

4-Mbit (256K x 16) Static RAM

Features

- **Very high speed: 45 ns**
- **Wide voltage range: 2.20V–3.60V**
- **Pin-compatible with CY62147CV25, CY62147CV30, and CY62147CV33**
- **Ultra-low active power**
 - Typical active current: 1.5 mA @ $f = 1 \text{ MHz}$
 - Typical active current: 8 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**
- **CMOS for optimum speed/power**
- **Packages offered 48-ball BGA and 44-pin TSOPII**
- **Also available in Lead-Free packages**
- **Byte power-down feature**

Functional Description^[1]

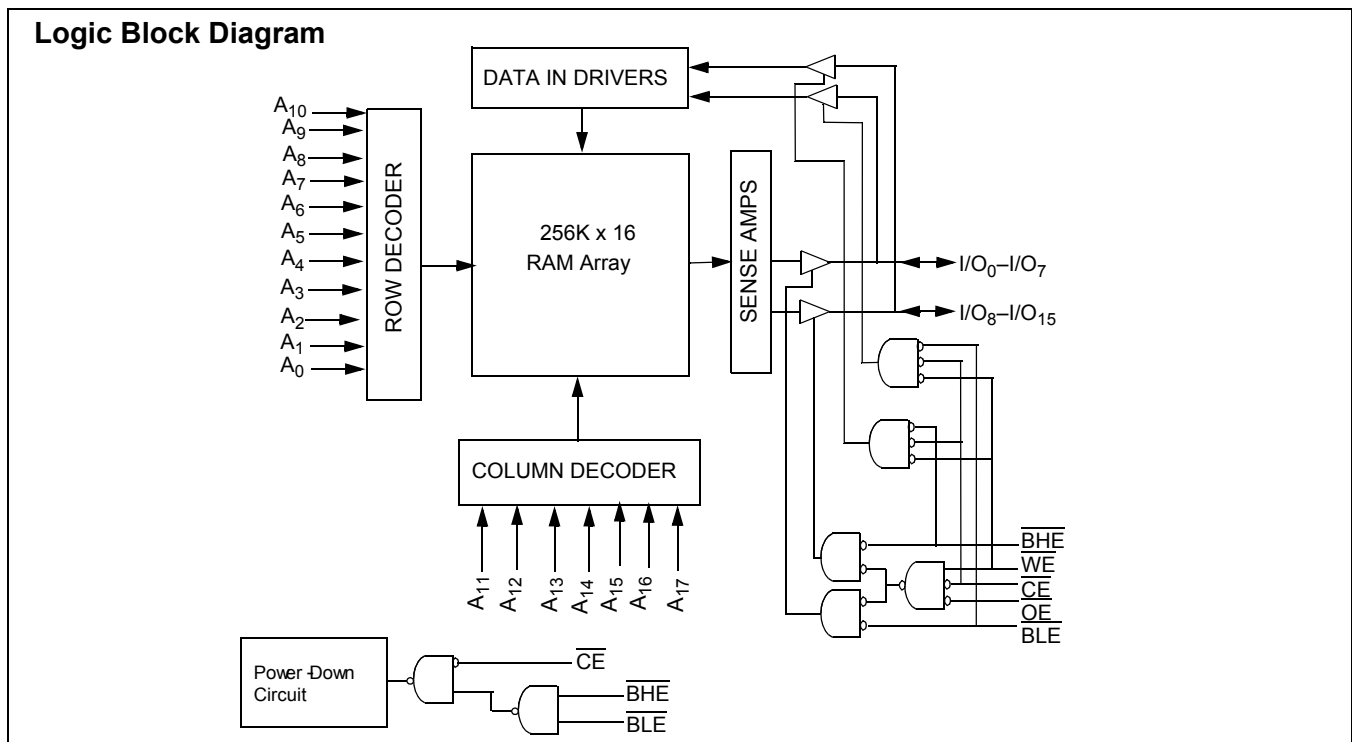
The CY62147DV30 is a high-performance CMOS static RAM organized as 256K words by 16 bits. This device features advanced circuit design to provide ultra-low active current. This is ideal for providing More Battery Life™ (MoBL®) in portable applications such as cellular telephones. The device also has

an automatic power-down feature that significantly reduces power consumption. The device can also be put into standby mode reducing power consumption by more than 99% when deselected ($\overline{\text{CE}}$ HIGH or both $\overline{\text{BLE}}$ and $\overline{\text{BHE}}$ are HIGH). The input/output pins (I/O_0 through 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 (I/O_0 through I/O_7), is written into the location specified on the address pins (A_0 through A_{17}). If Byte High Enable ($\overline{\text{BHE}}$) 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_{17}).

