

# 1-Mb (64K x 16) Static RAM

## Features

- **Temperature Ranges**
  - Industrial:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$
  - Automotive:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- **Very high speed: 45 ns**
- **Wide voltage range: 2.2V to 3.6V**
- **Pin compatible with CY62127BV**
- **Ultra-low active power**
  - Typical active current:  $0.85\text{ mA @ } f = 1\text{ MHz}$
  - Typical active current:  $5\text{ mA @ } f = f_{\text{MAX}}$
- **Ultra-low standby power**
- **Easy memory expansion with  $\overline{\text{CE}}$  and  $\overline{\text{OE}}$  features**
- **Automatic power-down when deselected**
- **Available in Pb-Free and non Pb-Free 48-ball FBGA and a 44-lead TSOP Type II packages**

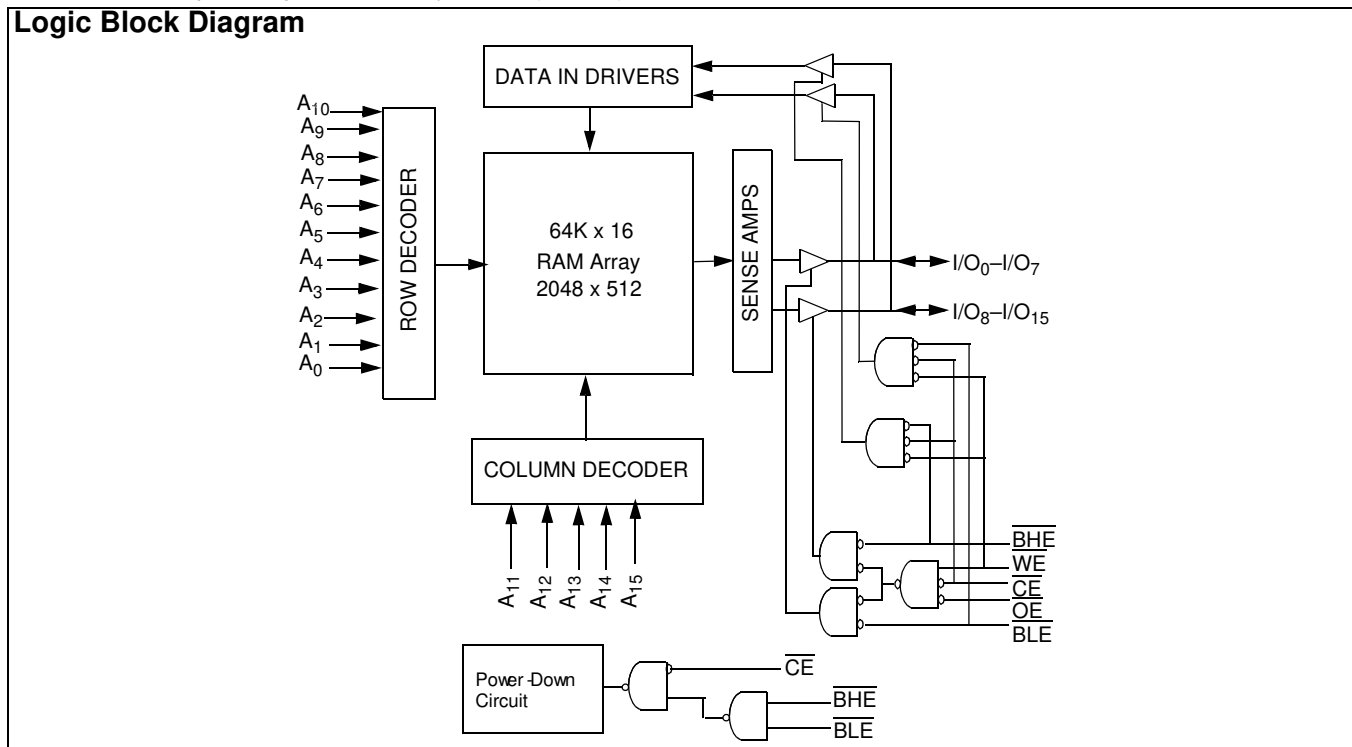
## Functional Description<sup>[1]</sup>

The CY62127DV30 is a high-performance CMOS static RAM organized as 64K words by 16 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 90% when addresses are not toggling. The device can be put into standby mode reducing power consumption by more than 99% when deselected ( $\overline{\text{CE}}$  HIGH or both  $\overline{\text{BHE}}$  and  $\overline{\text{BLE}}$  are HIGH). The input/output pins ( $\text{I/O}_0$  through  $\text{I/O}_{15}$ ) are placed in a high-impedance state when: deselected ( $\overline{\text{CE}}$  HIGH), outputs are disabled ( $\overline{\text{OE}}$  HIGH), both Byte High Enable and Byte Low Enable are disabled ( $\overline{\text{BHE}}$ ,  $\overline{\text{BLE}}$  HIGH) or during a write operation ( $\overline{\text{CE}}$  LOW and  $\overline{\text{WE}}$  LOW).

Writing to the device is accomplished by taking Chip Enable ( $\overline{\text{CE}}$ ) and Write Enable ( $\overline{\text{WE}}$ ) inputs LOW. If Byte Low Enable ( $\overline{\text{BLE}}$ ) is LOW, then data from I/O pins ( $\text{I/O}_0$  through  $\text{I/O}_7$ ), is written into the location specified on the address pins ( $\text{A}_0$  through  $\text{A}_{15}$ ). If Byte High Enable ( $\overline{\text{BHE}}$ ) is LOW, then data from I/O pins ( $\text{I/O}_8$  through  $\text{I/O}_{15}$ ) is written into the location specified on the address pins ( $\text{A}_0$  through  $\text{A}_{15}$ ).

