CY62127DV30
MoBL®

1 Mb (64K x 16) Static RAM

Features

- **Very high speed: 55 and 70 ns**
- **Wide voltage range: 2.2V to 3.6V**
- **Pin compatible with CY62127BV**
- **Ultra-low active power**
  - **Typical active current: 0.85 mA @ f = 1 MHz**
  - **Typical active current: 5 mA @ f = f_{MAX}**
- **Ultra-low standby power**
- **Easy memory expansion with $\overline{CE}$ and $\overline{OE}$ features**
- **Automatic power-down when deselected**
- **Packages offered in a 48-ball FBGA and a 44-lead TSOP Type II**

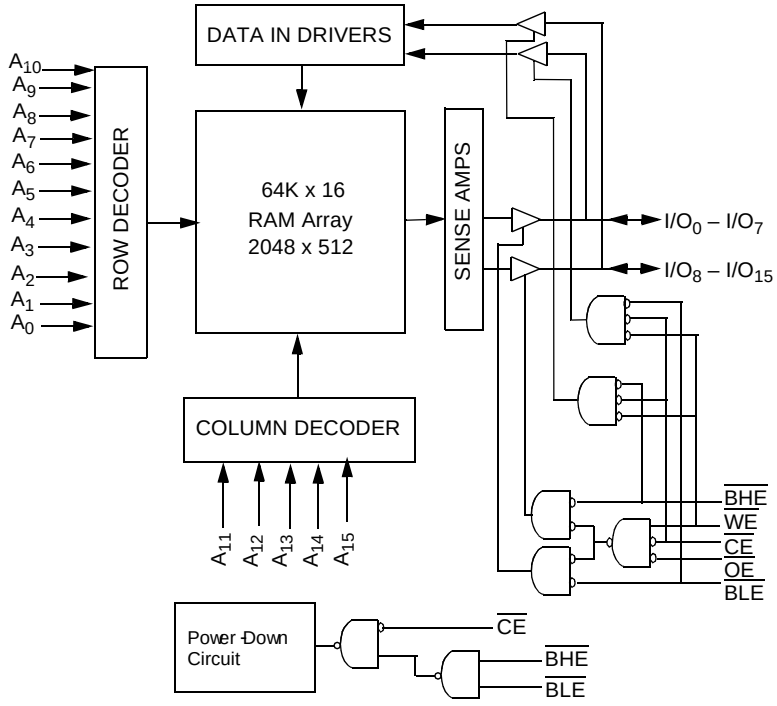
Functional Description[1]

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 Chip Enable ($\overline{CE}$) HIGH or both $\overline{BHE}$ and $\overline{BLE}$ are HIGH. The input/output pins (I/O_0 through I/O_{15}) are placed in a high-impedance state when: deselected Chip Enable ($\overline{CE}$) HIGH, outputs are disabled ($\overline{OE}$ HIGH), both Byte High Enable and Byte Low Enable are disabled ($\overline{BHE}$, $\overline{BLE}$ HIGH) or during a write operation (Chip Enable ($\overline{CE}$) LOW and Write Enable ($\overline{WE}$) LOW).

Writing to the device is accomplished by taking Chip Enable ($\overline{CE}$) LOW 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/Oh A_{15}). If Byte High Enable ($\overline{BHE}$) is LOW, then data from I/O pins (I/O_8 through I/O_{15}) is written into the location specified on the address pins (A_0 through A_{15}).

Reading from the device is accomplished by taking Chip Enable ($\overline{CE}$) LOW and Output Enable ($\overline{OE}$) LOW while forcing the Write Enable ($\overline{WE}$) HIGH. If Byte Low Enable ($\overline{BLE}$) is LOW, then O_7. If Byte High Enable ($\overline{BHE}$) is LOW, then data from memory will appear on I/O_8 to I/O_{15}.

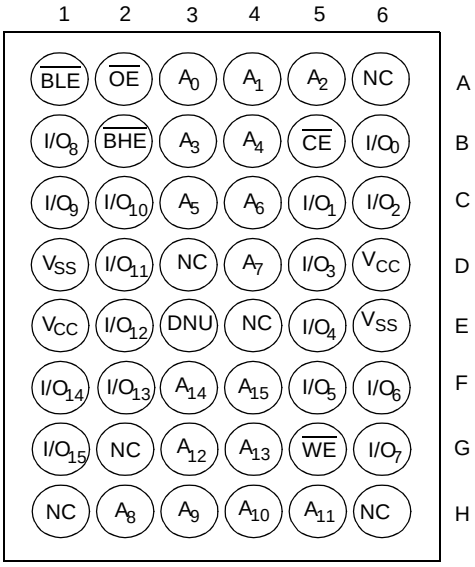
Logic Block Diagram



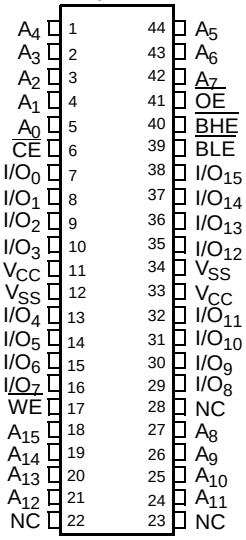
Note:
1. For best-practice recommendations, please refer to the Cypress application note "System Design Guidelines" on http://www.cypress.com.

