

93425/93L425



T-46-23-05

# 93425/93L425 1024 x 1-Bit Static Random Access Memory

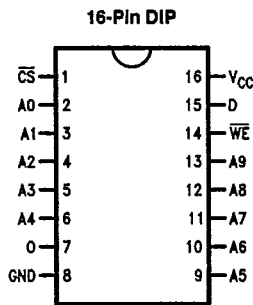
## General Description

The 93425 is a 1024-bit read write Random Access Memory (RAM), organized 1024 words by one bit. It is designed for high speed cache control and buffer storage applications. The device includes full on-chip decoding, separate Data input and non-inverting Data output as well as an active LOW Chip Select line.

## Features

- Commercial address access time  
93425—20 to 60 ns max
- Military address access time  
93425—30 to 70 ns max
- Low power version also available (93L425)
- Features TRI-STATE® output
- Power dissipation decreases with increasing temperature
- Standard processing includes burn-in

## Connection Diagram



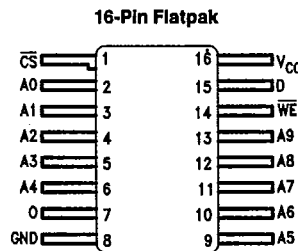
Top View

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Order Number 93425DC, 93425ADC, 93425DC25, 93425DMQB, 93425DMQB40, 93425DMQB50, 93425PC, 93425APC, 93425PC25, 93L425DC, 93L425ADC, 93L425DC25, 93L425DMQB, 93L425DMQB40, 93L425DMQB50, 93L425PC, 93L425APC or 93L425PC25  
 See NS Package Number J16A\* or N16E\*

\*For most current package information, contact product marketing.

Optional Processing QR = Burn-In



Top View

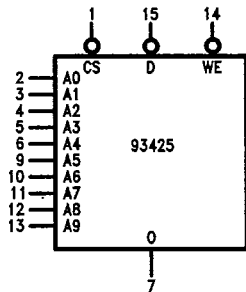
TL/D/9674-2

Order Number 93425FMQB, 93425AFMQB, 93L425FMQB40, 93L425FMQB, 93L425AFMQB or 93L425FMQB50  
 See NS Package Number W16A\*

\*For most current package information, contact product marketing.

Optional Processing QR = Burn-In

## Logic Symbol



VCC = Pin 16  
 GND = Pin 8

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## Pin Names

$\overline{CS}$	Chip Select (Active LOW)
A <sub>0</sub> -A <sub>9</sub>	Address Inputs
$\overline{WE}$	Write Enable Input (Active LOW)
D	Data Input
O	Data Output

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**Absolute Maximum Ratings**

Above which the useful life may be impaired

Storage Temperature	-65°C to +150°C
Supply Voltage Range	-0.5V to +7.0V
Input Voltage (DC) (Note 1)	-0.5V to V <sub>CC</sub>
Voltage Applied to Outputs (Note 2)	-0.5V to +5.5V
Lead Temperature (Soldering, 10 sec.)	300°C
Maximum Junction Temperature (T <sub>J</sub> )	+175°C
Output Current	+20 mA
Input Current (DC)	-12 mA to +5.0 mA

**Guaranteed Operating Ranges**

Supply Voltage (V <sub>CC</sub> )	Commercial 5.0V ± 5%	Military 5.0V ± 10%
Case Temperature (T <sub>C</sub> )	Commercial 0°C to +75°C	Military -55°C to +125°C

