## May 2003

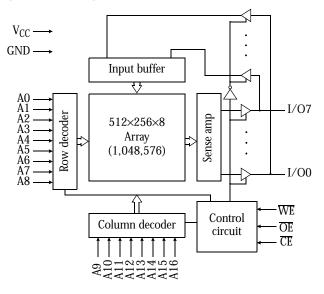


#### 5V/3.3V 128K X 8 CMOS SRAM (Revolutionary pinout)

#### **Features**

- AS7C1025A (5V version)
- AS7C31025A (3.3V version)
- Industrial and commercial temperatures
- Organization: 131,072 x 8 bits
- High speed
- 10/12/15/20 ns address access time
- 5, 6, 7, 8 ns output enable access time
- Low power consumption: ACTIVE
  - 853 mW (AS7C1025A) / max @ 10 ns (5V)
  - 522 mW (AS7C31025A) / max @ 10 ns (3.3V)
- Low power consumption: STANDBY
  - 55 mW (AS7C1025A) / max CMOS (5V)
- 36 mW (AS7C31025A) / max CMOS (3.3V)

### Logic block diagram



- Latest 6T 0.25u CMOS technology
- Easy memory expansion with  $\overline{CE}$ ,  $\overline{OE}$  inputs
- Center power and ground
- TTL/LVTTL-compatible, three-state I/O
- JEDEC-standard packages
  - 32-pin, 300 mil SOJ
  - 32-pin, 400 mil SOJ
  - 32-pin, TSOP 2
- ESD protection  $\geq$  2000 volts
- Latch-up current  $\geq 200 \text{ mA}$

#### **Pin arrangement**

32-pi	n TSOP 2
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	32 A16 31 A15 30 A14 29 A13 20 C10529 V22C10529 V22C310529 V22C310529 V22C310529 V22C310529 V22C310529 V22C3105 V22C3104 V25 V22C3105 V25 V25 V25 V25 V25 V25 V25 V2
32-pin S 32-pin S	OJ (300 mil) OJ (400 mil)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c} 32\\ 31\\ 31\\ 31\\ 31\\ 31\\ 31\\ 30\\ 31\\ 31\\ 32\\ 32\\ 32\\ 32\\ 32\\ 32\\ 32\\ 32\\ 32\\ 32$

17 - A8

## **Selection guide**

		-10	-12	-15	-20	Unit
Maximum address	access time	10	12	15	20	ns
Maximum output enable access time		5	6	7	8	ns
Maximum	AS7C1025A	155	150	145	140	mA
operating current	AS7C31025A	145	140	135	130	mA
Maximum CMOS standby current	AS7C1025A	10	10	10	10	mA
	AS7C31025A	5	5	5	5	mA

#### **Functional description**

The AS7C1025A and AS7C31025A are high-performance CMOS 1,048,576-bit Static Random Access Memory (SRAM) devices organized as 131,072 x 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 5, 6, 7, 8 ns are ideal for high-performance applications. The chip enable input  $\overline{CE}$  permits easy memory and expansion with multiple-bank memory systems.

When CE is high the devices enter standby mode. The standard AS7C1025A is guaranteed not to exceed 55 mW power consumption in standby mode.

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 chips drive 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 (AS7C1025A) or 3.3V supply (AS7C31025A). The AS7C1025A and AS7C31025A are packaged in common industry standard packages.