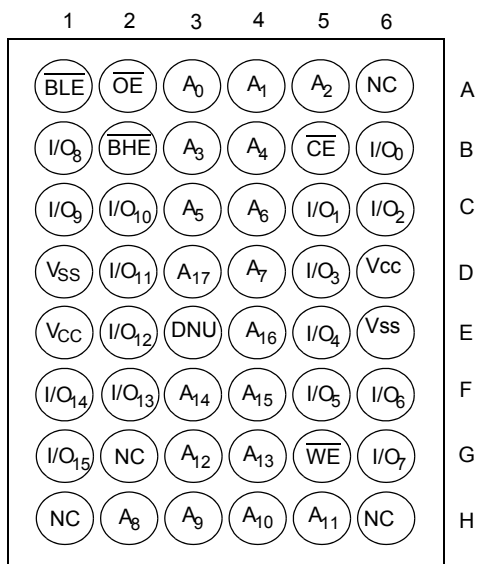
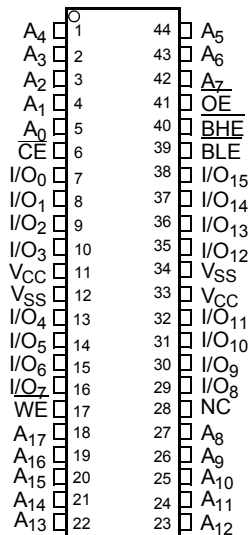
Reading from the device is accomplished by taking Chip Enable ($\overline{\text{CE}}$) and Output Enable ($\overline{\text{OE}}$) LOW while forcing the Write Enable ($\overline{\text{WE}}$) HIGH. If Byte Low Enable ($\overline{\text{BLE}}$) is LOW, then data from the memory location specified by the address pins will appear on I/O_0 to I/O_7 . If Byte High Enable ($\overline{\text{BHE}}$) is LOW, then data from memory will appear on I/O_8 to I/O_{15} . See the truth table at the back of this data sheet for a complete description of read and write modes.

The CY62147DV30 is available in a 48-ball VFBGA, 44 Pin TSOPII packages.



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, 4]
VFBGA (Top View)

44 TSOP II (Top View)

Product Portfolio

Product	V _{CC} Range (V)			Speed (ns)	Power Dissipation					
					Operating I _{CC} (mA)				Standby I _{SB2} (μA)	
					f = 1MHz		f = f _{max}			
	Min.	Typ. ^[5]	Max.		Typ. ^[5]	Max.	Typ. ^[5]	Max.	Typ. ^[5]	Max.
CY62147DV30L	2.20V	3.0	3.60	45	1.5	3	10	20	2	12
CY62147DV30LL										8
CY62147DV30L	2.20V	3.0	3.60	55	1.5	3	8	15	2	12
CY62147DV30LL										8
CY62147DV30L	2.20V	3.0	3.60	70	1.5	3	8	15	2	12
CY62147DV30LL										8

Notes:

- NC pins are not internally connected on the die.
- DNU pins have to be left floating or tied to V_{SS} to ensure proper application.
- Pins H1, G2, and H6 in the BGA package are address expansion pins for 8 Mb, 16 Mb, and 32 Mb, respectively.
- 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.

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 + $V_{CC(MAX)}$ + 0.3V

DC Voltage Applied to Outputs in High-Z State^[6,7] -0.3V to $V_{CC(MAX)}$ + 0.3V

DC Input Voltage^[6,7] -0.3V to $V_{CC(MAX)}$ + 0.3V

Output Current into Outputs (LOW) 20 mA

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

Latch-up Current >200 mA

Device	Range	Ambient Temperature (T_A)	V_{CC} ^[8]
CY62147DV30L	Industrial	-40°C to +85°C	2.20V to 3.60V
CY62147DV30LL			

Electrical Characteristics (Over the Operating Range)

