### March 2001



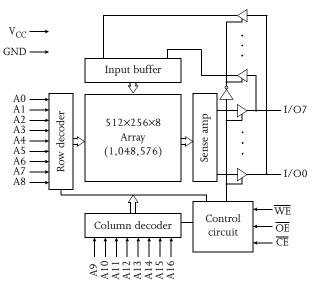
### AS7C1025 AS7C31025

### 5V/3.3V 128Kx8 CMOS SRAM (Revolutionary pinout)

### Features

- AS7C1025 (5V version)
- AS7C31025 (3.3V version)
- Industrial and commercial temperatures
- Organization: 131,072 words × 8 bits
- High speed
- 12/15/20 ns address access time
- 6,7,8 ns output enable access time
- Low power consumption: ACTIVE
  - 715 mW (AS7C1025) / max @ 12 ns (5V)
  - 360 mW (AS7C31025) / max @ 12 ns (3.3V)

### Logic block diagram



- Low power consumption: STANDBY
- 27.5 mW (AS7C1025) / max CMOS (5V)
- 1.8 mW (AS7C31025) / max CMOS (3.3V)
- 2.0V data retention
- 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 II
- ESD protection  $\geq$  2000 volts
- Latch-up current  $\geq 200 \text{ mA}$

### Pin arrangement

32-pii	n TSO	P II
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	AS7C1025 AS7C31025	32         A16           31         A15           30         A14           29         A13           28         OE           27         I/O2           26         I/O2           25         GRL           24         VCc           21         I/O2           21         A12           20         A11           19         A10           18         A9           17         A8
32-pin S	OJ (3	00 mil)

3	2-pi	n S	OJ	(4(	)0 :	mil	l)
A0		1		J	32	Ь	A16
A1		2 3			31		A15
A2					30		A14
A3		4			29		A13
CE		5		Ь	28		OE
I/O0		6	C1025	02	27		I/07
I/01		7	0	10	26		I/06
V <sub>CC</sub>		8	ΰ	33	25		GND
GND		9	AS70	Ň	24		V <sub>CC</sub>
I/O2		10	A	AS7	23		I/O5
I/O3		11			22		I/O4
WE		12			21		A12
A4		13			20		A11
A5		14			19		A10
A6		15			18		A9
A7		16			17		A8

### Selection guide

		AS7C1025-12 AS7C31025-12	AS7C1025-15 AS7C31025-15	AS7C1025-20 AS7C31025-20	Unit
Maximum address access time		12	15	20	ns
Maximum output enable access time	Maximum output enable access time		4	5	ns
Maximum operating current	AS7C1025	130	85	80	mA
Maximum operating current	AS7C31025	100	85	80	mA
Maximum CMOS standby current	AS7C1025	5	5	5	mA
waximum CiviOs Stalludy Current	AS7C31025	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 Memory (SRAM) devices 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 12/15/20 ns with output enable access times ( $t_{OE}$ ) of 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  $\overline{CE}$  is high the devices enter 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 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 (AS7C1025) or 3.3V supply (AS7C31025). The AS7C1025 and AS7C31025 are packaged in common industry standard packages.

Absolute maximum ratings

Parameter	Device	Symbol	Min	Max	Unit
Voltage on V <sub>CC</sub> relative to GND	AS7C1025	V <sub>t1</sub>	-0.50	+7.0	V
voltage off v <sub>CC</sub> relative to GIVD	AS7C31025	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	AS7C1025	V <sub>CC</sub>	4.5	5.0	5.5	V
supply voltage	AS7C31025	V <sub>CC</sub>	3.0	3.3	3.6	V
	AS7C1025	V <sub>IH</sub>	2.2	_	$V_{CC} + 0.5$	V
Input voltage	AS7C31025	V <sub>IH</sub>	2.0	_	$V_{CC} + 0.5$	V
		v <sub>IL</sub> †	-0.5	_	0.8	V
Ambient operating temperature	commercial	T <sub>A</sub>	0	_	70	°C
Amount operating temperature	industrial	T <sub>A</sub>	-40	_	85	°C