Reading from the device is accomplished by taking Chip Enable ( $\overline{\text{CE}}$ ) and Output Enable ( $\overline{\text{OE}}$ ) LOW while forcing the Write Enable ( $\overline{\text{WE}}$ ) HIGH. If Byte Low Enable ( $\overline{\text{BLE}}$ ) is LOW, then data from the memory location specified by the address pins will appear on  $\text{I/O}_0$  to  $\text{I/O}_7$ . If Byte High Enable ( $\overline{\text{BHE}}$ ) is LOW, then data from memory will appear on  $\text{I/O}_8$  to  $\text{I/O}_{15}$ . See the truth table at the back of this data sheet for a complete description of read and write modes



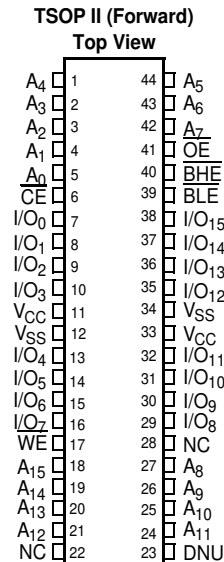
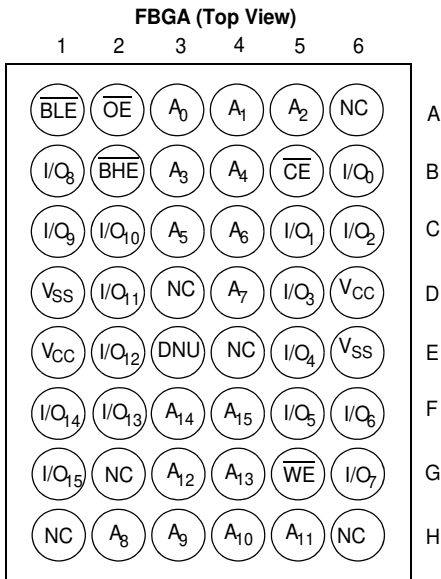
**Note:**

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

**Product Portfolio**

Product	V <sub>CC</sub> Range (V)			Speed (ns)	Power Dissipation						
					Operating, I <sub>CC</sub> (mA)					Standby I <sub>SB2</sub> (μA)	
	Min.	Typ.	Max.		f = 1 MHz		f = f <sub>MAX</sub>				
					Typ. <sup>[4]</sup>	Max.	Typ. <sup>[4]</sup>	Max.	Range	Typ. <sup>[4]</sup>	Max.
CY62127DV30L	2.2	3.0	3.6	45	0.85	1.5	6.5	13	Ind'l	1.5	5
CY62127DV30LL				45	0.85	1.5	6.5	13	Ind'l	1.5	4
CY62127DV30L	2.2	3.0	3.6	55	0.85	1.5	5	10	Ind'l	1.5	5
									Auto	1.5	15
CY62127DV30LL	2.2	3.0	3.6	55	0.85	1.5	5	10	Ind'l	1.5	4
CY62127DV30L	2.2	3.0	3.6	70	0.85	1.5	5	10	Ind'l	1.5	5
CY62127DV30LL				70	0.85	1.5	5	10	Ind'l	1.5	4

**Pin Configurations<sup>[2, 3]</sup>**



**Notes:**

- NC pins are not connected to the die.
- Pin #23 of TSOP II and E3 ball of FBGA are DNU, which have to be left floating or tied to Vss to ensure proper application. (Expansion Pins on FBGA Package: E4 - 2M, D3 - 4M, H1 - 8M, G2 - 16M, H6 - 32M).
- 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.

**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 ..... -0.3V to 3.9V  
 DC Voltage Applied to Outputs in High-Z State<sup>[5]</sup> ..... -0.3V to V<sub>CC</sub> + 0.3V

DC Input Voltage<sup>[5]</sup> ..... -0.3V to V<sub>CC</sub> + 0.3V  
 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 (T <sub>A</sub> )	V <sub>CC</sub> <sup>[6]</sup>
Industrial	-40°C to +85°C	2.2V to 3.6V
Automotive	-40°C to +125°C	2.2V to 3.6V

**DC Electrical Characteristics** (Over the Operating Range)

Parameter	Description	Test Conditions	-45			-55			-70			Unit		
			Min.	Typ. <sup>[4]</sup>	Max.	Min.	Typ. <sup>[4]</sup>	Max.	Min.	Typ. <sup>[4]</sup>	Max.			
V <sub>OH</sub>	Output HIGH Voltage	2.2 ≤ V <sub>CC</sub> ≤ 2.7	I <sub>OH</sub> = -0.1 mA		2.0			2.0			2.0	V		
		2.7 ≤ V <sub>CC</sub> ≤ 3.6	I <sub>OH</sub> = -1.0 mA		2.4			2.4			2.4			
V <sub>OL</sub>	Output LOW Voltage	2.2 ≤ V <sub>CC</sub> ≤ 2.7	I <sub>OL</sub> = 0.1 mA					0.4			0.4	V		
		2.7 ≤ V <sub>CC</sub> ≤ 3.6	I <sub>OL</sub> = 2.1 mA					0.4			0.4			
V <sub>IH</sub>	Input HIGH Voltage	2.2 ≤ V <sub>CC</sub> ≤ 2.7		1.8		V <sub>CC</sub> + 0.3	1.8		V <sub>CC</sub> + 0.3	1.8		V <sub>CC</sub> + 0.3	V	
		2.7 ≤ V <sub>CC</sub> ≤ 3.6		2.2		V <sub>CC</sub> + 0.3	2.2		V <sub>CC</sub> + 0.3	2.2		V <sub>CC</sub> + 0.3		
V <sub>IL</sub>	Input LOW Voltage	2.2 ≤ V <sub>CC</sub> ≤ 2.7		-0.3		0.6	-0.3		0.6	-0.3		0.6	V	
		2.7 ≤ V <sub>CC</sub> ≤ 3.6		-0.3		0.8	-0.3		0.8	-0.3		0.8		
I <sub>IX</sub>	Input Leakage Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>		Ind'l	-1	+1	-1	+1	-1	+1	-1	+1	μA	
				Auto			-4	+4						
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>O</sub> ≤ V <sub>CC</sub> , Output Disabled		Ind'l	-1	+1	-1	+1	-1	+1	-1	+1	μA	
				Auto			-4	+4						
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> = 3.6V, I <sub>OUT</sub> = 0 mA, CMOS level			6.5	13		5	10		5	10	mA
		f = 1 MHz				0.85	1.5		0.85	1.5		0.85	1.5	
I <sub>SB1</sub>	Automatic CE Power-down Current—CMOS Inputs	$\overline{CE} \geq V_{CC} - 0.2V$ , $V_{IN} \geq V_{CC} - 0.2V$ , $V_{IN} \leq 0.2V$ , $f = f_{MAX}$ (Address and Data Only), $f = 0$ ( $\overline{OE}$ , $\overline{WE}$ , $\overline{BHE}$ and $\overline{BLE}$ )	L	Ind'l	1.5	5		1.5	5		1.5	5	μA	
				Auto					1.5	15				
			LL		1.5	4		1.5	4		1.5	4		
I <sub>SB2</sub>	Automatic CE Power-down Current—CMOS Inputs	$\overline{CE} \geq V_{CC} - 0.2V$ , $V_{IN} \geq V_{CC} - 0.2V$ or $V_{IN} \leq 0.2V$ , $f = 0$ , V <sub>CC</sub> = 3.6V	L	Ind'l	1.5	5		1.5	5		1.5	5	μA	
				Auto					1.5	15				
			LL		1.5	4		1.5	4		1.5	4		

