CY62127DV30
MoBL®

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 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**
- **Also available in Lead-Free 48-ball FBGA, 56-pin QFN and 44-lead TSOP Type II packages**

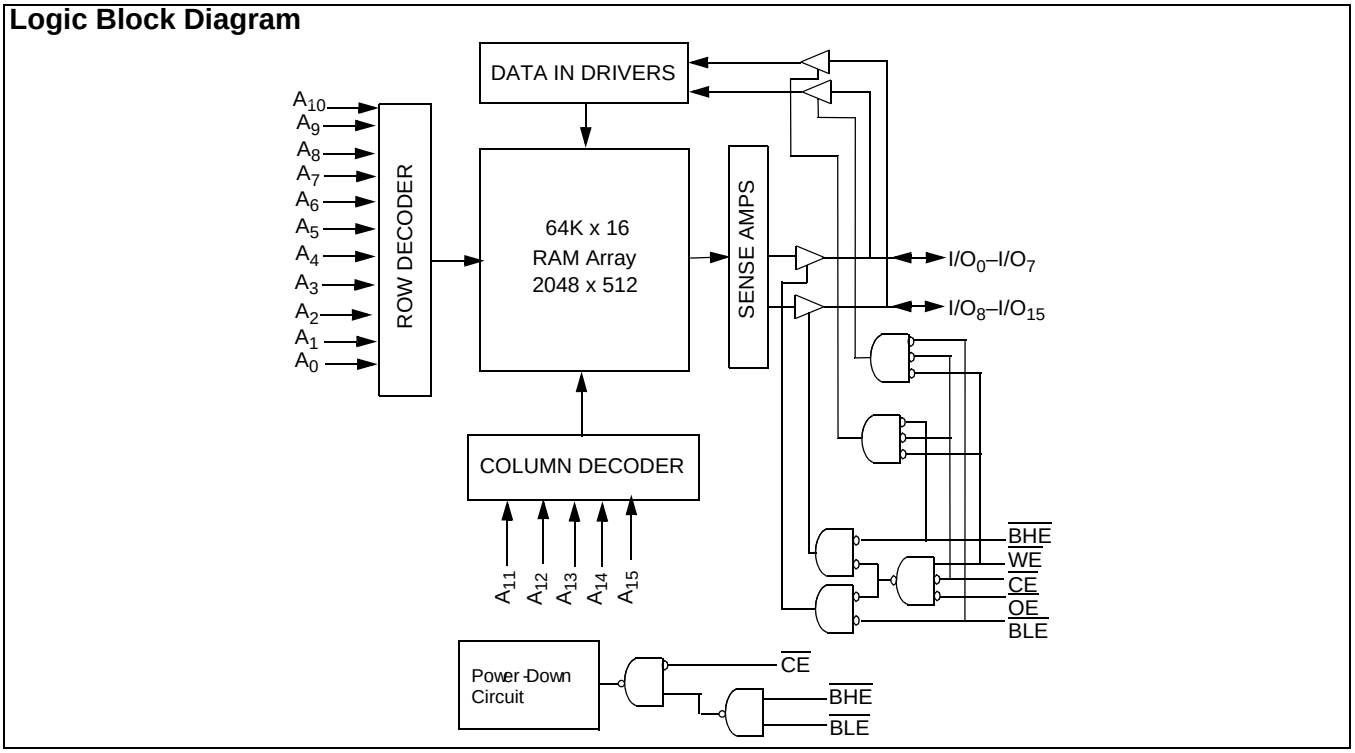
Functional Description[1]

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 ($\overline{CE}$ 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 ($\overline{CE}$ 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 ($\overline{CE}$ LOW and $\overline{WE}$ LOW).

Writing to the device is accomplished by taking Chip Enable ($\overline{CE}$) and Write Enable ($\overline{WE}$) inputs 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_{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 ($\overline{CE}$) 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 will appear on I/O_0 to I/O_7. If Byte High Enable ($\overline{BHE}$) 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



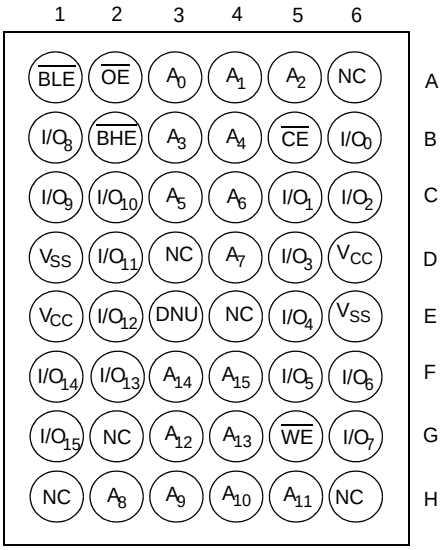
Note:
1. For best-practice recommendations, please refer to the Cypress application note "System Design Guidelines" on http://www.cypress.com.

