

512K x 32 Static RAM

Features

- High speed
 - $t_{AA} = 10 \text{ ns}$
- Low active power
 - 745 mW (max.)
- Operating voltages of $2.5 \pm 0.2\text{V}$
- 1.5V data retention
- Automatic power-down when deselected
- TTL-compatible inputs and outputs
- Easy memory expansion with $\overline{CE}_1$, $\overline{CE}_2$, and $\overline{CE}_3$ features
- Available in non Pb-free 119-ball pitch ball grid array package

Functional Description

The CY7C1062AV25 is a high-performance CMOS Static RAM organized as 524,288 words by 32 bits.

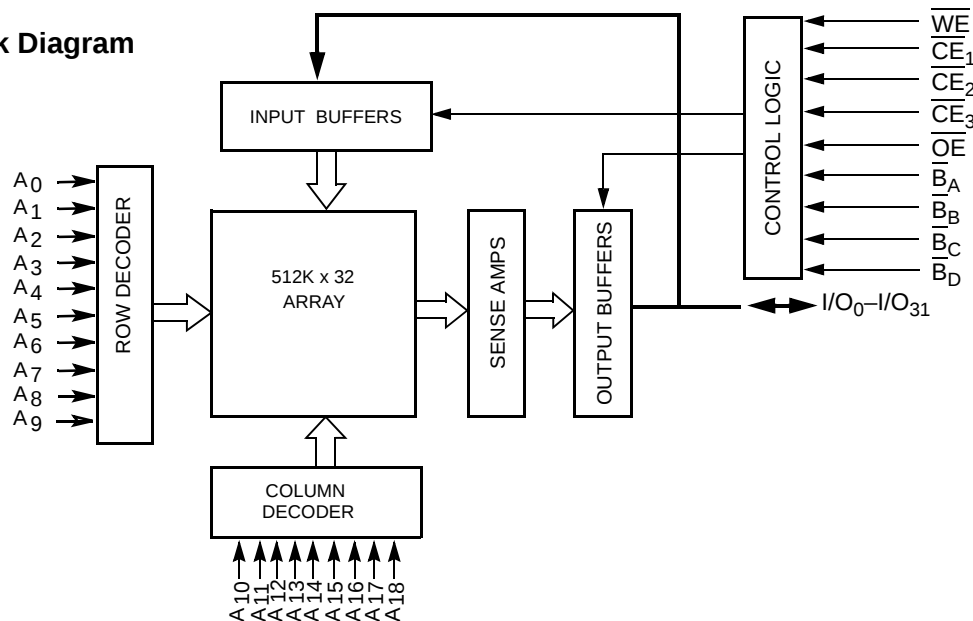
Writing to the device is accomplished by enabling the chip ($\overline{CE}_1$, $\overline{CE}_2$ and $\overline{CE}_3$ LOW) and forcing the Write Enable (WE) input LOW. If Byte Enable A ($\overline{B}_A$) is LOW, then data from I/O pins (I/O_0 through I/O_7), is written into the location specified on the address pins (A_0 through A_{18}). If Byte Enable B ($\overline{B}_B$) 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_{18}). Likewise, $\overline{B}_C$ and $\overline{B}_D$ correspond with the I/O pins I/O_{16} to I/O_{23} and I/O_{24} to I/O_{31} , respectively.

Reading from the device is accomplished by enabling the chip ($\overline{CE}_1$, $\overline{CE}_2$, and $\overline{CE}_3$ LOW) while forcing the Output Enable (OE) LOW and Write Enable (WE) HIGH. If the first Byte Enable ($\overline{B}_A$) 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 Enable B ($\overline{B}_B$) is LOW, then data from memory will appear on I/O_8 to I/O_{15} . Similarly, $\overline{B}_C$ and $\overline{B}_D$ correspond to the third and fourth bytes. See the truth table at the back of this data sheet for a complete description of read and write modes.

The input/output pins (I/O_0 through I/O_{31}) are placed in a high-impedance state when the device is deselected ($\overline{CE}_1$, $\overline{CE}_2$ or $\overline{CE}_3$ HIGH), the outputs are disabled (OE HIGH), the byte selects are disabled ($\overline{B}_{A-D}$ HIGH), or during a write operation ($\overline{CE}_1$, $\overline{CE}_2$, and $\overline{CE}_3$ LOW, and WE LOW).

The CY7C1062AV25 is available in a 119-ball pitch ball grid array (PBGA) package.