Pin Configuration[2,3]

FBGA (Top View)



TSOP II (Forward)
Top View



Notes:

2. NC pins are not connected to the die.
3. E3 (DNU) can be left as NC or Vss to ensure proper operation. (Expansion Pins on FBGA Package: E4 - 2M, D3 - 4M, H1 - 8M, G2 - 16M, H6 - 32M).

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[4] ..... –0.3V to V_{CC} + 0.3V

DC Input Voltage[4] ..... –0.3V to V_{CC} + 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_A)	V_{CC}[5]
Industrial	–40°C to +85°C	2.2V to 3.6V

Product Portfolio

Product	V_{CC} Range (V)			Speed (ns)	Power Dissipation					
					Operating, Icc (mA)				Standby, I_{SB2} (µA)	
					f = 1 MHz		f = f_{MAX}			
	Min.	Typ.	Max.		Typ.[6]	Max.	Typ.[6]	Max.	Typ.[6]	Max.
CY62127DV30L	2.2	3.0	3.6	55/70	0.85	1.5	5	10	1.5	5
CY62127DV30LL				55/70	0.85	1.5	5	10	1.5	4

DC Electrical Characteristics (Over the Operating Range)

Parameter	Description	Test Conditions			CY62127DV30-55/70			Unit
					Min.	Typ.[6]	Max.	
V_{OH}	Output HIGH Voltage	2.2 ≤ V_{CC} ≤ 2.7	I_{OH} = –0.1 mA		2.0			V
		2.7 ≤ V_{CC} ≤ 3.6	I_{OH} = –1.0 mA		2.4			
V_{OL}	Output LOW Voltage	2.2 ≤ V_{CC} ≤ 2.7	I_{OL} = 0.1 mA				0.4	V
		2.7 ≤ V_{CC} ≤ 3.6	I_{OL} = 2.1 mA				0.4	
V_{IH}	Input HIGH Voltage	2.2 ≤ V_{CC} ≤ 2.7			1.8		V_{CC} + 0.3	V
		2.7 ≤ V_{CC} ≤ 3.6			2.2		V_{CC} + 0.3	
V_{IL}	Input LOW Voltage	2.2 ≤ V_{CC} ≤ 2.7			–0.3		0.6	V
		2.7 ≤ V_{CC} ≤ 3.6			–0.3		0.8	
I_{IX}	Input Leakage Current	GND ≤ V_I ≤ V_{CC}			–1		+1	µA
I_{OZ}	Output Leakage Current	GND ≤ V_O ≤ V_{CC}, Output Disabled			–1		+1	µA
I_{CC}	V_{CC} Operating Supply Current	f = f_{MAX} = $1/t_{RC}$	Vcc = 3.6V, I_{OUT} = 0 mA, CMOS level			5	10	mA
		f = 1 MHz				0.85	1.5	
I_{SB1}	Automatic CE Power-down Current – CMOS Inputs	$\overline{CE}$ ≥ V_{CC} – 0.2V, V_{IN} ≥ V_{CC} – 0.2V, V_{IN} ≤ 0.2V, f = f_{MAX} (Address and Data Only), f = 0 (OE, WE, BHE and BLE)		L		1.5	5	µA
				LL		1.5	4	
I_{SB2}	Automatic CE Power-down Current – CMOS Inputs	$\overline{CE}$ ≥ V_{CC} – 0.2V, V_{IN} ≥ V_{CC} – 0.2V or V_{IN} ≤ 0.2V, f = 0, V_{CC} = 3.6V		L		1.5	5	µA
				LL		1.5	4	

Notes:

4. $V_{IL(min.)}$ = –2.0V for pulse durations less than 20 ns., $V_{IH(max.)}$ = Vcc+0.75V for pulse durations less than 20 ns.
5. Full device Operation Requires linear Ramp of Vcc from 0V to Vcc(min) & Vcc must be stable at Vcc(min) for 500µ s .
6. 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 = 25C.

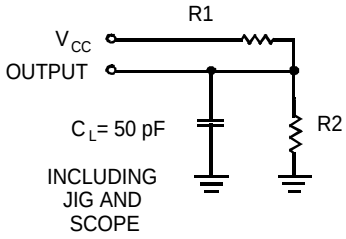
Capacitance [7]

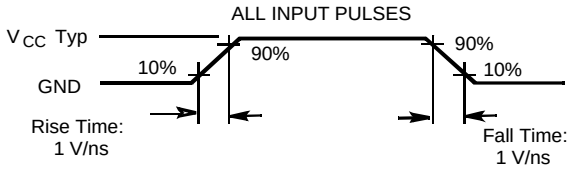
Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	T_A = 25°C, f = 1 MHz V_{CC} = $V_{CC(typ)}$	8	pF
C_{OUT}	Output Capacitance		8	pF

