

1-Mb (64K x 16) Static RAM

Features

- **Temperature Ranges**
 - Industrial: -40°C to 85°C
 - Automotive: -40°C to 125°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 mA @ $f = 1\text{ MHz}$
 - Typical active current: 5 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^[1]

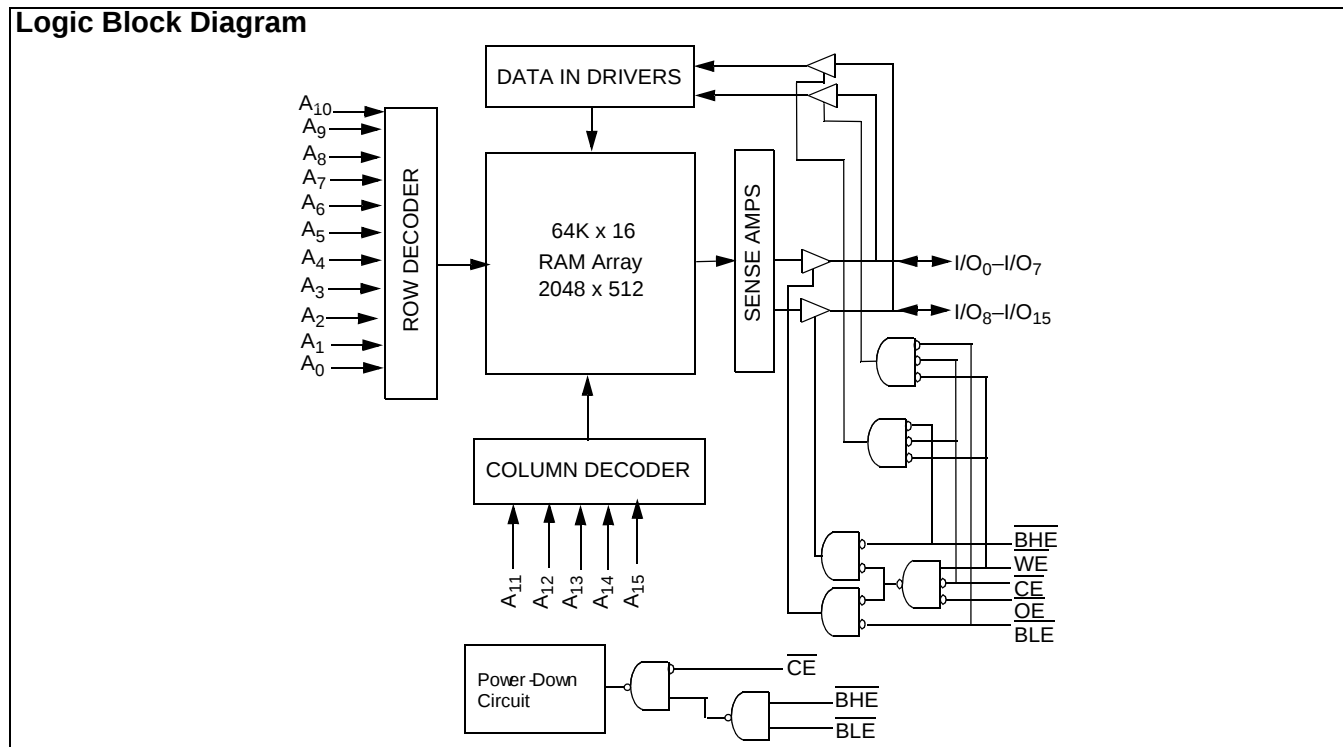
The CY62127DV30 is a high-performance CMOS static RAM organized as 64K words by 16 bits. This device features advanced circuit design to provide ultra-low active current. This is ideal for providing More Battery Life™ (MoBL®) in

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 ($\overline{\text{CE}}$ HIGH or both $\overline{\text{BHE}}$ and $\overline{\text{BLE}}$ 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_{15}). 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_{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 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

