



Rev. 1.2

# AS7C316098A

## 1024K X 16 BIT HIGH SPEED CMOS SRAM

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### **REVISION HISTORY**

| <b><u>Revision</u></b> | <b><u>Description</u></b>                                                                                                                                                                          | <b><u>Issue Date</u></b> |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Rev. 1.0               | Initial Issued                                                                                                                                                                                     | Jan.09. 2012             |
| Rev. 1.1               | Add 48 pin BGA package type.                                                                                                                                                                       | Mar.12. 2012             |
| Rev. 1.2               | 1."CE# $\geq V_{CC} - 0.2V$ " revised as "CE# $\leq 0.2$ " for TEST<br>CONDITION of Average Operating Power supply Current<br>Icc1 on page3<br>2.Revised <b><u>ORDERING INFORMATION</u></b> Page11 | July.19. 2012            |

### FEATURES

- Fast access time : 10ns
- **low power consumption:**  
Operating current:  
90mA (typical)  
Standby current:  
4mA(Typical)
- 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.)
- **Green package available**
- Package : 48-pin 12mm x 20mm TSOP-I  
48-ball 6mmx8mm TFBGA

### GENERAL DESCRIPTION

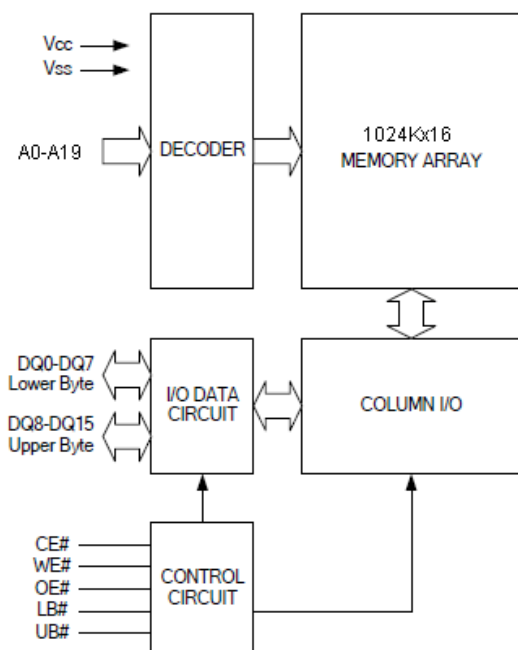
The AS7C316098A is a 16M-bit high speed CMOS static random access memory organized as 1024K words by 16 bits. It is fabricated using very high performance, high reliability CMOS technology. Its standby current is stable within the range of operating temperature.

The AS7C316098A operates from a single power supply of 3.3V and all inputs and outputs are fully TTL compatible

### PRODUCT FAMILY

| Product Family | Operating Temperature | Vcc Range  | Speed | Power Dissipation  |                      |
|----------------|-----------------------|------------|-------|--------------------|----------------------|
|                |                       |            |       | Standby(Isb1,TYP.) | Operating(Icc1,TYP.) |
| AS7C316098A(I) | -40 ~ 85°C            | 2.7 ~ 3.6V | 10ns  | 4mA                | 90mA                 |