Thermal Resistance

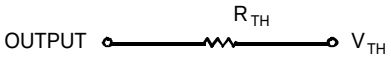
Parameter	Description	Test Conditions	FBGA	TSOP II	Unit
θ_{JA}	Thermal Resistance (Junction to Ambient)[7]	Still Air, soldered on a 3 x 4.5 inch, two-layer printed circuit board	55	76	°C/W
θ_{JC}	Thermal Resistance (Junction to Case)[7]		12	11	°C/W

AC Test Loads and Waveforms





Equivalent to: THÉVENIN EQUIVALENT

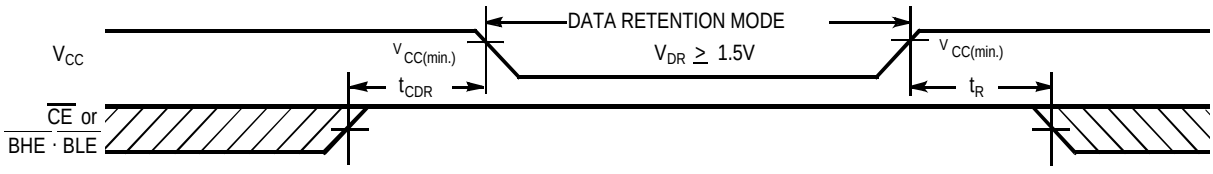


Parameters	2.5V (2.2 – 2.7V)	3.0V (2.7 – 3.6V)	Unit
R1	16600	1103	Ω
R2	15400	1554	Ω
R_{TH}	8000	645	Ω
V_{TH}	1.2	1.75	V

Data Retention Characteristics

Parameter	Description	Conditions		Min.	Typ.[6]	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			4	µA
			LL			3	
t_{CDR}[7]	Chip Deselect to Data Retention Time			0			ns
t_R[8]	Operation Recovery Time			200			µs

Data Retention Waveform[9]



Notes:

7. Tested initially and after any design or proces changes that may affect these parameters.
8. Full device operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(min.)}$ > 200 us.
9. $\overline{BHE}$·$\overline{BLE}$ is the AND of both $\overline{BHE}$ and $\overline{BLE}$. Chip can be deselected by either disabling the Chip Enable signals or by disabling both.

Switching Characteristics (Over the Operating Range)[10]

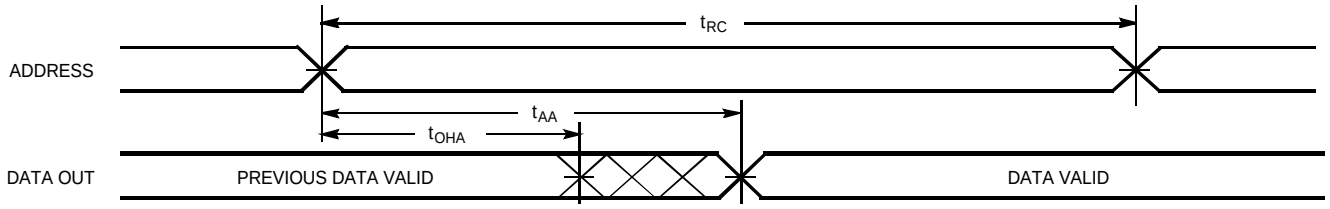
Parameter	Description	CY62127DV30-55		CY62127DV30-70		Unit
		Min.	Max.	Min.	Max.	
Read Cycle						
t_{RC}	Read Cycle Time	55		70		ns
t_{AA}	Address to Data Valid		55		70	ns
t_{OHA}	Data Hold from Address Change	10		10		ns
t_{ACE}	$\overline{CE}$ LOW to Data Valid		55		70	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		25		35	ns
t_{LZOE}	$\overline{OE}$ LOW to Low Z[11]	5		5		ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z[11,13]		20		25	ns
t_{LZCE}	$\overline{CE}$ LOW to Low Z[11]	10		10		ns
t_{HZCE}	$\overline{CE}$ HIGH to High Z[11,13]		20		25	ns
t_{PU}	$\overline{CE}$ LOW to Power-up	0		0		ns
t_{PD}	$\overline{CE}$ HIGH to Power-down		55		70	ns
t_{DBE}	$\overline{BLE}$/$\overline{BHE}$ LOW to Data Valid		55		70	ns
t_{LZBE}[12]	$\overline{BLE}$/$\overline{BHE}$ LOW to Low Z[11]	5		5		ns
t_{HZBE}	$\overline{BLE}$/$\overline{BHE}$ HIGH to High-Z[11,13]		20		25	ns
Write Cycle[14]						
t_{WC}	Write Cycle Time	55		70		ns
t_{SCE}	$\overline{CE}$ LOW to Write End	40		60		ns
t_{AW}	Address Set-up to Write End	40		60		ns
t_{HA}	Address Hold from Write End	0		0		ns
t_{SA}	Address Set-up to Write Start	0		0		ns
t_{PWE}	$\overline{WE}$ Pulse Width	40		50		ns
t_{BW}	$\overline{BLE}$/$\overline{BHE}$ LOW to Write End	40		60		ns
t_{SD}	Data Set-up to Write End	25		30		ns
t_{HD}	Data Hold from Write End	0		0		ns
t_{HZWE}	$\overline{WE}$ LOW to High Z[11,13]		20		25	ns
t_{LZWE}	$\overline{WE}$ HIGH to Low Z[11]	10		5		ns

