BGA
Commercial Temp
Industrial Temp

256K x 32
8Mb Asynchronous SRAM

8, 10, 12 ns
3.3 V V_{DD}

Features

- Fast access time: 8, 10, 12 ns
- CMOS low power operation: 260/210/180 mA at minimum cycle time
- Single 3.3 V ± 0.3 V power supply
- All inputs and outputs are TTL-compatible
- Byte control
- Fully static operation
- Industrial Temperature Option: –40° to 85°C
- 14 mm x 22 mm, 119-bump, 1.27 mm Pitch Ball Grid Array package
- RoHS-compliant package available

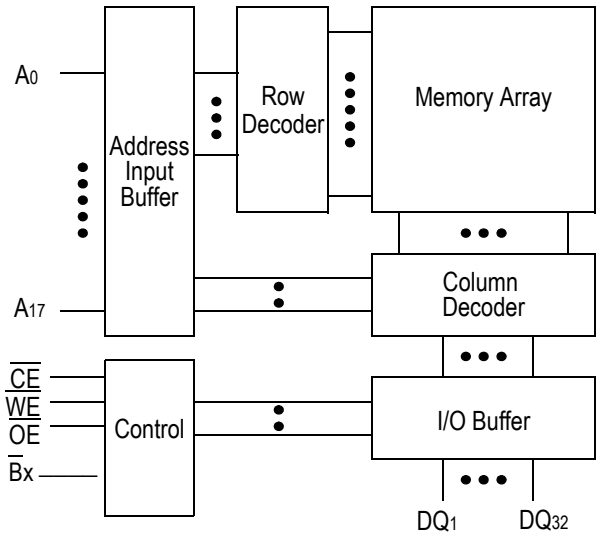
Description

The GS78132A is a high speed CMOS Static RAM organized as 262,144-words by 32-bits. Static design eliminates the need for external clocks or timing strobes. The GS78132A operates on a single 3.3 V power supply, and all inputs and outputs are TTL-compatible. The GS78132A is available in a 14 mm x 22 mm BGA package.

Pin Descriptions

Symbol	Description
A_0 to A_{17}	Address input
$\overline{CE}$	Chip enable input
DQ_{A1} TO DQ_{A8}	Byte A Data input/output
DQ_{B1} TO DQ_{B8}	Byte B Data input/output
DQ_{C1} TO DQ_{C8}	Byte C Data input/output
DQ_{D1} TO DQ_{D8}	Byte D Data input/output
$\overline{B}_A$	Byte A Byte enable input
$\overline{B}_B$	Byte B Byte enable input
$\overline{B}_C$	Byte C Byte enable input
$\overline{B}_D$	Byte D Byte enable input
$\overline{WE}$	Write enable input
$\overline{OE}$	Output enable input
V_{DD}	+3.3 V power supply
V_{SS}	Ground
NC	No connect

Block Diagram



256K x 32 Async SRAM in 119-bump, 14 mm x 22 mm BGA—Top View (Package B)

	1	2	3	4	5	6	7
A	NC	A_{15}	A_{14}	A_{16}	A_{13}	A_{12}	NC
B	$\overline{B}_C$	A_{11}	A_{10}	$\overline{CE}$	A_9	A_8	$\overline{B}_B$
C	DQ_{C6}	NC	V_{DD}, NC	A_{17}	V_{SS}, NC	NC	DQ_{B6}
D	DQ_{C5}	V_{DD}	V_{SS}	V_{SS}	V_{SS}	V_{DD}	DQ_{B5}
E	DQ_{C4}	DQ_{C8}	V_{DD}	V_{SS}	V_{DD}	DQ_{B8}	DQ_{B4}
F	DQ_{C3}	V_{DD}	V_{SS}	V_{SS}	V_{SS}	V_{DD}	DQ_{B3}
G	DQ_{C2}	DQ_{C7}	V_{DD}	V_{SS}	V_{DD}	DQ_{B7}	DQ_{B2}
H	DQ_{C1}	V_{DD}	V_{SS}	V_{SS}	V_{SS}	V_{DD}	DQ_{B1}
J	V_{DD}	V_{SS}	V_{DD}	V_{SS}	V_{DD}	V_{SS}	V_{DD}
K	DQ_{D1}	V_{DD}	V_{SS}	V_{SS}	V_{SS}	V_{DD}	DQ_{A1}
L	DQ_{D2}	DQ_{D7}	V_{DD}	V_{SS}	V_{DD}	DQ_{A7}	DQ_{A2}
M	DQ_{D3}	V_{DD}	V_{SS}	V_{SS}	V_{SS}	V_{DD}	DQ_{A3}
N	DQ_{D4}	DQ_{D8}	V_{DD}	V_{SS}	V_{DD}	DQ_{A8}	DQ_{A4}
P	DQ_{D5}	V_{DD}	V_{SS}	V_{SS}	V_{SS}	V_{DD}	DQ_{A5}
R	DQ_{D6}	NC	NC	NC	NC	NC	DQ_{A6}
T	$\overline{B}_D$	A_7	A_6	$\overline{WE}$	A_5	A_4	$\overline{B}_A$
U	NC	A_3	A_2	$\overline{OE}$	A_1	A_0	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