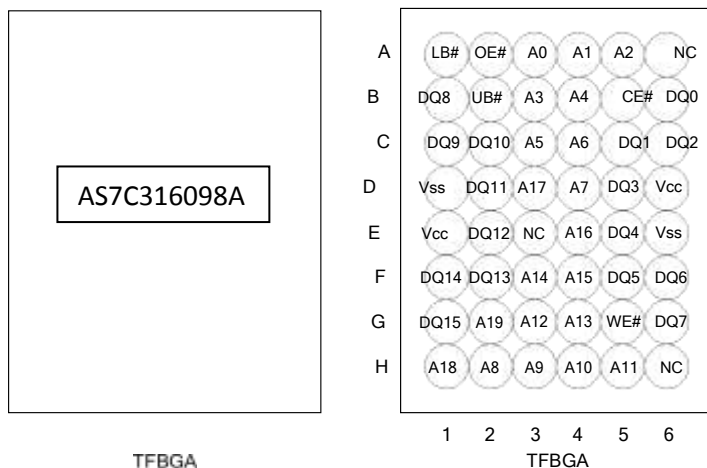
### FUNCTIONAL BLOCK DIAGRAM



### PIN DESCRIPTION

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

### PIN CONFIGURATION



### ABSOLUTE MAXIMUN RATINGS\*

| PARAMETER                                | SYMBOL           | RATING             | UNIT |
|------------------------------------------|------------------|--------------------|------|
| Voltage on Vcc relative to Vss           | V <sub>T1</sub>  | -0.5 to 4.6        | V    |
| Voltage on any other pin relative to Vss | V <sub>T2</sub>  | -0.5 to Vcc+0.5    | V    |
| Operating Temperature                    | T <sub>A</sub>   | 0 to 70(C grade)   | °C   |
|                                          |                  | -40 to 85(I 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   |

\*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# | OE# | WE# | LB# | UB# | I/O OPERATION    |                  | SUPPLY CURRENT                       |
|----------------|-----|-----|-----|-----|-----|------------------|------------------|--------------------------------------|
|                |     |     |     |     |     | DQ0-DQ7          | DQ8-DQ15         |                                      |
| Standby        | H   | X   | X   | X   | X   | High – Z         | High – Z         | I <sub>sb</sub> , I <sub>sb1</sub> , |
| Output Disable | L   | H   | H   | X   | X   | High – Z         | High – Z         | I <sub>cc</sub>                      |
|                | L   | X   | X   | H   | H   | High – Z         | High – Z         |                                      |
| Read           | L   | L   | H   | L   | H   | D <sub>OUT</sub> | High – Z         | I <sub>cc</sub>                      |
|                | L   | L   | H   | H   | L   | High – Z         | D <sub>OUT</sub> |                                      |
|                | L   | L   | H   | L   | L   | D <sub>OUT</sub> | D <sub>OUT</sub> |                                      |
| Write          | L   | X   | L   | L   | H   | D <sub>IN</sub>  | High – Z         | I <sub>cc</sub>                      |
|                | L   | X   | L   | H   | L   | High – Z         | D <sub>IN</sub>  |                                      |
|                | L   | X   | L   | L   | L   | D <sub>IN</sub>  | D <sub>IN</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   | 3.3                | 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> |                                                                                          |     | - 0.3 | -                  | 0.8                  | 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> ,<br>Output Disabled                |     | - 1   | -                  | 1                    | μA   |
| Output High Voltage                    | V <sub>OH</sub>               | I <sub>OH</sub> = -8mA                                                                   |     | 2.4   | -                  | -                    | V    |
| Output Low Voltage                     | V <sub>OL</sub>               | I <sub>OL</sub> =4mA                                                                     |     | -     | -                  | 0.4                  | V    |
| Average Operating Power supply Current | I <sub>cc</sub>               | CE# = V <sub>IL</sub> , I <sub>I/O</sub> = 0mA<br>;f=max                                 | -10 | -     | 110                | 160                  | mA   |
|                                        | I <sub>cc1</sub>              | CE# ≤ 0.2, Other pin is at 0.2V or V <sub>CC</sub> -0.2V<br>I <sub>I/O</sub> = 0mA;f=max | -10 | -     | 90                 | 120                  | mA   |
| Standby Power Supply Current           | I <sub>sb</sub>               | CE# ≥ V <sub>IH</sub><br>Other pin is at V <sub>IL</sub> or V <sub>IH</sub>              |     | -     | -                  | 80                   | mA   |
| Standby Power Supply Current           | I <sub>sb1</sub>              | CE# ≥ V <sub>CC</sub> - 0.2V;<br>Other pin is at 0.2V or V <sub>CC</sub> -0.2V           |     | -     | 4                  | 40                   | mA   |

Notes:

- V<sub>IH</sub>(max) = V<sub>CC</sub> + 3.0V for pulse width less than 10ns.
- V<sub>IL</sub>(min) = V<sub>SS</sub> - 3.0V for pulse width less than 10ns.
- Over/Undershoot specifications are characterized, not 100% tested.
- Typical values are included for reference only and are not guaranteed or tested.  
Typical valued are measured at V<sub>CC</sub> = V<sub>CC</sub>(TYP.) and T<sub>A</sub> = 25 °C

