power-down	Standby ( $I_{SB}$ )
X <sup>[38]</sup>	L	X	X	X <sup>[38]</sup>	X <sup>[38]</sup>	High Z	Deselect/Power-down	Standby ( $I_{SB}$ )
X <sup>[38]</sup>	X <sup>[38]</sup>	X	X	H	H	High Z	Deselect/Power-down	Standby ( $I_{SB}$ )
L	H	H	L	L	L	Data Out ( $I/O_0$ – $I/O_{15}$ )	Read	Active ( $I_{CC}$ )
L	H	H	L	H	L	Data Out ( $I/O_0$ – $I/O_7$ ); High Z ( $I/O_8$ – $I/O_{15}$ )	Read	Active ( $I_{CC}$ )
L	H	H	L	L	H	High Z ( $I/O_0$ – $I/O_7$ ); Data Out ( $I/O_8$ – $I/O_{15}$ )	Read	Active ( $I_{CC}$ )
L	H	H	H	L	H	High Z	Output disabled	Active ( $I_{CC}$ )
L	H	H	H	H	L	High Z	Output disabled	Active ( $I_{CC}$ )
L	H	H	H	L	L	High Z	Output disabled	Active ( $I_{CC}$ )
L	H	L	X	L	L	Data In ( $I/O_0$ – $I/O_{15}$ )	Write	Active ( $I_{CC}$ )
L	H	L	X	H	L	Data In ( $I/O_0$ – $I/O_7$ ); High Z ( $I/O_8$ – $I/O_{15}$ )	Write	Active ( $I_{CC}$ )
L	H	L	X	L	H	High Z ( $I/O_0$ – $I/O_7$ ); Data In ( $I/O_8$ – $I/O_{15}$ )	Write	Active ( $I_{CC}$ )

**Note**

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



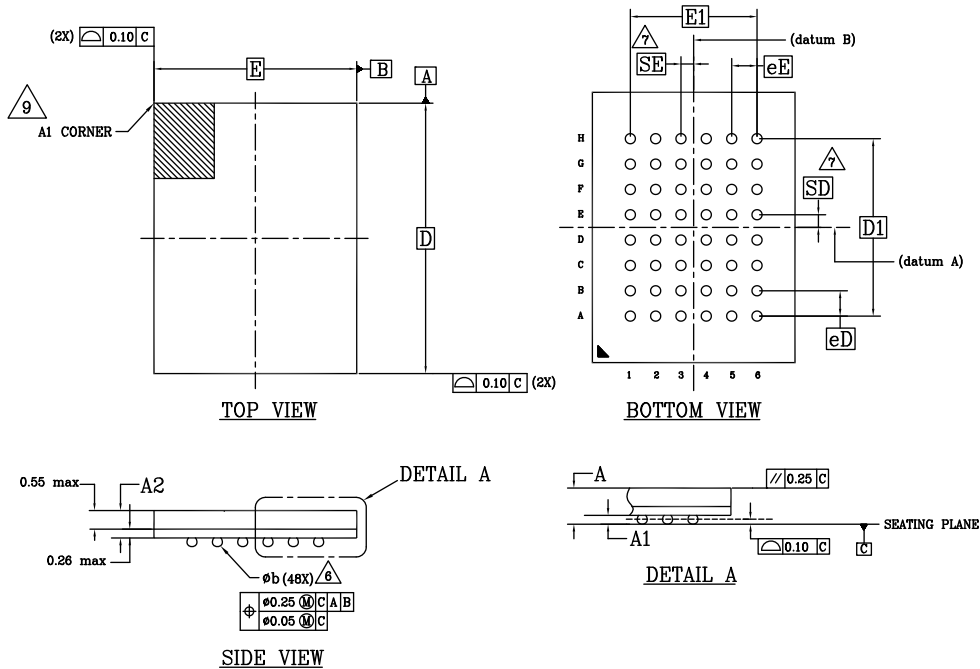
Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
45	CY62167EV30LL-45BVI	51-85150	48-ball VFBGA (6 × 8 × 1 mm), Package Code: BV48	Industrial
	CY62167EV30LL-45BVXI	51-85150	48-ball VFBGA (6 × 8 × 1 mm) (Pb-free), Package Code: BZ48	
	CY62167EV30LL-45ZXI	51-85183	48-pin TSOP I (Pb-free)	