**Capacitance<sup>[7]</sup>**

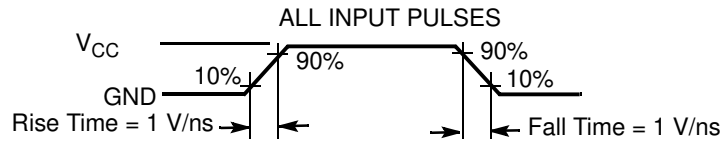
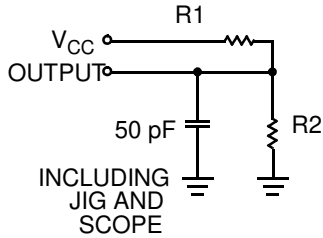
Parameter	Description	Test Conditions	Max.	Unit
C <sub>IN</sub>	Input Capacitance	T <sub>A</sub> = 25°C, f = 1 MHz V <sub>CC</sub> = V <sub>CC(typ)</sub>	8	pF
C <sub>OUT</sub>	Output Capacitance		8	pF

**Notes:**

- V<sub>IL(min.)</sub> = -2.0V for pulse durations less than 20 ns., V<sub>IH(max.)</sub> = V<sub>CC</sub>+0.75V for pulse durations less than 20 ns.
- Full device operation requires linear ramp of V<sub>CC</sub> from 0V to V<sub>CC(min)</sub> & V<sub>CC</sub> must be stable at V<sub>CC(min)</sub> for 500 μs.
- Tested initially and after any design or proces changes that may affect these parameters.

**Thermal Resistance<sup>[7]</sup>**

Parameter	Description	Test Conditions	FBGA	TSOP II	Unit
$\theta_{JA}$	Thermal Resistance (Junction to Ambient)	Still Air, soldered on a 3 x 4.5 inch, two-layer printed circuit board	55	76	°C/W
$\theta_{JC}$	Thermal Resistance (Junction to Case)		12	11	°C/W

**AC Test Loads and Waveforms<sup>[8]</sup>**


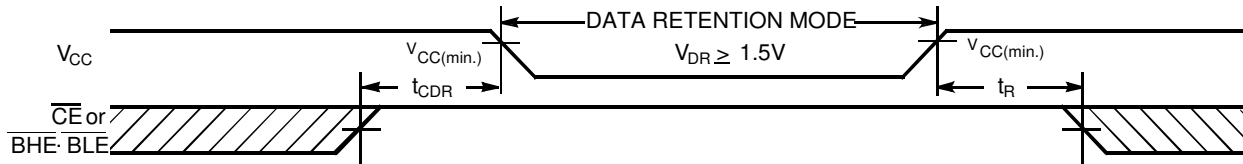
Equivalent to: THEVENIN EQUIVALENT



Parameters	2.5V (2.2V - 2.7V)	3.0V (2.7V - 3.6V)	Unit
R1	16600	1103	$\Omega$
R2	15400	1554	$\Omega$
$R_{TH}$	8000	645	$\Omega$
$V_{TH}$	1.20	1.75	V

**Data Retention Characteristics**

Parameter	Description	Conditions	Min.	Typ. <sup>[4]</sup>	Max.	Unit	
$V_{DR}$	$V_{CC}$ for Data Retention		1.5			V	
$I_{CCDR}$	Data Retention Current	$V_{CC}=1.5V, \overline{CE} \geq V_{CC} - 0.2V,$ $V_{IN} \geq V_{CC} - 0.2V$ or $V_{IN} \leq 0.2V$	L	Ind'l		4	$\mu A$
			L	Auto		10	
			LL	Ind'l		3	
$t_{CDR}^{[7]}$	Chip Deselect to Data Retention Time		0			ns	
$t_R^{[9]}$	Operation Recovery Time		200			$\mu s$	

**Data Retention Waveform<sup>[10]</sup>**

**Notes:**

8. Test condition for the 45-ns part is a load capacitance of 30 pF.
9. Full device operation requires linear  $V_{CC}$  ramp from  $V_{DR}$  to  $V_{CC(min.)} > 200 \mu s$ .
10. BHE-BLE is the AND of both BHE and BLE. Chip can be deselected by either disabling the Chip Enable signals or by disabling both.