### **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                                    | 10/12ns                                                                         |
| 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                              | $C_L = 30\text{pF} + 1\text{TTL}$ ,<br>$I_{OH}/I_{OL} = -8\text{mA}/4\text{mA}$ |

### **AC ELECTRICAL CHARACTERISTICS**

#### **(1) READ CYCLE**

| PARAMETER                          | SYM.        | AS7C316098A-10 |      | UNIT |
|------------------------------------|-------------|----------------|------|------|
|                                    |             | MIN.           | MAX. |      |
| Read Cycle Time                    | $t_{RC}$    | 10             | -    | ns   |
| Address Access Time                | $t_{AA}$    | -              | 10   | ns   |
| Chip Enable Access Time            | $t_{ACE}$   | -              | 10   | ns   |
| Output Enable Access Time          | $t_{OE}$    | -              | 4.5  | ns   |
| Chip Enable to Output in Low-Z     | $t_{CLZ}^*$ | 2              | -    | ns   |
| Output Enable to Output in Low-Z   | $t_{OLZ}^*$ | 0              | -    | ns   |
| Chip Disable to Output in High-Z   | $t_{CHZ}^*$ | -              | 4    | ns   |
| Output Disable to Output in High-Z | $t_{OHZ}^*$ | -              | 4    | ns   |
| Output Hold from Address Change    | $t_{OH}$    | 2              | -    | ns   |
| LB#, UB# Access Time               | $t_{BA}$    | -              | 4.5  | ns   |
| LB#, UB# to High-Z Output          | $t_{BHZ}^*$ | -              | 4    | ns   |
| LB#, UB# to Low-Z Output           | $t_{BLZ}^*$ | 0              | -    | ns   |

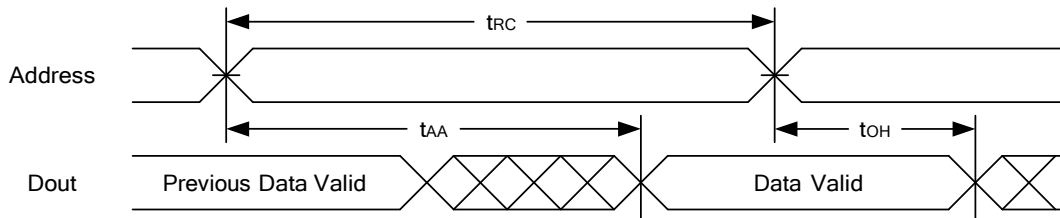
#### **(2) WRITE CYCLE**

| PARAMETER                        | SYM.        | AS7C316098A-10 |      | UNIT |
|----------------------------------|-------------|----------------|------|------|
|                                  |             | MIN.           | MAX. |      |
| Write Cycle Time                 | $t_{WC}$    | 10             | -    | ns   |
| Address Valid to End of Write    | $t_{AW}$    | 8              | -    | ns   |
| Chip Enable to End of Write      | $t_{CW}$    | 8              | -    | ns   |
| Address Set-up Time              | $t_{AS}$    | 0              | -    | ns   |
| Write Pulse Width                | $t_{WP}$    | 8              | -    | ns   |
| Write Recovery Time              | $t_{WR}$    | 0              | -    | ns   |
| Data to Write Time Overlap       | $t_{DW}$    | 6              | -    | ns   |
| Data Hold from End of Write Time | $t_{DH}$    | 0              | -    | ns   |
| Output Active from End of Write  | $t_{OW}^*$  | 2              | -    | ns   |
| Write to Output in High-Z        | $t_{WHZ}^*$ | -              | 4    | ns   |
| LB#, UB# Valid to End of Write   | $t_{BW}$    | 8              | -    | ns   |