**DC Electrical Characteristics** Over operating temperature ranges (Note 3)

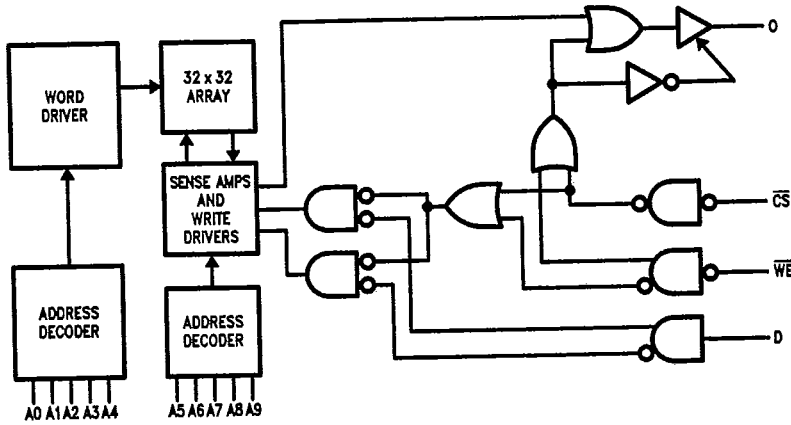
Symbol	Parameter	Min	Typ	Max	Units	Conditions
V <sub>OL</sub>	Output LOW Voltage			0.45	V	V <sub>CC</sub> = Min, I <sub>OL</sub> = 16 mA
V <sub>IH</sub>	Input HIGH Voltage	2.1			V	Guaranteed Input HIGH Voltage for All Inputs (Notes 4, 5 & 6)
V <sub>IL</sub>	Input LOW Voltage			0.8	V	Guaranteed Input LOW Voltage for All Inputs (Notes 4, 5 & 6)
V <sub>OH</sub>	Output HIGH Voltage	2.4			V	V <sub>CC</sub> = Max, I <sub>OH</sub> = -5.2 mA
I <sub>IL</sub>	Input LOW Current		-180	-300	μA	V <sub>CC</sub> = Max, V <sub>IN</sub> = 0.4V
I <sub>IH</sub>	Input HIGH Current		1.0	40	μA	V <sub>CC</sub> = Max, V <sub>IN</sub> = 4.5V
I <sub>IHB</sub>	Input Breakdown Current			1.0	mA	V <sub>CC</sub> = Max, V <sub>IN</sub> = V <sub>CC</sub>
V <sub>IC</sub>	Input Diode Clamp Voltage		-1.0	-1.5	V	V <sub>CC</sub> = Max, V <sub>IN</sub> = -10 mA
I <sub>OZH</sub> I <sub>OZL</sub>	Output Current (HIGH Z)			50 -50	μA	V <sub>CC</sub> = Max, V <sub>OUT</sub> = 2.4V V <sub>CC</sub> = Max, V <sub>OUT</sub> = 0.5V
I <sub>OS</sub>	Output Current Short Circuit to Ground (Note 7)			-100	mA	V <sub>CC</sub> = Max, (Note 7)
I <sub>CC</sub>	Power Supply Current		60	65 75 125 135	mA	93L425 Commercial 93L425 Military 93425 Commercial 93425 Military

- Note 1:** Either input voltage limit or input current limit is sufficient to protect the inputs.
- Note 2:** Output current limit required.
- Note 3:** Typical values are at V<sub>CC</sub> = 5.0V, T<sub>C</sub> = +25°C and maximum loading.
- Note 4:** Static condition only.
- Note 5:** Functional testing done at input levels V<sub>IL</sub> = V<sub>OL Max</sub> (0.45V), V<sub>IH</sub> = V<sub>OH Min</sub> (2.4V).
- Note 6:** AC testing done at input levels V<sub>IH</sub> = 3V, V<sub>IL</sub> = 0V.
- Note 7:** Short circuit to ground not to exceed one second.
- Note 8:** The maximum address access time is guaranteed to be the worst case bit in the memory using a pseudorandom testing pattern.
- Note 9:** t<sub>W</sub> measured at t<sub>WSA</sub> = Min. t<sub>WSA</sub> measured at t<sub>W</sub> = Min.

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**Logic Diagram**



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**Functional Description**

The 93425 is a fully decoded 1024-bit read write Random Access Memory organized 1024 words by one bit. Bit selection is achieved by means of a 10-bit address A0-A9.