Parameter	Description	Test Conditions	CY62147DV30-45			CY62147DV30-55			CY62147DV30-70			Unit
			Min.	Typ. ^[5]	Max.	Min.	Typ. ^[5]	Max.	Min.	Typ. ^[5]	Max.	
V_{OH}	Output HIGH Voltage	$I_{OH} = -0.1 \text{ mA}$, $V_{CC} = 2.20\text{V}$	2.0			2.0			2.0			V
		$I_{OH} = -1.0 \text{ mA}$, $V_{CC} = 2.70\text{V}$	2.4			2.4			2.4			V
V_{OL}	Output LOW Voltage	$I_{OL} = 0.1 \text{ mA}$, $V_{CC} = 2.20\text{V}$			0.4			0.4			0.4	V
		$I_{OL} = 2.1 \text{ mA}$, $V_{CC} = 2.70\text{V}$			0.4			0.4			0.4	V
V_{IH}	Input HIGH Voltage	$V_{CC} = 2.2\text{V to } 2.7\text{V}$	1.8		$V_{CC} + 0.3\text{V}$	1.8		$V_{CC} + 0.3\text{V}$	1.8		$V_{CC} + 0.3\text{V}$	V
		$V_{CC} = 2.7\text{V to } 3.6\text{V}$	2.2		$V_{CC} + 0.3\text{V}$	2.2		$V_{CC} + 0.3\text{V}$	2.2		$V_{CC} + 0.3\text{V}$	V
V_{IL}	Input LOW Voltage	$V_{CC} = 2.2\text{V to } 2.7\text{V}$	-0.3		0.6	-0.3		0.6	-0.3		0.6	V
		$V_{CC} = 2.7\text{V to } 3.6\text{V}$	-0.3		0.8	-0.3		0.8	-0.3		0.8	V
I_{IX}	Input Leakage Current	$GND \leq V_I \leq V_{CC}$	-1		+1	-1		+1	-1		+1	μA
I_{OZ}	Output Leakage Current	$GND \leq V_O \leq V_{CC}$, Output Disabled	-1		+1	-1		+1	-1		+1	μA
I_{CC}	V_{CC} Operating Supply Current	$f = f_{MAX} = 1/t_{RC}$, $V_{CC} = V_{CCmax}$, $I_{OUT} = 0 \text{ mA}$, CMOS levels		10	20		8	15		8	15	mA
		$f = 1 \text{ MHz}$		1.5	3		1.5	3		1.5	3	mA
I_{SB1}	Automatic CE Power-Down Current — CMOS Inputs	$CE \geq V_{CC} - 0.2\text{V}$, $V_{IN} \geq V_{CC} - 0.2\text{V}$, $V_{IN} \leq 0.2\text{V}$, $f = f_{MAX}$ (Address and Data Only), $f = 0$ (OE, WE, BHE and BLE), $V_{CC} = 3.60\text{V}$	L	2	12		2	12		2	12	μA
			LL		8			8			8	
I_{SB2}	Automatic CE Power-Down Current — CMOS Inputs	$CE \geq V_{CC} - 0.2\text{V}$, $V_{IN} \geq V_{CC} - 0.2\text{V}$ or $V_{IN} \leq 0.2\text{V}$, $f = 0$, $V_{CC} = 3.60\text{V}$	L	2	12		2	12		2	12	μA
			LL		8			8			8	

Notes:

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

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

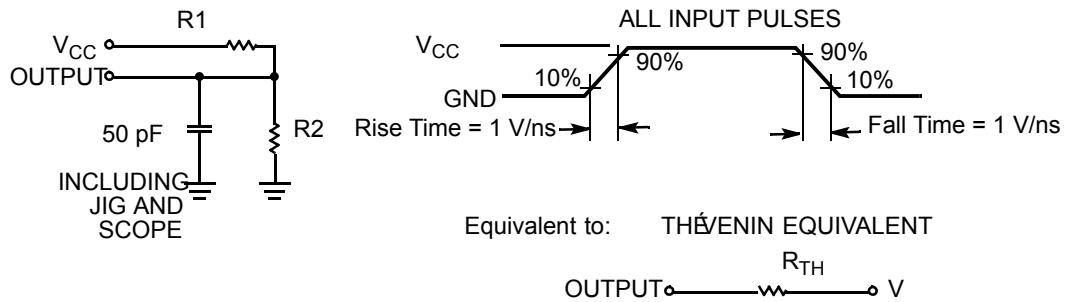
8. Full device AC operation assumes a 100- μs ramp time from 0 to $V_{CC(min)}$ and 200- μs wait time after V_{CC} stabilization.

Capacitance (for all packages)^[9]

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

Thermal Resistance^[9]

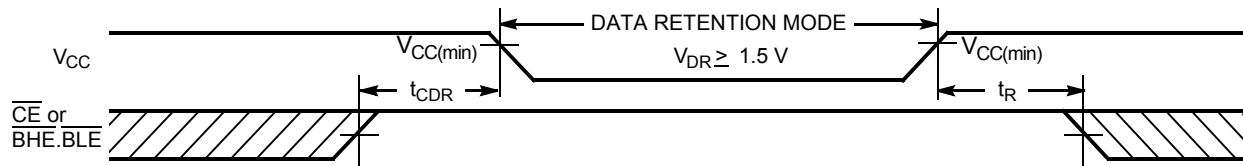
Parameter	Description	Test Conditions	BGA	TSOP II	Unit
Θ_{JA}	Thermal Resistance (Junction to Ambient)	Still Air, soldered on a 3 × 4.5 inch, four-layer printed circuit board	72	75.13	$^\circ\text{C/W}$
Θ_{JC}	Thermal Resistance (Junction to Case)		8.86	8.95	$^\circ\text{C/W}$

AC Test Loads and Waveforms^[10]


