



AS7C1025  
AS7C31025

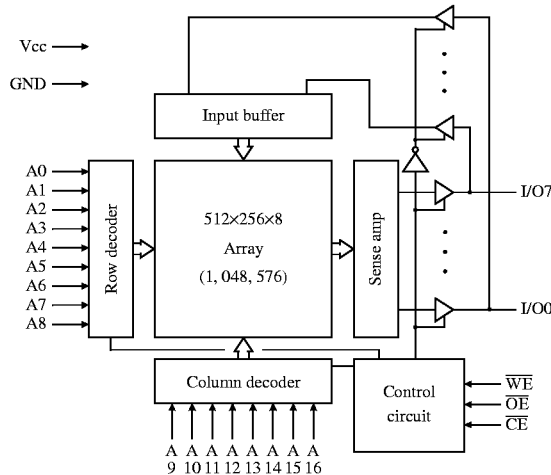
5V/3.3V 128K×8 CMOS SRAM (Common I/O)

SRAM

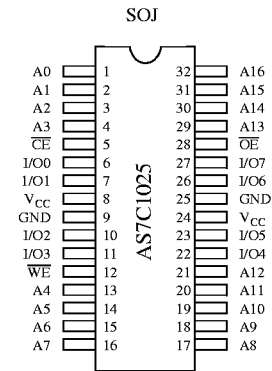
## Features

- Organization: 131,072 words × 8 bits
- High speed
  - 10/12/15/20 ns address access time
  - 3/3/4/5 ns output enable access time
- Low power consumption
  - Active: 770 mW max (10 ns cycle, 5V)
  - Standby: 27.5 mW max, CMOS I/O (5V)
  - Very low DC component in active power
- 2.0V data retention
- Equal access and cycle times
- Easy memory expansion with  $\overline{CE}$ ,  $\overline{OE}$  inputs
- TTL-compatible, three-state I/O
- 32-pin JEDEC standard package
  - 300/400 mil SOJ
- Center power and ground pins for low noise
- ESD protection ≥ 2000 volts
- Latch-up current ≥ 200 mA
- 3.3V version available (AS7C31025)
- Industrial and commercial temperature available

## Logic block diagram



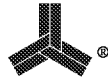
## Pin arrangement



## Selection guide

|                                   | 7C1025-10 | 7C1025-12  | 7C1025-15  | 7C1025-20  | Unit |
|-----------------------------------|-----------|------------|------------|------------|------|
|                                   | –         | 7C31025-12 | 7C31025-15 | 7C31025-20 |      |
| Maximum address access time       | 10        | 12         | 15         | 20         | ns   |
| Maximum output enable access time | 3         | 3          | 4          | 5          | ns   |
| Maximum operating current         | AS7C1025  | 140        | 130        | 120        | mA   |
|                                   | AS7C31025 | –          | 100        | 85         | mA   |
| Maximum CMOS standby current      | 5         | 5          | 5          | 5          | mA   |

Shaded areas contain advance information.



## Functional description

The AS7C1025 and AS7C31025 are high performance CMOS 1,048,576-bit Static Random Access Memories (SRAM) organized as 131,072 words  $\times$  8 bits. They are designed for memory applications where fast data access, low power, and simple interfacing are desired.

Equal address access and cycle times ( $t_{AA}$ ,  $t_{RC}$ ,  $t_{WC}$ ) of 10/12/15/20 ns with output enable access times ( $t_{OE}$ ) of 3/3/4/5 ns are ideal for high performance applications. The chip enable input  $\overline{CE}$  permits easy memory expansion with multiple-bank memory systems.

When  $\overline{CE}$  is HIGH the device enters standby mode. The standard AS7C1025 is guaranteed not to exceed 27.5 mW power consumption in standby mode, and typically requires only 5 mW. Both devices also offer 2.0V data retention.

A write cycle is accomplished by asserting write enable ( $\overline{WE}$ ) and chip enable ( $\overline{CE}$ ). Data on the input pins I/O0-I/O7 is written on the rising edge of  $\overline{WE}$  (write cycle 1) or  $\overline{CE}$  (write cycle 2). To avoid bus contention, external devices should drive I/O pins only after outputs have been disabled with output enable ( $\overline{OE}$ ) or write enable ( $\overline{WE}$ ).