Logic Block Diagram



Selection Guide

		-10	Unit
Maximum Access Time		10	ns
Maximum Operating Current	Com'I/Ind'I	275	mA
Maximum CMOS Standby Current	Com'I/Ind'I	50	mA

Pin Configuration
119-ball PBGA
(Top View)

	1	2	3	4	5	6	7
A	I/O ₁₆	A	A	A	A	A	I/O ₀
B	I/O ₁₇	A	A	$\overline{CE}_1$	A	A	I/O ₁
C	I/O ₁₈	$\overline{B}_c$	$\overline{CE}_2$	NC	$\overline{CE}_3$	$\overline{B}_a$	I/O ₂
D	I/O ₁₉	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	I/O ₃
E	I/O ₂₀	V _{SS}	V _{DD}	V _{SS}	V _{DD}	V _{SS}	I/O ₄
F	I/O ₂₁	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	I/O ₅
G	I/O ₂₂	V _{SS}	V _{DD}	V _{SS}	V _{DD}	V _{SS}	I/O ₆
H	I/O ₂₃	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	I/O ₇
J	NC	V _{SS}	V _{DD}	V _{SS}	V _{DD}	V _{SS}	DNU
K	I/O ₂₄	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	I/O ₈
L	I/O ₂₅	V _{SS}	V _{DD}	V _{SS}	V _{DD}	V _{SS}	I/O ₉
M	I/O ₂₆	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	I/O ₁₀
N	I/O ₂₇	V _{SS}	V _{DD}	V _{SS}	V _{DD}	V _{SS}	I/O ₁₁
P	I/O ₂₈	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	I/O ₁₂
R	I/O ₂₉	A	B _d	NC	B _b	A	I/O ₁₃
T	I/O ₃₀	A	A	$\overline{WE}$	A	A	I/O ₁₄
U	I/O ₃₁	A	A	$\overline{OE}$	A	A	I/O ₁₅

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 on V_{CC} Relative to GND^[1] -0.5V to +3.6V

DC Voltage Applied to Outputs
in High-Z State^[1] -0.5V to $V_{CC} + 0.5V$

DC Input Voltage^[1] -0.5V to $V_{CC} + 0.5V$

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	V_{CC}
Commercial	0°C to +70°C	2.5V ± 0.2V
Industrial	-40°C to +85°C	

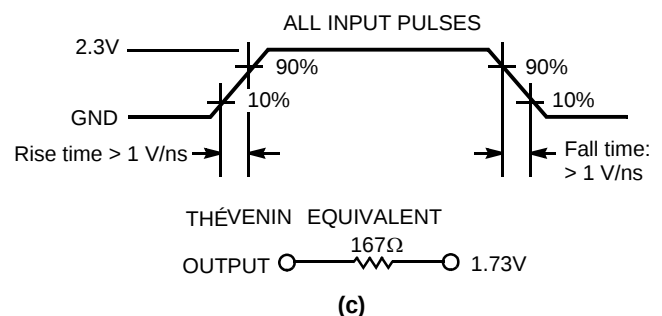
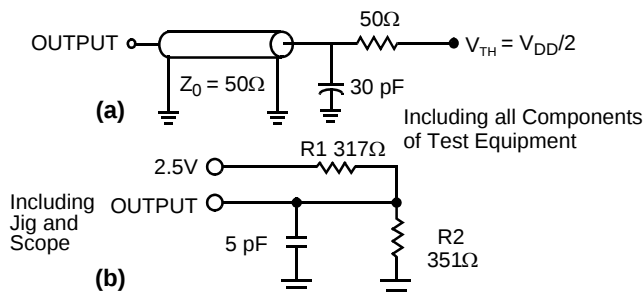
DC Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	-10		Unit
			Min.	Max.	
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -1.0 \text{ mA}$	2.0		V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 1.0 \text{ mA}$		0.4	V
V_{IH}	Input HIGH Voltage		2.0	$V_{CC} + 0.3$	V
V_{IL}	Input LOW Voltage ^[1]		-0.3	0.8	V
I_{IX}	Input Leakage Current	$GND \leq V_I \leq V_{CC}$	-1	+1	μA
I_{OZ}	Output Leakage Current	$GND \leq V_{OUT} \leq V_{CC}$, Output Disabled	-1	+1	μA
I_{CC}	V_{CC} Operating Supply Current	$V_{CC} = \text{Max.}, f = f_{MAX} = 1/t_{RC}$		275	mA
I_{SB1}	Automatic CE Power-down Current—TTL Inputs	Max. $V_{CC}, \overline{CE} \geq V_{IH}, V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}, f = f_{MAX}$		100	mA
I_{SB2}	Automatic CE Power-down Current —CMOS Inputs	Max. $V_{CC}, \overline{CE} \geq V_{CC} - 0.2V, V_{IN} \geq V_{CC} - 0.2V$, or $V_{IN} \leq 0.2V, f = 0$		50	mA