#### **Absolute maximum ratings**

Parameter	Device	Symbol	Min	Max	Unit
Voltage on $V_{CC}$ relative to GND	AS7C1025A	V <sub>t1</sub>	-0.50	+7.0	V
voltage on v(c) relative to GIVD	AS7C31025A	V <sub>t1</sub>	-0.50	+5.0	V
Voltage on any pin relative to GND	·	V <sub>t2</sub>	-0.50	$V_{CC} + 0.5$	V
Power dissipation	-	P <sub>D</sub>	-	1.0	W
Storage temperature (plastic)	-	T <sub>stg</sub>	-65	+150	°C
Ambient temperature with $V_{CC}$ applied	-	T <sub>bias</sub>	-55	+125	°C
DC current into outputs (low)	-	I <sub>OUT</sub>	-	20	mA

NOTE: 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**

CE	WE	OE	Data	Mode
Н	Х	Х	High Z	Standby (I <sub>SB</sub> , I <sub>SB1</sub> )
L	Н	Н	High Z	Output disable (I <sub>CC</sub> )
L	Н	L	D <sub>OUT</sub>	Read (I <sub>CC</sub> )
L	L	Х	D <sub>IN</sub>	Write (I <sub>CC</sub> )

Key: X = Don't Care, L = Low, H = High

### **Recommended operating conditions**

Parameter	Device	Symbol	Min	Nominal	Max	Unit
Supply voltage	AS7C1025A	V <sub>CC</sub>	4.5	5.0	5.5	V
Supply voltage	AS7C31025A	V <sub>CC</sub>	3.0	3.3	3.6	V
	AS7C1025A	V <sub>IH</sub>	2.2	-	$V_{CC} + 0.5$	V
Input voltage	AS7C31025A	V <sub>IH</sub>	2.2	_	$V_{CC} + 0.5$	V
	Both	V <sub>IL</sub> †	-0.5	-	0.8	V
Ambient operating temperature	commercial	T <sub>A</sub>	0	-	70	°С
	industrial	T <sub>A</sub>	-40	-	85	°C

ß

 $^{\dagger}$ V<sub>IL</sub> min. = -3.0V for pulse width less than t<sub>RC</sub>/2.

### DC operating characteristics (over the operating range)<sup>1</sup>

				-]	10	-]	12	-1	15	-2	20	
Parameter	Sym	Test conditions	Device	Min	Max	Min	Max	Min	Max	Min	Max	Unit
Input leakage current	I <sub>LI</sub>	$V_{CC} = Max$ , $V_{IN} = GND$ to $V_{CC}$	Both	_	1	_	1	_	1	_	1	μΑ
Output leakage current	I <sub>LO</sub>	$V_{CC} = Max, \overline{CE} = V_{IH}, V_{out} = GND$ to $V_{CC}$	Both	_	1	_	1	_	1	_	1	μΑ
Operating			AS7C1025A	-	155	_	150	-	145	-	140	
power supply current	I <sub>CC</sub>	$\overline{\text{CE}} = \text{V}_{\text{IL}}, \text{ f} = \text{f}_{\text{Max}}, \text{I}_{\text{OUT}} = 0 \text{ mA}$	AS7C31025A	_	145	_	140	-	135	_	130	mA
Standby	I <sub>SB</sub>	$\overline{\text{CE}} = \text{V}_{\text{IH}}, \text{ f} = \text{f}_{\text{Max}}, \text{ f}_{\text{OUT}} = 0$	AS7C1025A	-	30	_	25	-	20	-	20	mA
power	12B	$OL = V_{\text{IH}}, 1 = 1_{\text{Max}}, 1_{\text{OUI}} = 0$	AS7C31025A	-	30	-	25	-	20	-	20	IIIA
supply	Im	$\overline{\text{CE}} \ge \text{V}_{\text{CC}} - 0.2 \text{V}, \text{ V}_{\text{IN}} \le 0.2 \text{V} \text{ or } \text{V}_{\text{IN}}$	AS7C1025A	-	10		10		10		10	mA
current	current <sup>1</sup> I <sub>SB1</sub>	$\geq$ V <sub>CC</sub> –0.2V, f = 0, f <sub>OUT</sub> = 0	AS7C31025A	-	5		5		5		5	IIIA
Output	VOL	$I_{OL} = 8 \text{ mA}, V_{CC} = \text{Min}$	Both	-	0.4	-	0.4	-	0.4	-	0.4	V
voltage	V <sub>OH</sub>	$I_{OH} = -4 \text{ mA}, V_{CC} = \text{Min}$	DOUI	2.4		2.4	-	2.4	-	2.4	-	V

