



## FEATURES

- Access time : 55ns
- Low power consumption:  
Operating current : 20mA (TYP.)  
Standby current : 20mA(TYP.) L Version  
1 $\mu$ A (TYP.) LL-version
- Single 2.7V ~ 3.6V power supply
- Fully static operation
- Tri-state output
- Data retention voltage : 1.5V (MIN.)
- **All Products ROHS Compliant**
- Package : 32-pin 450 mil SOP  
32-pin 8mm x 20mm TSOP-I  
32-pin 8mm x 13.4mm sTSOP  
36-ball 6mm x 8mm TFBGA

## GENERAL DESCRIPTION

The AS6C2008 is a 2,097,152-bit low power CMOS static random access memory organized as 262,144 words by 8 bits. It is fabricated using very high performance, high reliability CMOS technology. Its standby current is stable within the range of operating temperature.

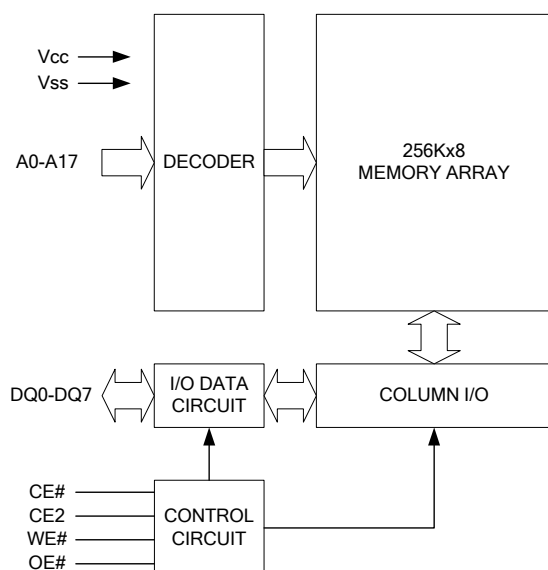
The AS6C2008 is well designed for very low power system applications, and particularly well suited for battery back-up nonvolatile memory application.

The AS6C2008 operates from a single power supply of 2.7V ~ 3.6V

## PRODUCT FAMILY

Product Family	Operating Temperature	Vcc Range	Speed	Power Dissipation	
				Standby(I <sub>SB1</sub> , TYP.)	Operating(I <sub>CC</sub> , TYP.)
AS6C2008 (I)	-40 ~ 85°C	2.7 ~ 3.6V	55ns	20 $\mu$ A(L)/1 $\mu$ A(LL)	20mA

## FUNCTIONAL BLOCK DIAGRAM

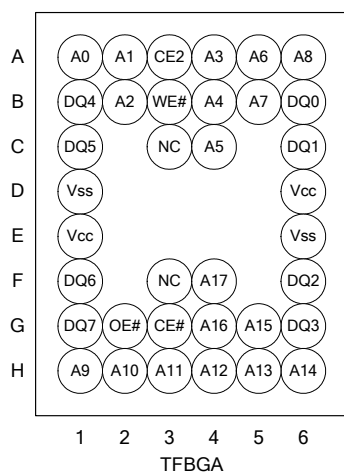
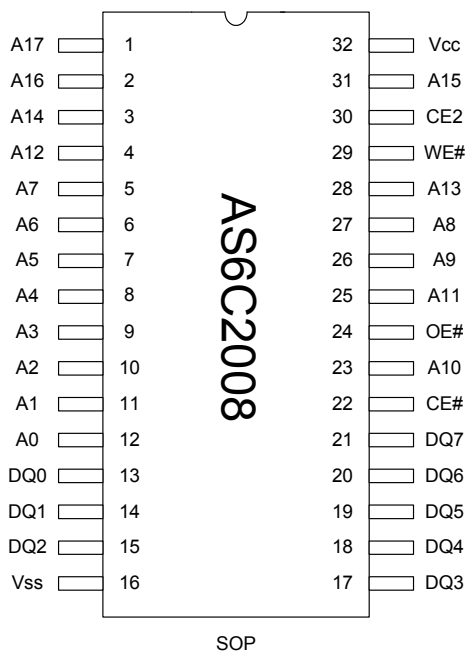


## PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0 - A17	Address Inputs
DQ0 - DQ7	Data Inputs/Outputs
CE#, CE2	Chip Enable Inputs
WE#	Write Enable Input
OE#	Output Enable Input
Vcc	Power Supply
Vss	Ground
NC	No Connection



## PIN CONFIGURATION



**ABSOLUTE MAXIMUM RATINGS\***

PARAMETER	SYMBOL	RATING	UNIT
Terminal Voltage with Respect to V <sub>SS</sub>	V <sub>TERM</sub>	-0.5 to 4.6	V
Operating Temperature	T <sub>A</sub>		°C
		-40 to 85(l grade)	
Storage Temperature	T <sub>STG</sub>	-65 to 150	°C
Power Dissipation	P <sub>D</sub>	1	W
DC Output Current	I <sub>OUT</sub>	50	mA
Soldering Temperature (under 10 sec)	T <sub>SOLDER</sub>	260	°C

\*Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to the absolute maximum rating conditions for extended period may affect device reliability.