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

Data Retention Characteristics (Over the Operating Range)

Parameter	Description	Conditions	Min.	Typ. ^[5]	Max.	Unit
V_{DR}	V_{CC} for Data Retention		1.5			V
I_{CCDR}	Data Retention Current	$V_{CC} = 1.5\text{V}$ $CE \geq V_{CC} - 0.2\text{V}$, $V_{IN} \geq V_{CC} - 0.2\text{V}$ or $V_{IN} \leq 0.2\text{V}$	L		9	μA
			LL		6	
$t_{CDR}^{[9]}$	Chip Deselect to Data Retention Time		0			ns
$t_R^{[11]}$	Operation Recovery Time		t_{RC}			ns

Data Retention Waveform^[12]

Notes:

9. Tested initially and after any design or process changes that may affect these parameters.
10. Test condition for the 45 ns part is a load capacitance of 30 pF.
11. Full device operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(\text{min.})} \geq 100\ \mu\text{s}$ or stable at $V_{CC(\text{min.})} \geq 100\ \mu\text{s}$.
12. 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 $\overline{\text{BHE}}$ and $\overline{\text{BLE}}$.

Switching Characteristics Over the Operating Range^[13]

Parameter	Description	45 ns ^[10]		55 ns		70 ns		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle								
t _{RC}	Read Cycle Time	45		55		70		ns
t _{AA}	Address to Data Valid		45		55		70	ns
t _{OHA}	Data Hold from Address Change	10		10		10		ns
t _{ACE}	$\overline{CE}$ LOW to Data Valid		45		55		70	ns
t _{DOE}	$\overline{OE}$ LOW to Data Valid		25		25		35	ns
t _{LZOE}	$\overline{OE}$ LOW to LOW Z ^[14]	5		5		5		ns
t _{HZOE}	$\overline{OE}$ HIGH to High Z ^[14, 15]		15		20		25	ns
t _{LZCE}	$\overline{CE}$ LOW to Low Z ^[14]	10		10		10		ns
t _{HZCE}	$\overline{CE}$ HIGH to High Z ^[14, 15]		20		20		25	ns
t _{PU}	$\overline{CE}$ LOW to Power-Up	0		0		0		ns
t _{PD}	$\overline{CE}$ HIGH to Power-Down		45		55		70	ns
t _{DBE}	$\overline{BLE/BHE}$ LOW to Data Valid		45		55		70	ns
t _{LZBE}	$\overline{BLE/BHE}$ LOW to Low Z ^[14]	10		10		10		ns
t _{HZBE}	$\overline{BLE/BHE}$ HIGH to HIGH Z ^[14, 15]		15		20		25	ns
Write Cycle ^[16]								
t _{WC}	Write Cycle Time	45		55		70		ns
t _{SCE}	$\overline{CE}$ LOW to Write End	40		40		60		ns
t _{AW}	Address Set-up to Write End	40		40		60		ns
t _{HA}	Address Hold from Write End	0		0		0		ns
t _{SA}	Address Set-up to Write Start	0		0		0		ns
t _{PWE}	$\overline{WE}$ Pulse Width	35		40		45		ns
t _{BW}	$\overline{BLE/BHE}$ LOW to Write End	40		40		60		ns
t _{SD}	Data Set-up to Write End	25		25		30		ns
t _{HD}	Data Hold from Write End	0		0		0		ns
t _{HZWE}	$\overline{WE}$ LOW to High-Z ^[14, 15]		15		20		25	ns
t _{LZWE}	$\overline{WE}$ HIGH to Low-Z ^[14]	10		10		10		ns

Notes:

13. Test conditions for all parameters other than three-state parameters assume signal transition time of 3 ns (1 V/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}/I_{OH} as shown in the "AC Test Loads and Waveforms" section.

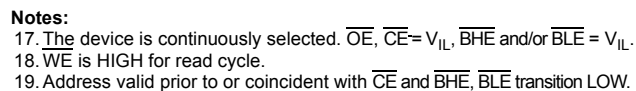
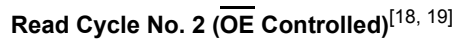
14. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE} , t_{HZBE} is less than t_{LZBE} , t_{HZOE} is less than t_{LZOE} , and t_{HZWE} is less than t_{LZWE} for any given device.