Product Portfolio

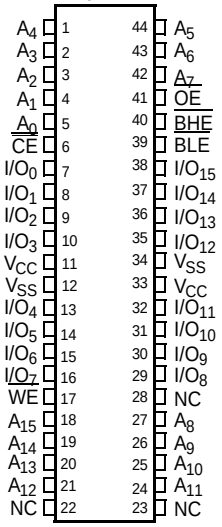
Product	V_{CC} Range (V)			Speed (ns)	Power Dissipation						
					Operating, I_{CC} (mA)					Standby I_{SB2} (µA)	
					f = 1 MHz		f = f_{MAX}				
	Min.	Typ.	Max.		Typ[4]	Max.	Typ.[4]	Max.	Range	Typ.[4]	Max.
CY62127DV30L	2.2	3.0	3.6	45	0.85	1.5	6.5	13	Ind'l	1.5	5
CY62127DV30LL				45	0.85	1.5	6.5	13	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]

FBGA (Top View)

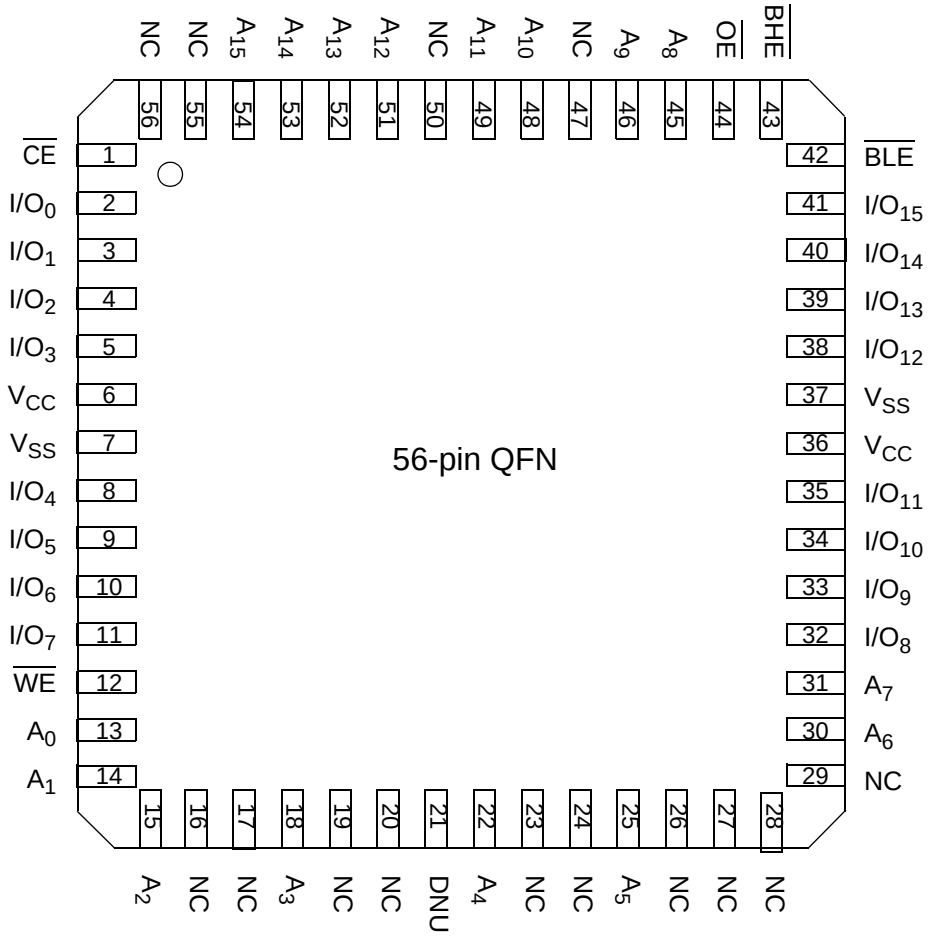


TSOP II (Forward) Top View



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

Pin Configurations (continued)



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	$2.2 \le V_{CC} \le 2.7$	I_{OH} = –0.1 mA		2.0			2.0			2.0			V
		$2.7 \le V_{CC} \le 3.6$	I_{OH} = –1.0 mA		2.4			2.4			2.4			
V_{OL}	Output LOW Voltage	$2.2 \le V_{CC} \le 2.7$	I_{OL} = 0.1 mA				0.4			0.4			0.4	V
		$2.7 \le V_{CC} \le 3.6$	I_{OL} = 2.1 mA				0.4			0.4			0.4	
V_{IH}	Input HIGH Voltage	$2.2 \le V_{CC} \le 2.7$			1.8		V_{CC} + 0.3	1.8		V_{CC} + 0.3	1.8		V_{CC} + 0.3	V
		$2.7 \le V_{CC} \le 3.6$			2.2		V_{CC} + 0.3	2.2		V_{CC} + 0.3	2.2		V_{CC} + 0.3	
V_{IL}	Input LOW Voltage	$2.2 \le V_{CC} \le 2.7$			–0.3		0.6	–0.3		0.6	–0.3		0.6	V
		$2.7 \le V_{CC} \le 3.6$			–0.3		0.8	–0.3		0.8	–0.3		0.8	
I_{IX}	Input Leakage Current	$GND \le V_I \le V_{CC}$		Ind'l	–1		+1	–1		+1	–1		+1	µA
				Auto				–4		+4				µA
I_{OZ}	Output Leakage Current	$GND \le V_O \le V_{CC}$, Output Disabled		Ind'l	–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	$\overline{CE} \ge V_{CC}$ – 0.2V, $V_{IN} \ge V_{CC}$ – 0.2V, $V_{IN} \le$ 0.2V, f = f_{MAX} (Address and Data Only), f = 0 (OE, WE, BHE and 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_{SB2}	Automatic CE Power-down Current—CMOS Inputs	$\overline{CE} \ge V_{CC}$ – 0.2V, $V_{IN} \ge V_{CC}$ – 0.2V or $V_{IN} \le$ 0.2V, f = 0, V_{CC} = 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	