**TRUTH TABLE**

MODE	CE#	CE2	OE#	WE#	I/O OPERATION	SUPPLY CURRENT
Standby	H	X	X	X	High-Z	I <sub>SB</sub> , I <sub>SB1</sub>
	X	L	X	X	High-Z	I <sub>SB</sub> , I <sub>SB1</sub>
Output Disable	L	H	H	H	High-Z	I <sub>CC</sub> , I <sub>CC1</sub>
Read	L	H	L	H	D <sub>OUT</sub>	I <sub>CC</sub> , I <sub>CC1</sub>
Write	L	H	X	L	D <sub>IN</sub>	I <sub>CC</sub> , I <sub>CC1</sub>

Note: H = V<sub>IH</sub>, L = V<sub>IL</sub>, X = Don't care.

**DC ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP. <sup>4</sup>	MAX.	UNIT
Supply Voltage	V <sub>CC</sub>		2.7	3.0	3.6	V
Input High Voltage	V <sub>IH</sub> <sup>1</sup>		2.2	-	V <sub>CC</sub> +0.3	V
Input Low Voltage	V <sub>IL</sub> <sup>2</sup>		-0.2	-	0.6	V
Input Leakage Current	I <sub>LI</sub>	V <sub>CC</sub> ≥ V <sub>IN</sub> ≥ V <sub>SS</sub>	-1	-	1	μA
Output Leakage Current	I <sub>LO</sub>	V <sub>CC</sub> ≥ V <sub>OUT</sub> ≥ V <sub>SS</sub> , Output Disabled	-1	-	1	μA
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -1mA	2.2	2.7	-	V
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 2mA	-	-	0.4	V
Average Operating Power supply Current	I <sub>CC</sub>	Cycle time = Min. CE# = V <sub>IL</sub> and CE2 = V <sub>IH</sub> , I <sub>I/O</sub> = 0mA	-55	20	35	mA
	I <sub>CC1</sub>	Cycle time = 1μs CE# ≤ 0.2V and CE2 ≥ V <sub>CC</sub> -0.2V, I <sub>I/O</sub> = 0mA other pins at 0.2V or V <sub>CC</sub> -0.2V	-	4	5	mA
Standby Power Supply Current	I <sub>SB</sub>	CE# = V <sub>IH</sub> or CE2 = V <sub>IL</sub>	-	0.3	0.5	mA
	I <sub>SB1</sub>	CE# ≥ V <sub>CC</sub> -0.2V	-	-	-	-
		or CE2 ≤ 0.2V	-I*	1	20 <sup>5</sup>	μA

\*I = Industrial temperature



## Notes:

1.  $V_{IH(max)} = V_{CC} + 3.0V$  for pulse width less than 10ns.
2.  $V_{IL(min)} = V_{SS} - 3.0V$  for pulse width less than 10ns.
3. Over/Undershoot specifications are characterized, not 100% tested.
4. Typical values are included for reference only and are not guaranteed or tested.  
Typical values are measured at  $V_{CC} = V_{CC(TYP.)}$  and  $T_A = 25^\circ C$
5. 10 $\mu A$  for special request

**CAPACITANCE ( $T_A = 25^\circ C$ ,  $f = 1.0MHz$ )**

PARAMETER	SYMBOL	MIN.	MAX	UNIT
Input Capacitance	$C_{IN}$	-	6	pF
Input/Output Capacitance	$C_{I/O}$	-	8	pF

Note : These parameters are guaranteed by device characterization, but not production tested.

**AC TEST CONDITIONS**

Input Pulse Levels	0.2V to $V_{CC} - 0.2V$
Input Rise and Fall Times	3ns
Input and Output Timing Reference Levels	1.5V
Output Load	$C_L = 30pF + 1TTL$ , $I_{OH}/I_{OL} = -1mA/2mA$

**AC ELECTRICAL CHARACTERISTICS****(1) READ CYCLE**

PARAMETER	SYM			AS6C2008-55				UNIT
				MIN	MAX.			
Read Cycle Time	$t_{RC}$			55	-			ns
Address Access Time	$t_{AA}$			-	55			ns
Chip Enable Access Time	$t_{ACE}$			-	55			ns
Output Enable Access Time	$t_{OE}$			-	30			ns
Chip Enable to Output in Low-Z	$t_{CLZ}^*$			10	-			ns
Output Enable to Output in Low-Z	$t_{OLZ}^*$			5	-			ns
Chip Disable to Output in High-Z	$t_{CHZ}^*$			-	20			ns
Output Disable to Output in High-Z	$t_{OHZ}^*$			-	20			ns
Output Hold from Address Change	$t_{OH}$			10	-			ns