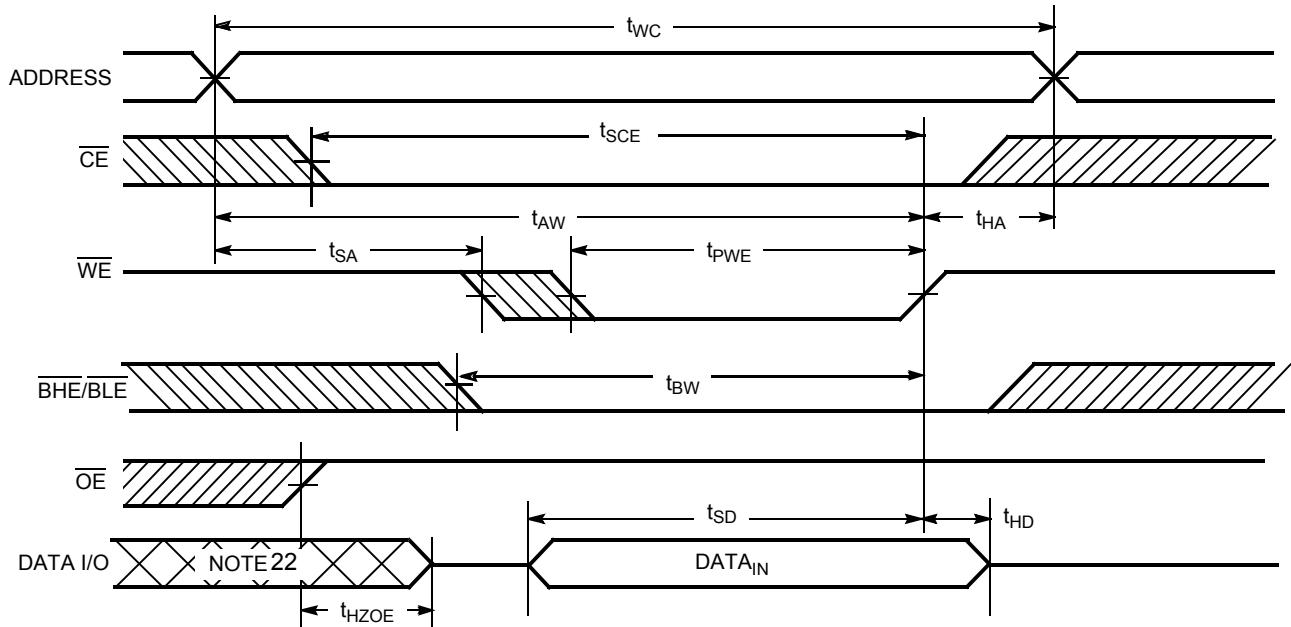
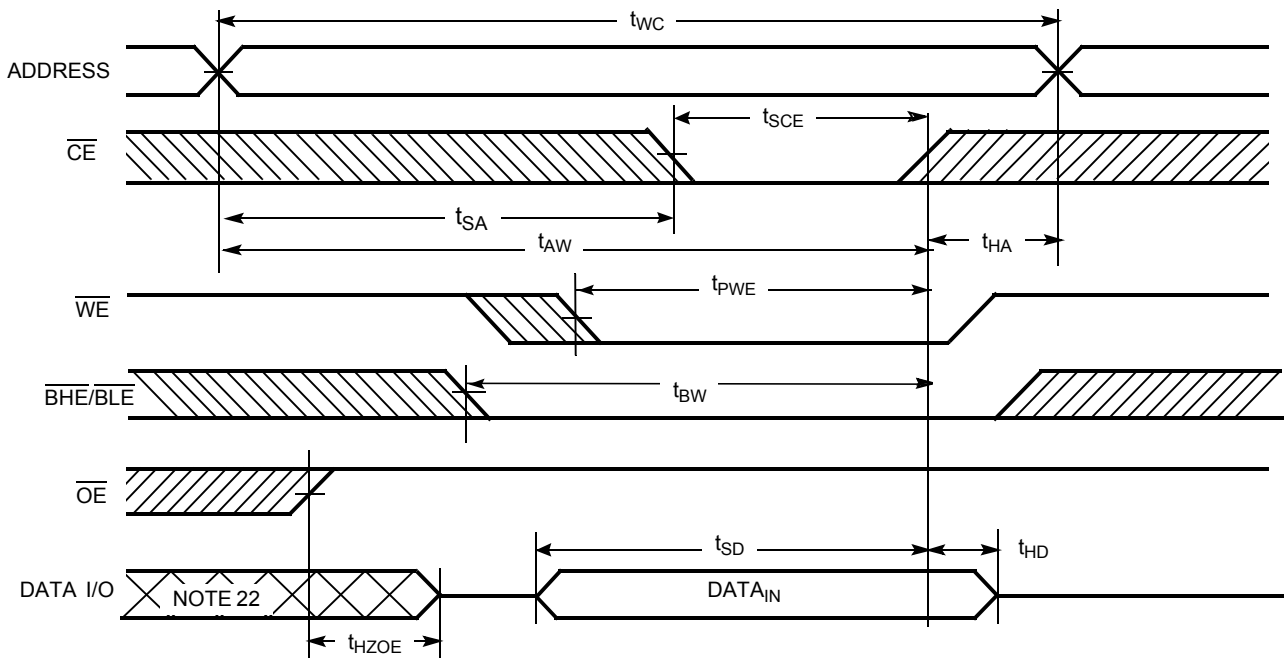
15. t_{HZOE} , t_{HZCE} , t_{HZBE} , and t_{HZWE} transitions are measured when the outputs enter a high impedance state.