One Chip Select input is provided for easy memory array expansion of up to 2048 bits without the need for external decoding. For larger memories the fast chip select access time permits direct address decoding without an increase in overall memory access time.

The read and write functions of the 93425 are controlled by the state of the active LOW Write Enable WE input. When WE is held LOW and the chip is selected, the data at D is written into the location specified by the binary address present at A0 through A9. Since the write function is level triggered, data must be held stable at the data input for at least  $t_{WSD(min)}$  plus  $t_{W(min)}$  plus  $t_{WHD(min)}$  to insure a valid write. When WE is held HIGH and the chip selected, data is read from the addressed location and presented at the output O.

The 93425 has a three-state output which provides an active pull-up or pull-down when enabled and a high impedance (HIGH Z) state when disabled. The active pull-up provides drive capability for high capacitive loads while the high impedance state allows optimization of word expansion in bus organized systems.

**Truth Table**

Inputs			Output	Mode
CS	WE	D	O	
H	H	X	HIGH Z	Not Selected
L	L	L	HIGH Z	Write 0
L	L	H	HIGH Z	Write 1
L	H	X	DOUT	Read

H = HIGH Voltage Level: 2.4V  
 L = LOW Voltage Level: 0.45V  
 X = Don't Care HIGH or LOW  
 HIGH Z = High Impedance State

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**Commercial**

**AC Electrical Characteristics** (Note 6)  $V_{CC} = 5.0V \pm 5\%$ ,  $GND = 0V$ ,  $T_C = 0^\circ C$  to  $+75^\circ C$

Symbol	Parameter	Conditions	93425-25		93425-30 93425A		93425-45 93425		Units
			Min	Max	Min	Max	Min	Max	
<b>READ TIMING</b>									
$t_{ACS}$	Chip Select Access Time	(Figures 3a, 3b)		15		20		35	ns
$t_{ZRCS}$	Chip Select to HIGH Z			15		20		35	ns
$t_{AA}$	Address Access Time (Note 8)			25		30		45	ns

<b>WRITE TIMING</b>									
Symbol	Parameter	Conditions	93425-25		93425-30 93425A		93425-45 93425		Units
			Min	Max	Min	Max	Min	Max	
$t_w$	Write Pulse Width to Guarantee Writing (Note 9)	(Figure 4)	20		20		35		ns
$t_{WSD}$	Data Setup Time prior to Write		5		5		5		ns
$t_{WHD}$	Data Hold Time after Write		5		5		5		ns
$t_{WSA}$	Address Setup Time prior to Write (Note 9)		5		5		5		ns
$t_{WHA}$	Address Hold Time after Write		5		5		5		ns
$t_{WSCS}$	Chip Select Setup Time prior to Write		5		5		5		ns
$t_{WHCS}$	Chip Select Hold Time after Write		5		5		5		ns
$t_{ZWS}$	Write Enable to HIGH Z			15		20		35	ns
$t_{WR}$	Write Recovery Time			15		20		40	ns
$t_{WR}$	Write Recovery Time (93425A)					25			ns

**Military**

**AC Electrical Characteristics** (Note 6)  $V_{CC} = 5.0V \pm 10\%$ ,  $GND = 0V$ ,  $T_C = -55^\circ C$  to  $+125^\circ C$

Symbol	Parameter	Conditions	93425-25		93425-40 93425A		93425-60 93425		Units
			Min	Max	Min	Max	Min	Max	
<b>READ TIMING</b>									
$t_{ACS}$	Chip Select Access Time	(Figures 3a, 3b)		20		25		45	ns
$t_{ZRCS}$	Chip Select to HIGH Z			20		25		50	ns
$t_{AA}$	Address Access Time (Note 8)			30		40		60	ns