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

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

				- ]	12	-	15	-2	20	
Parameter	Sym	Test conditions	Device	Min	Max	Min	Max	Min	Max	Unit
Input leakage current	I <sub>LI</sub>	$V_{CC} = Max$ , $V_{IN} = GND$ to $V_{CC}$		_	1	_	1	_	1	μΑ
Output leakage current	I <sub>LO</sub>	$V_{CC} = Max, \overline{CE} = V_{IH}, V_{out} = GND to V_{CC}$		_	1	_	1	_	1	μA
Operating			AS7C1025	_	130	l	120	_	110	
power supply current	I <sub>CC</sub>	$\overline{\text{CE}} = \text{V}_{\text{IL}}, \text{ f} = \text{f}_{\text{Max}}, \text{I}_{\text{OUT}} = 0 \text{ mA}$	AS7C31025	_	100	_	85	_	80	mA
	I <sub>SB</sub>	$\overline{\text{CE}} = \text{V}_{\text{IH}}, \text{ f} = \text{f}_{\text{Max}}, \text{ f}_{\text{OUT}} = 0$	AS7C1025	_	50	_	40	_	40	mA
Standby power supply	<sup>1</sup> SB	$CE = V_{IH}$ , $I = I_{Max}$ , $I_{OUT} = 0$	AS7C31025	-	50		40	_	40	шл
current <sup>I</sup>	т	$\overline{\text{CE}} \ge \text{V}_{\text{CC}}$ –0.2V, $\text{V}_{\text{IN}} \le 0.2$ V or	AS7C1025	_	5	I	5	_	5	mA
$I_{SB1} V_{IN} \ge$		$V_{IN} \ge V_{CC} - 0.2V$ , $f = 0$ , $f_{OUT} = 0$	AS7C31025	_	5	_	5	_	5	шл
Output	V <sub>OL</sub>	$I_{OL} = 8 \text{ mA}, V_{CC} = \text{Min}$		_	0.4		0.4	_	0.4	V
voltage	$V_{OH}$	$I_{OH} = -4 \text{ mA}, V_{CC} = \text{Min}$		2.4	_	2.4	_	2.4	Ι	V

Shaded areas contain advance information.

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

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



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

		- ]	12	-	15	-1	20		
Parameter	Symbol	Min	Max	Min	Max	Min	Max	Unit	Notes
Read cycle time	t <sub>RC</sub>	12	_	15	_	20	_	ns	
Address access time	t <sub>AA</sub>	_	12	_	15	-	20	ns	3
Chip enable $(\overline{CE})$ access time	t <sub>ACE</sub>	_	12	_	15	-	20	ns	3
Output enable $(\overline{OE})$ access time	t <sub>OE</sub>	_	6	_	7	-	8	ns	
Output hold from address change	t <sub>OH</sub>	3	_	3	_	3	-	ns	5
CE Low to output in low Z	t <sub>CLZ</sub>	0	_	0	_	0	-	ns	4,5
CE Low to output in high Z	t <sub>CHZ</sub>	_	3	_	4	-	5	ns	4,5
OE Low to output in low Z	t <sub>OLZ</sub>	0	_	0	_	0	_	ns	4,5
OE High to output in high Z	t <sub>OHZ</sub>	-	3	_	4	-	5	ns	4,5
Power up time	t <sub>PU</sub>	0	_	0	_	0	-	ns	4,5
Power down time	t <sub>PD</sub>	_	12	_	15	_	20	ns	4,5
Address	t <sub>RC</sub>				t <sub>OH</sub>				
D <sub>OUT</sub>			D	ata valid					
Read waveform 2 ( $\overline{CE}$ and $\overline{OE}$	controlled) <sup>5</sup>	3,6,8,9							
	- t <sub>OE</sub> - t <sub>OE</sub>				. t				
$D_{OUT} \xrightarrow{t_{ACE}} t_{ACE}$ Supply $t_{PU} \xrightarrow{t_{PU}} t_{PU}$			<b>←</b> Data va	lid F		CHZ			I <sub>CC</sub>
current	50%				5	0%			$I_{SB}$