**Switching Characteristics** (Over the Operating Range)<sup>[11]</sup>

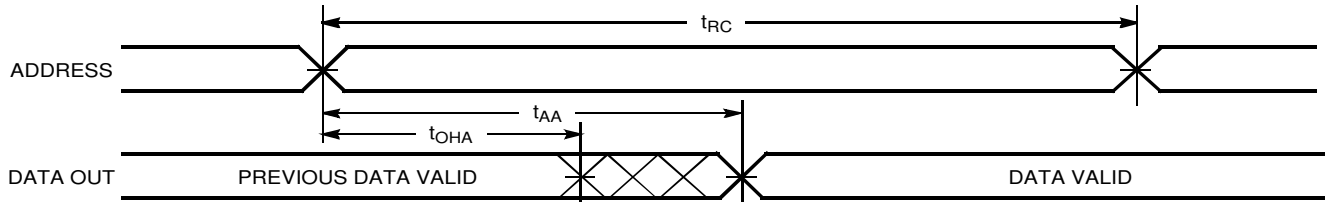
Parameter	Description	CY62127DV30-45 <sup>[8]</sup>		CY62127DV30-55		CY62127DV30-70		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
<b>Read Cycle</b>								
t <sub>RC</sub>	Read Cycle Time	45		55		70		ns
t <sub>AA</sub>	Address to Data Valid		45		55		70	ns
t <sub>OHA</sub>	Data Hold from Address Change	10		10		10		ns
t <sub>ACE</sub>	$\overline{CE}$ LOW to Data Valid		45		55		70	ns
t <sub>DOE</sub>	$\overline{OE}$ LOW to Data Valid		25		25		35	ns
t <sub>LZOE</sub>	$\overline{OE}$ LOW to Low Z <sup>[12]</sup>	5		5		5		ns
t <sub>HZOE</sub>	$\overline{OE}$ HIGH to High Z <sup>[12,14]</sup>		15		20		25	ns
t <sub>LZCE</sub>	$\overline{CE}$ LOW to Low Z <sup>[12]</sup>	10		10		10		ns
t <sub>HZCE</sub>	$\overline{CE}$ HIGH to High Z <sup>[12,14]</sup>		20		20		25	ns
t <sub>PU</sub>	$\overline{CE}$ LOW to Power-up	0		0		0		ns
t <sub>PD</sub>	$\overline{CE}$ HIGH to Power-down		45		55		70	ns
t <sub>DBE</sub>	$\overline{BLE}/\overline{BHE}$ LOW to Data Valid		45		55		70	ns
t <sub>LZBE</sub> <sup>[13]</sup>	$\overline{BLE}/\overline{BHE}$ LOW to Low Z <sup>[12]</sup>	5		5		5		ns
t <sub>HZBE</sub>	$\overline{BLE}/\overline{BHE}$ HIGH to High-Z <sup>[12,14]</sup>		15		20		25	ns
<b>Write Cycle<sup>[15]</sup></b>								
t <sub>WC</sub>	Write Cycle Time	45		55		70		ns
t <sub>SCE</sub>	$\overline{CE}$ LOW to Write End	40		40		60		ns
t <sub>AW</sub>	Address Set-up to Write End	40		40		60		ns
t <sub>HA</sub>	Address Hold from Write End	0		0		0		ns
t <sub>SA</sub>	Address Set-up to Write Start	0		0		0		ns
t <sub>PWE</sub>	$\overline{WE}$ Pulse Width	35		40		50		ns
t <sub>BW</sub>	$\overline{BLE}/\overline{BHE}$ LOW to Write End	40		40		60		ns
t <sub>SD</sub>	Data Set-up to Write End	25		25		30		ns
t <sub>HD</sub>	Data Hold from Write End	0		0		0		ns
t <sub>HZWE</sub>	$\overline{WE}$ LOW to High Z <sup>[12,14]</sup>		15		20		25	ns
t <sub>LZWE</sub>	$\overline{WE}$ HIGH to Low Z <sup>[12]</sup>	10		10		5		ns

**Notes:**

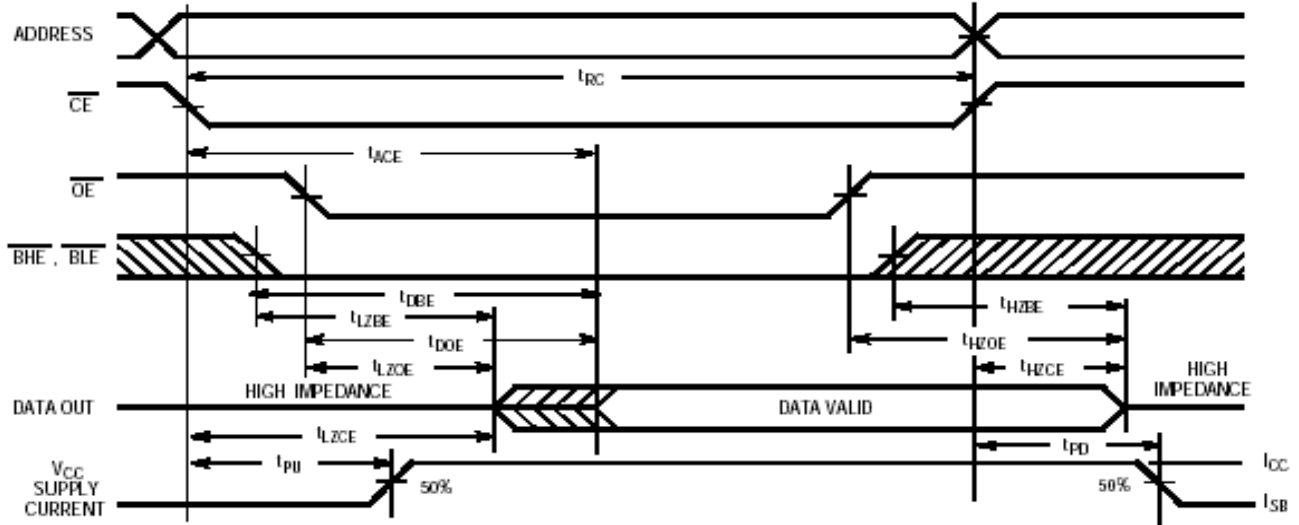
11. Test conditions assume signal transition time of 1V/ns or less, timing reference levels of  $V_{CC(typ.)}/2$ , input pulse levels of 0 to  $V_{CC(typ.)}$ , and output loading of the specified  $I_{OL}$ .
12. At any given temperature and voltage condition, t<sub>HZCE</sub> is less than t<sub>LZCE</sub>, t<sub>HZBE</sub> is less than t<sub>LZBE</sub>, t<sub>HZOE</sub> is less than t<sub>LZOE</sub>, and t<sub>HZWE</sub> is less than t<sub>LZWE</sub> for any given device.
13. If both byte enables are toggled together, this value is 10 ns.
14. t<sub>HZOE</sub>, t<sub>HZCE</sub>, t<sub>HZBE</sub>, and t<sub>HZWE</sub> 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  $\overline{WE}$ ,  $CE = V_{IL}$ ,  $\overline{BHE}$  and/or  $\overline{BLE} = V_{IL}$ . All signals must be ACTIVE to initiate a write and any of these signals can terminate a write by going INACTIVE. The data input set-up and hold timing should be referenced to the edge of the signal that terminates the write.