Notes:

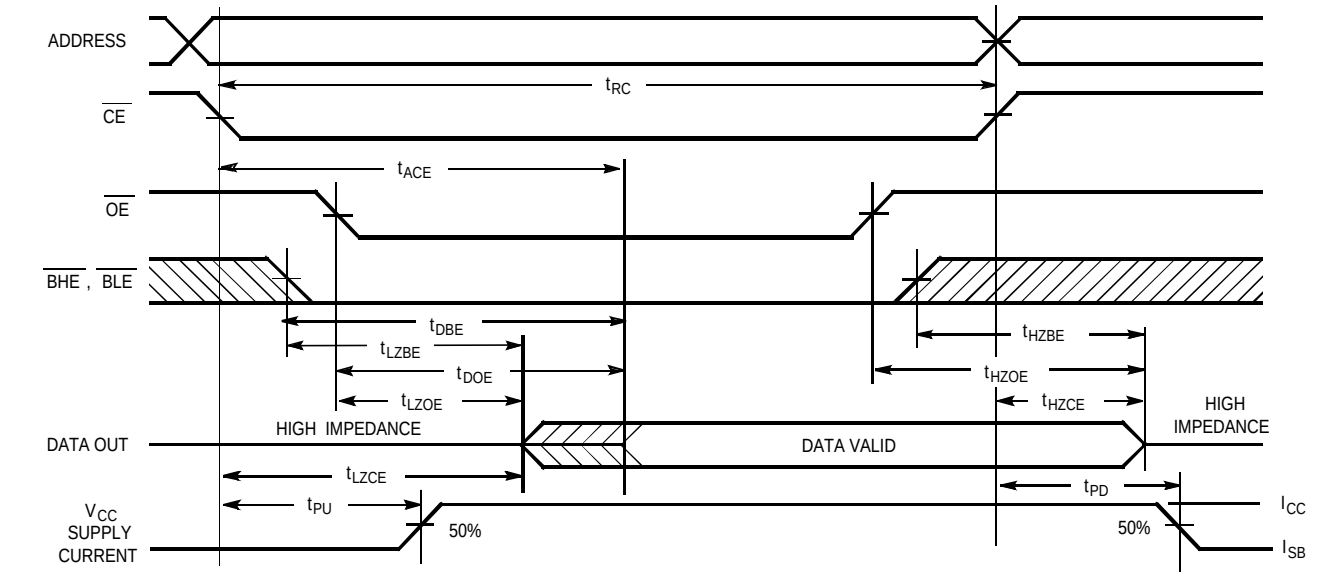
10. Test conditions assume signal transition time of 1V/ns or less, timing reference levels of $V_{CC(typ.)}/2$, input pulse levels of 0 to $V_{CC(typ.)}$, and output loading of the specified I_{OL}.
11. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, t_{HZBE} is less than t_{LZBE}, t_{HZOE} is less than t.
12. If both byte enables are toggled together, this value is 10 ns.
13. t_{HZOE}, t_{HZCE}, t_{HZBE}, and t_{HZWE} transitions are measured when the outputs enter a high-impedance state.
14. The internal Write time of the memory is defined by the overlap of $\overline{WE}$, $\overline{CE}$ = V_{IL}, $\overline{BHE}$ and/or $\overline{BLE}$ = V_{IL}. All signal.

Switching Waveforms

Read Cycle No. 1 (Address Transition Controlled)[15,16]