Logic Block Diagram

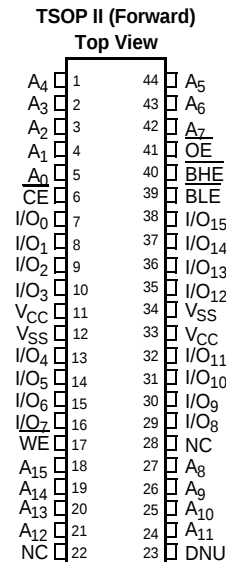
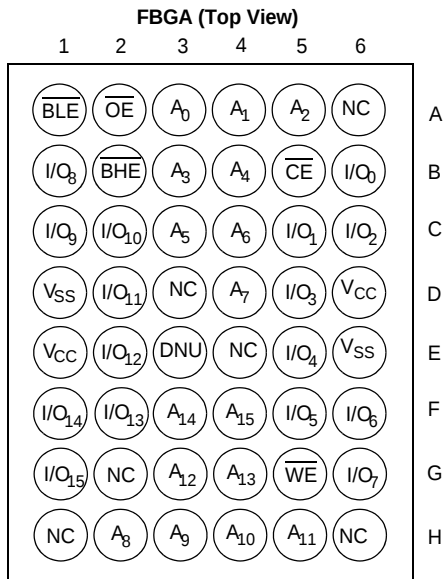


Note:

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

Product Portfolio

Product	V _{CC} Range (V)			Speed (ns)	Power Dissipation						
					Operating, I _{CC} (mA)					Standby I _{SB2} (μA)	
					f = 1 MHz		f = f _{MAX}				
	Min.	Typ.	Max.		Typ. ^[4]	Max.	Typ. ^[4]	Max.	Range	Typ. ^[4]	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^[2, 3]

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 V_{SS} 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_{CC} = V_{CC(yp)}, 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 3.9V

DC Voltage Applied to Outputs in High-Z State^[5] -0.3V to $V_{CC} + 0.3V$

DC Input Voltage^[5] -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} ^[6]
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. ^[4]	Max.	Min.	Typ. ^[4]	Max.	Min.	Typ. ^[4]	Max.		
V _{OH}	Output HIGH Voltage	2.2 ≤ V _{CC} ≤ 2.7	I _{OH} = −0.1 mA	2.0			2.0			2.0			V	
		2.7 ≤ V _{CC} ≤ 3.6	I _{OH} = −1.0 mA	2.4			2.4			2.4				
V _{OL}	Output LOW Voltage	2.2 ≤ V _{CC} ≤ 2.7	I _{OL} = 0.1 mA			0.4			0.4			0.4	V	
		2.7 ≤ V _{CC} ≤ 3.6	I _{OL} = 2.1 mA			0.4			0.4			0.4		
V _{IH}	Input HIGH Voltage	2.2 ≤ V _{CC} ≤ 2.7		1.8		V _{CC} + 0.3	1.8		V _{CC} + 0.3	1.8		V _{CC} + 0.3	V	
		2.7 ≤ V _{CC} ≤ 3.6		2.2		V _{CC} + 0.3	2.2		V _{CC} + 0.3	2.2		V _{CC} + 0.3		
V _{IL}	Input LOW Voltage	2.2 ≤ V _{CC} ≤ 2.7		−0.3		0.6	−0.3		0.6	−0.3		0.6	V	
		2.7 ≤ V _{CC} ≤ 3.6		−0.3		0.8	−0.3		0.8	−0.3		0.8		
I _{IX}	Input Leakage Current	GND ≤ V _I ≤ V _{CC}		Ind'I	−1		+1	−1		+1	−1		+1	μA
				Auto				−4		+4				μA
I _{OZ}	Output Leakage Current	GND ≤ V _O ≤ V _{CC} , Output Disabled		Ind'I	−1		+1	−1		+1	−1		+1	μA
				Auto				−4		+4				μA
I _{CC}	V _{CC} Operating Supply Current	f = f _{MAX} = 1/t _{RC}	V _{CC} = 3.6V, I _{OUT} = 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 _{SB1}	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), $f = 0$ ($\overline{OE}$, WE, BHE and BLE)		L	Ind'I	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 _{SB2}	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 _{CC} = 3.6V		L	Ind'I	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^[7]

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

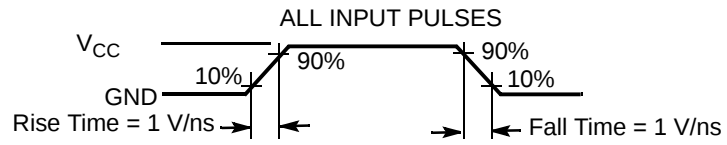
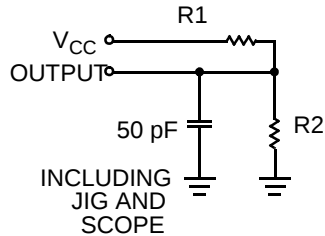
Notes:

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

Thermal Resistance^[7]

