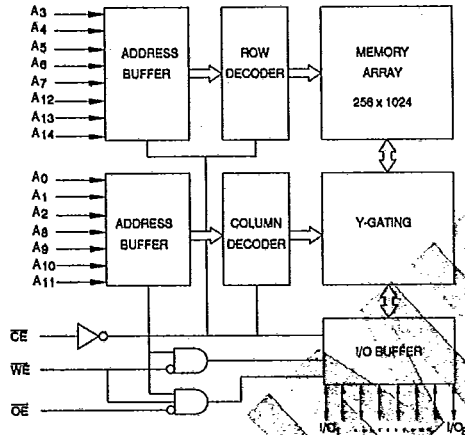


T-46-23-14

**Features**

- Fast Read Access Time - 20ns
- Low Power
  - 120mA Maximum (Active)
  - 1mA Maximum (Standby)
  - 500µA Maximum (2V Data Retention)
- Fully Static: No Clock Required
- Two Control Inputs (CE and OE)
- TTL Compatible Inputs and Outputs
- 5V ± 10% Supply
- 28 Lead Dual In-line and Surface Mount Packages
- JEDEC Pinout
- Commercial, Industrial and Military Temperature Ranges

**Block Diagram**



**256K (32K x 8)  
CMOS  
SRAM**

**Preliminary**

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**Description**

The AT38256 is a high performance CMOS static Random Access Memory. Its 256K of memory is organized as 32768 words by 8 bits. Manufactured with an advanced CMOS technology, the AT38256 offers access times down to 20ns with power dissipation of 660mW. When the AT38256 is deselected, the standby current is just 1mA. In addition, the AT38256 offers a data retention capability of only 1mW power dissipation when operated on a 2V power supply.

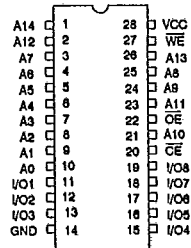
The AT38256 powers down to the standby mode when deselected ( $\overline{CE}$  is HIGH). The I/O pins remain in the high impedance state unless the chip is selected ( $\overline{CE}$  is LOW), the outputs are enabled ( $\overline{OE}$  is LOW), and Write Enable is not active ( $\overline{WE}$  is HIGH).

The AT38256 is completely TTL compatible and requires a single 5V power supply. The device is fully static and does not need any clocks or refresh control signals for operation.

**Pin Configurations**

For .300 DIP/.600 DIP/.300 SOJ

Pin Name	Function
A0-A14	Addresses
I/O <sub>1</sub> -I/O <sub>8</sub>	Outputs
$\overline{CE}$	Chip Enable
$\overline{OE}$	Output Enable
$\overline{WE}$	Write Enable
Vcc, GND	Power, Ground





**Device Operation**

**READ:** When  $\overline{CE}$  is LOW,  $\overline{OE}$  is LOW, and  $\overline{WE}$  is HIGH, the 8 bits of data stored at the memory location determined by the address input (pins A<sub>0</sub> through A<sub>14</sub>) are inserted on the data outputs (pins I/O<sub>1</sub> through I/O<sub>8</sub>).

**WRITE:** When  $\overline{CE}$  is LOW and  $\overline{WE}$  is LOW, the 8 bits of data placed on the input pins (I/O<sub>1</sub> through I/O<sub>8</sub>) are stored at the memory location determined by the address input (pins A<sub>0</sub> through A<sub>14</sub>).

**DATA RETENTION:** When the chip is in standby mode, V<sub>CC</sub> can be reduced to as low as 2 volts without impacting data integrity. Power dissipation will be reduced to 1mW maximum.