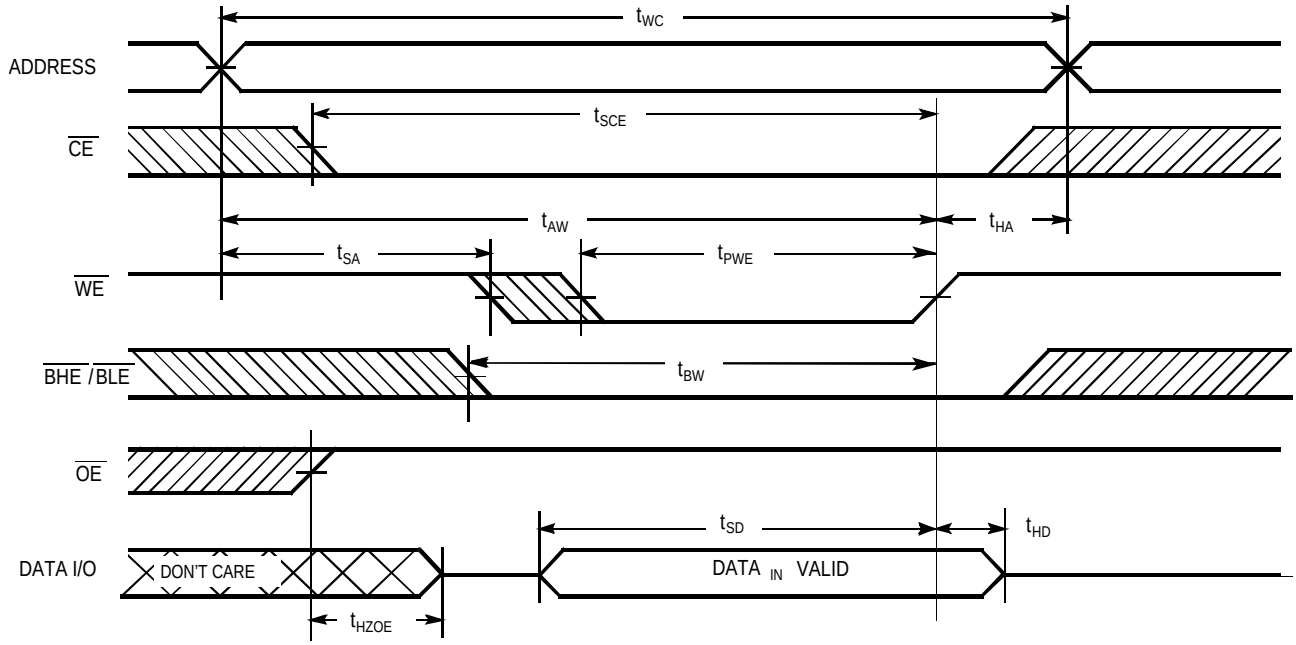
Read Cycle No. 2 ($\overline{OE}$ Controlled)[15,16,17]



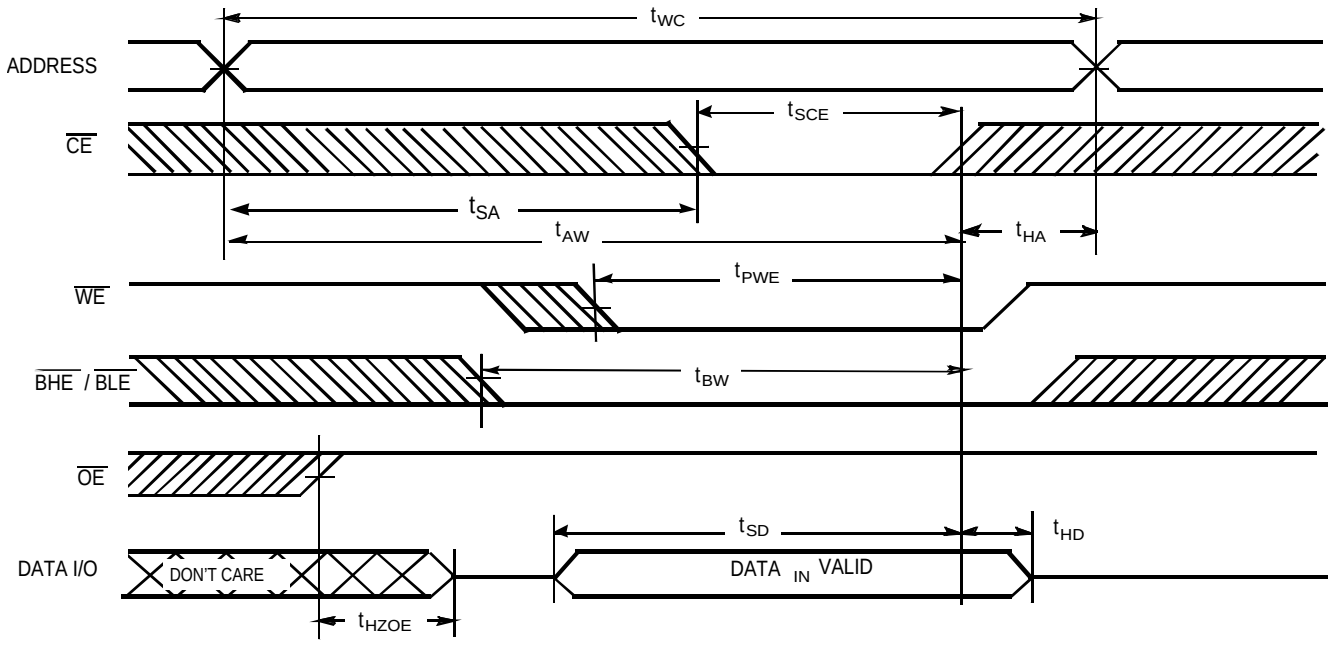
Notes:
15. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}, $\overline{BHE}$, $\overline{BLE}$ = V_{IL}.
16. $\overline{WE}$ is HIGH for Read cycle.
17. Address valid prior to or coincident with $\overline{CE}$, $\overline{BHE}$, $\overline{BLE}$ transition LOW.