Notes:
5. $V_{IL(min.)}$ = –2.0V for pulse durations less than 20 ns., $V_{IH(max.)}$ = Vcc+0.75V for pulse durations less than 20 ns.
6. 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.

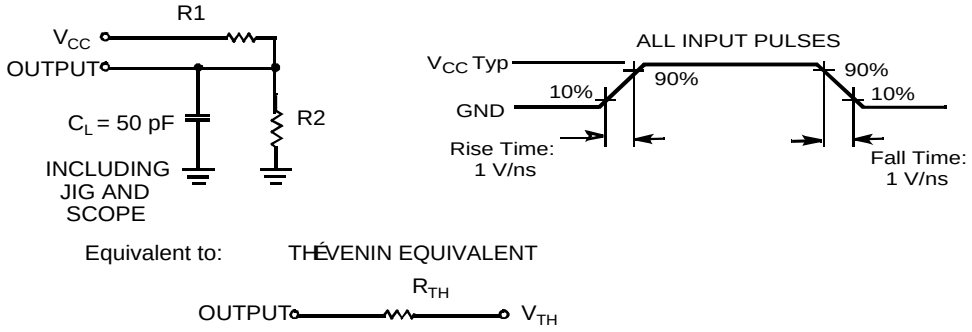
Capacitance[7]

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	QFN	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	22.08	°C/W
θ_{JC}	Thermal Resistance (Junction to Case)[7]		12	11	5.03	°C/W

AC Test Loads and Waveforms[8]

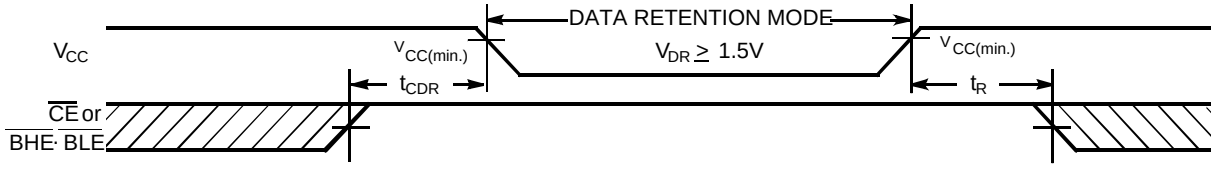


Parameters	2.5V (2.2– 2.7V)	3.0V (2.7– 3.6V)	Unit
R1	16600	1103	Ω
R2	15400	1554	Ω
R_{TH}	8000	645	Ω
V_{TH}	1.2	1.75	V

Data Retention Characteristics

Parameter	Description	Conditions			Min.	Typ.[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:
7. Tested initially and after any design or proces changes that may affect these parameters.
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 µs.
10. $\overline{BHE}$·$\overline{BLE}$ 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)[11]

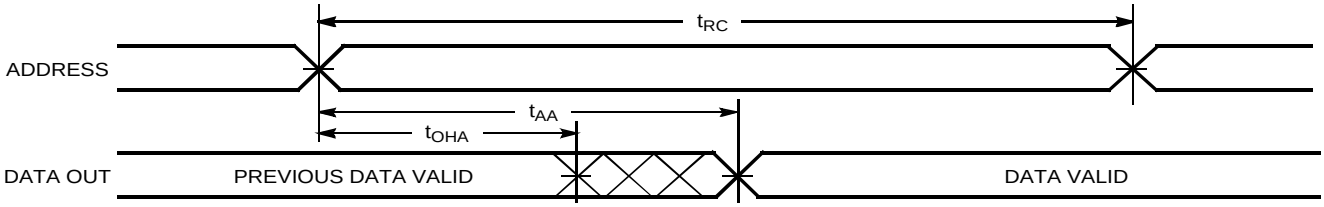
Parameter	Description	CY62127DV30-45[8]		CY62127DV30-55		CY62127DV30-70		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle								
t_{RC}	Read Cycle Time	45		55		70		ns
t_{AA}	Address to Data Valid		45		55		70	ns
t_{OHA}	Data Hold from Address Change	10		10		10		ns
t_{ACE}	$\overline{CE}$ LOW to Data 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:

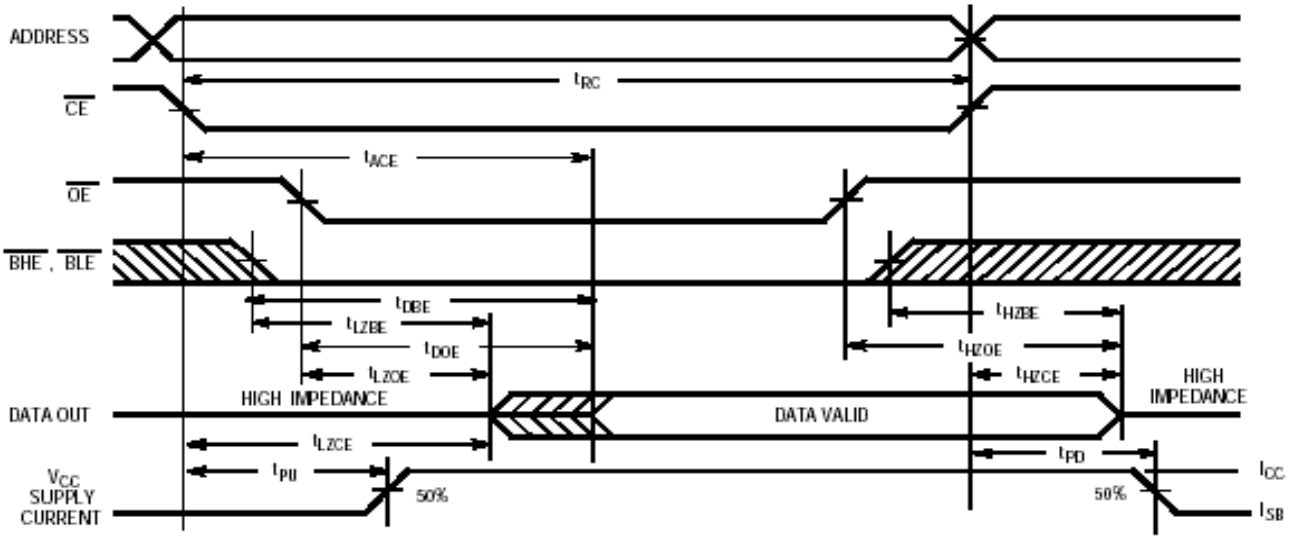
11. Test conditions assume signal transition time of 1V/ns or less, timing reference levels of $V_{CC(typ.)}/2$, input pulse levels of 0 to $V_{CC(typ.)}$, and output loading of the specified I_{OL}.
12. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, t_{HZBE} is less 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 WE, CE = V_{IL}, BHE and/or 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

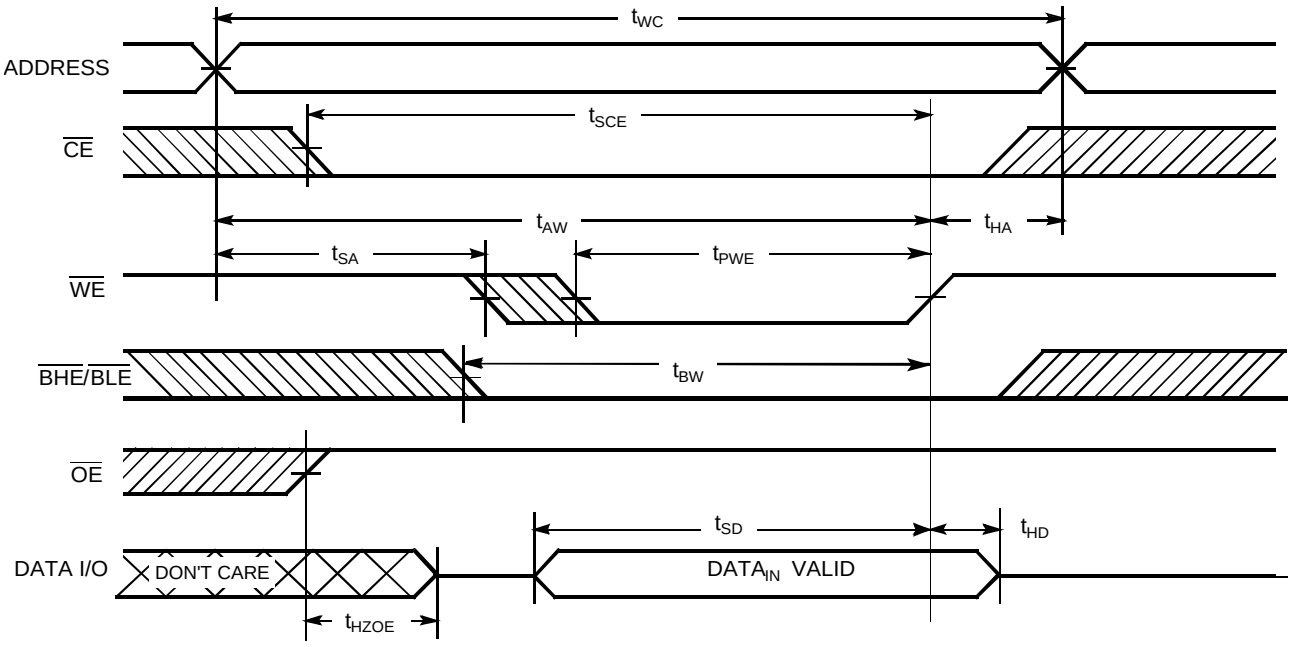
Read Cycle No. 1 (Address Transition Controlled)[16,17]