A read cycle is accomplished by asserting output enable ( $\overline{OE}$ ) and chip enable ( $\overline{CE}$ ), with write enable ( $\overline{WE}$ ) HIGH. The chip drives I/O pins with the data word referenced by the input address. When either chip enable or output enable is inactive, or write enable is active, output drivers stay in high-impedance mode.

All chip inputs and outputs are TTL-compatible, and operation is from a single 5V supply (AS7C1025) or 3.3V supply (7C31025). The AS7C1025 and AS7C31025 are packaged in common industry standard packages.

## Absolute maximum ratings

| Parameter                          | Symbol    | Min  | Max  | Unit |
|------------------------------------|-----------|------|------|------|
| Voltage on any pin relative to GND | $V_t$     | -0.5 | +7.0 | V    |
| Power dissipation                  | $P_D$     | –    | 1.0  | W    |
| Storage temperature (plastic)      | $T_{stg}$ | -55  | +150 | °C   |
| DC output current                  | $I_{out}$ | –    | 20   | 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 at these or any other conditions outside those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## Truth table

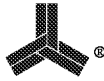
| $\overline{CE}$ | $\overline{WE}$ | $\overline{OE}$ | Data      | Mode                             |
|-----------------|-----------------|-----------------|-----------|----------------------------------|
| H               | X               | X               | High Z    | Standby ( $I_{SB}$ , $I_{SB1}$ ) |
| L               | H               | H               | High Z    | Output disable                   |
| L               | H               | L               | $D_{out}$ | Read                             |
| L               | L               | X               | $D_{in}$  | Write                            |

Key: X = Don't Care, L = LOW, H = HIGH

## Recommended operating conditions

| Parameter                     |           | Symbol   | Min  | Nominal | Max            | Unit |
|-------------------------------|-----------|----------|------|---------|----------------|------|
| Supply voltage                | AS7C1025  | $V_{CC}$ | 4.5  | 5.0     | 5.5            | V    |
|                               | AS7C31025 | $V_{CC}$ | 3.0  | 3.3     | 3.6            | V    |
|                               |           | GND      | 0.0  | 0.0     | 0.0            | V    |
| Input voltage                 | AS7C1025  | $V_{IH}$ | 2.2  | –       | $V_{CC} + 0.5$ | V    |
|                               | AS7C31025 | $V_{IH}$ | 2.0  | –       | $V_{CC} + 0.5$ | V    |
|                               |           | $V_{IL}$ | -0.5 | –       | 0.8            | V    |
| Ambient operating temperature |           | $T_A$    | 0    | –       | 70             | °C   |

$V_{IL}$  min = -3.0V for pulse width less than  $t_{RC}/2$ .



## DC operating characteristics

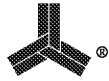
| Parameter                                 | Symbol           | Test conditions                                                                                                 | -10 |     | -12 |     | -15 |     | -20 |     | Unit |
|-------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
|                                           |                  |                                                                                                                 | Min | Max | Min | Max | Min | Max | Min | Max |      |
| Input leakage current                     | I <sub>LI</sub>  | V <sub>CC</sub> = Max, V <sub>in</sub> = GND to V <sub>CC</sub>                                                 | -   | 2   | -   | 2   | -   | 2   | -   | 2   | μA   |
| Output leakage current                    | I <sub>LO</sub>  | $\overline{CET} = V_{IH}$ , V <sub>CC</sub> = Max,<br>V <sub>out</sub> = GND to V <sub>CC</sub>                 | -   | 5   | -   | 5   | -   | 5   | -   | 5   | μA   |
| Operating power supply current            | I <sub>CC</sub>  | $\overline{CET} = V_{IL}$ , AS7C1025                                                                            | -   | 140 | -   | 130 | -   | 120 | -   | 110 | mA   |
|                                           |                  | f = f <sub>max</sub> , I <sub>out</sub> = 0 mA AS7C31025                                                        | -   | 135 | -   | 100 | -   | 85  | -   | 80  | mA   |
| Standby power supply current <sup>1</sup> | I <sub>SB</sub>  | $\overline{CET} = V_{IH}$ , f = f <sub>max</sub>                                                                | -   | 55  | -   | 50  | -   | 40  | -   | 40  | mA   |
|                                           | I <sub>SB1</sub> | $\overline{CET} \geq V_{CC}-0.2V$ ,<br>V <sub>in</sub> ≤ 0.2V or V <sub>in</sub> ≥ V <sub>CC</sub> -0.2V, f = 0 | -   | 5   | -   | 5   | -   | 5   | -   | 5   | mA   |
| Output voltage                            | V <sub>OL</sub>  | I <sub>OL</sub> = 8 mA, V <sub>CC</sub> = Min                                                                   | -   | 0.4 | -   | 0.4 | -   | 0.4 | -   | 0.4 | V    |
|                                           | V <sub>OH</sub>  | I <sub>OH</sub> = -4 mA, V <sub>CC</sub> = Min                                                                  | 2.4 | -   | 2.4 | -   | 2.4 | -   | 2.4 | -   | V    |

Shaded areas contain advance information.