Switching Waveforms (continued)

Write Cycle No. 1 ($\overline{WE}$ Controlled) [13,14, 18, 19, 20]



Write Cycle No. 2 ($\overline{CE}$ Controlled) [13,14, 18, 19, 20]

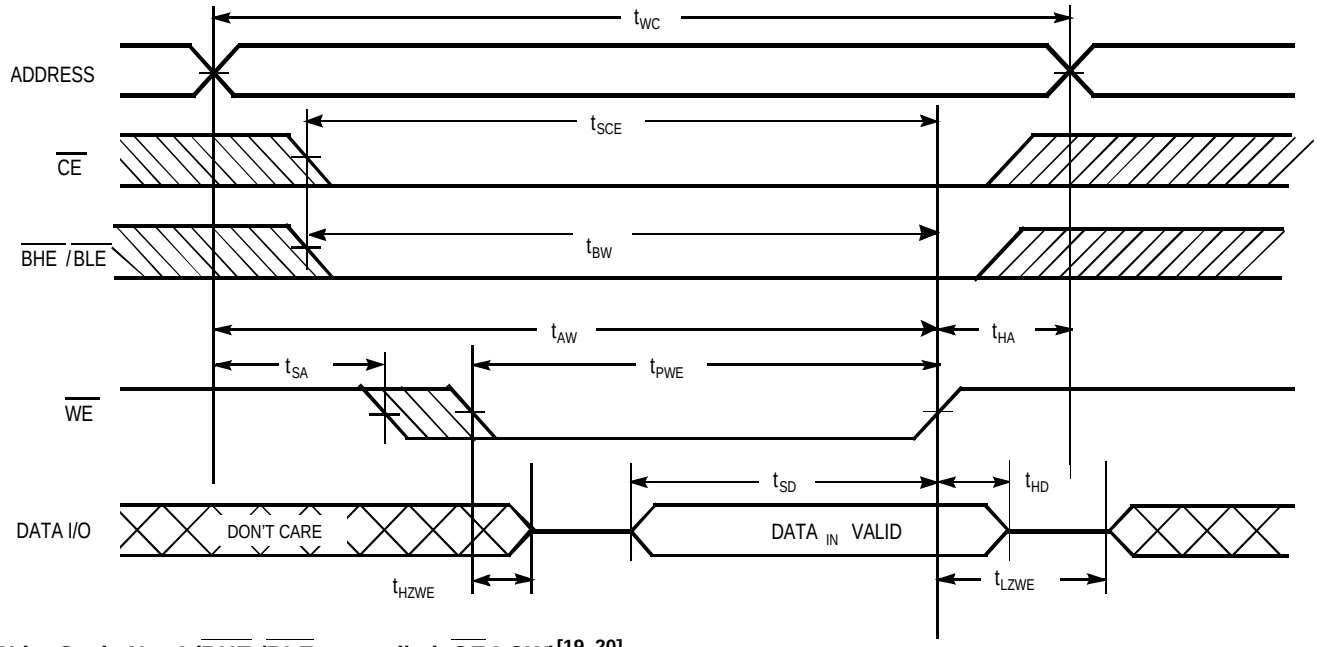


Notes:

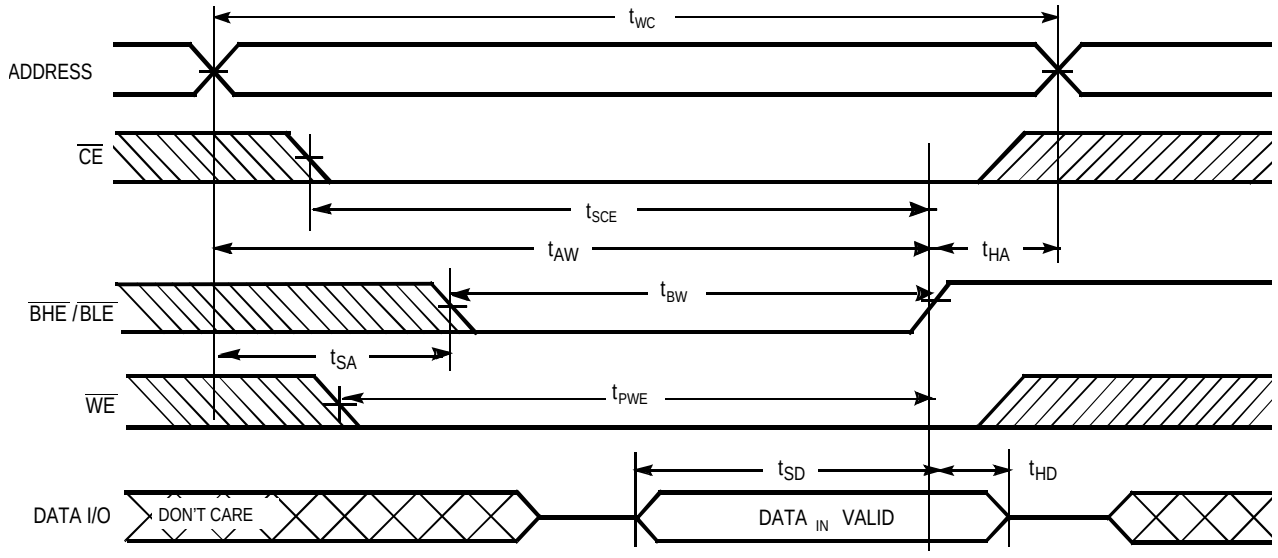
18. Data I/O is high-impedance if $\overline{OE}$ = V_{IH}.
19. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.
20. During the DON'T CARE period in the DATA I/O waveform, the I/Os are in output state and input signals should not be applied.