### Switching Waveforms

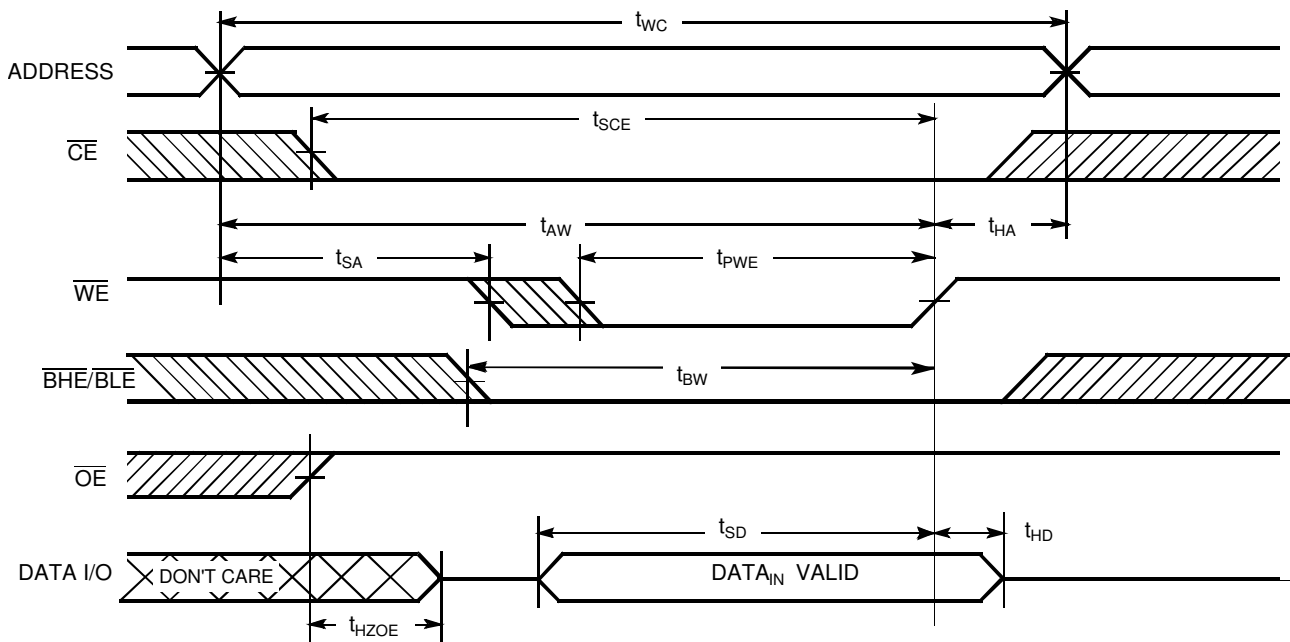
Read Cycle No. 1 (Address Transition Controlled)<sup>[16,17]</sup>