**(2) WRITE CYCLE**

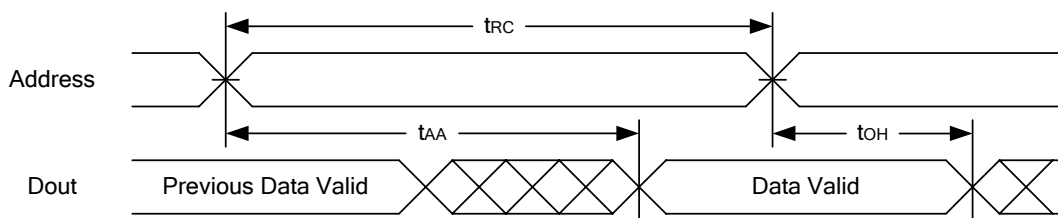
PARAMETER	SYM			AS6C2008-55				UNIT
				MIN	MAX.			
Write Cycle Time	$t_{WC}$			55	-			ns
Address Valid to End of Write	$t_{AW}$			50	-			ns
Chip Enable to End of Write	$t_{CW}$			50	-			ns
Address Set-up Time	$t_{AS}$			0	-			ns
Write Pulse Width	$t_{WP}$			45	-			ns
Write Recovery Time	$t_{WR}$			0	-			ns
Data to Write Time Overlap	$t_{DW}$			25	-			ns
Data Hold from End of Write Time	$t_{DH}$			0	-			ns
Output Active from End of Write	$t_{OW}^*$			5	-			ns
Write to Output in High-Z	$t_{WHZ}^*$			-	20			ns

\*These parameters are guaranteed by device characterization, but not production tested.

