

BGA
Commercial Temp
Industrial Temp

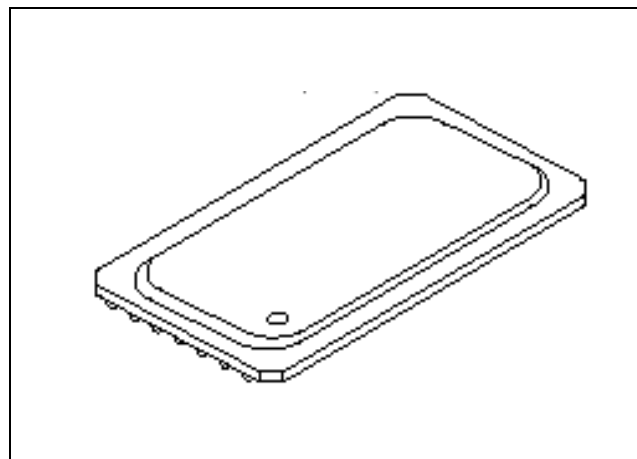
256K x 24 6Mb Asynchronous SRAM

10, 12, 15ns
3.3V V_{DD}

Features

- Fast access time: 10, 12, 15ns
- CMOS low power operation: 290/260/220 mA at min. cycle time.
- Single 3.3V $\pm$ 0.3V power supply
- All inputs and outputs are TTL compatible
- Fully static operation
- Industrial Temperature Option: -40 to 85°C
- Package
 - B: 14mm x 22mm, 119 bump, 1.27mm pitch BGA

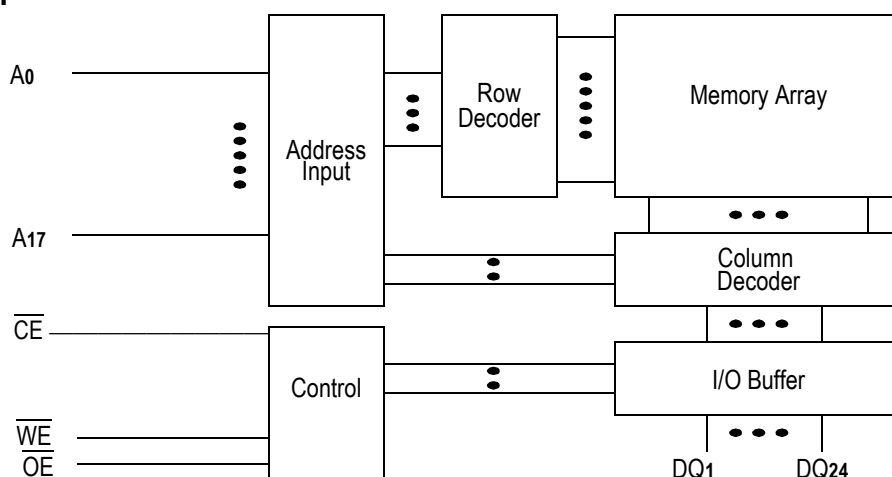
119 Bump Ball Grid Array Package



Description

The GS76024 is a high speed CMOS static RAM organized as 262,144 words by 24 bits. Static design eliminates the need for external clocks or timing strobes. Operating on a single 3.3V power supply and all inputs and outputs are TTL compatible. The GS76024 is available in a 119 Bump BGA package.

Block Diagram



Pin Descriptions

Symbol	Description	Symbol	Description
A0 to A17	Address input	DQ1 to DQ24	Data input/output
WE	Write enable input	OE	Output enable input
CE	Chip enable input		
VDD	+3.3V power supply	Vss	Ground

119 Bump, 1.27mm Pitch BGA Pad Out
Top View

	1	2	3	4	5	6	7
A	NC	A3	A2	A16	A1	A0	NC
B	NC	A7	A6	$\overline{\text{CE}}$	A5	A4	NC
C	DQ13	NC	V _{DD} , NC	A17	V _{SS} , NC	NC	DQ12
D	DQ14	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	DQ11
E	DQ15	NC	V _{DD}	V _{SS}	V _{DD}	NC	DQ10
F	DQ16	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	DQ9
G	DQ17	NC	V _{DD}	V _{SS}	V _{DD}	NC	DQ8
H	DQ18	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	DQ7
J	V _{DD}	V _{SS}	V _{DD}	V _{SS}	V _{DD}	V _{SS}	V _{DD}
K	DQ19	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	DQ6
L	DQ20	NC	V _{DD}	V _{SS}	V _{DD}	NC	DQ5
M	DQ21	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	DQ4
N	DQ22	NC	V _{DD}	V _{SS}	V _{DD}	NC	DQ3
P	DQ23	V _{DD}	V _{SS}	V _{SS}	V _{SS}	V _{DD}	DQ2
R	DQ24	NC	NC	NC	NC	NC	DQ1
T	NC	A11	A10	$\overline{\text{WE}}$	A9	A8	NC
U	NC	A15	A14	$\overline{\text{OE}}$	A13	A12	NC