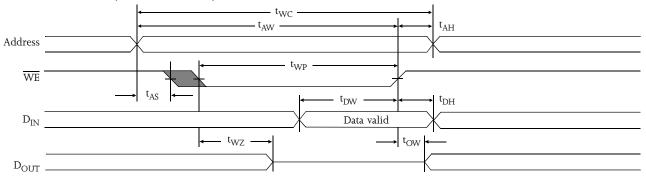


### Write cycle (over the operating range)<sup>11</sup>

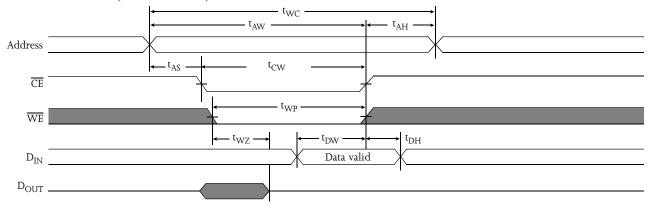
		-	12	-	15	-1	20		
Parameter	Symbol	Min	Max	Min	Max	Min	Max	Unit	Notes
Write cycle time	t <sub>WC</sub>	12	-	15	-	20	-	ns	
Chip enable $(\overline{CE})$ to write end	t <sub>CW</sub>	8	-	12	_	12	-	ns	
Address setup to write end	t <sub>AW</sub>	8	-	12	-	12	-	ns	
Address setup time	t <sub>AS</sub>	0	-	0	-	0	-	ns	
Write pulse width	t <sub>WP</sub>	8	-	9	-	12	-	ns	
Address hold from end of write	t <sub>AH</sub>	0	-	0	-	0	-	ns	
Data valid to write end	t <sub>DW</sub>	6	-	8	-	12	_	ns	
Data hold time	t <sub>DH</sub>	0	-	0	_	0	-	ns	4,5
Write enable to output in high Z	t <sub>WZ</sub>	-	5	-	5	_	5	ns	4,5
Output active from write end	t <sub>OW</sub>	3	-	3	-	3	-	ns	4,5

Shaded areas contain advance information.

## Write waveform 1 ( $\overline{\rm WE}$ controlled) $^{I0,I1}$



# Write waveform 2 $(\overline{CE} \text{ controlled})^{I0,I1}$

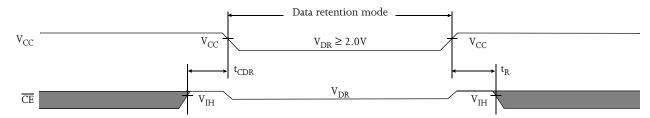




Sur recention characteristics (over the operating range)									
Parameter	Symbol	Test conditions	Min	Max	Unit				
V <sub>CC</sub> for data retention	V <sub>DR</sub>	V = 2.0 V	2.0	_	V				
Data retention current	I <sub>CCDR</sub>	$V_{CC} = 2.0V$	_	500	μΑ				
Chip enable to data retention time	t <sub>CDR</sub>	$\overline{\text{CE}} \ge \text{V}_{\text{CC}} - 0.2\text{V}$	0	-	ns				
Operation recovery time	t <sub>R</sub>	$V_{IN} \ge V_{CC} - 0.2V$ or $V_{IN} \le 0.2V$	t <sub>RC</sub>	-	ns				
Input leakage current	I <sub>LI</sub>	· IN = 0.2 (	_	1	μΑ				

### Data retention characteristics (over the operating range)<sup>13</sup>

#### Data retention waveform

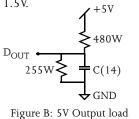


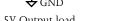
### AC test conditions

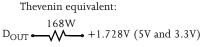
+3.0V

GND

- 5V 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.







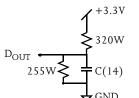


Figure C: 3.3V Output load

### Notes

1 During  $V_{CC}$  power-up, a pull-up resistor to  $V_{CC}$  on  $\overline{CE}$  is required to meet  $I_{SB}$  specification.

90%

10%

This parameter is sampled, but not 100% tested. 2

90%

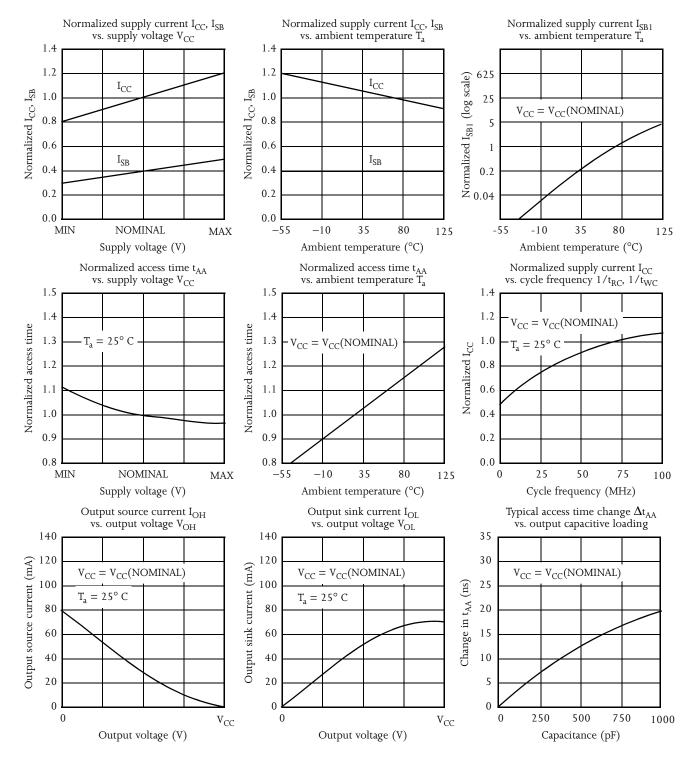
For test conditions, see AC Test Conditions, Figures A, B, and C. 3