Parameter	Description	Test Conditions	FBGA	TSOP II	Unit
θ_{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
θ_{JC}	Thermal Resistance (Junction to Case)		12	11	°C/W

AC Test Loads and Waveforms^[8]



Equivalent to: THEVENIN EQUIVALENT

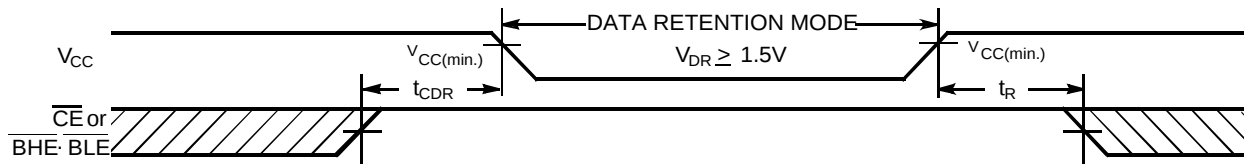


Parameters	2.5V (2.2V - 2.7V)	3.0V (2.7V - 3.6V)	Unit
R1	16600	1103	Ω
R2	15400	1554	Ω
R_{TH}	8000	645	Ω
V_{TH}	1.20	1.75	V

Data Retention Characteristics

Parameter	Description	Conditions	Min.	Typ. ^[4]	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	μA
			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			μs

Data Retention Waveform^[10]



Notes:

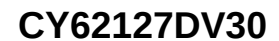
8. Test condition for the 45-ns part is a load capacitance of 30 pF.
9. Full device operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(min.)} > 200 \mu s$.
10. $BHE \cdot BLE$ is the AND of both BHE and BLE . Chip can be deselected by either disabling the Chip Enable signals or by disabling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

Switching Characteristics (Over the Operating Range)^[11]

Parameter	Description	CY62127DV30-45 ^[8]		CY62127DV30-55		CY62127DV30-70		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 ^[12]	5		5		5		ns
t _{HZOE}	$\overline{OE}$ HIGH to High Z ^[12,14]		15		20		25	ns
t _{LZCE}	$\overline{CE}$ LOW to Low Z ^[12]	10		10		10		ns
t _{HZCE}	$\overline{CE}$ HIGH to High Z ^[12,14]		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}	$\overline{BLE}/\overline{BHE}$ LOW to Data Valid		45		55		70	ns
t _{LZBE} ^[13]	$\overline{BLE}/\overline{BHE}$ LOW to Low Z ^[12]	5		5		5		ns
t _{HZBE}	$\overline{BLE}/\overline{BHE}$ HIGH to High-Z ^[12,14]		15		20		25	ns
Write Cycle ^[15]								
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		50		ns
t _{BW}	$\overline{BLE}/\overline{BHE}$ 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 ^[12,14]		15		20		25	ns
t _{LZWE}	$\overline{WE}$ HIGH to Low Z ^[12]	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_{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.
13. If both byte enables are toggled together, this value is 10 ns.
14. t_{HZOE} , t_{HZCE} , t_{HZBE} , and t_{HZWE} 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 $\overline{WE}$, $\overline{CE} = V_{IL}$, $\overline{BHE}$ 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.