## Capacitance <sup>2</sup>

| Parameter         | Symbol    | Signals                                                | Test conditions         | Max | Unit |
|-------------------|-----------|--------------------------------------------------------|-------------------------|-----|------|
| Input capacitance | $C_{IN}$  | A, $\overline{CE}$ , $\overline{WE}$ , $\overline{OE}$ | $V_{in} = 0V$           | 5   | pF   |
| I/O capacitance   | $C_{I/O}$ | I/O                                                    | $V_{in} = V_{out} = 0V$ | 7   | pF   |

SRAM


Read cycle <sup>3, 9</sup>

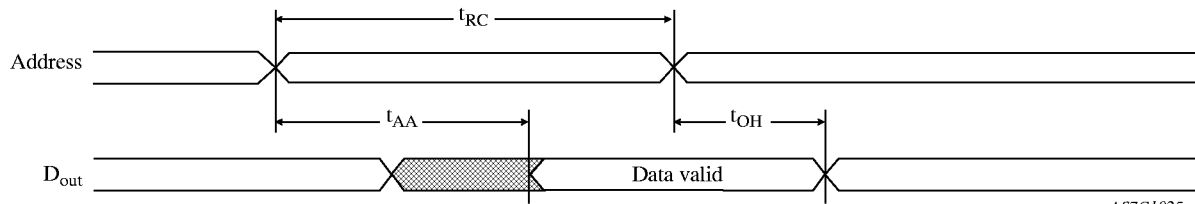
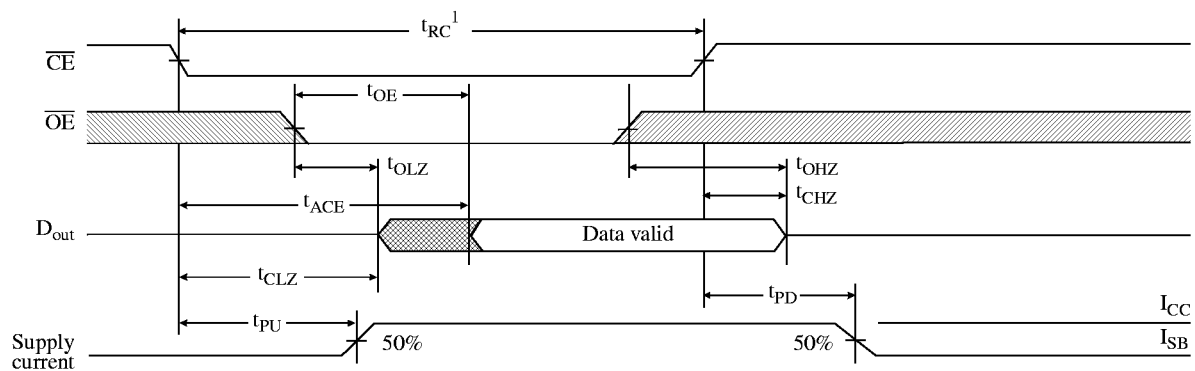
| Parameter                                     | Symbol    | -10 |     | -12 |     | -15 |     | -20 |     | Unit | Notes |
|-----------------------------------------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|
|                                               |           | Min | Max | Min | Max | Min | Max | Min | Max |      |       |
| Read cycle time                               | $t_{RC}$  | 10  | –   | 12  | –   | 15  | –   | 20  | –   | ns   |       |
| Address access time                           | $t_{AA}$  | –   | 10  | –   | 12  | –   | 15  | –   | 20  | ns   | 3     |
| Chip enable ( $\overline{CE}$ ) access time   | $t_{ACE}$ | –   | 10  | –   | 12  | –   | 15  | –   | 20  | ns   | 3     |
| Output enable ( $\overline{OE}$ ) access time | $t_{OE}$  | –   | 3   | –   | 3   | –   | 4   | –   | 5   | ns   |       |
| Output hold from address change               | $t_{OH}$  | 2   | –   | 3   | –   | 3   | –   | 3   | –   | ns   | 5     |
| $\overline{CE}$ LOW to output in low Z        | $t_{CLZ}$ | 0   | –   | 0   | –   | 0   | –   | 0   | –   | ns   | 4, 5  |
| $\overline{CE}$ HIGH to output in high Z      | $t_{CHZ}$ | –   | 3   | –   | 3   | –   | 4   | –   | 5   | ns   | 4, 5  |
| $\overline{OE}$ LOW to output in low Z        | $t_{OLZ}$ | 0   | –   | 0   | –   | 0   | –   | 0   | –   | ns   | 4, 5  |
| $\overline{OE}$ HIGH to output in high Z      | $t_{OHZ}$ | –   | 3   | –   | 3   | –   | 4   | –   | 5   | ns   | 4, 5  |
| Power up time                                 | $t_{PU}$  | 0   | –   | 0   | –   | 0   | –   | 0   | –   | ns   | 4, 5  |
| Power down time                               | $t_{PD}$  | –   | 10  | –   | 12  | –   | 15  | –   | 20  | ns   | 4, 5  |