Figure A: Input pulse

- $t_{CLZ}$  and  $t_{CHZ}$  are specified with CL = 5pF, as in Figure C. Transition is measured  $\pm 500mV$  from steady-state voltage. 4
- 5 This parameter is guaranteed, but not 100% tested.
- $\overline{\text{WE}}$  is High for read cycle. 6
- 7  $\overline{CE}$  and  $\overline{OE}$  are Low for read cycle.
- 8 Address valid prior to or coincident with  $\overline{\text{CE}}$  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 2V data retention applies to commercial temperature operating range only.
- 14 C=30pF, except all high Z and low Z parameters, where C=5pF.

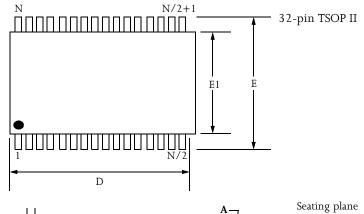


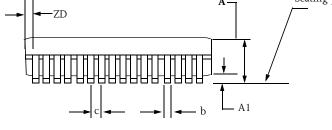
### Typical DC and AC characteristics



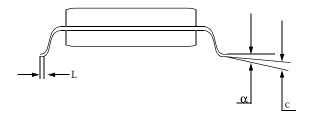


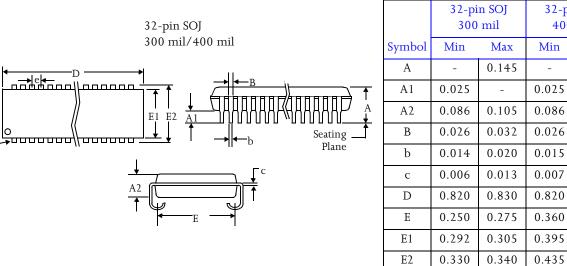






	32-pin TSOP II (mil)					
Symbol	Min	Max				
А	_	1.2				
A1	0.05	0.15				
b	0.3	0.52				
С	0.12	0.21				
D	20.82	21.08				
E1	10.03	10.29				
Е	11.56	11.96				
е	1.27	BSC				
L	0.40	0.60				
ZD	0.95 REF.					
α	0°	5°				





3/23/01; v.1.0

Pin 1

32-pin SOJ

400 mil

Max

0.145

\_

0.115

0.032

0.020

0.013

0.830

0.380

0.405

0.445

Min

\_



### Ordering codes

Package \ Access time	Voltage	Temperature	12 ns	15 ns	20 ns
sTSOP II	5V	Commercial	AS7C1025-12TC	AS7C1025-15TC	AS7C1025-20TC
		Industrial	AS7C1025-12TI	AS7C1025-15TI	AS7C1025-20TI
	3.3V	Commercial	AS7C31025-12TC	AS7C31025-15TC	AS7C31025-20TC
		Industrial	AS7C31025-12TI	AS7C31025-15TI	AS7C31025-20TI
300-mil SOJ	5V	Commercial	AS7C1025-12TJC	AS7C1025-15TJC	AS7C1025-20TJC
		Industrial	AS7C1025-12TJI	AS7C1025-15TJI	AS7C1025-20TJI
	3.3V	Commercial	AS7C31025-12TJC	AS7C31025-15TJC	AS7C31025-20TJC
		Industrial	AS7C31025-12TJI	AS7C31025-15TJI	AS7C31025-20TJI
400-mil SOJ	5V	Commercial	AS7C1025-12JC	AS7C1025-15JC	AS7C1025-20JC
		Industrial	AS7C1025-12JI	AS7C1025-15JI	AS7C1025-20JI
	3.3V	Commercial	AS7C31025-12JC	AS7C31025-15JC	AS7C31025-20JC
		Industrial	AS7C31025-12JI	AS7C31025-15JI	AS7C31025-20JI

### Part numbering system

AS7C	Х	1025	-XX	Х	Х
SRAM prefix	Blank=5V CMOS 3=3.3V CMOS	Device number	Access time	Package: T = TSOP II J = SOJ	Temperature range C = Commercial, $0^{\circ}$ C to $70^{\circ}$ C I = Industrial, -40°C to $85^{\circ}$ C

#### 3/23/01; v.1.0

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