<b>WRITE TIMING</b>									
Symbol	Parameter	Conditions	93425-25		93425-40 93425A		93425-60 93425		Units
			Min	Max	Min	Max	Min	Max	
$t_w$	Write Pulse Width to Guarantee Writing (Note 9)	(Figure 4)	25		25		40		ns
$t_{WSD}$	Data Setup Time prior to Write		5		5		5		ns
$t_{WHD}$	Data Hold Time after Write		5		5		5		ns
$t_{WSA}$	Address Setup Time prior to Write (Note 9)		5		10		15		ns
$t_{WHA}$	Address Hold Time after Write		5		5		5		ns
$t_{WSCS}$	Chip Select Setup Time prior to Write		5		5		5		ns
$t_{WHCS}$	Chip Select Hold Time after Write		5		5		5		ns
$t_{ZWS}$	Write Enable to HIGH Z			20		25		45	ns
$t_{WR}$	Write Recovery Time			20		25		50	ns

Notes on preceding page.

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**Commercial**

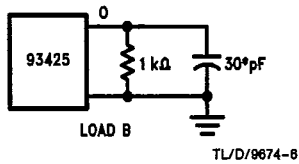
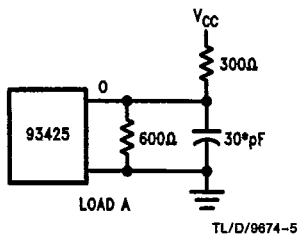
**AC Electrical Characteristics** (Note 6)  $V_{CC} = 5.0V \pm 5\%$ ,  $GND = 0V$ ,  $T_C = 0^\circ C$  to  $+75^\circ C$

Symbol	Parameter	Conditions	93L425-35		93L425-45 93L425A		93L425-60 93L425		Units
			Min	Max	Min	Max	Min	Max	
<b>READ TIMING</b>									
$t_{ACS}$	Chip Select Access Time	(Figures 3a, 3b)		25		30		40	ns
$t_{ZRCS}$	Chip Select to HIGH Z			25		30		40	ns
$t_{AA}$	Address Access Time (Note 8)			35		45		60	ns
<b>WRITE TIMING</b>									
$t_w$	Write Pulse Width to Guarantee Writing (Note 9)	(Figures 4a, 4b)	30		35		45		ns
$t_{WSD}$	Data Setup Time prior to Write		5		5		5		ns
$t_{WHD}$	Data Hold Time after Write		5		5		5		ns
$t_{WSA}$	Address Setup Time prior to Write (Note 9)		5		5		10		ns
$t_{WHA}$	Address Hold Time after Write		5		5		5		ns
$t_{WSCS}$	Chip Select Setup Time prior to Write		5		5		5		ns
$t_{WHCS}$	Chip Select Hold Time after Write		5		5		5		ns
$t_{ZWS}$	Write Enable to HIGH Z			20		25		45	ns
$t_{WR}$	Write Recovery Time			30		35		45	ns

**Military**

**AC Electrical Characteristics** (Note 6)  $V_{CC} = 5.0V \pm 10\%$ ,  $GND = 0V$ ,  $T_C = -55^\circ C$  to  $+125^\circ C$

Symbol	Parameter	Conditions	93L425-40		93L425-50 93L425A		93L425-70 93L425		Units
			Min	Max	Min	Max	Min	Max	
<b>READ TIMING</b>									
$t_{ACS}$	Chip Select Access Time	(Figures 3a, 3b)		30		35		45	ns
$t_{ZRCS}$	Chip Select to HIGH Z			25		30		50	ns
$t_{AA}$	Address Access Time (Note 8)			40		50		70	ns
<b>WRITE TIMING</b>									
$t_w$	Write Pulse Width to Guarantee Writing (Note 9)	(Figures 4a, 4b)	35		40		50		ns
$t_{WSD}$	Data Setup Time prior to Write		5		5		10		ns
$t_{WHD}$	Data Hold Time after Write		5		5		10		ns
$t_{WSA}$	Address Setup Time prior to Write (Note 9)		10		10		10		ns
$t_{WHA}$	Address Hold Time after Write		5		5		10		ns
$t_{WSCS}$	Chip Select Setup Time prior to Write		5		5		10		ns
$t_{WHCS}$	Chip Select Hold Time after Write		5		5		5		ns
$t_{ZWS}$	Write Enable to HIGH Z			25		30		45	ns
$t_{WR}$	Write Recovery Time			25		40		55	ns



Note: Load A is used for all production testing.