Capacitance^[2]

Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	$T_A = 25^\circ\text{C}, f = 1 \text{ MHz}, V_{CC} = 2.5V$	8	pF
C_{OUT}	I/O Capacitance		10	pF

AC Test Loads and Waveforms^[3]



Notes:

- $V_{IL} (\text{min.}) = -2.0V$ for pulse durations of less than 20 ns.
- Tested initially and after any design or process changes that may affect these parameters.
- Valid SRAM operation does not occur until the power supplies have reached the minimum operating V_{DD} (2.3V). As soon as 1ms (T_{power}) after reaching the minimum operating V_{DD} , normal SRAM operation can begin including reduction in V_{DD} to the data retention (V_{CCDR} , 1.5V) voltage.

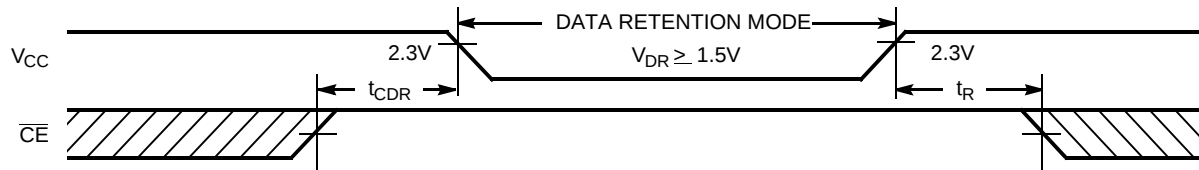
AC Switching Characteristics Over the Operating Range^[4]

Parameter	Description	–10		Unit
		Min.	Max.	
Read Cycle				
t _{power}	V _{CC} (typical) to the first access ^[5]	1		ms
t _{RC}	Read Cycle Time	10		ns
t _{AA}	Address to Data Valid		10	ns
t _{OHA}	Data Hold from Address Change	3		ns
t _{ACE}	$\overline{\text{CE}}_1$, $\overline{\text{CE}}_2$, or $\overline{\text{CE}}_3$ LOW to Data Valid		10	ns
t _{DOE}	$\overline{\text{OE}}$ LOW to Data Valid		5	ns
t _{LZOE}	$\overline{\text{OE}}$ LOW to Low-Z ^[6]	1		ns
t _{HZOE}	$\overline{\text{OE}}$ HIGH to High-Z ^[6]		5	ns
t _{LZCE}	$\overline{\text{CE}}_1$, $\overline{\text{CE}}_2$, or $\overline{\text{CE}}_3$ LOW to Low-Z ^[6]	3		ns
t _{HZCE}	$\overline{\text{CE}}_1$, $\overline{\text{CE}}_2$, or $\overline{\text{CE}}_3$ HIGH to High-Z ^[6]		5	ns
t _{PU}	$\overline{\text{CE}}_1$, $\overline{\text{CE}}_2$, or $\overline{\text{CE}}_3$ LOW to Power-up ^[7]	0		ns
t _{PD}	$\overline{\text{CE}}_1$, $\overline{\text{CE}}_2$, or $\overline{\text{CE}}_3$ HIGH to Power-down ^[7]		10	ns
t _{DBE}	Byte Enable to Data Valid		5	ns
t _{LZBE}	Byte Enable to Low-Z ^[6]	1		ns
t _{HZBE}	Byte Disable to High-Z ^[6]		5	ns
Write Cycle ^[8, 9]				
t _{WC}	Write Cycle Time	10		ns
t _{SCE}	$\overline{\text{CE}}_1$, $\overline{\text{CE}}_2$, or $\overline{\text{CE}}_3$ LOW to Write End	7		ns
t _{AW}	Address Set-up to Write End	7		ns
t _{HA}	Address Hold from Write End	0		ns
t _{SA}	Address Set-up to Write Start	0		ns
t _{PWE}	$\overline{\text{WE}}$ Pulse Width	7		ns
t _{SD}	Data Set-up to Write End	5.5		ns
t _{HD}	Data Hold from Write End	0		ns
t _{LZWE}	$\overline{\text{WE}}$ HIGH to Low-Z ^[6]	3		ns
t _{HZWE}	$\overline{\text{WE}}$ LOW to High-Z ^[6]		5	ns
t _{BW}	Byte Enable to End of Write	7		ns