# Capacitance (f = 1 MHz, $T_a = 25$ °C, $V_{CC} = \text{NOMINAL})^2$

Parameter	Symbol	Signals	Test conditions	Max	Unit
Input capacitance	C <sub>IN</sub>	A, CE, WE, OE	$V_{IN} = 0V$	5	pF
I/O capacitance	C <sub>I/O</sub>	I/O	$V_{\rm IN} = V_{\rm OUT} = 0V$	7	pF

### AS7C1025A AS7C31025A

## Read cycle (over the operating range)<sup>3,9</sup>

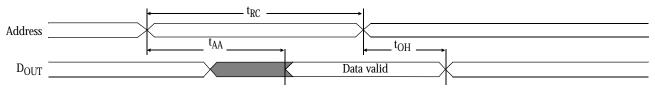
		-10		-12		-15		-2	20		
Parameter	Symbol	Min	Max	Min	Max	Min	Max	Min	Max	Unit	Notes
Read cycle time	t <sub>RC</sub>	10	-	12	-	15	_	20	-	ns	
Address access time	t <sub>AA</sub>	-	10	-	12	_	15	_	20	ns	3
Chip enable (CE) access time	t <sub>ACE</sub>	-	10	-	12	_	15	-	20	ns	3
Output enable (OE) access time	t <sub>OE</sub>	-	5	-	6	-	7	-	8	ns	
Output hold from address change	t <sub>OH</sub>	2	-	3	-	3	_	3	_	ns	5
CE Low to output in low Z	t <sub>CLZ</sub>	0	_	0	-	0	_	0	_	ns	4, 5
CE High to output in high Z	t <sub>CHZ</sub>	-	5	-	6	-	7	-	7	ns	4, 5
OE Low to output in low Z	t <sub>OLZ</sub>	0	-	0	-	0	_	0	_	ns	4, 5
OE High to output in high Z	t <sub>OHZ</sub>	-	5	-	6	-	7	-	7	ns	4, 5
Power up time	t <sub>PU</sub>	0	-	0	-	0	_	0	-	ns	4, 5
Power down time	t <sub>PD</sub>	-	10	-	12	-	15	-	20	ns	4, 5