Switching Waveforms (continued)

Write Cycle No. 3 (WE Controlled, OE LOW)[19, 20]



Write Cycle No. 4 (BHE-/BLE-controlled, OE LOW)[19, 20]



Truth Table

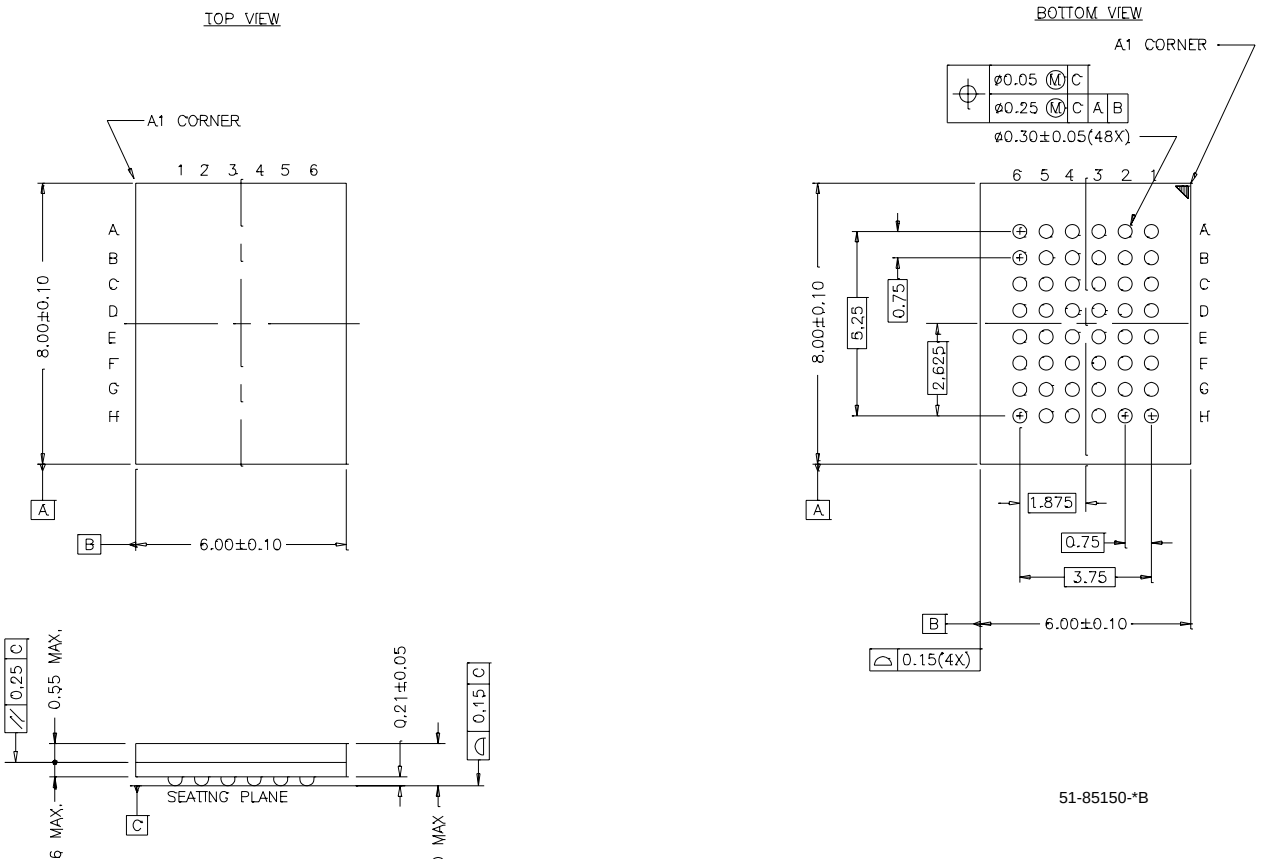
$\overline{CE}$	$\overline{WE}$	$\overline{OE}$	$\overline{BHE}$	$\overline{BLE}$	I/O_0–I/O_7	I/O_8–I/O_{15}	Mode	Power
H	X	X	X	X	High Z	High Z	Deselect/Power-down	Standby (I_{SB})
X	X	X	H	H	High Z	High Z	Deselect/Power-down	Standby (I_{SB})
L	H	L	L	L	Data Out	Data Out	Read All bits	Active (I_{CC})
L	H	L	H	L	Data Out	High Z	Read Lower Byte Only	Active (I_{CC})
L	H	L	L	H	High Z	Data Out	Read Upper Byte Only	Active (I_{CC})
L	H	H	L	L	High Z	High Z	Output Disabled	Active (I_{CC})
L	H	H	H	L	High Z	High Z	Output Disabled	Active (I_{CC})
L	H	H	L	H	High Z	High Z	Output Disabled	Active (I_{CC})
L	L	X	L	L	Data In	Data In	Write	Active (I_{CC})
L	L	X	H	L	Data In	High Z	Write Lower Byte Only	Active (I_{CC})
L	L	X	L	H	High Z	Data In	Write Upper Byte Only	Active (I_{CC})

Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
55	CY62127DV30L-55BVI	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm)	Industrial
	CY62127DV30LL-55BVI	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm)	
	CY62127DV30L-55ZI	Z44	44-lead TSOP Type II	
	CY62127DV30LL-55ZI	Z44	44-lead TSOP Type II	
70	CY62127DV30L-70BVI	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm)	Industrial
	CY62127DV30LL-70BVI	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm)	
	CY62127DV30L-70ZI	Z44	44-lead TSOP Type II	
	CY62127DV30LL-70ZI	Z44	44-lead TSOP Type II	

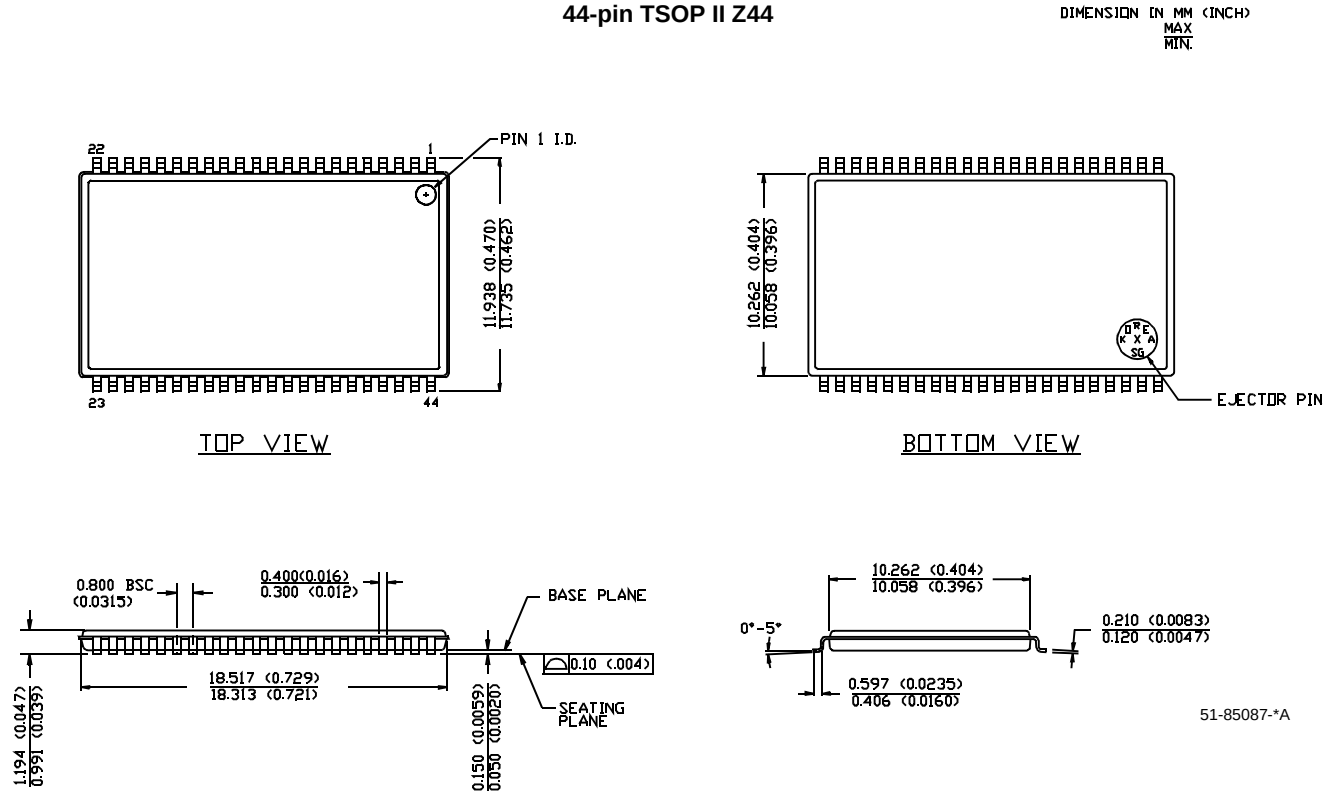
Package Diagrams

48-Lead VFBGA (6 x 8 x 1 mm) BV48A



Package Diagrams

44-pin TSOP II Z44



Document History Page

Document Title: CY62127DV30 MoBL®® 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 Isb2 to 5 uA (L), 4 uA (LL) Changed Iccdr to 4 uA (L), 3 uA (LL) Changed Cin 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 Icc 1 MHz typ from 0.5 mA to 0.85 mA