Note: Bumps 3C and 5C are actually NC's but should be wired 3C=V_{DD} and 5C=V_{SS} to assure compatibility with future versions.

Truth Table

$\overline{\text{CE}}$	$\overline{\text{OE}}$	$\overline{\text{WE}}$	Mode	DQ0 to DQ23	V_{DD} Current
H	X	X	Not selected	High Z	ISB1, ISB2
L	L	H	Read	Data Out	I_{DD}
L	X	L	Write	Data In	
L	H	H	Output disable	High Z	

X: "H" or "L"

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{DD}	-0.5 to +4.6	V
Input Voltage	V_{IN}	-0.5 to $V_{\text{DD}}+0.5$ ($\leq 4.6\text{V max.}$)	V
Output Voltage	V_{OUT}	-0.5 to $V_{\text{DD}}+0.5$ ($\leq 4.6\text{V max.}$)	V
Allowable BGA power dissipation	PD	1.5	W
Storage temperature	T_{STG}	-55 to 150	$^{\circ}\text{C}$

Note:

Permanent device damage may occur if Absolute Maximum Ratings are exceeded. Functional operation shall be restricted to Recommended Operating Conditions. Exposure to higher than recommended voltages for extended periods of time could affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage for -10/12/15	V_{DD}	3.0	3.3	3.6	V
Input High Voltage	V_{IH}	2.0	-	$V_{\text{DD}}+0.3$	V
Input Low Voltage	V_{IL}	-0.3	-	0.8	V
Ambient Temperature, Commercial Range	T_{Ac}	0	-	70	$^{\circ}\text{C}$
Ambient Temperature, Industrial Range	T_{Ai}	-40	-	85	$^{\circ}\text{C}$

Note:

1. Input overshoot voltage should be less than $V_{\text{DD}}+2\text{V}$ and not exceed 20ns.
2. Input undershoot voltage should be greater than -2V and not exceed 20ns.

Capacitance

Parameter	Symbol	Test Condition	Max	Unit
Input Capacitance	C_{IN}	$V_{IN}=0V$	10	pF
I/O Capacitance	C_{OUT}	$V_{OUT}=0V$	7	pF

Notes:

1. Tested at $T_A=25^{\circ}C$, $f=1MHz$
2. These parameters are sampled and are not 100% tested

DC I/O Pin Characteristics

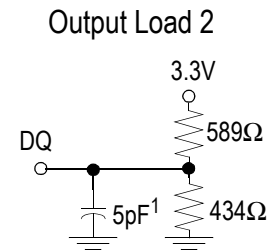
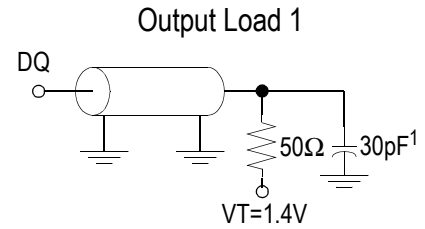
Parameter	Symbol	Test Conditions	Min	Max
Input Leakage Current	I_{IL}	$V_{IN} = 0 \text{ to } V_{DD}$	-2uA	2uA
Output Leakage Current	I_{OL}	Output High Z, $V_{OUT} = 0 \text{ to } V_{DD}$	-1uA	1uA
Output High Voltage	V_{OH}	$I_{OH} = -4mA$	2.4	
Output Low Voltage	V_{OL}	$I_{OL} = +4mA$		0.4V

AC Test Conditions

Parameter	Conditions
Input high level	$V_{IH}=2.4V$
Input low level	$V_{IL}=0.4V$
Input rise time	$t_r=1V/ns$
Input fall time	$t_f=1V/ns$
Input reference level	1.4V
Output reference level	1.4V
Output load	Fig. 1 & 2

Note:

1. Include scope and jig capacitance.
2. Test conditions as specified with output loading as shown in Fig. 1 unless otherwise noted
3. Output load 2 for t_{LZ} , t_{HZ} , t_{OLZ} and t_{OHZ} .