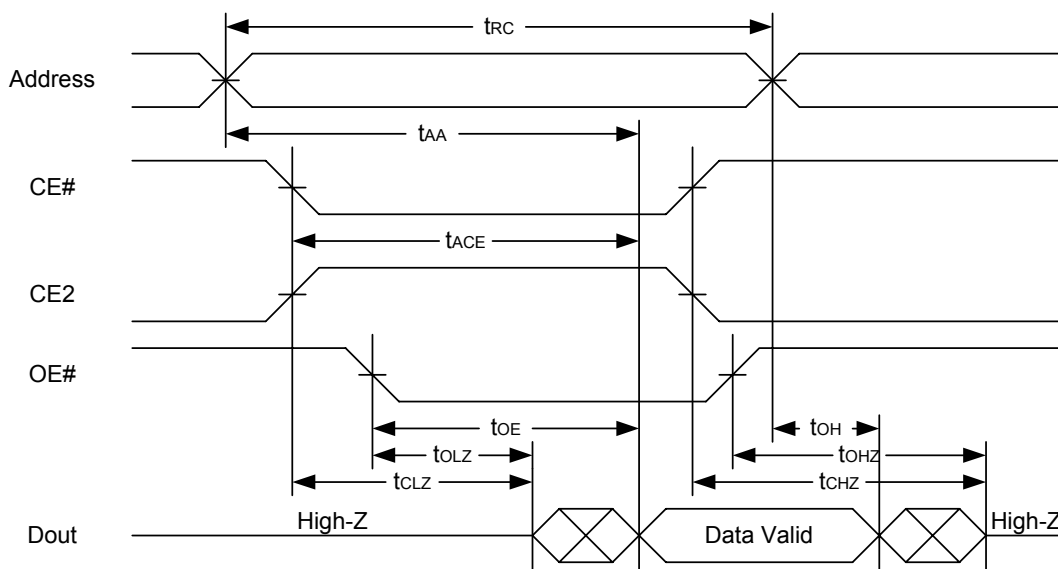


## TIMING WAVEFORMS

### READ CYCLE 1 (Address Controlled) (1,2)

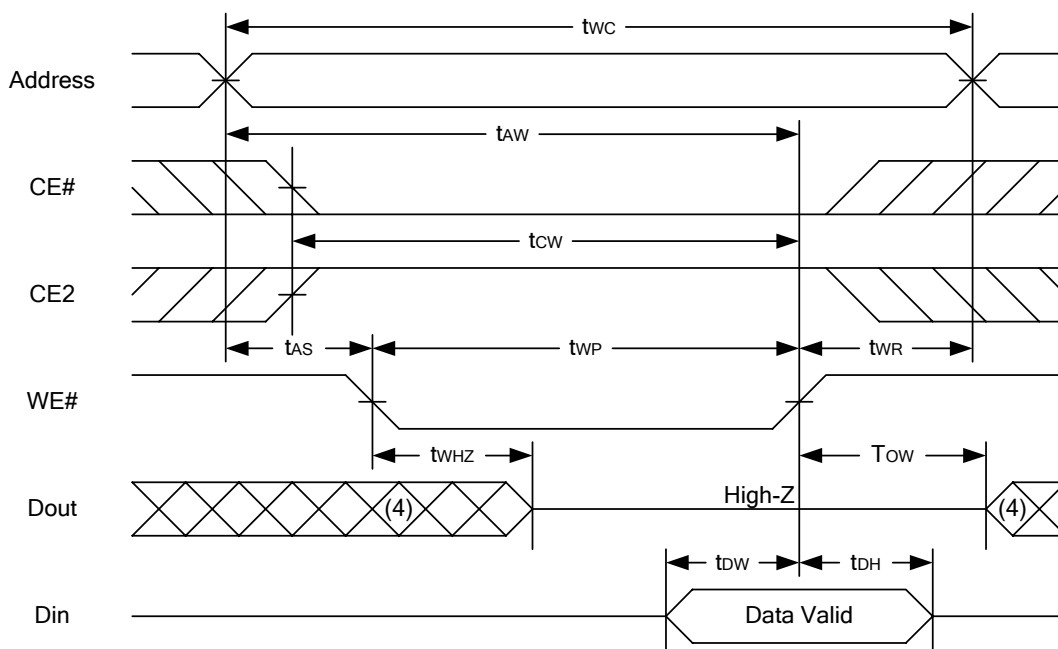
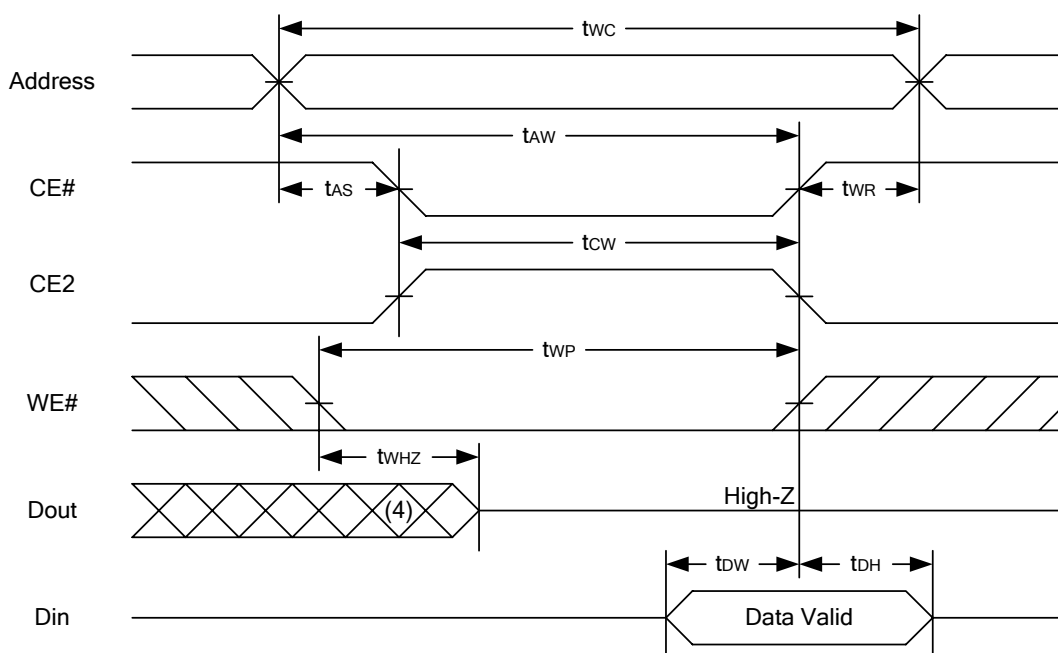


### READ CYCLE 2 (CE# and CE2 and OE# Controlled) (1,3,4,5)



#### Notes :

1. WE# is high for read cycle.
2. Device is continuously selected OE# = low, CE# = low, CE2 = high.
3. Address must be valid prior to or coincident with CE# = low, CE2 = high; otherwise tAA is the limiting parameter.
4. tCLZ, tOLZ, tCHZ and tOHZ are specified with  $C_L = 5\text{pF}$ . Transition is measured  $\pm 500\text{mV}$  from steady state.
5. At any given temperature and voltage condition, tCHZ is less than tCLZ, tOHZ is less than tOLZ.

**WRITE CYCLE 1 (WE# Controlled) (1,2,3,5,6)****WRITE CYCLE 2 (CE# and CE2 Controlled) (1,2,5,6)****Notes :**

1. WE#, CE# must be high or CE2 must be low during all address transitions.
2. A write occurs during the overlap of a low CE#, high CE2, low WE#.