**Operating Modes**

MODE\PIN	$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	I/O
Read	L	L	H	D <sub>OUT</sub>
Write	L	X <sup>(1)</sup>	L	D <sub>IN</sub>
Standby (not selected)	H	X	X	High Z
Output Disable	L	H	H	High Z

Note: 1. X can be L (Low) or H (High)

**Absolute Maximum Ratings\***

- Temperature Under Bias..... -55° C to 125° C
- Storage Temperature ..... -65° C to 150° C
- All Input Voltages  
with Respect to Ground..... -0.3 V<sup>(1)</sup> to V<sub>CC</sub>+0.3V
- All Output Voltages  
with Respect to Ground..... -0.3V<sup>(1)</sup> to V<sub>CC</sub>+0.3V
- Maximum Supply Voltage ..... +7.0V

\*NOTICE: Stresses beyond 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 beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note:

- 1. Minimum input voltages are -3.5V for pulse width less than 20 ns.

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**D.C. and A.C. Operating Conditions**

		AT38256
Operating Temperature (Ambient)	Commercial	0°C to 70°C
	Industrial	-40°C to 85°C
	Military	-55°C to 125°C
V <sub>CC</sub> Power Supply		5V ± 10%

**D.C. and Operating Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>LI</sub>	Input Load Current	V <sub>IN</sub> =0 to V <sub>CC</sub>	-1.0		1.0	μA
I <sub>LO</sub>	Output Leakage	$\overline{CE} = 2.2V$ to V <sub>CC</sub> + 0.3V or $\overline{OE} = 2.2V$ to V <sub>CC</sub> + 0.3V or $\overline{WE} = -0.3V$ to 0.8V V <sub>I/O</sub> =0 to V <sub>CC</sub>	-1.0		1.0	μA
I <sub>SB1</sub>	Standby Current (CMOS)	$\overline{CE} \geq V_{CC} - 0.2V$ , V <sub>IN</sub> ≥ (V <sub>CC</sub> -0.2V) or ≤ 0.2V			1	mA
I <sub>SB2</sub>	Standby Current (TTL)	$\overline{CE} = 2.2V$ to V <sub>CC</sub> +0.3V, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>			25	mA
I <sub>CC</sub>	V <sub>CC</sub> Active Current (TTL)	$\overline{CE} = -0.3V$ to 0.8V, I <sub>OUT</sub> = 0mA, min cycle			120	mA
V <sub>IL</sub> <sup>(1)</sup>	Input Low Voltage		-0.3 <sup>(2)</sup>		0.8	V
V <sub>IH</sub> <sup>(1)</sup>	Input High Voltage		2.2V		V <sub>CC</sub> + 0.3	V
V <sub>OL</sub>	Output Low Voltage	I <sub>OL</sub> = 8.0mA			0.4	V
V <sub>OH</sub>	Output High Voltage	I <sub>OH</sub> = -4.0mA	2.4			V

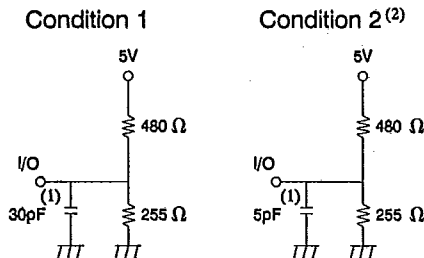
- Note: 1. These are voltages with respect to device GND.
- 2. V<sub>IL</sub> = -3.0V for pulse width less than 20ns.

**Pin Capacitance (f = 1MHz TA = 25°C)<sup>(1)</sup>**

Symbol	Parameter	Conditions	Min	Max	Unit
C <sub>OUT</sub>	Input/Output Capacitance	V <sub>OUT</sub> = 0V		8	pF
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V		8	pF

Note: 1. Typical values for nominal supply voltage. This parameter is only sampled and is not 100% tested.