$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	$\overline{B}_A$	$\overline{B}_B$	$\overline{B}_C$	$\overline{B}_D$	DQ_{A1-A8}	DQ_{B1-B8}	DQ_{C1-C8}	DQ_{D1-D8}	Supply Current
H	X	X	X	X	X	X	Not Selected	Not Selected	Not Selected	Not Selected	ISB1, ISB2
L	L	H	L	L	L	L	Read	Read	Read	Read	I_{DD}
			H	L	L	L	High Z	Read	Read	Read	
			L	H	L	L	Read	High Z	Read	Read	
			L	L	H	L	Read	Read	High Z	Read	
			L	L	L	H	Read	Read	Read	High Z	
L	X	L	L	L	L	L	Write	Write	Write	Write	
			H	L	L	L	High Z	Write	Write	Write	
			L	H	L	L	Write	High Z	Write	Write	
			L	L	H	L	Write	Write	High Z	Write	
			L	L	L	H	Write	Write	Write	High	
L	H	H	X	X	X	X	High Z	High Z	High Z	High Z	
L	X	X	H	H	H	H	High Z	High Z	High Z	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_{DD} +0.5 (≤ 4.6 V max.)	V
Output Voltage	V_{OUT}	–0.5 to V_{DD} +0.5 (≤ 4.6 V max.)	V
Allowable power dissipation	PD	1.5	W
Storage temperature	T_{STG}	–55 to 150	°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 -8/10/12	V_{DD}	3.0	3.3	3.6	V
Input High Voltage	V_{IH}	2.0	—	V_{DD} +0.3	V
Input Low Voltage	V_{IL}	–0.3	—	0.8	V
Ambient Temperature, Commercial Range	T_{Ac}	0	—	70	°C
Ambient Temperature, Industrial Range	T_{Ai}	–40	—	85	°C

Notes:
1. Input overshoot voltage should be less than V_{DD} +2 V and not exceed 20 ns.
2. Input undershoot voltage should be greater than –2 V and not exceed 20 ns.

Capacitance

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

Notes:
1. Tested at T_A = 25°C, f = 1 MHz
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 to V_{DD}	–2 uA	2 uA
Output Leakage Current	I_{OL}	Output High Z, V_{OUT} = 0 to V_{DD}	–1 uA	1 uA
Output High Voltage	V_{OH}	I_{OH} = –4 mA	2.4	
Output Low Voltage	V_{OL}	I_{OL} = +4 mA		0.4 V

Power Supply Currents

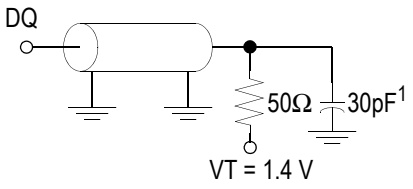
Parameter	Symbol	Test Conditions	0 to 70°C			–40 to 85°C		
			8 ns	10 ns	12 ns	8 ns	10 ns	12 ns
Operating Supply Current	I_{DD}	$\overline{E} \le V_{IL}$ All other inputs $\ge V_{IH}$ or $\le V_{IL}$ Min. cycle time I_{OUT} = 0 mA	260 mA	210 mA	180 mA	280 mA	230 mA	200 mA
Standby Current	I_{SB1}	$\overline{E} \ge V_{IH}$ All other inputs $\ge V_{IH}$ or $\le V_{IL}$ Min. cycle time	60 mA	50 mA	50 mA	80 mA	70 mA	70 mA
Standby Current	I_{SB2}	$E \ge V_{DD}$ - 0.2V All other inputs $\ge V_{DD}$ - 0.2V or $\le$ 0.2V	20 mA			40 mA		