3. During a WE#-controlled write cycle with OE# low,  $t_{wp}$  must be greater than  $t_{whZ} + t_{dW}$  to allow the drivers to turn off and data to be placed on the bus.
4. During this period, I/O pins are in the output state, and input signals must not be applied.
5. If the CE# low transition and CE2 high transition occurs simultaneously with or after WE# low transition, the outputs remain in a high impedance state.
6.  $t_{ow}$  and  $t_{whZ}$  are specified with  $C_L = 5pF$ . Transition is measured  $\pm 500mV$  from steady state.



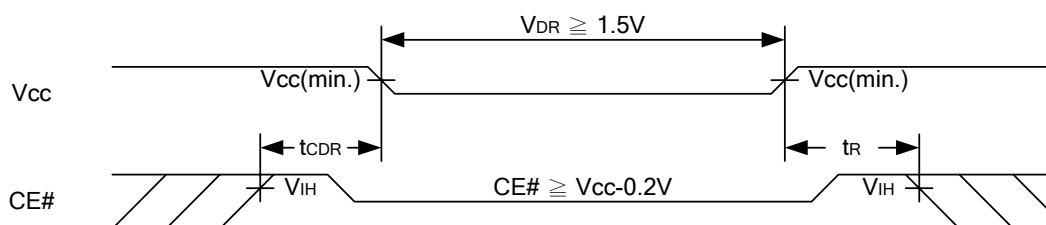
## DATA RETENTION CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
V <sub>CC</sub> for Data Retention	V <sub>DR</sub>	CE# $\geq$ V <sub>CC</sub> - 0.2V or CE2 $\leq$ 0.2V	1.5	-	3.6	V
Data Retention Current	I <sub>IDR</sub>	V <sub>CC</sub> = 1.5V	-	-	-	-
		CE# $\geq$ V <sub>CC</sub> - 0.2V	-	-	-	-
		or CE2 $\leq$ 0.2V	-I*	0.5	10	$\mu$ A
Chip Disable to Data Retention Time	t <sub>CDR</sub>	See Data Retention Waveforms (below)	0	-	-	ns
Recovery Time	t <sub>R</sub>		t <sub>RC</sub> *	-	-	ns