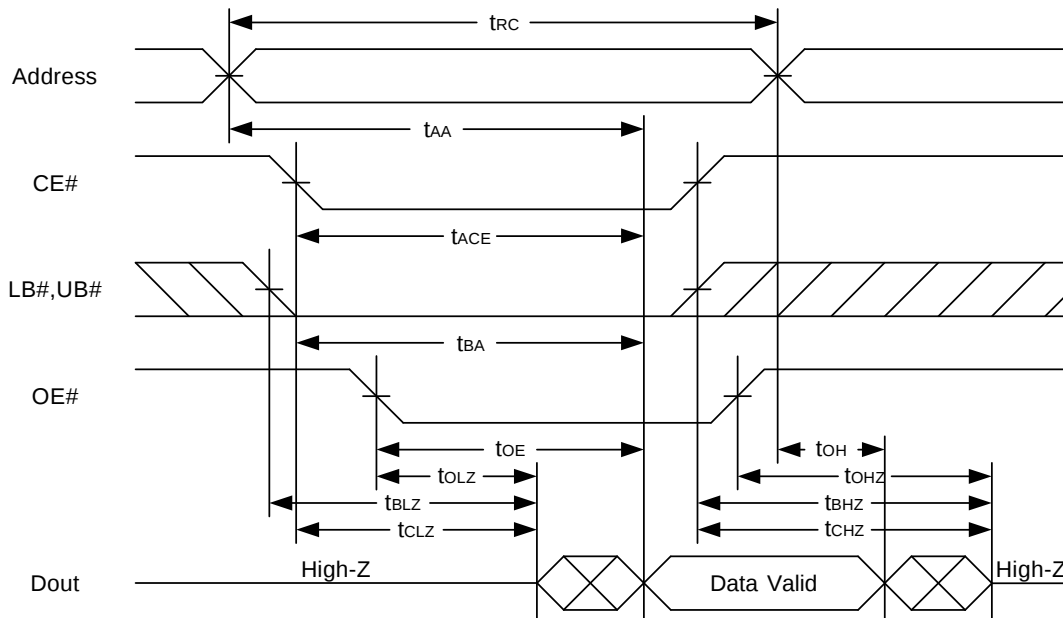
\*These parameters are guaranteed by device characterization, but not production tested.