16. 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 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.

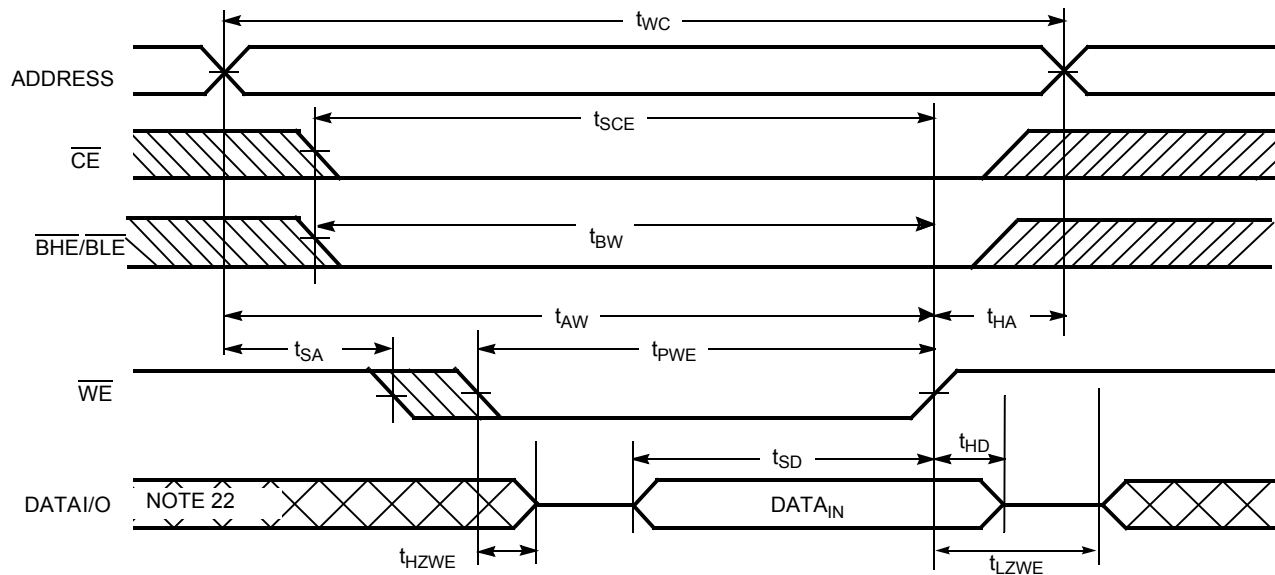
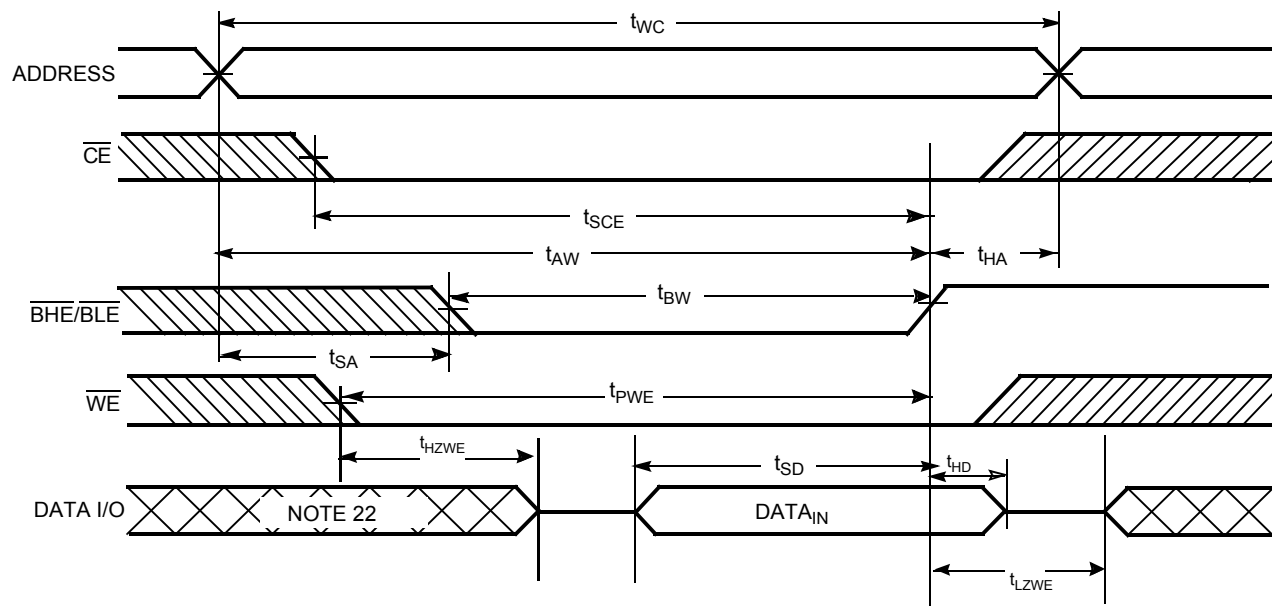