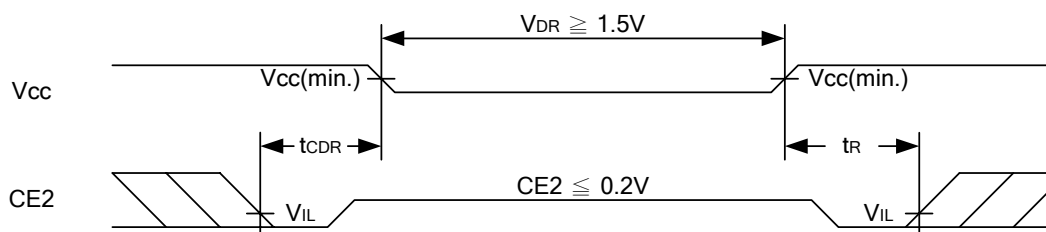
t<sub>RC</sub>\* = Read Cycle Time \*\*I\* = Industrial temperature

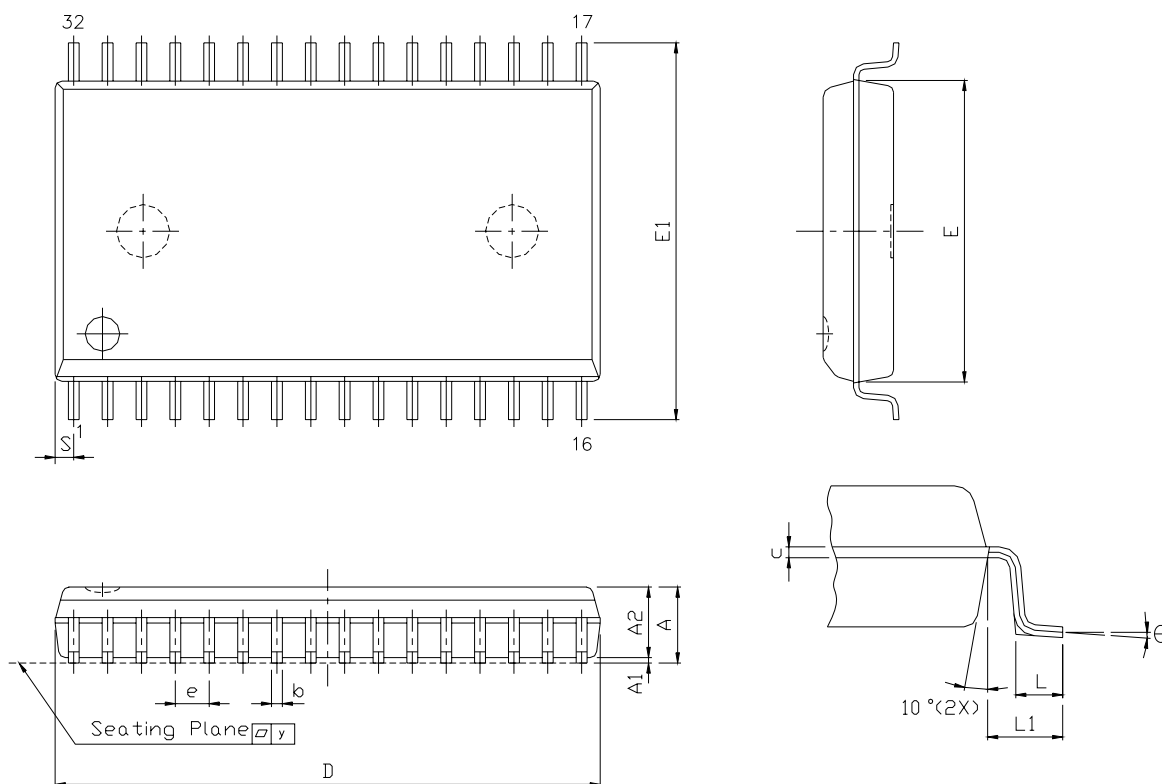
## DATA RETENTION WAVEFORM

### Low V<sub>CC</sub> Data Retention Waveform (1) (CE# controlled)



### Low V<sub>CC</sub> Data Retention Waveform (2) (CE2 controlled)



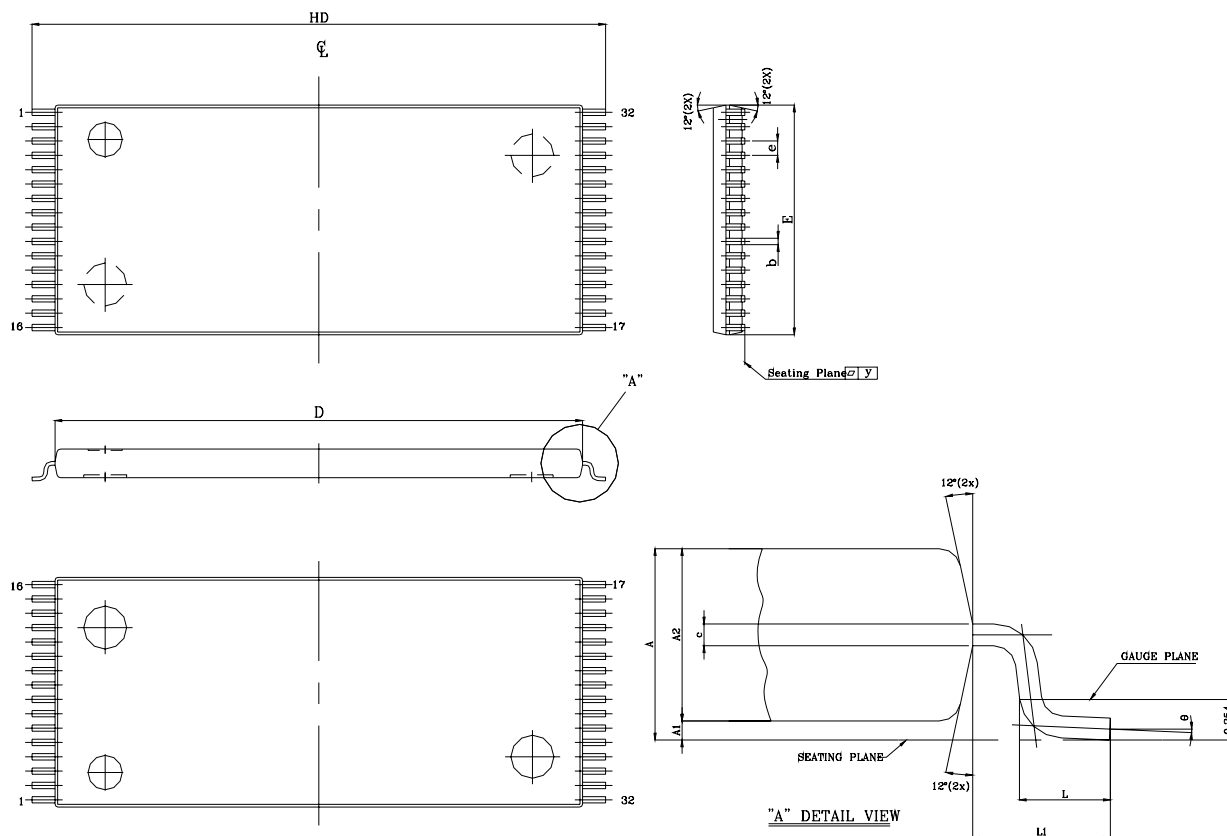
**PACKAGE OUTLINE DIMENSION****32 pin 450 mil SOP Package Outline Dimension**

SYM.	UNIT	INCH.(BASE)	MM(REF)
A		0.118 (MAX)	2.997 (MAX)
A1		0.004(MIN)	0.102(MIN)
A2		0.111(MAX)	2.82(MAX)
b		0.016(TYP)	0.406(TYP)
c		0.008(TYP)	0.203(TYP)
D		0.817(MAX)	20.75(MAX)
E		0.445 $\pm$ 0.005	11.303 $\pm$ 0.127
E1		0.555 $\pm$ 0.012	14.097 $\pm$ 0.305
e		0.050(TYP)	1.270(TYP)
L		0.0347 $\pm$ 0.008	0.881 $\pm$ 0.203
L1		0.055 $\pm$ 0.008	1.397 $\pm$ 0.203
S		0.026(MAX)	0.660 (MAX)
y		0.004(MAX)	0.101(MAX)
$\Theta$		0° -10°	0° -10°





