



Rev.3.0

# AS7C316098B-10TIN AS7C316098B-10BIN

1024K X 16 BIT HIGH SPEED CMOS SRAM

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## REVISION HISTORY

<u>Revision</u>	<u>Description</u>	<u>Issue Date</u>
Rev. 1.0	Initial Issued	June 2014
Rev. 2.0	Modified page5 "AC ELECTRICAL CHARACTERISTIC" We can offer special screened part "tested and passed for 8ns@ 25°C yield - shown with custom label on packaging as AS7C316098B-10TIN"	November 2017
Rev. 3.0	Added 48-ball TFBGA package as AS7C316098B-10BIN	July 2018

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Alliance Memory Inc. reserves the right to change products or specification without notice

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# AS7C316098B-10TIN AS7C316098B-10BIN

## 1024K X 16 BIT HIGH SPEED CMOS SRAM

### FEATURES

- Fast access time : 10ns
- **low power consumption:**  
Operating current : 70mA (TYP.)  
Standby current : 4mA(TYP.)
- Single 3.3V power supply
- All inputs and outputs TTL compatible
- Fully static operation
- Tri-state output
- Data byte control : LB# (DQ0 ~ DQ7)  
UB# (DQ8 ~ DQ15)
- Data retention voltage : 1.5V (MIN.)
- **All parts are ROHS Compliant**
- Package : 54-pin 400 mil TSOP-II  
48-ball 6mm x 8mm TFBGA

### GENERAL DESCRIPTION

The AS7C316098B is a 16M-bit high speed CMOS static random access memory organized as 1024K words by 16 bits. It is fabricated using very high performance, high reliability CMOS technology. Its standby current is stable within the range of operating temperature.

The AS7C316098B operates from a single power supply of 3.3V and all inputs and outputs are fully TTL compatible

**Table 1. Speed Grade Information**

Product Family	Vcc Range	Speed	Power Dissipation	
			Standby(I <sub>SB1</sub> ,TYP.)	Operating(I <sub>CC</sub> ,TYP.)
AS7C316098B	2.7 ~ 3.6V	10ns	4mA	70mA

**Table 2. Ordering Information**

Product part No	Org	Temperature	Package
AS7C316098B-10BIN	1024K x 16	Industrial -40°C to 85°C	48-ball TFGBA
AS7C316098B-10TIN	1024K x 16	Industrial -40°C to 85°C	54-pin 400mil TSOP-II

Please note: we can also offer a custom part - 'specially screened' part at 8ns at 25°C defined by specific labeling on package as AS7C316098B-10TIN\*

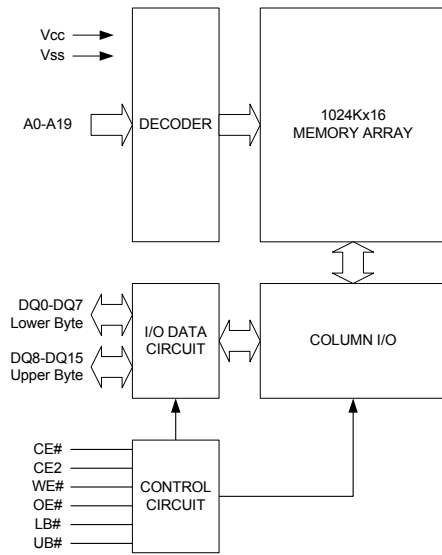


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## FUNCTIONAL BLOCK DIAGRAM



## PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0 - A19	Address Inputs
DQ0 - DQ15	Data Inputs/Outputs
CE#, CE2	Chip Enable Input
WE#	Write Enable Input
OE#	Output Enable Input
LB#	Lower Byte Control
UB#	Upper Byte Control
Vcc	Power Supply
Vss	Ground