### TIMING WAVEFORMS

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

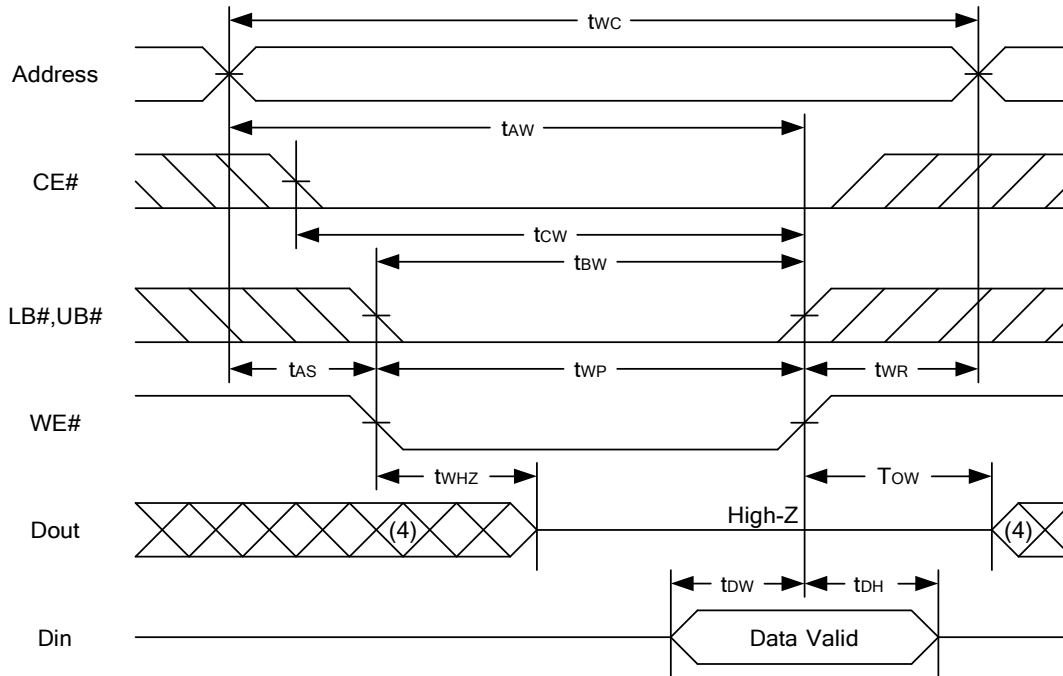
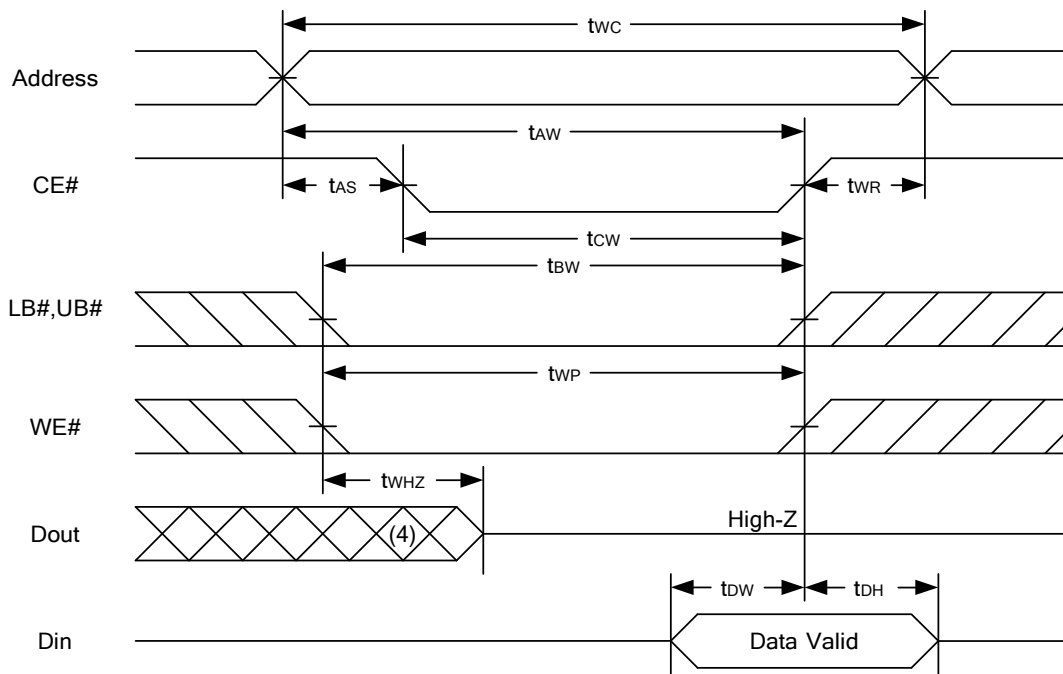