Read Cycle No. 2 ($\overline{OE}$ Controlled)[16,17, 1818]



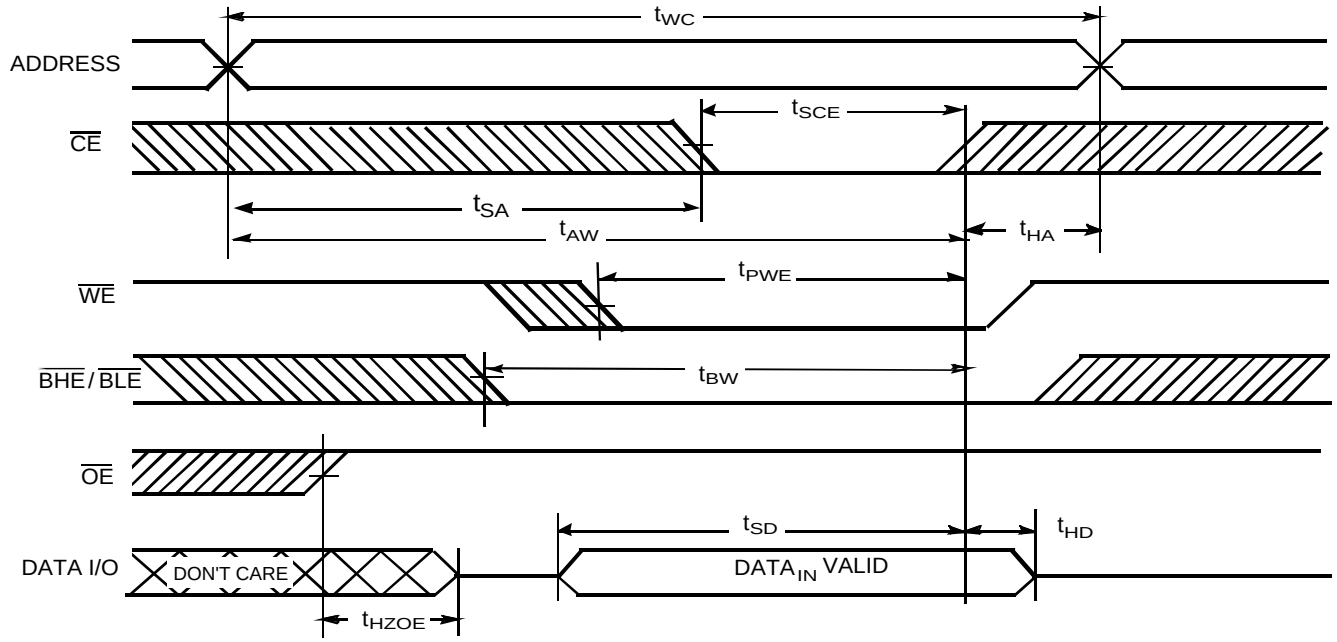
Write Cycle No. 1 ($\overline{WE}$ Controlled)[14, 15, 19, 20, 21]



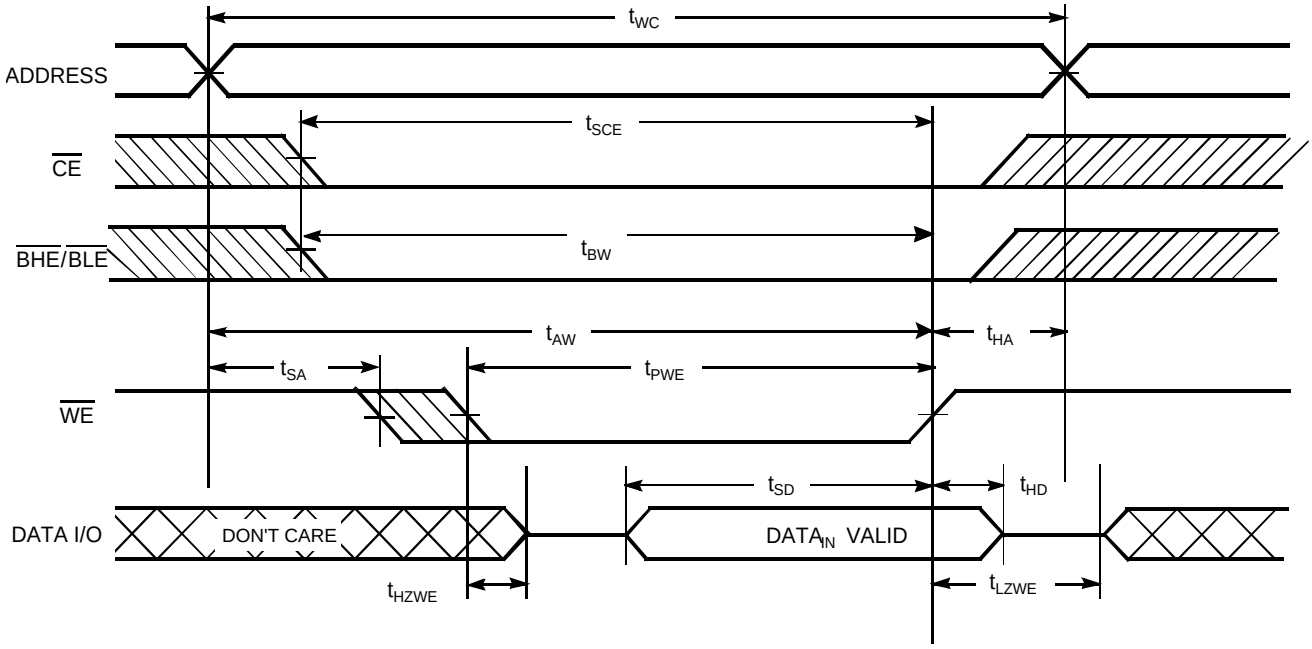
Notes:
16. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}, $\overline{BHE}$, $\overline{BLE}$ = V_{IL}.
17. $\overline{WE}$ is HIGH for Read cycle.
18. Address valid prior to or coincident with $\overline{CE}$, $\overline{BHE}$, $\overline{BLE}$ transition LOW.
19. Data I/O is high-impedance if $\overline{OE}$ = V_{IH}.
20. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ 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)[14, 15, 19, 20, 21]