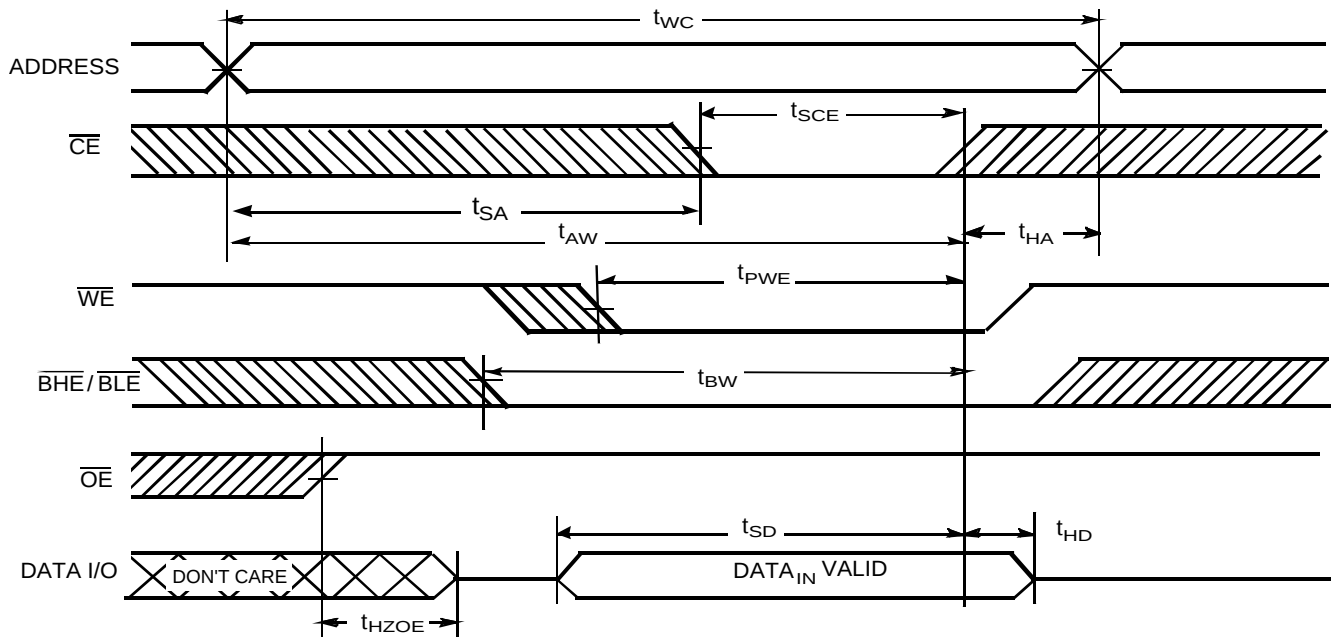


Read Cycle No. 1 (Address Transition Controlled)^[16,17]