Power Supply Currents

Parameter	Symbol	Test Conditions	0 to 70°C			-40 to 85°C		
			10ns	12ns	15ns	10ns	12ns	15ns
Operating Supply Current	I_{DD}	$\overline{CE} \leq V_{IL}$ All other inputs $\geq V_{IH}$ or $\leq V_{IL}$ Min. cycle time $I_{OUT} = 0 \text{ mA}$	290mA	260mA	220mA	310mA	280mA	240mA
Standby Current	I_{SB1}	$\overline{CE} \geq V_{IH}$ All other inputs $\geq V_{IH}$ or $\leq V_{IL}$ Min. cycle time	130mA	120mA	110mA	150mA	140mA	130mA
Standby Current	I_{SB2}	$CE \geq V_{DD} - 0.2V$ All other inputs $\geq V_{DD} - 0.2V$ or $\leq 0.2V$	60			80mA		

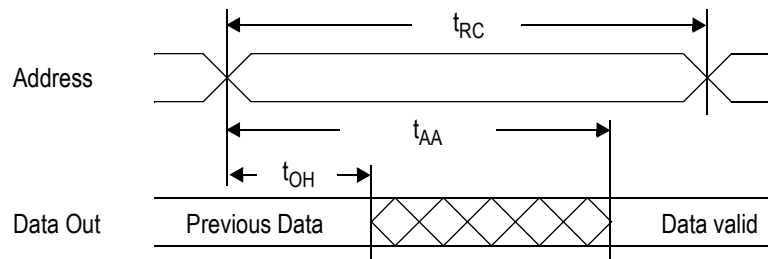
AC Characteristics

Read Cycle

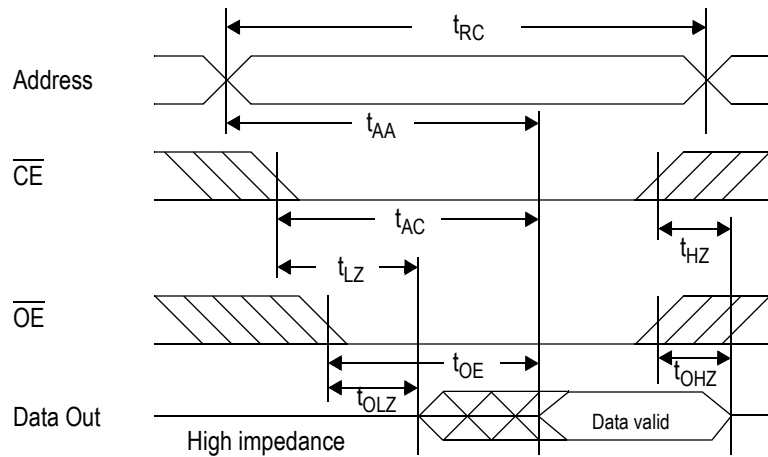
Parameter	Symbol	-10		-12		-15		Unit
		Min	Max	Min	Max	Min	Max	
Read cycle time	t_{RC}	10	---	12	---	15	---	ns
Address access time	t_{AA}	---	10	---	12	---	15	ns
Chip enable access time ($\overline{CE}$)	t_{AC}	---	10	---	12	---	15	ns
Output enable to output valid ($\overline{OE}$)	t_{OE}	---	5	---	6	---	7	ns
Output hold from address change	t_{OH}	3	---	3	---	3	---	ns
Chip enable to output in low Z ($\overline{CE}$)	t_{LZ}^*	3	---	3	---	3	---	ns
Output enable to output in low Z ($\overline{OE}$)	t_{OLZ}^*	0	---	0	---	0	---	ns
Chip disable to output in High Z ($\overline{CE}$)	t_{HZ}^*	---	5	---	6	---	7	ns
Output disable to output in High Z ($\overline{OE}$)	t_{OHZ}^*	---	5	---	6	---	7	ns