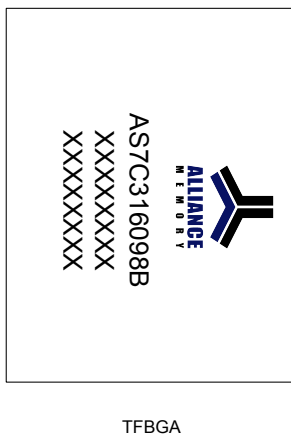
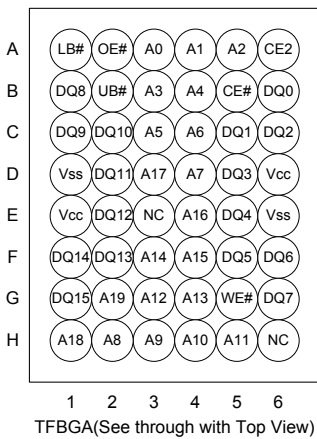
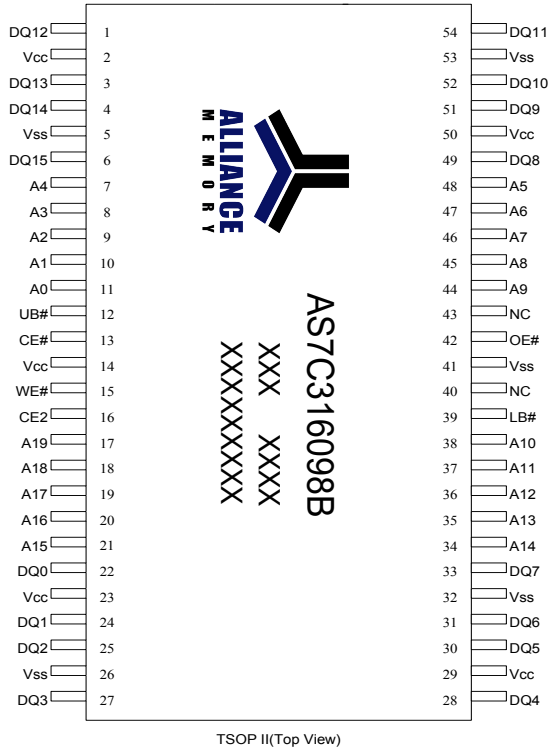


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## PIN CONFIGURATION





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1024K X 16 BIT HIGH SPEED CMOS SRAM

## ABSOLUTE MAXIMUM RATINGS\*

PARAMETER	SYMBOL	RATING	UNIT
Voltage on Vcc relative to Vss	$V_{T1}$	-0.5 to 4.6	V
Voltage on any other pin relative to Vss	$V_{T2}$	-0.5 to Vcc+0.5	V
Operating Temperature	$T_A$	-40 to 85(I grade)	°C
Storage Temperature	$T_{STG}$	-65 to 150	°C
Power Dissipation	$P_D$	1	W
DC Output Current	$I_{OUT}$	50	mA

\*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#	LB#	UB#	I/O OPERATION		SUPPLY CURRENT
							DQ0-DQ7	DQ8-DQ15	
Standby	H	X	X	X	X	X	High - Z	High - Z	$I_{SB1}$
	X	L	X	X	X	X	High - Z	High - Z	
Output Disable	L	H	H	H	L	X	High - Z	High - Z	$I_{CC}$
	L	H	H	H	X	L	High - Z	High - Z	
Read	L	H	L	H	L	H	$D_{OUT}$	High - Z	$I_{CC}$
	L	H	L	H	H	L	High - Z	$D_{OUT}$	
	L	H	L	H	L	L	$D_{OUT}$	$D_{OUT}$	
Write	L	H	X	L	L	H	$D_{IN}$	High - Z	$I_{CC}$
	L	H	X	L	H	L	High - Z	$D_{IN}$	
	L	H	X	L	L	L	$D_{IN}$	$D_{IN}$	

Note: H =  $V_{IH}$ , L =  $V_{IL}$ , X = Don't care.

## DC ELECTRICAL CHARACTERISTICS (Vcc=2.7V 3.6V)

PARAMETER	SYM.	TEST CONDITION	MIN.	TYP. <sup>4</sup>	MAX.	UNIT	
Supply Voltage	$V_{CC}$		2.7	3.3	3.6	V	
Input High Voltage	$V_{IH}^{1,2}$		2.2	-	$V_{CC}+0.3$	V	
Input Low Voltage	$V_{IL}^{1,2}$		-0.3	-	0.8	V	
Input Leakage Current	$I_{LI}$	$V_{CC} \geq V_{IN} \geq V_{SS}$	-1	-	1	$\mu A$	
Output Leakage Current	$I_{LO}$	$V_{CC} \geq V_{OUT} \geq V_{SS}$ , Output Disabled	-1	-	1	$\mu A$	
Output High Voltage	$V_{OH}$	$I_{OH} = -4mA$	2.4	-	-	V	
Output Low Voltage	$V_{OL}$	$I_{OL} = 8mA$	-	-	0.4	V	
Average Operating Power supply Current	$I_{CC}$	CE# $\leq 0.2V$ and CE2 $\geq V_{CC}-0.2V$ , other pins at 0.2V or $V_{CC}-0.2V$ , $I_{IO} = 0mA$ ; f=max.	-10	-	70	120	mA
Standby Power Supply Current	$I_{SB1}$	CE# $\geq V_{CC} - 0.2V$ ; other pins at 0.2V or $V_{CC}-0.2V$ .	-	4	40	mA	