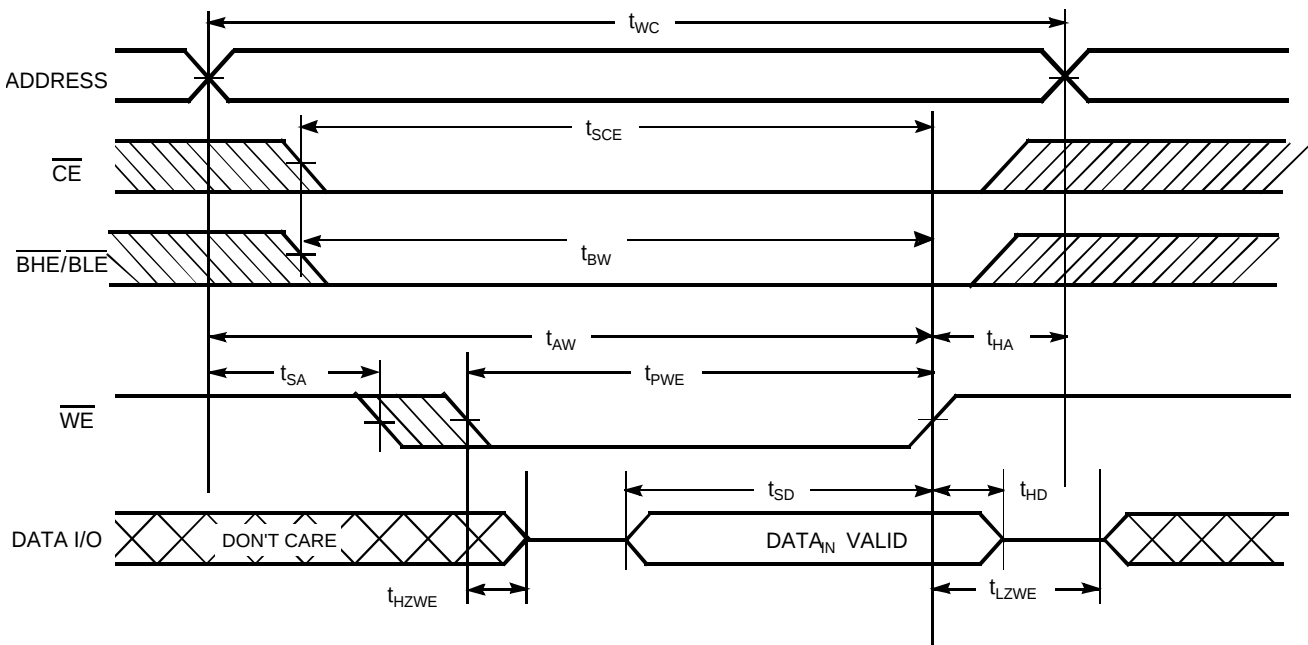


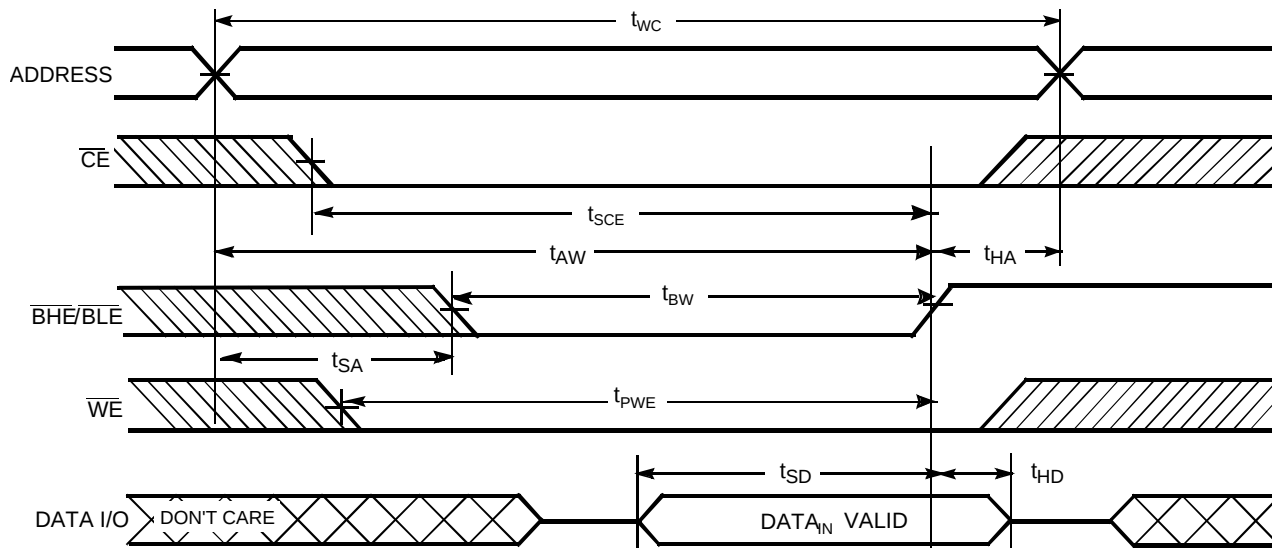
Switching Waveforms (continued)

Write Cycle No. 2 ($\overline{\text{CE}}$ Controlled)^[14, 15, 19, 20, 21]



Write Cycle No. 3 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW)^[20, 21]



Switching Waveforms (continued)
Write Cycle No. 4 ($\overline{\text{BHE}}/\overline{\text{BLE}}$ -controlled, $\overline{\text{OE}}$ LOW)^[20, 21]

Truth Table

CE	WE	OE	BHE	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})