**Output Test Load**



Item	Condition
Input pulse "High" level	V <sub>IH</sub> = 3.0V
Input pulse "Low" level	V <sub>IL</sub> = 0V
Input rise time	t <sub>R</sub> = 5ns
Input fall time	t <sub>F</sub> = 5ns
Input and output reference level	1.5V
Output load	See Figure 1

Figure 1

- Notes: 1. Capacitance Load includes scope and jig capacitances  
 2. For t<sub>COE</sub>, t<sub>OOE</sub>, t<sub>COD</sub>, t<sub>OOD</sub>, t<sub>WOE</sub>, t<sub>WOD</sub>

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**A.C. Characteristics for Read**

Symbol	Parameter	AT38256-20		AT38256-25		AT38256-35		Unit
		Min	Max	Min	Max	Min	Max	
t <sub>RC</sub>	Read Cycle Time	20		25		35		ns
t <sub>ACC</sub>	Address Access Time		20		25		35	ns
t <sub>CE</sub>	$\overline{CE}$ Access Time		20		25		35	ns
t <sub>OE</sub>	$\overline{OE}$ Access Time		12		12		20	ns
t <sub>OH</sub>	Output Hold Time	5		5		5		ns
t <sub>COE</sub> <sup>(1)</sup>	$\overline{CE}$ Output Enable Time	5		5		5		ns
t <sub>OOE</sub> <sup>(1)</sup>	$\overline{OE}$ Output Enable Time	0		0		0		ns
t <sub>COD</sub> <sup>(1)</sup>	$\overline{CE}$ Output Disable Time		15		15		15	ns
t <sub>OOD</sub> <sup>(1)</sup>	$\overline{OE}$ Output Disable Time		13		13		15	ns

**A.C. Characteristics for Write**

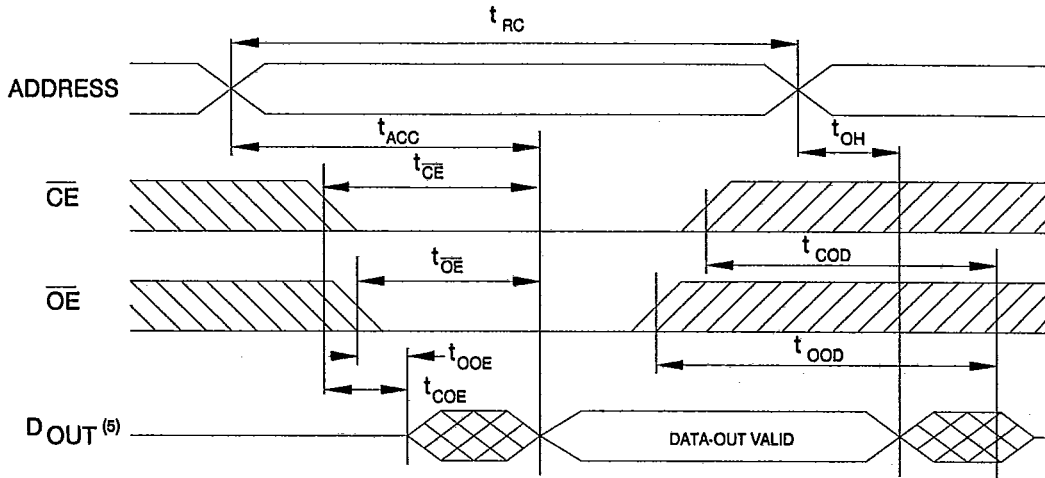
Symbol	Parameter	AT38256-20		AT38256-25		AT38256-35		Unit
		Min	Max	Min	Max	Min	Max	
t <sub>WC</sub>	Write Cycle Time	20		25		35		ns
t <sub>AS</sub>	Address Setup Time	0		0		0		ns
t <sub>WP</sub>	Write Pulse Width	15		20		30		ns
t <sub>CW</sub>	$\overline{CE}$ Setup Time	15		20		30		ns
t <sub>WR</sub>	Write Recovery Time	2		2		2		ns
t <sub>DS</sub>	Data Setup Time	12		12		15		ns
t <sub>DH</sub>	Data Hold Time	0		0		0		ns
t <sub>WOE</sub> <sup>(1)</sup>	$\overline{WE}$ Output Enable Time	0		0		0		ns
t <sub>WOD</sub> <sup>(1)</sup>	$\overline{WE}$ Output Disable Time		13		13		15	ns

Note: 1. Transition is measured by ± 500 mV from the normal state with the output test load circuit, condition 2. This parameter is sampled and is not 100% tested.