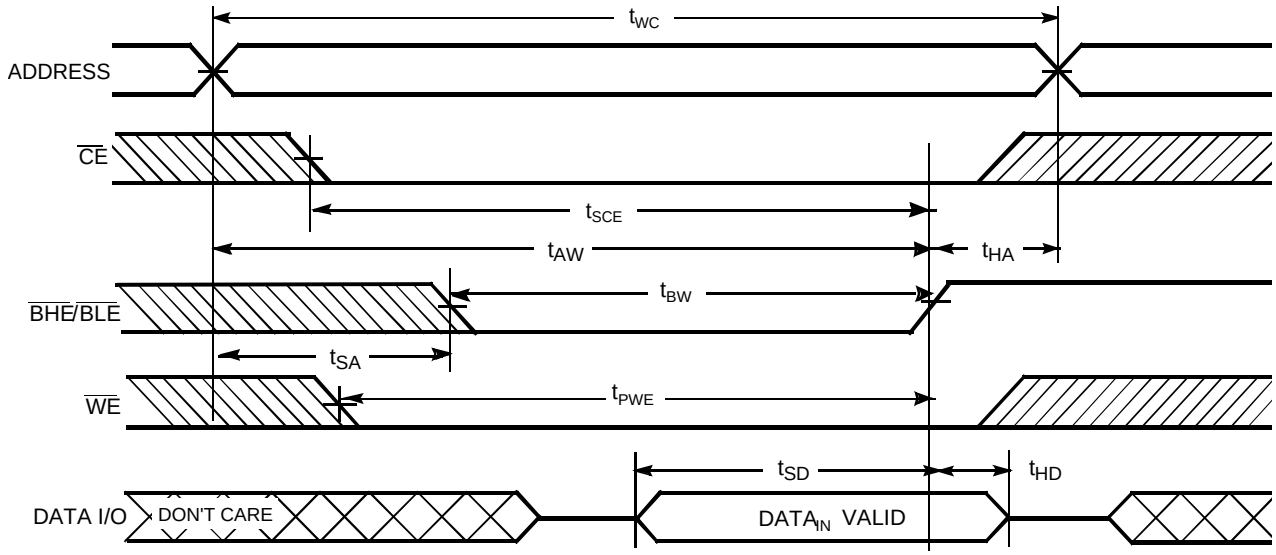


Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW)[20, 21]



Switching Waveforms (continued)

Write Cycle No. 4 (BHE-/BLE-controlled, OE LOW)[20, 21]



Truth Table

CE	WE	OE	BHE	BLE	I/O0–I/O7	I/O8–I/O15	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})