Notes:

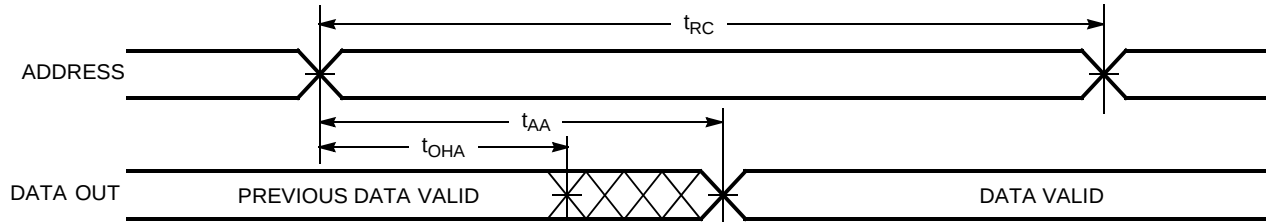
- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.1V, input pulse levels of 0 to 2.3V, and output loading of the specified $I_{\text{OL}}/I_{\text{OH}}$ and transmission line loads. Test conditions for the read cycle use output loading as shown in (a) of AC Test Loads, unless specified otherwise.
- This part has a voltage regulator that steps down the voltage from 2.3V to 2V internally. t_{power} time has to be provided initially before a read/write operation is started.
- t_{HZOE} , t_{HZCE} , t_{HZWE} , t_{HZBE} , and t_{LZOE} , t_{LZCE} , t_{LZWE} , and t_{LZBE} are specified with a load capacitance of 5 pF as in (b) of AC Test Loads. Transition is measured ± 200 mV from steady-state voltage.
- These parameters are guaranteed by design and are not tested.
- The internal write time of the memory is defined by the overlap of $\overline{\text{CE}}_1$ LOW, $\overline{\text{CE}}_2$ HIGH, $\overline{\text{CE}}_3$ LOW, and $\overline{\text{WE}}$ LOW. The chip enables must be active and $\overline{\text{WE}}$ must be LOW to initiate a write, and the transition of any of these signals can terminate the write. The input data set-up and hold timing should be referenced to the leading edge of the signal that terminates the write.
- The minimum write cycle time for Write Cycle No. 3 ($\overline{\text{WE}}$ controlled, $\overline{\text{OE}}$ LOW) is the sum of t_{HZWE} and t_{SD} .