The diagram shows the part number 621V30LL-45XX-X-X with callouts for each segment:

- Company ID: CY = Cypress
- Family Code: 621 = MoBL SRAM family
- Density = 16-Mbit
- Bus Width = x 16
- Process Technology: Low Power
- Voltage Range: V30 = 3 V typical
- LL = Low Power
- Speed Grade: 45 ns
- Package Type: XX = BV or Z  
BV = 48-ball VFBGA  
Z = 48-pin TSOP I
- Pb-free
- Temperature Grade: X = I  
I = Industrial;

## Package Diagrams

Figure 11. 48-ball VFBGA (6 × 8 × 1.0 mm) Package Outline, 51-85150



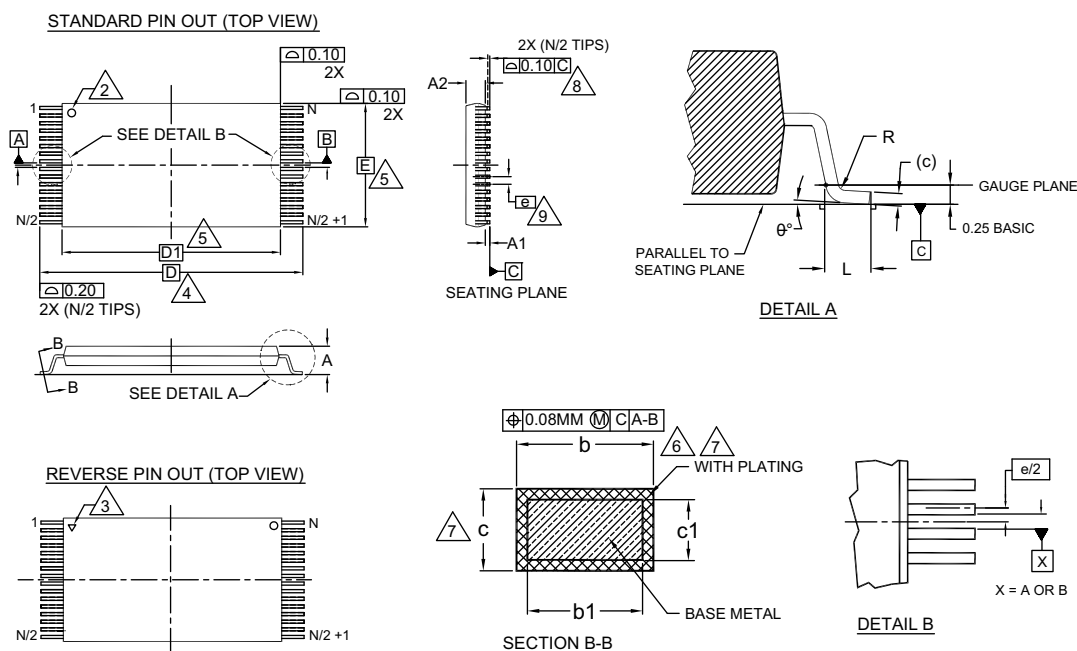
SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	-	-	1,00
A1	0,16	-	-
A2	-	-	0,81
D	8,00 BSC		
E	6,00 BSC		
D1	5,25 BSC		
E1	3,75 BSC		
MD	8		
ME	6		
n	48		
Ø b	0,25	0,30	0,35
eE	0,75 BSC		
eD	0,75 BSC		
SD	0,375 BSC		
SE	0,375 BSC		