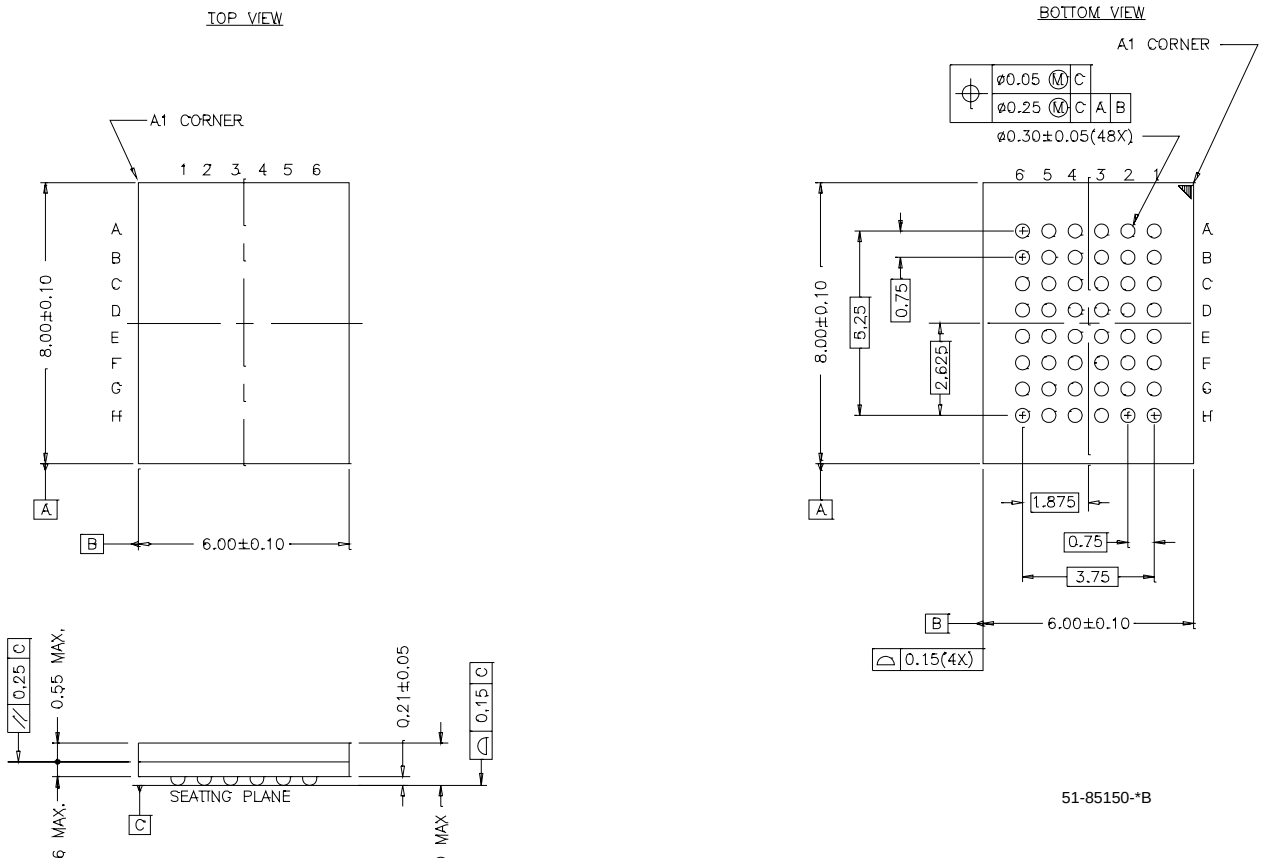
Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
45	CY62127DV30LL-45BVI	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm)	Industrial
	CY62127DV30LL-45BVXI	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm) (Pb-Free)	
	CY62127DV30LL-45ZSI	ZS44	44-lead TSOP Type II	
	CY62127DV30LL-45ZSXI	ZS44	44-lead TSOP Type II (Pb-Free)	
	CY62127DV30LL-45LFXI	LF56A	56-pin QFN (Pb-free)	

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)	
	CY62127DV30LL-55BVXI	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm) (Pb-Free)	
	CY62127DV30L-55ZSI	ZS44	44-lead TSOP Type II	
	CY62127DV30L-55ZSXI	ZS44	44-lead TSOP Type II (Pb-Free)	
	CY62127DV30LL-55ZSI	ZS44	44-lead TSOP Type II	
	CY62127DV30LL-55LFXI	LF56A	56-pin QFN (Pb-free)	
	CY62127DV30L-55BVXE	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm) (Pb-Free)	Automotive
	CY62127DV30L-55ZSXE	ZS44	44-lead TSOP Type II (Pb-Free)	
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)	
	CY62127DV30LL-70BVXI	BV48A	48-ball Fine Pitch BGA (6 mm x 8 mm x 1 mm) (Pb-Free)	
	CY62127DV30L-70ZSI	ZS44	44-lead TSOP Type II	
	CY62127DV30LL-70ZSI	ZS44	44-lead TSOP Type II	
	CY62127DV30LL-70LFXI	LF56A	56-pin QFN (Pb-free)	