Data Retention Waveform

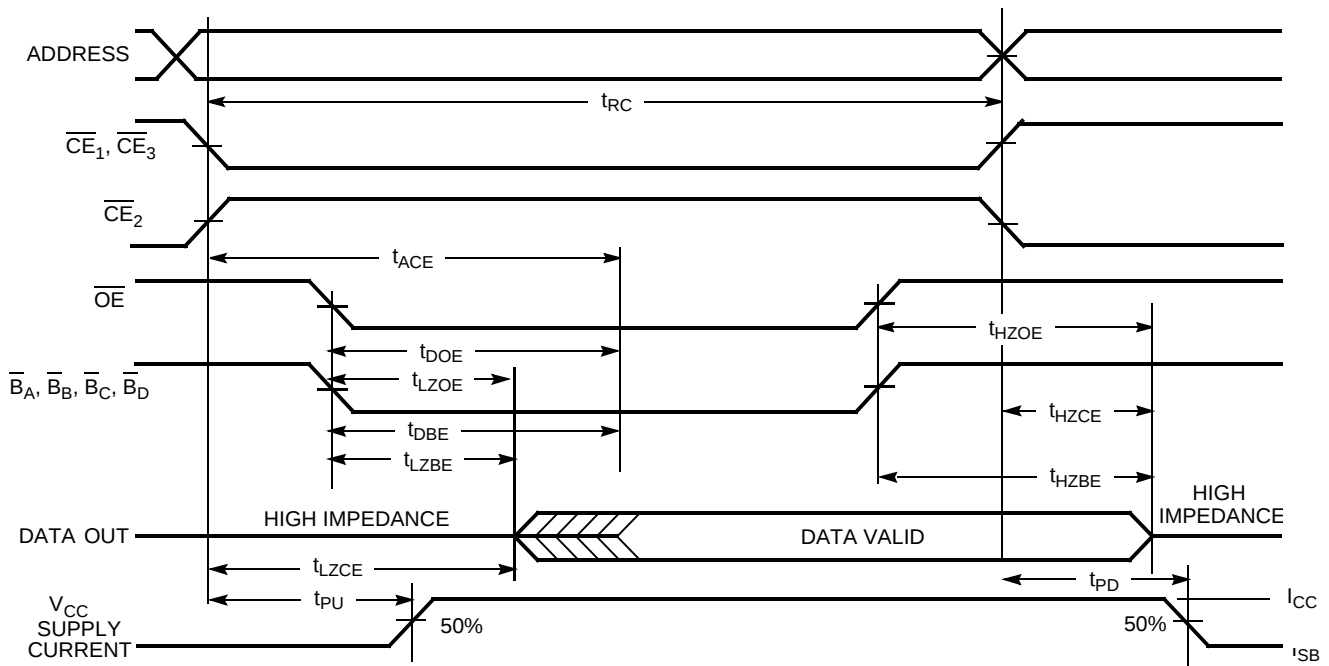


Switching Waveforms

Read Cycle No. 1^[11,12]



Read Cycle No. 2 ($\overline{OE}$ Controlled)^[11,13]

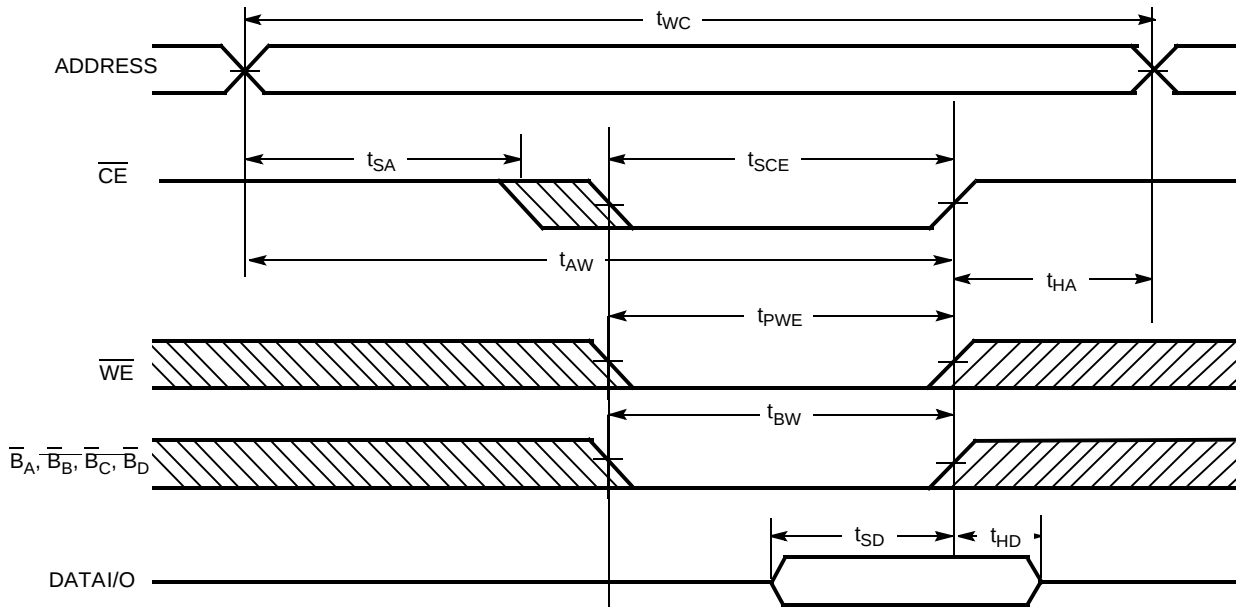


Notes:

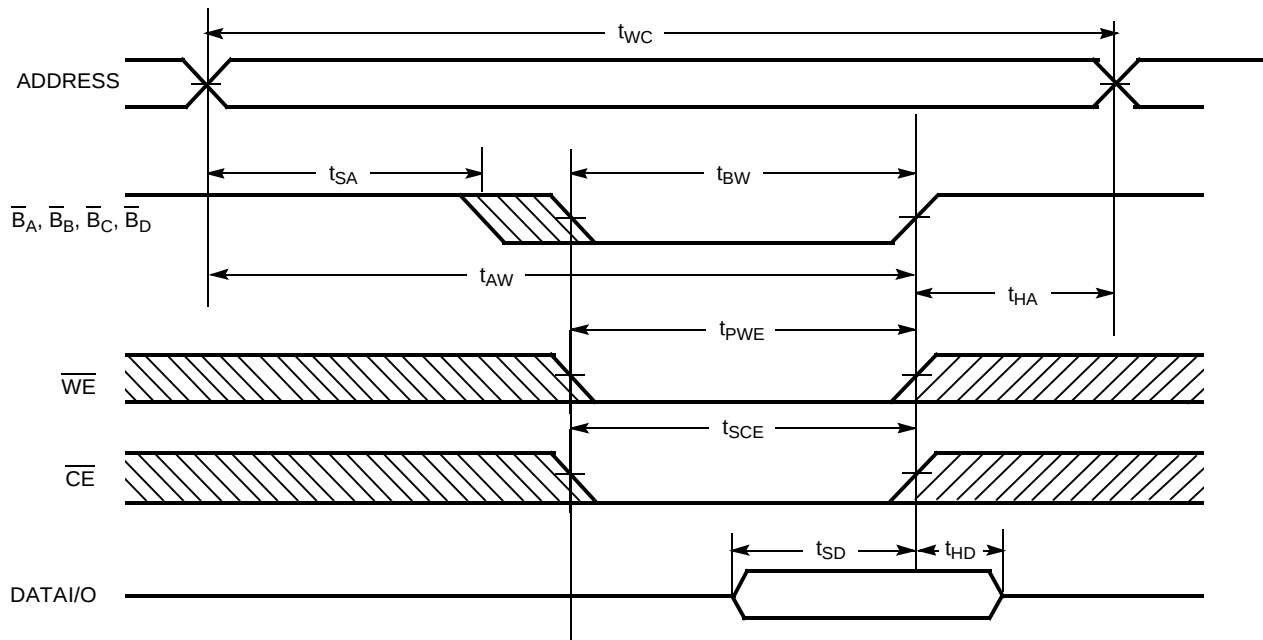
10. Full device operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(min.)} \geq 100 \mu s$ or stable at $V_{CC(min.)} \geq 100 \mu s$
11. Device is continuously selected. $\overline{OE}, \overline{CE}, \overline{B}_A, \overline{B}_B, \overline{B}_C, \overline{B}_D = V_{IL}$.
12. $\overline{WE}$ is HIGH for read cycle.
13. Address valid prior to or coincident with $\overline{CE}$ transition LOW.

Switching Waveforms

Write Cycle No. 1 ($\overline{\text{CE}}$ Controlled)^[14,15,16]



Write Cycle No. 2 ($\overline{\text{BLE}}$ or $\overline{\text{BHE}}$ Controlled)^[14,15,16]