Read Cycle 1 (Address Transition Controlled)^[17, 18]



Switching Waveforms (continued)
Write Cycle No. 1 ($\overline{\text{WE}}$ Controlled)^[16, 20, 21]

Write Cycle No. 2 ($\overline{\text{CE}}$ Controlled)^[16, 20, 21]

Notes:

20. Data I/O is high impedance if $\overline{\text{OE}} = V_{\text{IH}}$.
21. If $\overline{\text{CE}}$ goes HIGH simultaneously with $\text{WE} = V_{\text{IH}}$, the output remains in a high-impedance state.
22. During this period, the I/Os are in output state and input signals should not be applied.

Switching Waveforms (continued)
Write Cycle No. 3 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW)^[21]

Write Cycle No. 4 ($\overline{\text{BHE/BLE}}$ Controlled, $\overline{\text{OE}}$ LOW)^[21]


Truth Table

CE	WE	OE	BHE	BLE	Inputs/Outputs	Mode	Power
H	X	X	X	X	High Z	Deselect/Power-Down	Standby (I_{SB})
X	X	X	H	H	High Z	Deselect/Power-Down	Standby (I_{SB})
L	H	L	L	L	Data Out (I/O_0 – I/O_{15})	Read	Active (I_{CC})
L	H	L	H	L	Data Out (I/O_0 – I/O_7); I/O_8 – I/O_{15} in High Z	Read	Active (I_{CC})
L	H	L	L	H	Data Out (I/O_8 – I/O_{15}); I/O_0 – I/O_7 in High Z	Read	Active (I_{CC})
L	H	H	L	L	High Z	Output Disabled	Active (I_{CC})
L	H	H	H	L	High Z	Output Disabled	Active (I_{CC})
L	H	H	L	H	High Z	Output Disabled	Active (I_{CC})
L	L	X	L	L	Data In (I/O_0 – I/O_{15})	Write	Active (I_{CC})
L	L	X	H	L	Data In (I/O_0 – I/O_7); I/O_8 – I/O_{15} in High Z	Write	Active (I_{CC})
L	L	X	L	H	Data In (I/O_8 – I/O_{15}); I/O_0 – I/O_7 in High Z	Write	Active (I_{CC})

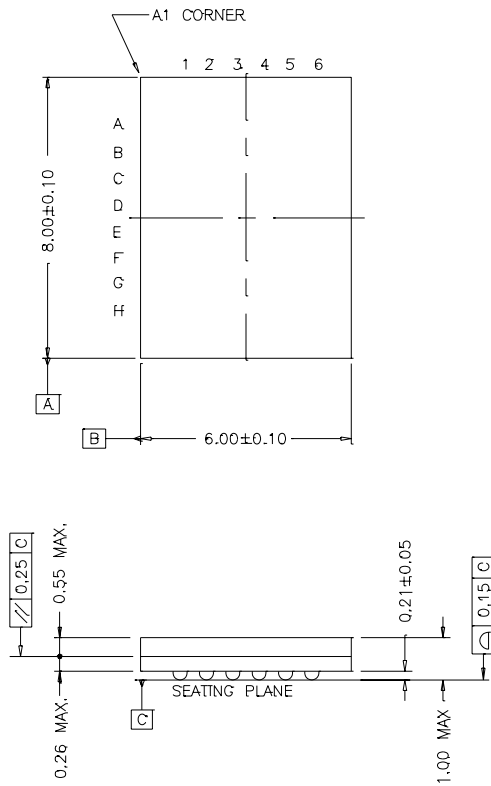
Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
45	CY62147DV30LL-45BVI	BV48A	48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm)	Industrial
	CY62147DV30LL-45BVXI		48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm) (Pb-free)	
	CY62147DV30LL-45ZSXI	ZS-44	44-pin TSOP II (Pb-free)	
55	CY62147DV30L-55BVI	BV48A	48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm)	Industrial
	CY62147DV30L-55BVXI		48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm) (Pb-free)	
	CY62147DV30LL-55BVI		48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm)	
	CY62147DV30LL-55BVXI		48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm) (Pb-free)	
55	CY62147DV30L-55ZSXI	ZS-44	44-pin TSOP II (Pb-free)	Industrial
	CY62147DV30LL-55ZSXI			
70	CY62147DV30L-70BVI	BV48A	48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm)	Industrial
	CY62147DV30L-70BVXI		48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm) (Pb-free)	
	CY62147DV30LL-70BVI		48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm)	
	CY62147DV30LL-70BVXI		48-ball Very Fine Pitch BGA (6 mm × 8mm × 1 mm) (Pb-free)	
70	CY62147DV30L-70ZSXI	ZS-44	44-pin TSOP II (Pb-free)	Industrial
	CY62147DV30LL-70ZSXI			