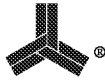
## Key to switching waveforms

Rising input

Falling input

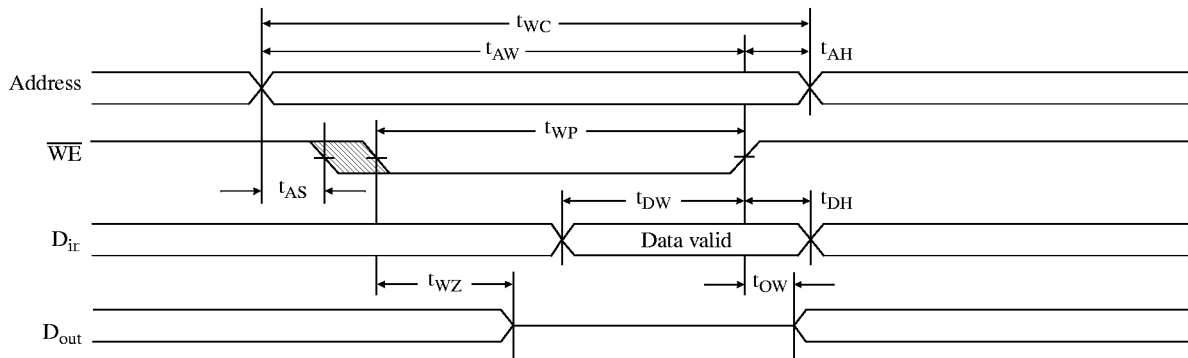
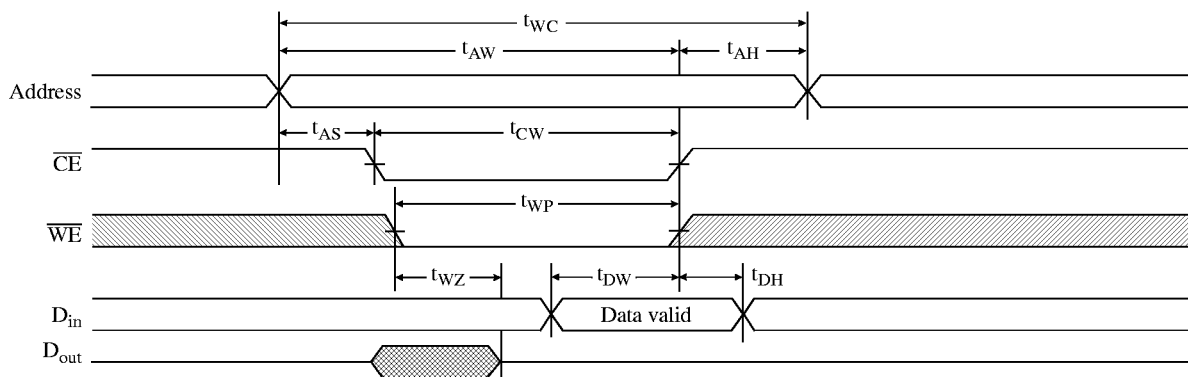
Undefined output/don't care