\*Includes jig and probe capacitance

FIGURE 1. AC Test Output Load

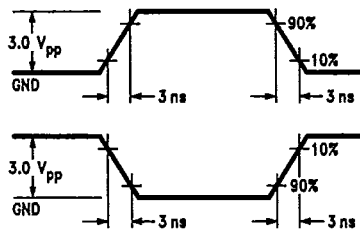
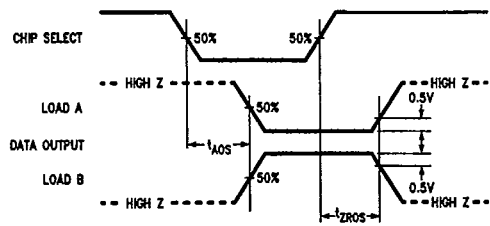
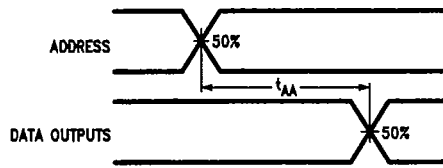


FIGURE 2. AC Test Input Levels



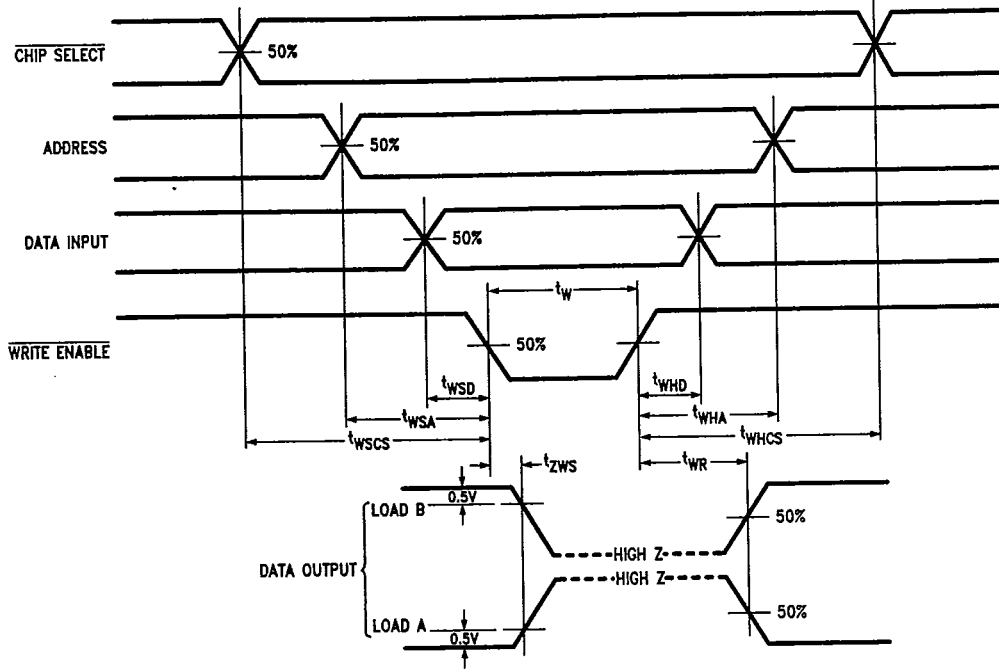
3a. Read Mode Propagation Delay from Chip Select



3b. Read Mode Propagation Delay from Address

FIGURE 3. Read Mode Timing

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Note 1: Timing Diagram represents one solution which results in an optimum cycle time. Timing may be changed to fit various applications as long as the worst case limits are not violated.

Note 2: Input voltage levels for worst case AC test are 3.0/0.0V.

FIGURE 4. Write Mode Timing