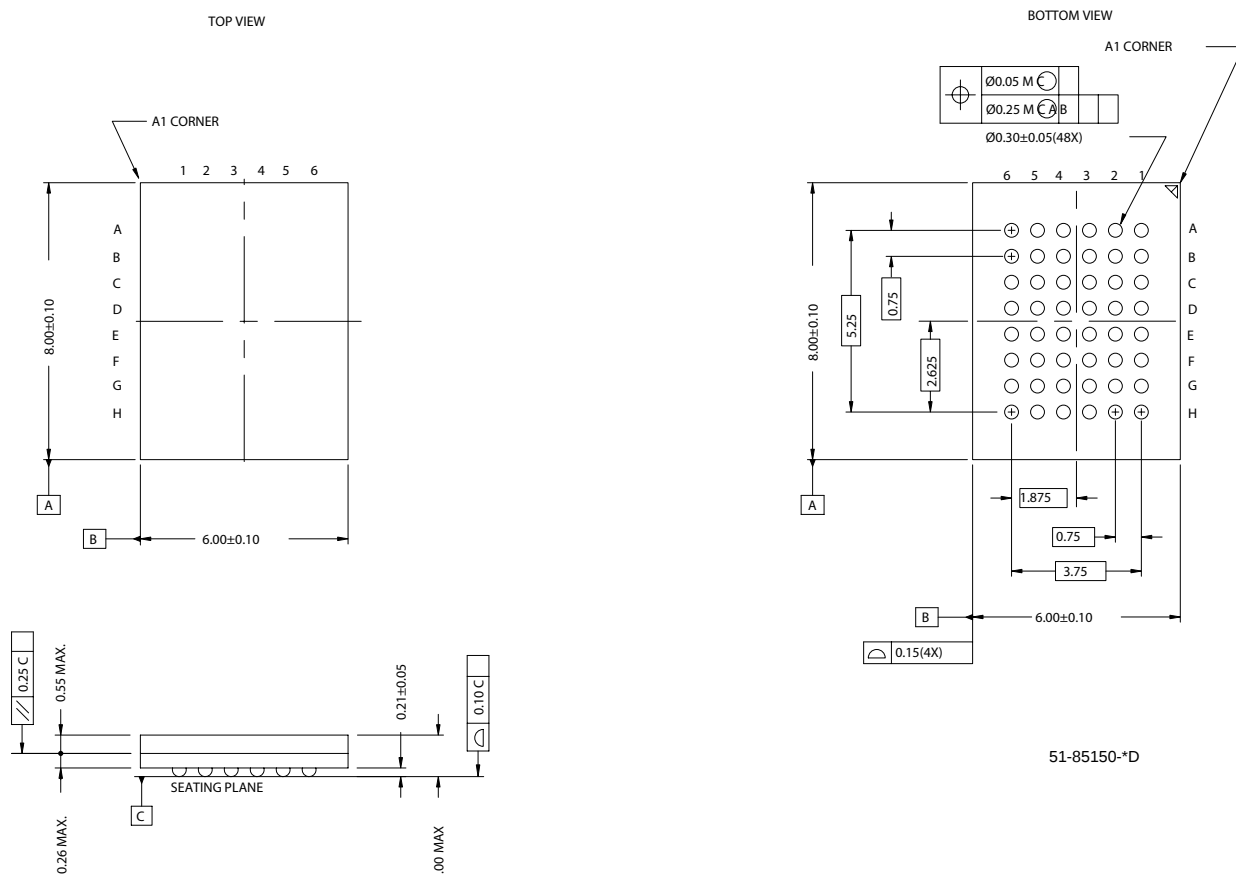
Ordering Information

Speed (ns)	Ordering Code	Package 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

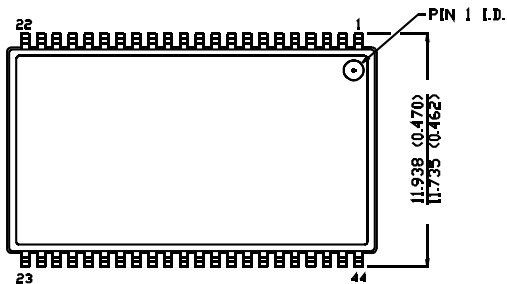
48-ball VFBGA (6 x 8 x 1 mm) (51-85150)



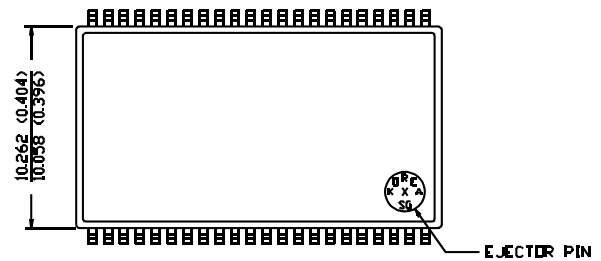
Package Diagrams (continued)

44-lead TSOP II (51-85087)

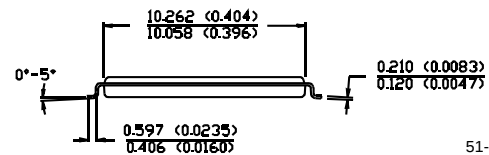
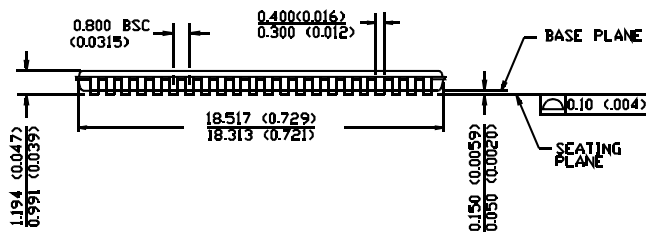
DIMENSION IN MM (INCH)
MAX
MIN



TOP VIEW



BOTTOM VIEW



51-85087-A

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Document History Page

Document Title: CY62127DV30 MoBL [®] 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 μ A (L), 4 μ A (LL) Changed Iccdr to 4 μ A (L), 3 μ A (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
*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 _{IX} , I _{OZ} , I _{SB1} and I _{SB2} in the Product portfolio on Page #2 and the DC Electrical Characteristics table on Page# 4 Added Automotive spec for I _{CCDR} 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