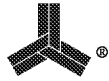
Read waveform 1 <sup>3, 6, 7, 9</sup>

Read waveform 2 <sup>3, 6, 8, 9</sup>


Write cycle <sup>11</sup>

| Parameter                                    | Symbol   | -10 |     | -12 |     | -15 |     | -20 |     | Unit | Notes |
|----------------------------------------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|
|                                              |          | Min | Max | Min | Max | Min | Max | Min | Max |      |       |
| Write cycle time                             | $t_{WC}$ | 10  | –   | 12  | –   | 15  | –   | 20  | –   | ns   |       |
| Chip enable ( $\overline{CE}$ ) to write end | $t_{CW}$ | 9   | –   | 10  | –   | 12  | –   | 12  | –   | ns   |       |
| Address setup to write end                   | $t_{AW}$ | 9   | –   | 10  | –   | 12  | –   | 12  | –   | ns   |       |
| Address setup time                           | $t_{AS}$ | 0   | –   | 0   | –   | 0   | –   | 0   | –   | ns   |       |
| Write pulse width                            | $t_{WP}$ | 7   | –   | 8   | –   | 9   | –   | 12  | –   | ns   |       |
| Address hold from end of write               | $t_{AH}$ | 0   | –   | 0   | –   | 0   | –   | 0   | –   | ns   |       |
| Data valid to write end                      | $t_{DW}$ | 6   | –   | 6   | –   | 8   | –   | 10  | –   | ns   |       |
| Data hold time                               | $t_{DH}$ | 0   | –   | 0   | –   | 0   | –   | 0   | –   | ns   | 4, 5  |
| Write enable to output in high Z             | $t_{WZ}$ | –   | 5   | –   | 5   | –   | 5   | –   | 5   | ns   | 4, 5  |
| Output active from write end                 | $t_{OW}$ | 3   | –   | 3   | –   | 3   | –   | 3   | –   | ns   | 4, 5  |

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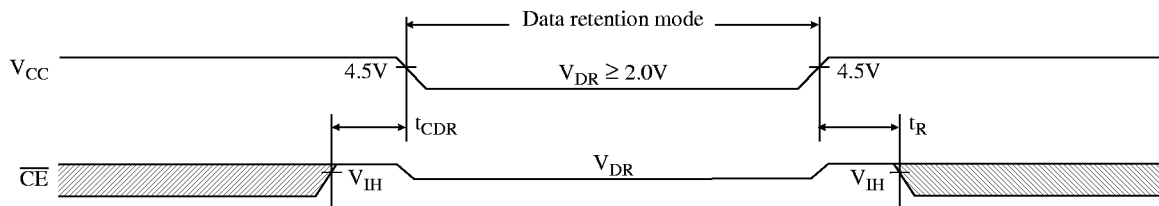
Write waveform 1 <sup>10, 11</sup>Write waveform 2 <sup>10, 11</sup>



## Data retention characteristics

| Parameter                          | Symbol     | Test conditions                                      | Min      | Max | Unit    |
|------------------------------------|------------|------------------------------------------------------|----------|-----|---------|
| $V_{CC}$ for data retention        | $V_{DR}$   | $V_{CC} = 2.0V$                                      | 2.0      | –   | V       |
| Data retention current             | $I_{CCDR}$ | $\overline{CE} \geq V_{CC} - 0.2V$                   | –        | 500 | $\mu A$ |
| Chip enable to data retention time | $t_{CDR}$  | $V_{in} \geq V_{CC} - 0.2V$ or<br>$V_{in} \leq 0.2V$ | 0        | –   | ns      |
| Operation recovery time            | $t_R$      |                                                      | $t_{RC}$ | –   | ns      |
| Input leakage current              | $ I_{LI} $ |                                                      | –        | 1   | $\mu A$ |

## Data retention waveform



## AC test conditions

- Output load: see Figure B, except as noted.
- Input pulse level: GND to 3.0V. See Figure A.
- Input rise and fall times: 5 ns. See Figure A.
- Input and output timing reference levels: 1.5V.