AC Test Conditions

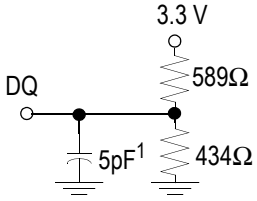
Parameter	Conditions
Input high level	V_{IH} = 2.4 V
Input low level	V_{IL} = 0.4 V
Input rise time	tr = 1 V/ns
Input fall time	tf = 1 V/ns
Input reference level	1.4 V
Output reference level	1.4 V
Output load	**Fig. 1& 2**

Notes:
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}.

Output Load 1



Output Load 2

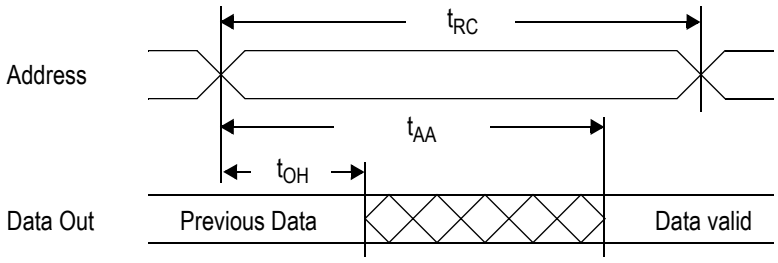


AC Characteristics

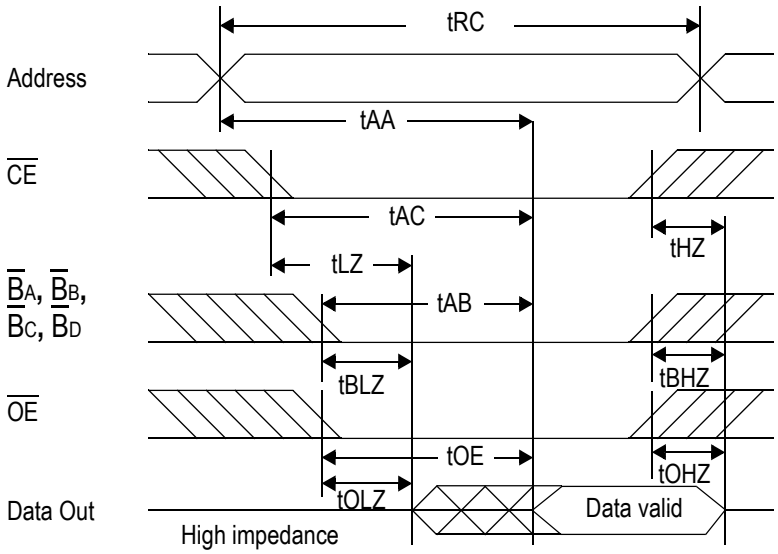
Read Cycle

Parameter	Symbol	-8		-10		-12		Unit
		Min	Max	Min	Max	Min	Max	
Read cycle time	t_{RC}	8	—	10	—	12	—	ns
Address access time	t_{AA}	—	8	—	10	—	12	ns
Chip enable access time ($\overline{CE}$)	t_{AC}	—	8	—	10	—	12	ns
Output enable to output valid ($\overline{OE}$)	t_{OE}	—	3.5	—	4	—	5	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}*	—	4	—	5	—	6	ns
Output disable to output in High Z ($\overline{OE}$)	t_{OHZ}*	—	3.5	—	4	—	5	ns

Read Cycle 1: $\overline{CE}$ = $\overline{OE}$ = V_{IL} , $\overline{WE}$ = V_{IH}, $\overline{B}_A$ = $\overline{B}_B$ = $\overline{B}_C$ = $\overline{B}_D$ = V_{IL}