Notes:

- $V_{IH(MAX)} = V_{CC} + 2.0V$  for pulse width less than 6ns.
- $V_{IL(MIN)} = V_{SS} - 2.0V$  for pulse width less than 6ns.
- Over/Undershoot specifications are characterized on engineering evaluation stage, not for mass production test.
- Typical values are included for reference only and are not guaranteed or tested.  
Typical values are measured at  $V_{CC} = V_{CC(TYP)}$  and  $T_A = 25^\circ C$



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## CAPACITANCE ( $T_A = 25^\circ\text{C}$ , $f = 1.0\text{MHz}$ )

PARAMETER	SYMBOL	MIN.	MAX	UNIT
Input Capacitance	$C_{IN}$	-	8	pF
Input/Output Capacitance	$C_{I/O}$	-	10	pF

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

## AC TEST CONDITIONS

speed	10ns
Input Pulse Levels	0.2V to $V_{CC}-0.2V$
Input Rise and Fall Times	3ns
Input and Output Timing Reference Levels	$V_{CC}/2$
Output Load	$C_L = 30\text{pF} + 1\text{TTL}$ , $I_{OH}/I_{OL} = -8\text{mA}/4\text{mA}$

## AC ELECTRICAL CHARACTERISTICS ( $V_{CC}=2.7V$ 3.6V)

### (1) READ CYCLE

PARAMETER	SYM.	AS7C316098B-10		Special Screened to-8		UNIT
		MIN.	MAX.	MIN.	MAX.	
Read Cycle Time	$t_{RC}$	10	-	8	-	ns
Address Access Time	$t_{AA}$	-	10	-	8	ns
Chip Enable Access Time	$t_{ACE}$	-	10	-	8	ns
Output Enable Access Time	$t_{OE}$	-	4.5	-	4.5	ns
Chip Enable to Output in Low-Z	$t_{CLZ}^*$	2	-	2	-	ns
Output Enable to Output in Low-Z	$t_{OLZ}^*$	0	-	0	-	ns
Chip Disable to Output in High-Z	$t_{CHZ}^*$	-	4	-	3	ns
Output Disable to Output in High-Z	$t_{OHZ}^*$	-	4	-	3	ns
Output Hold from Address Change	$t_{OH}$	2	-	2	-	ns
LB#, UB# Access Time	$t_{BA}$	-	4.5	-	4.5	ns
LB#, UB# to High-Z Output	$t_{BHZ}^*$	-	4	-	3	ns
LB#, UB# to Low-Z Output	$t_{BLZ}^*$	0	-	0	-	ns

### (2) WRITE CYCLE

PARAMETER	SYM.	AS7C316098B-10		Special Screened to -8		UNIT
		MIN.	MAX.	MIN.	MAX.	
Write Cycle Time	$t_{WC}$	10	-	8	-	ns
Address Valid to End of Write	$t_{AW}$	8	-	6.5	-	ns
Chip Enable to End of Write	$t_{CW}$	8	-	6.5	-	ns
Address Set-up Time	$t_{AS}$	0	-	0	-	ns
Write Pulse Width	$t_{WP}$	8	-	6.5	-	ns
Write Recovery Time	$t_{WR}$	0	-	0	-	ns
Data to Write Time Overlap	$t_{DW}$	6	-	5	-	ns
Data Hold from End of Write Time	$t_{DH}$	0	-	0	-	ns
Output Active from End of Write	$t_{OW}^*$	2	-	2	-	ns
Write to Output in High-Z	$t_{WHZ}^*$	-	4	-	3	ns
LB#, UB# Valid to End of Write	$t_{BW}$	8	-	6.5	-	ns

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



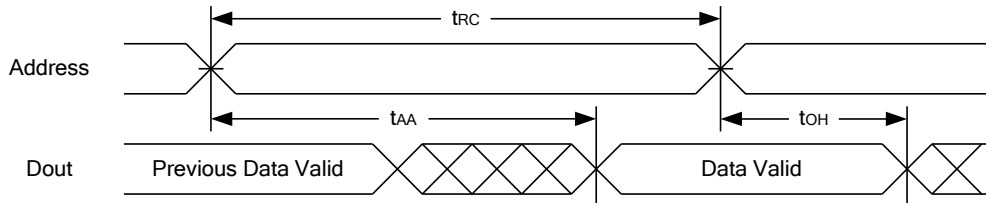
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# AS7C316098B-10TIN AS7C316098B-10BIN