* These parameters are sampled and are not 100% tested

Read Cycle 1: $\overline{CE} = \overline{OE} = V_{IL}$, $\overline{WE} = V_{IH}$



Read Cycle 2: $\overline{WE} = V_{IH}$

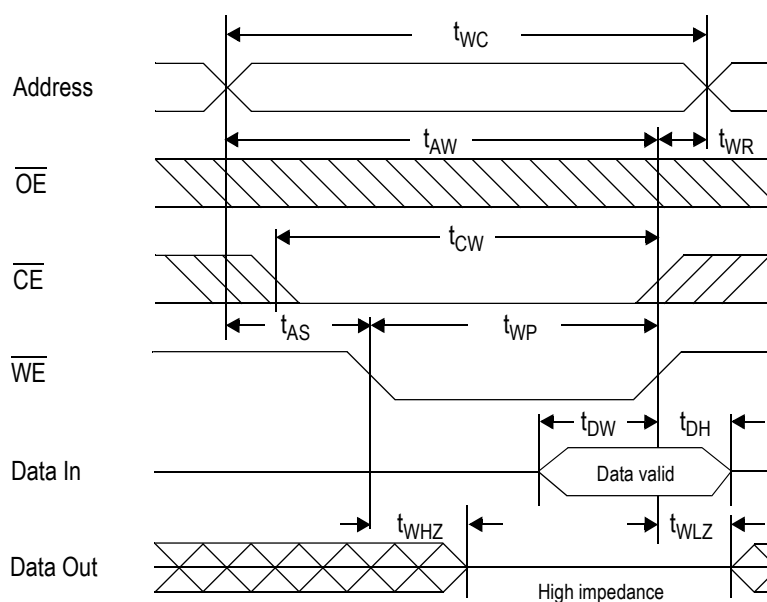


Write Cycle

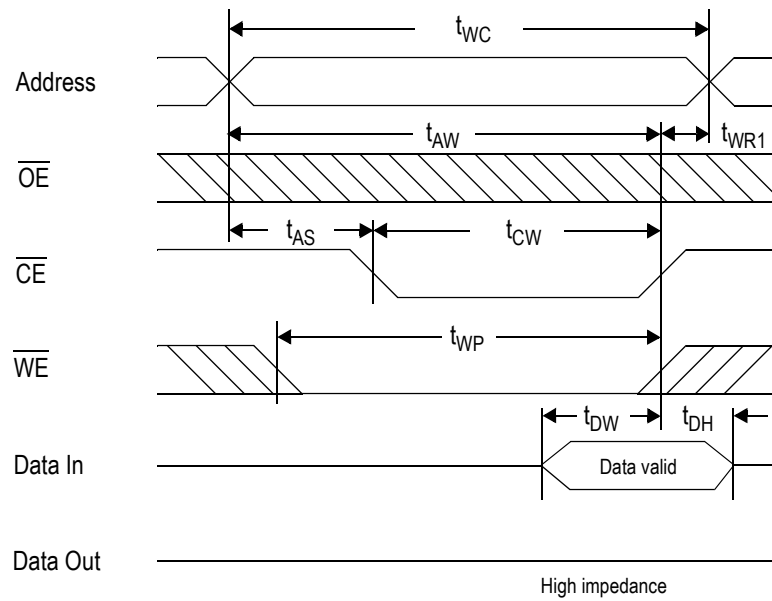
Parameter	Symbol	-10		-12		-15		Unit
		Min	Max	Min	Max	Min	Max	
Write cycle time	t_{WC}	10	---	12	---	15	---	ns
Address valid to end of write	t_{AW}	7	---	8	---	10	---	ns
Chip enable to end of write ($\overline{CE}$)	t_{CW}	7	---	8	---	10	---	ns
Data set up time	t_{DW}	5	---	6	---	7	---	ns
Data hold time	t_{DH}	0	---	0	---	0	---	ns
Write pulse width	t_{WP}	7	---	8	---	10	---	ns
Address set up time	t_{AS}	0	---	0	---	0	---	ns
Write recovery time ($\overline{WE}$)	t_{WR}	0	---	0	---	0	---	ns
Write recovery time ($\overline{CE}$)	t_{WR1}	0	---	0	---	0	---	ns
Output Low Z from end of write	t_{WLZ}^*	3	---	3	---	3	---	ns
Write to output in High Z	t_{WHZ}^*	---	5	---	6	---	7	ns