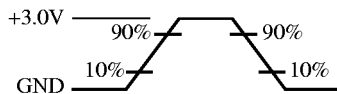


Figure A: Input waveform

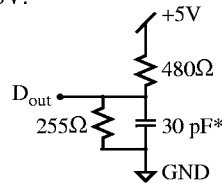


Figure B: Output load

Thevenin equivalent:  
 $D_{out} \rightarrow 168\Omega \rightarrow +1.728V$

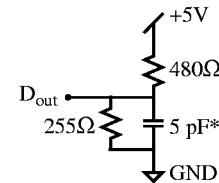
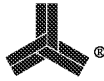


Figure C: Output load for  $t_{CLZ}$ ,  $t_{CHZ}$ ,  
 $t_{OLZ}$ ,  $t_{OHZ}$ ,  $t_{OW}$

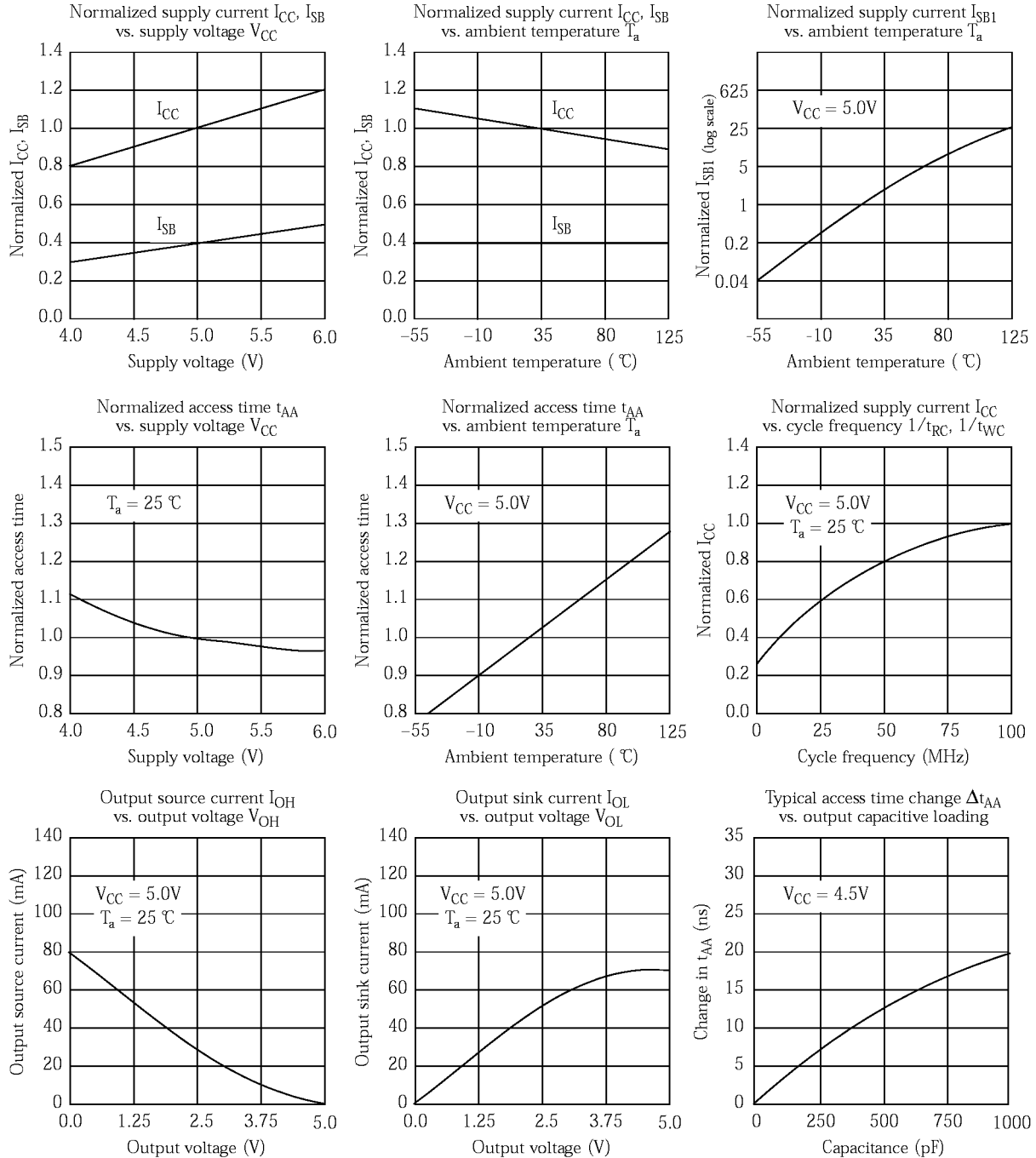
\*including scope  
and jig capacitance

## Notes

- During  $V_{CC}$  power-up, a pull-up resistor to  $V_{CC}$  on  $\overline{CE}$  is required to meet  $I_{SB}$  specification.
- This parameter is sampled and not 100% tested.
- For test conditions, see AC test conditions, Figures A, B, C.
- $t_{CLZ}$  and  $t_{CHZ}$  are specified with  $CL = 5pF$  as in Figure C. Transition is measured  $\pm 500mV$  from steady-state voltage.
- This parameter is guaranteed but not tested.
- $\overline{WE}$  is HIGH for read cycle.
- $\overline{CE}$  and  $\overline{OE}$  are LOW for read cycle.
- Address valid prior to or coincident with  $\overline{CE}$  transition LOW.
- All read cycle timings are referenced from the last valid address to the first transitioning address.
- $\overline{CE}$  or  $\overline{WE}$  must be HIGH during address transitions.
- All write cycle timings are referenced from the last valid address to the first transitioning address.
- This data applicable to the AS7C1025. The 7C31025 functions similarly.



## Typical DC and AC characteristics <sup>12</sup>



SRAM

# AS7C1025 AS7C31025



## AS7C1025 ordering codes

| Package \ Access time |      | 10 ns          | 12 ns           | 15 ns           | 20 ns           |
|-----------------------|------|----------------|-----------------|-----------------|-----------------|
| Plastic SOJ, 400 mil  | 5V   | AS7C1025-10JC  | AS7C1025-12JC   | AS7C1025-15JC   | AS7C1025-20JC   |
|                       | 3.3V | AS7C31025-10JC | AS7C31025-12JC  | AS7C31025-15JC  | AS7C31025-20JC  |
| Plastic SOJ, 300 mil  | 5V   |                | AS7C1025-12JI   | AS7C1025-15JI   | AS7C1025-20JI   |
|                       | 3.3V |                | AS7C31025-12TJC | AS7C31025-15TJC | AS7C31025-20TJC |

Shaded areas may contain advance information.

## AS7C1025 part numbering system

| AS7C        | X                                | 1025          | -XX         | X                                            | C                                                                                      |