Read Cycle No. 2 (OE Controlled)<sup>[16,17,18]</sup>



Write Cycle No. 1 (WE Controlled)<sup>[14, 15, 19, 20, 21]</sup>

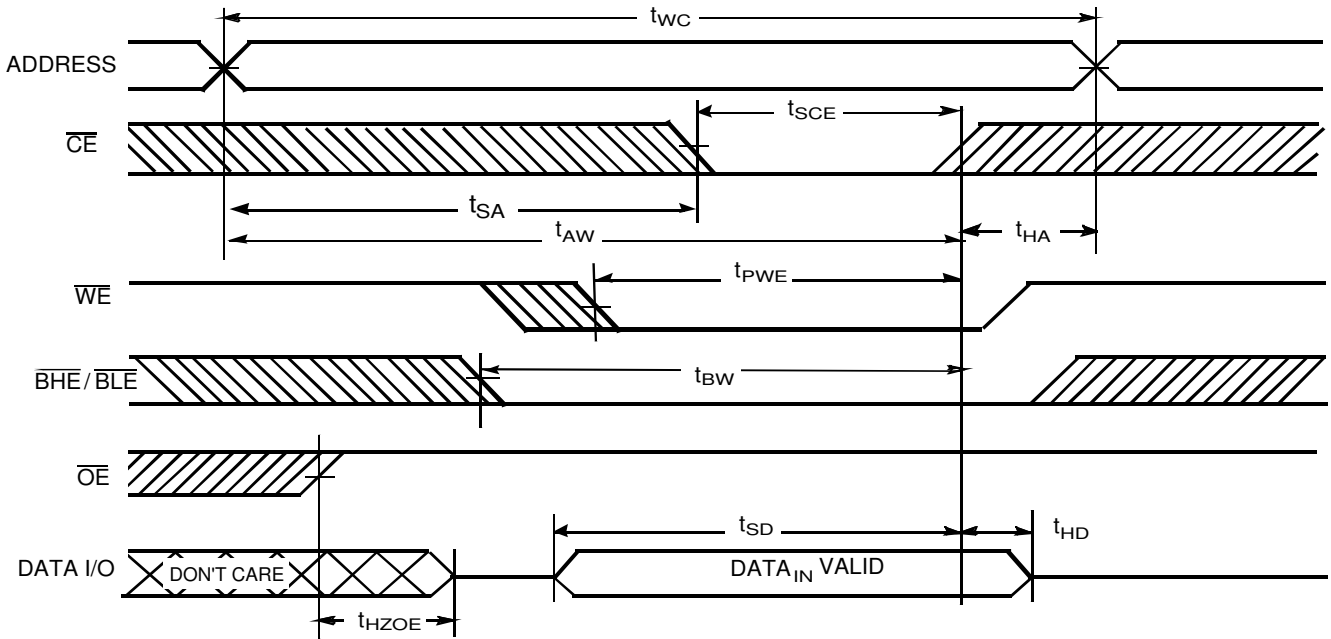


**Notes:**

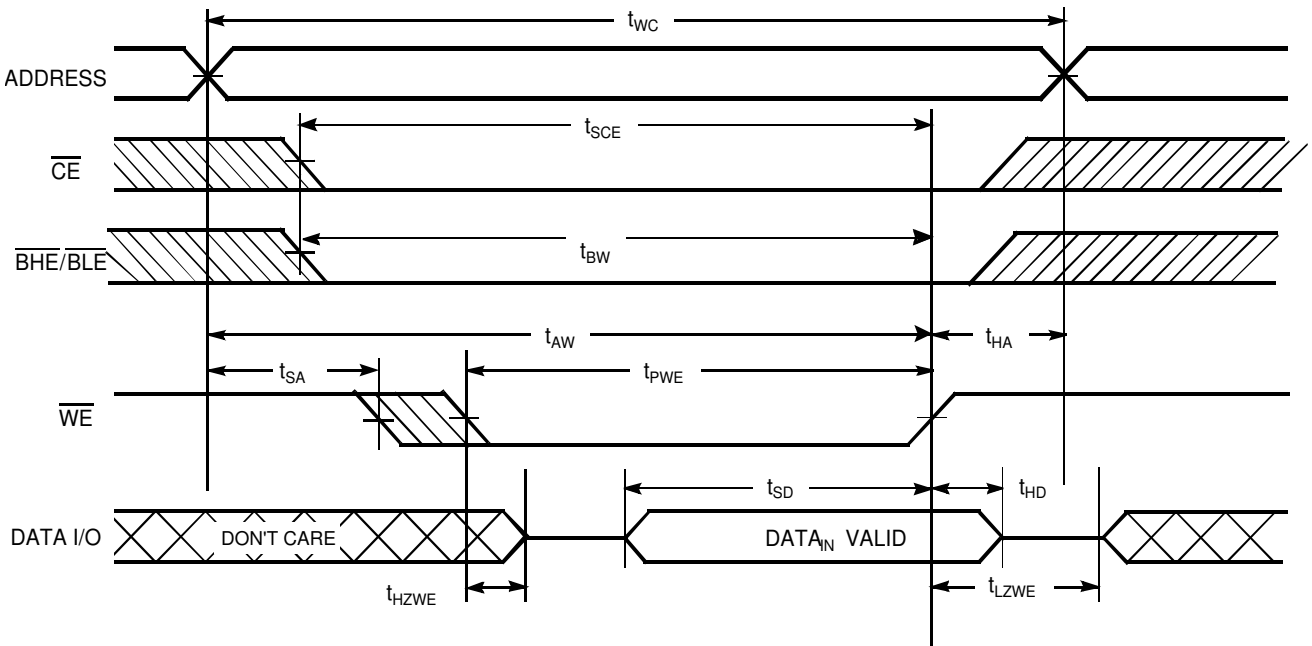
- 16. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE} = V_{IL}$ ,  $\overline{BHE}$ ,  $\overline{BLE} = V_{IL}$ .
- 17. WE is HIGH for Read cycle.
- 18. Address valid prior to or coincident with  $\overline{CE}$ ,  $\overline{BHE}$ ,  $\overline{BLE}$  transition LOW.
- 19. Data I/O is high-impedance if  $\overline{OE} = V_{IH}$ .
- 20. If  $\overline{CE}$  goes HIGH simultaneously with WE HIGH, the output remains in a high-impedance state.
- 21. During the DON'T CARE period in the DATA I/O waveform, the I/Os are in output state and input signals should not be applied.

Switching Waveforms (continued)