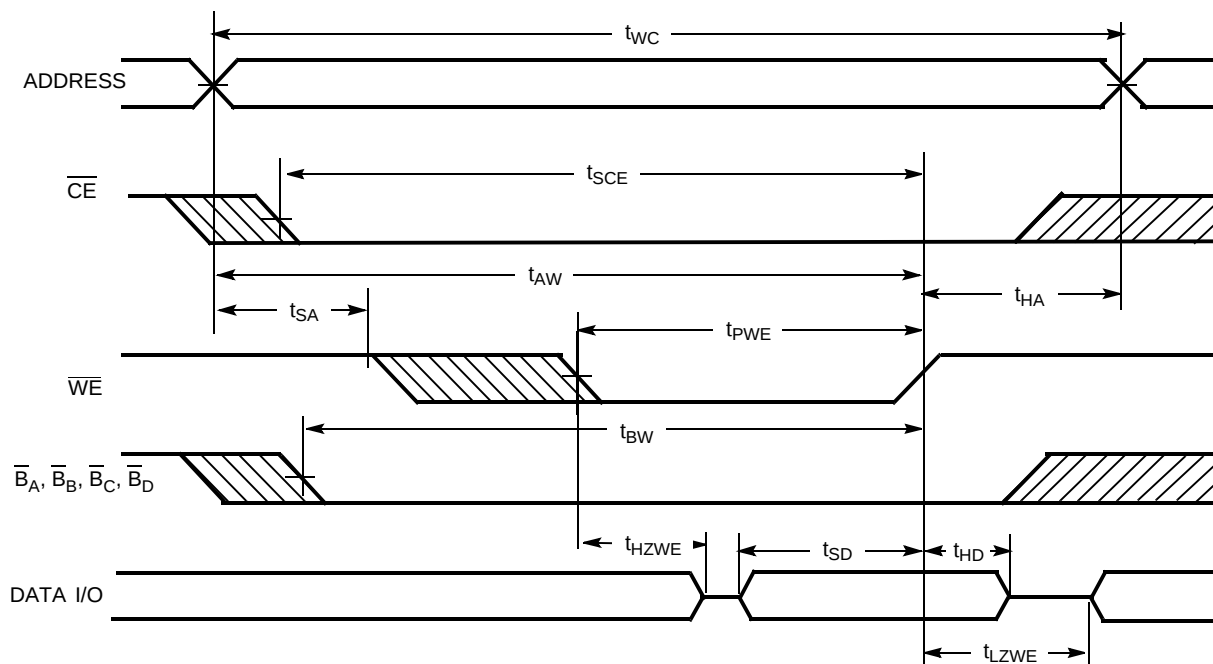


Notes:

14. $\overline{\text{CE}}$ indicates a combination of all three chip enables. When ACTIVE LOW, $\overline{\text{CE}}$ indicates the $\overline{\text{CE}}_1$, $\overline{\text{CE}}_2$ and $\overline{\text{CE}}_3$ are LOW.
15. Data I/O is high-impedance if $\overline{\text{OE}}$ or $\overline{\text{B}}_{\text{A}}, \overline{\text{B}}_{\text{B}}, \overline{\text{B}}_{\text{C}}, \overline{\text{B}}_{\text{D}} = V_{\text{IH}}$.
16. If $\overline{\text{CE}}$ goes HIGH simultaneously with $\overline{\text{WE}}$ going HIGH, the output remains in a high-impedance state.

Switching Waveforms

Write Cycle No. 3 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW)