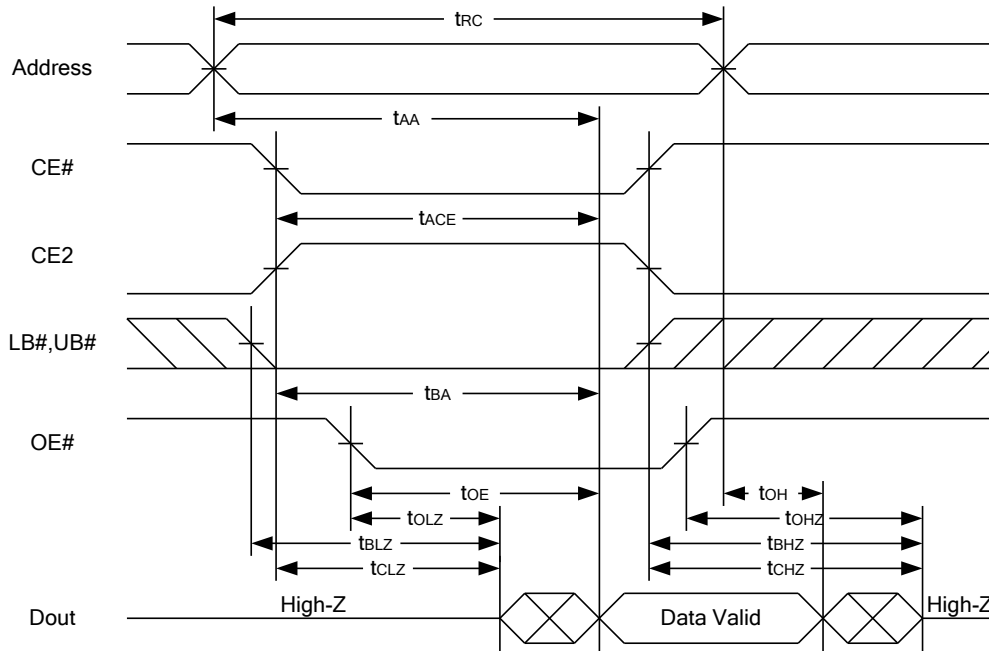
1024K X 16 BIT HIGH SPEED CMOS SRAM

## 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, LB# or UB# = low.
3. Address must be valid prior to or coincident with CE# = low, CE2 = high, LB# or UB# = low transition; otherwise  $t_{AA}$  is the limiting parameter.
4.  $t_{CLZ}$ ,  $t_{BLZ}$ ,  $t_{OLZ}$ ,  $t_{CHZ}$ ,  $t_{BHZ}$  and  $t_{OHZ}$  are specified with  $C_L = 5pF$ . Transition is measured  $\pm 500mV$  from steady state.
5. At any given temperature and voltage condition,  $t_{CHZ}$  is less than  $t_{CLZ}$ ,  $t_{BHZ}$  is less than  $t_{BLZ}$ ,  $t_{OHZ}$  is less than  $t_{OLZ}$ .