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

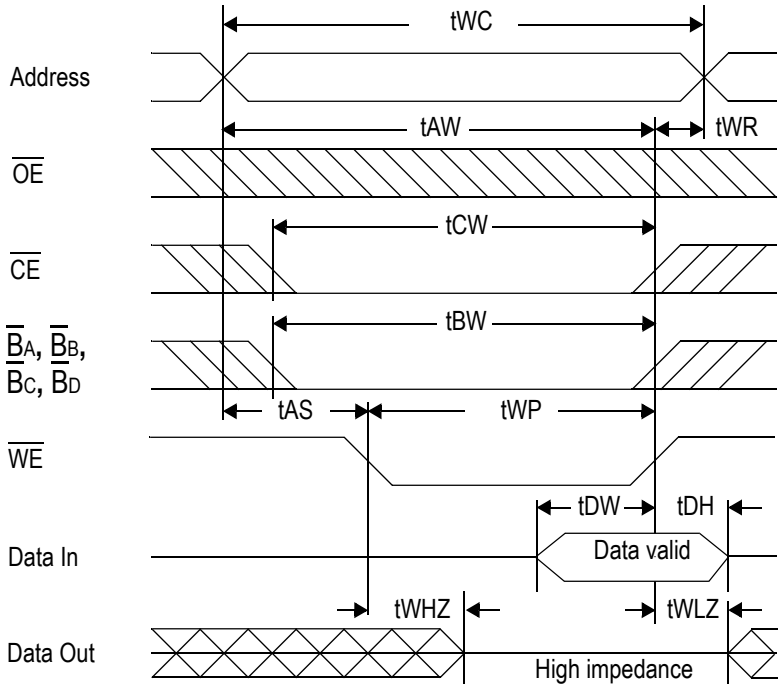


* These parameters are sampled and are not 100% tested

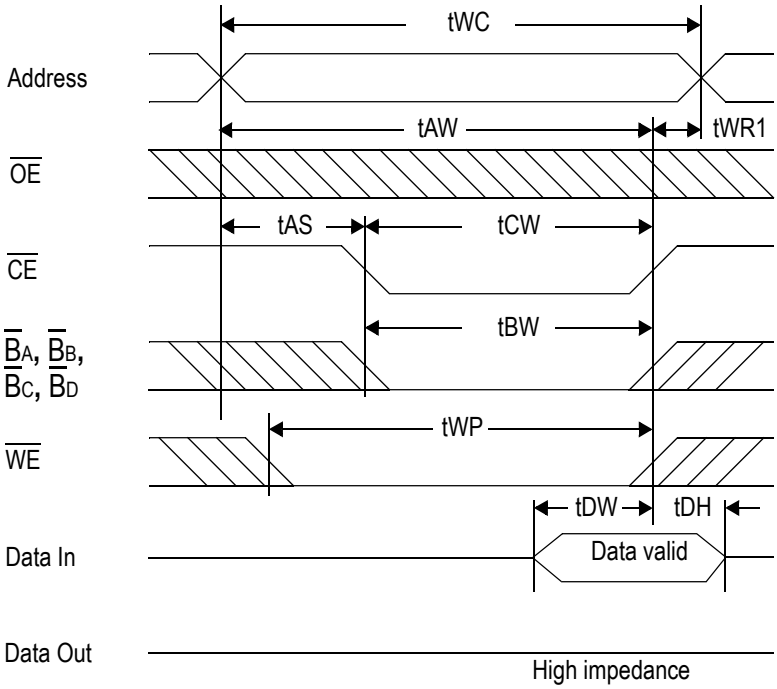
Write Cycle

Parameter	Symbol	-8		-10		-12		Unit
		Min	Max	Min	Max	Min	Max	
Write cycle time	tWC	8	—	10	—	12	—	ns
Address valid to end of write	tAW	5.5	—	7	—	8	—	ns
Chip enable to end of write	tCW	5.5	—	7	—	8	—	ns
Data set up time	tDW	4	—	5	—	6	—	ns
Data hold time	tDH	0	—	0	—	0	—	ns
Write pulse width	tWP	5.5	—	7	—	8	—	ns
Address set up time	tAS	0	—	0	—	0	—	ns
Write recovery time ($\overline{WE}$)	tWR	0	—	0	—	0	—	ns
Write recovery time ($\overline{CE}$)	tWR1	0	—	0	—	0	—	ns
Output Low Z from end of write	tWLZ*	3	—	3	—	3	—	ns
Write to output in High Z	tWHZ*	—	3.5	—	4	—	5	ns