### Key to switching waveforms

Rising input

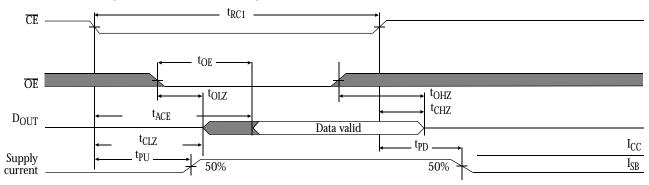
Undefined/don't care

### Read waveform 1 (address controlled)<sup>3,6,7,9</sup>



Falling input

### Read waveform 2 (CE and OE controlled)<sup>3,6,8,9</sup>

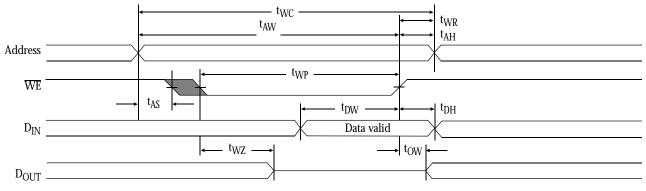


### AS7C1025A AS7C31025A

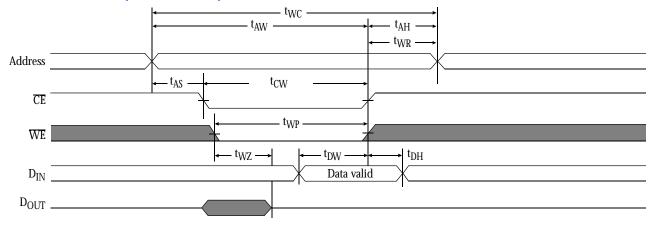
		-10 -12			15	-2	20				
Parameter	Symbol	Min	Max	Min	Max	Min	Max	Min	Max	Unit	Notes
Write cycle time	t <sub>WC</sub>	10	-	12	_	15	-	20	_	ns	
Chip enable (CE) to write end	t <sub>CW</sub>	8	-	10	-	12	-	12	_	ns	
Address setup to write end	t <sub>AW</sub>	8	-	9	-	10	-	12	_	ns	
Address setup time	t <sub>AS</sub>	0	-	0	_	0	-	0	_	ns	
Write pulse width	t <sub>WP</sub>	7	-	8	-	9	-	12	_	ns	
Write recovery time	t <sub>WR</sub>	0	-	0	-	0	-	0	_	ns	
Address hold from end of write	t <sub>AH</sub>	0	-	0	_	0	-	0	_	ns	
Data valid to write end	t <sub>DW</sub>	5	-	6	-	8	-	10	_	ns	
Data hold time	t <sub>DH</sub>	0	-	0	-	0	-	0	_	ns	4, 5
Write enable to output in high Z	t <sub>WZ</sub>	_	6	_	6	_	6	-	8	ns	4, 5
Output active from write end	t <sub>OW</sub>	1	-	1	-	1	-	2	-	ns	4, 5

# Write cycle (over the operating range)<sup>11</sup>

# Write waveform 1 (WE controlled)<sup>10,11</sup>



#### Write waveform 2 (CE controlled)<sup>10,11</sup>



Thevenin equivalent:

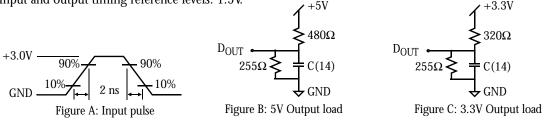
+1.728V (5V and 3.3V)

168Ω

D<sub>OUT</sub> -

#### AC test conditions

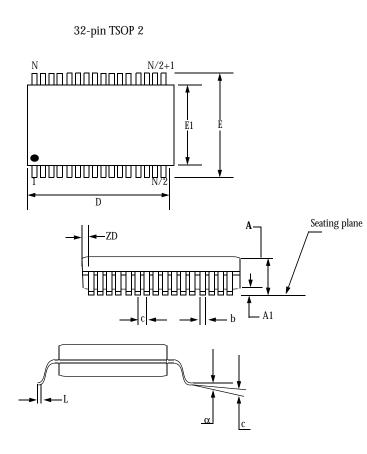
- Output load: see Figure B or Figure C.
- Input pulse level: GND to 3.0V. See Figure A.
- Input rise and fall times: 2 ns. See Figure A.
- Input and output timing reference levels: 1.5V.



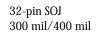
#### **Notes**

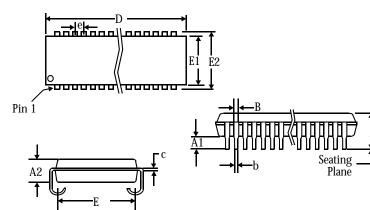
- 1 During  $V_{CC}$  power-up, a pull-up resistor to  $V_{CC}$  on  $\overline{CE}$  is required to meet  $I_{SB}$  specification.
- 2 This parameter is sampled, but not 100% tested.
- 3 For test conditions, see AC Test Conditions, Figures A, B, and C.
- 4  $t_{CLZ}$  and  $t_{CHZ}$  are specified with CL = 5pF, as in Figure C. Transition is measured  $\pm$ 500mV from steady-state voltage.
- 5 This parameter is guaranteed, but not 100% tested.
- $6 \quad \overline{\text{WE}} \text{ is High for read cycle.}$
- 7  $\overline{\text{CE}}$  and  $\overline{\text{OE}}$  are Low for read cycle.
- 8 Address valid prior to or coincident with CE transition Low.
- 9 All read cycle timings are referenced from the last valid address to the first transitioning address.
- 10 CE or WE must be High during address transitions. Either CE or WE asserting high terminates a write cycle.
- 11 All write cycle timings are referenced from the last valid address to the first transitioning address.
- 12 NA.
- 13 C=30pF, except all high Z and low Z parameters, where C=5pF.