Write Cycle No. 2 ( $\overline{CE}$  Controlled)<sup>[14, 15, 19, 20, 21]</sup>

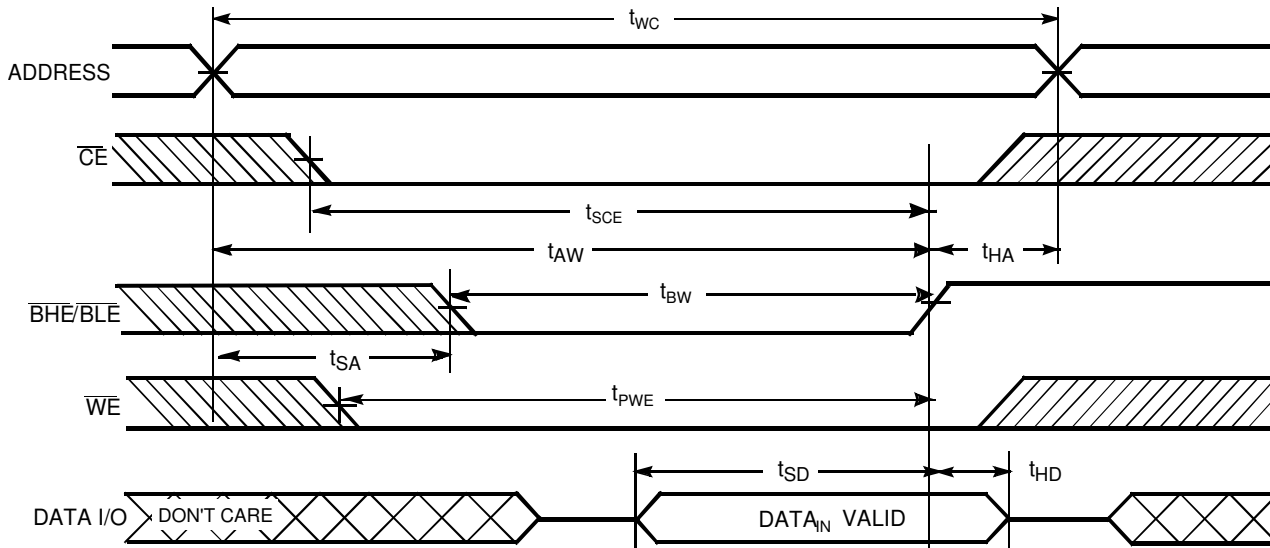


Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW)<sup>[20, 21]</sup>



**Switching Waveforms** (continued)

Write Cycle No. 4 ( $\overline{\text{BHE}}/\overline{\text{BLE}}$ -controlled,  $\overline{\text{OE}}$  LOW)<sup>[20, 21]</sup>



**Truth Table**

CE	WE	OE	BHE	BLE	I/O <sub>0</sub> -I/O <sub>7</sub>	I/O <sub>8</sub> -I/O <sub>15</sub>	Mode	Power
H	X	X	X	X	High Z	High Z	Deselect/Power-down	Standby (I <sub>SB</sub> )
X	X	X	H	H	High Z	High Z	Deselect/Power-down	Standby (I <sub>SB</sub> )
L	H	L	L	L	Data Out	Data Out	Read All bits	Active (I <sub>CC</sub> )
L	H	L	H	L	Data Out	High Z	Read Lower Byte Only	Active (I <sub>CC</sub> )
L	H	L	L	H	High Z	Data Out	Read Upper Byte Only	Active (I <sub>CC</sub> )
L	H	H	L	L	High Z	High Z	Output Disabled	Active (I <sub>CC</sub> )
L	H	H	H	L	High Z	High Z	Output Disabled	Active (I <sub>CC</sub> )
L	H	H	L	H	High Z	High Z	Output Disabled	Active (I <sub>CC</sub> )
L	L	X	L	L	Data In	Data In	Write	Active (I <sub>CC</sub> )
L	L	X	H	L	Data In	High Z	Write Lower Byte Only	Active (I <sub>CC</sub> )
L	L	X	L	H	High Z	Data In	Write Upper Byte Only	Active (I <sub>CC</sub> )