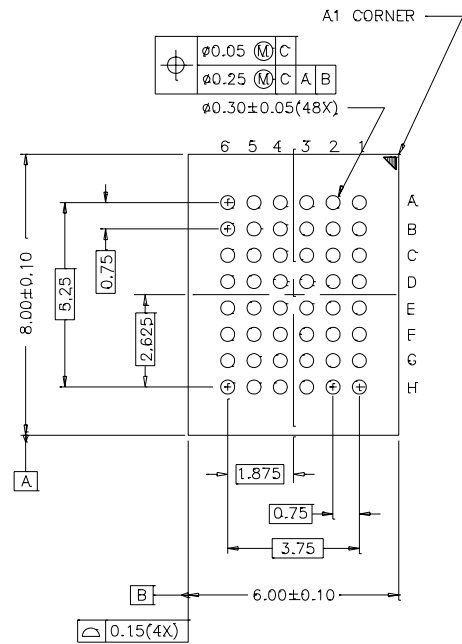
Package Diagram

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

TOP VIEW



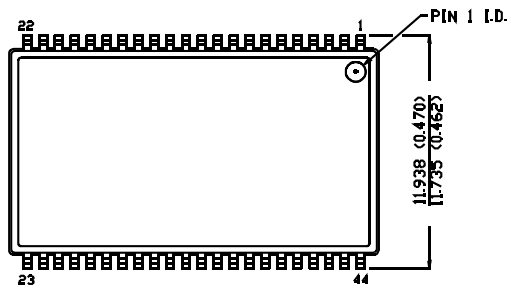
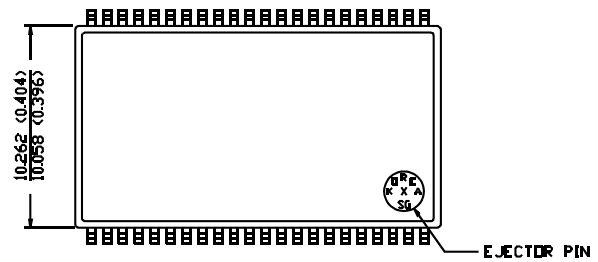
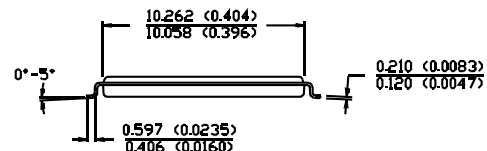
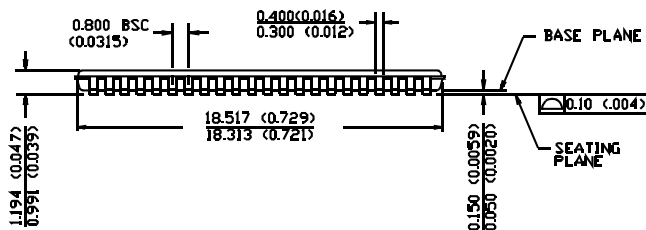
BOTTOM VIEW



51-85150-*B

Package Diagram (continued)
44-Pin TSOP II ZS44

DIMENSION IN MM (INCH)
MAX
MIN


TOP VIEW

BOTTOM VIEW


51-85087-*A

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Document History Page

Document Title: CY62147DV30 MoBL [®] 4-Mbit (256K x 16) Static RAM Document Number: 38-05340				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	127481	06/17/03	HRT	New Data Sheet
*A	131010	01/23/04	CBD	Change from Advance to Preliminary
*B	213252	See ECN	AJU	Change from Preliminary to Final Added 70 ns speed bin Modified footnote 7 to include ramp time and wait time Modified input and output capacitance values to 10 pF Modified Thermal Resistance values on page 4 Added "Byte power-down feature" in the features section Modified Ordering Information for Pb-free parts
*C	257349	See ECN	PCI	Modified ordering information for 70-ns Speed Bin
*D	316039	See ECN	PCI	Added 45-ns Speed Bin in AC, DC and Ordering Information tables Added Footnote #10 on page #4 Added Pb-free package ordering information on page # 9 Changed 44-lead TSOP-II package name on page 11 from Z44 to ZS44 Standardized Icc values across 'L' and 'LL' bins