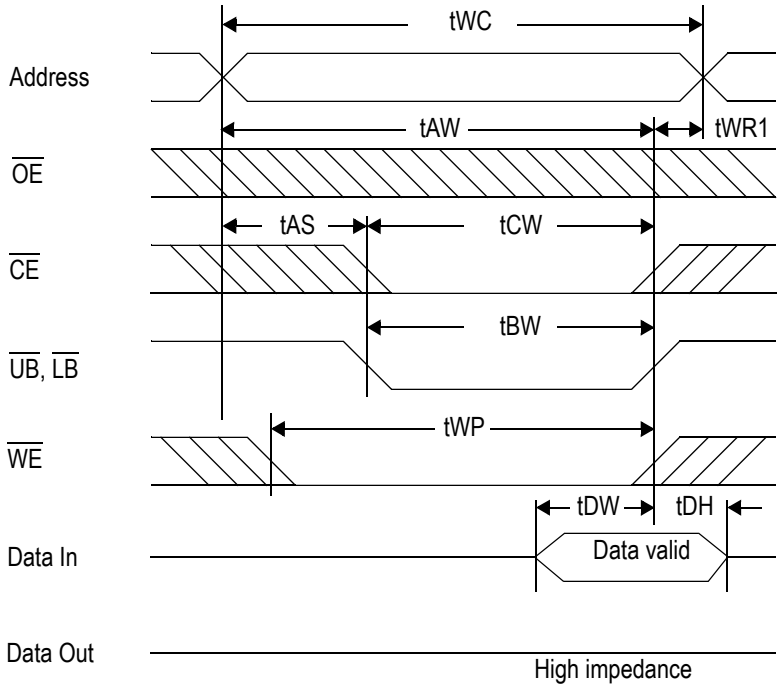
Write Cycle 1: $\overline{WE}$ Controlled