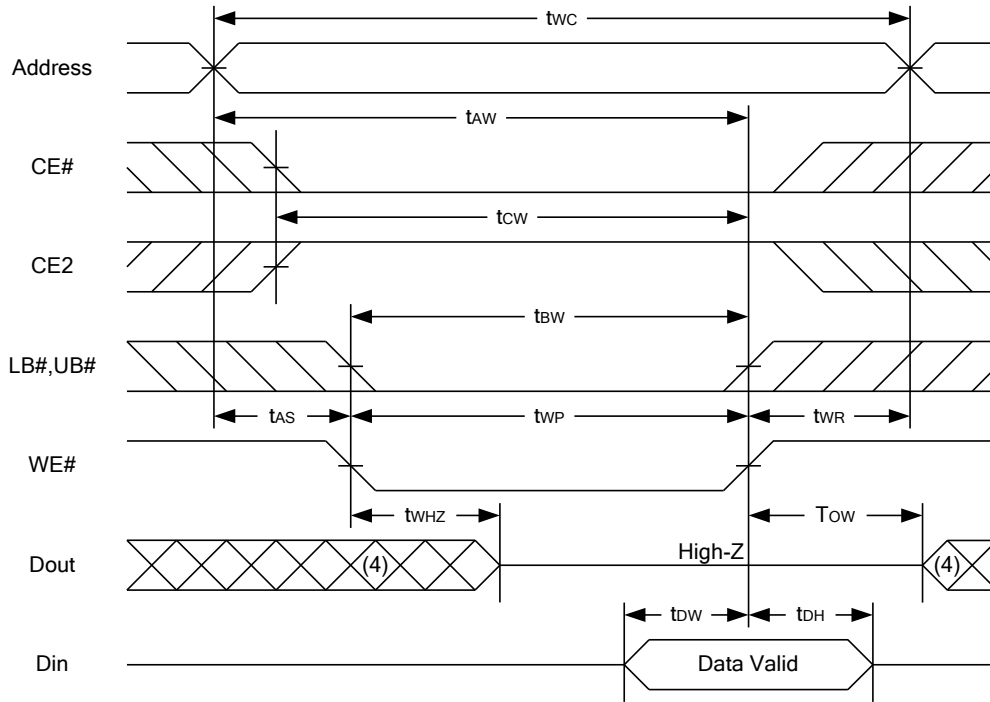


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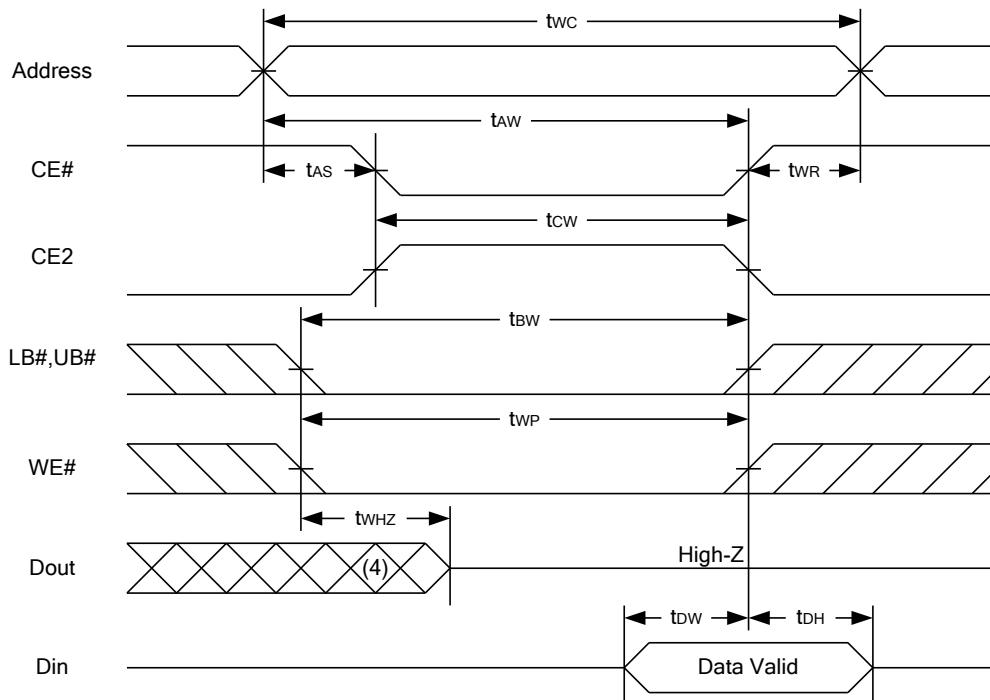
# AS7C316098B-10TIN AS7C316098B-10BIN

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## WRITE CYCLE 1 (WE# Controlled) (1,2,3,5,6)