#### READ CYCLE 2 (CE# and OE# Controlled) (1,3,4,5)

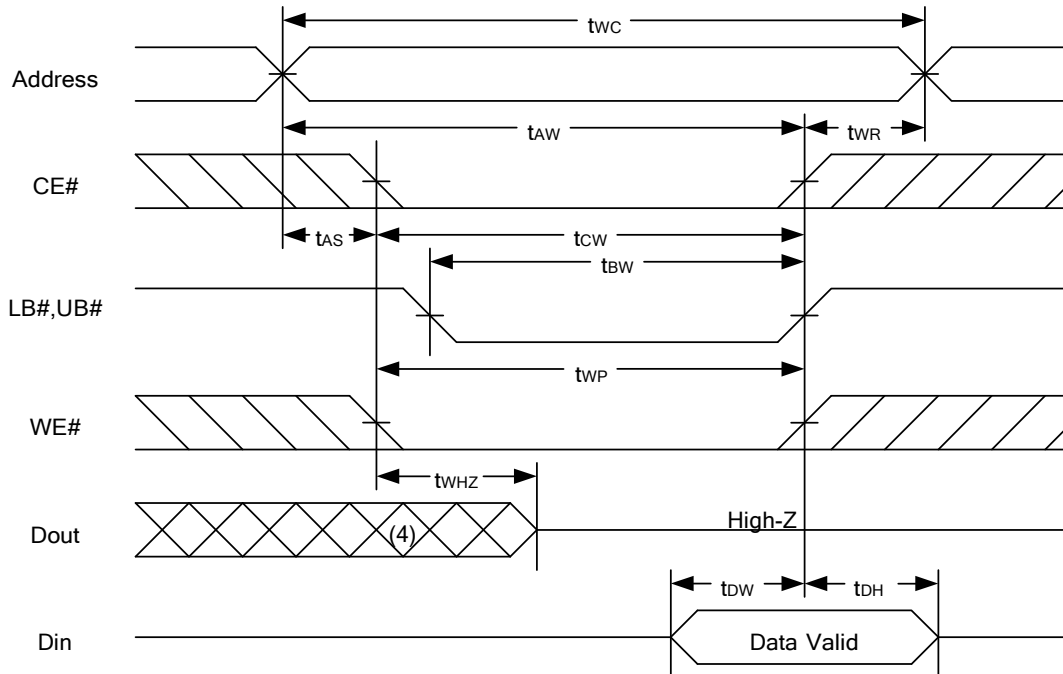


#### Notes :

1. WE# is high for read cycle.
2. Device is continuously selected OE# = low, CE# = low, LB# or UB# = low.
3. Address must be valid prior to or coincident with CE# = low, 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  $t_{OLZ}$ .

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

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


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



#### Notes :

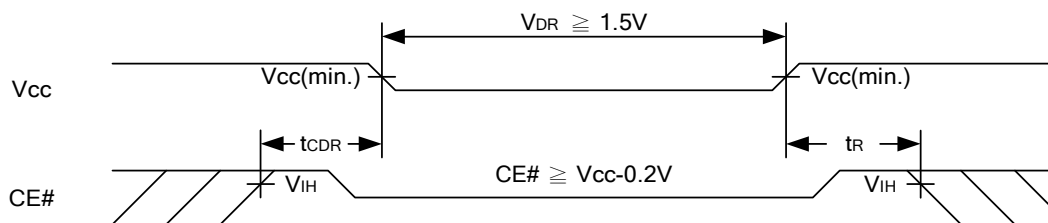
1. WE#, CE#, LB#, UB# must be high during all address transitions.
2. A write occurs during the overlap of a low CE#, low WE#, LB# or UB# = low.
3. During a WE# controlled write cycle with OE# low,  $t_{wp}$  must be greater than  $t_{whz} + t_{dw}$  to allow the drivers to turn off and data to be placed 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#, LB#, UB# low 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  $C_L = 5\text{pF}$ . Transition is measured  $\pm 500\text{mV}$  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                                                                             | 1.5              | -    | 3.6  | V    |
| Data Retention Current              | I <sub>DR</sub>  | V <sub>CC</sub> = 1.5V<br>CE# $\geq$ V <sub>CC</sub> - 0.2V;<br>Other pin is 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   |