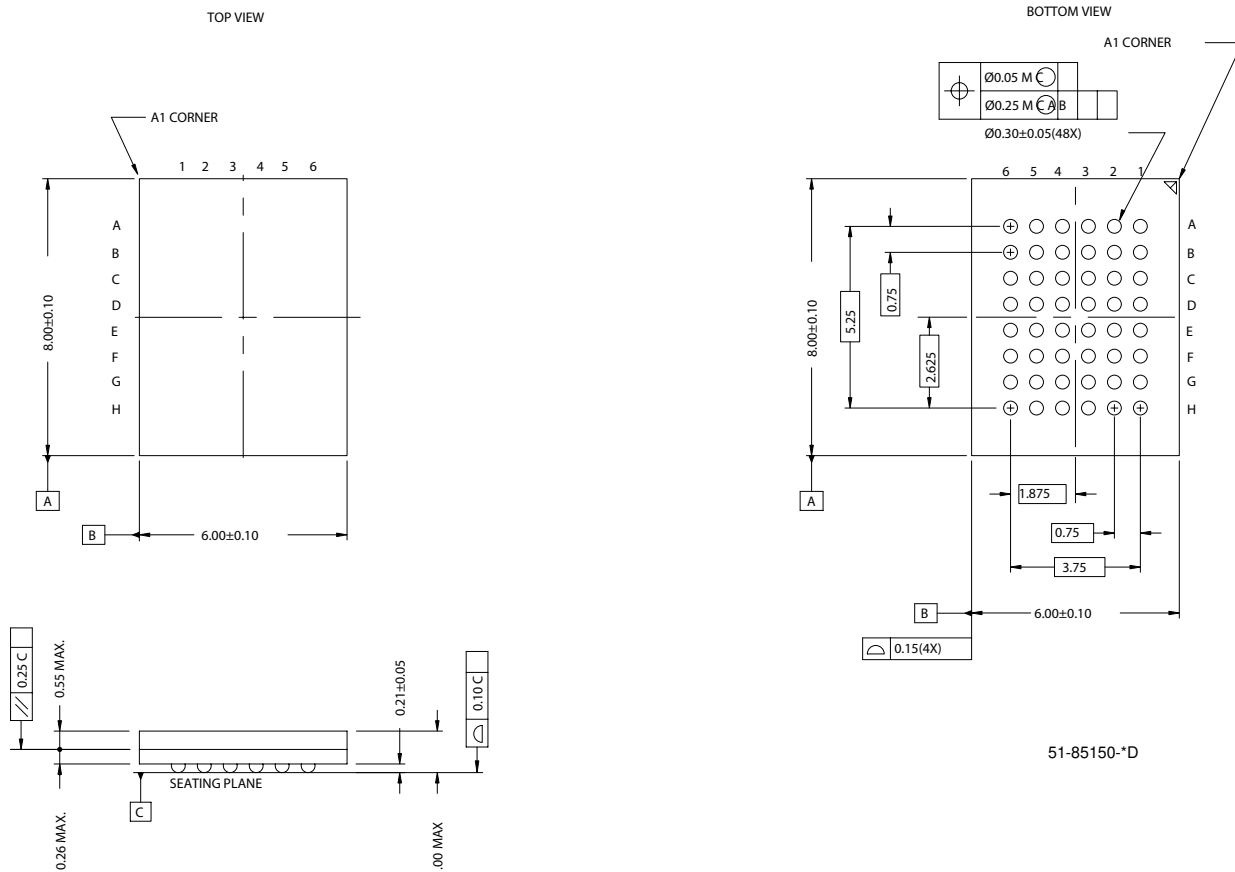
**Ordering Information**

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
45	CY62127DV30LL-45BVXI	51-85150	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm) (Pb-Free)	Industrial
	CY62127DV30LL-45ZXI	51-85087	44-lead TSOP Type II (Pb-Free)	
55	CY62127DV30LL-55BVI	51-85150	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm)	Industrial
	CY62127DV30LL-55BVXI	51-85150	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm) (Pb-Free)	
	CY62127DV30LL-55ZI	51-85087	44-lead TSOP Type II	
	CY62127DV30L-55ZXI	51-85087	44-lead TSOP Type II (Pb-Free)	
	CY62127DV30LL-55ZXI	51-85087	44-lead TSOP Type II (Pb-Free)	
	CY62127DV30L-55BVXE	51-85150	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm) (Pb-Free)	Automotive
	CY62127DV30L-55ZSXE	51-85087	44-lead TSOP Type II (Pb-Free)	
70	CY62127DV30L-70BVI	51-85150	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm)	Industrial
	CY62127DV30LL-70BVXI	51-85150	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm) (Pb-Free)	
	CY62127DV30L-70ZI	51-85087	44-lead TSOP Type II	
	CY62127DV30LL-70ZXI	51-85087	44-lead TSOP Type II (Pb-Free)	

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

**Package Diagrams**

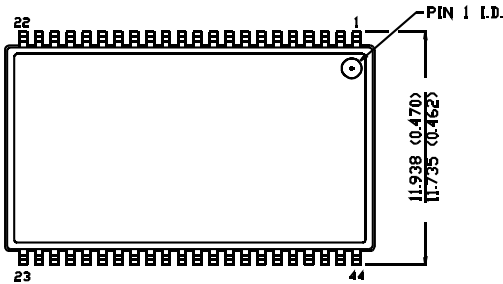
**48-ball VFBGA (6 x 8 x 1 mm) (51-85150)**



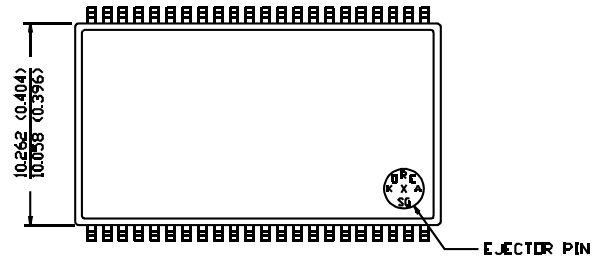
Package Diagrams (continued)

44-lead TSOP II (51-85087)

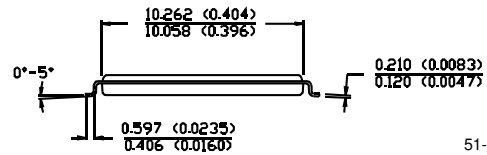
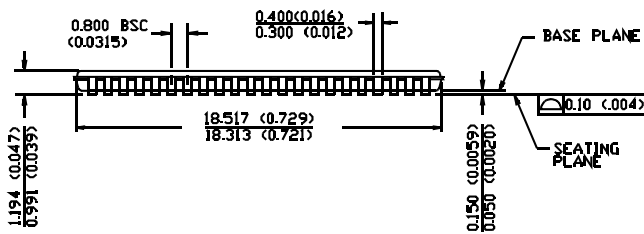
DIMENSION IN MM (INCH)  
MAX  
MIN



TOP VIEW



BOTTOM VIEW



51-85087-A

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**Document History Page**

Document Title: CY62127DV30 MoBL <sup>®</sup> 1-Mb (64K x 16) Static RAM				
Document Number: 38-05229				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	117690	08/27/02	JUI	New Data Sheet
*A	127311	06/13/03	MPR	Changed From Advanced Status to Preliminary Changed I <sub>sb2</sub> to 5 $\mu$ A (L), 4 $\mu$ A (LL) Changed I <sub>ccdr</sub> to 4 $\mu$ A (L), 3 $\mu$ A (LL) Changed C <sub>in</sub> from 6 pF to 8 pF
*B	128341	07/22/03	JUI	Changed from Preliminary to Final Add 70-ns speed, updated ordering information
*C	129000	08/29/03	CDY	Changed I <sub>cc</sub> 1 MHz typ from 0.5 mA to 0.85 mA
*D	316039	See ECN	PCI	Added 45-ns Speed Bin in AC, DC and Ordering Information tables Added Footnote # 8 on page #4 Added Lead-Free Package ordering information on page# 9 Changed 44-lead TSOP-II package name from Z44 to ZS44
*E	346982	See ECN	AJU	Added 56-pin QFN package
*F	369955	See ECN	SYT	Added Temperature Ranges in the Features Section on Page # 1 Added Automotive Specs for I <sub>IX</sub> , I <sub>OZ</sub> , I <sub>SB1</sub> and I <sub>SB2</sub> in the Product portfolio on Page #2 and the DC Electrical Characteristics table on Page# 4 Added Automotive spec for I <sub>CCDR</sub> in the Data Retention Characteristics table on Page# 5 Added Pb-Free Automotive parts for 55 ns Speed bin
*G	457685	See ECN	NXR	Removed 56-pin QFN package from product offering Updated ordering Information Table
*H	470383	See ECN	NXR	Changed pin #23 of TSOP II from NC to DNU and updated footnote #2