## Package dimensions



	32-pin TSOP 2 (mm)							
Symbol	Min	Max						
Α	-	1.2						
A1	0.05	0.15						
b	0.3	0.52						
С	0.12	0.21						
D	20.82	21.08						
<b>E1</b>	10.03	10.29						
E	11.56	11.96						
е	1.27	BSC						
L	0.40	0.60						
ZD	0.95	REF.						
α	0°	5°						





	-	n SOJ mil	32-pin SOJ 400 mil			
Symbol	Min	Max	Min	Max		
Α	-	0.145	-	0.145		
A1	0.025	-	0.025	-		
A2	0.086	0.105	0.086	0.115		
B	0.026	0.032	0.026	0.032		
b	0.014	0.020	0.015	0.020		
С	0.006	0.013	0.007	0.013		
D	0.820	0.830	0.820	0.830		
E	0.250	0.275	0.360	0.380		
E1	0.292	0.305	0.395	0.405		
<b>E2</b>	0.330	0.340	0.435	0.445		
e	0.050	) BSC	0.050 BSC			

#### **Ordering codes**

Package \ Access time	Volt.	Temperature	10 ns	12 ns	15 ns	20 ns
5V		Commercial	AS7C1025A-10HFC	AS7C1025A-12HFC	AS7C1025A-15HFC	AS7C1025A-20HFC
TSOP 2	57	Industrial	AS7C1025A-10TI	AS7C1025A-12HFI	AS7C1025A-15HFI	AS7C1025A-20HFI
1501 2	3.3V	Commercial	AS7C31025A-10HFC	AS7C31025A-12HFC	AS7C31025A-15HFC	AS7C31025A-20HFC
3.	5.57	Industrial	AS7C31025A-10HFI	AS7C31025A-12HFI	AS7C31025A-15HFI	AS7C31025A-20HFI
	5V	Commercial	AS7C1025A-10TJC	AS7C1025A-12TJC	AS7C1025A-15TJC	AS7C1025A-20TJC
300-mil SOJ	37	Industrial	AS7C1025A-10TJI	AS7C1025A-12TJI	AS7C1025A-15TJI	AS7C1025A-20TJI
500-1111 505	3.3V	Commercial	AS7C31025A-10TJC	AS7C31025A-12TJC	AS7C31025A-15TJC	AS7C31025A-20TJC
	5.57	Industrial	AS7C31025A-10TJI	AS7C31025A-12TJI	AS7C31025A-15TJI	AS7C31025A-20TJI
	5V	Commercial	AS7C1025A-10JC	AS7C1025A-12JC	AS7C1025A-15JC	AS7C1025A-20JC
400-mil SOJ	57	Industrial	AS7C1025A-10JI	AS7C1025A-12JI	AS7C1025A-15JI	AS7C1025A-20JI
400-1111 505	3.3V	Commercial	AS7C31025A-10JC	AS7C31025A-12JC	AS7C31025A-15JC	AS7C31025A-20JC
	5.57	Industrial	AS7C31025A-10JI	AS7C31025A-12JI	AS7C31025A-15JI	AS7C31025A-20JI

#### Part numbering system

AS7C	X	1025	- <b>XX</b>	X	X
SRAM prefix	Voltage: Blank=5V CMOS 3=3.3V CMOS	Device number	Access time	Package: HF = TSOP 2 / 32 Pin TJ = SOJ 300 mil J = SOJ 400 mil	Temperature range C = Commercial, 0°C to 70°C I = Industrial, -40°C to 85°C

5/28/03; v.0.9.9

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