## WRITE CYCLE 2 (CE# and CE2 Controlled) (1,2,5,6)





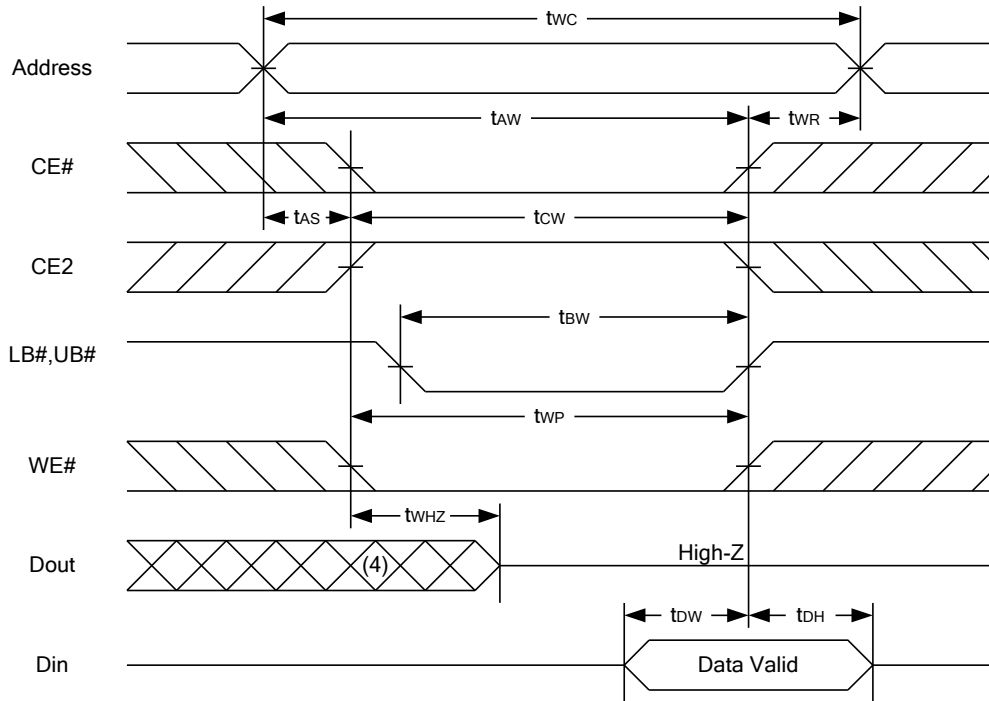


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# AS7C316098B-10TIN AS7C316098B-10BIN

1024K X 16 BIT HIGH SPEED CMOS SRAM

## WRITE CYCLE 3 (LB#,UB# Controlled) (1,2,5,6)



Notes :

1. WE#, CE#, LB#, UB# 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#, LB# or UB# = low.
3. During a WE# controlled write cycle with OE# low,  $t_{WP}$  must be greater than  $t_{WHZ} + t_{OW}$  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#, LB#, UB# 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.



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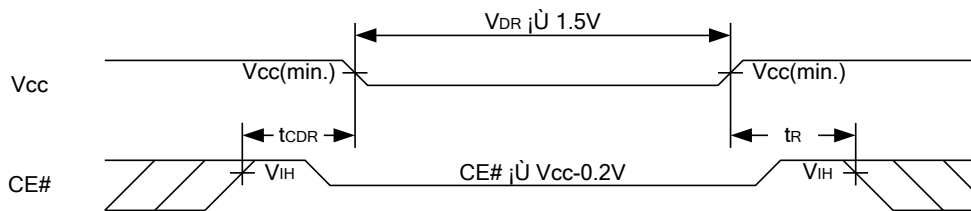
## DATA RETENTION CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
V <sub>CC</sub> for Data Retention	V <sub>DR</sub>	CE# ≥ V <sub>CC</sub> - 0.2V or CE2 ≤ 0.2V	1.5	-	3.6	V
Data Retention Current	I <sub>DR</sub>	V <sub>CC</sub> = 1.5V CE# ≥ V <sub>CC</sub> - 0.2V or CE2 ≤ 0.2V Other pins at 0.2V or V <sub>CC</sub> -0.2V	-	4	40	mA
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