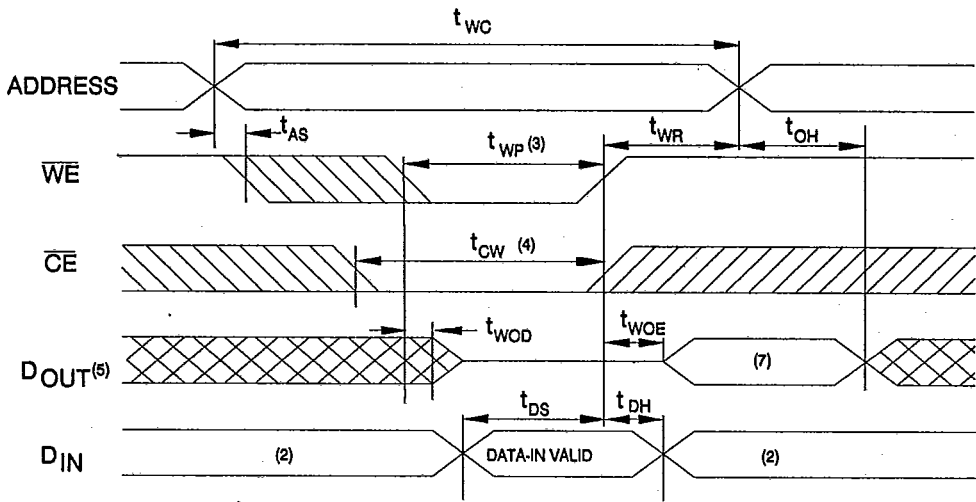


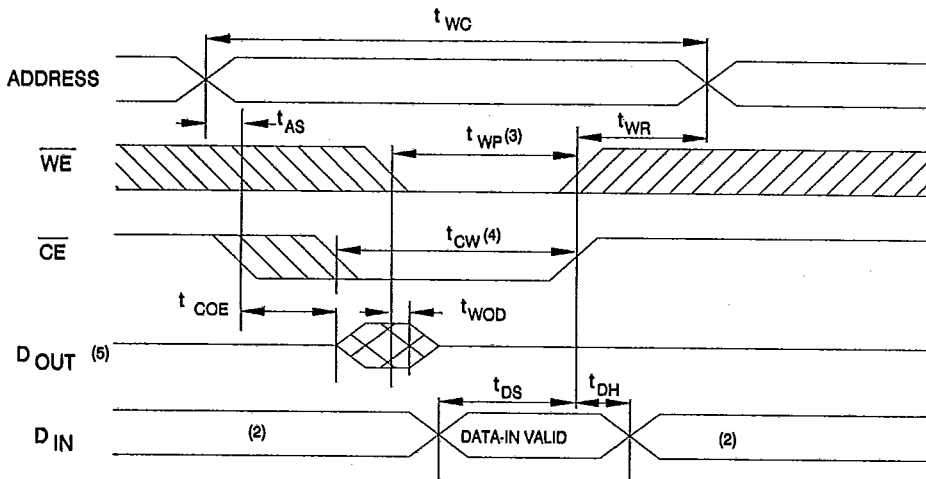


**A.C. Waveforms for Read Cycle <sup>(1)</sup>**



**A.C. Waveforms for Write Cycle 1 ( $\overline{WE}$  Write) <sup>(6)</sup>**



A.C. Waveforms for Write Cycle 2 ( $\overline{\text{CE}}$  Write)<sup>(6)</sup>

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**Notes:**

1. During a Read Cycle,  $\overline{\text{WE}}$  should be HIGH.
2. During this period, I/O pins are in the output state.
3. A Write occurs when  $\overline{\text{CE}}$  and  $\overline{\text{WE}}$  are LOW at the same time.  
A Write begins at the latest transition among  $\overline{\text{CE}}$  going LOW, and  $\overline{\text{WE}}$  going LOW.  
A Write ends at the earliest transition among  $\overline{\text{CE}}$  going HIGH, and  $\overline{\text{WE}}$  going HIGH.  
 $t_{WP}$  is measured from the beginning of Write to the end of Write.
4.  $t_{CW}$  is measured from the later of  $\overline{\text{CE}}$  going LOW or going HIGH to the end of Write.
5. If  $\overline{\text{CE}}$  or  $\overline{\text{OE}}$  is HIGH, or  $\overline{\text{WE}}$  is LOW,  $\text{D}_{OUT}$  goes to a high impedance state.
6. During a write cycle,  $\overline{\text{OE}} = V_{IH}$  or  $V_{IL}$ .
7.  $\text{D}_{OUT}$  is equal to the Input Data written during the same cycle.