### NOTES:

- DIMENSIONING AND TOLERANCING METHODS PER ASME Y14.5M-2009.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- BALL POSITION DESIGNATION PER JEP95, SECTION 3, SPP-020.
- 8 REPRESENTS THE SOLDER BALL GRID PITCH.
- SYMBOL "MD" IS THE BALL MATRIX SIZE IN THE "D" DIRECTION.  
SYMBOL "ME" IS THE BALL MATRIX SIZE IN THE "E" DIRECTION.  
n IS THE NUMBER OF POPULATED SOLDER BALL POSITIONS FOR MATRIX SIZE MD X ME.
- DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM C.
- "SD" AND "SE" ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW.  
WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW  
"SD" OR "SE" = 0.  
WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW,  
"SD" = eD/2 AND "SE" = eE/2.
- "\*" INDICATES THE THEORETICAL CENTER OF DEPOPULATED BALLS.
- A1 CORNER TO BE IDENTIFIED BY CHAMFER, LASER OR INK MARK METALIZED MARK, INDENTATION OR OTHER MEANS.

51-85150 \*I



**Package Diagrams (continued)**
**Figure 12. 48-pin TSOP I (18.4 × 12 × 1.2 mm) Package Outline, 51-85183**


SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b1	0.17	0.20	0.23
b	0.17	0.22	0.27
c1	0.10	—	0.16
c	0.10	—	0.21
D	20.00 BASIC		
D1	18.40 BASIC		
E	12.00 BASIC		
e	0.50 BASIC		
L	0.50	0.60	0.70
θ	0°	—	8
R	0.08	—	0.20
N	48		

**NOTES:**

1. DIMENSIONS ARE IN MILLIMETERS (mm).
2. PIN 1 IDENTIFIER FOR STANDARD PIN OUT (DIE UP).
3. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN): INK OR LASER MARK.
4. TO BE DETERMINED AT THE SEATING PLANE  $-C-$ . THE SEATING PLANE IS DEFINED AS THE PLANE OF CONTACT THAT IS MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT HORIZONTAL SURFACE.
5. DIMENSIONS D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION ON E IS 0.15mm PER SIDE AND ON D1 IS 0.25mm PER SIDE.
6. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08mm TOTAL IN EXCESS OF b DIMENSION AT MAX. MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.07mm.
7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm AND 0.25mm FROM THE LEAD TIP.
8. LEAD COPLANARITY SHALL BE WITHIN 0.10mm AS MEASURED FROM THE SEATING PLANE.
9. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.
10. JEDEC SPECIFICATION NO. REF: MO-142(D)DD.

51-85183 \*F

## Acronyms

**Table 1. Acronyms Used in this Document**

Acronym	Description
BHE	byte high enable
BLE	byte low enable
CE	chip enable
CMOS	complementary metal oxide semiconductor
I/O	input/output
OE	output enable
SRAM	static random access memory
TSOP	thin small outline package
VFBGA	very fine-pitch ball grid array
WE	write enable

## Document Conventions

### Units of Measure

**Table 2. Units of Measure**

Symbol	Unit of Measure
°C	degree Celsius
MHz	megahertz
μA	microampere
μs	microsecond
mA	milliampere
mm	millimeter
ns	nanosecond
Ω	ohm
%	percent
pF	picofarad
V	volt
W	watt

## Document History Page

Document Title: CY62167EV30 Industrial MoBL, 16-Mbit (1M × 16/2M × 8) Static RAM Document Number: 002-24706			
Rev.	ECN No.	Submission Date	Description of Change
**	6267677	07/31/2018	New data sheet.
*A	6294735	08/29/2018	Updated <a href="#">Product Portfolio</a> : Added Note 5 and referred the same note in “Typ” and “Max” columns under “Operating I <sub>CC</sub> ”. Updated <a href="#">Electrical Characteristics</a> : Added Note 11 and referred the same note in I <sub>CC</sub> parameter. Updated <a href="#">Thermal Resistance</a> : Added Note 15 and referred the same note in “Parameter” column.
*B	6843831	04/01/2020	Updated <a href="#">Maximum Ratings</a> : Updated Note references in “Supply voltage to ground potential”, “DC voltage applied to outputs in High Z state”, and “DC input voltage” (Replaced “9” with “6”). Updated <a href="#">Package Diagrams</a> : spec 51-85150 – Changed revision from *H to *I. Updated to new template.

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