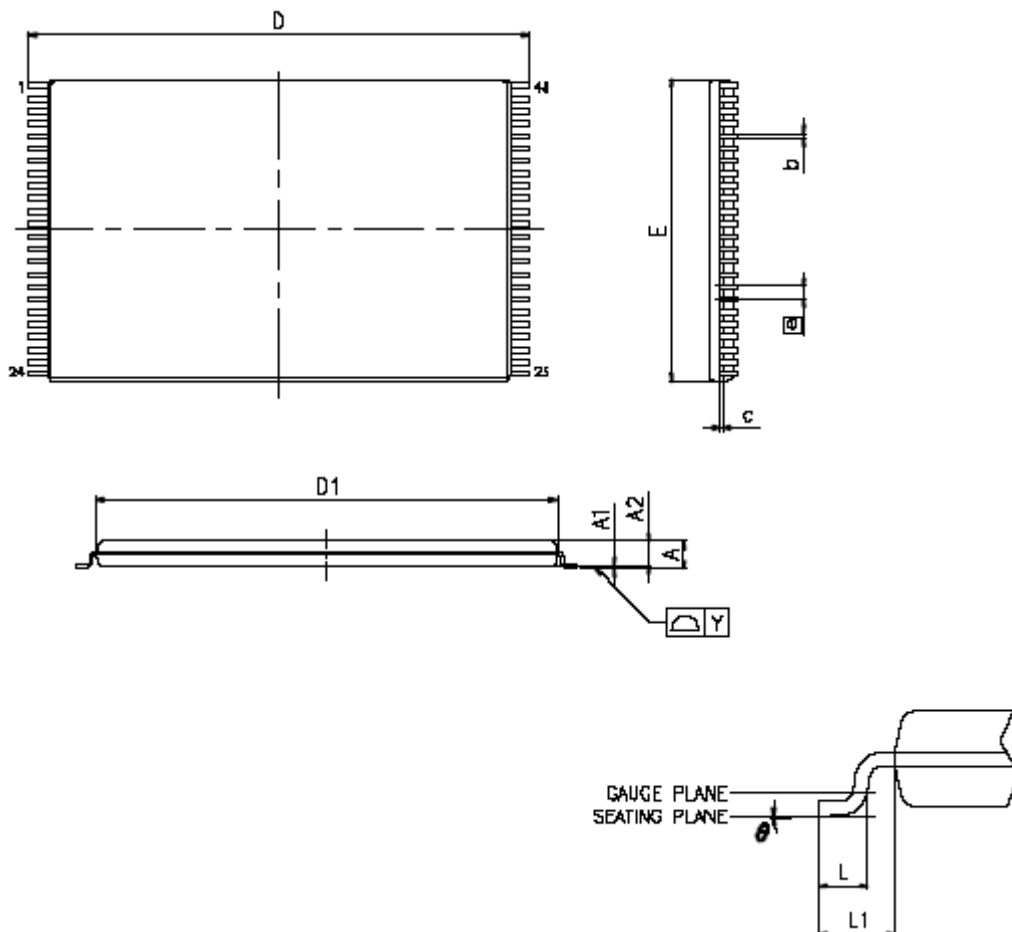
t<sub>RC\*</sub> = Read Cycle Time

### **DATA RETENTION WAVEFORM**



## **PACKAGE OUTLINE DIMENSION**

### **48-pin 12mm x 20mm TSOP-I Package Outline Dimension**

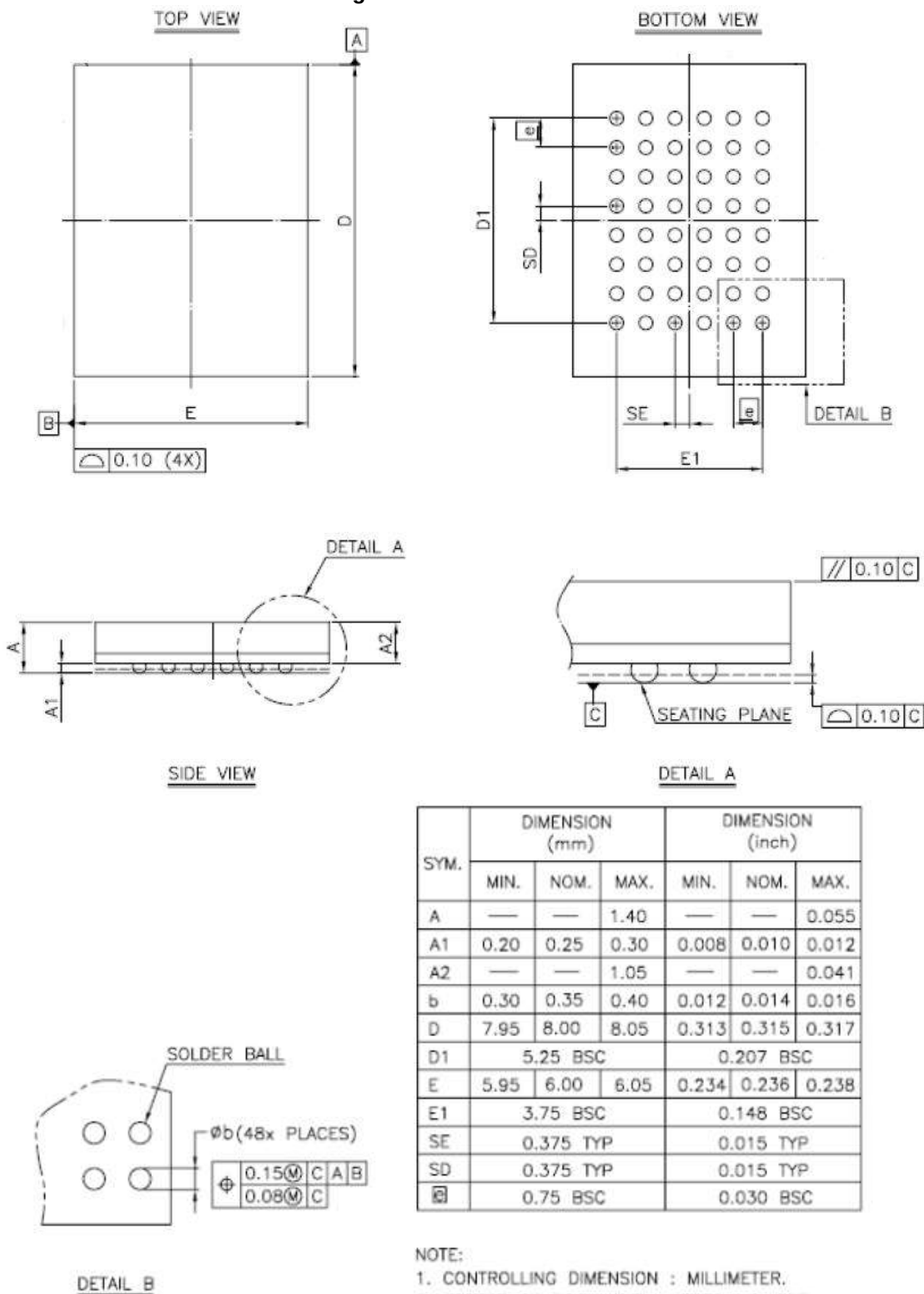


#### **VARIATIONS (ALL DIMENSIONS SHOWN IN MM)**

| SYMBOLS | MIN.       | NOM.  | MAX   |
|---------|------------|-------|-------|
| A       | —          | —     | 1.20  |
| A1      | 0.05       | —     | 0.15  |
| A2      | 0.95       | 1.00  | 1.05  |
| b       | 0.17       | 0.22  | 0.27  |
| c       | 0.10       | —     | 0.21  |
| D       | 19.80      | 20.00 | 20.20 |
| D1      | 18.30      | 18.40 | 18.50 |
| E       | 11.90      | 12.00 | 12.10 |
| e       | 0.50 BASIC |       |       |
| L       | 0.50       | 0.60  | 0.70  |
| L1      | —          | 0.80  | —     |
| Y       | —          | —     | 0.10  |
| θ       | 0°         | —     | 5°    |

#### **NOTES:**

- 1 JEDEC OUTLINE : MO-142 DD
2. PROFILE TOLERANCE ZONES FOR D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION ON E IS 0.15mm PER SIDE AND ON D1 IS 0.25mm PER SIDE.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08mm TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT.

**48-ball 6mm × 8mm TFBGA Package Outline Dimension**


### ORDERING INFORMATION

| Alliance          | Organization | VCC Range  | Package                    | Operating Temp          | Speed ns |
|-------------------|--------------|------------|----------------------------|-------------------------|----------|
| AS7C316098A-10TIN | 1024K x 16   | 2.7 ~ 3.6V | 48 pin TSOP-I              | Industrial (-40 ~ 85°C) | 10       |
| AS7C316098A-10BIN | 1024K x 16   | 2.7 ~ 3.6V | 48 ball TFBGA<br>6mm x 8mm | Industrial (-40 ~ 85°C) | 10       |



Rev. 1.2

AS7C316098A

1024K X 16 BIT HIGH SPEED CMOS SRAM

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Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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