**Data Retention Characteristics**

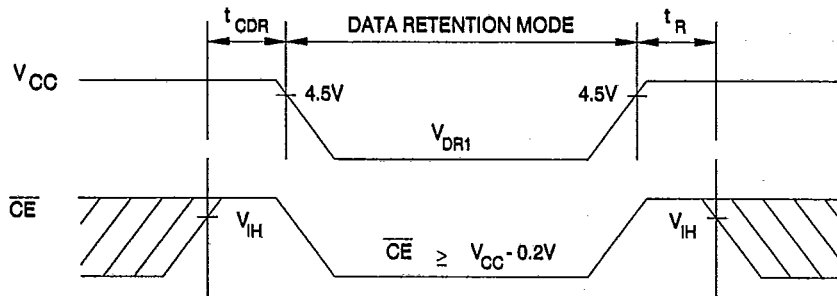
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Data Retention Power Supply Voltage	VDR1	$\overline{CE} \geq V_{CC} - 0.2V$	2.0		5.5	V
Data Retention Current	ICCDR1	$V_{CC} = 2.0V$ $\overline{CE} \geq V_{CC} - 0.2V$ and $V_{IN} \geq (V_{CC} - 0.2V)$ or $\leq 0.2V$			500	$\mu A$
	ICCDR2	$V_{CC} = 3.0V$ and $V_{IN} \geq (V_{CC} - 0.2V)$ or $\leq 0.2V$			750	$\mu A$
Chip Enable Setup Time	t <sub>CDR</sub>		0			ns
Chip Enable Hold Time	t <sub>R</sub>		t <sub>RC</sub> <sup>(1)</sup>			ns

Note: 1. t<sub>RC</sub> = Read Cycle Time

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**Data Retention Waveform ( $\overline{CE}$  Control)**



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**Ordering Information**

tACC (ns)	Icc (mA)		Ordering Code	Package	Operation Range
	Active	Standby			
20	120	1.0	AT38256-20NC AT38256-20XC	28P3 28X	Commercial (0° to 70°C)
			AT38256-20NI AT38256-20XI	28P3 28X	Industrial (-40° to 85°C)
25	120	1.0	AT38256-25PC AT38256-25NC AT38256-25XC	28P6 28P3 28X	Commercial (0° to 70°C)
			AT38256-25PI AT38256-25NI AT38256-25XI	28P6 28P3 28X	Industrial (-40° to 85°C)
			AT38256-25BM AT38256-25DM	28B 28D6	Military (-55° to 125°C)
35	120	1.0	AT38256-35PC AT38256-35NC AT38256-35XC	28P6 28P3 28X	Commercial (0° to 70°C)
			AT38256-35PI AT38256-35NI AT38256-35XI	28P6 28P3 28X	Industrial (-40° to 85°C)
			AT38256-35BM AT38256-35DM	28B 28D6	Military (-55° to 125°C)

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Package Type	
28D6	28 Lead, 0.600" Wide, Non-Windowed, Ceramic Dual Inline Package (Cerdip)
28B	28 Lead, 0.300" Wide, Ceramic Side Braze Dual Inline (Side Braze)
28P6	28 Lead, 0.600" Wide, Plastic Dual Inline Package (PDIP)
28P3	28 Lead, 0.300" Wide, Plastic Dual Inline Package (PDIP)
28X	28 Lead, 0.300" Wide, Plastic J-Leaded Small Outline (SOIC)