|-------------|----------------------------------|---------------|-------------|----------------------------------------------|----------------------------------------------------------------------------------------|
| SRAM prefix | Blank = 5V CMOS<br>3 = 3.3V CMOS | Device number | Access time | Package: J = SOJ 400 mil<br>TJ = SOJ 300 mil | Temperature range<br>C = Commercial, 0 °C to 70 °C<br>I = Industrial, -40 °C to +85 °C |

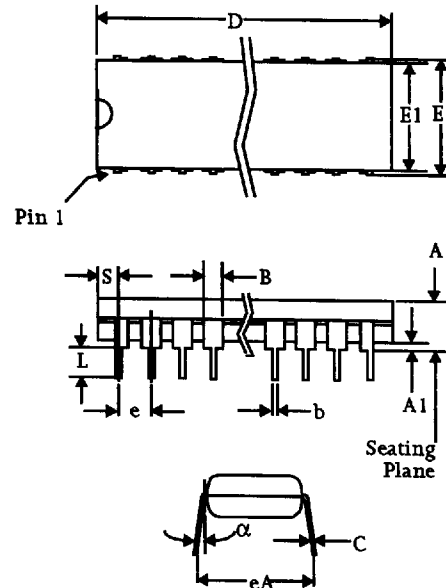




## Plastic dual in-line package (PDIP)

|          | 20-pin<br>300 mil |       | 28-pin<br>300 mil |       | 32-pin<br>300 mil |       | 32-pin<br>400 mil |       |
|----------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|
|          | Min               | Max   | Min               | Max   | Min               | Max   | Min               | Max   |
| A        | -                 | 0.175 | -                 | 0.175 | -                 | 0.180 | -                 | 0.200 |
| A1       | 0.010             | -     | 0.010             | -     | 0.015             | -     | 0.015             | -     |
| B        | 0.046             | 0.054 | 0.058             | 0.064 | 0.045             | 0.055 | 0.045             | 0.065 |
| b        | 0.018             | 0.024 | 0.016             | 0.022 | 0.015             | 0.021 | 0.014             | 0.022 |
| C        | 0.008             | 0.014 | 0.008             | 0.014 | 0.008             | 0.012 | 0.009             | 0.015 |
| D        | -                 | 0.980 | -                 | 1.400 | -                 | 1.571 | -                 | 1.620 |
| E        | 0.290             | 0.310 | 0.295             | 0.320 | 0.300             | 0.325 | 0.390             | 0.425 |
| E1       | 0.263             | 0.293 | 0.278             | 0.298 | 0.280             | 0.295 | 0.340             | 0.390 |
| e        | 0.100 BSC         |       | 0.100 BSC         |       | 0.100 BSC         |       | 0.100 BSC         |       |
| eA       | 0.310             | 0.350 | 0.330             | 0.370 | 0.330             | 0.370 | 0.430             | 0.470 |
| L        | 0.110             | 0.130 | 0.120             | 0.140 | 0.110             | 0.142 | 0.118             | 0.162 |
| $\alpha$ | 0°                | 15°   | 0°                | 15°   | 0°                | 15°   | 0°                | 15°   |
| S        | -                 | 0.040 | -                 | 0.055 | -                 | 0.043 | -                 | 0.065 |