Write Cycle 2: $\overline{CE}$ Controlled

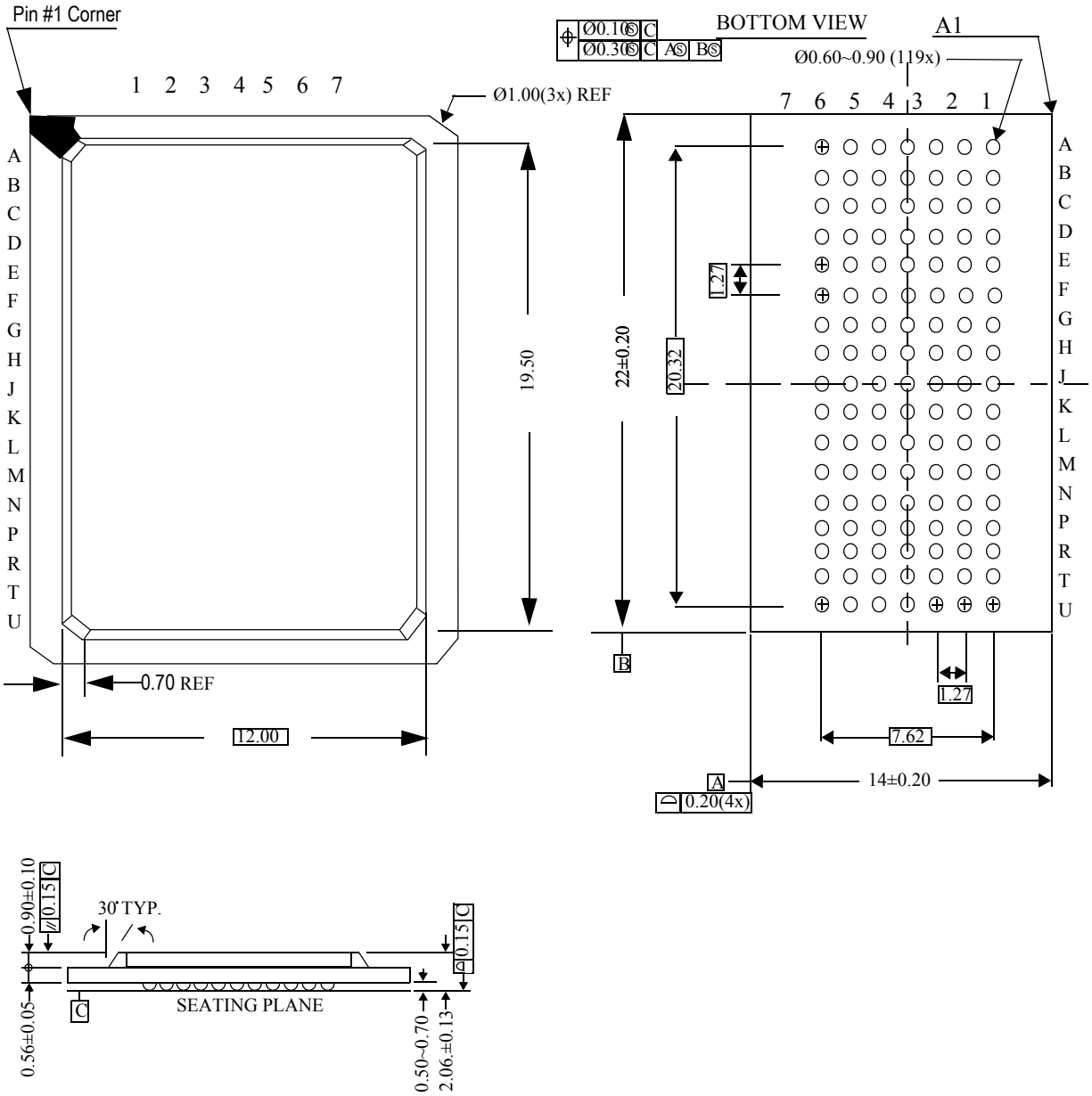


Write Cycle 3: $\overline{UB}$, $\overline{LB}$ control



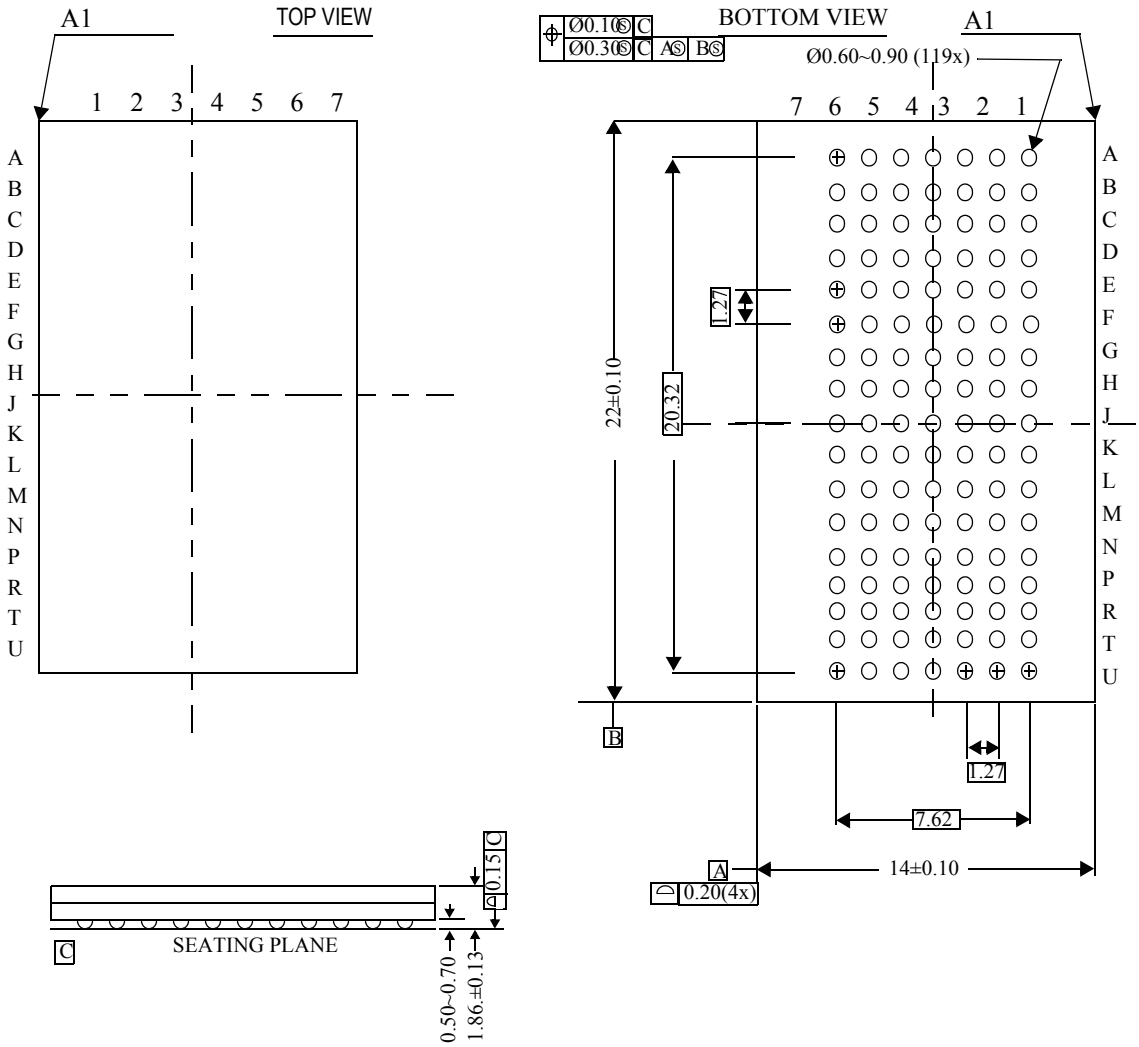
Package Dimensions—119-Bump FPBGA (Package B, Variation 1)