Truth Table

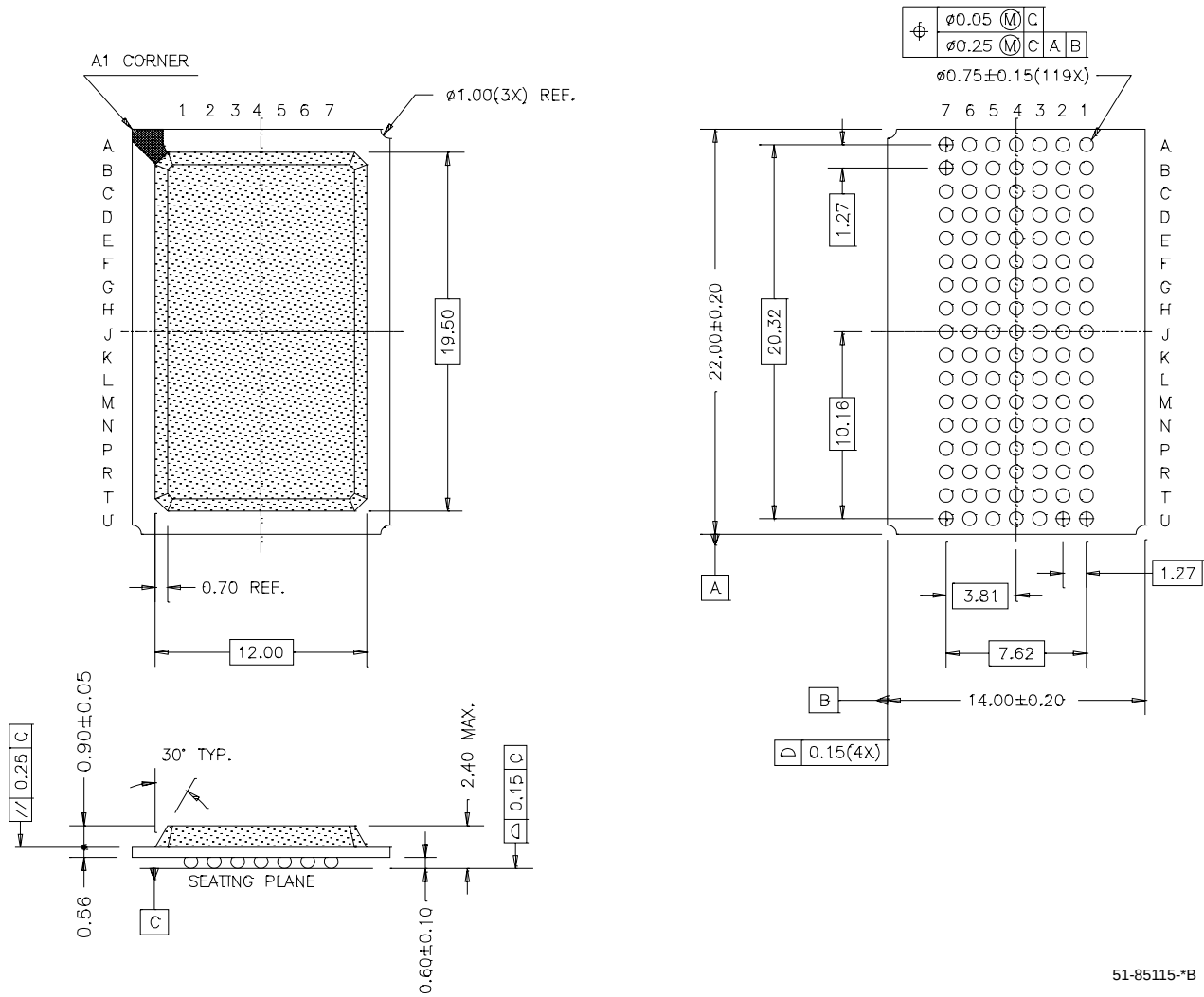
$\overline{\text{CE}}_1$	$\overline{\text{CE}}_2$	$\overline{\text{CE}}_3$	$\overline{\text{OE}}$	$\overline{\text{WE}}$	$\overline{\text{B}}_A$	$\overline{\text{B}}_B$	$\overline{\text{B}}_C$	$\overline{\text{B}}_D$	I/O ₀₋₇	I/O ₈₋₁₅	I/O ₁₆₋₂₃	I/O ₂₄₋₃₁	Mode	Power
H	H	H	X	X	X	X	X	X	High-Z	High-Z	High-Z	High-Z	Power Down	(I _{SB})
L	H	L	X	X	X	X	X	X	High-Z	High-Z	High-Z	High-Z	Power Down	(I _{SB})
L	L	L	L	H	L	L	L	L	Data Out	Data Out	Data Out	Data Out	Read All Bits	(I _{CC})
L	L	L	L	H	L	H	H	H	Data Out	High-Z	High-Z	High-Z	Read Byte A Bits Only	(I _{CC})
L	L	L	L	H	H	L	H	H	High-Z	Data Out	High-Z	High-Z	Read Byte B Bits Only	(I _{CC})
L	L	L	L	H	H	H	L	H	High-Z	High-Z	Data Out	High-Z	Read Byte C Bits Only	(I _{CC})
L	L	L	L	H	H	H	H	L	High-Z	High-Z	High-Z	Data Out	Read Byte D Bits Only	(I _{CC})
L	L	L	X	L	L	L	L	L	Data In	Data In	Data In	Data In	Write All Bits	(I _{CC})
L	L	L	X	L	L	H	H	H	Data In	High-Z	High-Z	High-Z	Write Byte A Bits Only	(I _{CC})
L	L	L	X	L	H	L	H	H	High-Z	Data In	High-Z	High-Z	Write Byte B Bits Only	(I _{CC})
L	L	L	X	L	H	H	L	H	High-Z	High-Z	Data In	High-Z	Write Byte C Bits Only	(I _{CC})
L	L	L	X	L	H	H	H	L	High-Z	High-Z	High-Z	Data In	Write Byte D Bits Only	(I _{CC})
L	L	L	H	H	X	X	X	X	High-Z	High-Z	High-Z	High-Z	Selected, Outputs Disabled	(I _{CC})

Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
10	CY7C1062AV25-10BGC	51-85115	119-ball Plastic Ball Grid Array (14 x 22 x 2.4 mm)	Commercial
	CY7C1062AV25-10BGI			Industrial

Package Diagram

119-ball PBGA (14 x 22 x 2.4 mm) (51-85115)



51-85115-*B

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Document History Page

Document Title: CY7C1062AV25 512K x 32 Static RAM Document Number: 38-05333				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	119626	01/29/03	DFP	New Data Sheet
*A	493565	See ECN	NXR	Converted from Preliminary to Final Removed -8 and -10 speed bins Changed the description of I_{IX} from Input Load Current to Input Leakage Current in DC Electrical Characteristics table Updated the ordering information table