Dimensions in inches



## Plastic small outline J-bend (SOJ)

|    | 20/26-pin<br>300 mil |       | 28-pin<br>300 mil |       | 32-pin<br>300 mil |       | 28-pin<br>400 mil |       | 32-pin<br>400 mil |       | 36-pin<br>400 mil |       | 40-pin<br>400 mil |       | 42-pin<br>400 mil |       | 44-pin<br>400 mil |       |
|----|----------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|
|    | Min                  | Max   | Min               | Max   | Min               | Max   | Min               | Max   | Min               | Max   | Min               | Max   | Min               | Max   | Min               | Max   | Min               | Max   |
| A  | -                    | 0.140 | -                 | 0.140 | -                 | 0.145 | 0.132             | 0.146 | -                 | 0.145 | -                 | -     | -                 | 0.145 | 0.128             | 0.148 | 0.128             | 0.148 |
| A1 | 0.020                | -     | 0.025             | -     | 0.025             | -     | 0.062             | -     | 0.025             | -     | -                 | -     | 0.025             | -     | 0.025             | -     | 0.025             | -     |
| A2 | 0.095                | 0.105 | 0.095             | 0.105 | 0.086             | 0.105 | 0.105             | 115   | 0.086             | 0.115 | 0.102             | NOM   | 0.086             | 0.115 | 1.105             | 1.115 | 1.105             | 1.115 |
| B  | 0.025                | 0.032 | 0.028             | TYP   | 0.026             | 0.032 | 0.024             | 0.032 | 0.026             | 0.032 | -                 | 0.032 | 0.026             | 0.032 | 0.026             | 0.032 | 0.026             | 0.032 |
| b  | 0.016                | 0.022 | 0.018             | TYP   | 0.014             | 0.020 | 0.013             | 0.021 | 0.015             | 0.020 | 0.013             | 0.021 | 0.015             | 0.022 | 0.015             | 0.020 | 0.015             | 0.020 |
| c  | 0.008                | 0.014 | 0.010             | TYP   | 0.006             | 0.013 | 0.005             | 0.012 | 0.007             | 0.013 | -                 | -     | 0.007             | 0.014 | 0.007             | 0.013 | 0.007             | 0.013 |
| D  | -                    | 0.686 | -                 | 0.730 | 0.820             | 0.830 | 0.720             | 0.729 | 0.820             | 0.830 | 0.920             | 0.930 | 1.015             | 1.035 | 1.070             | 1.080 | 1.120             | 1.130 |
| E  | 0.327                | 0.347 | 0.327             | 0.347 | 0.330             | 0.340 | 0.430             | 0.440 | 0.435             | 0.445 | 0.350             | 0.390 | 0.435             | 0.445 | 0.370             | NOM   | 0.370             | NOM   |
| E1 | 0.295                | 0.305 | 0.295             | 0.305 | 0.292             | 0.305 | 0.395             | 0.405 | 0.395             | 0.405 | 0.400             | NOM   | 0.395             | 0.405 | 0.395             | 0.405 | 0.395             | 0.405 |
| E2 | 0.245                | 0.285 | 0.245             | 0.285 | 0.250             | 0.275 | 0.354             | 0.378 | 0.360             | 0.380 | 0.435             | 0.445 | 0.348             | 0.390 | 0.435             | 0.445 | 0.435             | 0.445 |
| e  | 0.050 BSC            |       | 0.050 BSC         |       | 0.050 BSC         |       | 0.050 BSC         |       | 0.050 BSC         |       | 0.045             | 0.055 | 0.050 BSC         |       | 0.050 NOM         |       | 0.050 NOM         |       |

Dimensions in inches