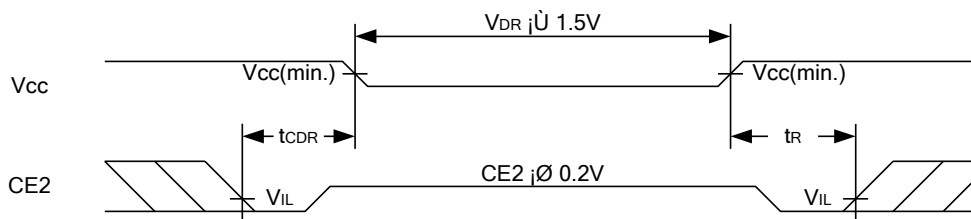
t<sub>RC</sub>\* = Read Cycle Time

## DATA RETENTION WAVEFORM

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

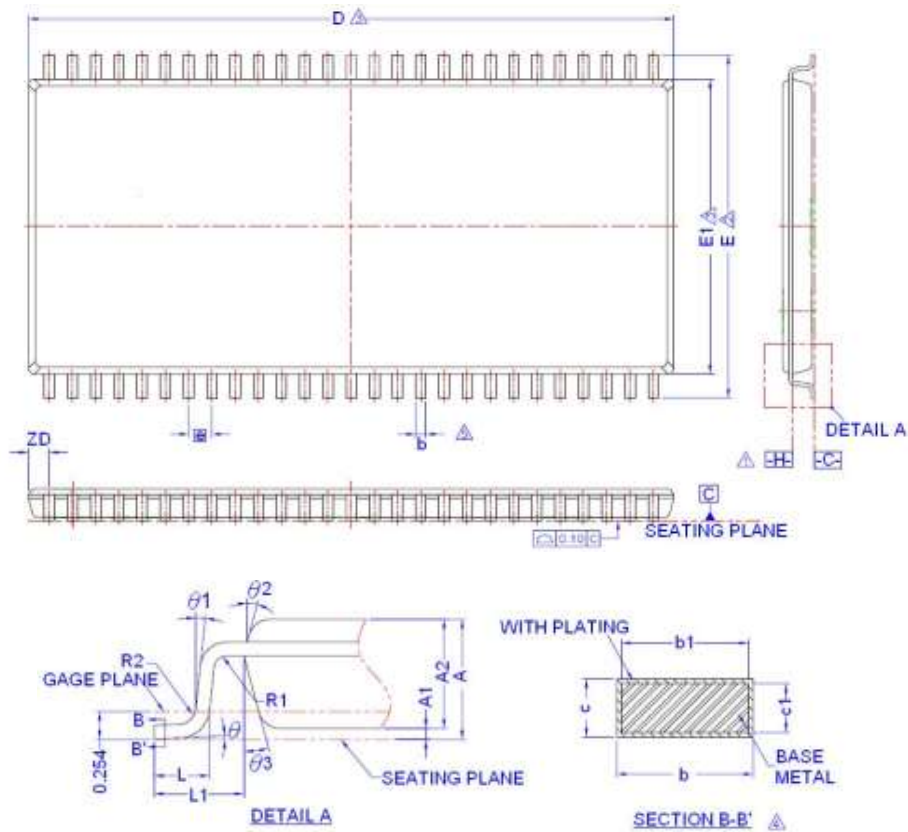


Low V<sub>CC</sub> Data Retention Waveform (2) (CE2 controlled)