* These parameters are sampled and are not 100% tested

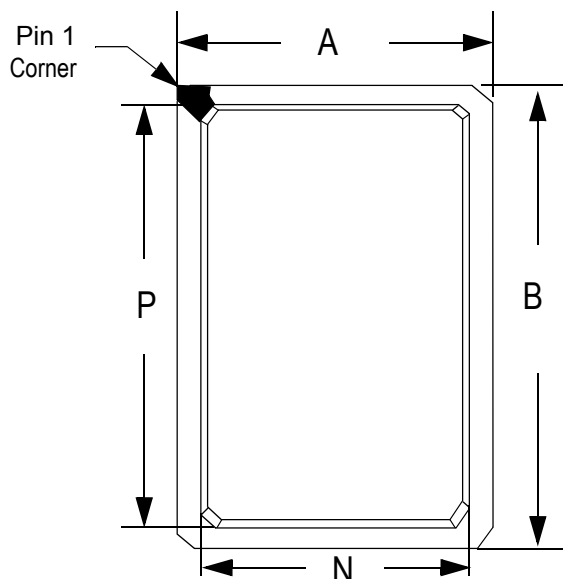
Write Cycle 1: $\overline{WE}$ control



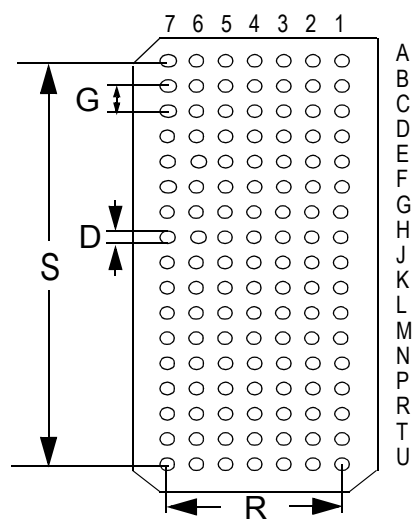
Write Cycle 2: $\overline{\text{CE}}$ control



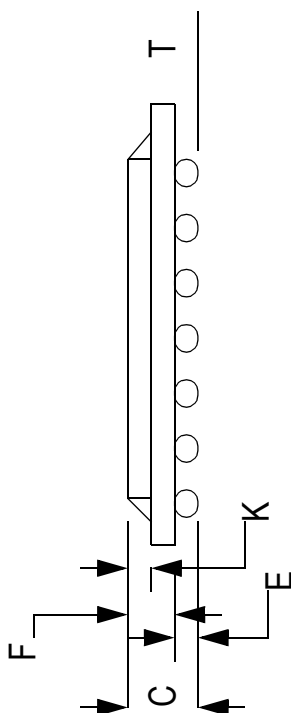
Package Dimensions - 119 Pin PBGA



Top View



Bottom View



Side View

Package Admissions - 119 Pin PBGA

Symbol	Description	Min.	Nom.	Max
A	Width	13.8	14.0	14.2
B	Length	21.8	22.0	22.2
C	Package Height (including ball)	-		2.40
D	Ball Size	0.60	0.75	0.90
E	Ball Height	0.50	0.60	0.70
F	Package Height (excluding balls)		1.46	1.70
G	Width between Balls		1.27	
K	Package Height above board	0.80	0.90	1.00
N	Cut-out Package Width		12.00	
P	Foot Length		19.50	
R	Width of package between balls		7.62	
S	Length of package between balls		20.32	
T	Variance of Ball Height		0.15	

Unit: mm

BPR 1999.05.18

Ordering Information

Part Number	Package	Access Time	Temp. Range	Status
GS76024B-10	119 Bump BGA	10 ns	Commercial	
GS76024B-12	119 Bump BGA	12 ns	Commercial	
GS76024B-15	119 Bump BGA	15 ns	Commercial	
GS76024B-10I	119 Bump BGA	10 ns	Industrial	
GS76024B-12I	119 Bump BGA	12 ns	Industrial	
GS76024B-15I	119 Bump BGA	15 ns	Industrial	

* Customers requiring Tape and Reel should add the character "T" to the end of the part number. For example: GS76024B-12T

Revision History

Rev. Code: Old; New	Types of Changes Format or Content	Page/Revisions/Reason
GS76024Rev 2:17pm, 4/8/1999; 1.00a5/1999	Format/Typos	- Document Changed subscripts to small caps. - Document/Replaced "micro" with "fine pitch".
	Content	- Ordering Information/Added Tape and Reel Note/Enhancement - Pin Description/Changed A0 - A14 to A0 - A17/Correction - Page 1/Took out "Byte Control" from Features/Correction - Document/Removed 8n version from Datasheet/Product not offered. - Package Diagram/Added "n" to Dimensions.
GS76024Rev1.01a5/ 1999C;Rev1.012/2000D	Format	GSI Logo