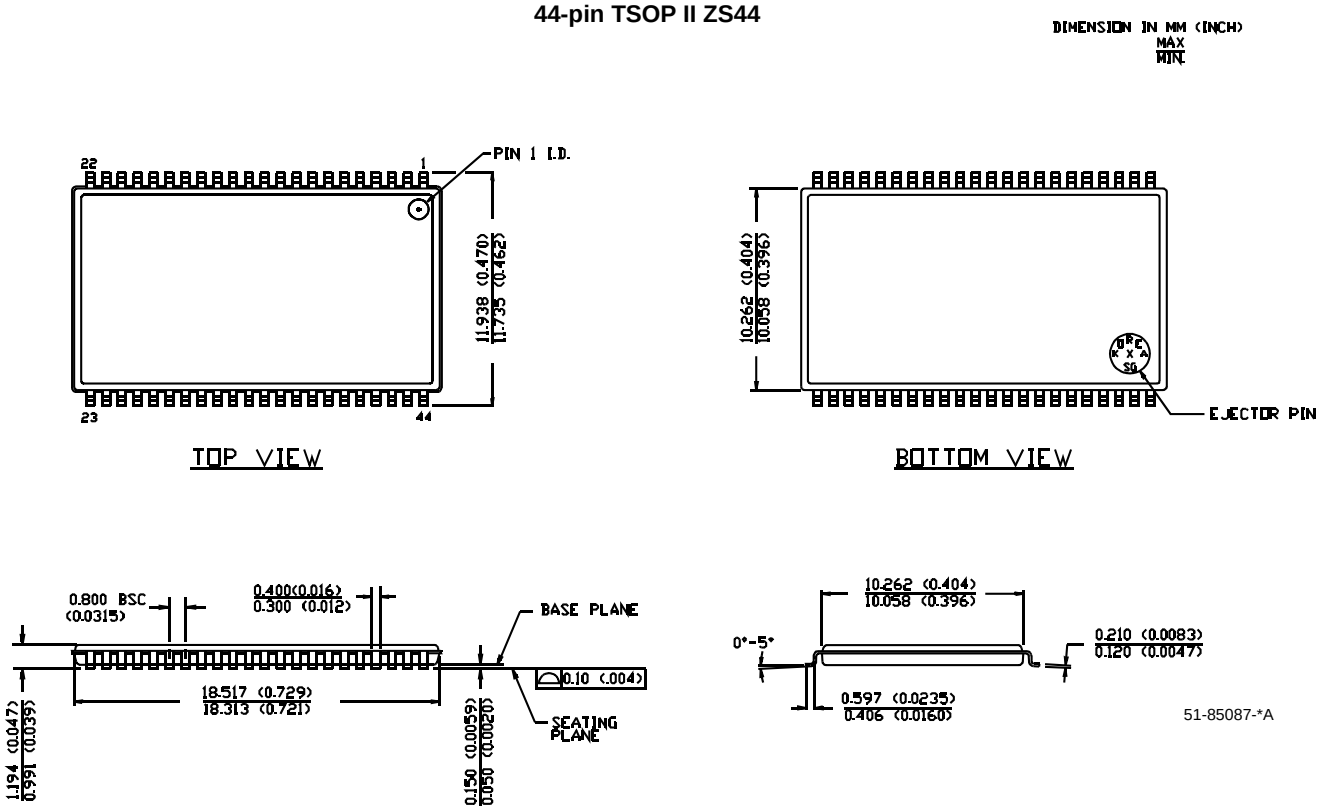
Package Diagrams

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

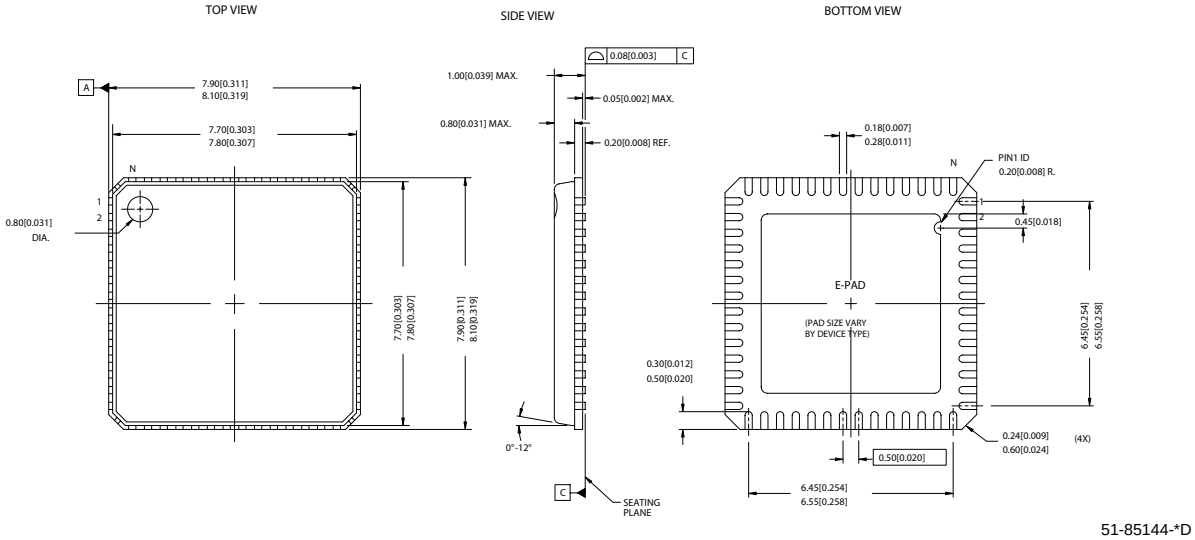


Package Diagrams

44-pin TSOP II ZS44



56-Lead QFN 8 x 8 MM LF56A



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 μA (L), 4 μA (LL) Changed Iccdr to 4 μA (L), 3 μA (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