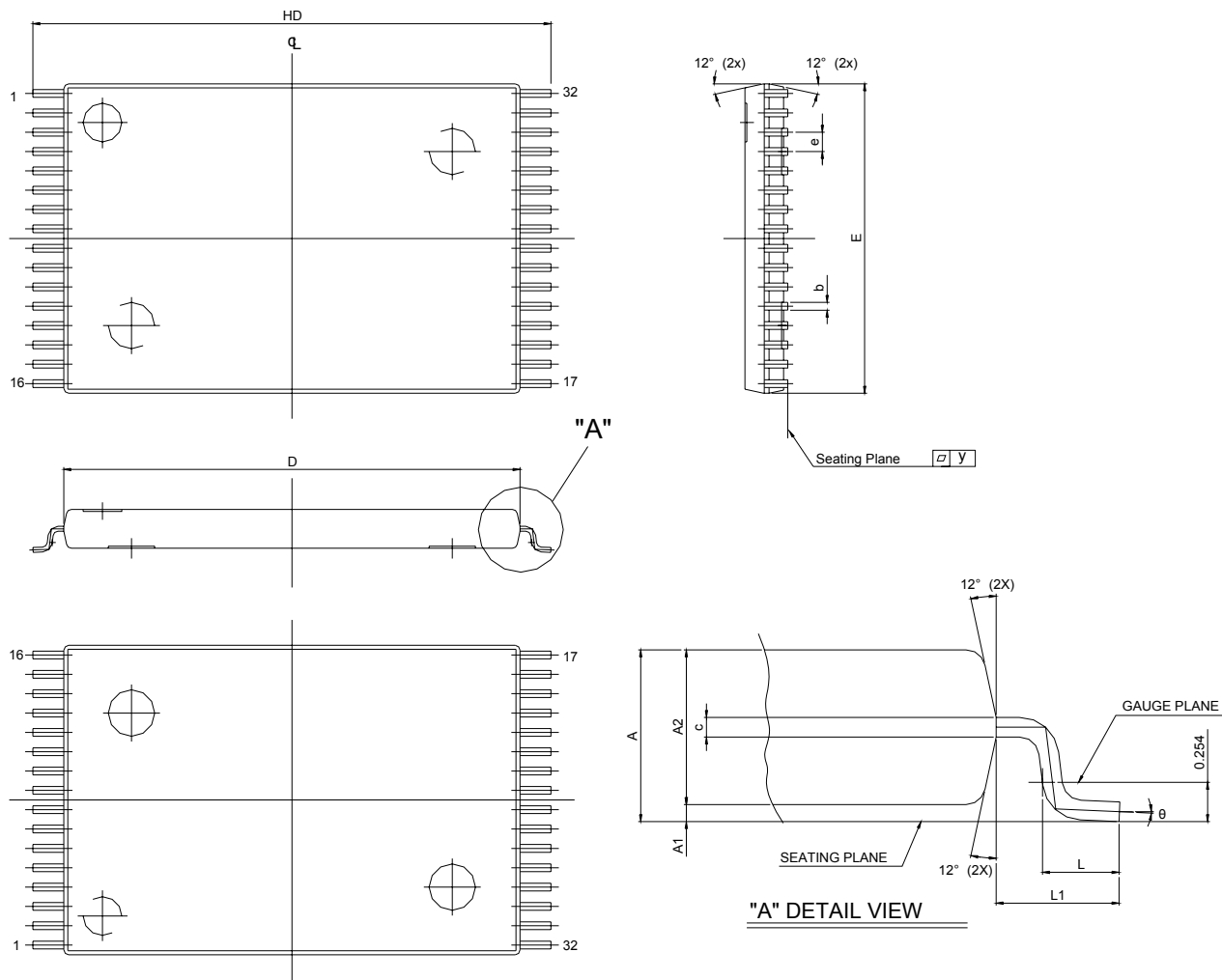
## 32 pin 8mm x 20mm TSOP-I Package Outline Dimension



SYM.	UNIT	INCH(BASE)	MM(REF)
A		0.047 (MAX)	1.20 (MAX)
A1		0.004 $\pm$ 0.002	0.10 $\pm$ 0.05
A2		0.039 $\pm$ 0.002	1.00 $\pm$ 0.05
b		0.008 + 0.002 - 0.001	0.20 + 0.05 - 0.03
c		0.005 (TYP)	0.127 (TYP)
D		0.724 $\pm$ 0.004	18.40 $\pm$ 0.10
E		0.315 $\pm$ 0.004	8.00 $\pm$ 0.10
e		0.020 (TYP)	0.50 (TYP)
HD		0.787 $\pm$ 0.008	20.00 $\pm$ 0.20
L		0.0197 $\pm$ 0.004	0.50 $\pm$ 0.10
L1		0.0315 $\pm$ 0.004	0.08 $\pm$ 0.10
y		0.003 (MAX)	0.076 (MAX)
$\theta$		0°~5°	0°~5°