(Date Code: yyww.31)



Package Dimensions—119-Bump FPBGA (Package B, Variation 2)

(Date Code: yyww.3H)



Ordering Information

Part Number[1]	Package	Access Time	Temp. Range	Status
GS78132AB-8	119-Bump BGA[2]	8 ns	Commercial	
GS78132AB-10	119-Bump BGA[2]	10 ns	Commercial	
GS78132AB-12	119-Bump BGA[2]	12 ns	Commercial	
GS78132AB-8I	119-Bump BGA[2]	8 ns	Industrial	
GS78132AB-10I	119-Bump BGA[2]	10 ns	Industrial	
GS78132AB-12I	119-Bump BGA[2]	12 ns	Industrial	
GS78132AB-15I	119-Bump BGA[2]	15 ns	Industrial	
GS78132AGB-8	RoHS-compliant 119-Bump BGA[2]	8 ns	Commercial	
GS78132AGB-10	RoHS-compliant 119-Bump BGA[2]	10 ns	Commercial	
GS78132AGB-12	RoHS-compliant 119-Bump BGA[2]	12 ns	Commercial	
GS78132AGB-8I	RoHS-compliant 119-Bump BGA[2]	8 ns	Industrial	
GS78132AGB-10I	RoHS-compliant 119-Bump BGA[2]	10 ns	Industrial	
GS78132AGB-12I	RoHS-compliant 119-Bump BGA[2]	12 ns	Industrial	
GS78132AGB-15I	RoHS-compliant 119-Bump BGA[2]	15 ns	Industrial	

Notes:

1. Customers requiring delivery in Tape and Reel should add the character "T" to the end of the part number. For example: GS78132AB-12T
2. Please see pages 9 and 10 for date code information for Variation 1 and Variation 2 of the 119-bump BGA.

Revision History

Rev. Code: Old; New	Types of Changes Format or Content	Page #/Revisions/Reason
GS78132AB_r1		• Creation of new datasheet
GS78132AB_r1_01	Content	• Added AC specifications to datasheet
GS78132AB_r1_01; GS78132AB_r1_02	Content/Format	• Updated format • Added variation information to package mechanical
GS78132AB_r1_02; GS78132AB_r1_03	Content	• Added Variation 2 119 BGA to datasheet • Added date codes to mechanicals
GS78132AB_r1_03; GS78132AB_r1_04	Content	• Added RoHS-compliant package information • (Rev1.04a: Added missing Write Cycle 3 timing diagram)

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