### PACKAGE OUTLINE DIMENSION

#### 54-pin 400 mil TSOP-II Package Outline Dimension

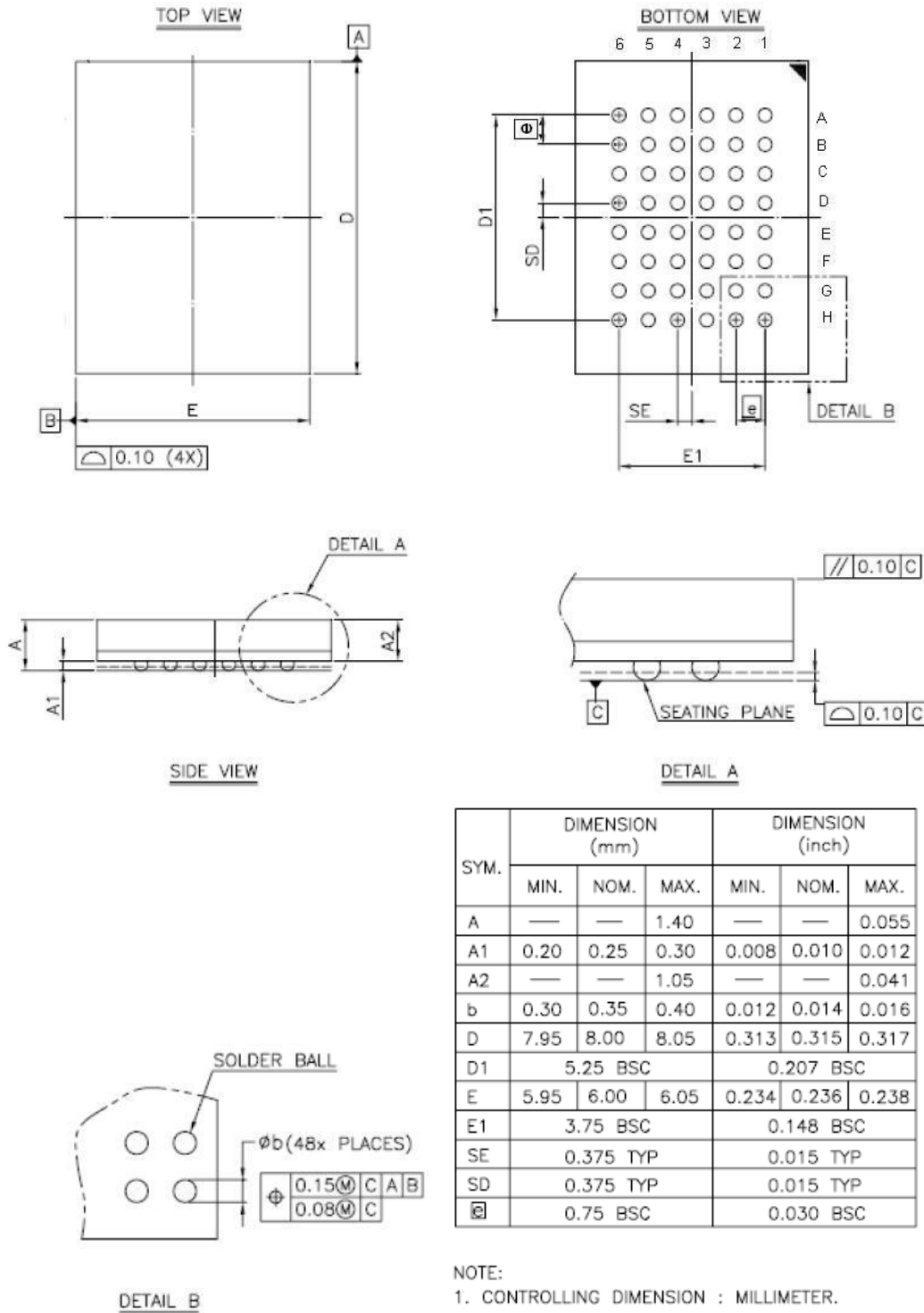


SYM.	DIMENSION (MM)			DIMENSION (INCH)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	-	-	1.20	-	-	0.047
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	0.95	1.00	1.05	0.037	0.039	0.041
b	0.30	-	0.45	0.012	-	0.018
b1	0.30	0.35	0.40	0.012	0.014	0.016
e	0.12	-	0.21	0.005	-	0.008
c1	0.10	0.127	0.16	0.004	0.005	0.006
D	22.22 BSC			0.875 BSC		
ZD	0.71 REF			0.028 REF		
E	11.76 BSC			0.463 BSC		
E1	10.16 BSC			0.400 BSC		
L	0.40	0.50	0.60	0.016	0.020	0.024
L1	0.80 REF			0.031 REF		
⌀	0.80 BSC			0.031 BSC		
R1	0.12	-	-	0.005	-	-
R2	0.12	-	0.25	0.005	-	0.010
⊖	0°	-	8°	0°	-	8°
⊖1	0°	-	-	0°	-	-
⊖2	10°	15°	20°	10°	15°	20°
⊖3	10°	15°	20°	10°	15°	20°

**NOTE:**

- DATUM PLANE  $\square$  COINCIDENT WITH BOTTOM OF LEAD, WHERE LEAD EXITS BODY.
- TO BE DETERMINED AT SEATING PLANE  $\square$ .
- DIMENSION D AND E1 ARE DETERMINED AT DATUM  $\square$ .  
DIMENSION D DOES NOT INCLUDE MOLD PROTRUSIONS OR GATE BURRS. MOLD PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.15mm PER SIDE.  
DIMENSION E1 DOES NOT INCLUDE INTERLEAD MOLD PROTRUSIONS. INTERLEAD MOLD PROTRUSIONS SHALL NOT EXCEED 0.25mm PER SIDE.
- THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm AND 0.25mm FROM THE LEAD TIP.
- DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION.
- CONTROLLING DIMENSION: MILLIMETER.
- REFER TO JEDEC STD MS-024, FA.

# AS7C316098B-10TIN AS7C316098B-10BIN

**1024K X 16 BIT HIGH SPEED CMOS SRAM**
**48-ball 6mm × 8mm TFBGA Package Outline Dimension**

**NOTE:**

1. CONTROLLING DIMENSION : MILLIMETER.
2. REFERENCE DOCUMENT : JEDEC MO-207.



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# AS7C316098B-10TIN AS7C316098B-10BIN

1024K X 16 BIT HIGH SPEED CMOS SRAM

## PART NUMBERING SYSTEM

AS7C	316098B	10	T/B	I	N
SRAM	3=3.3V 16098=1Mx16 B= B die option	10 =10ns	T= 54-pin 400mil TSOP-II	I=Industrial -40°C to 85°C	Indicates Pb and Halogen Free & ROHS Compliant
			B=48-ball TFBGA		

Please note: we can also offer a custom part - 'specially screened' part at 8ns at 25°C defined by specific labeling on package as AS7C316098B-10TIN\*