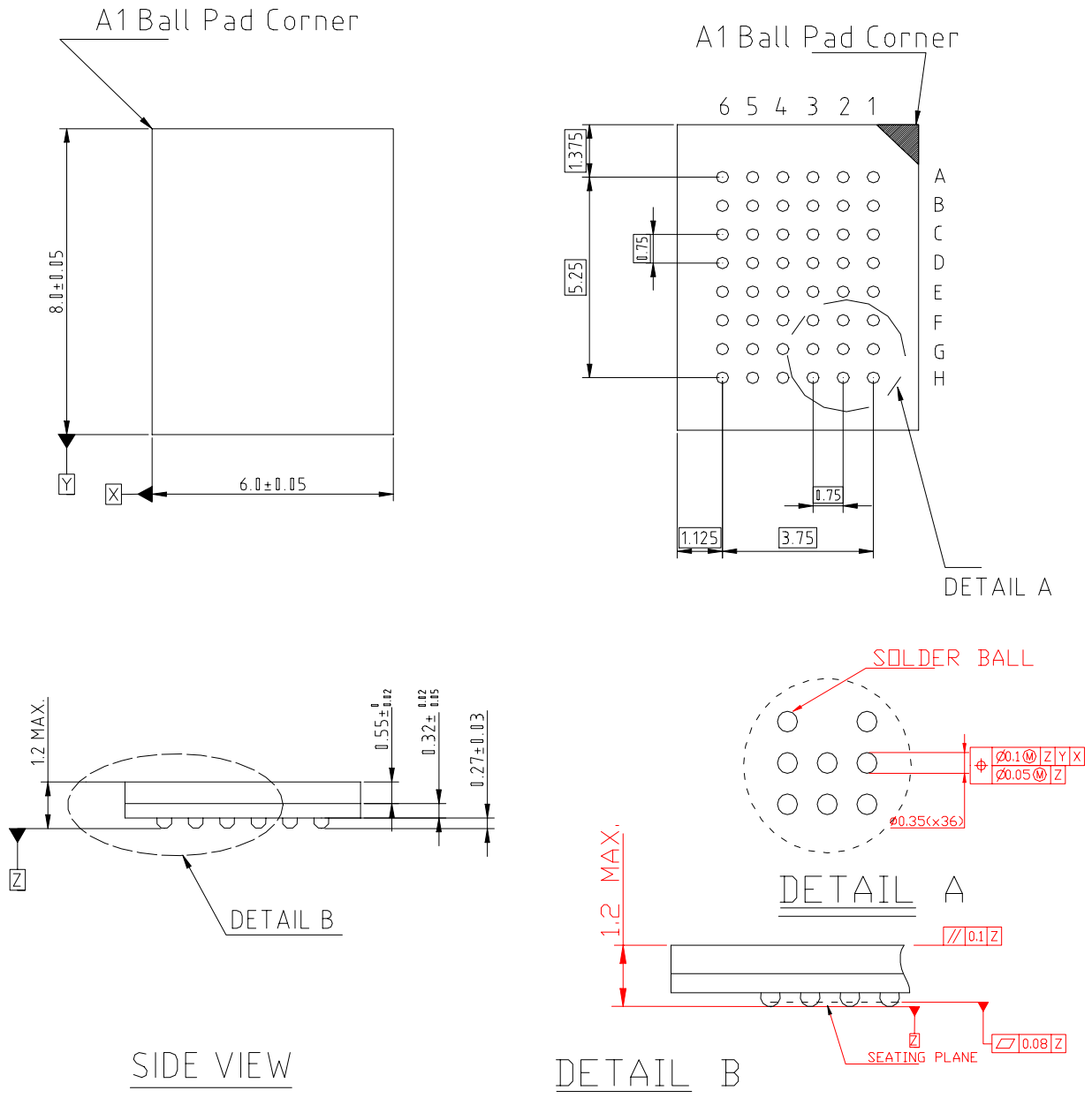
## 32 pin 8mm x 13.4mm sTSP Package Outline Dimension



SYM.	UNIT	INCH(BASE)	MM(REF)
A		0.049 (MAX)	1.25 (MAX)
A1		0.005 $\pm$ 0.002	0.130 $\pm$ 0.05
A2		0.039 $\pm$ 0.002	1.00 $\pm$ 0.05
b		0.008 $\pm$ 0.01	0.20 $\pm$ 0.025
c		0.005 (TYP)	0.127 (TYP)
D		0.465 $\pm$ 0.004	11.80 $\pm$ 0.10
E		0.315 $\pm$ 0.004	8.00 $\pm$ 0.10
e		0.020 (TYP)	0.50 (TYP)
HD		0.528 $\pm$ 0.008	13.40 $\pm$ 0.20.
L		0.0197 $\pm$ 0.004	0.50 $\pm$ 0.10
L1		0.0315 $\pm$ 0.004	0.8 $\pm$ 0.10
y		0.003 (MAX)	0.076 (MAX)
$\theta$		0°~5°	0°~5°



## 36 ball 6mm x 8mm TFBGA Package Outline Dimension





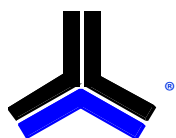
## ORDERING INFORMATION

### Ordering Codes

Alliance	Organization	VCC range	Package	Operating Temp	Speed ns
<b>AS6C2008-55SIN</b>	256K X 8	2.7-3.6V	32pin 450mil SOP	Industrial ~ -40°C to 85° C	55
<b>AS6C2008-55TIN</b>	256K X 8	2.7-3.6V	32pin TSOP-I (8 x 20 mm)	Industrial ~ -40°C to 85° C	55
<b>AS6C2008-55STIN</b>	256K X 8	2.7-3.6V	32pin sTSOP (8 x 13.4 mm)	Industrial ~ -40°C to 85° C	55
<b>AS6C2008-55BIN</b>	256K X 8	2.7-3.6V	36pin TFBGA (6mm x 8mm)	Industrial ~ -40°C to 85° C	55

### Part numbering system

AS6C	2008	- 55	X	X	N
low power SRAM prefix	Device Number <b>20</b> = 2M <b>08</b> = by 8	Access Time	Package Options: S = 32 pin 450 mil SOP T = 32 pin TSOP 1 (8mm x 20 mm) ST = 32 pin sTSOP (8 x 13.4 mm) B = 36 ball 6 x 8mm TFBGA	Temperature Range: I = Industrial (-40° to +85° C)	N = Lead Free ROHS Compliant Part



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Part Number: AS6C2008  
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